MINISTRY OF HEALTH MALAYSIA

MALAYSIAN STATISTICS ON MEDICINES

2011-2014

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MALAYSIAN STATISTICS ON MEDICINES (MSOM) 2011 - 2014

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PREFACE

Promoting equitable access to affordable essential medicines of good quality to improve health outcomes of the people is an important objective of Malaysia's National Medicines Policy. The Malaysian Statistics on Medicines (MSOM) continuously and systematically collect data on medicines utilisation in the hope to further improve their use as well as to provide a tool for better decision making in the allocation of healthcare resources for the Malaysian population.

For the MSOM project 2011-2014, data collection method was improved with the involvement of Quintiles IMS Malaysia. Due to these changes, the current set (2011-2014) of medicines utilisation data was not compared directly to data from the previous report (2009-2010). For meaningful time trends for example, comparisons and discussions were confined to utilisation data of the 4 years.

We are optimistic that the data collecting and processing methodologies will be constantly refined and future MSOM reports will continue to produce accurate and reliable statistics on Malaysian medicines consumption in a timely manner. We also foresee that there will be more chapters that can be deliberated in the future.

We sincerely hope that this MSOM 2011-2014 report is useful to relevant healthcare professionals, serving as a source of reference and baseline for embarking in future research or clinical audits towards promoting rational prescribing and effective medicines use.

We would like to thank all our colleagues who had worked very hard in ensuring the success of this MSOM project, all agencies and institutions that had helped in providing data, all expert panel members and everyone who has in one way or another contributed enthusiastically to the writing of this report. No matter how much we can do by ourselves on the national level, whether it be research or development, it is never enough. In a spirit of true cooperation, we must join in an action-oriented effort to uphold the rational use of medicine and healthcare of our nation.

Pharmaceutical Services Division
Ministry of Health Malaysia

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ABBREVIATIONS

5HT1	Serotonin
ACEI	Angiotensin Converting Enzyme Inhibitors
ACC/AHA	American College of Cardiology / American Heart Association
ACS	Acute Coronary Syndrome
ACTH	Adrenocorticotropic hormone
ADHD	Attention Deficit Hyperactivity Disorder
AED	Antiepileptics
APPL	Approve Product Purchase List
ARB	Angiotensin Receptor Blocker
ARI	Acute Respiratory Illness
ATC	Anatomical Therapeutic Chemical
BCG	Bacille Calmette-Guérin
BPH	Benign Prostate Hyperplasia
CAD	Coronary Artery Disease
CCB	Calcium Channel Blocker
COMT	Catechol-O-Methytransferase
COPD	Chronic Obstructive Pulmonary Disease
CNI	Calcineurin Inhibitors
CPG	Clinical Practice Guidelines
CRE	Carbapenem-resistant Enterobacteriaceae
CVD	Cardiovascular Disease
DDA	Dangerous Drugs Act
DDD	Defined Daily Dose
DPP-4	Dipeptidyl peptidase-4
DTaP	Diphtheria Tetanus and Pertussis
EAU	European Association of Urology
ESBL	Extended spectrum beta-lactamase
ESRD	End-Stage Renal Disease
EGFR	Epidermal Growth Factor Receptor
FDC	Fixed-Dose Combination
GLP-1	Glucagon-like peptide-1
GORD	Gastro-Oesophageal Reflux Disease
GVAP	Global Vaccine Action Plan
H2RA	H2 Receptor Antagonist
Hib	Haemophilus influenzae type b
HIV	Human Immunodeficiency Virus
HMG CoA	3-hydroxy-3-methyl-glutaryl-coenzyme A
HPV	Human Papillomavirus
HRT	Hormone Replacement Therapy
ICS	Inhaled Corticosteroid
IPD	Invasive Pneumococcal Disease
IPV	Inactivated Polio vaccine
LABA	Long-Acting Beta Agonists
LDL	Low Density Lipoprotein
LHRH	Lutenizing Hormone-Relasing Hormone
LMWH	Low-molecular-weight Heparin
LTRA	Leukotriene Receptor Antagonist
MAOI	Monoamine Oxidase A Inhibitor
MMR	Measles-mumps-rubella
MMRV	Measles-mumps-rubella-varicella
MOH	Ministry of Health
MSOM	Malaysian Statistics on Medicines
NASSA	Noradrenaline & Specific Serotonergic Antidepressant
NBUVB	Narrowband UVB
NCVD	National Cardiovascular Disease Database
NHMS	National Health Morbidity Survey
NIP	National Immunisation Programme
NMP	National Medicines Policy
NOAC	Newer Oral Anticoagulant
NSAIDs	Non Steroidal Anti-Inflammatory Drugs
OECD	Organisation for Economic Co-operation and Development
OTC	Over-the-Counter
PCC	Prothrombin Complex Concentrates
PCI	Percutaneous Coronary Intervention
PDE5	Phosphodiesterase Type-5
PPH	Postpartum Haemorrhage
PPI	Proton Pump Inhibitor
PUVA	Psoralen and Ultraviolet A
RAAS	Renin-Angiotensin-Aldosterone System
rHuEPO	Recombinant Human Erythropoietin
SABA	Short-Acting Beta Agonist
SAMA	Short-Acting Muscarinic Antagonist
SGLT2	Sodium-glucose Co-transporter 2
SPC	Single Pill Combination
SNRI	Serotonin-Norepinephrine Reuptake Inhibitor
SSRI	Selective Serotonin Reuptake Inhibitor
T3	Liothyronine sodium
T4	Levothyroxine
TB	Tuberculosis
TCA	Tricyclic Antidepressant
TNF	Tumor Necrosis Factor
UFH	Unfractionated Heparin
URTI	Upper Respiratory Tract Infection
WFH	World Federation of Haemophilia
WHO	World Health Organisation

CONTENTS

ABOUT THE MALAYSIAN STATISTICS ON MEDICINES

The Malaysian Statistics on Medicines (MSOM) is a publication produced by the Pharmaceutical Services Division, Ministry of Health Malaysia (PSD, MOH). The project was started in 2006 as the National Medicines Use Survey (NMUS) in which several surveys were conducted to estimate medicines utilisation and to report on patterns of medicines utilisation in the country. Since then, the initiative has evolved with improvements on the methodology to produce a more comprehensive report on annual utilisation of medicines in Malaysia in both public and private sectors.

The MSOM is designed to support the implementation of our National Medicines Policy (NMP). The objective of NMP is to promote equitable access and rational use of safe, effective and affordable medicines ultimately leading to improved health for all Malaysians. In supporting this, the MSOM provides the functional capacity for the collection, analysis, reporting and dissemination of data on drug utilisation in Malaysia.

Utilisation of medicines in this report is estimated from procurement and sales data, with assumption that medicines purchased are utilised. Actual data on medicines utilisation could not be obtained due to unavailability of a central prescribing database at this point of time.

Purpose of Medicines Utilisation Study

The availability of high quality, reliable and timely information on medicines use is crucial for any discussion on improving the use of medicines.

The objective of this utilisation study is therefore to quantify the current state and time trends of medicines utilisation at different sectors and various levels of the healthcare system.

Routinely compiled statistics on medicines utilisation have many uses, such as:

1. Estimate the consumption of medicines and describe pattern of medicines use through assessing which alternative drugs are being used for particular conditions and to what extent.
2. Estimate the number of medicine users and rate of exposure of population to different medicines.
3. Estimate on the basis of known disease epidemiology to what extent medicines are under or over-used.
4. Relate the number of adverse drug reactions reported to the pharmacovigilance system to the number of people exposed to the medicines in order to assess the magnitude of the problem, or to estimate the degree of under-reporting of adverse events.
5. Provide a crude estimate of disease prevalence based on its utilisation rate.
6. Estimate expenditure on pharmaceuticals, which constitutes a significant proportion of our healthcare expenditure.
7. Monitor and evaluate the effects of interventions to improve prescribing pattern/use of medicines.

Anatomical Therapeutic Chemical Code by World Health Organisation (WHO ATC)

Statistics on use of medicines reported are presented using the ATC classification system, and the unit of measurement is expressed in DDD. This is recommended by WHO to be used for drug utilisation research and for the purpose of comparing drug consumption statistics between countries, between regions or population groups within country and to evaluate trends in drug use over time.

Structure of the ATC Classification system

In this system, medicines are divided into different groups according to the organ or system on which the drugs act, and on chemical, pharmacological and therapeutic properties.

Medicines are classified in groups at five different levels as follows,

Level	Group and Subgroups
1	Anatomical main group
2	Therapeutic subgroup
3	Pharmacological subgroup
4	Chemical subgroup
5	Chemical substance

In total, there are 14 anatomical main groups, with a designated alphabet assigned,

ATC Level 1	Anatomical Group
A	Alimentary tract and metabolism
B	Blood and blood forming organs
C	Cardiovascular system
D	Dermatologicals
G	Genito urinary system and sex hormones
H	Systemic hormonal preparations, excluding sex hormones and insulins
J	Antiinfectives for systemic use
L	Antineoplastic and immunomodulating agents
M	Musculo-skeletal system
N	Nervous system
P	Antiparasitic products, insecticides and repellents
R	Respiratory system
S	Sensory organs
V	Various

For example, simvastatin is coded as C10AA01. The structure of this code is as follows,

Level	Code	Group and subgroups
1	C	Cardiovascular system
2	C10	Lipid modifying agents
3	C10A	Lipid modifying agents, plain
4	C10AA	HMG CoA reductase inhibitors
5	C10AA01	Simvastatin

Concept of the Defined Daily Dose (DDD)

Measurement unit for medicines use adopted in this report is the DDD. The DDD is the assumed average maintenance dose per-day for a drug used for its main indication in adults. The DDD is simply a technical measure of drug utilisation, it is not necessarily agree with the recommended or prescribed daily dose. Doses for individual patients and patient groups will often differ from DDD. The DDD is often a compromise based on review of the available information about doses used in various countries. DDD may even be a dose rarely prescribed because it is an average of two or more commonly used doses.

Statistics on medicines use in this report are presented for most drugs as numbers of DDDs per-1,000 inhabitants per-day. The DDDs per-1,000 inhabitants per-day provides a rough estimate of the proportion of population treated daily with a drug. For example, the figure 10 DDDs per-1,000 inhabitants per-day indicates that 10 in 1,000 or 1% of the population was prescribed or administered a certain drug or group of drugs every day in a particular year, on the average.

DDDs per-1,000 inhabitants per-day is most useful for drugs used in the treatment of chronic diseases and especially when there is a good agreement between the average prescribed daily dose and the DDD. For most drugs, number of DDDs per-1,000 inhabitants per-day are calculated for the total population, in which all ages and sex groups are included. Where a drug use is limited to particular age or sex groups, then it will be more meaningful to express the figure for the relevant age-sex groups only. For example, DDDs per-1,000 children age below 12 years old per-day, or DDDs per-1,000 women in reproductive age groups per-day.

For anti-infective or other drugs normally used for short duration, the medicine utilisations are presented as DDD per-inhabitant per-year. This gives an estimate of the number of days for one case is on average treated annually. For example, 5 DDDs per-inhabitant per-year indicates that the utilisation is equivalent to the treatment of every inhabitant with a 5-day course in the year.

While interpreting the statistics on medicine utilisation, a few limitations shall be taken into consideration, these include,

i. A medicine may have several indications while the DDD is based on the main indication in adults.
ii. Medicines procured, as presented here, may not necessarily be consumed.
iii. DDD may be difficult to be assigned or not assigned at all for certain medicines. This is especially true for medicines with multiple ingredients, topical products, antineoplastic drugs and anaesthetic agents.
iv. Medicines newly introduced into the market may not have ATC and DDD assigned.
v. The DDD assigned to a drug is primarily based on other countries' experience and may not reflect the average prescribed adult dose in Malaysia

For most parts of this report, only drugs with WHO-assigned DDDs are included in the utilisation statistics. However, a few groups of drug which do not have WHO-assigned DDDs, namely the antineoplastics, dermatologicals, ophthalmologicals, otologicals, cough and cold combinations and vaccines were given DDDs based on the WHO general guidelines. This permits presentation of the national utilisation and patterns of use, relative to drugs within the respective groups only.

METHODOLOGY

Project Scope

Medicines selected to be included in this report are pharmaceutical products of great interest to healthcare professionals in Malaysia. All medicines classified as poisons in the Malaysian Poison Act 1952 (revised 1989)[1] was included in the report. Other pharmaceutical products included are a number of over-the-counter medicines and supplements namely paracetamol, vitamin K, acetylsalicylic acid, calcitriol and alfacalcidol.

Data Source

Data were collected from several different sources from 2011 to 2014. In the public sector particularly MOH facilities, medicines are purchased through two main channels. The primary channel is via 'Central Purchase' which is provided by an appointed supplier contracted to supply selected pharmaceutical products (the Approved Product Purchase List or APPL). The procurement records of all purchases made by MOH facilities were collected directly from the appointed supplier. For medicines that are not supplied via this primary channel, they will be purchased separately by individual facility from a range of suppliers. These procurement records were collected from the individual facilities.

Medicines utilisation in the private sector was estimated using sales data from pharmaceutical companies and distributors/suppliers collected through Quintiles IMS Malaysia. The sales data captured 80% of the total pharmaceutical market and the remaining data coverage (20%) were estimated from panel sample of private hospitals, pharmacies and GP clinics maintained by Quintiles IMS Malaysia. This panel sample consists of 65 pharmacies, 12 private hospitals and 164 GP clinics. Data extraction was made on June 2015.

Data Processing and Assigning Anatomical Therapeutic Chemical (ATC) Code

The data collected were processed and consolidated into one single dataset. Pharmaceutical products not included in scope of analysis were removed from dataset. ATC code set by World Health Organisation (WHO ATC) was assigned to every medicine based on generic name and drug class. Consequently, the accompanying defined daily dose (DDD) of each ATC code and unit of measurement for DDD, was assigned to respective medicine based on the route of administration.

For products with combination of active ingredients and medicines that do not have DDD, the DDD was determined and assigned in accordance to 'Guidelines for ATC classification and DDD assignment'[3]. This was followed by several cycles of quality control (QC) to ensure accuracy of the final data.

Data Analysis

Statistics on Medicine Utilisation

First step of analysis was to calculate total dose for every pharmaceutical product. Total dose of a pharmaceutical product in every year is total number of packs procured multiply by the total dose per-pack. This was followed by summation of total dose for all pharmaceutical products for a particular drug according to ATC code. Lastly, statistics on medicine use is determined, either in number of DDDs per-1,000 inhabitants per-day or number of DDDs per-inhabitant per-year for every ATC code.

$$\textbf{DDDs per-1,000 inhabitants per-day} = \frac{\hat{T} \times 1{,}000}{\textbf{DDD} \times \textbf{P} \times 365}$$

$$\textbf{DDDs per-inhabitant per-year} = \frac{\hat{T}}{\textbf{DDD} \times \textbf{P}}$$

$\hat{T}$	An estimate of the total dose of the drug by ATC code utilised in the year under consideration.
DDD	DDD assigned for the drug according to WHO ATC/DDD system.
P	Mid-year population of Malaysia.
365	Refers to 365 days in a year.

In this analysis, mid-year population[4] taken for every year are as follows,

Year	Mid-year population, P
2011	29,062,000
2012	29,510,000
2013	29,915,300
2014	30,261,700

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CHAPTER 1: USE OF MEDICINES IN MALAYSIA

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Medicine use information is essential in promoting rational use of medications in a society. Inappropriate use of medicines discovered through medicine utilisation studies may trigger educational or policy interventions. Consequently, monitoring of medicine use can provide information on the success of these interventions.

In this chapter, we reported and discussed the national estimates for use of medicines in Malaysia from 2011 to 2014. The overall data on medicine utilisation is presented in several ranking tables; by medicine therapeutic groups and individual drug generic names. Overall result showed the total utilisation of medicines in the country had increased by 31.4% from 433.47 DDD/1,000 inhabitants/day in 2011 to 569.55 DDD/1,000 inhabitants/day in 2014.

Figure 1.1 showed that there was no change for the top 10 therapeutic groups of drugs utilised over the four-year period (2011-2014), except for antithrombotic drugs (B01) that have moved into the top 10 list from 2013 onwards displacing anti-inflammatory and antirheumatic products (M01). The trend was mainly caused by a significant increased in the public sector utilisation of antithrombotic. Among the therapeutic groups, utilisation for drugs used in diabetes (A10) remained highest throughout 2011 to 2014 (Table 1.1 to 1.4). An increased usage of 45.9% (from 55.15/1,000 inhabitants /day to 80.49/1,000 inhabitants /day) was seen between 2011 and 2014 from this therapeutic group. The increase was more apparent in the public sector (53.4%) compared to 14.3% in the private sector. This essentially highlighted the magnitude of burden in managing diabetes in the public sector which corresponded to the increase in prevalence of diabetes from 7.2% to 8.3% of known diabetes in 2011[1] and 2015[2].

Other major therapeutic groups that were consistently in the top 10 included calcium channel blockers (C08), drugs acting on the renin-angiotensin system (C09), beta blocking agents (C07), diuretics (C03) and lipid modifying agents (C10). These medicines which are predominantly used in the treatment of non-communicable diseases topped the list after drugs used in diabetes (A10). An increasing trend was also observed in the use of these therapeutic groups from 2011 to 2014 with larger increased seen in the public sector. For example, there was an increase of 48.7% of calcium channel blockers utilisation and 47.3% of lipid modifying agents during the same four-year period in the public sector. Other therapeutic groups that are in the top 10 list included drugs for obstructive airways disease (R03), antithrombotic agents (B01) and antihistamines for systemic use (R06).

Among all the therapeutic groups, between 2011 and 2014, a substantial increase in utilisation was observed for the ophthalmological and otological preparations (S03), urologicals (G04) and antivirals for systemic use (J05) at 97.1%, 77.0% and 56.3% respectively. On the other hand, a substantial decrease in utilisations was seen in antimycotics for systemic use (J02) and antiobesity preparations (A08) with 40.6% and 29.6% reductions, respectively. Although the actual reason for these changes may not be exactly determined, these may indicate possible changes in clinical practice and emergent of new medicines that are able to treat more conditions.

An average of 66% from the total utilisation of therapeutic groups was contributed by the public sector. These finding correlates with report from the National Medical Care Statistics on Primary Care 2014 whereby patient's attendance in public clinic were seen three times more than the private clinic[3]. One major difference in medicine utilisation trend observed between public and private sector was medicines to treat chronic conditions and non-communicable diseases like diabetes, hypertension and dyslipidaemia. In the private sector, the type of medicines used were mainly for treating acute or non-chronic conditions including anti-inflammatory and anti-rheumatics, anti-bacterial for systemic use and corticosteroids, dermatological preparations and nasal preparations and cough and cold preparations. These therapeutic groups of drugs also had higher usage compared to public sector. For example, drugs such as antibacterial for systemic use, nasal preparation, cough and cold preparations, drugs for functional gastrointestinal disorder and corticosteroid and dermatological preparations were used up to two to three times more in private sectors. This situation may indicate that patients with chronic condition are being treated more in public sector. Meanwhile, patients with mild and acute conditions prefer seeking treatment at private sector[3].

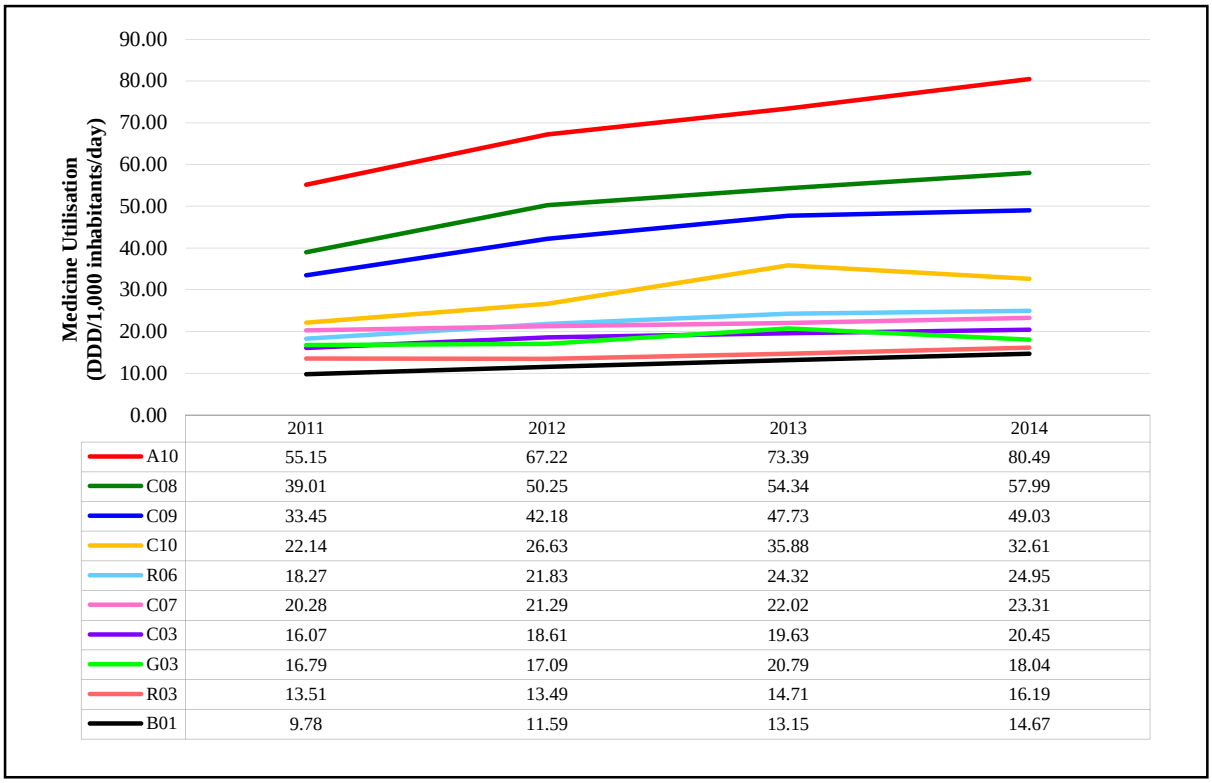
Overall, there was not much difference in ranking for the top 10 medicines utilisation throughout 2011 to 2014 (Figure 1.2). The top 10 medicines utilised were drugs for diabetes and cardiovascular disorders that consisted

of amlodipine, gliclazide, perindopril and metformin, which has also increased over the years (Table 1.5 to 1.8). Amlodipine was found to be the most utilised drug throughout 2011 to 2014. The high utilisation of amlodipine was due to change in prescribing category in the MOH formulary listing from A to B and the introduction of generic amlodipine in the public sector[4]. Gliclazide remained the second highest drug utilised until year 2014. Due to its characteristic with less hypoglycaemic effect, gliclazide was a more preferred choice compared to glibenclamide. Nevertheless, in terms of prescribing pattern, in treating diabetic condition, metformin is still the most prescribed drugs followed by gliclazide in antidiabetic group as reported by national surveys conducted by the Ministry of Health i.e. National Medical Care Statistics (Primary Care) in year 2014[3] and Drug Utilisation Study in MOH Diabetic Patients 2010[5].

There were a few medicines that showed tremendous increased (more than 100%) in utilisation from year 2011 to 2014 such as simvastatin, combination drug metformin plus sulphonylureas, medroxyprogesterone and chloramphenicol. The increased utilisation in simvastatin revealed a change of practise in prescribing simvastatin for dyslipidemia when lovastatin was removed from the Ministry of Health Formulary in 2013[4]. This caused approximately 33.4 % reduction in use of lovastatin from year 2011 to 2014. Other drugs which also demonstrated sudden decreased of utilisation were nifedipine (52.2%) and glibenclamide (37.4%). This could be due to changes in clinical practice as a result of emergence of newer or better choices for treatment.

In comparison with other countries such as Australia, in 2014, their top 10 medicines by utilisation was dominated by cardiovascular drugs. Meanwhile antidiabetic drugs and cardiovascular drugs both appeared among the top 10 drugs listing in Malaysia. Ranking for individual drugs for Malaysia are differed somewhat from that of Australia as shown in Table 1.9. This could be explained by the high prevalence of non-communicable diseases in Malaysia compared to Australia[6].

In conclusion, the overall utilisation pattern of medicines in the country for 2011-2014 appeared to be in accordance with the prevalence of chronic diseases reported in NHMS 2015.



	2011	2012	2013	2014
A10	55.15	67.22	73.39	80.49
C08	39.01	50.25	54.34	57.99
C09	33.45	42.18	47.73	49.03
C10	22.14	26.63	35.88	32.61
R06	18.27	21.83	24.32	24.95
C07	20.28	21.29	22.02	23.31
C03	16.07	18.61	19.63	20.45
G03	16.79	17.09	20.79	18.04
R03	13.51	13.49	14.71	16.19
B01	9.78	11.59	13.15	14.67

Figure 1.1: Top 10 most utilised therapeutic groups in year 2011-2014. (A10, Drugs used in diabetes; C08, Calcium channel blockers; C09, Agents acting on the renin-angiotensin system; C10, Lipid modifying agents; R06, Antihistamines for systemic use; C07, Beta blocking agents; C03, Diuretics; G03, Sex hormones and modulators of the genital system; R03, Drugs for obstructive airway diseases; B01, Antithrombotic agents)

Table 1.1: Total utilisation of medicines in DDD/1,000 inhabitants/day, 2011-2014.

Sector	2011	2012	2013	2014
Public	283.10	344.95	376.56	400.15
Private	150.37	169.13	176.95	169.40
Total	**433.47**	**514.08**	**553.51**	**569.55**

Table 1.2: Top 50 therapeutic groups, utilisation in DDD/1,000 inhabitants/day, 2014.

Rank	ATC	Therapeutic Group	Public	Private	Total
1	**A10**	Drugs used in diabetes	68.4853	12.0008	**80.4861**
2	**C08**	Calcium channel blockers	50.8156	7.1779	**57.9936**
3	**C09**	Agents acting on the renin-angiotensin system	38.0626	10.9658	**49.0284**
4	**C10**	Lipid modifying agents	24.4167	8.1967	**32.6134**
5	**R06**	Antihistamines for systemic use	7.2201	17.7338	**24.9539**
6	**C07**	Beta blocking agents	18.3914	4.9224	**23.3138**
7	**C03**	Diuretics	18.0767	2.3732	**20.4500**
8	**G03**	Sex hormones and modulators of the genital system	8.0562	9.9807	**18.0368**
9	**R03**	Drugs for obstructive airway diseases	10.5817	5.6064	**16.1881**
10	**B01**	Antithrombotic agents	11.2196	3.4552	**14.6748**
11	**M01**	Antiinflammatory and antirheumatic products	3.1336	9.6405	**12.7741**
12	**D07**	Corticosteroids, dermatological preparations	3.1329	7.7998	**10.9327**
13	**J01**	Antibacterials for systemic use	3.8052	7.0650	**10.8702**
14	**A02**	Drugs for acid related disorders	6.8232	3.5494	**10.3726**
15	**N02**	Analgesics	4.5198	4.4493	**8.9691**
16	**D01**	Antifungals for dermatological use	1.3250	5.8705	**7.1954**
17	**S01**	Ophthalmologicals	3.7216	2.6968	**6.4184**
18	**H02**	Corticosteroids for systemic use	2.7012	3.4932	**6.1944**
19	**C01**	Cardiac therapy	4.3420	1.3592	**5.7012**
20	**R01**	Nasal preparations	1.2839	3.7139	**4.9977**
21	**N05**	Psycholeptics	3.5112	1.2796	**4.7908**
22	**B03**	Antianaemic preparations	4.1404	0.3797	**4.5201**
23	**R05**	Cough and cold preparations	1.0727	2.2570	**3.3297**
24	**C02**	Antihypertensives	2.8712	0.2863	**3.1574**
25	**H03**	Thyroid therapy	2.0645	1.0820	**3.1465**
26	**G04**	Urologicals	2.1493	0.8467	**2.9960**
27	**D06**	Antibiotics and chemotherapeutics for dermatological use	1.5382	1.4356	**2.9738**
28	**A03**	Drugs for functional gastrointestinal disorders	0.7828	1.7223	**2.5051**
29	**N06**	Psychoanaleptics	1.6227	0.8442	**2.4669**
30	**N07**	Other nervous system drugs	1.3684	1.0679	**2.4364**
31	**N03**	Antiepileptics	1.7866	0.5276	**2.3142**
32	**M04**	Antigout preparations	1.0931	1.1432	**2.2364**
33	**J05**	Antivirals for systemic use	1.1961	0.1966	**1.3927**
34	**S03**	Ophthalmological and otological preparations	0.0683	1.2008	**1.2691**
35	**A11**	Vitamins	1.1424	0.1195	**1.2619**
36	**J07**	Vaccines	1.0131	0.2102	**1.2233**
37	**M03**	Muscle relaxants	0.1779	0.9150	**1.0929**
38	**N04**	Anti-parkinson drugs	0.8481	0.1471	**0.9951**
39	**D10**	Anti-acne preparations	0.1629	0.7794	**0.9423**
40	**J04**	Antimycobacterials	0.8375	0.0930	**0.9305**
41	**M05**	Drugs for treatment of bone diseases	0.3133	0.6097	**0.9230**
42	**D11**	Other dermatological preparations	0.0741	0.7568	**0.8309**
43	**L04**	Immunosuppressants	0.4721	0.1579	**0.6300**
44	**A08**	Antiobesity preparations, excluding diet products	< 0.0001	0.5941	**0.5941**
45	**L02**	Endocrine therapy	0.3379	0.1904	**0.5283**
46	**P01**	Antiprotozoals	0.2270	0.0886	**0.3156**
47	**S02**	Otologicals	0.2257	0.0667	**0.2924**
48	**J02**	Antimycotics for systemic use	0.0631	0.2208	**0.2839**
49	**G01**	Gynecological antiinfectives and antiseptics	0.0760	0.1652	**0.2412**
50	**D05**	Antipsoriatics	0.1358	0.0819	**0.2177**

Table 1.3: Top 50 therapeutic groups, utilisation in DDD/1,000 inhabitants/day, 2013.

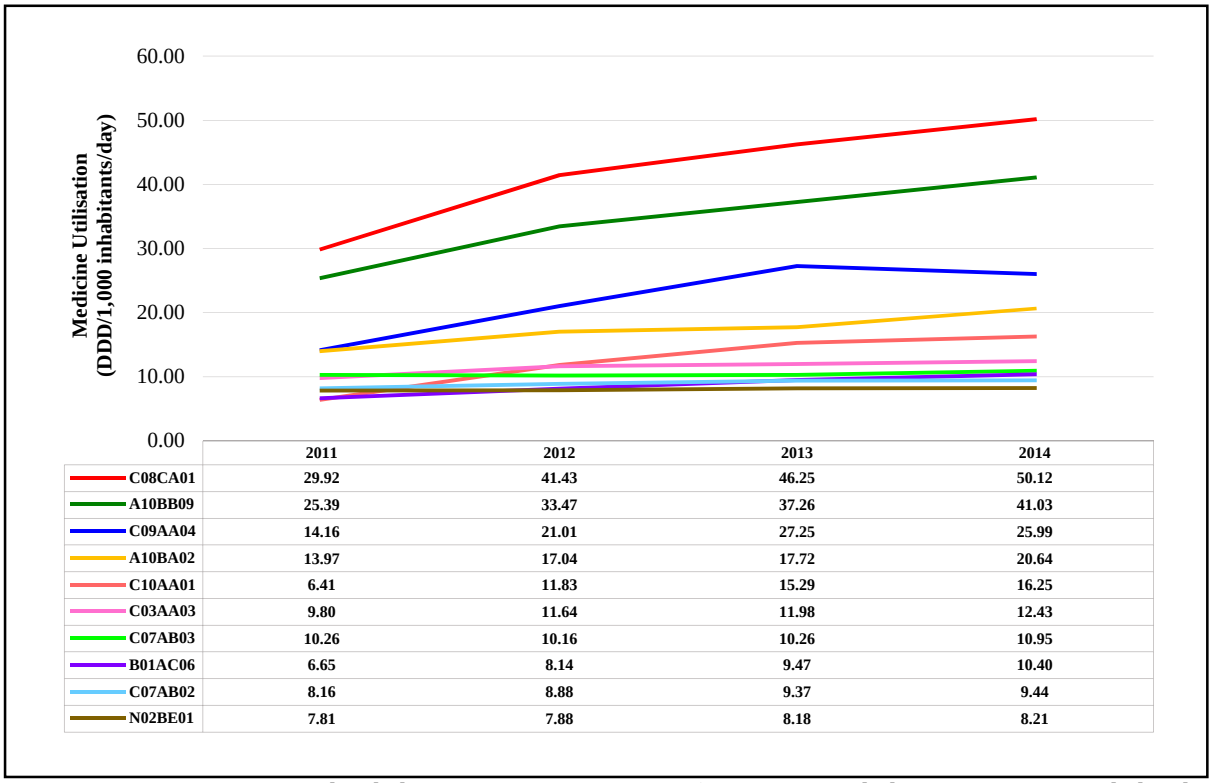
Rank	ATC	Therapeutic Group	Public	Private	Total
1	**A10**	Drugs used in diabetes	62.3295	11.0561	**73.3856**
2	**C08**	Calcium channel blockers	47.2068	7.1302	**54.3370**
3	**C09**	Agents acting on the renin-angiotensin system	37.5544	10.1768	**47.7312**
4	**C10**	Lipid modifying agents	28.0783	7.8003	**35.8786**
5	**R06**	Antihistamines for systemic use	6.1154	18.2013	**24.3167**
6	**C07**	Beta blocking agents	17.1612	4.8586	**22.0199**
7	**G03**	Sex hormones and modulators of the genital system	9.6997	11.0938	**20.7934**
8	**C03**	Diuretics	17.1145	2.5200	**19.6344**
9	**R03**	Drugs for obstructive airway diseases	9.5353	5.1714	**14.7067**
10	**B01**	Antithrombotic agents	9.5891	3.5571	**13.1462**
11	**M01**	Antiinflammatory and antirheumatic products	3.0119	10.0552	**13.0671**
12	**J01**	Antibacterials for systemic use	3.7084	7.1820	**10.8904**
13	**D07**	Corticosteroids, dermatological preparations	2.7146	7.8180	**10.5325**
14	**A02**	Drugs for acid related disorders	5.8073	3.5127	**9.3200**
15	**N02**	Analgesics	3.9345	4.9540	**8.8885**
16	**D01**	Antifungals for dermatological use	1.6055	5.7695	**7.3750**
17	**H02**	Corticosteroids for systemic use	2.4353	3.7256	**6.1609**
18	**S01**	Ophthalmologicals	3.2135	2.2903	**5.5038**
19	**C01**	Cardiac therapy	3.7113	1.3710	**5.0822**
20	**R01**	Nasal preparations	1.1722	3.9081	**5.0804**
21	**N05**	Psycholeptics	3.1591	1.4250	**4.5841**
22	**B03**	Antianaemic preparations	3.9167	0.3735	**4.2902**
23	**R05**	Cough and cold preparations	1.0071	2.2931	**3.3002**
24	**D06**	Antibiotics and chemotherapeutics for dermatological use	1.1689	1.5344	**2.7033**
25	**C02**	Antihypertensives	2.4367	0.2621	**2.6988**
26	**H03**	Thyroid therapy	1.7004	0.9859	**2.6863**
27	**G04**	Urologicals	1.6817	0.7637	**2.4454**
28	**A03**	Drugs for functional gastrointestinal disorders	0.6235	1.7118	**2.3352**
29	**N06**	Psychoanaleptics	1.4740	0.8309	**2.3049**
30	**N07**	Other nervous system drugs	1.1654	1.1252	**2.2906**
31	**N03**	Antiepileptics	1.8256	0.3536	**2.1792**
32	**M04**	Antigout preparations	1.0477	0.9497	**1.9973**
33	**D10**	Anti-acne preparations	0.1743	1.3885	**1.5629**
34	**M03**	Muscle relaxants	0.1479	0.9962	**1.1440**
35	**A11**	Vitamins	1.0260	0.1003	**1.1263**
36	**J07**	Vaccines	0.8303	0.2380	**1.0683**
37	**J05**	Antivirals for systemic use	0.8101	0.1815	**0.9917**
38	**S03**	Ophthalmological and otological preparations	0.0718	0.8885	**0.9603**
39	**M05**	Drugs for treatment of bone diseases	0.2992	0.6074	**0.9066**
40	**J04**	Antimycobacterials	0.7890	0.1174	**0.9064**
41	**N04**	Anti-parkinson drugs	0.7518	0.1351	**0.8869**
42	**D11**	Other dermatological preparations	0.0425	0.7705	**0.8131**
43	**L04**	Immunosuppressants	0.4509	0.1547	**0.6056**
44	**J02**	Antimycotics for systemic use	0.0564	0.5082	**0.5645**
45	**A08**	Antiobesity preparations, excluding diet products	-	0.5525	**0.5525**
46	**L02**	Endocrine therapy	0.3381	0.1794	**0.5175**
47	**S02**	Otologicals	0.2674	0.0574	**0.3248**
48	**P01**	Antiprotozoals	0.1962	0.1141	**0.3103**
49	**D05**	Antipsoriatics	0.0983	0.1041	**0.2025**
50	**G01**	Gynecological antiinfectives and antiseptics	0.0492	0.1365	**0.1856**

Table 1.4: Top 50 therapeutic groups, utilisation in DDD/1,000 inhabitants/day, 2012.

Rank	ATC	Therapeutic Group	Public	Private	Total
1	**A10**	Drugs used in diabetes	56.5723	10.6507	**67.2230**
2	**C08**	Calcium channel blockers	43.7260	6.5248	**50.2507**
3	**C09**	Agents acting on the renin-angiotensin system	32.3847	9.7954	**42.1801**
4	**C10**	Lipid modifying agents	19.5402	7.0896	**26.6297**
5	**R06**	Antihistamines for systemic use	5.7048	16.1294	**21.8342**
6	**C07**	Beta blocking agents	16.1966	5.0940	**21.2906**
7	**C03**	Diuretics	16.0368	2.5773	**18.6141**
8	**G03**	Sex hormones and modulators of the genital system	5.4289	11.6633	**17.0921**
9	**R03**	Drugs for obstructive airway diseases	8.6524	4.8363	**13.4887**
10	**M01**	Antiinflammatory and antirheumatic products	2.8779	10.1383	**13.0162**
11	**B01**	Antithrombotic agents	8.2519	3.3386	**11.5905**
12	**J01**	Antibacterials for systemic use	3.6324	7.1103	**10.7427**
13	**D07**	Corticosteroids, dermatological preparations	2.4285	7.0580	**9.4865**
14	**N02**	Analgesics	4.1076	4.5229	**8.6305**
15	**A02**	Drugs for acid related disorders	5.0828	3.1604	**8.2432**
16	**H02**	Corticosteroids for systemic use	2.3662	5.3110	**7.6772**
17	**D01**	Antifungals for dermatological use	1.3812	5.6424	**7.0237**
18	**N05**	Psycholeptics	3.3280	1.7566	**5.0847**
19	**R01**	Nasal preparations	1.1777	3.8864	**5.0641**
20	**C01**	Cardiac therapy	3.5609	1.2493	**4.8102**
21	**B03**	Antianaemic preparations	4.1926	0.3550	**4.5476**
22	**S01**	Ophthalmologicals	2.3701	2.0432	**4.4133**
23	**R05**	Cough and cold preparations	0.7443	2.2242	**2.9685**
24	**D06**	Antibiotics and chemotherapeutics for dermatological use	1.1185	1.5706	**2.6891**
25	**H03**	Thyroid therapy	1.6192	1.0017	**2.6209**
26	**A03**	Drugs for functional gastrointestinal disorders	0.6819	1.9321	**2.6140**
27	**C02**	Antihypertensives	2.1599	0.2877	**2.4476**
28	**N07**	Other nervous system drugs	1.3673	1.0371	**2.4044**
29	**G04**	Urologicals	1.4470	0.7756	**2.2226**
30	**N06**	Psychoanaleptics	1.2077	0.7826	**1.9903**
31	**N03**	Antiepileptics	1.5104	0.3479	**1.8583**
32	**M04**	Antigout preparations	0.8398	0.9562	**1.7960**
33	**J07**	Vaccines	0.8593	0.2545	**1.1138**
34	**J05**	Antivirals for systemic use	0.9237	0.1676	**1.0913**
35	**M03**	Muscle relaxants	0.1287	0.8925	**1.0211**
36	**D10**	Anti-acne preparations	0.1569	0.8479	**1.0049**
37	**A08**	Antiobesity preparations, excluding diet products	0.0002	0.8913	**0.8915**
38	**A11**	Vitamins	0.7766	0.1124	**0.8890**
39	**J04**	Antimycobacterials	0.8127	0.0734	**0.8861**
40	**S03**	Ophthalmological and otological preparations	0.0868	0.7849	**0.8718**
41	**D11**	Other dermatological preparations	0.0590	0.7927	**0.8517**
42	**N04**	Anti-parkinson drugs	0.7081	0.1261	**0.8342**
43	**M05**	Drugs for treatment of bone diseases	0.2804	0.5056	**0.7860**
44	**L04**	Immunosuppressants	0.3845	0.1388	**0.5233**
45	**J02**	Antimycotics for systemic use	0.0583	0.4277	**0.4860**
46	**L02**	Endocrine therapy	0.2632	0.1647	**0.4280**
47	**P01**	Antiprotozoals	0.2241	0.1166	**0.3407**
48	**G01**	Gynecological antiinfectives and antiseptics	0.0606	0.1685	**0.2291**
49	**S02**	Otologicals	0.1441	0.0575	**0.2016**
50	**D05**	Antipsoriatics	0.0807	0.0953	**0.1760**

Table 1.5: Top 50 therapeutic groups, utilisation in DDD/1,000 inhabitants/day, 2011.

Rank	ATC	Therapeutic Group	Public	Private	Total
1	**A10**	Drugs used in diabetes	44.6470	10.5030	**55.1500**
2	**C08**	Calcium channel blockers	33.3980	5.6099	**39.0079**
3	**C09**	Agents acting on the renin-angiotensin system	23.9350	9.5105	**33.4455**
4	**C10**	Lipid modifying agents	15.1727	6.9663	**22.1389**
5	**C07**	Beta blocking agents	15.3301	4.9541	**20.2842**
6	**R06**	Antihistamines for systemic use	5.3622	12.9081	**18.2703**
7	**G03**	Sex hormones and modulators of the genital system	5.4836	11.3107	**16.7943**
8	**C03**	Diuretics	13.4878	2.5774	**16.0652**
9	**R03**	Drugs for obstructive airway diseases	9.3762	4.1371	**13.5133**
10	**M01**	Antiinflammatory and antirheumatic products	2.8995	8.2631	**11.1626**
11	**B01**	Antithrombotic agents	6.8598	2.9235	**9.7833**
12	**J01**	Antibacterials for systemic use	3.4935	6.0941	**9.5876**
13	**D07**	Corticosteroids, dermatological preparations	2.6257	6.1330	**8.7587**
14	**N02**	Analgesics	3.8925	4.5350	**8.4275**
15	**A02**	Drugs for acid related disorders	4.1172	2.8107	**6.9278**
16	**D01**	Antifungals for dermatological use	1.2917	4.5498	**5.8415**
17	**H02**	Corticosteroids for systemic use	2.0067	2.9852	**4.9919**
18	**R01**	Nasal preparations	0.9970	3.6741	**4.6711**
19	**C01**	Cardiac therapy	3.3280	1.2840	**4.6120**
20	**N05**	Psycholeptics	2.7776	1.4825	**4.2601**
21	**B03**	Antianaemic preparations	3.6723	0.3249	**3.9972**
22	**S01**	Ophthalmologicals	2.0611	1.9255	**3.9866**
23	**R05**	Cough and cold preparations	0.7273	2.3049	**3.0323**
24	**C02**	Antihypertensives	2.2490	0.2226	**2.4716**
25	**H03**	Thyroid therapy	1.4230	0.9581	**2.3811**
26	**D06**	Antibiotics and chemotherapeutics for dermatological use	1.0251	1.3178	**2.3429**
27	**A03**	Drugs for functional gastrointestinal disorders	0.5601	1.6629	**2.2230**
28	**N07**	Other nervous system drugs	1.2638	0.8148	**2.0785**
29	**N06**	Psychoanaleptics	1.0664	0.6824	**1.7488**
30	**M04**	Antigout preparations	0.9254	0.8085	**1.7339**
31	**N03**	Antiepileptics	1.4066	0.3009	**1.7074**
32	**G04**	Urologicals	0.9935	0.6988	**1.6922**
33	**J07**	Vaccines	0.8462	0.2657	**1.1119**
34	**M03**	Muscle relaxants	0.1086	0.7926	**0.9013**
35	**J04**	Antimycobacterials	0.8146	0.0801	**0.8947**
36	**J05**	Antivirals for systemic use	0.7009	0.1902	**0.8911**
37	**D10**	Anti-acne preparations	0.1063	0.7838	**0.8900**
38	**D11**	Other dermatological preparations	0.0358	0.8194	**0.8552**
39	**A11**	Vitamins	0.7486	0.1002	**0.8488**
40	**A08**	Antiobesity preparations, excluding diet products	0.0000	0.8439	**0.8439**
41	**M05**	Drugs for treatment of bone diseases	0.2307	0.5829	**0.8136**
42	**N04**	Anti-parkinson drugs	0.6678	0.1300	**0.7978**
43	**S03**	Ophthalmological and otological preparations	0.0739	0.5701	**0.6440**
44	**J02**	Antimycotics for systemic use	0.0501	0.4280	**0.4781**
45	**L04**	Immunosuppressants	0.3185	0.1384	**0.4569**
46	**L02**	Endocrine therapy	0.2335	0.1376	**0.3710**
47	**P01**	Antiprotozoals	0.1092	0.1099	**0.2191**
48	**S02**	Otologicals	0.1386	0.0613	**0.1999**
49	**G01**	Gynecological antiinfectives and antiseptics	0.0495	0.1107	**0.1602**
50	**D05**	Antipsoriatics	0.0569	0.0858	**0.1427**



	2011	2012	2013	2014
C08CA01	29.92	41.43	46.25	50.12
A10BB09	25.39	33.47	37.26	41.03
C09AA04	14.16	21.01	27.25	25.99
A10BA02	13.97	17.04	17.72	20.64
C10AA01	6.41	11.83	15.29	16.25
C03AA03	9.80	11.64	11.98	12.43
C07AB03	10.26	10.16	10.26	10.95
B01AC06	6.65	8.14	9.47	10.40
C07AB02	8.16	8.88	9.37	9.44
N02BE01	7.81	7.88	8.18	8.21

Figure 1.2: Top 10 most utilised drugs in year 2011-2014. (C08CA01, amlodipine; A10BB09, gliclazide; C09AA04, perindopril; A10BA02, metformin; C10AA01, simvastatin; C03AA03, hydrochlorothiazide; C07AB03, atenolol; B01AC06, acetylsalicylic acid; C07AB02, metoprolol; N02BE01, paracetamol)

Table 1.6: Top 50 drugs, utilisation in DDD/1,000 inhabitants/day, 2014.

Rank	ATC	Drug	Public	Private	Total
1	**C08CA01**	Amlodipine	44.1348	5.9863	**50.1211**
2	**A10BB09**	Gliclazide	37.0476	3.9797	**41.0273**
3	**C09AA04**	Perindopril	24.5959	1.3914	**25.9873**
4	**A10BA02**	Metformin	17.4203	3.2165	**20.6369**
5	**C10AA01**	Simvastatin	13.8644	2.3903	**16.2547**
6	**C03AA03**	Hydrochlorothiazide	11.7483	0.6850	**12.4333**
7	**C07AB03**	Atenolol	7.9727	2.9750	**10.9477**
8	**B01AC06**	Acetylsalicylic acid	8.9877	1.4101	**10.3979**
9	**C07AB02**	Metoprolol	8.9393	0.5045	**9.4438**
10	**N02BE01**	Paracetamol	4.1256	4.0813	**8.2070**
11	**R06AE07**	Cetirizine	0.4337	6.1596	**6.5933**
12	**R03AC02**	Salbutamol	3.5311	2.9587	**6.4898**
13	**C10AA05**	Atorvastatin	3.2388	2.9268	**6.1656**
14	**C09AA02**	Enalapril	5.3003	0.7172	**6.0175**
15	**C10AA02**	Lovastatin	5.8732	0.0947	**5.9679**
16	**C03CA01**	Furosemide	5.2313	0.7209	**5.9522**
17	**R06AB04**	Chlorphenamine	2.6750	2.3167	**4.9917**
18	**A10BB01**	Glibenclamide	3.4429	0.8850	**4.3279**
19	**R06AA52**	Diphenhydramine, combinations	2.0202	2.2927	**4.3129**
20	**R06AX13**	Loratadine	1.8025	2.4858	**4.2883**
21	**C08CA02**	Felodipine	3.9314	0.3455	**4.2768**
22	**A02BA02**	Ranitidine	3.6040	0.4846	**4.0886**
23	**B03AA02**	Ferrous fumarate	3.9781	-	**3.9781**
24	**M01AB05**	Diclofenac	1.2343	2.7248	**3.9591**
25	**H02AB06**	Prednisolone	1.6576	2.2679	**3.9256**
26	**G03AA07**	Levonorgestrel and ethinylestradiol	1.8987	1.9759	**3.8746**
27	**G03AC06**	Medroxyprogesterone	3.1638	0.5859	**3.7497**
28	**A10BD02**	Metformin and sulfonylureas	2.5023	1.0322	**3.5345**
29	**G03AA09**	Desogestrel and ethinylestradiol	1.0489	2.3370	**3.3859**
30	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	3.2932	0.0340	**3.3272**
31	**R03BA02**	Budesonide	3.0829	0.0996	**3.1825**
32	**D01AC20**	Imidazoles/triazoles in combination with corticosteroids	0.0029	3.1724	**3.1752**
33	**J01CA04**	Amoxicillin	1.2215	1.8316	**3.0531**
34	**C08CA05**	Nifedipine	2.4558	0.5472	**3.0030**
35	**D07AC01**	Betamethasone	1.5740	1.3262	**2.9002**
36	**A02BC01**	Omeprazole	2.1416	0.6787	**2.8203**
37	**M01AG01**	Mefenamic acid	0.8528	1.9263	**2.7791**
38	**C01EB15**	Trimetazidine	1.9380	0.7236	**2.6615**
39	**C09CA07**	Telmisartan	1.7260	0.9332	**2.6592**
40	**C09CA01**	Losartan	1.3564	0.9356	**2.2919**
41	**C02CA01**	Prazosin	2.1709	0.0346	**2.2055**
42	**B01AC04**	Clopidogrel	0.5844	1.5794	**2.1637**
43	**D07AA02**	Hydrocortisone	1.2019	0.9448	**2.1467**
44	**S01AA01**	Chloramphenicol	1.2363	0.8641	**2.1004**
45	**A10AB01**	Insulin (human), fast-acting	2.0335	0.0080	**2.0415**
46	**C09CA04**	Irbesartan	1.3180	0.7185	**2.0365**
47	**C09AA01**	Captopril	1.8435	0.0187	**1.8622**
48	**A10AC01**	Insulin (human), intermediate-acting	1.8559	0.0061	**1.8621**
49	**D07AD01**	Clobetasol	0.0933	1.7324	**1.8257**
50	**C10AA07**	Rosuvastatin	0.1196	1.6184	**1.7380**

Table 1.7: Top 50 drugs, utilisation in DDD/1,000 inhabitants/day, 2013.

Rank	ATC	Drug	Public	Private	Total
1	**C08CA01**	Amlodipine	40.3530	5.8941	**46.2471**
2	**A10BB09**	Gliclazide	33.3015	3.9568	**37.2584**
3	**C09AA04**	Perindopril	25.8505	1.3953	**27.2459**
4	**A10BA02**	Metformin	15.1019	2.6182	**17.7201**
5	**C10AA01**	Simvastatin	12.9611	2.3327	**15.2938**
6	**C03AA03**	Hydrochlorothiazide	11.1850	0.7981	**11.9831**
7	**C10AA02**	Lovastatin	11.7182	0.1279	**11.8461**
8	**C07AB03**	Atenolol	7.2291	3.0347	**10.2637**
9	**B01AC06**	Acetylsalicylic acid	7.7355	1.7376	**9.4731**
10	**C07AB02**	Metoprolol	8.8488	0.5239	**9.3726**
11	**N02BE01**	Paracetamol	3.5783	4.6056	**8.1839**
12	**R06AE07**	Cetirizine	0.4301	6.6352	**7.0653**
13	**G03AA07**	Levonorgestrel and ethinylestradiol	3.6724	2.0231	**5.6955**
14	**R03AC02**	Salbutamol	3.1975	2.4435	**5.6410**
15	**C03CA01**	Furosemide	4.8665	0.6748	**5.5413**
16	**A10BB01**	Glibenclamide	4.3805	0.9987	**5.3792**
17	**C09AA02**	Enalapril	4.5277	0.6210	**5.1487**
18	**C10AA05**	Atorvastatin	2.0340	2.7684	**4.8024**
19	**R06AB04**	Chlorphenamine	2.2070	2.4325	**4.6395**
20	**G03AA09**	Desogestrel and ethinylestradiol	1.6547	2.7498	**4.4045**
21	**R06AX13**	Loratadine	1.4948	2.8804	**4.3752**
22	**H02AB06**	Prednisolone	1.5120	2.6719	**4.1840**
23	**M01AB05**	Diclofenac	1.2404	2.8426	**4.0830**
24	**B03AA02**	Ferrous fumarate	3.7731	-	**3.7731**
25	**C08CA05**	Nifedipine	3.1784	0.5826	**3.7611**
26	**C08CA02**	Felodipine	3.4075	0.3470	**3.7545**
27	**R06AA52**	Diphenhydramine, combinations	1.6966	2.0535	**3.7501**
28	**A02BA02**	Ranitidine	3.0342	0.4740	**3.5082**
29	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	3.3528	0.0382	**3.3911**
30	**D01AC20**	Imidazoles/triazoles in combination with corticosteroids	0.0067	3.2245	**3.2312**
31	**G03AC06**	Medroxyprogesterone	2.6116	0.5594	**3.1710**
32	**J01CA04**	Amoxicillin	1.1424	1.7263	**2.8687**
33	**R03BA02**	Budesonide	2.7192	0.0805	**2.7996**
34	**M01AG01**	Mefenamic acid	0.7795	2.0062	**2.7856**
35	**A10BD02**	Metformin and sulfonylureas	1.5921	0.9963	**2.5884**
36	**C09CA07**	Telmisartan	1.6378	0.8863	**2.5240**
37	**D07AC01**	Betamethasone	1.1518	1.3554	**2.5073**
38	**A02BC01**	Omeprazole	1.8383	0.6683	**2.5066**
39	**C01EB15**	Trimetazidine	1.6207	0.7207	**2.3413**
40	**C09AA01**	Captopril	2.1054	0.0238	**2.1292**
41	**D07AA02**	Hydrocortisone	1.2582	0.8278	**2.0861**
42	**C02CA01**	Prazosin	1.9268	0.0369	**1.9636**
43	**D07CC01**	Betamethasone and antibiotics	0.0793	1.8675	**1.9468**
44	**D07AD01**	Clobetasol	0.0522	1.8874	**1.9395**
45	**A10AB01**	Insulin (human), fast-acting	1.9021	0.0089	**1.9110**
46	**A10AC01**	Insulin (human), intermediate-acting	1.8408	0.0067	**1.8475**
47	**B01AC04**	Clopidogrel	0.4464	1.4002	**1.8466**
48	**R01BA52**	Pseudoephedrine, combinations	0.2031	1.6265	**1.8296**
49	**C09CA04**	Irbesartan	1.2329	0.5495	**1.7824**
50	**C09CA01**	Losartan	0.9240	0.8547	**1.7786**

Table 1.8: Top 50 drugs, utilisation in DDD/1,000 inhabitants/day, 2012.

Rank	ATC	Drug	Public	Private	Total
1	**C08CA01**	Amlodipine	36.2704	5.1638	**41.4342**
2	**A10BB09**	Gliclazide	29.7182	3.7474	**33.4657**
3	**C09AA04**	Perindopril	19.7741	1.2395	**21.0137**
4	**A10BA02**	Metformin	14.4387	2.6040	**17.0427**
5	**C10AA01**	Simvastatin	9.8238	2.0036	**11.8274**
6	**C03AA03**	Hydrochlorothiazide	10.7599	0.8814	**11.6414**
7	**C07AB03**	Atenolol	6.9151	3.2489	**10.1640**
8	**C07AB02**	Metoprolol	8.4421	0.4379	**8.8800**
9	**B01AC06**	Acetylsalicylic acid	6.6045	1.5309	**8.1354**
10	**N02BE01**	Paracetamol	3.7714	4.1122	**7.8836**
11	**C10AA02**	Lovastatin	6.5626	0.1375	**6.7001**
12	**R06AE07**	Cetirizine	0.2443	5.8801	**6.1245**
13	**A10BB01**	Glibenclamide	5.0216	0.9882	**6.0098**
14	**H02AB06**	Prednisolone	1.4946	4.2312	**5.7259**
15	**C09AA02**	Enalapril	5.0725	0.6277	**5.7002**
16	**C08CA05**	Nifedipine	4.3549	0.7381	**5.0930**
17	**R03AC02**	Salbutamol	2.9001	2.1024	**5.0026**
18	**C03CA01**	Furosemide	4.3015	0.6397	**4.9411**
19	**C10AA05**	Atorvastatin	1.9163	2.5758	**4.4920**
20	**R06AB04**	Chlorphenamine	2.0937	2.3090	**4.4027**
21	**G03AA09**	Desogestrel and ethinylestradiol	1.5647	2.8216	**4.3863**
22	**M01AB05**	Diclofenac	1.0312	3.3514	**4.3827**
23	**R06AX13**	Loratadine	1.4214	2.6724	**4.0937**
24	**B03AA02**	Ferrous fumarate	4.0363	-	**4.0363**
25	**G03AA07**	Levonorgestrel and ethinylestradiol	0.8559	2.4519	**3.3078**
26	**M01AG01**	Mefenamic acid	0.7930	2.4657	**3.2587**
27	**A02BA02**	Ranitidine	2.6396	0.5616	**3.2012**
28	**D01AC20**	Imidazoles/triazoles in combination with corticosteroids	0.0019	3.1834	**3.1853**
29	**C08CA02**	Felodipine	2.8568	0.2846	**3.1414**
30	**R06AA52**	Diphenhydramine, combinations	1.6786	1.3482	**3.0268**
31	**J01CA04**	Amoxicillin	1.0149	1.9800	**2.9949**
32	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	2.4469	0.0477	**2.4946**
33	**C09AA01**	Captopril	2.4631	0.0257	**2.4887**
34	**R03BA02**	Budesonide	2.3136	0.0688	**2.3824**
35	**D07AC01**	Betamethasone	1.1552	1.1475	**2.3027**
36	**A02BC01**	Omeprazole	1.7146	0.5835	**2.2981**
37	**C09CA07**	Telmisartan	1.4260	0.8329	**2.2589**
38	**C01EB15**	Trimetazidine	1.5759	0.6518	**2.2277**
39	**D07AA02**	Hydrocortisone	1.0480	1.0288	**2.0768**
40	**C09CA04**	Irbesartan	1.3087	0.6853	**1.9940**
41	**G03AC06**	Medroxyprogesterone	1.2631	0.6935	**1.9565**
42	**R01BA52**	Pseudoephedrine, combinations	0.2281	1.6008	**1.8289**
43	**A10BD02**	Metformin and sulfonylureas	0.9231	0.8974	**1.8205**
44	**D07CC01**	Betamethasone and antibiotics	0.0358	1.7772	**1.8129**
45	**B01AC04**	Clopidogrel	0.3453	1.4030	**1.7483**
46	**C09CA01**	Losartan	0.9207	0.8209	**1.7416**
47	**A10AB01**	Insulin (human), fast-acting	1.6494	0.0117	**1.6611**
48	**D07AD01**	Clobetasol	0.0475	1.6109	**1.6584**
49	**C02CA01**	Prazosin	1.5956	0.0400	**1.6355**
50	**A10AC01**	Insulin (human), intermediate-acting	1.5235	0.0127	**1.5362**

Table 1.9: Top 50 drugs, utilisation in DDD/1,000 inhabitants/day, 2011.

Rank	ATC	Drug	Public	Private	Total
1	**C08CA01**	Amlodipine	25.6233	4.2991	**29.9225**
2	**A10BB09**	Gliclazide	21.5663	3.8249	**25.3911**
3	**C09AA04**	Perindopril	13.0810	1.0809	**14.1619**
4	**A10BA02**	Metformin	11.3591	2.6121	**13.9712**
5	**C07AB03**	Atenolol	6.7712	3.4880	**10.2592**
6	**C03AA03**	Hydrochlorothiazide	8.9165	0.8829	**9.7994**
7	**C10AA02**	Lovastatin	8.8374	0.1284	**8.9658**
8	**C07AB02**	Metoprolol	7.8296	0.3339	**8.1635**
9	**N02BE01**	Paracetamol	3.6307	4.1836	**7.8144**
10	**A10BB01**	Glibenclamide	5.8124	1.1037	**6.9161**
11	**B01AC06**	Acetylsalicylic acid	5.3205	1.3341	**6.6545**
12	**C10AA01**	Simvastatin	3.9633	2.4432	**6.4065**
13	**C08CA05**	Nifedipine	5.5537	0.7289	**6.2826**
14	**C09AA02**	Enalapril	4.8262	0.7824	**5.6086**
15	**G03AA09**	Desogestrel and ethinylestradiol	2.0605	3.0023	**5.0628**
16	**R06AE07**	Cetirizine	0.2331	4.4615	**4.6947**
17	**R03AC02**	Salbutamol	3.0730	1.4407	**4.5137**
18	**C03CA01**	Furosemide	3.6654	0.5691	**4.2344**
19	**R06AB04**	Chlorphenamine	2.0285	1.9765	**4.0049**
20	**G03AA07**	Levonorgestrel and ethinylestradiol	1.2253	2.5851	**3.8104**
21	**H02AB06**	Prednisolone	1.2885	2.3993	**3.6878**
22	**R06AX13**	Loratadine	1.2390	2.4197	**3.6586**
23	**C10AA05**	Atorvastatin	1.4378	2.1597	**3.5975**
24	**B03AA02**	Ferrous fumarate	3.5469	-	**3.5469**
25	**M01AB05**	Diclofenac	1.1511	2.3560	**3.5071**
26	**R06AA52**	Diphenhydramine, combinations	1.6464	1.3457	**2.9920**
27	**D01AC20**	Imidazoles/triazoles in combination with corticosteroids	0.0018	2.7004	**2.7022**
28	**A02BA02**	Ranitidine	2.2236	0.4170	**2.6407**
29	**M01AG01**	Mefenamic acid	0.7549	1.8615	**2.6164**
30	**D07AC01**	Betamethasone	1.4646	1.0474	**2.5120**
31	**J01CA04**	Amoxicillin	0.8925	1.6031	**2.4956**
32	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	2.3982	0.0787	**2.4770**
33	**C09AA01**	Captopril	2.2997	0.0225	**2.3222**
34	**C08CA02**	Felodipine	2.0301	0.2920	**2.3221**
35	**R03BA02**	Budesonide	1.9683	0.0958	**2.0640**
36	**C01EB15**	Trimetazidine	1.4096	0.6509	**2.0605**
37	**A02BC01**	Omeprazole	1.3893	0.5761	**1.9654**
38	**C09CA07**	Telmisartan	1.1593	0.7764	**1.9357**
39	**D07CC01**	Betamethasone and antibiotics	0.0329	1.7228	**1.7557**
40	**C02CA01**	Prazosin	1.6875	0.0364	**1.7239**
41	**R01BA52**	Pseudoephedrine, combinations	0.2132	1.4957	**1.7089**
42	**D07AA02**	Hydrocortisone	0.9452	0.6168	**1.5620**
43	**D07AD01**	Clobetasol	0.0368	1.4782	**1.5150**
44	**C09CA01**	Losartan	0.6419	0.8419	**1.4838**
45	**R03AL02**	Salbutamol and ipratropium bromide	1.4079	0.0655	**1.4734**
46	**C09CA04**	Irbesartan	0.8661	0.5875	**1.4536**
47	**G03AC06**	Medroxyprogesterone	0.7854	0.6137	**1.3991**
48	**B01AC04**	Clopidogrel	0.2184	1.1750	**1.3934**
49	**M01AH05**	Etoricoxib	0.1904	1.1760	**1.3664**
50	**M04AA01**	Allopurinol	0.8768	0.4806	**1.3574**

Table 1.10 Top 10 most utilised drugs in Malaysia versus Australia, 2014.

Rank	Malaysia				Australia			
	ATC	Drug	Utilisation (DDD/1,000 inhabitants/day)		ATC	Drug	Utilisation (DDD/1,000 inhabitants/day)	Ranking in Malaysia
			Malaysia	Australia				
1	**C08CA01**	Amlodipine	50.12	38.62	**C10AA05**	Atorvastatin	69.26	13
2	**A10BB09**	Gliclazide	41.03	14.48	**C09AA04**	Perindopril	47.92	3
3	**C09AA04**	Perindopril	25.99	47.92	**C10AA07**	Rosuvastatin	43.27	50
4	**A10BA02**	Metformin	20.64	19.08	**C09CA04**	Irbesartan	39.75	46
5	**C10AA01**	Simvastatin	16.25	14.22	**C08CA01**	Amlodipine	38.62	1
6	**C03AA03**	Hydrochlorothiazide	12.43	1.31	**N02BE01**	Paracetamol	36.63	10
7	**C07AB03**	Atenolol	10.95	9.64	**C09CA06**	Candesartan	34.37	147
8	**B01AC06**	Acetylsalicylic acid	10.40	0.05	**C09AA05**	Ramipril	31.90	138
9	**C07AB02**	Metoprolol	9.44	8.93	**A02BC05**	Esomeprazole	28.95	77
10	**N02BE01**	Paracetamol	8.21	36.63	**C09CA07**	Telmisartan	28.92	39

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CHAPTER 2: EXPENDITURE ON MEDICINES IN MALAYSIA

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Drug expenditure makes up a sizeable portion of overall healthcare expenditure. The expenditure for pharmaceuticals in the Ministry of Health (MOH) has grown almost 3-fold within 10 years i.e. the MOH annual drug spending increased from RM 808 million in the year 2004 to RM 2.38 billion in the year 2014[1]. Thus, monitoring trend of drug expenditure is important to ensure long-term financial sustainability of the current health system.

Definition, data sources and limitations

The total pharmaceutical expenditure stated in this publication is an estimation and could differ from official reports. The estimates were made based on two main data sources. The public sector used procurement data, and for the private sector, the expenditure was estimated using sales data obtained from Quintiles IMS Malaysia.

Pharmaceutical expenditure covers spending on prescription medicines only and exclude over the counter drugs (except paracetamol, vitamin K, acetylsalicylic acid, calcitriol and alfacalcidol), consumables and intravenous fluid preparations. The amount of spending covers drugs supplied across distribution channels (hospitals and health clinics as well as those sold to retail outlets). Total drug expenditure on pharmaceuticals in the private sector was based on medicine purchasing prices paid by hospitals, clinics and pharmacy retailers. This represents 'gross' expenditure not adjusting for possible discounts and rebates. The calculation for pharmaceutical expenditure presented here is in nominal value.

This chapter assesses the trend for drug expenditure from 2011 to 2014. The trend will be discussed according to therapeutic groups as well as individual drugs. The total estimated expenditure for drugs has increased by 23% from RM 3.8 billion in 2011 to RM 4.7 billion in 2014, as shown in Figure 1. An increment of 27% was reported in the public sector whereas an increment of 20% was observed in the private sector. In 2014, the average market share by expenditure between public and private was estimated at 44% and 56%, respectively. It is important to note that the public-sector pharmaceutical expenditure here is lower than the officially reported expenditure[1] as the data were confined to drugs included in the MSOM.

The expenditure of the top 10 therapeutic groups in 2014 amounted to RM 2.3 billion, which attributed to 50% of the total expenditure for that year. Antibacterial for systemic use (J01) was the highest ranked therapeutic group by expenditure throughout 2011 to 2014, followed by drugs used in diabetes (A10). These two therapeutic groups contributed up to 17% of the total expenditure in the same period. Throughout the four years, the expenditure for the top 10 therapeutic group remains unchanged except for minor switching of ranks as shown in Table 2.1. In general, an increasing trend in expenditure was seen for the 10 therapeutic groups. Comparing between 2011 and 2014 the highest increase in expenditure was observed in antithrombotic agents (53%), drugs used in diabetes (45%) and antineoplastic agents (38%).

In the public sector, the highest expenditure was seen in drugs used in diabetes (A10) whereas in the private sector, the antibacterials for systemic use (J01) topped the list. Overall, almost the same list of top 10 therapeutic drugs appeared in the public and private sector (refer to Table 2.1). However, anti-inflammatory and antirheumatic products (M01), drugs for acid related disorders (A02) and sex hormones and modulators of the genital system (G03) were in the private sector list of top 10 therapeutic groups but were not in the public-sector list. On the contrary, psycholeptics (N05), drugs for obstructive airway diseases (R03) and immunosuppressants (L04) were listed in top 10 therapeutic groups in the public sector. The difference in these lists may not only due to the difference in types of cases/diseases frequently treated in the two sectors but also the diseases management and the prescribing trends within the therapeutic groups.

A rising trend in expenditure for the top 10 therapeutic groups was also observed in the public sector from 2011 to 2014. The highest increase was seen in lipid modifying agents (90%) followed by antithrombotic agents (73%), antineoplastic agents (56%) and drugs used in diabetes (55%). The increase in the expenditure of lipid modifying agents may be due to the increase in utilisation of statins to treat the increasing number of diagnosed cases of hypercholesterolaemia[2]. The increase expenditure for antithrombotic agents is likely due to the listing of newly patented drugs and addition of new strengths and indications that were listed into the MOH formulary. Example of such drugs are Alteplase (listed in MOH formulary in 2012), Ticagrelor (2012) and Prasugrel (2012). For Tinzaparin, Fondaparinux and Dabigatran, new indications and formulations were

added to the MOH formulary in 2011 and new indication for Rivaroxaban was added in 2012. Similar reason could also explain the increasing expenditure in antineoplastic agent with a number of newly targeted therapies listed in the MOH formulary during this period. Examples are tyrosine kinase inhibitors: Erlotinib (2011) and Pazopanib (2013) and HER2 inhibitor: Trastuzumab (2008).

In the private sector, between year 2011 and 2014, the highest increase was seen in antithrombotic agents (41%), drugs used in diabetes (37%) and drugs for acid related disorders (33%).The increase in expenditure is likely contributed by the steady increase in utilisation of drugs in these therapeutic groups.

For drug use in diabetes (A10), metformin (A10BA02) contributed to the highest expenditure mainly in the public sector followed by gliclazide (A10BB09) in both sectors and combination of metformin and sitagliptin (A10BD07) mainly in the private sector. For lipid modifying agents, the highest contributor is the statin group which are atorvastatin (C10AA05) in the private sector followed by simvastatin (C10AA01) in the public sector and rosuvastatin (C10AA07) in the private sector.

Table 2.2 to 2.5 present the expenditure for top 50 drugs from 2011 to 2014. The 5 drugs that had the highest expenditure throughout the years were metformin (A10BA02), erythropoietin (B03XA01), diphtheria-hemophilus influenzae b-pertussis-poliomyelitis-tetanus vaccine (J07CA06), gliclazide (A10BB09) and atorvastatin (C10AA05). In 2014, a total of RM 406 million was spent on these drugs contributing to around 9% of the total expenditure. For metformin (A10BA02), gliclazide (A10BB09) and diphtheria-hemophilus influenza b-pertussis-poliomyelitis-tetanus vaccine (J07CA06), the expenditure was mainly contributed by the public sector. Different expenditure trend was seen in Australia in which the top 5 drugs by expenditure were reported to be rosuvastatin (C10AA07), adalimumab (L04AB04), esomeprazole (A02BC05), salmeterol and fluticasone (R03AK06) and atorvastatin (C10AA05)[3].

The average public sector share of expenditure is 44%, which accounted for 66% of utilisation throughout the four years indicates that the public sector has managed to provide wider coverage of medicines at lower prices possibly due to effective procurement strategies.

Overall, there is an increasing trend of expenditure over the years contributed by the increased burden of disease particularly non-communicable diseases, increase in ageing population and emergent of newly innovative therapies. There is a need to ensure optimum use of resources to cater for the current and future needs of the population along with new approaches in funding pharmaceuticals in the country.

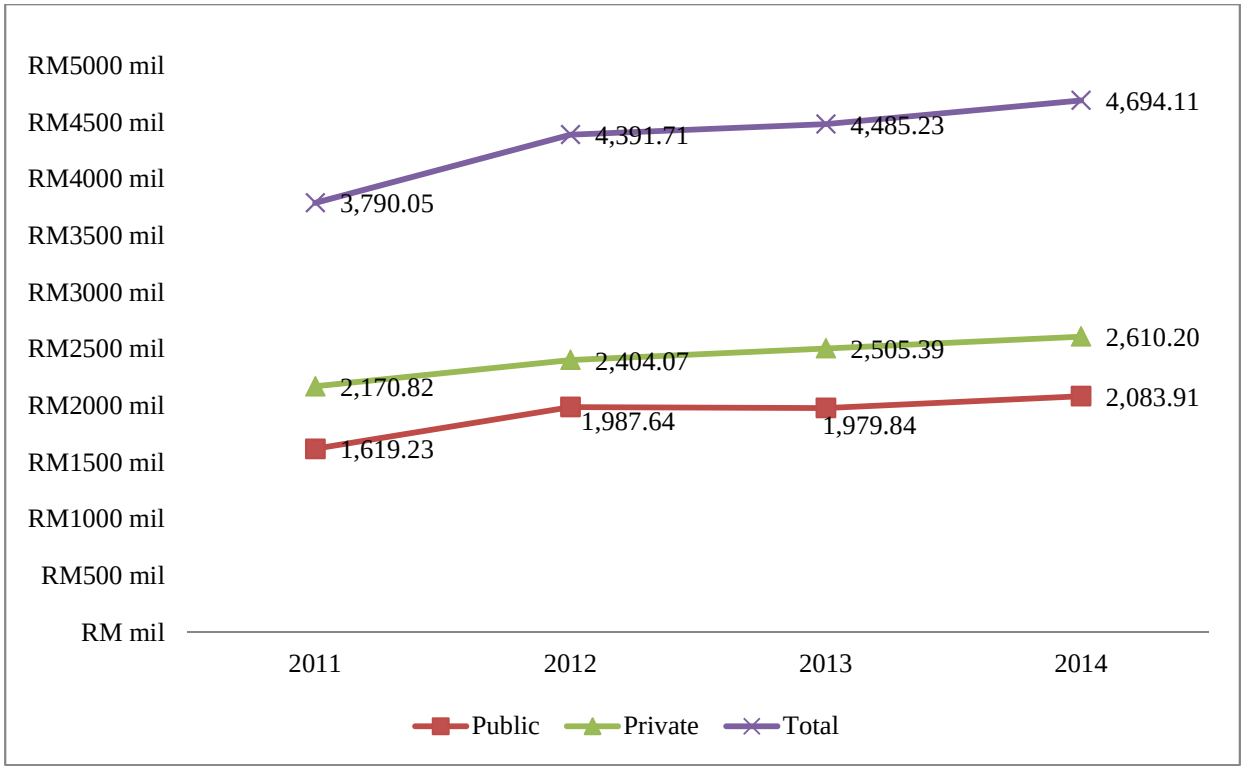

Figure 2.1: Estimated expenditure from 2011 to 2014 (Overall and between public and private).

Note: The estimated expenditure in Malaysian Statistics on Medicines (MSOM) report is lower than actual pharmaceutical expenditure reported in official documents on public and private sector pharmaceutical expenditure.

Table 2.1: Total estimated expenditure and ranking of top 10 therapeutic groups, 2011-2014.

Sector	ATC	Therapeutic Group	2011		2012		2013		2014	
			Expenditure (RM million)	**Rank**	**Expenditure** (RM million)	**Rank**	**Expenditure** (RM million)	**Rank**	**Expenditure** (RM million)	**Rank**
Public and private	**J01**	Antibacterials for systemic use	381.55	**1**	413.8	**1**	409.6	**1**	422.29	**1**
	A10	Drugs used in diabetes	268.40	**2**	323.6	**2**	352.7	**2**	389.89	**2**
	C09	Agents acting on the renin-angiotensin system	207.29	**3**	236.3	**4**	248.6	**3**	248.41	**3**
	J07	Vaccines	175.18	**4**	238.4	**3**	226.3	**4**	230.24	**4**
	C10	Lipid modifying agents	168.82	**5**	208.3	**5**	213.8	**5**	223.62	**5**
	L01	Antineoplastic agents	149.34	**6**	189.3	**6**	186.3	**6**	206.09	**6**
	B01	Antithrombotic agents	112.08	**9**	135.2	**8**	143.9	**8**	171.94	**7**
	R03	Drugs for obstructive airway diseases	141.18	**7**	152.4	**7**	165.0	**7**	165.30	**8**
	A02	Drugs for acid related disorders	105.69	**11**	122.2	**11**	132.8	**9**	143.52	**9**
	M01	Anti-inflammatory and antirheumatic products	102.57	**12**	120.9	**12**	127.0	**10**	134.22	**10**
Public	**A10**	Drugs used in diabetes	124.48	**2**	162.0	**2**	179.3	**1**	192.71	**1**
	J01	Antibacterials for systemic use	154.51	**1**	168.4	**1**	153.6	**2**	163.18	**2**
	J07	Vaccines	70.36	**3**	118.0	**3**	120.1	**3**	128.61	**3**
	L01	Antineoplastic agents	54.98	**7**	88.7	**5**	67.0	**7**	85.65	**4**
	N05	Psycholeptics	70.26	**4**	91.7	**4**	75.1	**5**	82.84	**5**
	B01	Antithrombotic agents	44.20	**9**	53.4	**10**	60.4	**8**	76.32	**6**
	C09	Agents acting on the renin-angiotensin system	61.47	**5**	79.0	**6**	82.8	**4**	73.69	**7**
	R03	Drugs for obstructive airway diseases	59.24	**6**	63.5	**9**	70.1	**6**	70.52	**8**
	C10	Lipid modifying agents	33.37	**13**	65.7	**8**	58.8	**9**	63.41	**9**
	L04	Immunosuppressants	35.82	**12**	45.0	**11**	52.0	**10**	54.26	**10**
Private	**J01**	Antibacterials for systemic use	227.04	**1**	245.33	**1**	255.98	**1**	259.11	**1**
	A10	Drugs used in diabetes	143.92	**3**	161.53	**2**	173.39	**2**	197.17	**2**
	C09	Agents acting on the renin-angiotensin system	145.82	**2**	157.31	**3**	165.86	**3**	174.72	**3**
	C10	Lipid modifying agents	135.45	**4**	142.69	**4**	155.02	**4**	160.21	**4**
	L01	Antineoplastic agents	94.36	**6**	100.57	**6**	119.25	**5**	120.44	**5**
	M01	Anti-inflammatory and antirheumatic products	84.06	**8**	99.28	**8**	106.09	**7**	111.23	**6**
	A02	Drugs for acid related disorders	80.37	**10**	90.61	**9**	101.18	**9**	106.59	**7**
	J07	Vaccines	104.82	**5**	120.42	**5**	106.16	**6**	101.63	**8**
	B01	Antithrombotic agents	67.87	**12**	81.87	**11**	83.44	**11**	95.62	**9**
	G03	Sex hormones and modulators of the genital system	91.34	**7**	99.78	**7**	102.04	**8**	94.97	**10**

Table 2.2: Top 50 drugs by expenditure for overall and in public and private sector in 2014 (RM '000).

Rank	ATC	Drug	Public	Private	Total
1	**A10BA02**	Metformin	65,797.73	26,173.08	**91,970.81**
2	**B03XA01**	Erythropoietin	15,245.18	71,711.28	**86,956.46**
3	**J07CA06**	Diphtheria-hemophilus influenzae B-pertussis-poliomyelitis-tetanus vaccines	75,468.83	8,441.99	**83,910.82**
4	**A10BB09**	Gliclazide	44,172.21	34,382.67	**78,554.89**
5	**C10AA05**	Atorvastatin	5,698.18	59,169.16	**64,867.34**
6	**J01CR02**	Amoxicillin and enzyme inhibitor	17,304.83	44,275.09	**61,579.92**
7	**B01AC04**	Clopidogrel	3,095.07	56,417.84	**59,512.92**
8	**N02BE01**	Paracetamol	24,343.68	35,135.45	**59,479.12**
9	**J01DC02**	Cefuroxime	20,137.54	31,312.69	**51,450.23**
10	**C08CA01**	Amlodipine	8,950.57	41,657.19	**50,607.77**
11	**C10AA01**	Simvastatin	32,934.37	15,964.09	**48,898.46**
12	**C10AA07**	Rosuvastatin	2,268.85	45,185.98	**47,454.83**
13	**A02BC05**	Esomeprazole	7,583.06	35,488.11	**43,071.16**
14	**A02BC02**	Pantoprazole	3,950.98	37,139.55	**41,090.53**
15	**R06AA52**	Diphenhydramine, combinations	24,514.05	15,027.16	**39,541.21**
16	**M01AH01**	Celecoxib	10,861.29	26,847.38	**37,708.67**
17	**C09AA04**	Perindopril	24,973.79	10,751.20	**35,724.99**
18	**J01DD04**	Ceftriaxone	9,962.36	25,139.33	**35,101.68**
19	**M01AH05**	Etoricoxib	2,842.40	31,320.24	**34,162.64**
20	**J07BM01**	Papillomavirus (human types 6, 11, 16, 18) vaccines	27,509.25	5,628.96	**33,138.20**
21	**A10BD07**	Metformin and sitagliptin	702.13	32,269.59	**32,971.71**
22	**R03AC02**	Salbutamol	12,607.10	20,309.05	**32,916.15**
23	**R01BA52**	Pseudoephedrine, combinations	1,627.21	30,300.32	**31,927.52**
24	**L01XC03**	Trastuzumab	14,245.63	15,141.84	**29,387.47**
25	**C09CA07**	Telmisartan	13,972.56	15,289.03	**29,261.59**
26	**C07AB02**	Metoprolol	26,753.67	2,458.98	**29,212.65**
27	**J01CA04**	Amoxicillin	19,046.42	9,847.30	**28,893.72**
28	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	27,449.93	999.02	**28,448.95**
29	**J01CF02**	Cloxacillin	24,708.62	2,604.46	**27,313.09**
30	**C09DB01**	Valsartan and amlodipine	1,350.61	24,977.49	**26,328.10**
31	**G04BE03**	Sildenafil	2,318.45	22,251.43	**24,569.88**
32	**R03DC03**	Montelukast	2,071.74	22,351.03	**24,422.77**
33	**L01XC02**	Rituximab	13,040.62	11,247.35	**24,287.96**
34	**B03AA02**	Ferrous fumarate	24,199.94	0.00	**24,199.94**
35	**R03AK06**	Salmeterol and fluticasone	9,824.27	13,732.72	**23,556.99**
36	**N05AH04**	Quetiapine	19,999.91	3,428.84	**23,428.75**
37	**J07AL02**	Pneumococcus, purified polysaccharides antigen conjugated, vaccine	42.43	22,230.15	**22,272.58**
38	**J01DD62**	Cefoperazone, combinations	1,985.51	20,246.90	**22,232.41**
39	**R03AK07**	Formoterol and budesonide	10,055.57	10,709.64	**20,765.21**
40	**B01AB01**	Heparin	17,494.73	3,181.06	**20,675.79**
41	**N03AG01**	Valproic acid	13,613.62	6,394.33	**20,007.95**
42	**A02BA02**	Ranitidine	12,796.55	7,047.45	**19,844.00**
43	**A02BC01**	Omeprazole	12,061.07	7,053.11	**19,114.18**
44	**C07AB03**	Atenolol	9,385.49	9,596.73	**18,982.23**
45	**C09CA04**	Irbesartan	8,969.45	9,975.48	**18,944.94**
46	**J01FA10**	Azithromycin	1,138.44	17,241.98	**18,380.42**
47	**R06AE07**	Cetirizine	256.51	18,055.60	**18,312.11**
48	**G03AA12**	Drospirenone and ethinylestradiol	16.20	17,881.03	**17,897.22**
49	**J01DH02**	Meropenem	4,660.28	12,816.84	**17,477.12**
50	**N03AX16**	Pregabalin	2,642.63	14,688.74	**17,331.37**

Table 2.3: Top 50 drugs by expenditure for overall and in public and private sector in 2013 (RM '000).

Rank	ATC	Drug	Public	Private	Total
1	**B03XA01**	Erythropoietin	16,654.25	70,351.13	**87,005.38**
2	**A10BA02**	Metformin	51,557.80	22,718.35	**74,276.15**
3	**J07CA06**	Diphtheria-hemophilus influenzae B-pertussis-poliomyelitis-tetanus vaccines	60,175.71	12,527.58	**72,703.30**
4	**A10BB09**	Gliclazide	37,069.60	31,520.91	**68,590.51**
5	**C10AA05**	Atorvastatin	4,939.06	58,799.83	**63,738.89**
6	**N02BE01**	Paracetamol	19,694.17	36,166.89	**55,861.06**
7	**J01CR02**	Amoxicillin and enzyme inhibitor	14,774.13	38,868.02	**53,642.16**
8	**B01AC04**	Clopidogrel	2,943.63	49,237.82	**52,181.45**
9	**J01DC02**	Cefuroxime	20,332.05	31,779.18	**52,111.23**
10	**C08CA01**	Amlodipine	8,603.54	42,119.28	**50,722.82**
11	**C10AA01**	Simvastatin	26,521.52	15,639.45	**42,160.97**
12	**C10AA07**	Rosuvastatin	1,440.94	40,141.82	**41,582.77**
13	**C09AA04**	Perindopril	30,700.27	10,423.27	**41,123.54**
14	**J07BM01**	Papillomavirus (human types 6, 11, 16, 18) vaccines	32,994.31	7,758.61	**40,752.91**
15	**A02BC02**	Pantoprazole	4,721.27	34,033.10	**38,754.37**
16	**A02BC05**	Esomeprazole	6,376.48	31,299.85	**37,676.33**
17	**M01AH05**	Etoricoxib	3,096.75	32,531.22	**35,627.97**
18	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	33,745.91	1,110.10	**34,856.01**
19	**R03AC02**	Salbutamol	15,517.33	19,241.66	**34,759.00**
20	**R01BA52**	Pseudoephedrine, combinations	1,899.26	31,792.57	**33,691.83**
21	**M01AH01**	Celecoxib	8,760.35	24,906.13	**33,666.48**
22	**R06AA52**	Diphenhydramine, combinations	19,048.41	13,140.15	**32,188.55**
23	**J01DD04**	Ceftriaxone	8,276.92	23,170.11	**31,447.03**
24	**A10BD07**	Metformin and sitagliptin	442.06	29,346.47	**29,788.53**
25	**C09CA07**	Telmisartan	13,093.68	14,903.89	**27,997.57**
26	**J01CA04**	Amoxicillin	18,054.55	9,613.40	**27,667.95**
27	**C07AB02**	Metoprolol	25,292.09	2,370.77	**27,662.86**
28	**R03DC03**	Montelukast	3,041.54	23,817.67	**26,859.21**
29	**C09DB01**	Valsartan and amlodipine	1,192.33	24,927.46	**26,119.79**
30	**J01CF02**	Cloxacillin	23,983.72	2,012.97	**25,996.69**
31	**R03AK06**	Salmeterol and fluticasone	9,224.72	14,981.55	**24,206.27**
32	**J01DD62**	Cefoperazone, combinations	2,434.48	21,392.85	**23,827.33**
33	**L01XC03**	Trastuzumab	9,393.98	13,133.22	**22,527.20**
34	**G03AA12**	Drospirenone and ethinylestradiol	12.73	22,091.26	**22,103.99**
35	**C09CA01**	Losartan	7,605.42	13,987.27	**21,592.69**
36	**G04BE03**	Sildenafil	892.88	20,610.63	**21,503.51**
37	**N05AH04**	Quetiapine	18,180.71	3,025.95	**21,206.66**
38	**L01XC02**	Rituximab	9,399.21	11,567.91	**20,967.13**
39	**B03AA02**	Ferrous fumarate	20,940.22	0.00	**20,940.22**
40	**J01FA10**	Azithromycin	987.84	19,722.98	**20,710.83**
41	**J07AL02**	Pneumococcus, purified polysaccharides antigen conjugated vaccines	4.39	20,498.89	**20,503.27**
42	**R06AE07**	Cetirizine	274.74	19,260.62	**19,535.36**
43	**J01MA02**	Ciprofloxacin	1,852.98	17,083.91	**18,936.88**
44	**B01AB01**	Heparin	15,782.48	2,994.94	**18,777.41**
45	**A02BC01**	Omeprazole	10,302.58	7,836.55	**18,139.13**
46	**C09CA04**	Irbesartan	9,994.49	8,076.76	**18,071.25**
47	**R03AK07**	Formoterol and budesonide	7,624.42	10,021.95	**17,646.37**
48	**C07AB03**	Atenolol	7,502.02	9,615.05	**17,117.08**
49	**J01DH02**	Meropenem	4,621.16	12,424.08	**17,045.24**
50	**N05AH03**	Olanzapine	13,782.69	3,077.75	**16,860.45**

Table 2.4: Top 50 drugs by expenditure for overall and in public and private sector in 2012 (RM '000).

Rank	ATC	Drug	Public	Private	Total
1	**B03XA01**	Erythropoietin	18,678.33	74,380.69	**93,059.02**
2	**J07CA06**	Diphtheria-hemophilus influenzae B-pertussis-poliomyelitis-tetanus vaccines	59,924.54	14,196.07	**74,120.62**
3	**A10BA02**	Metformin	49,005.41	23,883.65	**72,889.06**
4	**C10AA05**	Atorvastatin	6,398.30	55,798.61	**62,196.91**
5	**A10BB09**	Gliclazide	32,216.71	27,330.78	**59,547.49**
6	**B01AC04**	Clopidogrel	2,549.20	52,726.08	**55,275.27**
7	**N02BE01**	Paracetamol	19,037.71	35,298.11	**54,335.82**
8	**J01CR02**	Amoxicillin and enzyme inhibitor	13,760.46	38,124.13	**51,884.60**
9	**J01DC02**	Cefuroxime	21,137.89	29,760.66	**50,898.55**
10	**C08CA01**	Amlodipine	8,482.16	39,159.60	**47,641.77**
11	**C10AA01**	Simvastatin	30,307.08	14,547.31	**44,854.39**
12	**J07BM01**	Papillomavirus (human types 6, 11, 16, 18) vaccines	33,938.49	8,022.08	**41,960.57**
13	**N05AH03**	Olanzapine	34,765.03	3,252.23	**38,017.26**
14	**A02BC02**	Pantoprazole	6,040.50	30,174.37	**36,214.87**
15	**C10AA07**	Rosuvastatin	1,592.74	34,182.23	**35,774.97**
16	**C09AA04**	Perindopril	24,898.68	9,566.38	**34,465.06**
17	**M01AH01**	Celecoxib	9,987.36	23,709.88	**33,697.24**
18	**M01AH05**	Etoricoxib	3,469.74	29,308.08	**32,777.82**
19	**A02BC05**	Esomeprazole	5,748.54	25,614.92	**31,363.47**
20	**R01BA52**	Pseudoephedrine, combinations	1,588.82	28,877.67	**30,466.49**
21	**R03AC02**	Salbutamol	13,716.73	15,980.01	**29,696.74**
22	**R06AA52**	Diphenhydramine, combinations	18,581.18	10,936.17	**29,517.34**
23	**J01CA04**	Amoxicillin	19,088.87	10,325.73	**29,414.60**
24	**R03DC03**	Montelukast	4,820.25	23,131.55	**27,951.79**
25	**J01DD04**	Ceftriaxone	7,321.08	20,081.12	**27,402.20**
26	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	25,198.61	1,379.67	**26,578.28**
27	**A10BD07**	Metformin and sitagliptin	257.29	26,247.32	**26,504.61**
28	**C07AB02**	Metoprolol	24,041.29	2,437.32	**26,478.61**
29	**J01CF02**	Cloxacillin	24,388.85	1,951.35	**26,340.19**
30	**C09CA07**	Telmisartan	11,509.85	13,628.29	**25,138.14**
31	**L01XE01**	Imatinib	20,174.09	3,400.52	**23,574.61**
32	**C09CA01**	Losartan	8,723.58	14,428.08	**23,151.66**
33	**R03AK06**	Salmeterol and fluticasone	7,202.72	14,894.16	**22,096.88**
34	**J01FA10**	Azithromycin	2,864.00	19,020.57	**21,884.57**
35	**J01DD62**	Cefoperazone, combinations	2,327.15	19,403.29	**21,730.44**
36	**C09DB01**	Valsartan and amlodipine	679.20	21,010.03	**21,689.23**
37	**J01DH02**	Meropenem	10,581.39	10,875.19	**21,456.59**
38	**L01XC03**	Trastuzumab	11,819.47	9,204.93	**21,024.40**
39	**J07AL02**	Pneumococcus, purified polysaccharides antigen conjugated vaccines	5.87	20,722.72	**20,728.60**
40	**C09CA04**	Irbesartan	10,641.89	10,051.71	**20,693.60**
41	**B03AA02**	Ferrous fumarate	20,572.17	0.00	**20,572.17**
42	**G04BE03**	Sildenafil	602.76	19,737.52	**20,340.28**
43	**G03AA12**	Drospirenone and ethinylestradiol	17.28	19,941.53	**19,958.81**
44	**J01MA02**	Ciprofloxacin	1,862.11	17,026.78	**18,888.89**
45	**N05AH04**	Quetiapine	15,844.44	2,847.75	**18,692.19**
46	**J05AG03**	Efavirenz	17,521.22	1,040.61	**18,561.83**
47	**L01XC02**	Rituximab	9,167.87	9,330.30	**18,498.17**
48	**A02BC01**	Omeprazole	10,687.60	7,500.44	**18,188.03**
49	**A10AB01**	Insulin (human), fast-acting	17,611.69	338.76	**17,950.44**
50	**R06AE07**	Cetirizine	168.28	17,768.08	**17,936.36**

Table 2.5: Top 50 drugs by expenditure for overall and in public and private sector in 2011 (RM '000).

Rank	ATC	Drug	Public	Private	Total
1	**B03XA01**	Erythropoietin	16,870.65	69,722.52	**86,593.17**
2	**J07CA06**	Diphtheria-hemophilus influenzae B-pertussis-poliomyelitis-tetanus vaccines	50,440.10	13,793.71	**64,233.81**
3	**C10AA05**	Atorvastatin	5,562.62	49,647.18	**55,209.80**
4	**A10BA02**	Metformin	26,827.83	23,957.48	**50,785.30**
5	**A10BB09**	Gliclazide	24,118.83	25,984.21	**50,103.04**
6	**B01AC04**	Clopidogrel	2,023.39	46,215.95	**48,239.34**
7	**J01CR02**	Amoxicillin and enzyme inhibitor	11,456.16	35,930.43	**47,386.59**
8	**N02BE01**	Paracetamol	18,115.87	28,005.77	**46,121.64**
9	**J01DC02**	Cefuroxime	17,128.77	26,695.21	**43,823.97**
10	**C08CA01**	Amlodipine	6,614.88	34,293.12	**40,907.99**
11	**N05AH03**	Olanzapine	30,910.22	3,520.64	**34,430.86**
12	**C10AA07**	Rosuvastatin	1,090.95	32,305.89	**33,396.85**
13	**A02BC02**	Pantoprazole	4,212.10	27,850.56	**32,062.66**
14	**A10AD01**	Insulin (human), intermediate- or long-acting combined with fast acting	28,629.77	2,406.21	**31,035.98**
15	**M01AH05**	Etoricoxib	2,598.92	27,393.50	**29,992.42**
16	**C10AA01**	Simvastatin	11,757.03	17,571.35	**29,328.38**
17	**M01AH01**	Celecoxib	8,753.26	19,418.99	**28,172.25**
18	**R03DC03**	Montelukast	4,989.51	22,643.83	**27,633.34**
19	**R01BA52**	Pseudoephedrine, combinations	1,576.15	25,308.93	**26,885.07**
20	**R06AA52**	Diphenhydramine, combinations	17,383.68	8,998.89	**26,382.58**
21	**J01DD04**	Ceftriaxone	6,994.76	19,106.35	**26,101.11**
22	**A02BC05**	Esomeprazole	5,314.79	20,734.22	**26,049.01**
23	**C09AA04**	Perindopril	16,773.75	9,167.34	**25,941.09**
24	**J01CA04**	Amoxicillin	15,204.89	8,762.07	**23,966.97**
25	**R03AC02**	Salbutamol	11,098.26	12,097.18	**23,195.44**
26	**J01FA10**	Azithromycin	3,895.07	19,093.03	**22,988.10**
27	**J01CF02**	Cloxacillin	20,958.12	1,573.43	**22,531.55**
28	**C09CA07**	Telmisartan	9,617.49	12,379.21	**21,996.70**
29	**C07AB02**	Metoprolol	19,352.60	2,081.03	**21,433.63**
30	**C09CA01**	Losartan	6,356.69	14,536.75	**20,893.44**
31	**J01DD62**	Cefoperazone, combinations	3,640.03	17,109.71	**20,749.73**
32	**J01DH02**	Meropenem	9,815.74	9,953.85	**19,769.59**
33	**A10BD07**	Metformin and sitagliptin	123.72	19,472.27	**19,595.99**
34	**C09DB01**	Valsartan and amlodipine	336.62	18,709.66	**19,046.28**
35	**R03AK06**	Salmeterol and fluticasone	5,157.11	13,876.04	**19,033.15**
36	**G04BE03**	Sildenafil	313.97	18,175.10	**18,489.08**
37	**L01XC02**	Rituximab	9,560.97	8,798.83	**18,359.81**
38	**B03AA02**	Ferrous fumarate	18,089.27	0.00	**18,089.27**
39	**N07BC51**	Buprenorphine, combinations	22.67	17,461.39	**17,484.06**
40	**J01MA02**	Ciprofloxacin	929.83	16,531.84	**17,461.68**
41	**G03AA12**	Drospirenone and ethinylestradiol	0.79	17,173.00	**17,173.79**
42	**C07AB03**	Atenolol	6,421.84	9,990.01	**16,411.85**
43	**A02BC01**	Omeprazole	8,219.51	8,140.01	**16,359.53**
44	**G03AA09**	Desogestrel and ethinylestradiol	1,092.70	15,211.27	**16,303.97**
45	**C09DA01**	Losartan and diuretics	1,545.46	14,290.02	**15,835.48**
46	**C09CA04**	Irbesartan	6,733.91	8,749.65	**15,483.56**
47	**M05BB03**	Alendronic acid and colecalciferol	5,791.48	9,447.88	**15,239.35**
48	**R06AE07**	Cetirizine	216.43	15,010.63	**15,227.06**
49	**G04CB01**	Finasteride	7,578.79	7,086.38	**14,665.17**
50	**A10BH01**	Sitagliptin	845.04	13,663.95	**14,508.99**

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CHAPTER 3: USE OF DRUGS FOR ALIMENTARY DISORDERS

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Acid-related diseases involved a variety of disorders that can affect the oesophagus, stomach and duodenum. Peptic ulcer disease and gastro-oesophageal reflux disease (GORD) remain the commonest causes of acid-related gastrointestinal diseases. Prevalence of peptic ulcer disease has declined in the West for the past three to four decades[1, 2], similar trend has been observed in the Asia–Pacific region[3]. At the same time, gastroesophageal reflux disease (GORD) which previously was considered as uncommon in Asia, has been acknowledged as an emerging digestive disease[4-6]. Recent data of 10 years apart have shown that the prevalence of duodenal ulcer and gastric ulcer in Malaysia has declined from 21.2% to 9.5% ($P < 0.001$) and 11.9% to 9.4% ($P < 0.001$) respectively, whereas erosive esophagitis has increased from 2.0% to 8.4% ($P < 0.001$)[7]. *Helicobacter pylori* (*H. pylori*) prevalence has decreased from 51.7% to 30.3% ($P < 0.001$).

In year 2011, the total utilisation of medications for acid related disorder was 6.9278 DDD/1,000 inhabitants/day. There was an increasing trend for the year 2011 to 2014, contributed by both H_2-receptor antagonists (H_2RA) and proton pump inhibitor (PPI). The total utilisation for year 2012, 2013 and 2014 is 8.2432, 9.3200 and 10.3726 DDD/1,000 inhabitants/day, respectively. Similar trend is seen in most of the other developed countries including European, United Kingdom, Canada and Korea[8].

The trend of medications used for acid related disorders has changed from being a predominant to H_2RA to PPI in year 2011, 2012, 2013 and 2014, 3.1217 vs. 3.7709, 3.6584 vs. 4.5494, 4.0555 vs. 5.2253 and 4.5897 vs. 5.7541 DDD/1,000 inhabitants/day, respectively. This is similar in trend to those observed in developed countries, i.e. in Finland[9] PPI is preferred over H_2RA in year 2011, 2012, 2013, and 2014, 53.69 vs. 2.20, 57.64 vs. 1.92, 61.10 vs. 1.52 and 63.83 vs. 1.42 DDD/1,000 inhabitants/day, respectively[9,10].

Within 2011-2014, the most widely H_2RA being prescribed was ranitidine (87.1%) followed by famotidine (7.3%) and cimetidine (5.6%). The trend of ranitidine is seen to be more preferred in the public sector which used 85.8% of the total ranitidine prescribed in Malaysia.Cimetidine is only available until year 2011 in public sector whereas famotidine is only being used by the private sector. In Finland, only two types of H_2RA is being prescribed and the total utilisation of ranitidine (63.4%) is higher than famotidine (36.6%) within the 4 years period[10,11].

Based on total utilisation, the most commonly prescribed PPI in year 2011-2014 remains omeprazole (49.7%), followed by pantoprazole (25.2%), esomeprazole (17.2%), lansoprazole (3.9%), rabeprazole (3.7%) and lastly, dexlansoprazole (0.3%). In Finland, the top three total PPI usage was similar to Malaysia i.e. omeprazole, (67.6%), pantoprazole (19.8%) and esomeprazole (9.9%).

Comparing the usage within the public and private sector, omeprazole is seen to be the preferred PPI in the public sector (73.9%) in year 2011-2014. In contrast, pantoprazole (58.2%), esomeprazole (69.6%), lansoprazole (87.9%) and rabeprazole (88.0%) are more commonly being prescribed in private sector as they tend to use newer generation of PPI and their clients are affordable. Dexlansoprazole is the newest PPI in Malaysia and only available in private sector currently.

The data collected for eradication of *H. pylori* is inadequate to do a meaningful analysis. This may be due to lack of mechanism to capture the data where the individual drugs were prescribed separately in the presence of a high number of possible combinations of PPI and antibiotics. The combination for eradication of *H. pylori* is only available in private sector and the limited data available showed a decrease in the usage from year 2013 to 2014, 0.0247 to 0.0176 DDD/1,000 inhabitants/day respectively. This trend is consistent with the decrease in the prevalence of *H. pylori* infection in Malaysia. One local study showed the prevalence of *H. pylori* associated duodenal ulcers dropped from 90.1% (1989-90) to 69.8% (1999-2000) while the prevalence of gastric ulcers dropped from 86.6% (1989-90) to 56.8% (1999-2000)[11]. In comparison with Finland, the combination for eradication of *H. pylori* utilisation is low in year 2011, 2012, 2013 and 2014, 0.05, 0.05, 0.05 and 0.04 DDD/1,000 inhabitants/day respectively[9,10]. This may be contributed by low prevalence of *H. pylori* infection with a low number of immigrants in the country.

For non-acid related disorders, the most widely prescribed medication within the year of 2011-2014 is the propulsives group (56.6%), followed by belladonna and derivatives (33.6%) and drugs for functional gastrointestinal disorders (9.8%).

In the treatment of functional bowel disorders, mebeverine (91.5%) is the most widely used synthetic anticholinergic for year 2011 to 2014, where 85.5% is prescribed by the private sector. This is followed by dicycloverine (6.1%), trimebutine (2.5%) and glycopyrronium bromide (0.3%). The usage of other drugs for functional bowel disorders such as silicon remained low whereas alverin showed increasing trend from year 2011 (0.0498 DDD/1,000 inhabitants/day), 2012 (0.0499 DDD/1,000 inhabitants/day), 2013 (0.0694 DDD/1,000 inhabitants/day) to 2014 (0.0697 DDD/1,000 inhabitants/day). The usage of papaverine and derivatives is low in general. Papaverine is available is public sector whereas drotaverine and pinaverium are only available in private sector.

The most common antispasmodic agents being utilised within the 4 years period is butylscopolamine (95%) and followed by atropine (5%). Butylscopolamine (68.6%) is more frequently used by private sector and the public sector tend to use atropine (83.2%)

In the management of motility disorder, metoclopromide remained the most popular drug compared to domperidone except for year 2012 where domperidone over took metoclopramide, 0.6702 vs. 0.6679 DDD/1,000 inhabitants/day. Itopride contribute only 10.3% of the total usage of propulsive agent within the 4 years, in which 77.8% was prescribed by private sector.

Conclusion

PPI remains the most widely prescribed drugs in the management of acid related disorders in Malaysia. This may be attributed by a better understanding of the acid related gastrointestinal diseases and the availability of few generic preparations. Despite the availability of newer PPI, omeprazole still remains the most commonly prescribed PPI mainly attributed by its cheaper cost with generic formulation, easily accessible and familiarity with prescription.

Even though ranitidine is considered as an old H_2RA, it is still widely being used in public and private sector. This may be attributed by the familiarity of the drugs among the prescribers, easily available, cost-effective and safe.

For non-acid related diseases, it did not show much change except that itopride has been increasingly prescribed especially in private sector.

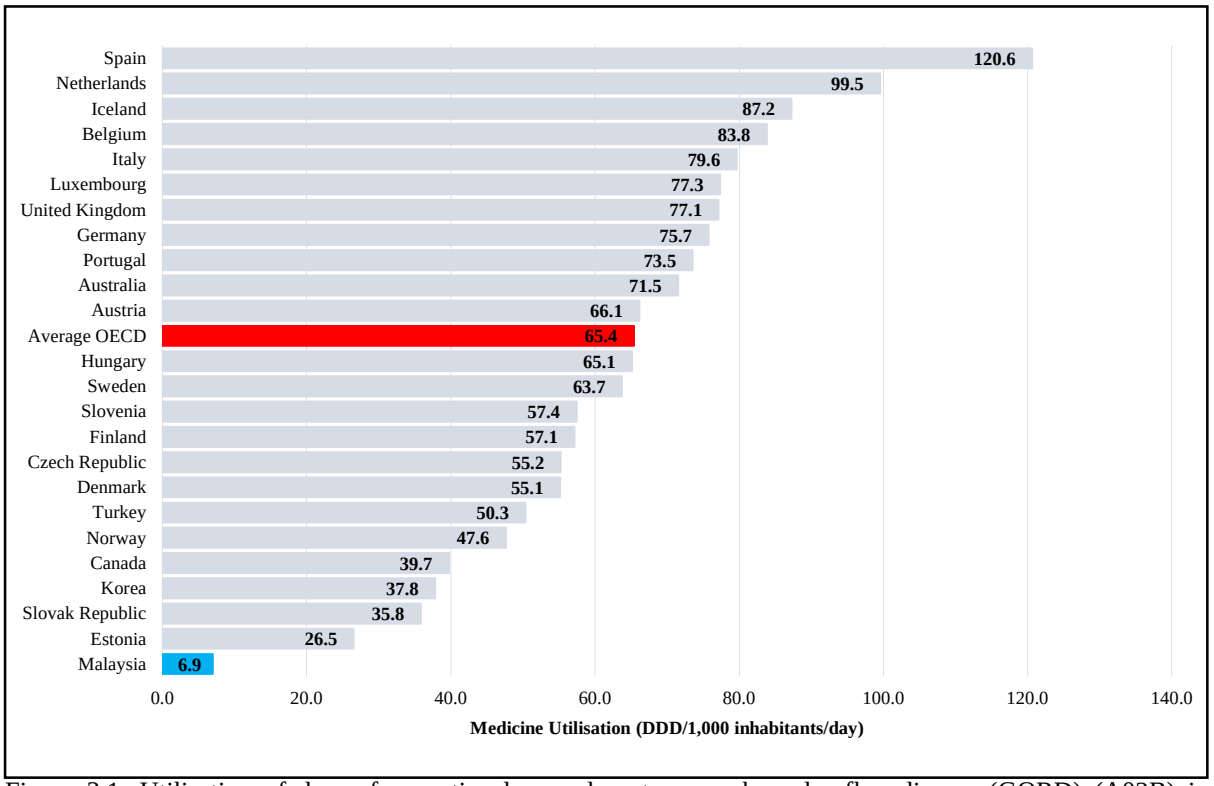

Figure 3.1: Utilisation of drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD) (A02B) in Malaysia and OECD Countries, 2011.

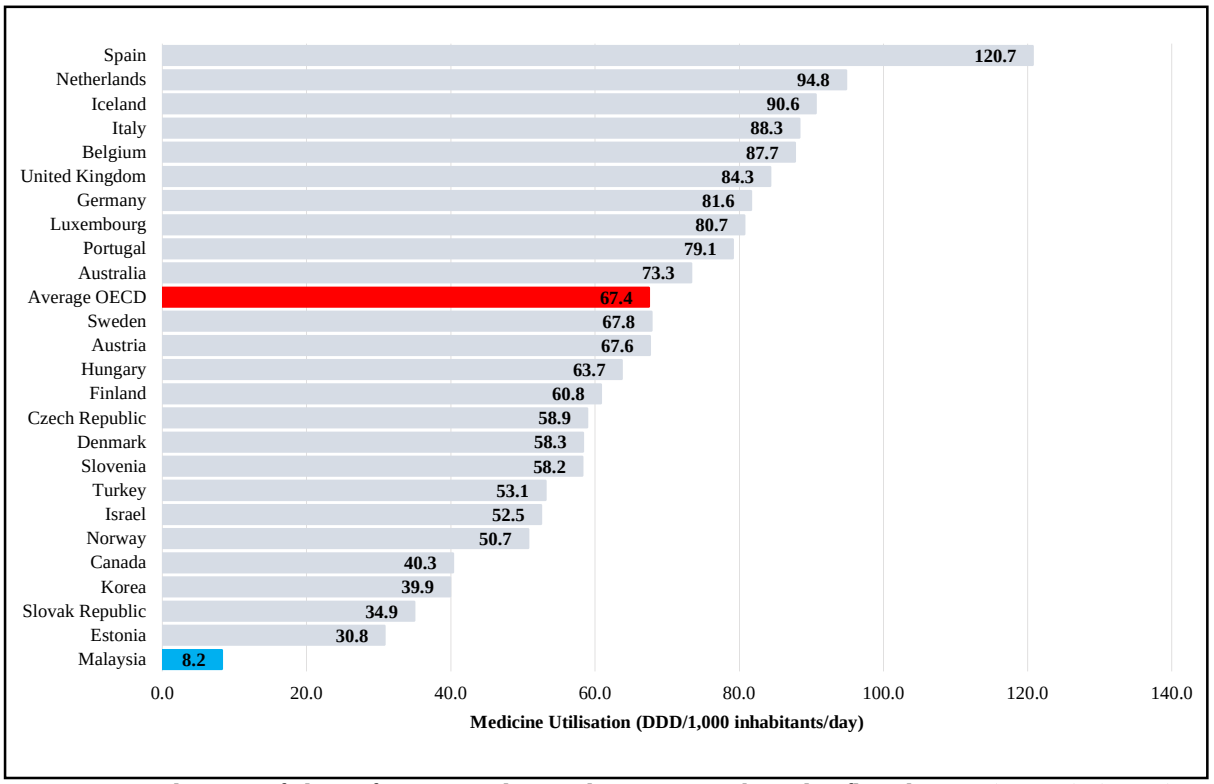

Figure 3.2: Utilisation of drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD) (A02B) in Malaysia and OECD Countries, 2012.

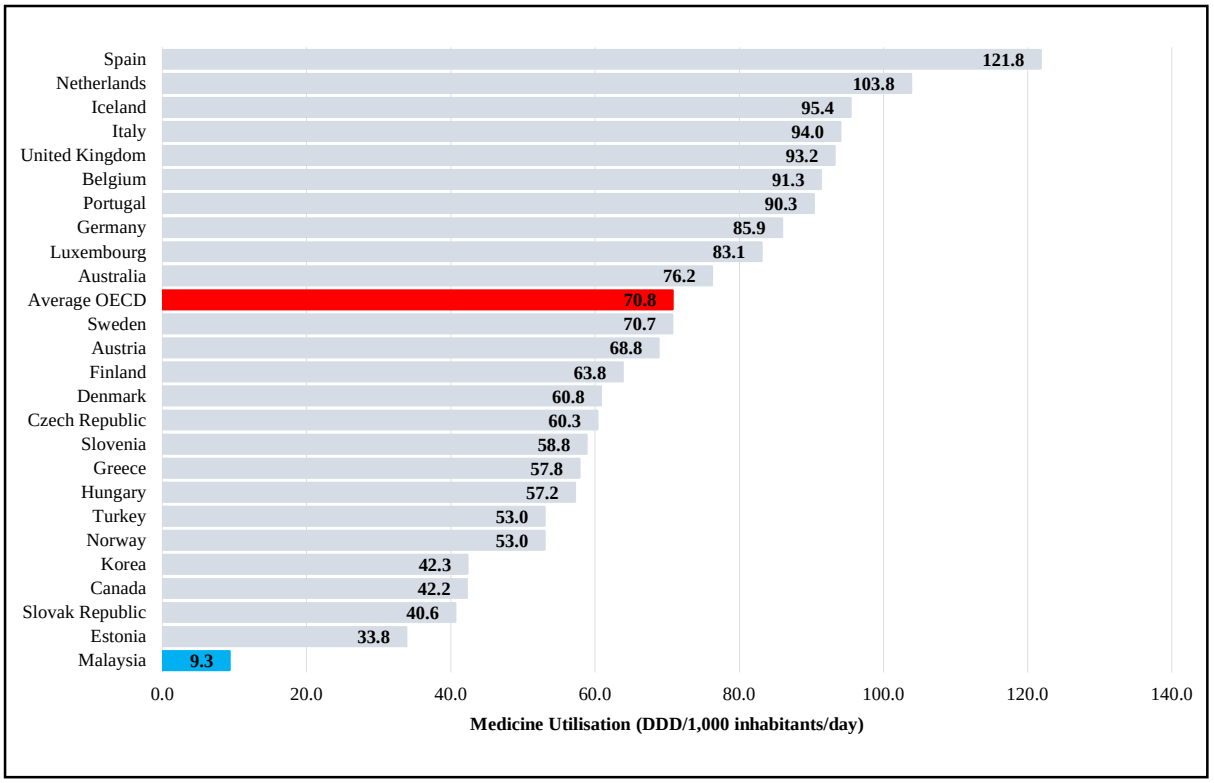

Figure 3.3: Utilisation of drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD) (A02B) in Malaysia and OECD Countries, 2013.

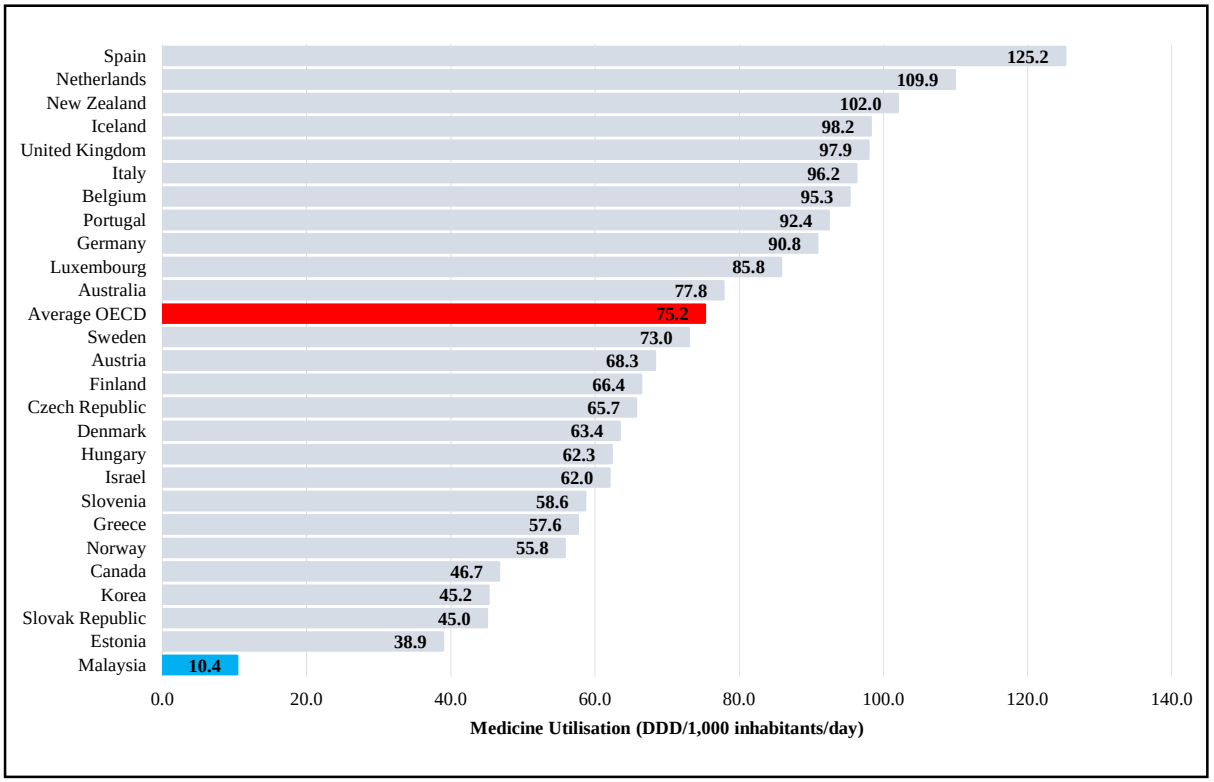

Figure 3.4: Utilisation of drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD) (A02B) in Malaysia and OECD Countries, 2014.

Table 3.1: Use of agents in treating peptic ulcer and gastro-oesophageal reflux disease (GORD) from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
A02	**DRUGS FOR ACID RELATED DISORDERS**					
A02B	**DRUGS FOR PEPTIC ULCER AND GASTRO-OESOPHAGEAL REFLUX DISEASE (GORD)**	**Public**	**4.1172**	**5.0828**	**5.8073**	**6.8232**
		Private	**2.8107**	**3.1604**	**3.5127**	**3.5494**
		Total	**6.9278**	**8.2432**	**9.3200**	**10.3726**
A02BA	**H2-receptor antagonists**	**Public**	**2.2493**	**2.6396**	**3.0342**	**3.6040**
		Private	**0.8725**	**1.0188**	**1.0213**	**0.9857**
		Total	**3.1217**	**3.6584**	**4.0555**	**4.5897**
A02BA01	Cimetidine	Public	0.0256	-	-	-
		Private	0.1919	0.1837	0.2545	0.2012
		Total	**0.2175**	**0.1837**	**0.2545**	**0.2012**
A02BA02	Ranitidine	Public	2.2236	2.6396	3.0342	3.6040
		Private	0.4170	0.5616	0.4740	0.4846
		Total	**2.6407**	**3.2012**	**3.5082**	**4.0886**
A02BA03	Famotidine	Public	-	-	-	-
		Private	0.2635	0.2735	0.2928	0.2999
		Total	**0.2635**	**0.2735**	**0.2928**	**0.2999**
A02BB	**Prostaglandins**					
A02BB01	Misoprostol	Public	< 0.0001	-	< 0.0001	0.0001
		Private	0.0127	0.0130	0.0143	0.0105
		Total	**0.0128**	**0.0130**	**0.0143**	**0.0106**
A02BC	**Proton pump inhibitors**	**Public**	**1.8676**	**2.4430**	**2.7729**	**3.2184**
		Private	**1.9033**	**2.1064**	**2.4524**	**2.5357**
		Total	**3.7709**	**4.5494**	**5.2253**	**5.7541**
A02BC01	Omeprazole	Public	1.3893	1.7146	1.8383	2.1416
		Private	0.5761	0.5835	0.6683	0.6787
		Total	**1.9654**	**2.2981**	**2.5066**	**2.8203**
A02BC02	Pantoprazole	Public	0.2300	0.4232	0.6212	0.7582
		Private	0.5903	0.6568	0.7730	0.8036
		Total	**0.8203**	**1.0800**	**1.3942**	**1.5619**
A02BC03	Lansoprazole	Public	0.0262	0.0181	0.0229	0.0241
		Private	0.1656	0.1683	0.1863	0.1443
		Total	**0.1918**	**0.1864**	**0.2092**	**0.1684**
A02BC04	Rabeprazole	Public	0.0213	0.0318	0.0166	0.0170
		Private	0.1232	0.1520	0.1923	0.1707
		Total	**0.1445**	**0.1838**	**0.2089**	**0.1878**
A02BC05	Esomeprazole	Public	0.2008	0.2555	0.2739	0.2774
		Private	0.4480	0.5457	0.6325	0.6805
		Total	**0.6488**	**0.8012**	**0.9065**	**0.9580**
A02BC06	Dexlansoprazole	Public	-	-	-	-
		Private	-	-	-	0.0578
		Total	**-**	**-**	**-**	**0.0578**
A02BD	**Combinations for eradication of *Helicobacter pylori***					
A02BD05	Omeprazole, amoxicillin and clarithromycin	Public	-	-	-	-
		Private	0.0222	0.0222	0.0247	0.0176
		Total	**0.0222**	**0.0222**	**0.0247**	**0.0176**
A02BX	**Other drugs for peptic ulcer and gastro-oesophageal reflux disease (GORD)**					
A02BX02	Sucralfate	Public	0.0002	0.0002	0.0002	0.0006
		Private	-	-	-	-
		Total	**0.0002**	**0.0002**	**0.0002**	**0.0006**

Table 3.2: Use of agents in treating other gastrointestinal disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
A03	**DRUGS FOR FUNCTIONAL GASTROINTESTINAL DISORDERS**	**Public**	**0.5601**	**0.6819**	**0.6235**	**0.7828**
		Private	**1.6629**	**1.9321**	**1.7118**	**1.7223**
		Total	**2.2230**	**2.6140**	**2.3352**	**2.5051**
A03A	**DRUGS FOR FUNCTIONAL GASTROINTESTINAL DISORDERS**	**Public**	**0.0115**	**0.0169**	**0.0117**	**0.0142**
		Private	**0.2117**	**0.1870**	**0.2059**	**0.2904**
		Total	**0.2232**	**0.2039**	**0.2177**	**0.3046**
A03AA	**Synthetic anticholinergics, esters with tertiary amino group**	**Public**	**0.0113**	**0.0166**	**0.0114**	**0.0138**
		Private	**0.0839**	**0.0897**	**0.0835**	**0.0901**
		Total	**0.0951**	**0.1062**	**0.0948**	**0.1039**
A03AA04	Mebeverine	Public	0.0113	0.0166	0.0114	0.0138
		Private	0.0765	0.0786	0.0780	0.0797
		Total	**0.0877**	**0.0952**	**0.0894**	**0.0935**
A03AA05	Trimebutine	Public	-	-	-	-
		Private	0.0024	0.0046	0.0012	0.0016
		Total	**0.0024**	**0.0046**	**0.0012**	**0.0016**
A03AA07	Dicycloverine	Public	-	-	-	-
		Private	0.0050	0.0065	0.0042	0.0087
		Total	**0.0050**	**0.0065**	**0.0042**	**0.0087**
A03AB	**Synthetic anticholinergics, quaternary ammonium compounds**					
A03AB02	Glycopyrronium bromide	Public	0.0002	0.0002	0.0003	0.0004
		Private	< 0.0001	< 0.0001	< 0.0001	0.0001
		Total	**0.0002**	**0.0002**	**0.0003**	**0.0005**
A03AD	**Papaverine and derivatives**	**Public**	**< 0.0001**	**0.0001**	**-**	**0.0001**
		Private	**0.0780**	**0.0474**	**0.0469**	**0.1187**
		Total	**0.0780**	**0.0475**	**0.0469**	**0.1188**
A03AD01	Papaverine	Public	< 0.0001	0.0001	-	0.0001
		Private	< 0.0001	-	-	-
		Total	**< 0.0001**	**0.0001**	**-**	**0.0001**
A03AD02	Drotaverine	Public	-	-	-	-
		Private	0.0780	0.0474	0.0469	0.1187
		Total	**0.0780**	**0.0474**	**0.0469**	**0.1187**
A03AX	**Other drugs for functional gastrointestinal disorders**	**Public**	**< 0.0001**	**< 0.0001**	**0.0001**	**< 0.0001**
		Private	**0.0498**	**0.0499**	**0.0755**	**0.0814**
		Total	**0.0498**	**0.0500**	**0.0756**	**0.0814**
A03AX04	Pinaverium	Public	-	-	-	-
		Private	-	-	0.0061	0.0117
		Total	**-**	**-**	**0.0061**	**0.0117**
A03AX13	Silicones	Public	< 0.0001	< 0.0001	0.0001	< 0.0001
		Private	-	-	-	-
		Total	**< 0.0001**	**< 0.0001**	**0.0001**	**< 0.0001**
A03AX58	Alverine, combinations	Public	-	-	-	-
		Private	0.0498	0.0499	0.0694	0.0697
		Total	**0.0498**	**0.0499**	**0.0694**	**0.0697**
A03B	**BELLADONNA AND DERIVATIVES, PLAIN**	**Public**	**0.3023**	**0.2794**	**0.2472**	**0.2756**
		Private	**0.4778**	**0.6437**	**0.5830**	**0.4424**
		Total	**0.7801**	**0.9231**	**0.8303**	**0.7179**

Table 3.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
A03BA	**Belladonna alkaloids, tertiary amines**					
A03BA01	Atropine	Public	0.0444	0.0346	0.0261	0.0304
		Private	0.0042	0.0059	0.0085	0.0088
		Total	**0.0486**	**0.0404**	**0.0346**	**0.0392**
A03BB	**Belladonna alkaloids, semisynthetic, quaternary ammonium compounds**	**Public**	**0.2579**	**0.2449**	**0.2212**	**0.2451**
		Private	**0.4736**	**0.6378**	**0.5745**	**0.4336**
		Total	**0.7315**	**0.8827**	**0.7957**	**0.6787**
A03BB01	Butylscopolamine	Public	0.2579	0.2449	0.2212	0.2451
		Private	0.4726	0.6378	0.5745	0.4336
		Total	**0.7305**	**0.8827**	**0.7957**	**0.6787**
A03BB03	Methylscopolamine	Public	-	-	-	-
		Private	0.0010	-	-	-
		Total	**0.0010**	**-**	**-**	**-**
A03F	**PROPULSIVES**					
A03FA	**Propulsives**	**Public**	**0.2463**	**0.3855**	**0.3645**	**0.4930**
		Private	**0.9734**	**1.1014**	**0.9228**	**0.9896**
		Total	**1.2198**	**1.4869**	**1.2873**	**1.4826**
A03FA01	Metoclopramide	Public	0.2015	0.2754	0.2990	0.3856
		Private	0.4183	0.3924	0.2953	0.2991
		Total	**0.6198**	**0.6679**	**0.5943**	**0.6847**
A03FA03	Domperidone	Public	0.0311	0.0701	0.0370	0.0645
		Private	0.4678	0.6001	0.5081	0.5682
		Total	**0.4989**	**0.6702**	**0.5451**	**0.6328**
A03FA07	Itopride	Public	0.0137	0.0399	0.0284	0.0429
		Private	0.0874	0.1089	0.1194	0.1222
		Total	**0.1011**	**0.1488**	**0.1479**	**0.1651**

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CHAPTER 4: USE OF ANTIOBESITY AGENTS

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The total consumption of antiobesity agents in Malaysia between 2011 and 2014 were 0.8439, 0.8915, 0.5525 and 0.5941 DDD/1,000 inhabitants/day respectively. There was an increase in the use of all antiobesity drugs between 2011 and 2012 but the usage declined by almost half in 2013 and 2014.

Centrally acting antiobesity agent continued to be the most commonly prescribed within those 4 years, almost three times more than peripherally acting antiobesity product, representing 73.1%, 70.8%, 68.4% and 61.1% respectively. The use of centrally acting antiobesity drug showed a declining trend over the years. The use of centrally and peripherally acting antiobesity agents are low in public sector compared to private, less than 0.1% in public sector within those 4 years . Data usage of centrally acting antiobesity from Australia and Finland is not available for comparison except for year 2011. The usage of phentermine in Australia 2011 was 2.0051, which is much higher compared to Malaysia[1].

The use of peripherally acting antiobesity agent, orlistat in Malaysia is much higher compared to Australia but comparable to Finland from 2011 to 2014 [1-6]. Finland only used peripherally acting antiobesity agents which is orlistat. The usage of this agent is comparable to Malaysia, 0.19 to 0.38 vs 0.17 to 0.26[3-6] consistent with the similar prevalence of obesity in Malaysia, 15.8% and 15.1% respectively[7]. Phentermine, as a centrally acting agent is not being prescribed at all in Finland.

The differing utilisation rates either centrally or peripherally acting agents could be influenced by the drug cost and availability in Malaysia. There was a reduction in the total usage of antiobesity agents compared to the previous year's even though the prevalence of overweight and obesity remained high as evidence by the National Health Morbidity Survey (47.7% in 2015 and 44.5% in 2011 compared to 43.1% in 2006)[7-9].

The usage of antiobesity in Australia is two times higher compared to Malaysia which is consistent with the higher prevalence of obesity, almost doubled compared to Malaysia (27% vs 15.1%)[10]. This is likely due to the availability and Medicare coverage for antiobesity agents. A slight reduction of antiobesity usage was seen in 2011 in Australia, which could be as a result of the increased in bariatric surgery[11].

Table 4.1: Use of agents in treating obesity from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
A08	**ANTIOBESITY PREPARATIONS, EXCLUDING DIET PRODUCTS**					
A08A	**ANTIOBESITY PREPARATIONS, EXCLUDING DIET PRODUCTS**	**Public**	**< 0.0001**	**0.0002**	**-**	**< 0.0001**
		Private	**0.8439**	**0.8913**	**0.5525**	**0.5941**
		Total	**0.8439**	**0.8915**	**0.5525**	**0.5941**
A08AA	**Centrally acting antiobesity products**	**Public**	**-**	**0.0001**	**-**	**-**
		Private	**0.6168**	**0.6314**	**0.3779**	**0.3631**
		Total	**0.6168**	**0.6315**	**0.3779**	**0.3631**
A08AA01	Phentermine	Public	-	0.0001	-	-
		Private	0.6161	0.6314	0.3779	0.3631
		Total	**0.6161**	**0.6315**	**0.3779**	**0.3631**
A08AA10	Sibutramine	Public	-	-	-	-
		Private	0.0007	-	-	-
		Total	**0.0007**	**-**	**-**	**-**
A08AB	**Peripherally acting antiobesity products**					
A08AB01	Orlistat	Public	< 0.0001	0.0001	-	< 0.0001
		Private	0.2271	0.2600	0.1746	0.2310
		Total	**0.2271**	**0.2600**	**0.1746**	**0.2311**

Table 4.2: Use of orlistat in Malaysia, Finland and Australia from 2011 to 2014 (DDD/1,000 inhabitants/day).

Country	2011	2012	2013	2014
Malaysia	0.23	0.26	0.17	0.23
Finland	0.38	0.28	0.22	0.19
Australia	0.01	-	-	-

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CHAPTER 5: USE OF ANTI-DIABETIC DRUGS

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In Malaysia, from the years 2011-2014, there was an overall increase of total consumption of anti-diabetics by 45.9% from 55.1500 DDD/1,000 inhabitants/day to 80.4861 DDD/1,000 inhabitants/day, reflecting higher prevalence of diabetes (Table 5.1). In the National Health Morbidity Survey (NHMS), there was an increased in the overall prevalence of diabetes mellitus (known and undiagnosed) among adults 18 years and above from 15.2% (2011) to 17.5% (2015)[1]. In addition, other factors contributing towards higher antidiabetics utilisation include more aggressive treatment as well as increase in the number of patients being treated.

Oral Hypoglycaemic Agents

From the years 2011-2014, there was an overall increase of consumption of blood glucose lowering drugs excluding insulins by 45.5% from 49.8487 DDD/1,000 inhabitants/day to 72.5326 DDD/1,000 inhabitants/day, which was consistent with the overall increase in consumption of antidiabetics (Table 5.1).

Among the oral hypoglycaemic agents, the most commonly procured drug class was the sulfonylureas, followed by biguanides, alpha glucosidase inhibitors, dipeptidyl peptidase 4 (DPP-4) inhibitors and thiazolidinediones. Since WHO had set the DDD[2] for gliclazide to be 60 mg in 2010 based on the modified release formulation, the usage for sulfonylureas seemed higher in Malaysia. This was because 83% of diabetics in the public sector in 2014[3] was on immediate release gliclazide. Hence, technically there was an apparent 1.3 times higher utilisation than the actual situation in terms of drug procurement, expressed as Defined Daily Dose (DDD). In the National Medical Care Statistics for Primary Care 2014[4] which studied prescribed medications, the rate of prescribed metformin (5.8 per 100 diagnoses) was higher compared to gliclazide (2.7 per 100 diagnoses).

The use of metformin had increased by 47.7%, over the years from 2011 (13.9712 DDD/1,000 inhabitants/day) to 2014 (20.6369 DDD/1,000 inhabitants/day) which was mainly driven by utilisation in the public sector (Table 5.2). This was in line with the recommendation of metformin as first line therapy in the Clinical Practice Guidelines on Management of Type 2 Diabetes Mellitus[5].

The use of acarbose had slightly decreased by 8.3% over the years due to its gastrointestinal adverse events. The use of the DPP-4 inhibitors had increased by 53.5%, and this was mainly contributed by the private sector, since usage in public sector was limited due to the cost factor. Sitagliptin remained the most commonly prescribed DPP-4 inhibitor since it was the first DPP-4 inhibitor in the Malaysian market.

The overall use of thiazolidinediones decreased by 50.5% over the years because of its widely reported adverse events and availability of newer antidiabetics. There was low usage of the sodium glucose cotransporter 2 (SGLT2) inhibitor, dapagliflozin, as it was a new drug introduced in 2014. Finally, the use of repaglinide and nateglinide remained low due to its high cost, multiple dosing and no positive outcome clinical trials.

Insulin

There was an overall increase in the total consumption of insulins and analogues by 50% from 2011 to 2014 (Table 5.1). The utilisation of premixed human insulin seemed higher than non-premixed human insulins. However, when the combined DDD of fast acting and intermediate acting insulins (also known as basal bolus insulin) was compared to the DDD of premixed insulin, there was a 66.9% increase in the former compared to 34.3% increase in the latter. As of 2014, the usage of basal bolus therapy had surpassed the premixed insulin. This could reflect the more aggressive diabetes management in 2014. Furthermore, there was an overall increase in the use of insulin analogues by 49.1% from 2011 to 2014. Further analysis of the results showed that only 9.1% of diabetics were using insulin analogues compared to human insulins. This was attributed to the undeniably fact of higher cost of insulin analogues.

Other Injectable Antidiabetics

The use of GLP-1 agonists, particularly liraglutide had increased by three-fold and this was mainly prescribed by clinicians in the private sector.

Comparison with Australia's Drug Usage

The overall use of insulin in Malaysia was still much lower compared to Australia's insulin usage in 2014[6]. This could possibly be due to heavier body weight of Australian diabetics who may need higher doses of insulin. In addition, Australia utilised predominantly insulin analogues rather than human insulins.

Conclusion

In summary, the increase in utilisation of oral hypoglycaemic agents and insulins could reflect a more aggressive management of diabetes by clinicians in Malaysia. Interestingly, the increase in overall antidiabetic utilisation was more in the public health facilities in comparison to the private sector. The usage of newer antidiabetics remained relatively low due to the higher medicines price. However, the usage of basal bolus therapy had finally surpassed the usage of premixed human insulin, in accordance with the local clinical practice guidelines.

Table 5.1: Use of agents in treating diabetes by therapeutic groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
A10	**Drugs used in diabetes**	**Public**	**44.6470**	**56.5723**	**62.3295**	**68.4853**
		Private	**10.5030**	**10.6507**	**11.0561**	**12.0008**
		Total	**55.1500**	**67.2230**	**73.3856**	**80.4861**
A10A	**Insulins and analogues**	**Public**	**4.8136**	**5.7734**	**7.2975**	**7.3719**
		Private	**0.4877**	**0.5116**	**0.5284**	**0.5816**
		Total	**5.3013**	**6.2850**	**7.8259**	**7.9535**
A10AB	Insulins and analogues for injection, fast-acting	Public	1.1615	1.6814	1.9443	2.0737
		Private	0.0709	0.0808	0.0821	0.0938
		Total	**1.2324**	**1.7623**	**2.0264**	**2.1675**
A10AC	Insulins and analogues for injection, intermediate-acting	Public	1.1641	1.5235	1.8408	1.8559
		Private	0.0172	0.0127	0.0067	0.0061
		Total	**1.1813**	**1.5362**	**1.8475**	**1.8621**
A10AD	Insulins and analogues for injection, intermediate- or long-acting combined with fast-acting	Public	2.4300	2.4963	3.3989	3.3535
		Private	0.2970	0.2993	0.3108	0.3461
		Total	**2.7269**	**2.7956**	**3.7096**	**3.6996**
A10AE	Insulins and analogues for injection, long-acting	Public	0.0580	0.0721	0.1135	0.0888
		Private	0.1026	0.1188	0.1289	0.1355
		Total	**0.1606**	**0.1910**	**0.2424**	**0.2243**
A10B	**Blood glucose lowering drugs, excluding insulins**	**Public**	**39.8334**	**50.7989**	**55.0320**	**61.1134**
		Private	**10.0153**	**10.1390**	**10.5277**	**11.4192**
		Total	**49.8487**	**60.9379**	**65.5597**	**72.5326**
A10BA	Biguanides	Public	11.3591	14.4387	15.1019	17.4203
		Private	2.6121	2.6040	2.6182	3.2165
		Total	**13.9712**	**17.0427**	**17.7201**	**20.6369**
A10BB	Sulfonylureas	Public	27.3788	34.7399	37.6820	40.4905
		Private	5.5213	5.3455	5.3948	5.3215
		Total	**32.9001**	**40.0854**	**43.0768**	**45.8120**
A10BD	Combinations of oral blood glucose lowering drugs	Public	0.4625	0.9442	1.6272	2.5527
		Private	1.3662	1.6014	1.9155	2.1869
		Total	**1.8287**	**2.5456**	**3.5427**	**4.7396**
A10BF	Alpha glucosidase inhibitors	Public	0.5944	0.6247	0.5666	0.5607
		Private	0.0926	0.0888	0.0894	0.0695
		Total	**0.6870**	**0.7134**	**0.6560**	**0.6302**
A10BG	Thiazolidinediones	Public	0.0105	0.0090	0.0025	0.0020
		Private	0.0569	0.0427	0.0418	0.0314
		Total	**0.0675**	**0.0518**	**0.0442**	**0.0334**

Table 5.1: (*continued*)

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
A10BH	Dipeptidyl peptidase 4 (DPP-4) inhibitors	Public	0.0240	0.0367	0.0474	0.0813
		Private	0.3305	0.4105	0.4167	0.4628
		Total	**0.3545**	**0.4473**	**0.4642**	**0.5441**
A10BX	Other blood glucose lowering drugs, excluding insulins	Public	0.0039	0.0057	0.0045	0.0059
		Private	0.0358	0.0461	0.0513	0.1305
		Total	**0.0397**	**0.0518**	**0.0558**	**0.1364**

Table 5.2: Use of antidiabetic agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Drug	Sector	2011	2012	2013	2014
A10AB	**Insulins and analogues for injection, fast-acting**					
A10AB01	Insulin (human)	Public	1.1382	1.6494	1.9021	2.0335
		Private	0.0203	0.0117	0.0089	0.0080
		Total	**1.1584**	**1.6611**	**1.9110**	**2.0415**
A10AB04	Insulin lispro	Public	0.0020	0.0036	0.0055	0.0059
		Private	0.0057	0.0062	0.0061	0.0075
		Total	**0.0077**	**0.0098**	**0.0116**	**0.0133**
A10AB05	Insulin aspart	Public	0.0213	0.0285	0.0367	0.0343
		Private	0.0434	0.0606	0.0633	0.0742
		Total	**0.0647**	**0.0890**	**0.1001**	**0.1084**
A10AB06	Insulin glulisine	Public	-	-	-	-
		Private	0.0016	0.0024	0.0038	0.0042
		Total	**0.0016**	**0.0024**	**0.0038**	**0.0042**
A10AC	**Insulins and analogues for injection, intermediate-acting**					
A10AC01	Insulin (human)	Public	1.1641	1.5235	1.8408	1.8559
		Private	0.0172	0.0127	0.0067	0.0061
		Total	**1.1813**	**1.5362**	**1.8475**	**1.8621**
A10AD	**Insulins and analogues for injection, intermediate- or long-acting combined with fast-acting**					
A10AD01	Insulin (human)	Public	2.3982	2.4469	3.3528	3.2932
		Private	0.0787	0.0477	0.0382	0.0340
		Total	**2.4770**	**2.4946**	**3.3911**	**3.3272**
A10AD04	Insulin lispro	Public	0.0003	0.0042	0.0061	0.0095
		Private	0.0122	0.0192	0.0302	0.0413
		Total	**0.0126**	**0.0233**	**0.0363**	**0.0508**
A10AD05	Insulin aspart	Public	0.0314	0.0453	0.0400	0.0508
		Private	0.2060	0.2324	0.2423	0.2709
		Total	**0.2374**	**0.2777**	**0.2823**	**0.3216**
A10AE	**Insulins and analogues for injection, long-acting**					
A10AE04	Insulin glargine	Public	0.0533	0.0629	0.1032	0.0739
		Private	0.0640	0.0720	0.0825	0.0868
		Total	**0.1172**	**0.1349**	**0.1857**	**0.1607**
A10AE05	Insulin detemir	Public	0.0047	0.0092	0.0103	0.0149
		Private	0.0386	0.0469	0.0464	0.0487
		Total	**0.0433**	**0.0561**	**0.0567**	**0.0636**
A10BA	**Biguanides**					
A10BA02	Metformin	Public	11.3591	14.4387	15.1019	17.4203
		Private	2.6121	2.6040	2.6182	3.2165
		Total	**13.9712**	**17.0427**	**17.7201**	**20.6369**

Table 5.2: (*continued*)

ATC	Drug	Sector	2011	2012	2013	2014
A10BB	**Sulfonylureas**					
A10BB01	Glibenclamide	Public	5.8124	5.0216	4.3805	3.4429
		Private	1.1037	0.9882	0.9987	0.8850
		Total	**6.9161**	**6.0098**	**5.3792**	**4.3279**
A10BB07	Glipizide	Public	-	-	-	-
		Private	0.0450	0.0381	0.0327	0.0334
		Total	**0.0450**	**0.0381**	**0.0327**	**0.0334**
A10BB09	Gliclazide	Public	21.5663	29.7182	33.3015	37.0476
		Private	3.8249	3.7474	3.9568	3.9797
		Total	**25.3911**	**33.4657**	**37.2584**	**41.0273**
A10BB12	Glimepiride	Public	0.0001	-	-	-
		Private	0.5478	0.5718	0.4066	0.4234
		Total	**0.5479**	**0.5718**	**0.4066**	**0.4234**
A10BD	**Combinations of oral blood glucose lowering drugs**					
A10BD02	Metformin and sulfonylureas	Public	0.4554	0.9231	1.5921	2.5023
		Private	0.8545	0.8974	0.9963	1.0322
		Total	**1.3099**	**1.8205**	**2.5884**	**3.5345**
A10BD03	Metformin and rosiglitazone	Public	-	-	-	-
		Private	0.0072	0.0029	0.0015	0.0018
		Total	**0.0072**	**0.0029**	**0.0015**	**0.0018**
A10BD07	Metformin and sitagliptin	Public	0.0037	0.0076	0.0129	0.0205
		Private	0.3575	0.4843	0.5319	0.5870
		Total	**0.3612**	**0.4919**	**0.5448**	**0.6075**
A10BD08	Metformin and vildagliptin	Public	0.0034	0.0135	0.0222	0.0281
		Private	0.1471	0.2129	0.2747	0.3005
		Total	**0.1505**	**0.2264**	**0.2969**	**0.3286**
A10BD10	Metformin and saxagliptin	Public	-	-	-	0.0018
		Private	-	0.0039	0.0900	0.1708
		Total	**-**	**0.0039**	**0.0900**	**0.1726**
A10BD11	Metformin and linagliptin	Public	-	-	-	-
		Private	-	-	0.0210	0.0947
		Total	**-**	**-**	**0.0210**	**0.0947**
A10BF	**Alpha glucosidase inhibitors**					
A10BF01	Acarbose	Public	0.5944	0.6247	0.5666	0.5607
		Private	0.0926	0.0888	0.0894	0.0695
		Total	**0.6870**	**0.7134**	**0.6560**	**0.6302**
A10BG	**Thiazolidinediones**					
A10BG02	Rosiglitazone	Public	0.0105	0.0090	0.0025	0.0019
		Private	0.0078	0.0052	0.0031	0.0023
		Total	**0.0184**	**0.0142**	**0.0056**	**0.0042**
A10BG03	Pioglitazone	Public	-	-	< 0.0001	< 0.0001
		Private	0.0491	0.0375	0.0387	0.0291
		Total	**0.0491**	**0.0375**	**0.0387**	**0.0292**
A10BH	**Dipeptidyl peptidase 4 (DPP-4) inhibitors**					
A10BH01	Sitagliptin	Public	0.0235	0.0331	0.0359	0.0555
		Private	0.2601	0.2862	0.2447	0.2354
		Total	**0.2836**	**0.3193**	**0.2806**	**0.2909**
A10BH02	Vildagliptin	Public	0.0005	0.0018	0.0046	0.0068
		Private	0.0393	0.0501	0.0431	0.0434
		Total	**0.0398**	**0.0519**	**0.0477**	**0.0502**

Table 5.2: (*continued*)

ATC	Drug	Sector	2011	2012	2013	2014
A10BH03	Saxagliptin	Public	-	0.0018	0.0069	0.0095
		Private	0.0311	0.0436	0.0412	0.0350
		Total	**0.0311**	**0.0454**	**0.0481**	**0.0444**
A10BH05	Linagliptin	Public	-	-	-	0.0096
		Private	-	0.0307	0.0877	0.1490
		Total	**-**	**0.0307**	**0.0877**	**0.1586**
A10BX	**Other blood glucose lowering drugs, excluding insulins**					
A10BX02	Repaglinide	Public	0.0037	0.0052	0.0035	0.0037
		Private	0.0202	0.0175	0.0149	0.0130
		Total	**0.0239**	**0.0227**	**0.0184**	**0.0168**
A10BX03	Nateglinide	Public	-	-	-	-
		Private	0.0031	0.0026	0.0020	0.0013
		Total	**0.0031**	**0.0026**	**0.0020**	**0.0013**
A10BX04	Exenatide	Public	0.0001	-	-	-
		Private	0.0013	0.0008	0.0005	0.0003
		Total	**0.0014**	**0.0008**	**0.0005**	**0.0003**
A10BX07	Liraglutide	Public	0.0001	0.0005	0.0010	0.0021
		Private	0.0112	0.0251	0.0340	0.0327
		Total	**0.0113**	**0.0257**	**0.0349**	**0.0348**
A10BX09	Dapagliflozin	Public	-	-	-	0.0001
		Private	-	-	-	0.0832
		Total	**-**	**-**	**-**	**0.0833**

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CHAPTER 6: USE OF ANTIANAEMIC DRUGS

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As compared to 2011-2012, the usage of antianaemic drugs appeared to be similar in 2013-2014 (Table 6.1). The most commonly prescribed antianaemic is oral iron formulation in both 2011-2012 and 2013-2014 periods (3.5469 and 4.0363 as compared to 3.7731 and 3.9781 DDD/1,000 inhabitants/day). There is also an increase in the usage of parenteral iron preparations, albeit much lower than oral forms. However, there is no record available of their usage in private sector in the same periods. Australia has much lower usage (0.16528 DDD/1,000 inhabitants/day) as compared to Malaysia (3.9781 DDD/1,000 inhabitants/day) in 2014[1]. This may reflect the differences in lifestyle, diet and socioeconomics strata.

Erythropoietin, another antianaemic drug, also known as recombinant human erythropoietin (rHuEPO), is a protein hormone, produced by specialised cells in the kidneys. Erythropoietin is released as a response to low haemoglobin to stimulate the bone marrow to produce more red blood cells[2]. There is increasing trend of erythropoietin usage in both private and public sectors in 2011-2012 and 2013-2014 periods. It seems that the usage in private sector is higher than public sector (0.3382 compared to 0.1444 DDD/1,000 inhabitants/day in 2014). The increment may be due to an increase number of patients requiring erythropoietin namely end stage renal disease (ESRD) and haematology patients[3,4]. As compared to darbepoetin alfa and methoxy polyethylene glycol-epoetin beta, erythropoietin is more popular.

In Malaysia, erythropoietin is the standard of care for many patients with ESRD except for those who developed antibodies to the erythropoietin and develop pure red cell aplasia or those who developed uncontrolled arterial hypertension. It is also used to treat anaemia resulting from treatment of cancer and certain diseases like myelodysplastic syndrome. When the hidden costs of the complications of blood transfusion are taken into account, erythropoietin would be a potential and cost effective alternative to transfusion. In some cases, intravenous iron without erythropoietin was just as effective in treating the anaemia related to iron deficiency.

For erythropoietin to be effective, it should be supplemented with iron. Parenteral iron was used in cases where the intake of oral iron was inadequate and absorption was not reliable[2]. However, there was not enough data on iron usage in Malaysia as iron preparations are classified as OTC which was not included in the MSOM. The results shown in the tables below do not reflect actual total consumption of all iron preparations. It is recommended that ferrous preparations be included in this survey in the future to enable assessment of the trend of use and consumption of these drugs.

Table 6.1: Use of agents in treating anaemia from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
B03	**Antianaemic preparations**	**Public**	**3.6723**	**4.1926**	**3.9167**	**4.1404**
		Private	**0.3249**	**0.3550**	**0.3735**	**0.3797**
		Total	**3.9972**	**4.5476**	**4.2902**	**4.5201**
B03A	**Iron preparations**	**Public**	**3.5564**	**4.0484**	**3.7857**	**3.9903**
		Private	**-**	**-**	**-**	**-**
		Total	**3.5564**	**4.0484**	**3.7857**	**3.9903**
B03AA	**Iron bivalent, oral preparations**					
B03AA02	Ferrous fumarate	Public	3.5469	4.0363	3.7731	3.9781
		Private	-	-	-	-
		Total	**3.5469**	**4.0363**	**3.7731**	**3.9781**
B03AC	**Iron, parenteral preparations**	**Public**	**0.0095**	**0.0121**	**0.0126**	**0.0121**
		Private	**-**	**-**	**-**	**-**
		Total	**0.0095**	**0.0121**	**0.0126**	**0.0121**
B03X	**Other antianaemic preparations**					
B03XA	**Other antianaemic preparations**	**Public**	**0.1159**	**0.1442**	**0.1311**	**0.1501**
		Private	**0.3249**	**0.3550**	**0.3735**	**0.3797**
		Total	**0.4407**	**0.4992**	**0.5045**	**0.5298**
B03XA01	Erythropoietin	Public	0.1148	0.1421	0.1292	0.1444
		Private	0.2967	0.3264	0.3396	0.3382
		Total	**0.4115**	**0.4684**	**0.4688**	**0.4826**
B03XA02	Darbepoetin alfa	Public	-	-	-	-
		Private	-	0.0001	0.0009	0.0010
		Total	**-**	**0.0001**	**0.0009**	**0.0010**
B03XA03	Methoxy polyethylene glycol-epoetin beta	Public	0.0011	0.0021	0.0019	0.0057
		Private	0.0281	0.0285	0.0330	0.0405
		Total	**0.0293**	**0.0306**	**0.0349**	**0.0462**

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CHAPTER 7: USE OF ANTIHAEMORRHAGICS

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The usage of antihaemorrhagics had increased about 14.9% from 2011-2012 to 2013-2014. The most commonly used class of antihaemorrhagics was still the class of antifibrinolytics, namely tranexamic acid in 2011 to 2014 (0.0614 – 0.0827 DDD/1,000 inhabitants/day), owing to its safety profile, readily available forms as capsules and injection ampoules as well as cheap price (Table 7.1). Tranexamic acid was used for local fibrinolysis and menorrhagia[1].

There is an annual increment in the usage of vitamin K from 2011-2012 (0.0077-0.0084 DDD/1,000 inhabitants/day) to 2013-2014 (0.0094 – 0.0102 DDD/1,000 inhabitants/day). This might be explained by the increased usage of anticoagulant in particular warfarin among patients with heart disease as the number of patients with heart disease has increased tremendously as shown by the data from World Health Rankings Research and Features. The age adjusted death rate due to coronary heart disease for Malaysia is 138.75 per 100,000 of population and it put Malaysia at number 57 in the world rank whereby Australia's age adjusted death rate is 60.34 per 100,000 of population (number 162 in the world rank)[2]. With the increase of anticoagulant usage, that might lead to the increase of overwarfarinization needing vitamin K as antidote.

The World Federation of Haemophilia (WFH) estimated the prevalence of haemophilia A of developing countries as a mean 6.6 SD 4.8 per 100,000 males in 2004[3]. For the severe forms of haemophilia, treatment was required regularly and throughout the patients' entire lifetime, to avoid target joints damage, deformity, disability or even early death. Factor concentrates are normally given as on-demand basis, as opposed to primary or secondary prophylaxis in the West. Without insurance coverage due to its nature as a congenital disease, haemophilia patients largely obtain factor concentrates from the public hospitals at no cost. It appears that the blood coagulation factors VIII and factor IX concentrates were minimally used in private while recording a low DDD in public sector for both periods (2011-2012 and 2013-2014). The main reason is due to majority of the patients obtained treatment in public sector. There is an overall increase in the usage of blood clotting factors, mainly factor VIII from 0.0013 DDD/1,000 inhabitants/day in 2011 to 0.0024 DDD/1,000 inhabitants/day in 2012 and 2013. This could be due to change of practice from on demand therapy to regular prophylaxis and immune tolerance therapy for eradication of factor VIII inhibitor in severe haemophilia A patients. However, the reason for the drop in usage to 0.0012 DDD/1,000 inhabitants/day in 2014 was unclear.

Other haemostatic agents such as Von Willebrand factor and factor VIII inhibitor bypassing activity are still low in usage from 2011 to 2014. The usage of 4-factor prothrombin complex concentrates (PCC) saw a significant reduction in 2014, indicating its limited use for warfarin overdose cases only, not for haemophiliacs. Coagulation factor XIII deficiency is a very rare disorder in our country that so far we have encountered only one case nationwide.

Recombinant factor VIIa or Eptacog Alfa (activated factor VII) is one of the few agents available for haemophiliacs with inhibitors. Recent years had seen it being used in excessive bleeding incidences unmanageable by conservative treatments or blood coagulation factors during minor or major surgical even critical neuro-surgical or obstetrics-gynaecological procedures[4]. However, its overall usage was still very minimal at <0.0001 DDD/1,000 inhabitants/day, perhaps due to its exorbitant price tag. The usage of recombinant factor VIIa or Eptacog alfa (activated factor VII) is still appropriate as the length of stay in critically ill patients that need reversal of coagulopathy can be shortened and the costs of hospitalisation can be reduced[5].

Thrombopoetin receptor agonists such as Romiplostim and Eltrombopag are the new agents being used to treat platelet disorder such as chronic immune thrombocytopenia. Eltrombopag seems to be more popular and shows a steady increase in usage both in public and private sectors from 2011 to 2014 (0.0003 – 0.0012 DDD/1,000 inhabitants/day).

Table 7.1: Use of antihaemorrhagic agents and respective therapeutic groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
B02	**Antihaemorrhagics**	**Public**	**0.0522**	**0.0640**	**0.0589**	**0.0746**
		Private	**0.0198**	**0.0222**	**0.0171**	**0.0223**
		Total	**0.0720**	**0.0862**	**0.0760**	**0.0969**
B02A	**Antifibrinolytics**					
B02AA	**Amino acids**					
B02AA02	Tranexamic acid	Public	0.0435	0.0532	0.0470	0.0628
		Private	0.0179	0.0198	0.0148	0.0199
		Total	**0.0614**	**0.0730**	**0.0618**	**0.0827**
B02B	**Vitamin K and other hemostatics**	**Public**	**0.0087**	**0.0109**	**0.0119**	**0.0118**
		Private	**0.0019**	**0.0024**	**0.0024**	**0.0024**
		Total	**0.0107**	**0.0132**	**0.0143**	**0.0142**
B02BA	**Vitamin K**					
B02BA01	Phytomenadione	Public	0.0061	0.0064	0.0075	0.0083
		Private	0.0017	0.0020	0.0019	0.0019
		Total	**0.0077**	**0.0084**	**0.0094**	**0.0102**
B02BD	**Blood coagulation factors**	**Public**	**0.0026**	**0.0042**	**0.0043**	**0.0028**
		Private	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
		Total	**0.0027**	**0.0042**	**0.0043**	**0.0028**
B02BD01	Coagulation factor IX, II, VII and X in combination	Public	0.0012	0.0017	0.0014	0.0005
		Private	-	-	-	-
		Total	**0.0012**	**0.0017**	**0.0014**	**0.0005**
B02BD02	Coagulation factor VIII	Public	0.0013	0.0024	0.0024	0.0012
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0013**	**0.0024**	**0.0024**	**0.0012**
B02BD03	Factor VIII inhibitor bypassing activity	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	-	-	-	-
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
B02BD04	Coagulation factor IX	Public	0.0002	0.0001	0.0005	0.0009
		Private	-	-	< 0.0001	-
		Total	**0.0002**	**0.0001**	**0.0005**	**0.0009**
B02BD06	Von Willebrand factor and coagulation factor VIII in combination	Public	-	-	-	0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**0.0001**
B02BD08	Eptacog alfa (activated)	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
B02BD09	Nonacog alfa	Public	-	-	< 0.0001	< 0.0001
		Private	-	-	< 0.0001	-
		Total	**-**	**-**	**< 0.0001**	**< 0.0001**
B02BX	**Other systemic hemostatics**	**Public**	**< 0.0001**	**0.0002**	**0.0001**	**0.0008**
		Private	**0.0002**	**0.0004**	**0.0004**	**0.0005**
		Total	**0.0003**	**0.0006**	**0.0005**	**0.0013**
B02BX04	Romiplostim	Public	-	-	-	-
		Private	-	-	< 0.0001	< 0.0001
		Total	**-**	**-**	**< 0.0001**	**< 0.0001**
B02BX05	Eltrombopag	Public	< 0.0001	0.0002	0.0001	0.0008
		Private	0.0002	0.0004	0.0004	0.0004
		Total	**0.0003**	**0.0006**	**0.0005**	**0.0012**

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CHAPTER 8: USE OF DRUGS FOR CARDIOVASCULAR DISORDERS

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This chapter presents information on the use of antithrombotic agents (B01) and drugs for cardiovascular disorders excluding antihypertensive (C02) and lipid modifying agents (C10) for the year 2011 to 2014.

Drugs used in management of cardiovascular disease (CVD) remain frequently prescribed in Malaysia. From 2011 to 2014, there was predominant usage of evidence based drugs, in part due to the rising prevalence of cardiovascular risk factors and improved access of patients with CVD to healthcare facilities[1,2]. The value presented in this chapter is based on DDD/1,000 inhabitants/day.

Listed in Table 8.1 are the DDD for antithrombotic agents and drugs for cardiovascular disorders by therapeutic subgroups. Overall, from 2011 to 2014, there was a drastic increase in the use of antithrombotic agents (from 9.7833 to 14.6748, respectively). The use of anti-thrombotic drugs in public and private sector increase by 64% and 18% respectively.

Table 8.2 showed that of all types of antithrombotic agents by drug class and agents. More than 90% of the consumption of antithrombotic agents mainly contributed by platelet aggregation inhibitors. Within this group, aspirin (acetylsalicyclic acid) remain as the commonly used, rising from 6.6545 in 2011 to 10.3979 in 2014 and the rise primarily being accounted at the public sector (5.3205 to 8.9877). Thus, aspirin remained the most widely used agent in this four-year period constituting more than 70.7% of the total use of all antithrombotic agents.

The use of clopidogrel rose slightly from 1.3934 to 2.1637 in 2011 to 2014, respectively. However, the use of ticlopidine reduced by 1.6% in 2014 compared to 2011. This is probably due to availability of newer and more effective antiplatelet agents. Although it was anticipated that the usage of prasugrel and ticargrelor will increase due to its effectiveness in reducing ischemic events[3], the usage remained low in 2014 (prasugrel 0.0123 and ticargrelor 0.0692). Higher cost compared to the other older agents' limit the use of both drug in treating acute coronary syndrome (ACS) patients[4].

Over the four-year period, the use of unfractionated heparin (UFH) remain higher in the public compared to the private sector. Similarly, the use of low molecular weight heparin (LMWH) such as enoxaparin (0.0587 to 0.1052) and fondaprinux also increased in the public sector (0.0160 to 0.0297). The usage in the private sector remained low at 0.0125 and 0.0027 for enoxaparin and fondaparinux, respectively in 2014. It is reassuring to note the overall increase in the use of LMWH, which offer several advantages over UFH in the public sector. However, this trend was not seen in the private sector (Table 8.2). The use of UFH during percutaneous coronary intervention (PCI) is limited by its unpredictable effect, risk of infection, the need for close monitoring, and the uncertainty around optimal levels of activated clotting time[5-7].

Warfarin use from 2011 to 2014 increase slightly in public sector from 0.3425 to 0.4334 but there was slight decrease in private sector from 0.1493 to 0.0904. The use of newer oral anticoagulants (NOACs) showed slight increased in trend in both sector. Among the NOACs, dabigatran was the most commonly prescribed as it was the first agent approved to be used in Malaysia (from 0.0178 to 0.0565 in 2011 to 2014, respectively). Due to limitation use of warfarin and the reassurance of the effectiveness and safety of NOAC in everyday practice the utilisation of dabigatran and other newer agent's may increase from 2014 onwards[8,9].

Among thrombolytics/fibrinolytics drugs, the most commonly used was streptokinase, predominantly used in the public sector due to cost factor as compared to newer agents (0.0008 to 0.0011 in 2011 to 2014, respectively). The usage in the private sector was negligible (<0.0001). The use of other thrombolytics agents remained low over the same period (<0.0001). Primary PCI for ST-elevation myocardial infraction is preferred over thrombolytics. There are limited public sector facilities as compared to private for primary PCI. This may explain the low usage of thrombolytics in the private sector.

Table 8.3 listed the use of cardiac glycosides by drug class and agents for 2011 to 2014. Among the established cardiac glycoside, digoxin remained commonly used in Malaysia and it is indicated for heart failure and arrhythmias. However, the consumption was unchanged throughout this four-year period at approximately 0.5.

In 2014, the use of digoxin in the OECD countries ranged from 0.5 to 4.6 (Figure 8.1). In comparison, usage of digoxin in Malaysia is low. The reasons were it was mainly use in heart failure patients and it limited use as anti-arrhythmic agents. This also may be due in part to the increasing number of heart failure patients receiving evidence-based newer beta blockers and also undergoing cardiac resynchronization therapy.

Other commonly prescribed anti-arrhythmics drugs were amiodarone followed by flecainide. Amiodarone utilisation remained unchanged at 0.09 from 2011 to 2014, while the use of flecainide was increase by 72.7% from 2011 to 2014 (0.0055 versus 0.0095). The consumption of both drugs were mainly at the private compared to the public sector (Table 8.3).

Except epinephrine and norepinephrine, the spending of other adrenergic and dopaminergic agents remained low and was consistent from 2011 to 2014. The use of epinephrine increased from 0.1605 in 2011 to 0.2626 in 2014. Similarly, the use of norepinephrine also increases from 0.0298 in 2011 to 0.0687 in 2014, which may be due to its increased use during cardiac resuscitation (Table 8.3).

The use of oral nitrates revealed interesting findings, with the shorter acting isosorbide dinitrate demonstrating a higher usage compared to the longer acting isosorbide mononitrate version (Table 8.4). The usage of mononitrate had showed increase by 24% from 0.5561 to 0.6909 in 2011 to 2014. The majority of the both nitrate was prescribed in the public sector. The anti-ischaemic compound trimetazidine was commonly prescribed in Malaysia, with an increase trend from 2.0605 in 2011 to 2.6615 in 2014. The use of ivabradine also increased in use from 0.0678 to 0.1357 in 2011 and 2014, respectively (Table 8.4).

Table 8.5 listed the use of diuretics by drug class and agents for 2011 to 2014. Hydrochlorthiazide is now the most commonly prescribed thiazide diuretic, with a DDD of 9.7994 to 12.4333 in 2011 and 2014, respectively. The use was more common in public sector. The use of indapamide reduced from 0.6321 to 0.4412 in 2011 and 2014 respectively. There was a corresponding rise in the use of furosemide (4.2344 in 2011 to 5.9522 in 2014). The use of spironolactone also rose from 0.3468 in 2011 to 0.4612 in 2014. As compared to OECD countries, the local usage of diuretics was low being only higher than Korea and Austria (Figure 8.2).

The most commonly prescribed beta-blockers in 2011 to 2014 were atenolol, metoprolol, bisoprolol, propanolol and carvedilol, respectively (Table 8.7). In 2014, the highest consumption was atenolol (10.9477) and followed by metoprolol (9.4438), with greater usage in public compared to private sector. Bisoprolol scores were 1.5343 and carvedilol 0.3241, with approximately similar usage in both public and private sector. The consistently low usage in carvedilol was a bit puzzling because carvedilol has been proven to be useful as it reduces mortality in patients with heart failure and that it serves as better options compared to conventional beta-blockers[10]. Probably the prescribers prefer long acting bisoprolol (0.6629 in 2011 versus 1.5343 in 2014) instead of short acting carvedilol (0.3138 in 2011 and 0.3241 in 2014) for better patients compliance. As compared to OECD countries, overall usage of beta blockers was also low (Figure 8.3). This is probably due to the reluctance of prescriber to initiate it for patient following ACS and heart failure due to it side effects.

The use of calcium channel blockers (CCB) agents by drug class and agents for 2011 to 2014 is presented in Table 8.8. Among the dihydropyridine CCB, amlodipine was widely prescribed in Malaysia, with a DDD of 29.9225 in 2011, increasing substantially to 50.1211 in 2014, especially in public sector from 25.6233 to 44.1348. The utilisation of felodipine slightly increased from 2.3221 to 4.2768 mainly at public sector. However, there was a reduced trend in nifedipine use from 6.2826 to 3.0030 mainly also at public sector. The usage of two non-dihydropyridine CCB, diltiazem and verapamil increased by 27% and 3.3% from 2011 to 2014 respectively.

Thus, among the CCB, only amlodipine showed significant increase in usage from 2011 to 2014 and the utilisation has expanded almost double from 2011 to 2014, particularly in the public sector. The increased use of amlodipine could partly be explained by the introduction of generic amlodipine and the readily available in the public sector especially in health clinic. The convenience of once-a-day dosing of amlodipine compared to thrice a day dosing for nifedipine and diltiazem could also explain the rise of amlodipine use. Due to cost-effectiveness[11] and safety profile of amlodipine[12,13], it is encouraging to see that the utilisation of amlodipine showed an upward trend. The local usage of CCB was higher than half of the other OECD countries which range from 37 to 89 (Figure 8.4). The use of CCB was mainly for hypertension and coronary artery disease.

Numerous studies have confirmed that angiotensin converting enzyme inhibitors (ACEIs) are commonly used to treat cardiovascular disorders[14]. Thus, within the group of agents acting on the renin-angiotensin-aldosterone system (RAAS), ACEIs are the most used subgroup accounting to 70.9% of the total agents used in 2014. The

consumption of single ACEIs was increased from 23.2440 to 34.7246 during this period. Among the ACEIs utilisation, the use of captopril reduced by 19.8% in 2014 from 2.3222 to 1.8622. Study has shown that the efficacy, safety and tolerability of perindopril was well established in the treatment of hypertension and heart failure[15]. Parallel to this study, the consumption of perindopril increased substantially from 14.1619 in 2011 to 25.9873 in 2014 mainly in public sector. However, ramipril and enalapril used were almost similar throughout this period (Table 8.9). Although, the usage locally has increased, it is still low when compared to other OECD. This may be due to the commonly seen side effects (dry cough) in our population (Figure 8.5).

Table 8.9 shows data for both single agents within the angiotensin receptor blockers (ARBs) group or products containing their combinations. Telmisartan remains the most commonly utilised ARBs, followed closely by losartan and irbesartan at 2.6592, 2.2919 and 2.0365 in 2014, respectively.

The consumption of ARBs/diuretics remains the same from 2011 to 2014: losartan/diuretic (0.7), valsartan/diuretics (0.6), irbesartan/diuretics (0.5) and telmisartan/diuretics (0.5). Study shown that the combination amlodipine/losartan therapy provides an effective and generally well-tolerated with improved adherence[16] for reducing blood pressure in stage 2 hypertensive patients[17]. This was portrayed in Malaysia when the combination of amlodipine and ARB show a substantial increase in use, with a DDD of amlodipine/valsartan increased from 0.7312 to 1.0438 and amlodipine/telmisartan from 0.0181 to 0.6385 in 2011 to 2014, respectively and amlodipine/losartan from 0.0249 to 0.1954 from 2012 to 2014. There is also an increase in trend of three-drug combination (amlodipine, valsartan and hychlorothizide) from 0.0647 to 0.2283 during the same period.

In summary, the most commonly prescribed antiplatelets were aspirin, clopidogrel and ticlopidine. Compared to NOACs, warfarin was still the most commonly prescribed oral anticoagulant. The most utilised cardiovascular drugs are the CCB (57.9936), followed by ACE-Is (34.7246), beta-blockers (22.8967), diuretics (20.4500) and ARBs (8.7679). While, the five most commonly used single drugs to treat CVD were amlodipine (50.1211), perindopril (25.9873), hydrochorthiazide (12.4333), metoprolol (9.4438) and furosemide (5.9522). Increase use in some of the drug classes appear to be based on trial evidence or clinical practice guidelines. In conclusion, except for minimal decrease in utilisation of digoxin, there has been significant increase in utilisation of most of the cardiovascular drug class from 2011 to 2014.

Table 8.1: Use of drugs in treating cardiovascular disorders, by therapeutic groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
B01	Antithrombotic agents	Public	6.8598	8.2519	9.5891	11.2196
		Private	2.9235	3.3386	3.5571	3.4552
		Total	**9.7833**	**11.5905**	**13.1462**	**14.6748**
C01	Cardiac therapy	Public	3.3280	3.5609	3.7113	4.3420
		Private	1.2840	1.2493	1.3710	1.3592
		Total	**4.6120**	**4.8102**	**5.0822**	**5.7012**
C02	Antihypertensives	Public	2.2490	2.1599	2.4367	2.8712
		Private	0.2226	0.2877	0.2621	0.2863
		Total	**2.4716**	**2.4476**	**2.6988**	**3.1574**
C03	Diuretics	Public	13.4878	16.0368	17.1145	18.0767
		Private	2.5774	2.5773	2.5200	2.3732
		Total	**16.0652**	**18.6141**	**19.6344**	**20.4500**
C04	Peripheral vasodilators	Public	0.0380	0.0340	0.0307	0.0329
		Private	0.0137	0.0127	0.0145	0.0144
		Total	**0.0517**	**0.0466**	**0.0452**	**0.0473**
C07	Beta blocking agents	Public	15.3301	16.1966	17.1612	18.3914
		Private	4.9541	5.0940	4.8586	4.9224
		Total	**20.2842**	**21.2906**	**22.0199**	**23.3138**
C08	Calcium channel blockers	Public	33.3980	43.7260	47.2068	50.8156
		Private	5.6099	6.5248	7.1302	7.1779
		Total	**39.0079**	**50.2507**	**54.3370**	**57.9936**
C09	Agents acting on the renin-angiotensin system	Public	23.9350	32.3847	37.5544	38.0626
		Private	9.4216	9.7408	10.1520	10.9486
		Total	**33.3566**	**42.1255**	**47.7064**	**49.0112**

Table 8.2: Use of antithrombotic agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
B01A	**Antithrombotic agents**	**Public**	**6.8598**	**8.2519**	**9.5891**	**11.2196**
		Private	**2.9235**	**3.3386**	**3.5571**	**3.4552**
		Total	**9.7833**	**11.5905**	**13.1462**	**14.6748**
B01AA	**Vitamin K antagonists**					
B01AA03	Warfarin	Public	0.3425	0.3036	0.3390	0.4334
		Private	0.1493	0.0834	0.0990	0.0904
		Total	**0.4918**	**0.3870**	**0.4379**	**0.5239**
B01AB	**Heparin group**	**Public**	**0.2929**	**0.3218**	**0.3585**	**0.4378**
		Private	**0.0744**	**0.0795**	**0.0662**	**0.0728**
		Total	**0.3673**	**0.4012**	**0.4247**	**0.5106**
B01AB01	Heparin	Public	0.2297	0.2388	0.2664	0.3191
		Private	0.0221	0.0280	0.0229	0.0293
		Total	**0.2518**	**0.2668**	**0.2894**	**0.3484**
B01AB05	Enoxaparin	Public	0.0587	0.0772	0.0766	0.1052
		Private	0.0146	0.0143	0.0130	0.0125
		Total	**0.0732**	**0.0916**	**0.0896**	**0.1177**
B01AB10	Tinzaparin	Public	0.0045	0.0057	0.0155	0.0134
		Private	0.0019	0.0024	0.0032	0.0019
		Total	**0.0065**	**0.0081**	**0.0187**	**0.0154**
B01AB11	Sulodexide	Public	-	-	-	-
		Private	0.0358	0.0347	0.0270	0.0290
		Total	**0.0358**	**0.0347**	**0.0270**	**0.0290**
B01AC	**Platelet aggregation inhibitors excluding heparin**	**Public**	**6.2069**	**7.5982**	**8.8524**	**10.2931**
		Private	**2.6792**	**3.1180**	**3.3114**	**3.1866**
		Total	**8.8861**	**10.7163**	**12.1638**	**13.4797**
B01AC04	Clopidogrel	Public	0.2184	0.3453	0.4464	0.5844
		Private	1.1750	1.4030	1.4002	1.5794
		Total	**1.3934**	**1.7483**	**1.8466**	**2.1637**
B01AC05	Ticlopidine	Public	0.6287	0.6185	0.6350	0.6698
		Private	0.1215	0.1118	0.0812	0.0681
		Total	**0.7501**	**0.7303**	**0.7162**	**0.7379**
B01AC06	Acetylsalicylic acid	Public	5.3205	6.6045	7.7355	8.9877
		Private	1.3341	1.5309	1.7376	1.4101
		Total	**6.6545**	**8.1354**	**9.4731**	**10.3979**
B01AC07	Dipyridamole	Public	0.0393	0.0298	0.0333	0.0369
		Private	0.0066	0.0048	0.0030	0.0028
		Total	**0.0460**	**0.0347**	**0.0362**	**0.0397**
B01AC11	Iloprost	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
B01AC13	Abciximab	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
B01AC17	Tirofiban	Public	< 0.0001	< 0.0001	< 0.0001	0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0001**	**0.0001**	**0.0001**
B01AC18	Triflusal	Public	-	-	-	0.0001
		Private	0.0201	0.0270	0.0283	0.0269
		Total	**0.0201**	**0.0270**	**0.0283**	**0.0270**

Table 8.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
B01AC22	Prasugrel	Public	< 0.0001	-	0.0001	0.0018
		Private	0.0113	0.0107	0.0135	0.0105
		Total	**0.0113**	**0.0107**	**0.0135**	**0.0123**
B01AC23	Cilostazol	Public	-	-	-	0.0010
		Private	0.0050	0.0058	0.0063	0.0069
		Total	**0.0050**	**0.0058**	**0.0063**	**0.0079**
B01AC24	Ticagrelor	Public	-	< 0.0001	0.0020	0.0113
		Private	0.0057	0.0240	0.0384	0.0578
		Total	**0.0057**	**0.0240**	**0.0405**	**0.0692**
B01AC30	Combinations	Public	-	-	-	-
		Private	-	-	0.0030	0.0240
		Total	**-**	**-**	**0.0030**	**0.0240**
B01AD	**Enzymes**	**Public**	**0.0009**	**0.0009**	**0.0010**	**0.0012**
		Private	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**
		Total	**0.0010**	**0.0010**	**0.0010**	**0.0013**
B01AD01	Streptokinase	Public	0.0008	0.0008	0.0009	0.0011
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0009**	**0.0009**	**0.0009**	**0.0011**
B01AD02	Alteplase	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
B01AD04	Urokinase	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
B01AD10	Drotrecogin alfa (activated)	Public	-	-	-	-
		Private	< 0.0001	-	-	-
		Total	**< 0.0001**	**-**	**-**	**-**
B01AD11	Tenecteplase	Public	0.0001	0.0001	0.0001	0.0002
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0001**	**0.0001**	**0.0002**
B01AE	**Direct thrombin inhibitors**					
B01AE07	Dabigatran etexilate	Public	0.0005	0.0039	0.0097	0.0182
		Private	0.0173	0.0384	0.0398	0.0384
		Total	**0.0178**	**0.0422**	**0.0494**	**0.0565**
B01AF	**Direct factor Xa inhibitors**	**Public**	**0.0001**	**0.0001**	**0.0006**	**0.0062**
		Private	**0.0010**	**0.0165**	**0.0381**	**0.0642**
		Total	**0.0012**	**0.0166**	**0.0387**	**0.0705**
B01AF01	Rivaroxaban	Public	0.0001	0.0001	0.0006	0.0061
		Private	0.0010	0.0165	0.0381	0.0577
		Total	**0.0012**	**0.0166**	**0.0387**	**0.0638**
B01AF02	Apixaban	Public	-	-	-	0.0002
		Private	-	-	-	0.0065
		Total	**-**	**-**	**-**	**0.0067**
B01AX	**Other antithrombotic agents**	**Public**	**0.0160**	**0.0234**	**0.0280**	**0.0297**
		Private	**0.0022**	**0.0027**	**0.0026**	**0.0027**
		Total	**0.0182**	**0.0260**	**0.0306**	**0.0324**
B01AX01	Defibrotide	Public	< 0.0001	0.0001	< 0.0001	0.0001
		Private	-	-	-	-
		Total	**< 0.0001**	**0.0001**	**< 0.0001**	**0.0001**
B01AX05	Fondaparinux	Public	0.0160	0.0233	0.0280	0.0297
		Private	0.0022	0.0027	0.0026	0.0027
		Total	**0.0181**	**0.0260**	**0.0306**	**0.0323**

Table 8.3: Use of cardiac glycosides, antiarrhymic agents and other cardiac stimulants from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C01A	**Cardiac glycosides**					
C01AA	**Digitalis glycosides**					
C01AA05	Digoxin	Public	0.3384	0.3400	0.2874	0.3465
		Private	0.1624	0.1432	0.1427	0.1407
		Total	**0.5008**	**0.4831**	**0.4302**	**0.4872**
C01B	**Antiarrhythmics, class I and III**	**Public**	**0.0237**	**0.0409**	**0.0332**	**0.0322**
		Private	**0.0824**	**0.0732**	**0.0800**	**0.0856**
		Total	**0.1062**	**0.1141**	**0.1132**	**0.1178**
C01BB	**Antiarrhythmics, class Ib**					
C01BB01	Lidocaine	Public	0.0011	0.0011	0.0013	0.0013
		Private	0.0013	0.0013	0.0014	0.0014
		Total	**0.0023**	**0.0025**	**0.0027**	**0.0028**
C01BC	**Antiarrhythmics, class Ic**	**Public**	**0.0006**	**0.0025**	**0.0015**	**0.0032**
		Private	**0.0083**	**0.0093**	**0.0085**	**0.0098**
		Total	**0.0089**	**0.0118**	**0.0100**	**0.0130**
C01BC03	Propafenone	Public	-	-	-	-
		Private	0.0034	0.0043	0.0035	0.0035
		Total	**0.0034**	**0.0043**	**0.0035**	**0.0035**
C01BC04	Flecainide	Public	0.0006	0.0025	0.0015	0.0032
		Private	0.0048	0.0050	0.0050	0.0063
		Total	**0.0055**	**0.0075**	**0.0065**	**0.0095**
C01BD	**Antiarrhythmics, class III**	**Public**	**0.0220**	**0.0373**	**0.0305**	**0.0276**
		Private	**0.0729**	**0.0626**	**0.0700**	**0.0744**
		Total	**0.0949**	**0.0998**	**0.1005**	**0.1021**
C01BD01	Amiodarone	Public	0.0220	0.0372	0.0305	0.0276
		Private	0.0696	0.0594	0.0672	0.0716
		Total	**0.0916**	**0.0966**	**0.0977**	**0.0992**
C01BD07	Dronedarone	Public	< 0.0001	0.0001	< 0.0001	-
		Private	0.0033	0.0032	0.0028	0.0029
		Total	**0.0033**	**0.0033**	**0.0028**	**0.0029**
C01C	**Cardiac stimulants excluding cardiac glycosides**	**Public**	**0.2154**	**0.2289**	**0.2885**	**0.3346**
		Private	**0.0187**	**0.0169**	**0.0296**	**0.0423**
		Total	**0.2341**	**0.2457**	**0.3181**	**0.3770**
C01CA	**Adrenergic and dopaminergic agents**	**Public**	**0.2154**	**0.2288**	**0.2885**	**0.3346**
		Private	**0.0187**	**0.0169**	**0.0296**	**0.0423**
		Total	**0.2341**	**0.2457**	**0.3181**	**0.3769**
C01CA02	Isoprenaline	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
C01CA03	Norepinephrine	Public	0.0283	0.0291	0.0648	0.0675
		Private	0.0016	0.0017	0.0024	0.0012
		Total	**0.0298**	**0.0308**	**0.0672**	**0.0687**
C01CA04	Dopamine	Public	0.0191	0.0186	0.0165	0.0149
		Private	0.0023	0.0024	0.0031	0.0026
		Total	**0.0214**	**0.0209**	**0.0196**	**0.0175**
C01CA06	Phenylephrine	Public	0.0024	0.0030	0.0049	0.0045
		Private	0.0005	0.0005	0.0002	-
		Total	**0.0029**	**0.0035**	**0.0052**	**0.0045**

Table 8.3: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C01CA07	Dobutamine	Public	0.0115	0.0101	0.0102	0.0113
		Private	0.0008	0.0009	0.0007	0.0007
		Total	**0.0124**	**0.0109**	**0.0109**	**0.0120**
C01CA17	Midodrine	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
C01CA24	Epinephrine	Public	0.1477	0.1596	0.1845	0.2257
		Private	0.0128	0.0081	0.0218	0.0369
		Total	**0.1605**	**0.1678**	**0.2063**	**0.2626**
C01CA26	Ephedrine	Public	0.0064	0.0084	0.0075	0.0107
		Private	0.0008	0.0033	0.0014	0.0009
		Total	**0.0071**	**0.0117**	**0.0089**	**0.0116**
C01CE	**Phosphodiesterase inhibitors**					
C01CE02	Milrinone	Public	< 0.0001	< 0.0001	< 0.0001	0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**0.0001**	**< 0.0001**	**0.0001**

Table 8.4: Use of vasodilators and other agents in treating cardiac disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C01D	**Vasodilators used in cardiac diseases**					
C01DA	**Organic nitrates**	**Public**	**1.3320**	**1.3586**	**1.4589**	**1.6590**
		Private	**0.3091**	**0.2872**	**0.3013**	**0.2613**
		Total	**1.6411**	**1.6458**	**1.7602**	**1.9204**
C01DA02	Glyceryl trinitrate	Public	0.1160	0.1844	0.2279	0.2627
		Private	0.0306	0.0346	0.0393	0.0252
		Total	**0.1466**	**0.2189**	**0.2672**	**0.2879**
C01DA08	Isosorbide dinitrate	Public	0.9074	0.8809	0.8479	0.9186
		Private	0.0310	0.0363	0.0344	0.0230
		Total	**0.9384**	**0.9172**	**0.8822**	**0.9416**
C01DA14	Isosorbide mononitrate	Public	0.3086	0.2933	0.3831	0.4777
		Private	0.2475	0.2164	0.2277	0.2131
		Total	**0.5561**	**0.5097**	**0.6108**	**0.6909**
C01E	**Other cardiac preparations**	**Public**	**1.4184**	**1.5926**	**1.6432**	**1.9697**
		Private	**0.7113**	**0.7288**	**0.8173**	**0.8292**
		Total	**2.1297**	**2.3214**	**2.4605**	**2.7989**
C01EA	**Prostaglandins**					
C01EA01	Alprostadil	Public	0.0003	0.0002	0.0002	0.0002
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0003**	**0.0002**	**0.0002**	**0.0002**
C01EB	**Other cardiac preparations**	**Public**	**1.4181**	**1.5924**	**1.6431**	**1.9695**
		Private	**0.7113**	**0.7288**	**0.8173**	**0.8292**
		Total	**2.1294**	**2.3212**	**2.4603**	**2.7987**
C01EB03	Indometacin	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
C01EB10	Adenosine	Public	0.0010	0.0011	0.0010	0.0013
		Private	0.0001	0.0001	0.0002	0.0002
		Total	**0.0011**	**0.0012**	**0.0012**	**0.0015**

Table 8.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C01EB15	Trimetazidine	Public	1.4096	1.5759	1.6207	1.9380
		Private	0.6509	0.6518	0.7207	0.7236
		Total	**2.0605**	**2.2277**	**2.3413**	**2.6615**
C01EB17	Ivabradine	Public	0.0075	0.0153	0.0214	0.0303
		Private	0.0603	0.0769	0.0964	0.1054
		Total	**0.0678**	**0.0922**	**0.1178**	**0.1357**

Table 8.5: Use of thiazides and other diuretics from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C03A	**Low-ceiling diuretics, thiazides**					
C03AA	**Thiazides, plain**					
C03AA03	Hydrochlorothiazide	Public	8.9165	10.7599	11.1850	11.7483
		Private	0.8829	0.8814	0.7981	0.6850
		Total	**9.7994**	**11.6414**	**11.9831**	**12.4333**
C03B	**Low-ceiling diuretics, excluding thiazides**					
C03BA	**Sulfonamides, plain**	**Public**	**0.0006**	**0.0028**	**0.0048**	**0.0167**
		Private	**0.6712**	**0.6065**	**0.5152**	**0.4486**
		Total	**0.6718**	**0.6093**	**0.5200**	**0.4653**
C03BA04	Chlortalidone	Public	-	-	-	-
		Private	0.0391	0.0059	0.0229	0.0075
		Total	**0.0391**	**0.0059**	**0.0229**	**0.0075**
C03BA08	Metolazone	Public	0.0006	0.0028	0.0048	0.0167
		Private	-	-	-	-
		Total	**0.0006**	**0.0028**	**0.0048**	**0.0167**
C03BA11	Indapamide	Public	-	-	-	< 0.0001
		Private	0.6321	0.6006	0.4923	0.4412
		Total	**0.6321**	**0.6006**	**0.4923**	**0.4412**
C03C	**High-ceiling diuretics**					
C03CA	**Sulfonamides, plain**	**Public**	**3.6767**	**4.3278**	**4.9019**	**5.2570**
		Private	**0.5886**	**0.6591**	**0.6852**	**0.7330**
		Total	**4.2653**	**4.9870**	**5.5871**	**5.9900**
C03CA01	Furosemide	Public	3.6654	4.3015	4.8665	5.2313
		Private	0.5691	0.6397	0.6748	0.7209
		Total	**4.2344**	**4.9411**	**5.5413**	**5.9522**
C03CA02	Bumetanide	Public	0.0113	0.0264	0.0354	0.0257
		Private	0.0196	0.0195	0.0105	0.0121
		Total	**0.0309**	**0.0459**	**0.0459**	**0.0378**
C03D	**Potassium-sparing agents**	**Public**	**0.2343**	**0.2674**	**0.3200**	**0.3057**
		Private	**0.1128**	**0.0905**	**0.1582**	**0.1590**
		Total	**0.3471**	**0.3579**	**0.4782**	**0.4647**
C03DA	**Aldosterone antagonists**	**Public**	**0.2342**	**0.2674**	**0.3200**	**0.3057**
		Private	**0.1128**	**0.0905**	**0.1582**	**0.1590**
		Total	**0.3470**	**0.3579**	**0.4782**	**0.4647**
C03DA01	Spironolactone	Public	0.2341	0.2674	0.3195	0.3052
		Private	0.1126	0.0892	0.1561	0.1560
		Total	**0.3468**	**0.3566**	**0.4756**	**0.4612**
C03DA04	Eplerenone	Public	0.0001	< 0.0001	0.0004	0.0005
		Private	0.0002	0.0013	0.0021	0.0031
		Total	**0.0002**	**0.0014**	**0.0026**	**0.0035**

Table 8.5: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C03DB	**Other potassium-sparing agents**					
C03DB01	Amiloride	Public	0.0001	< 0.0001	< 0.0001	-
		Private	-	-	-	-
		Total	**0.0001**	**< 0.0001**	**< 0.0001**	**-**
C03E	**Diuretics and potassium-sparing agents in combination**					
C03EA	**Low-ceiling diuretics and potassium-sparing agents**					
C03EA01	Hydrochlorothiazide and potassium-sparing agents	Public	0.6598	0.6788	0.7028	0.7490
		Private	0.3219	0.3397	0.3632	0.3476
		Total	**0.9817**	**1.0185**	**1.0660**	**1.0966**

Table 8.6: Use of peripheral vasodilators from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C04A	**Peripheral vasodilators**	**Public**	**0.0380**	**0.0340**	**0.0307**	**0.0329**
		Private	**0.0137**	**0.0127**	**0.0145**	**0.0144**
		Total	**0.0517**	**0.0466**	**0.0452**	**0.0473**
C04AD	**Purine derivatives**					
C04AD03	Pentoxifylline	Public	0.0339	0.0251	0.0278	0.0312
		Private	0.0108	0.0107	0.0116	0.0122
		Total	**0.0447**	**0.0358**	**0.0395**	**0.0434**
C04AE	**Ergot alkaloids**					
C04AE01	Ergoloid mesylates	Public	0.0041	0.0089	0.0029	0.0017
		Private	0.0029	0.0020	0.0028	0.0021
		Total	**0.0070**	**0.0109**	**0.0058**	**0.0039**
C04AX	**Other peripheral vasodilators**					
C04AX02	Phenoxybenzamine	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**

Table 8.7: Use of beta blockers from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C07A	**Beta blocking agents**	**Public**	**15.3290**	**16.1965**	**17.1612**	**18.3914**
		Private	**4.6605**	**4.6187**	**4.4910**	**4.5053**
		Total	**19.9894**	**20.8152**	**21.6522**	**22.8967**
C07AA	**Beta blocking agents, non-selective**	**Public**	**0.2507**	**0.2301**	**0.2498**	**0.2649**
		Private	**0.1865**	**0.1866**	**0.1738**	**0.1785**
		Total	**0.4372**	**0.4167**	**0.4235**	**0.4433**
C07AA05	Propranolol	Public	0.2500	0.2288	0.2483	0.2611
		Private	0.1671	0.1608	0.1603	0.1643
		Total	**0.4171**	**0.3896**	**0.4087**	**0.4254**
C07AA07	Sotalol	Public	0.0006	0.0013	0.0014	0.0038
		Private	0.0194	0.0257	0.0134	0.0142
		Total	**0.0201**	**0.0271**	**0.0149**	**0.0180**
C07AB	**Beta blocking agents, selective**	**Public**	**14.8031**	**15.7251**	**16.6456**	**17.8355**
		Private	**4.3495**	**4.2868**	**4.1873**	**4.1887**
		Total	**19.1526**	**20.0119**	**20.8329**	**22.0242**
C07AB02	Metoprolol	Public	7.8296	8.4421	8.8488	8.9393
		Private	0.3339	0.4379	0.5239	0.5045
		Total	**8.1635**	**8.8800**	**9.3726**	**9.4438**
C07AB03	Atenolol	Public	6.7712	6.9151	7.2291	7.9727
		Private	3.4880	3.2489	3.0347	2.9750
		Total	**10.2592**	**10.1640**	**10.2637**	**10.9477**
C07AB05	Betaxolol	Public	-	-	-	-
		Private	0.0625	0.0517	0.0443	0.0457
		Total	**0.0625**	**0.0517**	**0.0443**	**0.0457**
C07AB07	Bisoprolol	Public	0.2023	0.3678	0.5678	0.9235
		Private	0.4605	0.5402	0.5659	0.6107
		Total	**0.6627**	**0.9080**	**1.1336**	**1.5343**
C07AB09	Esmolol	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	-	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
C07AB12	Nebivolol	Public	-	-	-	-
		Private	0.0046	0.0082	0.0186	0.0528
		Total	**0.0046**	**0.0082**	**0.0186**	**0.0528**
C07AG	**Alpha and beta blocking agents**	**Public**	**0.2752**	**0.2413**	**0.2658**	**0.2910**
		Private	**0.1244**	**0.1453**	**0.1299**	**0.1381**
		Total	**0.3996**	**0.3866**	**0.3957**	**0.4291**
C07AG01	Labetalol	Public	0.0765	0.0883	0.0839	0.0768
		Private	0.0093	0.0248	0.0211	0.0282
		Total	**0.0858**	**0.1131**	**0.1050**	**0.1050**
C07AG02	Carvedilol	Public	0.1986	0.1531	0.1820	0.2142
		Private	0.1152	0.1205	0.1088	0.1099
		Total	**0.3138**	**0.2736**	**0.2908**	**0.3241**
C07B	**Beta blocking agents and thiazides**					
C07BB	**Beta blocking agents, selective, and thiazides**					
C07BB07	Bisoprolol and thiazides	Public	0.0011	0.0001	-	-
		Private	0.0562	0.0550	0.0602	0.0579
		Total	**0.0573**	**0.0552**	**0.0602**	**0.0579**
C07C	**Beta blocking agents and other diuretics**	**Public**	**-**	**-**	**-**	**-**
		Private	**0.2374**	**0.4203**	**0.3074**	**0.3593**
		Total	**0.2374**	**0.4203**	**0.3074**	**0.3593**

Table 8.7: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C07CA	**Beta blocking agents, non-selective, and other diuretics**					
C07CA03	Pindolol and other diuretics	Public	-	-	-	-
		Private	0.0045	0.0037	-	-
		Total	**0.0045**	**0.0037**	**-**	**-**
C07CB	**Beta blocking agents, selective, and other diuretics**					
C07CB03	Atenolol and other diuretics	Public	-	-	-	-
		Private	0.2329	0.4166	0.3074	0.3593
		Total	**0.2329**	**0.4166**	**0.3074**	**0.3593**

Table 8.8: Use of calcium channel blockers from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C08C	**Selective calcium channel blockers with mainly vascular effects**					
C08CA	**Dihydropyridine derivatives**	**Public**	**33.2078**	**43.4829**	**46.9398**	**50.5239**
		Private	**5.4764**	**6.3951**	**7.0071**	**7.0747**
		Total	**38.6843**	**49.8780**	**53.9469**	**57.5986**
C08CA01	Amlodipine	Public	25.6233	36.2704	40.3530	44.1348
		Private	4.2991	5.1638	5.8941	5.9863
		Total	**29.9225**	**41.4342**	**46.2471**	**50.1211**
C08CA02	Felodipine	Public	2.0301	2.8568	3.4075	3.9314
		Private	0.2920	0.2846	0.3470	0.3455
		Total	**2.3221**	**3.1414**	**3.7545**	**4.2768**
C08CA03	Isradipine	Public	-	-	-	-
		Private	0.0028	0.0012	-	-
		Total	**0.0028**	**0.0012**	**-**	**-**
C08CA04	Nicardipine	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
C08CA05	Nifedipine	Public	5.5537	4.3549	3.1784	2.4558
		Private	0.7289	0.7381	0.5826	0.5472
		Total	**6.2826**	**5.0930**	**3.7611**	**3.0030**
C08CA06	Nimodipine	Public	0.0006	0.0008	0.0009	0.0019
		Private	0.0003	0.0003	0.0003	0.0003
		Total	**0.0009**	**0.0011**	**0.0012**	**0.0022**
C08CA09	Lacidipine	Public	-	-	-	-
		Private	0.0129	0.0103	0.0104	0.0088
		Total	**0.0129**	**0.0103**	**0.0104**	**0.0088**
C08CA13	Lercanidipine	Public	-	-	-	-
		Private	0.1405	0.1968	0.1726	0.1866
		Total	**0.1405**	**0.1968**	**0.1726**	**0.1866**
C08D	**Selective calcium channel blockers with direct cardiac effects**	**Public**	**0.1902**	**0.2431**	**0.2669**	**0.2917**
		Private	**0.1335**	**0.1296**	**0.1232**	**0.1032**
		Total	**0.3237**	**0.3727**	**0.3901**	**0.3950**
C08DA	**Phenylalkylamine derivatives**					
C08DA01	Verapamil	Public	0.0268	0.0299	0.0298	0.0415
		Private	0.0416	0.0429	0.0376	0.0292
		Total	**0.0684**	**0.0728**	**0.0674**	**0.0707**
C08DB	**Benzothiazepine derivatives**					
C08DB01	Diltiazem	Public	0.1634	0.2132	0.2371	0.2503
		Private	0.0919	0.0867	0.0856	0.0740
		Total	**0.2553**	**0.2999**	**0.3227**	**0.3243**

Table 8.9: Use of angiotensin enzyme converting inhibitors, angiontensin II antagonists and combinations with other agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C09A	**ACE inhibitors, plain**					
C09AA	**ACE inhibitors, plain**	**Public**	**20.4353**	**27.5377**	**32.6740**	**31.9544**
		Private	**2.8088**	**2.6265**	**2.6416**	**2.7702**
		Total	**23.2440**	**30.1641**	**35.3156**	**34.7246**
C09AA01	Captopril	Public	2.2997	2.4631	2.1054	1.8435
		Private	0.0225	0.0257	0.0238	0.0187
		Total	**2.3222**	**2.4887**	**2.1292**	**1.8622**
C09AA02	Enalapril	Public	4.8262	5.0725	4.5277	5.3003
		Private	0.7824	0.6277	0.6210	0.7172
		Total	**5.6086**	**5.7002**	**5.1487**	**6.0175**
C09AA03	Lisinopril	Public	-	-	-	-
		Private	0.5728	0.4237	0.3635	0.3503
		Total	**0.5728**	**0.4237**	**0.3635**	**0.3503**
C09AA04	Perindopril	Public	13.0810	19.7741	25.8505	24.5959
		Private	1.0809	1.2395	1.3953	1.3914
		Total	**14.1619**	**21.0137**	**27.2459**	**25.9873**
C09AA05	Ramipril	Public	0.2284	0.2280	0.1905	0.2147
		Private	0.3277	0.2867	0.2222	0.2652
		Total	**0.5561**	**0.5146**	**0.4127**	**0.4799**
C09AA16	Imidapril	Public	-	-	-	-
		Private	0.0225	0.0232	0.0157	0.0274
		Total	**0.0225**	**0.0232**	**0.0157**	**0.0274**
C09B	**ACE inhibitors, combinations**	**Public**	**0.0388**	**0.0928**	**0.0054**	**0.2114**
		Private	**0.3721**	**0.4212**	**0.4799**	**0.5602**
		Total	**0.4109**	**0.5140**	**0.4853**	**0.7716**
C09BA	**ACE inhibitors and diuretics**					
C09BA04	Perindopril and diuretics	Public	0.0388	0.0928	0.0054	0.2114
		Private	0.1691	0.1602	0.1609	0.1665
		Total	**0.2079**	**0.2530**	**0.1664**	**0.3779**
C09BB	**ACE inhibitors and calcium channel blockers**					
C09BB04	Perindopril and amlodipine	Public	-	-	-	-
		Private	0.2030	0.2609	0.3189	0.3937
		Total	**0.2030**	**0.2609**	**0.3189**	**0.3937**
C09C	**Angiotensin II antagonists, plain**					
C09CA	**Angiotensin II antagonists, plain**	**Public**	**2.9914**	**4.1329**	**4.2480**	**4.9286**
		Private	**3.4110**	**3.6056**	**3.5491**	**3.8393**
		Total	**6.4023**	**7.7385**	**7.7971**	**8.7679**
C09CA01	Losartan	Public	0.6419	0.9207	0.9240	1.3564
		Private	0.8419	0.8209	0.8547	0.9356
		Total	**1.4838**	**1.7416**	**1.7786**	**2.2919**
C09CA03	Valsartan	Public	0.3239	0.4775	0.4534	0.5281
		Private	0.4980	0.5178	0.5452	0.5526
		Total	**0.8219**	**0.9953**	**0.9986**	**1.0808**
C09CA04	Irbesartan	Public	0.8661	1.3087	1.2329	1.3180
		Private	0.5875	0.6853	0.5495	0.7185
		Total	**1.4536**	**1.9940**	**1.7824**	**2.0365**
C09CA06	Candesartan	Public	0.0002	< 0.0001	-	-
		Private	0.4118	0.4158	0.4325	0.4338
		Total	**0.4120**	**0.4159**	**0.4325**	**0.4338**

Table 8.9: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C09CA07	Telmisartan	Public	1.1593	1.4260	1.6378	1.7260
		Private	0.7764	0.8329	0.8863	0.9332
		Total	**1.9357**	**2.2589**	**2.5240**	**2.6592**
C09CA08	Olmesartan medoxomil	Public	-	-	-	-
		Private	0.2954	0.3329	0.2810	0.2656
		Total	**0.2954**	**0.3329**	**0.2810**	**0.2656**
C09D	**Angiotensin II antagonists, combinations**	**Public**	**0.4696**	**0.6213**	**0.6270**	**0.9683**
		Private	**2.8298**	**3.0876**	**3.4815**	**3.7789**
		Total	**3.2994**	**3.7089**	**4.1085**	**4.7471**
C09DA	**Angiotensin II antagonists and diuretics**	**Public**	**0.4492**	**0.5724**	**0.4716**	**0.6198**
		Private	**2.0362**	**2.0224**	**1.9228**	**1.8936**
		Total	**2.4854**	**2.5948**	**2.3944**	**2.5134**
C09DA01	Losartan and diuretics	Public	0.1427	0.1928	0.1331	0.1720
		Private	0.5813	0.5580	0.5539	0.5109
		Total	**0.7241**	**0.7508**	**0.6870**	**0.6829**
C09DA03	Valsartan and diuretics	Public	0.1075	0.1173	0.1144	0.1576
		Private	0.5120	0.5033	0.5037	0.4768
		Total	**0.6195**	**0.6206**	**0.6182**	**0.6344**
C09DA04	Irbesartan and diuretics	Public	0.0799	0.1163	0.0775	0.1227
		Private	0.3852	0.4192	0.3228	0.3969
		Total	**0.4651**	**0.5355**	**0.4002**	**0.5196**
C09DA06	Candesartan and diuretics	Public	-	-	-	-
		Private	0.1585	0.1453	0.1536	0.1481
		Total	**0.1585**	**0.1453**	**0.1536**	**0.1481**
C09DA07	Telmisartan and diuretics	Public	0.1190	0.1461	0.1467	0.1676
		Private	0.3488	0.3411	0.3287	0.3105
		Total	**0.4678**	**0.4871**	**0.4753**	**0.4780**
C09DA08	Olmesartan medoxomil and diuretics	Public	-	-	-	-
		Private	0.0504	0.0556	0.0601	0.0503
		Total	**0.0504**	**0.0556**	**0.0601**	**0.0503**
C09DB	**Angiotensin II antagonists and calcium channel blockers**	**Public**	**0.0204**	**0.0489**	**0.1554**	**0.3417**
		Private	**0.7289**	**0.9465**	**1.3767**	**1.6638**
		Total	**0.7493**	**0.9954**	**1.5320**	**2.0055**
C09DB01	Valsartan and amlodipine	Public	0.0204	0.0406	0.0719	0.1188
		Private	0.7108	0.7700	0.9096	0.9250
		Total	**0.7312**	**0.8106**	**0.9815**	**1.0438**
C09DB02	Olmesartan medoxomil and amlodipine	Public	-	-	-	-
		Private	-	0.0241	0.0787	0.1278
		Total	**-**	**0.0241**	**0.0787**	**0.1278**
C09DB04	Telmisartan and amlodipine	Public	-	0.0083	0.0778	0.2121
		Private	0.0181	0.1275	0.2726	0.4264
		Total	**0.0181**	**0.1358**	**0.3503**	**0.6385**
C09DB06	Losartan and amlodipine	Public	-	-	0.0057	0.0109
		Private	-	0.0249	0.1158	0.1846
		Total	**-**	**0.0249**	**0.1215**	**0.1954**
C09DX	**Angiotensin II antagonists, other combinations**					
C09DX01	Valsartan, amlodipine and hydrochlorothiazide	Public	-	-	-	0.0067
		Private	0.0647	0.1186	0.1820	0.2216
		Total	**0.0647**	**0.1186**	**0.1820**	**0.2283**

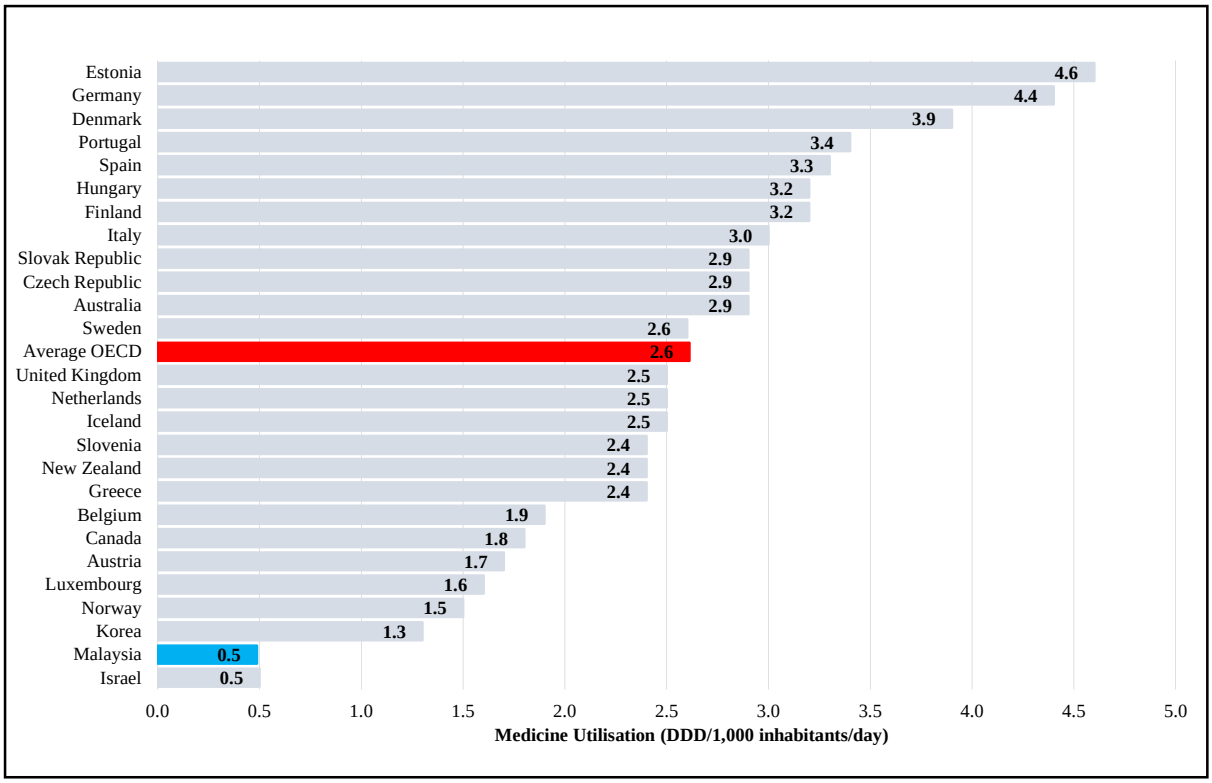

Figure 8.1: Utilisation of cardiac glycosides (C01A) in Malaysia and OECD Countries, 2014.

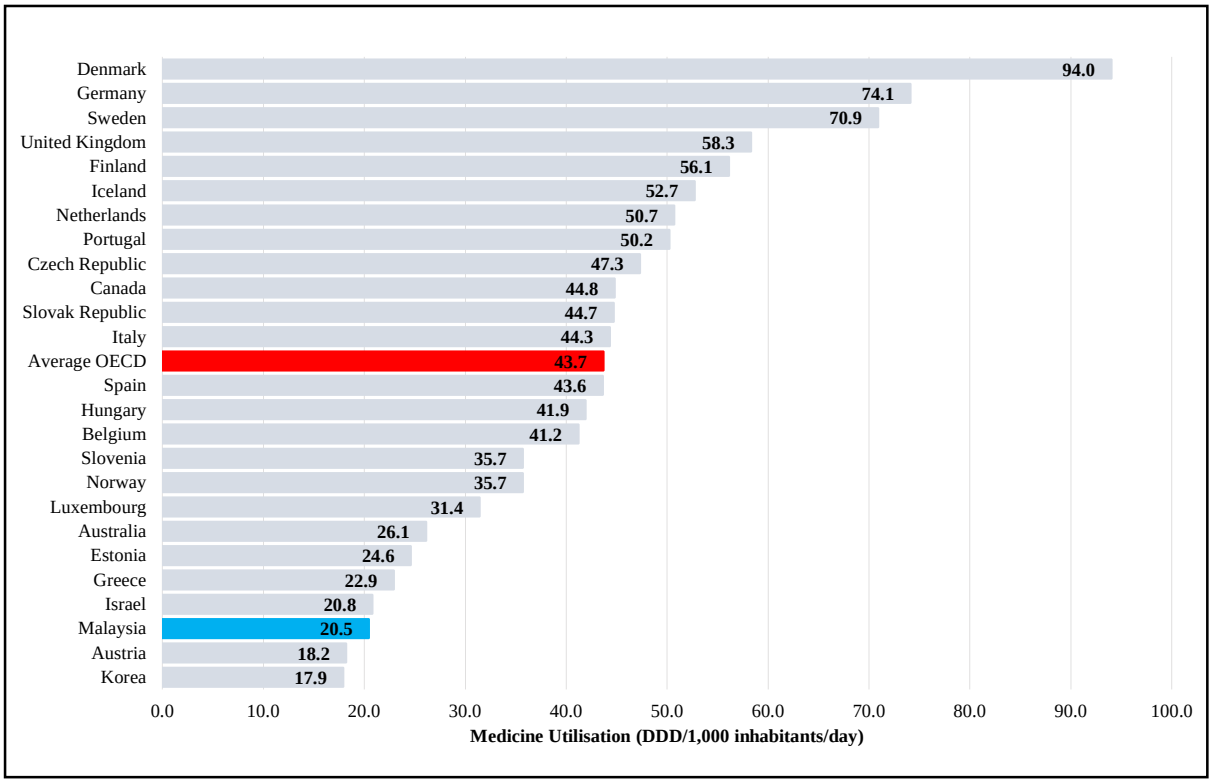

Figure 8.2: Utilisation of diuretics (C03) in Malaysia and OECD Countries, 2014.

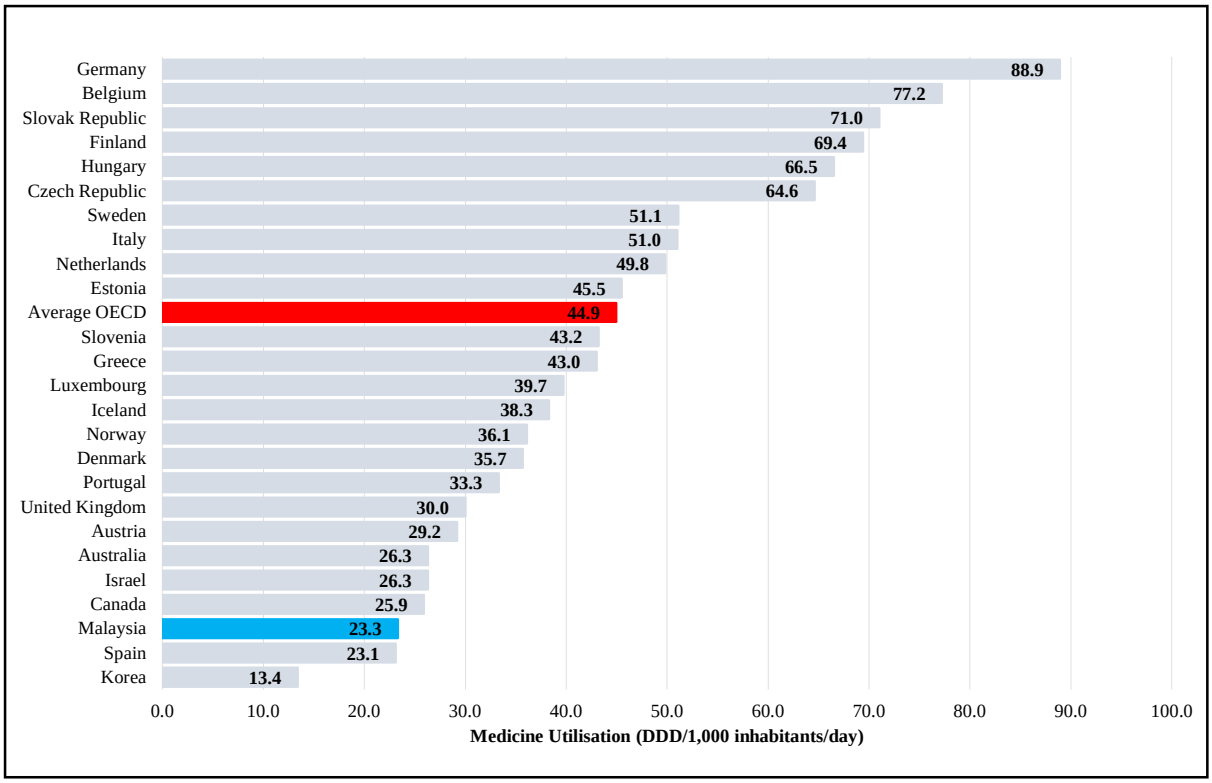

Figure 8.3: Utilisation of beta blocking agents (C07) in Malaysia and OECD Countries, 2014.

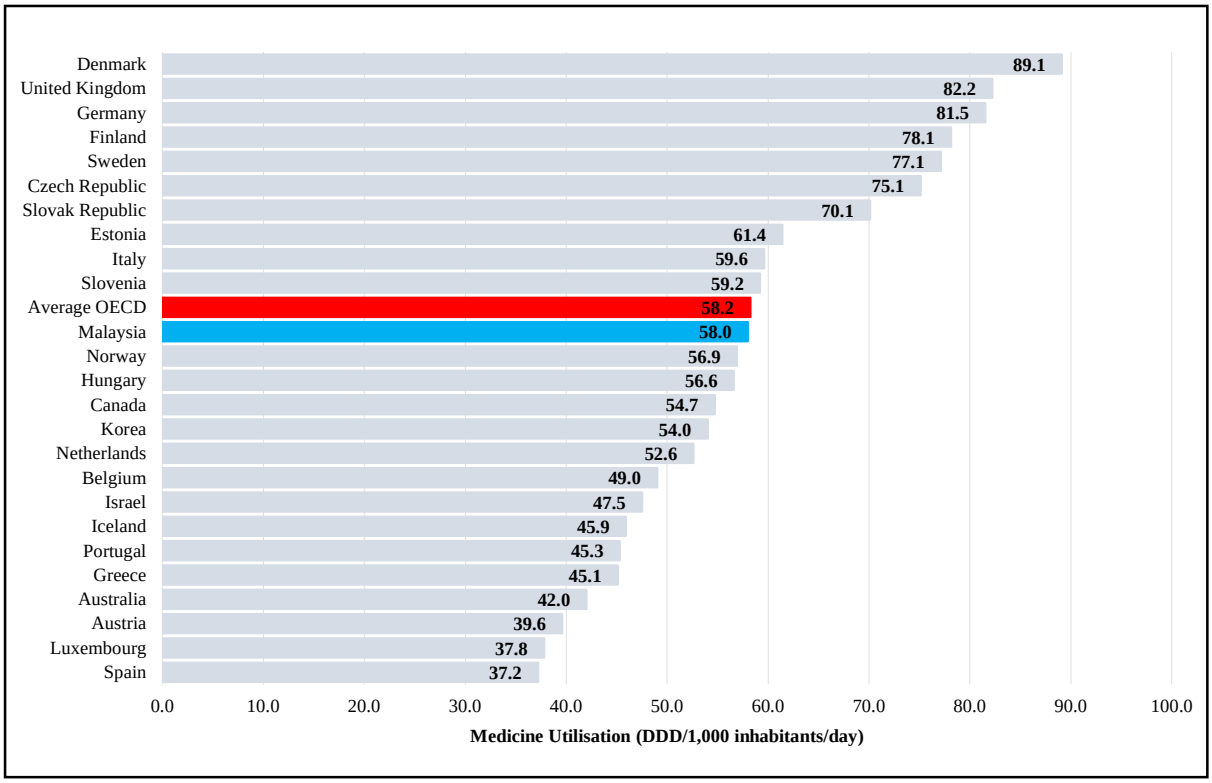

Figure 8.4: Utilisation of calcium channel blockers (C08) in Malaysia and OECD Countries, 2014.

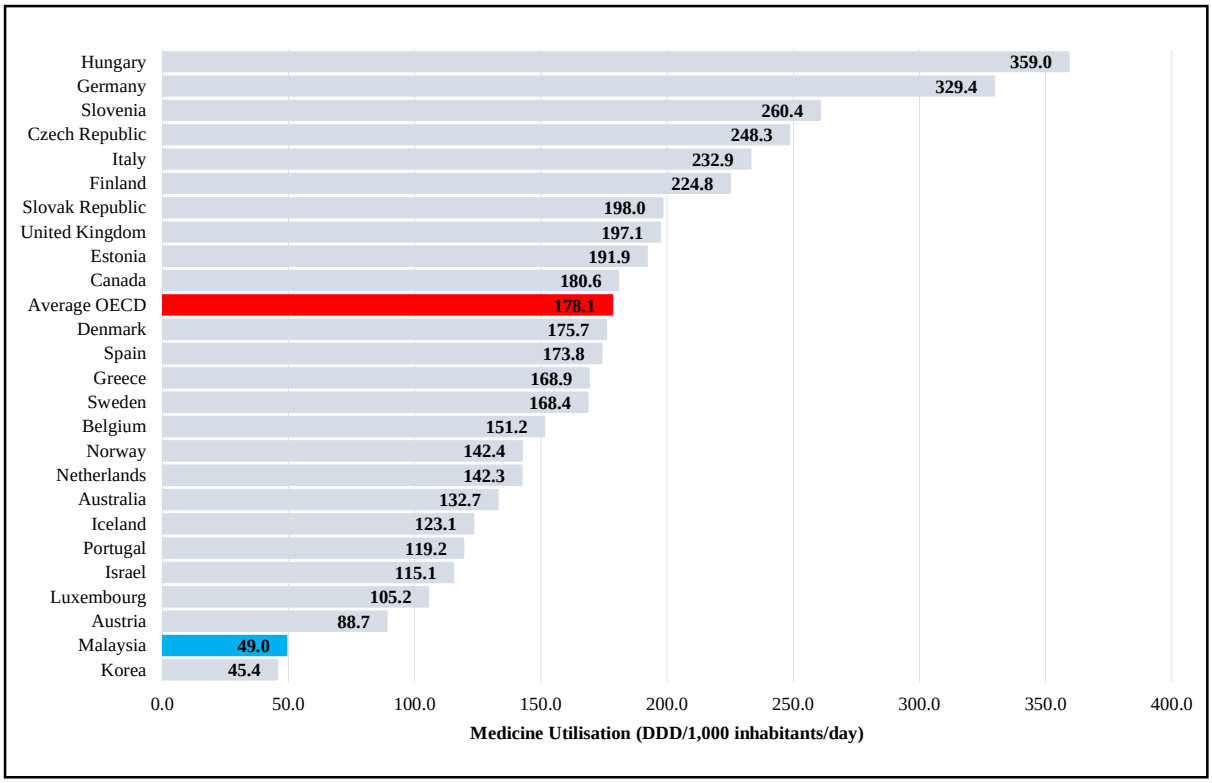

Figure 8.5: Utilisation of agents acting on the renin-angiotensin system (C09) in Malaysia and OECD Countries, 2014.

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CHAPTER 9: USE OF ANTIHYPERTENSIVES

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Malaysian Statistics on Medicines (MSOM) 2011-2014 seek to address the utilisation of drugs amongst the population. With this, the current utilisation is compared with the data from the National Health Morbidity Survey (NHMS) 2015. Of particular interest is the trend in drug usage in keeping with the high prevalence of hypertension as indicated by NHMS.NHMS 2015 showed that the prevalence of hypertension among adult of 18 years old was 30.3% and 75.5% in those above 70-74 years old[1].

The total utilisation of antihypertensives was 111.3 in 2011 and 154.0 in 2014 (Table 9.1). The total increase of antihypertensives use over the four years was 38.3% with an average increase 11.6% per year. There is no significant difference in the prevalence of hypertension from 2011 to 2014 (NHMS 2011, 32.7% and NHMS 2015, 30.3%). Thus, it may reflect better diagnosis and treatment of patients with this condition.

The highest use of single monotherapy agents were calcium channel blockers (CCB) (57.9936), renin-angiotensin-aldosterone system (RAAS) blockers (49.0284), beta-blockers (22.8967) and diuretics (20.4500). Of the RAAS blockers, the highest monotherapy agents were angiotensin-converting-enzyme inhibitors (ACEIs) (34.7246) and angiotensin II receptor blockers (ARBs) (8.7679). Over the last four years, there is an increased trend in the use of ACEI (49.4%), CCB (48.7%), ARB by 36.9%, diuretics (27.3%) and beta-blockers (14.5%). This is consistent with the current CPG on Management of Hypertension 2013 encouraging the use of RAAS blockers and CCB as first line therapy[2].

Because 83.3% of all antihypertensives were utilised by the public sector in 2014, little comparison is made of the data between public and private sector. In both sectors, similar usage trends in the classes of antihypertensives exist. The largest differences in public versus private sector were in the use of ACEI, diuretics and CCB, which were 12, nine and seven times more in the public sector, respectively.

The most commonly used beta blockers are still atenolol (10.9477), metoprolol (9.4438) and bisoprolol (1.5343) (Table 9.4). Among the beta-blockers, atenolol and metoprolol were still largely in use with a small percentage in growth despite its shorter duration of action and inferiority in reducing mortality and morbidity. Its continued use due to familiarity and maintenance dose in some individuals with a compelling indication, example coronary artery disease (CAD). There is a huge difference in usage between the first generation and the newer non-selective beta-blockers such as bisoprolol and carvedilol. The usage of metoprolol increased 15.7%, whereas, carvedilol use has hardly increased over the last 4 years. Bisoprolol, however, has increased growth by 131.5%. The current guidelines recommend the use of newer beta-blockers (e.g. bisoprolol, carvedilol) for the advantage of its safety profile and survival benefits.

CCBs are the most widely used antihypertensive agents over the last four years with a growth of 48.7% (Table 9.5). In 2014, amlodipine remains as the largest CCB in use (50.1211), followed by felodipine 4.2768 and nifedipine 3.0030. Nifedipine use, however has showed a gradual decrease by 52.2%.

ACEI is the second largest antihypertensives in use. The most widely used ACEI were perindopril (25.9873) and enalapril (6.0175). The first generation ACEI, captopril has decreased use by 19.8%. Enalapril, another short acting ACEI, however, increased by 7.3%. Perindopril usage increased by 48.4% between 2011 and 2012 but unfortunately its use has dropped by 4.6% in 2013-2014. Ramipril which showed strong survival benefit from landmark trials in patients at risk of having cardiovascular events unfortunately has also reduced in usage by 13.7%. Current guideline recommend longer acting ACEIs (e.g. perindopril and ramipril) for 24 hours protection and risk reduction[2].

In general, ARB has shown an increased utilisation. The largest use being telmisartan (2.6592), with an increase of 37.4%, followed by losartan (2.2919), with an increase of 54.5%, from 2011 to 2014 (Table 9.6). This may reflect cost consideration influencing ARB choice.

The most commonly used monotherapy diuretics were hydrochlorothiazide (12.4333) and spironolactone (0.4612). There is a vast difference in the usage between the two aforementioned agents and this maybe influenced by the antiandrogenic side effects of spironolactone. Furosemide, although can lower blood pressure,

it is not recommended as first line treatment in hypertension guidelines. Most diuretics are used as part of dual combination therapy with beta-blockers, ARB and ACEI. The largest in use is hydrochlorothiazide, in combination with losartan.

The current guidelines recommended the use of combination therapy for better adherence and control of elevated blood pressures[2]. This practice will also reduce cost. They should be started early when indicated in preference to multiple monotherapy agents. The combination therapy recommended are RAAS blockers with CCBs, and a low dose diuretics, unless compelling indicators exists. In 2014, the most frequently use combination preparation involve ARB (4.7471). Combination involving ARB has shown an increment of 43.9% between 2011 and 2014. The second largest are combination involving ACEI (0.7716) with an increase of 87.8% from 2011 to 2014. The most prescribed combination involving ACEI was perindopril with amlodipine (0.3937) followed by perindopril with diuretics (0.3779). Although the percentage growth is large, the absolute numbers in practice are still small. This is partly attributable to poor availability due to cost. More use of combination therapy may be achieved by improving affordability to these medications and various combination of different drugs and doses.

The most common combination of ARB is with a diuretic but in general, its used has plateaued (Table 9.6): candesartan/diuretics (-6.6%), losartan/diuretics (-5.7%), olmesartan/diuretics (-0.2%), valsartan/diuretics (2.4%), irbesartan/diuretics (11.7%) and telmisartan/diuretics (2.2%). Although diuretics are popular combination, there is a marked increase in the use of ARB/CCB: valsartan/amlodipine (42.8%), telmisartan/amlodipine (3427.6%), losartan/amlodipine (684.7%) and olmesartan/amlodipine (430.3%).

This combination of RAAS and CCB is gaining more acceptances because of the longer half-life of each of this drugs and synergistic effect when given together with much lower side effects. The growth of ARB/diuretics combination, appears to be reduced or slightly increased in comparison with the ARB/CCB growth, and although an absolute number is not high, percentage of growth has been phenomenal (Table 9.7).

Compared to other OECD countries, the use of all antihypertensives in Malaysia is low (Figure 9.1). In United Kingdom and Italy, drug acting on the RAAS were the most commonly prescribed agents rather than beta-blockers or CCB (Figure 9.2 to 9.6). On the other hand, in Malaysia, CCB is the most commonly utilised as antihypertensive agents. This may be due to cost considerations.

In summary, the dual combination therapy of RAAS blocker such as ARB with a CCB is known to have better tolerability and adherence. Its synergytic action also enables better control blood pressure. These factors may have contributed to the markedly increased trend in its usage.

The newer triple drug combination antihypertensive agents as single pill combinations (SPC) are also in used. The available combination is valsartan, amlodipine and hydrochlorothiazide. Emphasis is now made not just on early use of combination therapy to better control blood pressure but also the use of SPC. These include dual combination therapy as well as triple combination therapy tablets.

Table 9.1: Use of agents in treating hypertension, by therapeutic agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
C02	Antihypertensives	Public	2.2490	2.1599	2.4367	2.8712
		Private	0.2226	0.2877	0.2621	0.2863
		Total	**2.4716**	**2.4476**	**2.6988**	**3.1574**
C03	Diuretics	Public	13.4878	16.0368	17.1145	18.0767
		Private	2.5774	2.5773	2.5200	2.3732
		Total	**16.0652**	**18.6141**	**19.6344**	**20.4500**
C04	Peripheral vasodilators	Public	0.0380	0.0340	0.0307	0.0329
		Private	0.0137	0.0127	0.0145	0.0144
		Total	**0.0517**	**0.0466**	**0.0452**	**0.0473**
C07	Beta blocking agents	Public	15.3301	16.1966	17.1612	18.3914
		Private	4.9541	5.0940	4.8586	4.9224
		Total	**20.2842**	**21.2906**	**22.0199**	**23.3138**
C08	Calcium channel blockers	Public	33.3980	43.7260	47.2068	50.8156
		Private	5.6099	6.5248	7.1302	7.1779
		Total	**39.0079**	**50.2507**	**54.3370**	**57.9936**
C09	Agents acting on the renin-angiotensin system	Public	23.9350	32.3847	37.5544	38.0626
		Private	9.5105	9.7954	10.1768	10.9658
		Total	**33.4455**	**42.1801**	**47.7312**	**49.0284**

Table 9.2: Use of antiadrenergic agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C02A	**Antiadrenergic agents, centrally acting**	**Public**	**0.2504**	**0.2278**	**0.1917**	**0.1946**
		Private	**0.0935**	**0.1073**	**0.0887**	**0.1114**
		Total	**0.3439**	**0.3350**	**0.2804**	**0.3060**
C02AB	**Methyldopa**					
C02AB01	Methyldopa (levorotatory)	Public	0.2504	0.2278	0.1917	0.1946
		Private	0.0180	0.0185	0.0202	0.0242
		Total	**0.2684**	**0.2462**	**0.2119**	**0.2188**
C02AC	**Imidazoline receptor agonists**	**Public**	**0.0001**	**-**	**< 0.0001**	**< 0.0001**
		Private	**0.0754**	**0.0888**	**0.0685**	**0.0872**
		Total	**0.0755**	**0.0888**	**0.0686**	**0.0872**
C02AC01	Clonidine	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
C02AC05	Moxonidine	Public	0.0001	-	< 0.0001	-
		Private	0.0754	0.0888	0.0685	0.0872
		Total	**0.0755**	**0.0888**	**0.0686**	**0.0872**
C02C	**Antiadrenergic agents, peripherally acting**					
C02CA	**Alpha-adrenoreceptor antagonists**	**Public**	**1.9944**	**1.9287**	**2.2380**	**2.6667**
		Private	**0.1284**	**0.1798**	**0.1730**	**0.1747**
		Total	**2.1228**	**2.1085**	**2.4110**	**2.8414**
C02CA01	Prazosin	Public	1.6875	1.5956	1.9268	2.1709
		Private	0.0364	0.0400	0.0369	0.0346
		Total	**1.7239**	**1.6355**	**1.9636**	**2.2055**
C02CA04	Doxazosin	Public	0.3069	0.3331	0.3112	0.4958
		Private	0.0921	0.1398	0.1362	0.1401
		Total	**0.3990**	**0.4730**	**0.4474**	**0.6359**

Table 9.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C02D	**Arteriolar smooth muscle, agents acting on**	**Public**	**0.0041**	**0.0033**	**0.0068**	**0.0096**
		Private	**0.0006**	**0.0002**	**0.0002**	**-**
		Total	**0.0048**	**0.0035**	**0.0070**	**0.0096**
C02DB	**Hydrazinophthalazine derivatives**					
C02DB02	Hydralazine	Public	0.0005	0.0007	0.0024	0.0029
		Private	-	-	-	-
		Total	**0.0005**	**0.0007**	**0.0024**	**0.0029**
C02DC	**Pyrimidine derivatives**					
C02DC01	Minoxidil	Public	0.0023	0.0026	0.0043	0.0066
		Private	0.0006	0.0001	0.0002	-
		Total	**0.0028**	**0.0027**	**0.0045**	**0.0066**
C02DD	**Nitroferricyanide derivatives**					
C02DD01	Nitroprusside	Public	0.0014	< 0.0001	< 0.0001	0.0001
		Private	0.0001	0.0001	< 0.0001	-
		Total	**0.0015**	**0.0001**	**0.0001**	**0.0001**
C02K	**Other antihypertensives**					
C02KX	**Antihypertensives for pulmonary arterial hypertension**	**Public**	**< 0.0001**	**0.0001**	**0.0002**	**0.0003**
		Private	**0.0001**	**0.0004**	**0.0002**	**0.0001**
		Total	**0.0001**	**0.0005**	**0.0003**	**0.0004**
C02KX01	Bosentan	Public	< 0.0001	0.0001	0.0002	0.0003
		Private	0.0001	0.0004	0.0002	0.0001
		Total	**0.0001**	**0.0005**	**0.0003**	**0.0004**
C02KX02	Ambrisentan	Public	-	< 0.0001	< 0.0001	< 0.0001
		Private	-	-	< 0.0001	-
		Total	**-**	**< 0.0001**	**< 0.0001**	**< 0.0001**

Table 9.3: Use of diuretics from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C03A	**Low-ceiling diuretics, thiazides**					
C03AA	**Thiazides, plain**					
C03AA03	Hydrochlorothiazide	Public	8.9165	10.7599	11.1850	11.7483
		Private	0.8829	0.8814	0.7981	0.6850
		Total	**9.7994**	**11.6414**	**11.9831**	**12.4333**
C03B	**Low-ceiling diuretics, excluding thiazides**					
C03BA	**Sulfonamides, plain**	**Public**	**0.0006**	**0.0028**	**0.0048**	**0.0167**
		Private	**0.6712**	**0.6065**	**0.5152**	**0.4486**
		Total	**0.6718**	**0.6093**	**0.5200**	**0.4653**
C03BA04	Chlortalidone	Public	-	-	-	-
		Private	0.0391	0.0059	0.0229	0.0075
		Total	**0.0391**	**0.0059**	**0.0229**	**0.0075**
C03BA08	Metolazone	Public	0.0006	0.0028	0.0048	0.0167
		Private	-	-	-	-
		Total	**0.0006**	**0.0028**	**0.0048**	**0.0167**
C03BA11	Indapamide	Public	-	-	-	< 0.0001
		Private	0.6321	0.6006	0.4923	0.4412
		Total	**0.6321**	**0.6006**	**0.4923**	**0.4412**

Table 9.3: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C03C	**High-ceiling diuretics**					
C03CA	**Sulfonamides, plain**	**Public**	**3.6767**	**4.3278**	**4.9019**	**5.2570**
		Private	**0.5886**	**0.6591**	**0.6852**	**0.7330**
		Total	**4.2653**	**4.9870**	**5.5871**	**5.9900**
C03CA01	Furosemide	Public	3.6654	4.3015	4.8665	5.2313
		Private	0.5691	0.6397	0.6748	0.7209
		Total	**4.2344**	**4.9411**	**5.5413**	**5.9522**
C03CA02	Bumetanide	Public	0.0113	0.0264	0.0354	0.0257
		Private	0.0196	0.0195	0.0105	0.0121
		Total	**0.0309**	**0.0459**	**0.0459**	**0.0378**
C03D	**Potassium-sparing agents**	**Public**	**0.2343**	**0.2674**	**0.3200**	**0.3057**
		Private	**0.1128**	**0.0905**	**0.1582**	**0.1590**
		Total	**0.3471**	**0.3579**	**0.4782**	**0.4647**
C03DA	**Aldosterone antagonists**	**Public**	**0.2342**	**0.2674**	**0.3200**	**0.3057**
		Private	**0.1128**	**0.0905**	**0.1582**	**0.1590**
		Total	**0.3470**	**0.3579**	**0.4782**	**0.4647**
C03DA01	Spironolactone	Public	0.2341	0.2674	0.3195	0.3052
		Private	0.1126	0.0892	0.1561	0.1560
		Total	**0.3468**	**0.3566**	**0.4756**	**0.4612**
C03DA04	Eplerenone	Public	0.0001	< 0.0001	0.0004	0.0005
		Private	0.0002	0.0013	0.0021	0.0031
		Total	**0.0002**	**0.0014**	**0.0026**	**0.0035**
C03DB	**Other potassium-sparing agents**					
C03DB01	Amiloride	Public	0.0001	< 0.0001	< 0.0001	-
		Private	-	-	-	-
		Total	**0.0001**	**< 0.0001**	**< 0.0001**	**-**
C03E	**Diuretics and potassium-sparing agents in combination**					
C03EA	**Low-ceiling diuretics and potassium-sparing agents**					
C03EA01	Hydrochlorothiazide and potassium-sparing agents	Public	0.6598	0.6788	0.7028	0.7490
		Private	0.3219	0.3397	0.3632	0.3476
		Total	**0.9817**	**1.0185**	**1.0660**	**1.0966**

Table 9.4: Use of beta blockers from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C07A	**Beta blocking agents**	**Public**	**15.3290**	**16.1965**	**17.1612**	**18.3914**
		Private	**4.6605**	**4.6187**	**4.4910**	**4.5053**
		Total	**19.9894**	**20.8152**	**21.6522**	**22.8967**
C07AA	**Beta blocking agents, non-selective**	**Public**	**0.2507**	**0.2301**	**0.2498**	**0.2649**
		Private	**0.1865**	**0.1866**	**0.1738**	**0.1785**
		Total	**0.4372**	**0.4167**	**0.4235**	**0.4433**
C07AA05	Propranolol	Public	0.2500	0.2288	0.2483	0.2611
		Private	0.1671	0.1608	0.1603	0.1643
		Total	**0.4171**	**0.3896**	**0.4087**	**0.4254**
C07AA07	Sotalol	Public	0.0006	0.0013	0.0014	0.0038
		Private	0.0194	0.0257	0.0134	0.0142
		Total	**0.0201**	**0.0271**	**0.0149**	**0.0180**

Table 9.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C07AB	**Beta blocking agents, selective**	**Public**	**14.8031**	**15.7251**	**16.6456**	**17.8355**
		Private	**4.3495**	**4.2868**	**4.1873**	**4.1887**
		Total	**19.1526**	**20.0119**	**20.8329**	**22.0242**
C07AB02	Metoprolol	Public	7.8296	8.4421	8.8488	8.9393
		Private	0.3339	0.4379	0.5239	0.5045
		Total	**8.1635**	**8.8800**	**9.3726**	**9.4438**
C07AB03	Atenolol	Public	6.7712	6.9151	7.2291	7.9727
		Private	3.4880	3.2489	3.0347	2.9750
		Total	**10.2592**	**10.1640**	**10.2637**	**10.9477**
C07AB05	Betaxolol	Public	-	-	-	-
		Private	0.0625	0.0517	0.0443	0.0457
		Total	**0.0625**	**0.0517**	**0.0443**	**0.0457**
C07AB07	Bisoprolol	Public	0.2023	0.3678	0.5678	0.9235
		Private	0.4605	0.5402	0.5659	0.6107
		Total	**0.6627**	**0.9080**	**1.1336**	**1.5343**
C07AB09	Esmolol	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	-	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
C07AB12	Nebivolol	Public	-	-	-	-
		Private	0.0046	0.0082	0.0186	0.0528
		Total	**0.0046**	**0.0082**	**0.0186**	**0.0528**
C07AG	**Alpha and beta blocking agents**	**Public**	**0.2752**	**0.2413**	**0.2658**	**0.2910**
		Private	**0.1244**	**0.1453**	**0.1299**	**0.1381**
		Total	**0.3996**	**0.3866**	**0.3957**	**0.4291**
C07AG01	Labetalol	Public	0.0765	0.0883	0.0839	0.0768
		Private	0.0093	0.0248	0.0211	0.0282
		Total	**0.0858**	**0.1131**	**0.1050**	**0.1050**
C07AG02	Carvedilol	Public	0.1986	0.1531	0.1820	0.2142
		Private	0.1152	0.1205	0.1088	0.1099
		Total	**0.3138**	**0.2736**	**0.2908**	**0.3241**
C07B	**Beta blocking agents and thiazides**					
C07BB	**Beta blocking agents, selective, and thiazides**					
C07BB07	Bisoprolol and thiazides	Public	0.0011	0.0001	-	-
		Private	0.0562	0.0550	0.0602	0.0579
		Total	**0.0573**	**0.0552**	**0.0602**	**0.0579**
C07C	**Beta blocking agents and other diuretics**	**Public**	**-**	**-**	**-**	**-**
		Private	**0.2374**	**0.4203**	**0.3074**	**0.3593**
		Total	**0.2374**	**0.4203**	**0.3074**	**0.3593**
C07CA	**Beta blocking agents, non-selective, and other diuretics**					
C07CA03	Pindolol and other diuretics	Public	-	-	-	-
		Private	0.0045	0.0037	-	-
		Total	**0.0045**	**0.0037**	**-**	**-**
C07CB	**Beta blocking agents, selective, and other diuretics**					
C07CB03	Atenolol and other diuretics	Public	-	-	-	-
		Private	0.2329	0.4166	0.3074	0.3593
		Total	**0.2329**	**0.4166**	**0.3074**	**0.3593**

Table 9.5: Use of calcium channel blockers from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C08C	**Selective calcium channel blockers with mainly vascular effects**					
C08CA	**Dihydropyridine derivatives**	**Public**	**33.2078**	**43.4829**	**46.9398**	**50.5239**
		Private	**5.4764**	**6.3951**	**7.0071**	**7.0747**
		Total	**38.6843**	**49.8780**	**53.9469**	**57.5986**
C08CA01	Amlodipine	Public	25.6233	36.2704	40.3530	44.1348
		Private	4.2991	5.1638	5.8941	5.9863
		Total	**29.9225**	**41.4342**	**46.2471**	**50.1211**
C08CA02	Felodipine	Public	2.0301	2.8568	3.4075	3.9314
		Private	0.2920	0.2846	0.3470	0.3455
		Total	**2.3221**	**3.1414**	**3.7545**	**4.2768**
C08CA03	Isradipine	Public	-	-	-	-
		Private	0.0028	0.0012	-	-
		Total	**0.0028**	**0.0012**	**-**	**-**
C08CA04	Nicardipine	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
C08CA05	Nifedipine	Public	5.5537	4.3549	3.1784	2.4558
		Private	0.7289	0.7381	0.5826	0.5472
		Total	**6.2826**	**5.0930**	**3.7611**	**3.0030**
C08CA06	Nimodipine	Public	0.0006	0.0008	0.0009	0.0019
		Private	0.0003	0.0003	0.0003	0.0003
		Total	**0.0009**	**0.0011**	**0.0012**	**0.0022**
C08CA09	Lacidipine	Public	-	-	-	-
		Private	0.0129	0.0103	0.0104	0.0088
		Total	**0.0129**	**0.0103**	**0.0104**	**0.0088**
C08CA13	Lercanidipine	Public	-	-	-	-
		Private	0.1405	0.1968	0.1726	0.1866
		Total	**0.1405**	**0.1968**	**0.1726**	**0.1866**
C08D	**Selective calcium channel blockers with direct cardiac effects**	**Public**	**0.1902**	**0.2431**	**0.2669**	**0.2917**
		Private	**0.1335**	**0.1296**	**0.1232**	**0.1032**
		Total	**0.3237**	**0.3727**	**0.3901**	**0.3950**
C08DA	**Phenylalkylamine derivatives**					
C08DA01	Verapamil	Public	0.0268	0.0299	0.0298	0.0415
		Private	0.0416	0.0429	0.0376	0.0292
		Total	**0.0684**	**0.0728**	**0.0674**	**0.0707**
C08DB	**Benzothiazepine derivatives**					
C08DB01	Diltiazem	Public	0.1634	0.2132	0.2371	0.2503
		Private	0.0919	0.0867	0.0856	0.0740
		Total	**0.2553**	**0.2999**	**0.3227**	**0.3243**

Table 9.6: Use of angiotensin converting enzyme inhibitors, angiotension II antagonists and combinations with other agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C09A	**ACE inhibitors, plain**					
C09AA	**ACE inhibitors, plain**	**Public**	**20.4353**	**27.5377**	**32.6740**	**31.9544**
		Private	**2.8088**	**2.6265**	**2.6416**	**2.7702**
		Total	**23.2440**	**30.1641**	**35.3156**	**34.7246**
C09AA01	Captopril	Public	2.2997	2.4631	2.1054	1.8435
		Private	0.0225	0.0257	0.0238	0.0187
		Total	**2.3222**	**2.4887**	**2.1292**	**1.8622**
C09AA02	Enalapril	Public	4.8262	5.0725	4.5277	5.3003
		Private	0.7824	0.6277	0.6210	0.7172
		Total	**5.6086**	**5.7002**	**5.1487**	**6.0175**
C09AA03	Lisinopril	Public	-	-	-	-
		Private	0.5728	0.4237	0.3635	0.3503
		Total	**0.5728**	**0.4237**	**0.3635**	**0.3503**
C09AA04	Perindopril	Public	13.0810	19.7741	25.8505	24.5959
		Private	1.0809	1.2395	1.3953	1.3914
		Total	**14.1619**	**21.0137**	**27.2459**	**25.9873**
C09AA05	Ramipril	Public	0.2284	0.2280	0.1905	0.2147
		Private	0.3277	0.2867	0.2222	0.2652
		Total	**0.5561**	**0.5146**	**0.4127**	**0.4799**
C09AA16	Imidapril	Public	-	-	-	-
		Private	0.0225	0.0232	0.0157	0.0274
		Total	**0.0225**	**0.0232**	**0.0157**	**0.0274**
C09B	**ACE inhibitors, combinations**	**Public**	**0.0388**	**0.0928**	**0.0054**	**0.2114**
		Private	**0.3721**	**0.4212**	**0.4799**	**0.5602**
		Total	**0.4109**	**0.5140**	**0.4853**	**0.7716**
C09BA	**ACE inhibitors and diuretics**					
C09BA04	Perindopril and diuretics	Public	0.0388	0.0928	0.0054	0.2114
		Private	0.1691	0.1602	0.1609	0.1665
		Total	**0.2079**	**0.2530**	**0.1664**	**0.3779**
C09BB	**ACE inhibitors and calcium channel blockers**					
C09BB04	Perindopril and amlodipine	Public	-	-	-	-
		Private	0.2030	0.2609	0.3189	0.3937
		Total	**0.2030**	**0.2609**	**0.3189**	**0.3937**
C09C	**Angiotensin II antagonists, plain**					
C09CA	**Angiotensin II antagonists, plain**	**Public**	**2.9914**	**4.1329**	**4.2480**	**4.9286**
		Private	**3.4110**	**3.6056**	**3.5491**	**3.8393**
		Total	**6.4023**	**7.7385**	**7.7971**	**8.7679**
C09CA01	Losartan	Public	0.6419	0.9207	0.9240	1.3564
		Private	0.8419	0.8209	0.8547	0.9356
		Total	**1.4838**	**1.7416**	**1.7786**	**2.2919**
C09CA03	Valsartan	Public	0.3239	0.4775	0.4534	0.5281
		Private	0.4980	0.5178	0.5452	0.5526
		Total	**0.8219**	**0.9953**	**0.9986**	**1.0808**
C09CA04	Irbesartan	Public	0.8661	1.3087	1.2329	1.3180
		Private	0.5875	0.6853	0.5495	0.7185
		Total	**1.4536**	**1.9940**	**1.7824**	**2.0365**
C09CA06	Candesartan	Public	0.0002	< 0.0001	-	-
		Private	0.4118	0.4158	0.4325	0.4338
		Total	**0.4120**	**0.4159**	**0.4325**	**0.4338**

Table 9.6: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C09CA07	Telmisartan	Public	1.1593	1.4260	1.6378	1.7260
		Private	0.7764	0.8329	0.8863	0.9332
		Total	**1.9357**	**2.2589**	**2.5240**	**2.6592**
C09CA08	Olmesartan medoxomil	Public	-	-	-	-
		Private	0.2954	0.3329	0.2810	0.2656
		Total	**0.2954**	**0.3329**	**0.2810**	**0.2656**
C09D	**Angiotensin II antagonists, combinations**	**Public**	**0.4696**	**0.6213**	**0.6270**	**0.9683**
		Private	**2.8298**	**3.0876**	**3.4815**	**3.7789**
		Total	**3.2994**	**3.7089**	**4.1085**	**4.7471**
C09DA	**Angiotensin II antagonists and diuretics**	**Public**	**0.4492**	**0.5724**	**0.4716**	**0.6198**
		Private	**2.0362**	**2.0224**	**1.9228**	**1.8936**
		Total	**2.4854**	**2.5948**	**2.3944**	**2.5134**
C09DA01	Losartan and diuretics	Public	0.1427	0.1928	0.1331	0.1720
		Private	0.5813	0.5580	0.5539	0.5109
		Total	**0.7241**	**0.7508**	**0.6870**	**0.6829**
C09DA03	Valsartan and diuretics	Public	0.1075	0.1173	0.1144	0.1576
		Private	0.5120	0.5033	0.5037	0.4768
		Total	**0.6195**	**0.6206**	**0.6182**	**0.6344**
C09DA04	Irbesartan and diuretics	Public	0.0799	0.1163	0.0775	0.1227
		Private	0.3852	0.4192	0.3228	0.3969
		Total	**0.4651**	**0.5355**	**0.4002**	**0.5196**
C09DA06	Candesartan and diuretics	Public	-	-	-	-
		Private	0.1585	0.1453	0.1536	0.1481
		Total	**0.1585**	**0.1453**	**0.1536**	**0.1481**
C09DA07	Telmisartan and diuretics	Public	0.1190	0.1461	0.1467	0.1676
		Private	0.3488	0.3411	0.3287	0.3105
		Total	**0.4678**	**0.4871**	**0.4753**	**0.4780**
C09DA08	Olmesartan medoxomil and diuretics	Public	-	-	-	-
		Private	0.0504	0.0556	0.0601	0.0503
		Total	**0.0504**	**0.0556**	**0.0601**	**0.0503**
C09DB	**Angiotensin II antagonists and calcium channel blockers**	**Public**	**0.0204**	**0.0489**	**0.1554**	**0.3417**
		Private	**0.7289**	**0.9465**	**1.3767**	**1.6638**
		Total	**0.7493**	**0.9954**	**1.5320**	**2.0055**
C09DB01	Valsartan and amlodipine	Public	0.0204	0.0406	0.0719	0.1188
		Private	0.7108	0.7700	0.9096	0.9250
		Total	**0.7312**	**0.8106**	**0.9815**	**1.0438**
C09DB02	Olmesartan medoxomil and amlodipine	Public	-	-	-	-
		Private	-	0.0241	0.0787	0.1278
		Total	**-**	**0.0241**	**0.0787**	**0.1278**
C09DB04	Telmisartan and amlodipine	Public	-	0.0083	0.0778	0.2121
		Private	0.0181	0.1275	0.2726	0.4264
		Total	**0.0181**	**0.1358**	**0.3503**	**0.6385**
C09DB06	Losartan and amlodipine	Public	-	-	0.0057	0.0109
		Private	-	0.0249	0.1158	0.1846
		Total	**-**	**0.0249**	**0.1215**	**0.1954**
C09DX	**Angiotensin II antagonists, other combinations**					
C09DX01	Valsartan, amlodipine and hydrochlorothiazide	Public	-	-	-	0.0067
		Private	0.0647	0.1186	0.1820	0.2216
		Total	**0.0647**	**0.1186**	**0.1820**	**0.2283**

Table 9.6: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
C09X	**Other agents acting on the renin-angiotensin system**					
C09XA	**Renin-inhibitors**	**Public**	**-**	**< 0.0001**	**-**	**-**
		Private	**0.0889**	**0.0546**	**0.0248**	**0.0173**
		Total	**0.0889**	**0.0546**	**0.0248**	**0.0173**
C09XA02	Aliskiren	Public	-	< 0.0001	-	-
		Private	0.0784	0.0490	0.0228	0.0172
		Total	**0.0784**	**0.0490**	**0.0228**	**0.0172**
C09XA52	Aliskiren and hydrochlorothiazide	Public	-	-	-	-
		Private	0.0105	0.0056	0.0020	0.0001
		Total	**0.0105**	**0.0056**	**0.0020**	**0.0001**

Table 9.7: Growth pattern of combined ARB/CCB versus ARB/diuretics.

Combination drugs	Percentage of Growth between years (%)			
	2012 vs 2011	2013 vs 2012	2014 vs 2013	2014 vs 2011
ARB-diuretics				
Irbesartan and diuretics	15.1	-25.3	29.8	11.7
Valsartan and diuretics	0.2	-0.4	2.6	2.4
Telmisartan and diuretics	4.1	-2.4	0.6	2.2
Olmesartan medoxomil and diuretics	10.4	8.1	-16.4	-0.2
Losartan and diuretics	3.7	-8.5	-0.6	-5.7
Candesartan and diuretics	-8.4	5.8	-3.6	-6.6
ARB-CCB				
Telmisartan and amlodipine	649.8	158.0	82.3	3,425.3
Losartan and amlodipine	NA	387.7	60.9	NA
Olmesartan medoxomil and amlodipine	NA	226.2	62.3	NA
Valsartan and amlodipine	10.9	21.1	6.3	42.8
ARB-CCB-diuretics				
Valsartan, amlodipine and hydrochlorothiazide	83.4	53.4	25.5	252.9

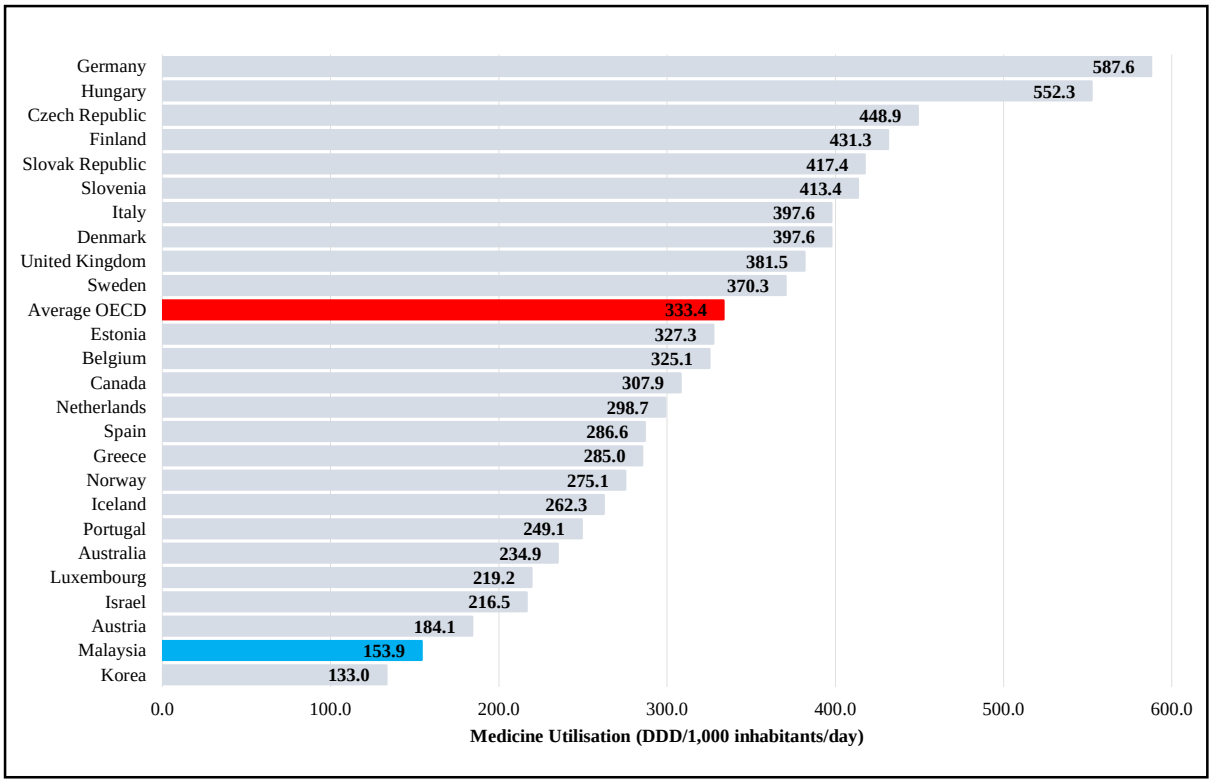

Figure 9.1: Utilisation of all antihypertensives in Malaysia and OECD Countries, 2014.

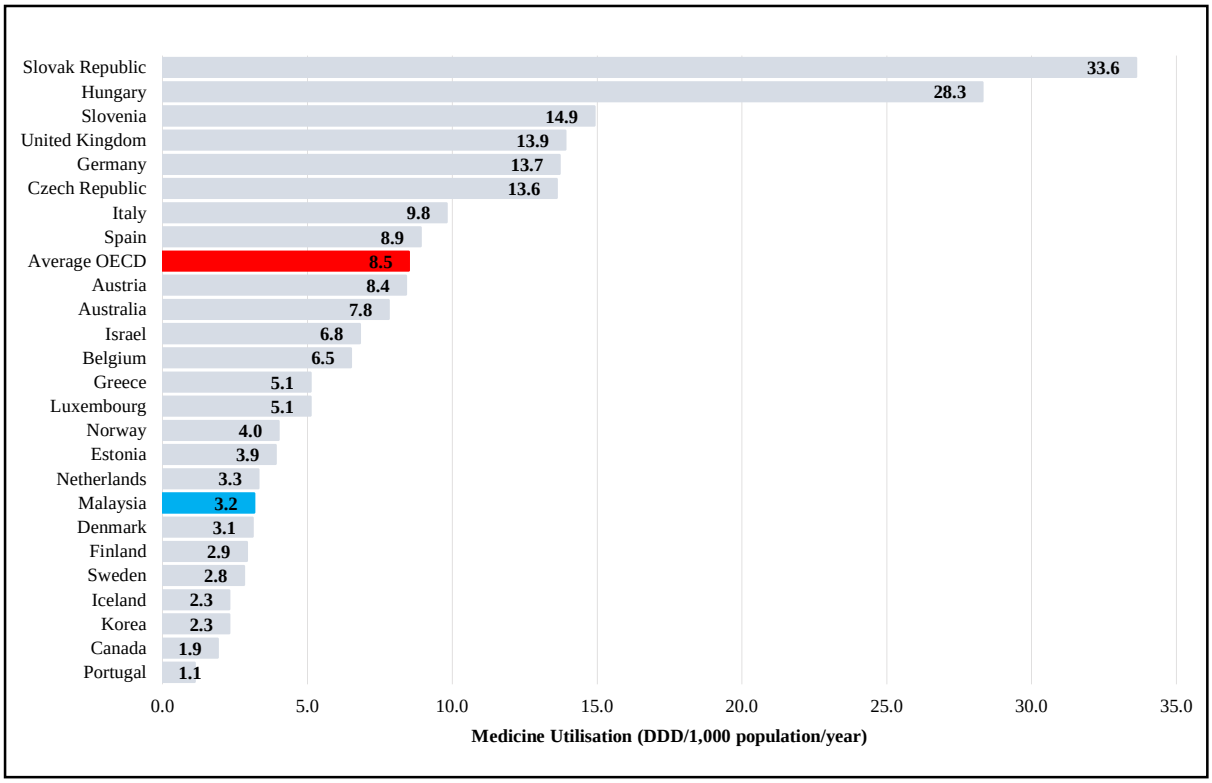

Figure 9.2: Utilisation of antihypertensives (C02) in Malaysia and OECD Countries, 2014.

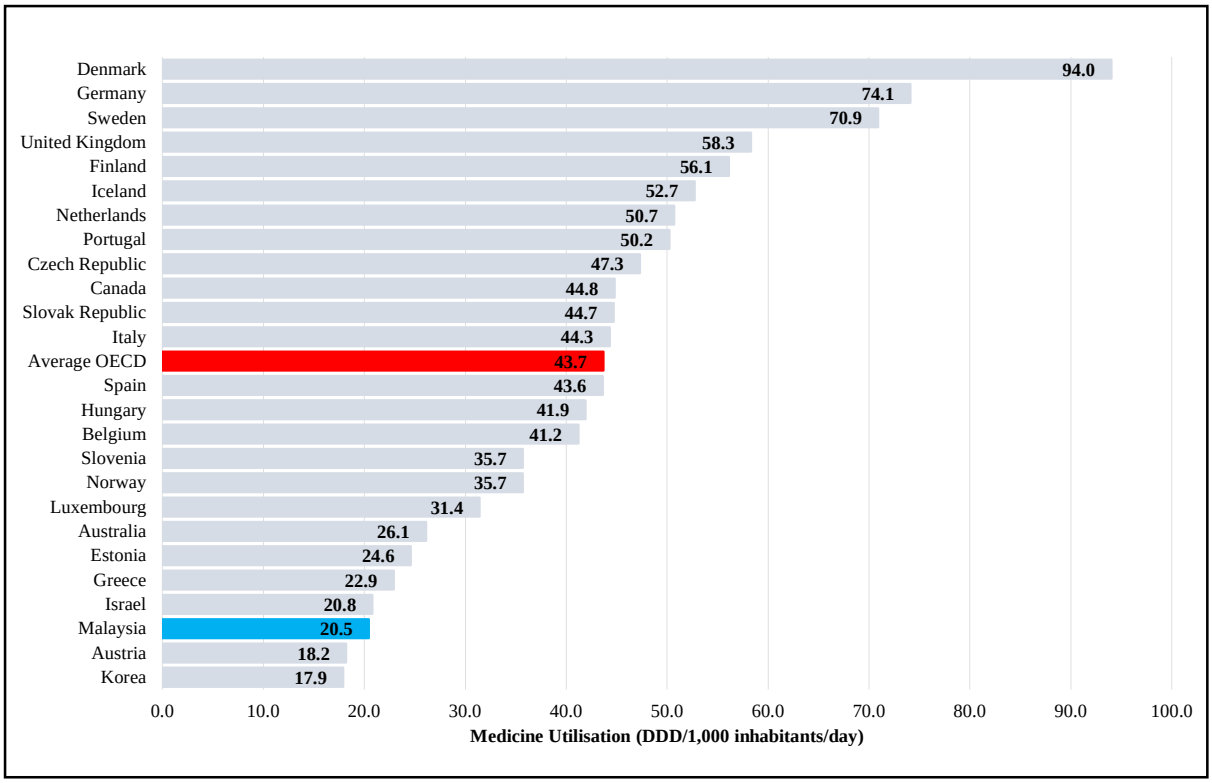

Figure 9.3: Utilisation of diuretics (C03) in Malaysia and OECD Countries, 2014.

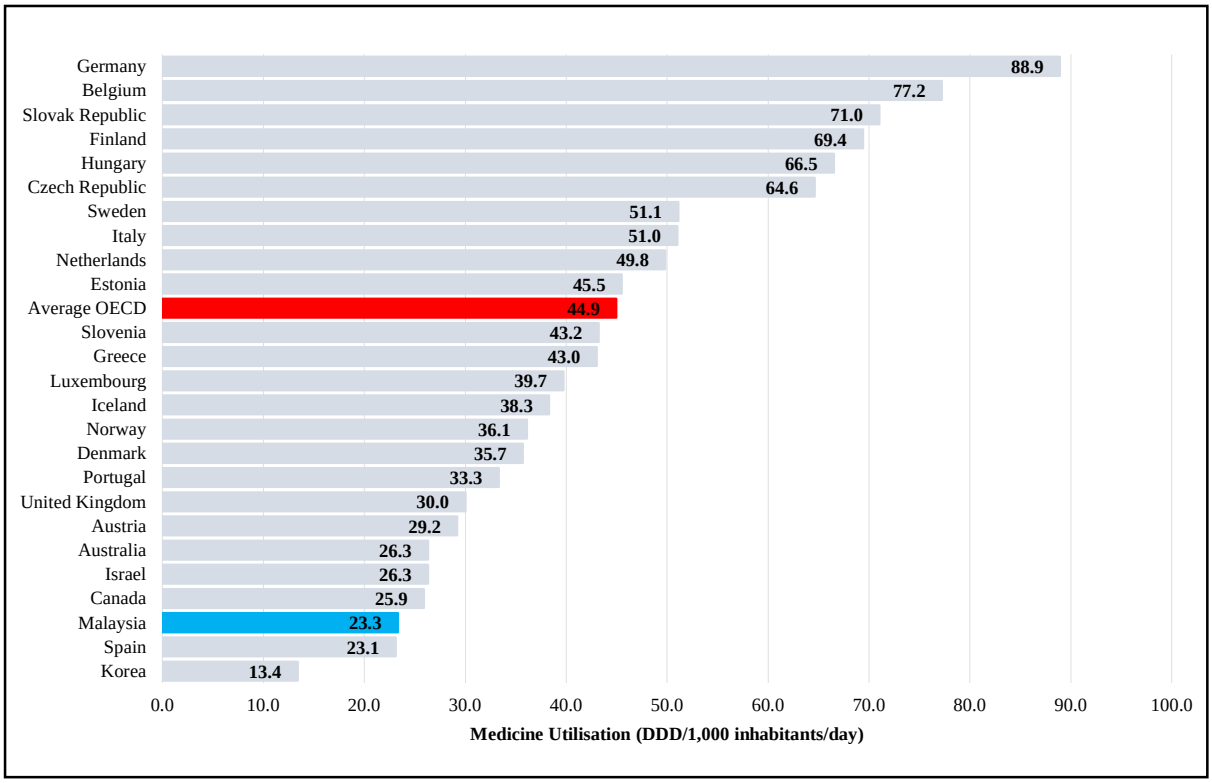

Figure 9.4: Utilisation of beta blocking agents (C07) in Malaysia and OECD Countries, 2014.

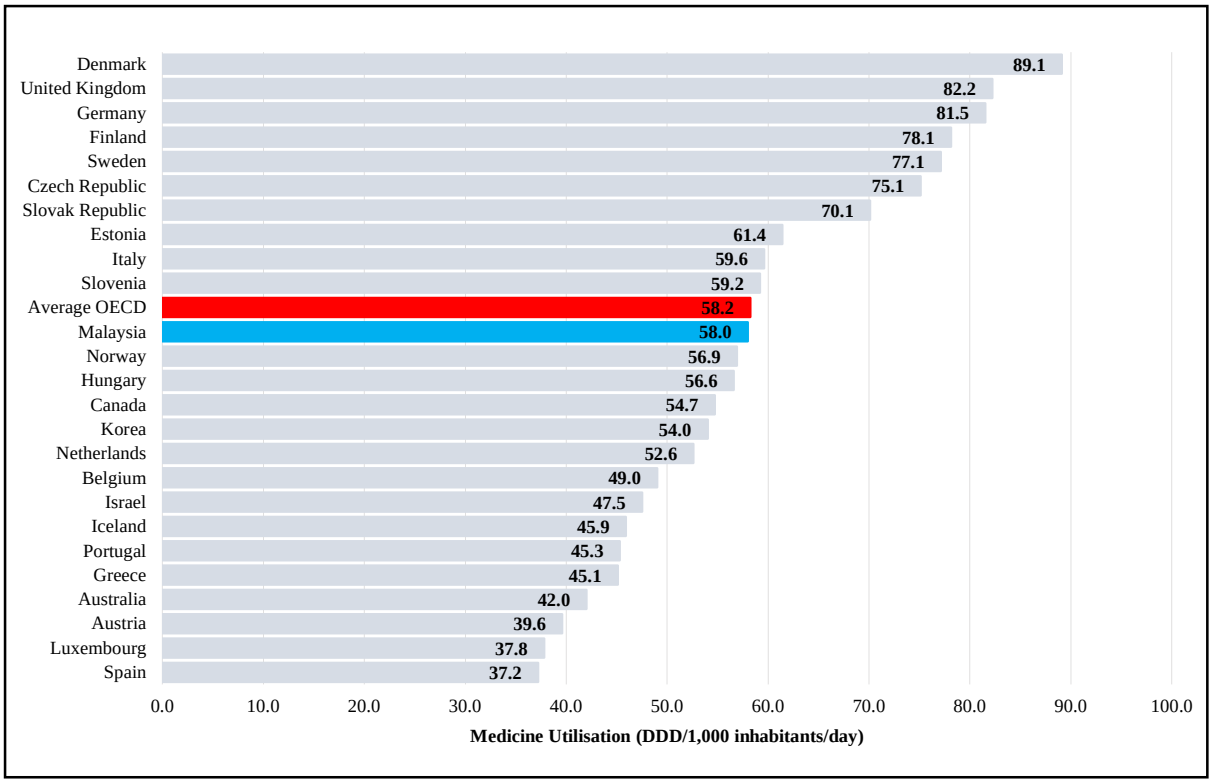

Figure 9.5: Utilisation of calcium channel blockers (C08) in Malaysia and OECD Countries, 2014.

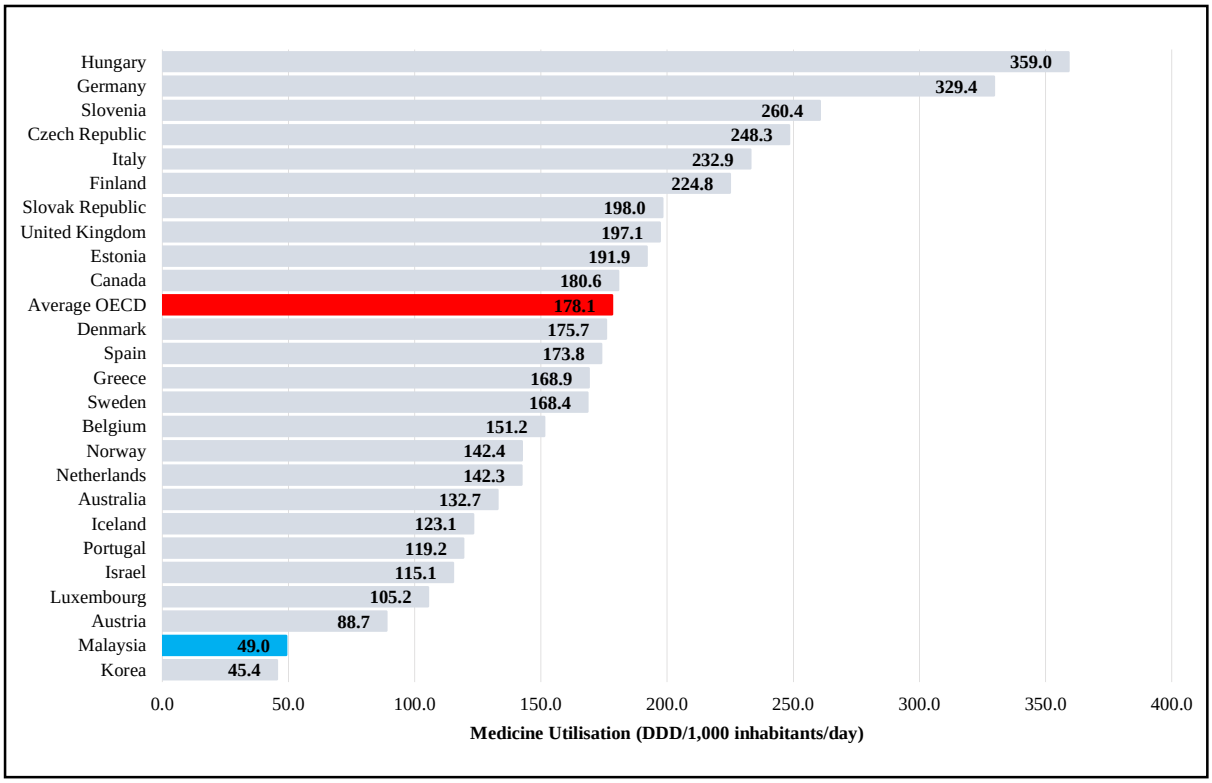

Figure 9.6: Utilisation of agents acting on the renin-angiotensin system (C09) in Malaysia and OECD Countries, 2014.

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1. *National Health and Morbidity Survey: Non Communicable Diseases 2015 Vol II*; Institute for Public Health (IPH), Ministry of Health Malaysia Printing Office: Kuala Lumpur 2015.

2. *Clinical Practice Guideline on Management of Hypertension (4th Edition)2013.* Hypertension Guideline Working Group, Ministry of Health Malaysia Printing Office: Kuala Lumpur 2013.

CHAPTER 10: USE OF LIPID MODIFYING DRUGS

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Cardiovascular disease (CVD) has been the leading cause of mortality in both Malaysian men and women for more than a decade[1,2]. Ministry of Health (MOH) Health Facts showed that 'diseases of the circulatory system' which includes CVD were responsible for 24.7% of the total deaths in Malaysia's public and private hospitals, placing it at the top of the list[3].

The prevalence of hypercholesterolemia in Malaysia was reported by the National Health and Morbidity Survey (NHMS) to be 47.7% in 2015, an increase from 32.6% in 2011[4]. Only 9.1% of Malaysian adults were categorised as 'known hypercholesterolemia', defined as either self-reported or being told to have hypercholesterolemia by a doctor or assistant medical officer. The remaining 38.6% were classified as 'undiagnosed hypercholesterolemia'. These were patients who had total blood cholesterol of 5.2mmol/L or more and were not known to have hypercholesterolemia[4].

The latest annual report of the National Cardiovascular Disease Database-Percutaneous Coronary Intervention (NCVD-PCI) Registry 2013-2014 showed that 59.4% of patients who had PCI had dyslipidemia[5].

Despite treatment options are available for hypercholesterolemia in Malaysia, a large proportion of patients still do not achieve their low density lipoprotein cholesterol (LDL-C) targets. Studies among Asian population reported that less than 50% of patients attained their recommended LDL-C targets with statins and other lipid lowering therapy[6,7]. In the Malaysian subset of the REALITY-ASIA study, fewer than four out of 10 patients with coronary heart disease and/or diabetes were able to attain the defined LDL-C goal of 2.56mmol/L[7].

In comparison to 2010, lovastatin was still the most prescribed statin in Malaysia with 43.4% in 2011 (Figure 10.1). Simvastatin was second with 32.5%. This trend changed in the following years (2012-2014) where simvastatin predominate the market with increasing usage in the public facilities (Table 10.2). The percentage use of simvastatin rose from 48.8% to 53.9% during this period. After 2011, lovastatin was removed from the Drug Formulary of Ministry of Health Malaysia, making it less used in primary care services, hence its use declined significantly[8].

Atorvastatin and rosuvastatin usage doubled from 2011 to 2014. The use of atorvastatin has seen a shift from a predominant private sector to now being mostly used in the public facilities (52.5% in 2014 versus 40.0% in 2011). Rosuvastatin repeated a steady increase in usage in both public and private sector although the rate is slower compared to atorvastatin. This trend may be due to the release of the lipid lowering guidelines from ACC/AHA recommending the use of moderate to high intensity statins[9]. Pravastatin was mainly used in the public sector. Its use has dropped from 0.5% in 2011 to 0.4% in 2014.

The fibrate group remains the second most commonly used lipid modifying agent (Table 10.1). Its usage has showed an increasing trend from year 2011 to 2014. Two main fibrates used in Malaysia are gemfibrozil and fenofibrate. The use of ciprofibrate is minimal (1-2% of the total fibrates usage). Gemfibrozil is still the most commonly used fibrates (55.3% in 2011 to 61.6% in 2014). As for fenofibrate, its use has declined from 42.4% (2011) to 36.7% (2014). Compared to the private sector, there was a significant increased in fenofibrate use in public sector from 0.1% (2011) to 4.1% (2014). This could be due to the availability of the generic formulation.

Ezetimibe, a cholesterol absorption inhibitor, usage has increased by 27.8% from 2011 to 2014. Its use in the public sector has more than doubled, with an absolute increase of 110.5%. There was also 24.0% increase in its use in private sector.

Overall, the use of combination therapy of ezetimibe and simvastatin has decreased from 1.4% (2011) to 1.1% (2014). The use of this combination in the private sector has been consistent however there was an increase of 54.3% in the public sector. The combination drug of atorvastatin and amlodipine has had a reduction in trend, accounting for 0.8% of the total lipid modifying agents used in 2011 to 0.6% in 2014. This combination was primarily used in private sector.

The use of statin therapy in Malaysia was comparable to countries like Finland, the statin usage in 2014 in Finland was 96% versus 94% in Malaysia[10].

In Australia, the overall usage of lipid modifying therapy for 2014 was 131.6. Atorvastatin was the most used statin in 2014 (69.26) versus rosuvastatin (43.27), however these figures include the contribution of co-payment scheme for statin[11]. Amongst OECD countries, country with the highest usage for lipid modifying agents was the Republic of Slovakia at 152.2. Indeed, the last time this country had a similar usage compared to Malaysia for lipid modifying agents was in 2003-2004[12].

Compared to the previous report there was an increasing trend of prescribing more potent statins. There was also significant increased in the use of fenofibrate and ezetimibe in the public sector. With this change in the prescription pattern we hope more patients are able to achieve the LDL-cholesterol target goal particularly those in the very high and high risk group.

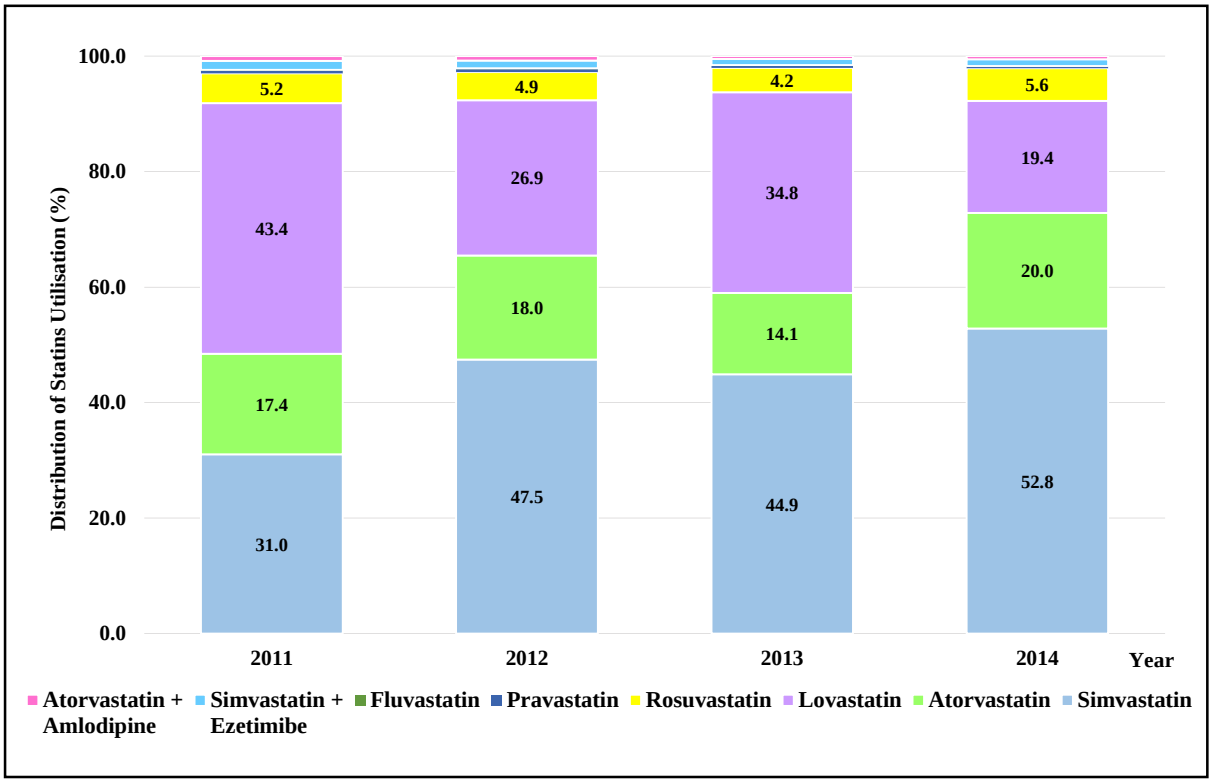

Figure 10.1: Distribution of statins usage in year 2011 to 2014. (Distribution of usage from 2011 to 2014 in sequence for other statins and their combination are: pravastatin, 0.5%, 0.5%, 0.4%, 0.4%; fluvastatin, 0.2%, 0.1%, 0.1%, 0.1%; simvastatin and ezetimibe, 1.5%, 1.3%, 1.0%, 1.1%; atorvastatin and amlodipine, 0.8%, 0.8%, 0.5%, 0.6%)

Table 10.1: Use of lipid modifying agents, by therapeutics groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
C10	**Lipid modifying agents**	**Public**	**15.1727**	**19.5402**	**28.0783**	**24.4167**
		Private	**6.9663**	**7.0896**	**7.8003**	**8.1967**
		Total	**22.1389**	**26.6297**	**35.8786**	**32.6134**
C10A	**Lipid modifying agents, plain**	**Public**	**15.1374**	**19.4871**	**28.0310**	**24.3624**
		Private	**6.5132**	**6.6142**	**7.3131**	**7.7276**
		Total	**21.6506**	**26.1014**	**35.3441**	**32.0900**
C10AA	HMG CoA reductase inhibitors	Public	14.3546	18.4593	26.8898	23.1815
		Private	5.8164	5.9376	6.6568	7.0738
		Total	**20.1710**	**24.3969**	**33.5466**	**30.2553**
C10AB	Fibrates	Public	0.7009	0.8828	0.9745	1.0078
		Private	0.6071	0.5761	0.5586	0.5426
		Total	**1.3080**	**1.4589**	**1.5331**	**1.5505**
C10AC	Bile acid sequestrants	Public	0.0002	0.0001	0.0014	0.0009
		Private	-	-	-	< 0.0001
		Total	**0.0002**	**0.0001**	**0.0014**	**0.0009**
C10AD	Nicotinic acid and derivatives	Public	-	-	-	-
		Private	0.0001	-	-	-
		Total	**0.0001**	**-**	**-**	**-**
C10AX	Other lipid modifying agents	Public	0.0818	0.1449	0.1653	0.1722
		Private	0.0896	0.1006	0.0977	0.1111
		Total	**0.1713**	**0.2455**	**0.2630**	**0.2833**
C10B	**Lipid modifying agents, combinations**	**Public**	**0.0352**	**0.0530**	**0.0472**	**0.0543**
		Private	**0.4531**	**0.4753**	**0.4872**	**0.4691**
		Total	**0.4883**	**0.5284**	**0.5344**	**0.5234**
C10BA	HMG CoA reductase inhibitors in combination with other lipid modifying agents	Public	0.0352	0.0530	0.0472	0.0543
		Private	0.2838	0.2825	0.3074	0.2891
		Total	**0.3190**	**0.3356**	**0.3546**	**0.3435**
C10BX	HMG CoA reductase inhibitors, other combinations	Public	-	-	-	-
		Private	0.1693	0.1928	0.1798	0.1799
		Total	**0.1693**	**0.1928**	**0.1798**	**0.1799**

Table 10.2: Use of lipid modifying agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Drug	Sector	2011	2012	2013	2014
C10AA	**HMG CoA reductase inhibitors**					
C10AA01	Simvastatin	Public	3.9633	9.8238	12.9611	13.8644
		Private	2.4432	2.0036	2.3327	2.3903
		Total	**6.4065**	**11.8274**	**15.2938**	**16.2547**
C10AA02	Lovastatin	Public	8.8374	6.5626	11.7182	5.8732
		Private	0.1284	0.1375	0.1279	0.0947
		Total	**8.9658**	**6.7001**	**11.8461**	**5.9679**
C10AA03	Pravastatin	Public	0.0727	0.0886	0.0832	0.0856
		Private	0.0220	0.0446	0.0500	0.0237
		Total	**0.0946**	**0.1332**	**0.1332**	**0.1093**
C10AA04	Fluvastatin	Public	-	-	-	-
		Private	0.0382	0.0337	0.0322	0.0198
		Total	**0.0382**	**0.0337**	**0.0322**	**0.0198**
C10AA05	Atorvastatin	Public	1.4378	1.9163	2.0340	3.2388
		Private	2.1597	2.5758	2.7684	2.9268
		Total	**3.5975**	**4.4920**	**4.8024**	**6.1656**
C10AA07	Rosuvastatin	Public	0.0434	0.0680	0.0933	0.1196
		Private	1.0250	1.1424	1.3456	1.6184
		Total	**1.0684**	**1.2104**	**1.4389**	**1.7380**
C10AB	**Fibrates**					
C10AB04	Gemfibrozil	Public	0.7001	0.8718	0.9550	0.9446
		Private	0.0233	0.0239	0.0196	0.0110
		Total	**0.7234**	**0.8957**	**0.9746**	**0.9555**
C10AB05	Fenofibrate	Public	0.0008	0.0110	0.0195	0.0633
		Private	0.5541	0.5286	0.5207	0.5060
		Total	**0.5549**	**0.5396**	**0.5402**	**0.5693**
C10AB08	Ciprofibrate	Public	-	-	-	-
		Private	0.0297	0.0236	0.0184	0.0256
		Total	**0.0297**	**0.0236**	**0.0184**	**0.0256**
C10AC	**Bile acid sequestrants**					
C10AC01	Colestyramine	Public	0.0002	0.0001	0.0014	0.0009
		Private	-	-	-	< 0.0001
		Total	**0.0002**	**0.0001**	**0.0014**	**0.0009**
C10AD	**Nicotinic acid and derivatives**					
C10AD02	Nicotinic acid	Public	-	-	-	-
		Private	0.0001	-	-	-
		Total	**0.0001**	**-**	**-**	**-**
C10AX	**Other lipid modifying agents**					
C10AX09	Ezetimibe	Public	0.0818	0.1449	0.1653	0.1722
		Private	0.0896	0.1006	0.0977	0.1111
		Total	**0.1713**	**0.2455**	**0.2630**	**0.2833**
C10BA	**HMG CoA reductase inhibitors in combination with other lipid modifying agents**					
C10BA02	Simvastatin and ezetimibe	Public	0.0352	0.0530	0.0472	0.0543
		Private	0.2838	0.2825	0.3074	0.2891
		Total	**0.3190**	**0.3356**	**0.3546**	**0.3435**
C10BX	**HMG CoA reductase inhibitors, other combinations**					
C10BX03	Atorvastatin and amlodipine	Public	-	-	-	-
		Private	0.1693	0.1928	0.1798	0.1799
		Total	**0.1693**	**0.1928**	**0.1798**	**0.1799**

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CHAPTER 11: USE OF DERMATOLOGICALS

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Most dermatological conditions can be treated with topical or systemic therapy. The medications include antifungals, anti-psoriatics, antibiotics, antivirals, corticosteroids, anti-acne agents and calcineurin inhibitors. This study analyzed all the medications used in the treatment of dermatological conditions from the year 2011 to 2014. Data collected were analysed to determine the trend of utilisation in both the public and private sectors. Topical medications remain the mainstay treatment[1-3].

The utilisation of antifungals had increased by 23% from 2011 to 2014 mainly due to the increased usage in the private sector. Topical azoles like clotrimazole and miconazole were the two most commonly prescribed topical antifungal. Fixed dose combinations of azole with corticosteroids were favoured mainly by the private sector whereas the public sector contributed to only less than 0.2% of the total usage[4]. The use of selenium sulfide in private sector remained low but the usage in public sector has increased six folds from 2011 to 2014.

The most commonly prescribed systemic antifungal was griseofulvin followed by terbinafine. The overall usage of griseofulvin has increased by 80% mainly contributed by the increased usage in the private sector. Oral ketoconazole usage has declined by 50% possibly due to heightened awareness of its potential hepatotoxicity[5].

In term anti-psoriatics, it was noted that the total utilisation of calcipotriol had remain static from 2011 to 2014. However, there was a twofold increased in the total usage of fixed dose calcipotriol combination due to increased in usage in the public sector. There was no data available on the usage of tar-based preparation, despite its wide usage in the public sector. It was also not possible to analyze the use of topical corticosteroids for psoriasis, as the information on its use for individual dermatological conditions was unavailable. These finding were also observed in the previous reports. Utilisation pattern of systemic anti-psoriatic agents was not able to be determined, as this study did not document the indications for each treatment. Methotrexate and cyclosporin, the two conventional systemic anti-psoriatic agents, were also used in other non-dermatological conditions. Overall usage of acitretin has remained low in the public sector with no documentation of usage in the private sector since 2012.

Topical methoxsalen had very low usage in the public sector and it was not used with at all in the private sector. The overall usage of oral methoxsalen has decreased by 60% from 2011 to 2014. PUVA therapy as a treatment option for psoriasis had gone out of favour in the both public and private sector in Malaysia[6]. This is mainly because NBUVB has been found to be efficacious in the treatment of psoriasis. PUVA is used mainly in cases that had failed NBUVB treatment.

There was a slight increased (17%) in the usage of topical antibiotics from 2011 to 2014. The most commonly used topical antibiotics were neomycin, followed by fusidic acid and mupirocin. There was also a marked increased (80%) in the usage of topical acyclovir over the four years. The usage of imiquimod, an effective treatment for genital wart[7], remained low, probably due to its high cost. Topical metronidazole is not available in the public sector.

There was an overall increased (25%) in the usage of topical corticosteroids and its combination from 2011 to 2014. The two most frequently prescribed topical corticosteroids were betamethasone and hydrocortisone. Fixed dose combination topical corticosteroid preparations (with antibiotics or other combinations) are used mainly in the private sector reaching more than 95%. The overall usage of very potent topical corticosteroid, such as clobetasol has increase slightly (20%) from 2011 to 2014 with the private sector accounted more than 95% of the usage.

Topical treatments for acne vulgaris include benzoyl peroxide, retinoids, topical antibiotic and azelaic acid[8,9]. The preference of topical anti-acne medications differed between the public and private sectors. Topical antibiotics preparations, both in single and combined agents were not used in the public sector due to non-availability. The most common anti-acne preparation in the public sector was benzoyl peroxide (65%) followed by tretinoin (28%), adapalene (6%) and azelaic acid (1%). In contrast, topical antibiotic especially clindamycin (82%) was the most popular anti-acne preparation in the private sector, followed by erythromycin (11%), clindamycin combination (4%), azelaic acid (1.7%) and erythromycin combination (1.3%). There was no

documentation of benzoyl peroxide usage in the private sector. Adapalene was the topical retinoid of choice in the private. However in the public sector, more tretinoin was prescribed as compared to adapalene due to its relatively lower cost.

There was an overall increased in the use of oral isotretinoin (70%) both in the private and public sector from 2011 to 2014. This is possibly due to the availability of generic preparations that has brought the cost down. Private sector contributed about 90% of the total usage in the four years.

Data on wart and anti-corn preparations use in the private sector were not captured however their usage in the public sector was low. Most of the cases were treated with physical modalities. The utilisation of topical calcineurin inhibitors such as tacrolimus and pimecrolimus were higher in the private sector due to its high cost.

Topical minoxidil (hair growth stimulant) is not available in the public sector and its documented usage in private sector was low. The actual number of usage might be higher as it can be purchased over the counter. Low usage of hydroquinone in the public sector was also due to non-availability.

In conclusion, we noticed a different in prescribing pattern among the public and the private sector. The fixed dose combinations corticosteroids and fixed dose antifungal were mainly prescribed by the private sector. Among the topical corticosteroids, the very potent class of topical steroid was the preferred choice in the private sector.

Table 11.1: Use of dermatological agents, by therapeutic groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
D01	Antifungals for dermatological use	Public	1.2917	1.3812	1.6055	1.3250
		Private	4.5498	5.6424	5.7695	5.8705
		Total	**5.8415**	**7.0237**	**7.3750**	**7.1954**
D05	Antipsoriatics	Public	0.0569	0.0807	0.0983	0.1358
		Private	0.0858	0.0953	0.1041	0.0819
		Total	**0.1427**	**0.1760**	**0.2025**	**0.2177**
D06	Antibiotics and chemotherapeutics for dermatological use	Public	1.0251	1.1185	1.1689	1.5382
		Private	1.3178	1.5706	1.5344	1.4356
		Total	**2.3429**	**2.6891**	**2.7033**	**2.9738**
D07	Corticosteroids, dermatological preparations	Public	2.6257	2.4285	2.7146	3.1329
		Private	6.1330	7.0580	7.8180	7.7998
		Total	**8.7587**	**9.4865**	**10.5325**	**10.9327**
D09	Medicated dressings	Public	0.0001	< 0.0001	-	-
		Private	0.0332	0.0328	0.0311	0.0263
		Total	**0.0333**	**0.0328**	**0.0311**	**0.0263**
D10	Anti-acne preparations	Public	0.1063	0.1569	0.1743	0.1629
		Private	0.7838	0.8479	1.3885	0.7794
		Total	**0.8900**	**1.0049**	**1.5629**	**0.9423**
D11	Other dermatological preparations	Public	0.0358	0.0590	0.0425	0.0741
		Private	0.8194	0.7927	0.7705	0.7568
		Total	**0.8552**	**0.8517**	**0.8131**	**0.8309**
J02	Antimycotics for systemic use	Public	0.0474	0.0550	0.0531	0.0584
		Private	0.4278	0.4276	0.5080	0.2205
		Total	**0.4752**	**0.4825**	**0.5611**	**0.2789**

Table 11.2: Use of topical antifungal agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D01A	**Antifungals for topical use**	**Public**	**1.2014**	**1.3018**	**1.5442**	**1.2523**
		Private	**4.4011**	**5.3887**	**5.5036**	**5.5235**
		Total	**5.6025**	**6.6905**	**7.0478**	**6.7757**
D01AA	**Antibiotics**					
D01AA01	Nystatin	Public	0.0978	0.0919	0.0930	0.0725
		Private	-	0.0034	0.0021	0.0028
		Total	**0.0978**	**0.0953**	**0.0951**	**0.0753**
D01AC	**Imidazole and triazole derivatives**	**Public**	**0.9101**	**1.0407**	**1.2215**	**0.8771**
		Private	**4.3714**	**5.3605**	**5.4887**	**5.4909**
		Total	**5.2815**	**6.4012**	**6.7102**	**6.3680**
D01AC01	Clotrimazole	Public	0.0998	0.1146	0.1428	0.2945
		Private	0.3543	0.4473	0.5114	0.5330
		Total	**0.4540**	**0.5619**	**0.6542**	**0.8275**
D01AC02	Miconazole	Public	0.7177	0.8259	0.9239	0.4146
		Private	0.4085	0.5608	0.5426	0.4302
		Total	**1.1263**	**1.3867**	**1.4665**	**0.8448**
D01AC03	Econazole	Public	-	-	-	-
		Private	-	-	-	0.0011
		Total	**-**	**-**	**-**	**0.0011**
D01AC05	Isoconazole	Public	-	-	-	-
		Private	0.0073	0.0089	0.0046	0.0026
		Total	**0.0073**	**0.0089**	**0.0046**	**0.0026**
D01AC07	Tioconazole	Public	0.0014	0.0005	-	-
		Private	0.0076	-	-	-
		Total	**0.0090**	**0.0005**	**-**	**-**
D01AC08	Ketoconazole	Public	0.0894	0.0978	0.1482	0.1651
		Private	0.8933	1.1600	1.2056	1.2574
		Total	**0.9827**	**1.2578**	**1.3538**	**1.4225**
D01AC14	Sertaconazole	Public	-	-	-	-
		Private	-	-	-	0.0943
		Total	**-**	**-**	**-**	**0.0943**
D01AC20	Imidazoles/triazoles in combination with corticosteroids	Public	0.0018	0.0019	0.0067	0.0029
		Private	2.7004	3.1834	3.2245	3.1724
		Total	**2.7022**	**3.1853**	**3.2312**	**3.1752**
D01AE	**Other antifungals for topical use**	**Public**	**0.1936**	**0.1692**	**0.2297**	**0.3026**
		Private	**0.0297**	**0.0248**	**0.0128**	**0.0298**
		Total	**0.2233**	**0.1940**	**0.2425**	**0.3324**
D01AE12	Salicylic acid	Public	0.1773	0.1393	0.1858	0.1858
		Private	-	-	-	-
		Total	**0.1773**	**0.1393**	**0.1858**	**0.1858**
D01AE13	Selenium sulfide	Public	0.0159	0.0276	0.0430	0.1154
		Private	0.0292	0.0242	0.0119	0.0279
		Total	**0.0451**	**0.0517**	**0.0550**	**0.1434**
D01AE15	Terbinafine	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
D01AE16	Amorolfine	Public	0.0003	0.0005	0.0008	0.0012
		Private	0.0005	0.0006	0.0009	0.0018
		Total	**0.0008**	**0.0012**	**0.0017**	**0.0030**

Table 11.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D01AE18	Tolnaftate	Public	-	0.0017	-	0.0003
		Private	-	-	-	-
		Total	**-**	**0.0017**	**-**	**0.0003**
D01B	**Antifungals for systemic use**					
D01BA	**Antifungals for systemic use**	**Public**	**0.0903**	**0.0794**	**0.0613**	**0.0727**
		Private	**0.1487**	**0.2538**	**0.2659**	**0.3470**
		Total	**0.2389**	**0.3332**	**0.3272**	**0.4197**
D01BA01	Griseofulvin	Public	0.0858	0.0746	0.0585	0.0676
		Private	0.1363	0.2401	0.2529	0.3380
		Total	**0.2221**	**0.3147**	**0.3113**	**0.4056**
D01BA02	Terbinafine	Public	0.0045	0.0048	0.0028	0.0051
		Private	0.0123	0.0137	0.0130	0.0090
		Total	**0.0168**	**0.0185**	**0.0158**	**0.0141**

Table 11.3: Use of topical antipsoriatic agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D05A	**Antipsoriatics for topical use**	**Public**	**0.0448**	**0.0692**	**0.0832**	**0.1258**
		Private	**0.0840**	**0.0949**	**0.1039**	**0.0817**
		Total	**0.1288**	**0.1641**	**0.1871**	**0.2075**
D05AD	**Psoralens for topical use**					
D05AD02	Methoxsalen	Public	-	-	0.0003	0.0071
		Private	-	-	-	-
		Total	**-**	**-**	**0.0003**	**0.0071**
D05AX	**Other antipsoriatics for topical use**	**Public**	**0.0448**	**0.0692**	**0.0830**	**0.1186**
		Private	**0.0840**	**0.0949**	**0.1039**	**0.0817**
		Total	**0.1288**	**0.1641**	**0.1869**	**0.2003**
D05AX02	Calcipotriol	Public	0.0239	0.0309	0.0287	0.0203
		Private	0.0156	0.0093	0.0078	0.0046
		Total	**0.0395**	**0.0401**	**0.0365**	**0.0248**
D05AX52	Calcipotriol, combinations	Public	0.0209	0.0383	0.0543	0.0984
		Private	0.0684	0.0856	0.0961	0.0771
		Total	**0.0893**	**0.1239**	**0.1503**	**0.1755**
D05B	**Antipsoriatics for systemic use**	**Public**	**0.0121**	**0.0115**	**0.0151**	**0.0101**
		Private	**0.0018**	**0.0004**	**0.0002**	**0.0002**
		Total	**0.0139**	**0.0119**	**0.0153**	**0.0102**
D05BA	**Psoralens for systemic use**					
D05BA02	Methoxsalen	Public	0.0017	0.0016	0.0003	0.0005
		Private	0.0002	0.0004	0.0002	0.0002
		Total	**0.0018**	**0.0019**	**0.0006**	**0.0007**
D05BB	**Retinoids for treatment of psoriasis**					
D05BB02	Acitretin	Public	0.0105	0.0100	0.0148	0.0096
		Private	0.0016	-	-	-
		Total	**0.0120**	**0.0100**	**0.0148**	**0.0096**

Table 11.4: Use of topical antibiotics from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D06A	**Antibiotics for topical use**	**Public**	**0.6867**	**0.7591**	**0.8124**	**0.9306**
		Private	**1.1171**	**1.3278**	**1.2447**	**1.1823**
		Total	**1.8038**	**2.0869**	**2.0571**	**2.1129**
D06AA	**Tetracycline and derivatives**					
D06AA04	Tetracycline	Public	-	-	-	-
		Private	0.0765	-	-	-
		Total	**0.0765**	**-**	**-**	**-**
D06AX	**Other antibiotics for topical use**	**Public**	**0.6867**	**0.7591**	**0.8124**	**0.9306**
		Private	**1.0406**	**1.3278**	**1.2447**	**1.1823**
		Total	**1.7273**	**2.0869**	**2.0571**	**2.1129**
D06AX01	Fusidic acid	Public	0.0399	0.0549	0.0790	0.0777
		Private	0.4602	0.6603	0.5964	0.5549
		Total	**0.5001**	**0.7152**	**0.6754**	**0.6325**
D06AX04	Neomycin	Public	0.6063	0.6344	0.6722	0.7972
		Private	0.1844	0.2475	0.2294	0.2292
		Total	**0.7907**	**0.8818**	**0.9015**	**1.0264**
D06AX05	Bacitracin	Public	-	-	-	-
		Private	0.0865	0.1053	0.0770	0.0769
		Total	**0.0865**	**0.1053**	**0.0770**	**0.0769**
D06AX07	Gentamicin	Public	0.0201	0.0423	0.0272	0.0279
		Private	0.1243	0.0969	0.1045	0.0962
		Total	**0.1444**	**0.1392**	**0.1317**	**0.1241**
D06AX09	Mupirocin	Public	0.0205	0.0275	0.0340	0.0277
		Private	0.1845	0.2151	0.2356	0.2239
		Total	**0.2050**	**0.2426**	**0.2696**	**0.2517**
D06AX13	Retapamulin	Public	-	-	-	-
		Private	0.0007	0.0028	0.0019	0.0012
		Total	**0.0007**	**0.0028**	**0.0019**	**0.0012**
D06B	**Chemotherapeutics for topical use**	**Public**	**0.3384**	**0.3594**	**0.3566**	**0.6076**
		Private	**0.2008**	**0.2428**	**0.2896**	**0.2533**
		Total	**0.5391**	**0.6023**	**0.6462**	**0.8610**
D06BA	**Sulfonamides**					
D06BA01	Silver sulfadiazine	Public	0.3370	0.3568	0.3547	0.5676
		Private	0.1169	0.1511	0.2039	0.1524
		Total	**0.4539**	**0.5080**	**0.5586**	**0.7200**
D06BB	**Antivirals**	**Public**	**0.0014**	**0.0026**	**0.0019**	**0.0400**
		Private	**0.0585**	**0.0641**	**0.0530**	**0.0635**
		Total	**0.0599**	**0.0667**	**0.0549**	**0.1035**
D06BB02	Tromantadine	Public	-	-	-	-
		Private	0.0015	-	-	-
		Total	**0.0015**	**-**	**-**	**-**
D06BB03	Aciclovir	Public	0.0013	0.0025	0.0018	0.0399
		Private	0.0562	0.0634	0.0523	0.0626
		Total	**0.0575**	**0.0659**	**0.0541**	**0.1025**
D06BB04	Podophyllotoxin	Public	-	-	-	-
		Private	0.0001	-	-	0.0001
		Total	**0.0001**	**-**	**-**	**0.0001**
D06BB10	Imiquimod	Public	0.0001	0.0001	0.0001	0.0001
		Private	0.0007	0.0007	0.0007	0.0008
		Total	**0.0007**	**0.0008**	**0.0008**	**0.0010**

Table 11.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D06BX	**Other chemotherapeutics**					
D06BX01	Metronidazole	Public	-	-	-	-
		Private	0.0253	0.0276	0.0327	0.0375
		Total	**0.0253**	**0.0276**	**0.0327**	**0.0375**

Table 11.5: Use of topical corticosteroids from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D07A	**Corticosteroids, plain**	**Public**	**2.5584**	**2.3579**	**2.6041**	**3.0328**
		Private	**3.7673**	**4.5362**	**4.8393**	**4.8086**
		Total	**6.3258**	**6.8941**	**7.4434**	**7.8414**
D07AA	**Corticosteroids, weak (group I)**					
D07AA02	Hydrocortisone	Public	0.9452	1.0480	1.2582	1.2019
		Private	0.6168	1.0288	0.8278	0.9448
		Total	**1.5620**	**2.0768**	**2.0861**	**2.1467**
D07AB	**Corticosteroids, moderately potent (group II)**	**Public**	**0.0870**	**0.0716**	**0.0928**	**0.0985**
		Private	**0.0621**	**0.0902**	**0.0793**	**0.0689**
		Total	**0.1491**	**0.1618**	**0.1721**	**0.1674**
D07AB01	Clobetasone	Public	0.0870	0.0716	0.0928	0.0985
		Private	0.0532	0.0664	0.0521	0.0394
		Total	**0.1402**	**0.1380**	**0.1449**	**0.1379**
D07AB08	Desonide	Public	-	-	-	-
		Private	-	0.0174	0.0265	0.0280
		Total	**-**	**0.0174**	**0.0265**	**0.0280**
D07AB09	Triamcinolone	Public	-	-	-	-
		Private	0.0089	0.0064	0.0006	0.0015
		Total	**0.0089**	**0.0064**	**0.0006**	**0.0015**
D07AC	**Corticosteroids, potent (group III)**	**Public**	**1.4894**	**1.1908**	**1.2009**	**1.6391**
		Private	**1.6103**	**1.8063**	**2.0448**	**2.0624**
		Total	**3.0997**	**2.9971**	**3.2457**	**3.7015**
D07AC01	Betamethasone	Public	1.4646	1.1552	1.1518	1.5740
		Private	1.0474	1.1475	1.3554	1.3262
		Total	**2.5120**	**2.3027**	**2.5073**	**2.9002**
D07AC04	Fluocinolone acetonide	Public	-	-	-	-
		Private	0.0074	0.0090	0.0076	0.0106
		Total	**0.0074**	**0.0090**	**0.0076**	**0.0106**
D07AC13	Mometasone	Public	0.0248	0.0356	0.0490	0.0651
		Private	0.5089	0.5844	0.6112	0.6450
		Total	**0.5337**	**0.6201**	**0.6602**	**0.7101**
D07AC17	Fluticasone	Public	-	-	0.0001	-
		Private	0.0466	0.0653	0.0706	0.0806
		Total	**0.0466**	**0.0653**	**0.0707**	**0.0806**
D07AD	**Corticosteroids, very potent (group IV)**					
D07AD01	Clobetasol	Public	0.0368	0.0475	0.0522	0.0933
		Private	1.4782	1.6109	1.8874	1.7324
		Total	**1.5150**	**1.6584**	**1.9395**	**1.8257**
D07C	**Corticosteroids, combinations with antibiotics**	**Public**	**0.0619**	**0.0641**	**0.1022**	**0.1000**
		Private	**1.8947**	**1.9483**	**2.0773**	**1.7873**
		Total	**1.9566**	**2.0124**	**2.1795**	**1.8873**

Table 11.5: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D07CA	**Corticosteroids, weak, combinations with antibiotics**					
D07CA01	Hydrocortisone and antibiotics	Public	0.0290	0.0283	0.0229	0.0220
		Private	0.1470	0.1604	0.2045	0.1350
		Total	**0.1760**	**0.1887**	**0.2274**	**0.1570**
D07CC	**Corticosteroids, potent, combinations with antibiotics**	**Public**	**0.0329**	**0.0358**	**0.0793**	**0.0780**
		Private	**1.7477**	**1.7879**	**1.8728**	**1.6523**
		Total	**1.7806**	**1.8237**	**1.9521**	**1.7304**
D07CC01	Betamethasone and antibiotics	Public	0.0329	0.0358	0.0793	0.0780
		Private	1.7228	1.7772	1.8675	1.6495
		Total	**1.7557**	**1.8129**	**1.9468**	**1.7275**
D07CC02	Fluocinolone acetonide and antibiotics	Public	-	-	-	-
		Private	0.0249	0.0108	0.0052	0.0028
		Total	**0.0249**	**0.0108**	**0.0052**	**0.0028**
D07X	**Corticosteroids, other combinations**	**Public**	**0.0054**	**0.0065**	**0.0082**	**-**
		Private	**0.4709**	**0.5735**	**0.9014**	**1.2040**
		Total	**0.4764**	**0.5800**	**0.9096**	**1.2040**
D07XA	**Corticosteroids, weak, other combinations**					
D07XA01	Hydrocortisone	Public	0.0053	0.0065	-	-
		Private	-	0.0012	0.0056	0.0053
		Total	**0.0053**	**0.0077**	**0.0056**	**0.0053**
D07XC	**Corticosteroids, potent, other combinations**					
D07XC01	Betamethasone	Public	0.0002	-	0.0082	-
		Private	0.4709	0.5723	0.8958	1.1987
		Total	**0.4711**	**0.5723**	**0.9040**	**1.1987**

Table 11.6: Use of medicated dressing from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D09A	**Medicated dressings**					
D09AA	**Medicated dressings with antiinfectives**					
D09AA02	Fusidic acid	Public	0.0001	< 0.0001	-	-
		Private	0.0332	0.0328	0.0311	0.0263
		Total	**0.0333**	**0.0328**	**0.0311**	**0.0263**

Table 11.7: Use of systemic and topical anti-acne preparations from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D10A	**Anti-acne preparations for topical use**	**Public**	**0.1002**	**0.1503**	**0.1643**	**0.1517**
		Private	**0.7385**	**0.7695**	**1.3073**	**0.7025**
		Total	**0.8387**	**0.9198**	**1.4716**	**0.8542**
D10AD	**Retinoids for topical use in acne**	**Public**	**0.0243**	**0.0460**	**0.0793**	**0.0427**
		Private	**0.2465**	**0.2703**	**0.3135**	**0.2565**
		Total	**0.2708**	**0.3162**	**0.3928**	**0.2992**
D10AD01	Tretinoin	Public	0.0214	0.0394	0.0687	0.0302
		Private	0.1227	0.1300	0.1294	0.0869
		Total	**0.1441**	**0.1693**	**0.1981**	**0.1171**
D10AD03	Adapalene	Public	0.0029	0.0066	0.0106	0.0125
		Private	0.1238	0.1403	0.1841	0.1696
		Total	**0.1267**	**0.1469**	**0.1947**	**0.1821**
D10AE	**Peroxides**					
D10AE01	Benzoyl peroxide	Public	0.0747	0.1029	0.0831	0.1067
		Private	-	-	-	-
		Total	**0.0747**	**0.1029**	**0.0831**	**0.1067**
D10AF	**Antiinfectives for treatment of acne**	**Public**	**-**	**-**	**-**	**-**
		Private	**0.4764**	**0.4801**	**0.9902**	**0.4417**
		Total	**0.4764**	**0.4801**	**0.9902**	**0.4417**
D10AF01	Clindamycin	Public	-	-	-	-
		Private	0.3347	0.3481	0.9348	0.3850
		Total	**0.3347**	**0.3481**	**0.9348**	**0.3850**
D10AF02	Erythromycin	Public	-	-	-	-
		Private	0.1188	0.0998	0.0199	0.0190
		Total	**0.1188**	**0.0998**	**0.0199**	**0.0190**
D10AF51	Clindamycin, combinations	Public	-	-	-	-
		Private	0.0167	0.0241	0.0266	0.0306
		Total	**0.0167**	**0.0241**	**0.0266**	**0.0306**
D10AF52	Erythromycin, combinations	Public	-	-	-	-
		Private	0.0063	0.0080	0.0089	0.0071
		Total	**0.0063**	**0.0080**	**0.0089**	**0.0071**
D10AX	**Other anti-acne preparations for topical use**					
D10AX03	Azelaic acid	Public	0.0012	0.0015	0.0018	0.0023
		Private	0.0156	0.0191	0.0036	0.0044
		Total	**0.0168**	**0.0206**	**0.0054**	**0.0067**
D10B	**Anti-acne preparations for systemic use**					
D10BA	**Retinoids for treatment of acne**					
D10BA01	Isotretinoin	Public	0.0061	0.0066	0.0100	0.0111
		Private	0.0453	0.0784	0.0813	0.0769
		Total	**0.0513**	**0.0850**	**0.0913**	**0.0880**

Table 11.8: Use of other topical and systemic dermatological agents from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
D11A	**Other dermatological preparations**	**Public**	**0.0358**	**0.0590**	**0.0425**	**0.0741**
		Private	**0.8194**	**0.7927**	**0.7705**	**0.7568**
		Total	**0.8552**	**0.8517**	**0.8131**	**0.8309**
D11AC	**Medicated shampoos**					
D11AC03	Selenium compounds	Public	0.0334	0.0310	0.0391	0.0566
		Private	0.6199	0.6076	0.6045	0.5672
		Total	**0.6533**	**0.6386**	**0.6435**	**0.6237**
D11AF	**Wart and anti-corn preparations**					
D11AF	Wart and anti-corn preparations	Public	0.0018	0.0012	0.0012	0.0015
		Private	-	-	-	-
		Total	**0.0018**	**0.0012**	**0.0012**	**0.0015**
D11AH	**Agents for dermatitis, excluding corticosteroids**	**Public**	**0.0006**	**0.0016**	**0.0022**	**0.0025**
		Private	**0.0268**	**0.0276**	**0.0265**	**0.0277**
		Total	**0.0274**	**0.0291**	**0.0287**	**0.0302**
D11AH01	Tacrolimus	Public	0.0006	0.0016	0.0022	0.0025
		Private	0.0237	0.0245	0.0236	0.0250
		Total	**0.0243**	**0.0261**	**0.0258**	**0.0275**
D11AH02	Pimecrolimus	Public	-	-	-	-
		Private	0.0031	0.0030	0.0029	0.0027
		Total	**0.0031**	**0.0030**	**0.0029**	**0.0027**
D11AX	**Other dermatologicals**	**Public**	**< 0.0001**	**0.0251**	**< 0.0001**	**0.0135**
		Private	**0.1726**	**0.1575**	**0.1396**	**0.1619**
		Total	**0.1726**	**0.1826**	**0.1396**	**0.1754**
D11AX01	Minoxidil	Public	-	-	-	-
		Private	0.1200	0.1126	0.1102	0.1370
		Total	**0.1200**	**0.1126**	**0.1102**	**0.1370**
D11AX05	Magnesium sulfate	Public	-	0.0251	-	0.0135
		Private	-	-	-	-
		Total	**-**	**0.0251**	**-**	**0.0135**
D11AX11	Hydroquinone	Public	< 0.0001	0.0001	< 0.0001	< 0.0001
		Private	0.0526	0.0449	0.0295	0.0249
		Total	**0.0526**	**0.0450**	**0.0295**	**0.0249**

Table 11.9: Use of systemic antimycotics from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
J02A	**Antimycotics for systemic use**	**Public**	**0.0474**	**0.0550**	**0.0531**	**0.0584**
		Private	**0.4278**	**0.4276**	**0.5080**	**0.2205**
		Total	**0.4752**	**0.4825**	**0.5611**	**0.2789**
J02AB	**Imidazole derivatives**					
J02AB02	Ketoconazole	Public	0.0110	0.0130	0.0091	0.0101
		Private	0.3708	0.3708	0.4454	0.1604
		Total	**0.3818**	**0.3838**	**0.4545**	**0.1705**
J02AC	**Triazole derivatives**	**Public**	**0.0364**	**0.0420**	**0.0439**	**0.0482**
		Private	**0.0570**	**0.0567**	**0.0626**	**0.0601**
		Total	**0.0934**	**0.0987**	**0.1065**	**0.1083**
J02AC01	Fluconazole	Public	0.0162	0.0194	0.0225	0.0218
		Private	0.0331	0.0343	0.0398	0.0379
		Total	**0.0494**	**0.0537**	**0.0623**	**0.0597**
J02AC02	Itraconazole	Public	0.0196	0.0220	0.0210	0.0258
		Private	0.0236	0.0221	0.0225	0.0219
		Total	**0.0431**	**0.0441**	**0.0435**	**0.0476**
J02AC03	Voriconazole	Public	0.0005	0.0005	0.0004	0.0006
		Private	0.0002	0.0002	0.0002	0.0002
		Total	**0.0008**	**0.0007**	**0.0006**	**0.0008**
J02AC04	Posaconazole	Public	< 0.0001	< 0.0001	< 0.0001	0.0001
		Private	0.0001	0.0001	< 0.0001	0.0001
		Total	**0.0001**	**0.0001**	**0.0001**	**0.0001**

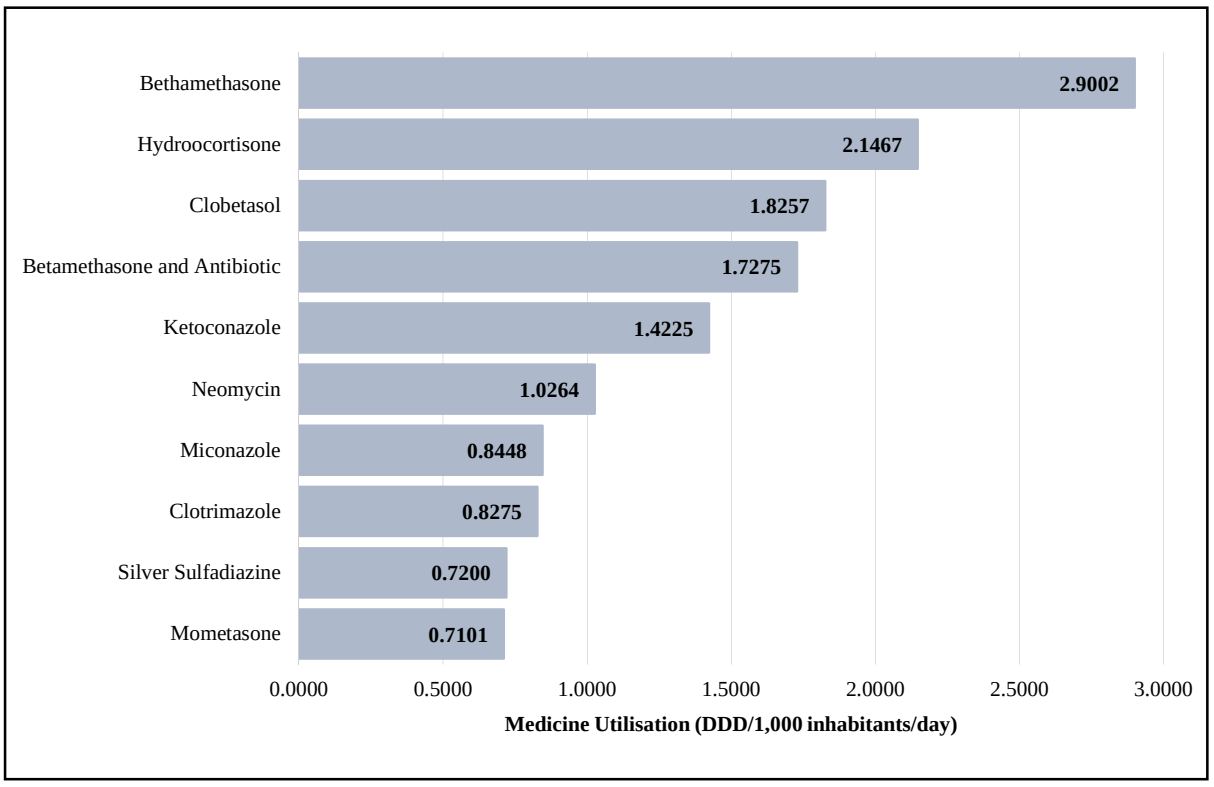

Figure 11.1: Ten commonest topical dermatological preparations used 2014 (DDD/1,000 inhabitants/day).

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CHAPTER 12: USE OF GYNAECOLOGICALS, SEX HORMONES AND HORMONAL CONTRACEPTION

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This chapter reviews the trends in drug usage in Obstetrics and Gynaecology for the years 2011 to 2014.

The use of gynaecological anti-infectives particularly clotrimazole and miconazole, has shown an increase in usage from 2011 to 2014 whilst nystatin usage has been on a decreasing trend from 2011 to 2013 and completely discontinued in 2014. Imidazole derivatives are shown to have higher cure rates and only require a shorter duration of treatment compared to nystatin and hence, more favoured. Amongst the imidazole derivatives, clotrimazole had the highest usage.

Overall the usage of dinoprostone and gemeprost showed an increasing trend from 2011 to 2014. Methylergometrine is not used in public hospitals. In private sectors there was a decreasing trend of usage for this agent during this study period. This can be attributed to the availability of other safer alternatives such as oxytocin and syntometrine[1, 2].

Postpartum haemorrhage (PPH) is one of the causes of maternal death in Malaysia. From the Confidential Enquiry Maternal Report 2009 to 2011 there was an increase in the incidence of PPH however there was a reduction in maternal mortality due to PPH. During the study period there was no increase in the use of carboprost despite the increased incidence of PPH. It is postulated that this is due to the introduction of Obstetrics Life Savings Skills courses that have been ongoing since 2009. This has allowed the use of better surgical techniques as well as mechanical interventions[3].

Both dinoprostone and gemeprost are shown to be used more in the public sector compared to private sector during this study period.

Pertaining to the use of prolactin inhibitors, bromocriptine usage is four to six folds higher compared to cabergoline. This may be attributed to the higher cost of carbergoline. A recent meta-analysis done in 2011 favour the use of carbegoline to bromocriptine due to concerns of adverse effects[4]. This survey however doesn't differentiate the indications where these drugs have been used.

The usage of levonogestrel as an emergency contraceptive was much higher in the private sectors as compared to the public sector where its usage is restricted solely in the one stop crisis centers for alleged rape victims. Overall, there was also a downward trend in the usage of hormonal contraceptives and this was reflected in the last survey on contraceptive prevalence rate in 2014 by the National Population and Family Development Board. However there was an increasing trend for the usage of medroxyprogesterone which could be due to its ease of administration, requiring a three monthly depot injection.

The usage of hormone replacement therapy has been reducing in trend possibly due to concerns on breast cancer and cardiovascular complications although current guidelines recommend that HRT should be individualized and used for short term (up to five years)[5,6].

In general, the use of progestogens for menstrual disorders is comparable among the different agents. However the use of medroxyprogesterone was five folds higher in the public sector possibly due to the lower cost compared to other agents.

Clomiphene citrate is a non-steroidal fertility drug which is the first line in the management of subfertility. The usage was three to four folds higher in private sectors. This trend was also reflected in the usage of gonadotrophins possibly due to more fertility centers in private sectors as compared to public hospitals.

Table 12.1: Use of gynaecologicals, sex hormones and hormonal contraception from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G01	Gynecological antiinfectives and antiseptics	Public	0.0495	0.0606	0.0492	0.0760
		Private	0.1107	0.1685	0.1365	0.1652
		Total	**0.1602**	**0.2291**	**0.1856**	**0.2412**
G02	Other gynecologicals	Public	0.0575	0.0637	0.0586	0.0677
		Private	0.0413	0.0483	0.0431	0.0332
		Total	**0.0988**	**0.1120**	**0.1017**	**0.1009**
G03	Sex hormones and modulators of the genital system	Public	5.4836	5.4289	9.6997	8.0562
		Private	11.3107	11.6633	11.0938	9.9807
		Total	**16.7943**	**17.0921**	**20.7934**	**18.0368**

Table 12.2: Use of antiinfectives and antiseptics on gynaecological system from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Theraoeutic Group/Drug	Sector	2011	2012	2013	2014
G01A	**Antiinfectives and antiseptics, excluding combinations with corticosteroids**	**Public**	**0.0495**	**0.0606**	**0.0492**	**0.0760**
		Private	**0.1107**	**0.1685**	**0.1365**	**0.1652**
		Total	**0.1602**	**0.2291**	**0.1856**	**0.2412**
G01AA	**Antibiotics**					
G01AA01	Nystatin	Public	0.0001	-	0.0004	-
		Private	0.0030	0.0009	0.0003	-
		Total	**0.0031**	**0.0009**	**0.0007**	**-**
G01AF	**Imidazole derivatives**	**Public**	**0.0494**	**0.0606**	**0.0488**	**0.0760**
		Private	**0.1077**	**0.1675**	**0.1362**	**0.1652**
		Total	**0.1571**	**0.2281**	**0.1850**	**0.2412**
G01AF01	Metronidazole	Public	-	-	-	-
		Private	0.0119	0.0076	0.0010	0.0003
		Total	**0.0119**	**0.0076**	**0.0010**	**0.0003**
G01AF02	Clotrimazole	Public	0.0494	0.0606	0.0488	0.0760
		Private	0.0898	0.1545	0.1298	0.1590
		Total	**0.1392**	**0.2151**	**0.1786**	**0.2350**
G01AF04	Miconazole	Public	-	-	-	-
		Private	0.0012	0.0015	0.0009	0.0022
		Total	**0.0012**	**0.0015**	**0.0009**	**0.0022**
G01AF05	Econazole	Public	-	-	-	-
		Private	0.0029	0.0019	0.0026	0.0020
		Total	**0.0029**	**0.0019**	**0.0026**	**0.0020**
G01AF08	Tioconazole	Public	-	-	-	< 0.0001
		Private	0.0019	0.0021	0.0019	0.0016
		Total	**0.0019**	**0.0021**	**0.0019**	**0.0017**
G01AF15	Butoconazole	Public	-	-	-	-
		Private	-	< 0.0001	-	-
		Total	**-**	**< 0.0001**	**-**	**-**

Table 12.3: Use of other agents on gynaecological system from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G02A	**Uterotonics**	**Public**	**0.0406**	**0.0427**	**0.0437**	**0.0492**
		Private	**0.0129**	**0.0119**	**0.0075**	**0.0080**
		Total	**0.0535**	**0.0546**	**0.0512**	**0.0572**
G02AB	**Ergot alkaloids**	**Public**	**0.0004**	**0.0005**	**0.0001**	**-**
		Private	**0.0070**	**0.0052**	**0.0004**	**< 0.0001**
		Total	**0.0074**	**0.0057**	**0.0004**	**< 0.0001**
G02AB01	Methylergometrine	Public	-	-	-	-
		Private	0.0067	0.0051	0.0003	-
		Total	**0.0067**	**0.0051**	**0.0003**	**-**
G02AB03	Ergometrine	Public	0.0004	0.0005	0.0001	-
		Private	0.0003	0.0001	0.0001	< 0.0001
		Total	**0.0007**	**0.0006**	**0.0001**	**< 0.0001**
G02AD	**Prostaglandins**	**Public**	**0.0402**	**0.0421**	**0.0436**	**0.0492**
		Private	**0.0059**	**0.0067**	**0.0071**	**0.0080**
		Total	**0.0461**	**0.0489**	**0.0507**	**0.0572**
G02AD02	Dinoprostone	Public	0.0389	0.0408	0.0424	0.0478
		Private	0.0058	0.0066	0.0070	0.0079
		Total	**0.0447**	**0.0474**	**0.0494**	**0.0557**
G02AD03	Gemeprost	Public	0.0012	0.0012	0.0011	0.0013
		Private	0.0001	0.0001	0.0001	0.0001
		Total	**0.0013**	**0.0013**	**0.0012**	**0.0014**
G02AD04	Carboprost	Public	0.0001	0.0001	0.0001	0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0002**	**0.0002**	**0.0002**
G02C	**Other gynecologicals**					
G02CB	**Prolactine inhibitors**	**Public**	**0.0169**	**0.0210**	**0.0149**	**0.0185**
		Private	**0.0284**	**0.0364**	**0.0356**	**0.0252**
		Total	**0.0453**	**0.0574**	**0.0505**	**0.0436**
G02CB01	Bromocriptine	Public	0.0140	0.0175	0.0107	0.0134
		Private	0.0250	0.0324	0.0316	0.0215
		Total	**0.0390**	**0.0499**	**0.0423**	**0.0349**
G02CB03	Cabergoline	Public	0.0029	0.0036	0.0042	0.0051
		Private	0.0035	0.0039	0.0040	0.0037
		Total	**0.0064**	**0.0075**	**0.0082**	**0.0088**

Table 12.4: Use of systemic hormonal contraceptives from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G03A	**Hormonal contraceptives for systemic use**	**Public**	**4.7202**	**4.6158**	**8.9252**	**7.1571**
		Private	**8.8856**	**9.0002**	**8.4665**	**7.4554**
		Total	**13.6058**	**13.6161**	**17.3917**	**14.6125**
G03AA	**Progestogens and estrogens, fixed combinations**	**Public**	**3.2859**	**2.4217**	**5.3287**	**2.9486**
		Private	**7.2427**	**7.1854**	**6.7856**	**5.9581**
		Total	**10.5286**	**9.6070**	**12.1143**	**8.9067**
G03AA07	Levonorgestrel and ethinylestradiol	Public	1.2253	0.8559	3.6724	1.8987
		Private	2.5851	2.4519	2.0231	1.9759
		Total	**3.8104**	**3.3078**	**5.6955**	**3.8746**
G03AA09	Desogestrel and ethinylestradiol	Public	2.0605	1.5647	1.6547	1.0489
		Private	3.0023	2.8216	2.7498	2.3370
		Total	**5.0628**	**4.3863**	**4.4045**	**3.3859**
G03AA10	Gestodene and ethinylestradiol	Public	-	-	0.0008	-
		Private	0.4951	0.4968	0.3856	0.3470
		Total	**0.4951**	**0.4968**	**0.3863**	**0.3470**
G03AA12	Drospirenone and ethinylestradiol	Public	0.0001	0.0011	0.0008	0.0010
		Private	1.1030	1.3524	1.5562	1.2166
		Total	**1.1030**	**1.3535**	**1.5570**	**1.2176**
G03AA13	Norelgestromin and ethinylestradiol	Public	-	-	-	-
		Private	0.0573	0.0626	0.0655	0.0694
		Total	**0.0573**	**0.0626**	**0.0655**	**0.0694**
G03AA14	Nomegestrol and estradiol	Public	-	-	-	-
		Private	-	-	0.0054	0.0123
		Total	**-**	**-**	**0.0054**	**0.0123**
G03AB	**Progestogens and estrogens, sequential preparations**					
G03AB03	Levonorgestrel and ethinylestradiol	Public	0.0102	0.0042	-	-
		Private	0.1473	0.1252	0.0337	-
		Total	**0.1575**	**0.1294**	**0.0337**	**-**
G03AC	**Progestogens**	**Public**	**1.4239**	**2.1852**	**3.5964**	**4.2084**
		Private	**1.4480**	**1.6421**	**1.5999**	**1.4456**
		Total	**2.8719**	**3.8273**	**5.1963**	**5.6540**
G03AC01	Norethisterone	Public	0.6371	0.9044	0.9325	0.9316
		Private	0.3889	0.4368	0.4974	0.3891
		Total	**1.0260**	**1.3413**	**1.4300**	**1.3207**
G03AC06	Medroxyprogesterone	Public	0.7854	1.2631	2.6116	3.1638
		Private	0.6137	0.6935	0.5594	0.5859
		Total	**1.3991**	**1.9565**	**3.1710**	**3.7497**
G03AC08	Etonogestrel	Public	0.0013	0.0177	0.0518	0.1119
		Private	0.4454	0.4864	0.5000	0.4257
		Total	**0.4468**	**0.5041**	**0.5519**	**0.5376**
G03AC09	Desogestrel	Public	-	-	0.0004	0.0012
		Private	-	0.0253	0.0431	0.0449
		Total	**-**	**0.0253**	**0.0434**	**0.0460**
G03AD	**Emergency contraceptives**	**Public**	**0.0003**	**0.0048**	**0.0001**	**0.0001**
		Private	**0.0475**	**0.0476**	**0.0474**	**0.0517**
		Total	**0.0479**	**0.0524**	**0.0475**	**0.0518**
G03AD01	Levonorgestrel	Public	0.0003	0.0048	0.0001	0.0001
		Private	0.0475	0.0474	0.0471	0.0513
		Total	**0.0479**	**0.0522**	**0.0472**	**0.0514**

Table 12.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G03AD02	Ulipristal	Public	-	-	-	-
		Private	-	0.0002	0.0003	0.0004
		Total	**-**	**0.0002**	**0.0003**	**0.0004**
G03B	**Androgens**	**Public**	**0.0128**	**0.0095**	**0.0112**	**0.0162**
		Private	**0.0690**	**0.0800**	**0.0786**	**0.0712**
		Total	**0.0819**	**0.0895**	**0.0898**	**0.0875**
G03BA	**3-oxoandrosten (4) derivatives**					
G03BA03	Testosterone	Public	0.0128	0.0095	0.0112	0.0162
		Private	0.0628	0.0708	0.0694	0.0648
		Total	**0.0756**	**0.0804**	**0.0807**	**0.0810**
G03BB	**5-androstanon (3) derivatives**					
G03BB01	Mesterolone	Public	-	-	-	-
		Private	0.0062	0.0092	0.0091	0.0064
		Total	**0.0062**	**0.0092**	**0.0091**	**0.0064**
G03C	**Estrogens**	**Public**	**0.1368**	**0.1372**	**0.0924**	**0.1115**
		Private	**0.4318**	**0.4510**	**0.4210**	**0.3976**
		Total	**0.5686**	**0.5882**	**0.5134**	**0.5091**
G03CA	**Natural and semisynthetic estrogens, plain**	**Public**	**0.1110**	**0.1079**	**0.0679**	**0.0870**
		Private	**0.2907**	**0.3252**	**0.2794**	**0.2631**
		Total	**0.4017**	**0.4331**	**0.3474**	**0.3501**
G03CA03	Estradiol	Public	0.0162	0.0158	0.0107	0.0188
		Private	0.1167	0.1205	0.1168	0.1172
		Total	**0.1329**	**0.1363**	**0.1275**	**0.1360**
G03CA53	Estradiol, combinations	Public	-	-	-	< 0.0001
		Private	-	0.0149	0.0178	0.0173
		Total	**-**	**0.0149**	**0.0178**	**0.0173**
G03CA57	Conjugated estrogens	Public	0.0948	0.0921	0.0573	0.0682
		Private	0.1740	0.1899	0.1448	0.1286
		Total	**0.2688**	**0.2820**	**0.2021**	**0.1968**
G03CX	**Other estrogens**					
G03CX01	Tibolone	Public	0.0258	0.0293	0.0244	0.0245
		Private	0.1411	0.1258	0.1415	0.1345
		Total	**0.1668**	**0.1551**	**0.1660**	**0.1590**
G03D	**Progestogens**	**Public**	**0.3876**	**0.4269**	**0.4680**	**0.5238**
		Private	**0.9208**	**0.9581**	**1.1541**	**1.1299**
		Total	**1.3083**	**1.3850**	**1.6221**	**1.6538**
G03DA	**Pregnen (4) derivatives**	**Public**	**0.2359**	**0.2757**	**0.2963**	**0.3254**
		Private	**0.1756**	**0.2609**	**0.2361**	**0.2421**
		Total	**0.4116**	**0.5366**	**0.5324**	**0.5676**
G03DA02	Medroxyprogesterone	Public	0.2335	0.2714	0.2931	0.3162
		Private	0.0471	0.0695	0.0633	0.0593
		Total	**0.2806**	**0.3410**	**0.3565**	**0.3755**
G03DA03	Hydroxyprogesterone	Public	0.0012	0.0014	0.0013	0.0033
		Private	0.0863	0.1289	0.0963	0.0965
		Total	**0.0876**	**0.1304**	**0.0976**	**0.0998**
G03DA04	Progesterone	Public	0.0012	0.0028	0.0019	0.0060
		Private	0.0422	0.0624	0.0765	0.0863
		Total	**0.0433**	**0.0652**	**0.0784**	**0.0923**

Table 12.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G03DB	**Pregnadien derivatives**	**Public**	**0.0977**	**0.1066**	**0.1169**	**0.1382**
		Private	**0.2061**	**0.2297**	**0.2624**	**0.2604**
		Total	**0.3037**	**0.3363**	**0.3794**	**0.3986**
G03DB01	Dydrogesterone	Public	0.0977	0.1066	0.1169	0.1357
		Private	0.2061	0.2297	0.2519	0.2346
		Total	**0.3037**	**0.3363**	**0.3689**	**0.3703**
G03DB08	Dienogest	Public	-	-	-	0.0025
		Private	-	-	0.0105	0.0258
		Total	**-**	**-**	**0.0105**	**0.0283**
G03DC	**Estren derivatives**	**Public**	**0.0540**	**0.0446**	**0.0548**	**0.0602**
		Private	**0.5391**	**0.4675**	**0.6555**	**0.6274**
		Total	**0.5931**	**0.5121**	**0.7103**	**0.6876**
G03DC01	Allylestrenol	Public	-	-	-	-
		Private	0.0020	0.0132	0.0127	0.0103
		Total	**0.0020**	**0.0132**	**0.0127**	**0.0103**
G03DC02	Norethisterone	Public	0.0540	0.0446	0.0548	0.0602
		Private	0.5371	0.4544	0.6428	0.6171
		Total	**0.5911**	**0.4989**	**0.6976**	**0.6773**
G03F	**Progestogens and estrogens in combination**	**Public**	**0.0653**	**0.0548**	**0.0676**	**0.0574**
		Private	**0.1666**	**0.1569**	**0.1321**	**0.1350**
		Total	**0.2318**	**0.2116**	**0.1997**	**0.1925**
G03FA	**Progestogens and estrogens, fixed combinations**	**Public**	**0.0155**	**0.0192**	**0.0229**	**0.0182**
		Private	**0.0697**	**0.0640**	**0.0533**	**0.0569**
		Total	**0.0852**	**0.0832**	**0.0762**	**0.0750**
G03FA01	Norethisterone and estrogen	Public	0.0004	-	-	0.0002
		Private	0.0043	0.0001	-	-
		Total	**0.0047**	**0.0001**	**-**	**0.0002**
G03FA11	Levonorgestrel and estrogen	Public	0.0001	-	-	-
		Private	-	-	-	-
		Total	**0.0001**	**-**	**-**	**-**
G03FA14	Dydrogesterone and estrogen	Public	0.0150	0.0192	0.0220	0.0180
		Private	0.0517	0.0533	0.0447	0.0497
		Total	**0.0667**	**0.0725**	**0.0667**	**0.0677**
G03FA17	Drospirenone and estrogen	Public	-	-	0.0009	-
		Private	0.0137	0.0106	0.0086	0.0072
		Total	**0.0137**	**0.0106**	**0.0095**	**0.0072**
G03FB	**Progestogens and estrogens, sequential preparations**	**Public**	**0.0498**	**0.0356**	**0.0447**	**0.0393**
		Private	**0.0969**	**0.0928**	**0.0788**	**0.0782**
		Total	**0.1467**	**0.1284**	**0.1235**	**0.1174**
G03FB01	Norgestrel and estrogen	Public	0.0413	0.0278	0.0356	0.0352
		Private	0.0914	0.0864	0.0748	0.0747
		Total	**0.1327**	**0.1142**	**0.1105**	**0.1099**
G03FB06	Medroxyprogesterone and estrogen	Public	0.0084	0.0078	0.0091	0.0041
		Private	0.0055	0.0064	0.0040	0.0034
		Total	**0.0139**	**0.0142**	**0.0130**	**0.0075**
G03G	**Gonadotropins and other ovulation stimulants**	**Public**	**0.0813**	**0.1098**	**0.0741**	**0.1234**
		Private	**0.3680**	**0.4800**	**0.4007**	**0.3993**
		Total	**0.4492**	**0.5897**	**0.4748**	**0.5227**

Table 12.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G03GA	**Gonadotropins**	**Public**	**0.0138**	**0.0161**	**0.0139**	**0.0173**
		Private	**0.0423**	**0.0341**	**0.0365**	**0.0385**
		Total	**0.0561**	**0.0502**	**0.0505**	**0.0558**
G03GA01	Chorionic gonadotrophin	Public	0.0110	0.0124	0.0117	0.0135
		Private	0.0316	0.0203	0.0237	0.0258
		Total	**0.0426**	**0.0327**	**0.0354**	**0.0394**
G03GA02	Human menopausal gonadotrophin	Public	0.0003	0.0004	0.0002	0.0004
		Private	-	< 0.0001	0.0001	0.0003
		Total	**0.0003**	**0.0004**	**0.0003**	**0.0007**
G03GA04	Urofollitropin	Public	0.0004	0.0008	0.0004	0.0016
		Private	-	0.0001	0.0002	0.0003
		Total	**0.0004**	**0.0008**	**0.0006**	**0.0020**
G03GA05	Follitropin alfa	Public	0.0011	0.0016	0.0015	0.0010
		Private	0.0062	0.0092	0.0077	0.0069
		Total	**0.0073**	**0.0107**	**0.0092**	**0.0079**
G03GA06	Follitropin beta	Public	0.0009	0.0009	0.0001	0.0006
		Private	0.0039	0.0035	0.0038	0.0039
		Total	**0.0047**	**0.0043**	**0.0038**	**0.0045**
G03GA07	Lutropin alfa	Public	-	-	-	-
		Private	0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
G03GA08	Choriogonadotropin alfa	Public	< 0.0001	0.0001	0.0001	0.0001
		Private	0.0005	0.0008	0.0008	0.0007
		Total	**0.0005**	**0.0009**	**0.0009**	**0.0008**
G03GA09	Corifollitropin alfa	Public	-	-	-	-
		Private	-	-	< 0.0001	< 0.0001
		Total	**-**	**-**	**< 0.0001**	**< 0.0001**
G03GA30	Combinations	Public	-	-	-	-
		Private	0.0001	0.0002	0.0003	0.0005
		Total	**0.0001**	**0.0002**	**0.0003**	**0.0005**
G03GB	**Ovulation stimulants, synthetic**					
G03GB02	Clomifene	Public	0.0675	0.0937	0.0602	0.1061
		Private	0.3257	0.4458	0.3642	0.3608
		Total	**0.3931**	**0.5395**	**0.4244**	**0.4669**
G03H	**Antiandrogens**	**Public**	**0.0177**	**0.0202**	**0.0199**	**0.0187**
		Private	**0.3996**	**0.4741**	**0.3773**	**0.3367**
		Total	**0.4172**	**0.4943**	**0.3971**	**0.3554**
G03HA	**Antiandrogens, plain**					
G03HA01	Cyproterone	Public	0.0032	0.0021	0.0011	0.0020
		Private	0.0035	0.0033	0.0043	0.0034
		Total	**0.0067**	**0.0054**	**0.0054**	**0.0054**
G03HB	**Antiandrogens and estrogens**					
G03HB01	Cyproterone and estrogen	Public	0.0145	0.0181	0.0188	0.0168
		Private	0.3961	0.4708	0.3730	0.3333
		Total	**0.4106**	**0.4889**	**0.3917**	**0.3501**
G03X	**Other sex hormones and modulators of the genital system**	**Public**	**0.0620**	**0.0547**	**0.0413**	**0.0479**
		Private	**0.0694**	**0.0630**	**0.0635**	**0.0555**
		Total	**0.1314**	**0.1177**	**0.1049**	**0.1034**

Table 12.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G03XA	**Antigonadotropins and similar agents**	**Public**	**0.0075**	**0.0068**	**0.0079**	**0.0076**
		Private	**0.0041**	**0.0035**	**0.0028**	**0.0037**
		Total	**0.0116**	**0.0102**	**0.0107**	**0.0113**
G03XA01	Danazol	Public	0.0073	0.0065	0.0079	0.0076
		Private	0.0035	0.0034	0.0028	0.0037
		Total	**0.0108**	**0.0099**	**0.0107**	**0.0113**
G03XA02	Gestrinone	Public	0.0002	0.0003	-	-
		Private	0.0007	< 0.0001	-	-
		Total	**0.0008**	**0.0003**	**-**	**-**
G03XC	**Selective estrogen receptor modulators**					
G03XC01	Raloxifene	Public	0.0545	0.0479	0.0334	0.0404
		Private	0.0653	0.0596	0.0607	0.0517
		Total	**0.1198**	**0.1075**	**0.0942**	**0.0921**

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CHAPTER 13: USE OF UROLOGICALS

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Drugs used in urology can be divided into the following categories:

Drugs used in overactive bladder

Tolterodine, solifenacin, propiverine, fesoterodine, trospium and oxybutynin (listed in descending frequency of usage) are drugs used in overactive bladder[1] (Table 13.2).

Flavoxate (Urispas) is an old antimuscarinic agent and is usually not available and not used in most public urological centres. It is the oldest drug in the group and has questionable efficacy as it has only level 2 evidence for its use in the treatment of overactive bladder[2]. It has been removed from the Guidelines from the European Association of Urology (EAU) Working Panel on Urinary Incontinence[1]. However, it is still available in the private sector. Therefore, its usage was higher in the private than the public sector. The consistent usage of Flavoxate in the private sector from year 2011 to 2014 could be due to its prescription by non-urologists.

Oxybutinin is still available in the public centres due to lower cost and it's indicated usage for paediatric patients. However, its use has been consistently low from year 2011 to 2014 (0.0020 DDD/1,000 inhabitants/day to 0.0026 DDD/1,000 inhabitants/day) because it has worse side effects compared to the other drugs. This may also be due to the availability of other antimuscarinic agents with fewer side effects in the public sector.

Tolterodine extended-release as a single dose therapy (4mg daily) was introduced in the public and private sector in 2009. There was a continuous increasing trend in its usage from year 2011 to 2014 especially in the public sector (0.0494 DDD/1,000 inhabitants/day to 0.0836 DDD/1,000 inhabitants/day).

Solifenacin usage has overtaken tolterodine in the private sector. Solifenacin was introduced to the private sector in 2010 and public sector in 2013. The higher usage of solifenacin in private sector compare to public sector may be explained by this. There is however, an increasing trend in the usage of solifenancin in public sector from 2013 (0.0037 DDD/1,000 inhabitants/day) to 2014 (0.0074 DDD/1,000 inhabitants/day) and this might be due to the introduction of solifenacin into the MOH formulary in 2013.

Propeverine usage is steady in private sector but increasing in the public sector (from 0.0053 DDD/1,000 inhabitants/day in 2013 to 0.0073 DDD/1,000 inhabitants/day in 2014). This may be due to its indicated usage in paediatric patients. Since propiverine is given in multiple and titratable dosages, it is less popular than single dose antimuscarinic agents in both public and private sectors.

Fesoterodine is not used in public sector since it's not available in the MOH formulary. Its usage is increasing in the private sector from 0.0008 DDD/1,000 inhabitants/day in 2011 to 0.0092 DDD/1,000 inhabitants/day in 2014. It is the third most commonly used antimuscarinic in the private sector.

Trospium was available in the public sector in year 2014. However, it has been used in the private sector since 2010. It is twice daily dosing and is more commonly used in the geriatric population due to its reduced cognitive side effects. However, its usage in private sector has declined from 0.0054 DDD/1,000 inhabitants/day in 2013 to 0.0037 DDD/1,000 inhabitants/day in 2014.

Drugs used in erectile dysfunction and premature ejaculation

Sildenafil, tadalafil and vardenafil are the three selective phosphodiesterase type-5 (PDE5) inhibitors used in the treatment of erectile dysfunction (Table 13.2). PDE5 inhibitors were more commonly prescribed in the private sector because the drugs were still not available in the public sector.

Sildenafil remains the most popular among the three PDE5 inhibitors. It was far more commonly prescribed in the private sectors (0.1376 DDD/1,000 inhabitants/day in 2014) compared to the public sector (0.0058

DDD/1,000 inhabitants/day in 2014). This is probably because it is the first and the most recognised PDE5 inhibitor by the public in Malaysia.

Tadalafil was the second most frequently prescribed PDE5 inhibitors because it is a longer acting drug (duration is 36 hours) compared to vardenafil (duration is five hours). There has been a slow increase in its usage of tadalafil from 0.0614 DDD/1,000 inhabitants/day in 2011 to 0.0721 DDD/1,000 inhabitants/day in 2014. Vardenafil usage has been steady from 2011 to 2014 (0.0251 DDD/1,000 inhabitants/day to 0.0260 DDD/1,000 inhabitants/day). In comparison to Australia, the ranking of PDE5 inhibitors usage is similar. However, the usage of all these three drugs in Australia is lower compared to Malaysia[3]. Udenafil has recently been introduced in Malaysia in 2011 and its usage has remained low.

Interestingly, there has been no change in the use of alprostadil from 2011 to 2014 and it is only been utilised in the private sector (0.0002 DDD/1,000 inhabitants/day).

Dapoxetine has been used in Malaysia since 2010 in the treatment of premature ejaculation. It is a Selective Serotonin Reuptake Inhibitor (SSRI) agent with fewer side effects. It is not available in public sector and the usage in the private sector has been fluctuating (0.0032 DDD/1,000 inhabitants/day in 2011, 0.0019 DDD/1,000 inhabitants/day in 2012, 0.0023 DDD/1,000 inhabitants/day in 2013 and 0.0044 DDD/1,000 inhabitants/day in 2014)

Alpha-adrenoceptor antagonists

α_1-blockers are often considered the first-line drug treatment of moderate-to-severe male lower urinary tract symptoms. All α-blockers have similar efficacy and only vary in their side effect profile. The most frequent side effects of α-blockers are asthenia, dizziness and (orthostatic) hypotension[4].

The most commonly used α_1-blockers are terazosin, doxazosin, alfuzosin and tamsulosin in descending order of usage (Table 13.2 and Table 13.3). There is a consistently increasing trend of usage of all the α_1-blockers in both public and private sectors. This may reflect the increasing diagnosis and treatment for benign prostate hyperplasia (BPH) in Malaysia.

The usage of terazosin is significantly higher in the public sector (0.6918 DDD/1,000 inhabitants/day in 2014) compared to private sector (0.0598 DDD/1,000 inhabitants/day in 2014). This also applies to doxazosin but the difference in usage between the public and private sector is smaller (0.4958 DDD/1,000 inhabitants/day in public sector compared to 0.1401 DDD/1,000 inhabitants/day in private sector in 2014) (Table 13.3).
Similar trend was seen for alfuzosin usage which was higher (0.3346 DDD/1,000 inhabitants/day) in public sector compared to private sector (0.1441 DDD/1,000 inhabitants/day in 2014).

Tamsulosin was the latest α_1-blockers to be introduced in 2010 and its usage has increased 325.9% and 28.8% both in public and private sectors respectively (Public 0.0767 DDD/1,000 inhabitants/day to 0.3267 DDD/1,000 inhabitants/day from 2011 to 2014, Private 0.1039 DDD/1,000 inhabitants/day to 0.1338 DDD/1,000 inhabitants/day from 2011 to 2014).

Overall, there is higher usage of α_1-blockers in the public sector compared to the private sector and this reflected the higher number of patients treated for BPH in the public sector.

However, in Australia, tamsulosin was the preferred drug[3] due to better prostate selectivity and its usage is much higher compared to Malaysia. Thus, the usage of alfuzosin and terazosin remains very low in Australia compared to Malaysia. Doxazosin is still not available in Australia[3].

5-alpha reductase inhibitors

The two 5-alpha reductase inhibitors used were finasteride (5α-reductase type 2 inhibitor) and dutasteride (5α-reductase types 1 and 2 inhibitor) (Table 13.2). The usage of both these drugs is higher in public sector compared to private sector and finasteride remained as the more popular choice of the two. However, the overall trend shows increasing usage of 5-alpha reductase inhibitors in the treatment of BPH patients.

The use of finasteride has been steadily increasing in the private sector from 0.0654 DDD/1,000 inhabitants/day in 2011 to 0.0867 DDD/1,000 inhabitants/day in 2014 and in the public sector from 0.2022 DDD/1,000 inhabitants/day in 2011 to 0.3464 DDD/1,000 inhabitants/day in 2014.

Dutasteride usage has also been steadily increasing in the public sector from 0.1320 DDD/1,000 inhabitants/day in 2011 to 0.2624 DDD/1,000 inhabitants/day in 2014 but decreasing in the private sector from 0.0675 DDD/1,000 inhabitants/day in 2011 to 0.0527 DDD/1,000 inhabitants/day in 2014. The decrease in the private sector may reflect the increasing use of the combination drug treatment (tamsulosin and dutasteride).

Finasteride was the more preferred option in the public hospitals in Malaysia due to its lower cost. However, dutasteride was the more prefered option in Australia[3].

Combination Therapy (alpha blockers and 5-alpha reductase inhibitors)

Tamsulosin and dutasteride combination (Duodart) is the only one available in Malaysia. It was available in the private sector in 2011 and public sector in 2012. There is a consistently marked increasing trend in its usage in both public (0.0007 DDD/1,000 inhabitants/day in 2011 to 0.0795 DDD/1,000 inhabitants/day in 2014) and private (0.0027 DDD/1,000 inhabitants/day in 2011 to 0.0710 DDD/1,000 inhabitants/day in 2014). The convenience of having two drugs in one tablet has made this a popular choice of BPH treatment in Malaysia (total usage 0.1506 DDD/1,000 inhabitants/day in 2014).

Gonadotropin releasing hormone analogues

Long-acting luteinising hormone releasing hormone (LHRH) agonists have been used in the treatment of advanced prostate cancer[5] and are currently the main forms of androgen deprivation treatment in the public and private sectors. Leuprorelin and goserelin are the two most commonly used LHRH agonists in the treatment of metastatic prostate cancer in Malaysia (Table 13.3).

The use of buserelin has remained low in the public and private sectors because it is not commonly used in the treatment of metastatic prostate cancer.

In 2014, the most commonly used LHRH analogue in the public and private sectors was leuprorelin (0.0981 DDD/1,000 inhabitants/day), followed by goserelin (0.0289 DDD/1,000 inhabitants/day) and triptorelin (0.0096 DDD/1,000 inhabitants/day).

All these three medications are available as three-monthly injections. Leuprorelin is the first to introduce the three-monthly injection to Malaysia in 2010 and this may explain why it is the most commonly used drug.

Overall, the use of LHRH analogues were higher in the public sector and this may be because more prostate cancer patients are seen in the public sector. Although early detection of prostate cancer has improved in Malaysia, there is still a high number of patients presenting with metastatic disease. The use of LHRH analogues in Australia was very much higher for leuprorelin (0.7658 DDD/1,000 inhabitants/day) and goserelin (0.5930 DDD/1,000 inhabitants/day) because of the higher incidence of prostate cancer there[6] and also because these drugs were reimbursed through the Pharmaceutical Benefit Scheme[3].

Anti-androgens

The anti-androgens are indicated for metastatic prostate cancer. It is used during the initiation of LHRH analogue to prevent the 'flare phenomenon' or added to either surgical or pharmacological castration for complete androgen blockade.

Cyproterone acetate is the oldest drug available[5]. Overall, cyproterone acetate usage has reduced in both public and private sector (0.0067 DDD/1,000 inhabitants/day in 2011 to 0.0054 DDD/1,000 inhabitants/day in 2014) and this could be because it's a steroid based anti-androgen with potentially higher side effects and it's administered as multiple titratable daily dosing (Table 13.1).

The most popular anti-androgen in 2014 in both public and private sectors was bicatulamide (0.0235 DDD/1,000 inhabitants/day) (Table 13.3). Bicatulamide is the preferred anti-androgen because it is non-steroidal, has less side effects and available as single daily dosing[5].

The other non-steroidal anti-androgen, flutamide is available but its usage has remained consistently low in both public and private sector (0.0015 DDD/1,000 inhabitants/day in 2014).

The use of bicatulamide in Australia in 2014 was much higher (0.1391 DDD/1,000 inhabitants/day)[3] than in Malaysia (0.0235 DDD/1,000 inhabitants/day). Bicatulamide was still the most popular anti-androgen in Australia followed by nilutamide and flutamide[3].

Testosterone

Testosterone replacement therapy is recommended in male hypogonadism for patients with a decline in muscle mass and strength, reduced bone mineral density at the lumbar spine, and decreased libido and erection[7]. The use of testosterone supplement is higher in the private sector (0.0648 DDD/1,000 inhabitants/day in 2014) compared to public sector (0.0162 DDD/1,000 inhabitants/day in 2014). This could be due to the increasing number of specialised men's health clinics as well as better awareness among patients who visit the private sectors. The cost of testosterone treatment is high and this may be a limiting factor to the availability of various testosterone replacement preparations in the public sector.

However, there is an increasing trend of usage of testosterone in the public sector from 2012 (0.0095 DDD/1,000 inhabitants/day) to 2014 (0.0162 DDD/1,000 inhabitants/day). This is due to increasing awareness of testosterone replacement therapy in the public sector with the increase use of the available testosterone formulation.

The use of testosterone in Australia in 2014 was much higher (1.0888 DDD/1,000 inhabitants/day) and this drug was reimbursed through the Pharmaceutical Benefit Scheme[3].

BCG Vaccine

Intravesical BCG is given as maintenance therapy for at least two years after giving an induction therapy of six weekly installations. There is a decreasing trend in the usage of intravesical BCG from 0.0022 DDD/1,000 inhabitants/day in 2011 to 0.0001 DDD/1,000 inhabitants/day in 2014 (Table 13.3). This is because of the worldwide shortage of BCG vaccine due to the closure of the main manufacturing plant of the most commonly used BCG strain (Connaught Strain-Immucyst).

Table 13.1: Use of sex hormones and modulators of the genital system from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G03	**Sex hormones and modulators of the genital system**	**Public**	**0.0160**	**0.0116**	**0.0123**	**0.0182**
		Private	**0.0663**	**0.0741**	**0.0738**	**0.0682**
		Total	**0.0823**	**0.0857**	**0.0861**	**0.0864**
G03B	**Androgens**					
G03BA	**3-oxoandrosten (4) derivatives**					
G03BA03	Testosterone	Public	0.0128	0.0095	0.0112	0.0162
		Private	0.0628	0.0708	0.0694	0.0648
		Total	**0.0756**	**0.0804**	**0.0807**	**0.0810**
G03H	**Antiandrogens**					
G03HA	**Antiandrogens, plain**					
G03HA01	Cyproterone	Public	0.0032	0.0021	0.0011	0.0020
		Private	0.0035	0.0033	0.0043	0.0034
		Total	**0.0067**	**0.0054**	**0.0054**	**0.0054**

Table 13.2: Use of agents act on urological system from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G04	**Urologicals**	**Public**	**0.9935**	**1.4470**	**1.6817**	**2.1493**
		Private	**0.6988**	**0.7756**	**0.7637**	**0.8467**
		Total	**1.6922**	**2.2226**	**2.4454**	**2.9960**
G04B	**Urologicals**	**Public**	**0.0553**	**0.0839**	**0.0905**	**0.1079**
		Private	**0.2671**	**0.2839**	**0.2864**	**0.2986**
		Total	**0.3224**	**0.3678**	**0.3769**	**0.4065**
G04BD	**Drugs for urinary frequency and incontinence**	**Public**	**0.0546**	**0.0824**	**0.0884**	**0.1021**
		Private	**0.0418**	**0.0493**	**0.0501**	**0.0524**
		Total	**0.0964**	**0.1317**	**0.1385**	**0.1545**
G04BD02	Flavoxate	Public	0.0004	0.0002	0.0001	0.0003
		Private	0.0097	0.0084	0.0083	0.0095
		Total	**0.0101**	**0.0087**	**0.0085**	**0.0098**
G04BD04	Oxybutynin	Public	0.0020	0.0022	0.0026	0.0026
		Private	0.0001	0.0001	0.0001	0.0001
		Total	**0.0021**	**0.0023**	**0.0026**	**0.0027**
G04BD06	Propiverine	Public	0.0025	0.0047	0.0053	0.0073
		Private	0.0022	0.0036	0.0032	0.0036
		Total	**0.0047**	**0.0083**	**0.0085**	**0.0109**
G04BD07	Tolterodine	Public	0.0494	0.0737	0.0767	0.0836
		Private	0.0142	0.0113	0.0103	0.0109
		Total	**0.0636**	**0.0850**	**0.0870**	**0.0945**
G04BD08	Solifenacin	Public	0.0003	0.0016	0.0037	0.0074
		Private	0.0136	0.0159	0.0156	0.0153
		Total	**0.0139**	**0.0174**	**0.0193**	**0.0227**
G04BD09	Trospium	Public	-	-	-	0.0008
		Private	0.0012	0.0031	0.0054	0.0037
		Total	**0.0012**	**0.0031**	**0.0054**	**0.0045**
G04BD11	Fesoterodine	Public	-	-	-	< 0.0001
		Private	0.0008	0.0070	0.0072	0.0092
		Total	**0.0008**	**0.0070**	**0.0072**	**0.0093**
G04BE	**Drugs used in erectile dysfunction**	**Public**	**0.0007**	**0.0014**	**0.0021**	**0.0058**
		Private	**0.2220**	**0.2327**	**0.2339**	**0.2418**
		Total	**0.2227**	**0.2342**	**0.2361**	**0.2476**
G04BE01	Alprostadil	Public	-	-	-	-
		Private	0.0002	0.0002	0.0002	0.0002
		Total	**0.0002**	**0.0002**	**0.0002**	**0.0002**
G04BE03	Sildenafil	Public	0.0007	0.0014	0.0021	0.0058
		Private	0.1295	0.1346	0.1314	0.1376
		Total	**0.1302**	**0.1361**	**0.1336**	**0.1435**
G04BE08	Tadalafil	Public	-	-	< 0.0001	-
		Private	0.0614	0.0634	0.0692	0.0721
		Total	**0.0614**	**0.0634**	**0.0692**	**0.0721**
G04BE09	Vardenafil	Public	-	-	-	-
		Private	0.0251	0.0277	0.0263	0.0260
		Total	**0.0251**	**0.0277**	**0.0263**	**0.0260**
G04BE11	Udenafil	Public	-	-	-	-
		Private	0.0058	0.0068	0.0068	0.0058
		Total	**0.0058**	**0.0068**	**0.0068**	**0.0058**

Table 13.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
G04BX	**Other urologicals**					
G04BX14	Dapoxetine	Public	-	-	-	-
		Private	0.0032	0.0019	0.0023	0.0044
		Total	**0.0032**	**0.0019**	**0.0023**	**0.0044**
G04C	**Drugs used in benign prostatic hypertrophy**	**Public**	**0.9382**	**1.3631**	**1.5912**	**2.0413**
		Private	**0.4317**	**0.4917**	**0.4773**	**0.5481**
		Total	**1.3699**	**1.8548**	**2.0685**	**2.5895**
G04CA	**Alpha-adrenoreceptor antagonists**	**Public**	**0.6040**	**0.8778**	**1.0463**	**1.4326**
		Private	**0.2988**	**0.3671**	**0.3558**	**0.4088**
		Total	**0.9028**	**1.2449**	**1.4021**	**1.8414**
G04CA01	Alfuzosin	Public	0.1945	0.2972	0.3721	0.3346
		Private	0.1252	0.1266	0.1114	0.1441
		Total	**0.3197**	**0.4239**	**0.4835**	**0.4787**
G04CA02	Tamsulosin	Public	0.0767	0.1771	0.2335	0.3267
		Private	0.1039	0.1257	0.1361	0.1338
		Total	**0.1806**	**0.3028**	**0.3696**	**0.4605**
G04CA03	Terazosin	Public	0.3328	0.4027	0.4049	0.6918
		Private	0.0671	0.0858	0.0553	0.0598
		Total	**0.3998**	**0.4886**	**0.4601**	**0.7515**
G04CA52	Tamsulosin and dutasteride	Public	-	0.0007	0.0358	0.0795
		Private	0.0027	0.0289	0.0530	0.0710
		Total	**0.0027**	**0.0296**	**0.0888**	**0.1506**
G04CB	**Testosterone-5-alpha reductase inhibitors**	**Public**	**0.3342**	**0.4853**	**0.5449**	**0.6087**
		Private	**0.1329**	**0.1246**	**0.1215**	**0.1394**
		Total	**0.4671**	**0.6099**	**0.6664**	**0.7481**
G04CB01	Finasteride	Public	0.2022	0.2569	0.3062	0.3464
		Private	0.0654	0.0602	0.0623	0.0867
		Total	**0.2676**	**0.3171**	**0.3686**	**0.4331**
G04CB02	Dutasteride	Public	0.1320	0.2284	0.2387	0.2624
		Private	0.0675	0.0644	0.0592	0.0527
		Total	**0.1995**	**0.2928**	**0.2978**	**0.3151**

Table 13.3: Use of other agents for treatment of urological disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
L02	**Endocrine therapy**	**Public**	**0.0605**	**0.0671**	**0.0804**	**0.0933**
		Private	**0.0602**	**0.0635**	**0.0717**	**0.0700**
		Total	**0.1207**	**0.1306**	**0.1521**	**0.1633**
L02A	**Hormones and related agents**	**Public**	**0.0470**	**0.0518**	**0.0618**	**0.0774**
		Private	**0.0512**	**0.0533**	**0.0632**	**0.0608**
		Total	**0.0983**	**0.1051**	**0.1250**	**0.1382**
L02AE	**Gonadotropin releasing hormone analogues**	**Public**	**0.0470**	**0.0518**	**0.0618**	**0.0774**
		Private	**0.0512**	**0.0533**	**0.0632**	**0.0608**
		Total	**0.0983**	**0.1051**	**0.1250**	**0.1382**
L02AE01	Buserelin	Public	-	-	-	-
		Private	0.0016	0.0017	0.0016	0.0016
		Total	**0.0016**	**0.0017**	**0.0016**	**0.0016**
L02AE02	Leuprorelin	Public	0.0314	0.0400	0.0464	0.0603
		Private	0.0350	0.0353	0.0429	0.0379
		Total	**0.0664**	**0.0753**	**0.0893**	**0.0981**
L02AE03	Goserelin	Public	0.0149	0.0109	0.0142	0.0150
		Private	0.0132	0.0125	0.0133	0.0140
		Total	**0.0281**	**0.0234**	**0.0275**	**0.0289**
L02AE04	Triptorelin	Public	0.0008	0.0008	0.0012	0.0022
		Private	0.0014	0.0038	0.0055	0.0074
		Total	**0.0022**	**0.0046**	**0.0066**	**0.0096**
L02B	**Hormone antagonists and related agents**					
L02BB	**Anti-androgens**	**Public**	**0.0134**	**0.0153**	**0.0186**	**0.0158**
		Private	**0.0090**	**0.0102**	**0.0085**	**0.0092**
		Total	**0.0224**	**0.0255**	**0.0271**	**0.0251**
L02BB01	Flutamide	Public	0.0005	0.0006	0.0006	0.0007
		Private	0.0007	0.0014	0.0017	0.0008
		Total	**0.0012**	**0.0019**	**0.0022**	**0.0015**
L02BB03	Bicalutamide	Public	0.0129	0.0147	0.0181	0.0151
		Private	0.0082	0.0088	0.0068	0.0084
		Total	**0.0211**	**0.0235**	**0.0249**	**0.0235**
L03	**Immunostimulants**					
L03A	**Immunostimulants**					
L03AX	**Other immunostimulants**					
L03AX03	BCG vaccine	Public	0.0010	0.0002	-	0.0001
		Private	0.0012	0.0005	-	-
		Total	**0.0022**	**0.0007**	**-**	**0.0001**
C02	**Antihypertensives**					
C02C	**Antiadrenergic agents, peripherally acting**					
C02CA	**Alpha-adrenoreceptor antagonists**					
C02CA04	Doxazosin	Public	0.3069	0.3331	0.3112	0.4958
		Private	0.0921	0.1398	0.1362	0.1401
		Total	**0.3990**	**0.4730**	**0.4474**	**0.6359**

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CHAPTER 14: USE OF DRUGS FOR ENDOCRINE DISORDERS

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In Malaysia, the total consumption for endocrine-related drugs showed a steady rise annually from 2011 (2.4311 DDD/1,000 inhabitants/day) to 2014 (3.2107 DDD/1,000 inhabitants/day) representing a cumulative increase of 32.1% (Table 14.1 to 14.3). This consisted of mainly thyroid-related drugs (98%) with very low utilisation of pituitary-hypothalamic hormones and analogues (1.1%), and drugs for calcium homeostasis (0.9%).

Drugs for thyroid disorders comprise of thyroid hormones and anti-thyroid drugs. Levothyroxine (T4) was the mainstay for the treatment of hypothyroidism at 1.1981 DDD/1,000 inhabitants/day in 2011 and increased by 28.5% in 2014 (Table 14.2). Levothyroxine utilisation was 12-fold higher in Australia (19.9413 DDD/1,000 inhabitants/day) in 2014. The large difference is likely due to the different methods of data collection and possibly not due to under diagnosis. In Malaysia, neonatal screening of congenital hypothyroidism is a standard practice since year 2000. Currently, there is no recommendation for active screening of hypothyroidism among adults in Malaysia. Liothyronine (T3) sodium was rarely utilised throughout 2011 to 2014.

In 2014, there was an increase of 35.8% in anti-thyroid drug utilisation (1.6069 DDD/1,000 inhabitants/day) compared to 2011.This was higher than Australia (1.0814 DDD/1,000 inhabitants/day) for the same year. This may be due to better acceptance and accessibility for radio-iodine therapy in Australia. Among the anti-thyroid drugs in Malaysia, carbimazole (53.9%) was the most utilised, followed by thiamazole (38.3%) also known as methimazole, the active metabolite of carbimazole (Table 14.2). Thiamazole is not listed in Ministry of Health drug formulary. Carbimazole is the drug of choice in paediatric and adolescent patients. The use of prophylthiouracil has decreased with a reduction of 15.3% in 2014 compared to year 2011. This is consistent with the prescribing restrictions both in adults and paediatric patients.

Drug utilisation of pituitary-hypothalamic hormones and analogues in Malaysia were generally low with an increment of 34.9% from the year 2011 to 2014 (0.0348 DDD/1,000 inhabitants/day in 2014) (Table 14.1). The difference may be suggested by an increase in awareness and diagnosis of pituitary-hypothalamic endocrine disorders. The utilisation of somatropin and somatropin agonists increased by 15.7% when compared to year 2011 which may likely be contributed by the expansion of endocrine services in Malaysia with better accessibility to these therapies. Utilisation of vasopressin and analogues increased by 36.3% (0.0218 DDD/1,000 inhabitants/day) in 2014 compared to 2011. This was 10-folds lower when compared to Australia data (0.2899 DDD/1,000 inhabitants/day) possibly due to different data collection methods and different therapeutic approach to hypothalamic pituitary diseases.

There was an increment of 21.2% (0.0292 DDD/1,000 inhabitants/day) in the utilisation of drugs for calcium homeostasis in 2014 as compared to year 2011 (Table 14.3). The total utilisation of teriparatide, used for osteoporosis, in 2014 was 0.0153 DDD/1,000 inhabitants/day which increased by 50% compared to year 2011. This rise may possibly be due to the increasing number of geriatric patients with severe osteoporosis. The available anti-parathyroid agents include calcitonin, cinacalcet and paricalcitol. The utilisation of anti-parathyroid agents remained low at 0.0139 DDD/1,000 inhabitants/day in 2014 mainly due to a reduction in usage in public hospitals. The utilisation of calcitonin (salmon synthetic) was 0.0048 DDD/1,000 inhabitants/day which was 34.3% lower than 2011. This reduction was evident in both public and private sector. There was a similar reduction in usage of calcitonin in Australia in 2014. Cinacalcet was recently introduced in 2013 with utilisation of 0.0001 DDD/1,000 inhabitants/day in that year and increased by almost 5-fold in 2014 (0.0007 DDD/1,000 inhabitants/day).

Glucagon utilisation in Malaysia was extremely low (0.0001 DDD/1,000 inhabitants/day) which was 39-fold lower as compared to Australian data (0.0075 DDD/1,000 inhabitants/day) in 2014 (Table 14.3). This was possibly contributed by the difference in type 1 diabetes self-care practice where glucagon injection devices were not given to patients for emergency treatment of hypoglycaemia at home in Malaysia.

In conclusion, the overall consumption of endocrine related drugs has increased as expected with the expansion of both paediatric and adult endocrine services in Malaysia. However, these figures may still not accurately reflect the actual usage of drugs as these data rely heavily on public and private sectors purchasing reports.

Table 14.1: Use of drugs for endocrine disorders, by therapeutic group from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
H01	**Pituitary and hypothalamic hormones and analogues**	**Public**	**0.0208**	**0.0239**	**0.0245**	**0.0277**
		Private	**0.0051**	**0.0060**	**0.0068**	**0.0071**
		Total	**0.0258**	**0.0300**	**0.0313**	**0.0348**
H01A	**Anterior pituitary lobe hormones and analogues**	**Public**	**0.0048**	**0.0048**	**0.0050**	**0.0049**
		Private	**0.0025**	**0.0029**	**0.0035**	**0.0035**
		Total	**0.0072**	**0.0078**	**0.0086**	**0.0084**
H01AA	ACTH	Public	0.0002	0.0002	0.0001	0.0002
		Private	-	-	-	-
		Total	**0.0002**	**0.0002**	**0.0001**	**0.0002**
H01AB	Thyrotropin	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
H01AC	Somatropin and somatropin agonists	Public	0.0046	0.0046	0.0049	0.0047
		Private	0.0025	0.0029	0.0035	0.0035
		Total	**0.0070**	**0.0075**	**0.0084**	**0.0081**
H01B	**Posterior pituitary lobe hormones**					
H01BA	Vasopressin and analogues	Public	0.0146	0.0172	0.0177	0.0203
		Private	0.0014	0.0018	0.0015	0.0015
		Total	**0.0160**	**0.0190**	**0.0192**	**0.0218**
H01C	**Hypothalamic hormones**	**Public**	**0.0014**	**0.0019**	**0.0017**	**0.0025**
		Private	**0.0011**	**0.0013**	**0.0018**	**0.0021**
		Total	**0.0025**	**0.0032**	**0.0035**	**0.0046**
H01CB	Somatostatin and analogues	Public	0.0013	0.0017	0.0016	0.0024
		Private	0.0004	0.0004	0.0006	0.0006
		Total	**0.0017**	**0.0022**	**0.0022**	**0.0029**
H01CC	Anti-gonadotropin-releasing hormones	Public	0.0001	0.0002	0.0001	0.0002
		Private	0.0007	0.0009	0.0012	0.0015
		Total	**0.0009**	**0.0011**	**0.0013**	**0.0017**

Table 14.2: Use of agents for thyroid disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
H03	**Thyroid therapy**	**Public**	**1.4230**	**1.6192**	**1.7004**	**2.0645**
		Private	**0.9581**	**1.0017**	**0.9859**	**1.0820**
		Total	**2.3811**	**2.6209**	**2.6863**	**3.1465**
H03A	**Thyroid preparations**					
H03AA	**Thyroid hormones**	**Public**	**0.7502**	**0.8702**	**0.8982**	**1.0169**
		Private	**0.4479**	**0.4833**	**0.5099**	**0.5227**
		Total	**1.1981**	**1.3535**	**1.4082**	**1.5396**
H03AA01	Levothyroxine sodium	Public	0.7502	0.8702	0.8982	1.0169
		Private	0.4479	0.4833	0.5099	0.5227
		Total	**1.1981**	**1.3535**	**1.4082**	**1.5396**
H03AA02	Liothyronine sodium	Public	< 0.0001	< 0.0001	-	< 0.0001
		Private	-	-	-	-
		Total	**< 0.0001**	**< 0.0001**	**-**	**< 0.0001**
H03B	**Antithyroid preparations**	**Public**	**0.6729**	**0.7490**	**0.8022**	**1.0476**
		Private	**0.5101**	**0.5184**	**0.4759**	**0.5593**
		Total	**1.1830**	**1.2673**	**1.2781**	**1.6069**
H03BA	**Thiouracils**					
H03BA02	Propylthiouracil	Public	0.0885	0.0791	0.0598	0.0742
		Private	0.0588	0.0454	0.0377	0.0506
		Total	**0.1474**	**0.1245**	**0.0974**	**0.1249**
H03BB	**Sulfur-containing imidazole derivatives**	**Public**	**0.5843**	**0.6699**	**0.7424**	**0.9734**
		Private	**0.4513**	**0.4730**	**0.4383**	**0.5087**
		Total	**1.0356**	**1.1429**	**1.1807**	**1.4820**
H03BB01	Carbimazole	Public	0.5843	0.6699	0.7422	0.3654
		Private	0.4188	0.4178	0.4301	0.5008
		Total	**1.0031**	**1.0877**	**1.1724**	**0.8661**
H03BB02	Thiamazole	Public	-	-	0.0002	0.6080
		Private	0.0325	0.0552	0.0082	0.0079
		Total	**0.0325**	**0.0552**	**0.0083**	**0.6159**

Table 14.3: Use of otheragents for endocrine disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
H04	**Pancreatic hormones**					
H04A	**Glycogenolytic hormones**					
H04AA	**Glycogenolytic hormones**					
H04AA01	Glucagon	Public	0.0001	0.0001	0.0003	0.0002
		Private	0.0001	0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0002**	**0.0004**	**0.0002**
H05	**Calcium homeostasis**	**Public**	**0.0053**	**0.0074**	**0.0030**	**0.0034**
		Private	**0.0188**	**0.0195**	**0.0238**	**0.0258**
		Total	**0.0241**	**0.0269**	**0.0268**	**0.0292**
H05A	**Parathyroid hormones and analogues**					
H05AA	**Parathyroid hormones and analogues**					
H05AA02	Teriparatide	Public	-	0.0001	0.0001	0.0001
		Private	0.0102	0.0113	0.0139	0.0152
		Total	**0.0102**	**0.0114**	**0.0140**	**0.0153**
H05B	**Anti-parathyroid agents**	**Public**	**0.0053**	**0.0073**	**0.0030**	**0.0033**
		Private	**0.0086**	**0.0082**	**0.0099**	**0.0106**
		Total	**0.0139**	**0.0155**	**0.0128**	**0.0139**
H05BA	**Calcitonin preparations**					
H05BA01	Calcitonin (salmon synthetic)	Public	0.0041	0.0060	0.0026	0.0027
		Private	0.0031	0.0031	0.0030	0.0020
		Total	**0.0073**	**0.0091**	**0.0056**	**0.0048**
H05BX	**Other anti-parathyroid agents**	**Public**	**0.0011**	**0.0013**	**0.0003**	**0.0006**
		Private	**0.0055**	**0.0051**	**0.0069**	**0.0086**
		Total	**0.0066**	**0.0064**	**0.0072**	**0.0092**
H05BX01	Cinacalcet	Public	-	-	< 0.0001	0.0001
		Private	-	-	0.0001	0.0006
		Total	**-**	**-**	**0.0001**	**0.0007**
H05BX02	Paricalcitol	Public	0.0011	0.0013	0.0003	0.0005
		Private	0.0055	0.0051	0.0068	0.0080
		Total	**0.0066**	**0.0064**	**0.0071**	**0.0085**

CHAPTER 15 : USE OF ANTI-INFECTIVES

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Antibiotics are an essential part of modern medicine. With the advent of more invasive procedures and immune-modulatory therapy, infections have become a major cause of morbidity and mortality. To compound the problem, antibiotic resistance is increasing, limiting the options available to doctors to treat their patients. In recent times antibiotic research and development has also seen a decline with very few new agents in the pipelines. In this setting, it is imperative for doctors and pharmacists to preserve the current agents that we have and to use them appropriately.

Antibacterials

Cephalosporins is a big group of antibiotics commonly used in health care facilities throughout Malaysia. For these anti-infectives, the largest increase in prescription in both public and private sectors was for cefepime. This agent saw a 164.6% increase (Table 15.2). Piperacillin/tazobactam usage also increased by 66.6%. These two agents are potent anti-pseudomonal agents. Based on national surveillance data, pseudomonas is not as commonly isolated as other gram negative organisms[1]. Health care practitioners should be made aware and re-assess their choice of empirical antibiotics.

The carbapenem group saw a 29.5% increase in usage between 2011 and 2014 (Table 15.2). Ertapenem showed a significant increase of 165.5% in the public sector. This may be due to empirical usage while awaiting culture results and the lack of de-escalation to more targeted or narrow spectrum antibiotics. Meropenem also increased by 40.1% due to the introduction of the generic formulation and rising incidence of ESBL-producing organisms. Imipenem and doripenem usage are not common compared to other carbapenems (Figure 15.1).

Levofloxacin saw a five-fold increase in the public hospitals (Table 15.2). This may be due to increasing usage as a second line agent against TB infections either due to intolerance to first line agents or resistance to the latter.

Usage of colistin increased by 228.5% (Table 15.2). This is consistent with the increase in numbers of multi-drug resistant acinetobacter infections. With the advent of carbapenem-resistant enterobacteriaceae (CRE) we would expect an even more obvious increment in the prescription of this agent in the coming years (Figure 15.2).

Anti-Methicillin resistant *Staphylococcus aureus* (MRSA)

Methicillin resistant *Staphylococcus aureus* remains a problem pathogen in the public and private hospitals. Vancomycin has been the mainstay of treatment and saw an increase of 30.7% in the public sector. Over the years, there has been alternative agents to treat this infection i.e. teicoplanin, linezolid and daptomycin. Linezolid increased by 27.7% overall but this was seen mainly in the private sector (81.2%).

Antifungals

Amphotericin B has seen an increase in usage of 74.0% in both in public and private sectors. This may reflect an increase in the number of immunocompromised patients either due to underlying disease, invasive procedures, immune-modulatory therapy or inappropriate usage of anti-bacterials.

Unlike amphotericin B, the azole group of anti-fungals did not show any significant increase. Amphotericin B is a broad spectrum antifungal and is effective against azole-resistant species. Speciation and sensitivity is not available in all facilities hence the attending physician will have to administer amphotericin B to cover for the possibility of azole resistant species.

There is an increase in the usage of the echinocandins although it remains low probably due to cost issues.

Anti-Tuberculosis

Usage of individual drugs i.e. ethambutol and pyrazinamide have seen a decline in favor of fixed dose combinations (FDCs). Isoniazid and rifampicin usage remains static. There is an increase in the usage of ethambutol/isoniazid/rifampicin/pyrazinamide (EHRZ) FDC by 223.0% and isoniazid/rifampicin (HR) FDC by 156.5% in line with WHO recommendation[2] (Table 15.4). The overall usage of these anti-tuberculosis drugs also reflects a worrying trend in the increase of number of tuberculosis infection in our population. Ethionamide which is a second line agent has seen a four-fold rise from 2011 to 2014. This is a concern as it may reflect rising resistance to the first line agents.

Antivirals

Both zanamivir and oseltamivir saw an increase in usage. Zanamivir was only used in the private sector as it is not in the Drug formulary of Ministry of Health Malaysia (Table 15.5). In tandem with the increasing availability of diagnostic kits for influenza, it is not surprising that neuraminidase inhibitors are being prescribed more.

Tenofovir/emtricitabine FDC increased by nearly 800% as part of combination anti-retroviral therapy. This follows the WHO guidelines where this FDC is the preferred choice for treating naïve patients[3]. Lopinavir/ritonavir which is mainly used as a second line agent increased by 144.2%. HIV infection is now a chronic manageable disease and patients have an almost normal life expectancy. Not surprisingly the number of patients who fail their first line regime will also increase. Lopinavir/ritonavir is a common agent used as part of the second line regime for those who experience first line failure.

Anti-Malarials

Amongst all the drugs used to treat malaria, artemether/lumefantrine FDC saw the highest increment (Table 15.6). Vivax malaria is the most common plasmodium causing disease followed by falciparum malaria. Knowlesi malaria is now increasingly being diagnosed especially in Sabah and Sarawak. The advantage of artemisinin-based combination therapy is that it is efficacious against all types of plasmodium.

Quinine usage increased whereas chloroquine declined. This is consistent with the trend towards chloroquine-resistant amongst vivax malaria[4].

Table 15.1: Use of antimicrobial agents, by therapeutic group from 2011 to 2014.

ATC	Therapeutic Group	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01	Antibacterials for systemic use	Public	3.4935	3.6324	3.7084	3.8052	1.2751	1.3258	1.3536	1.3889
		Private	6.0941	7.1103	7.1820	7.0650	2.2243	2.5953	2.6214	2.5787
		Total	**9.5876**	**10.7427**	**10.8904**	**10.8702**	**3.4995**	**3.9211**	**3.9750**	**3.9676**
J02	Antimycotics for systemic use	Public	0.0501	0.0583	0.0564	0.0631	0.0183	0.0213	0.0206	0.0230
		Private	0.4280	0.4277	0.5082	0.2208	0.1562	0.1561	0.1855	0.0806
		Total	**0.4781**	**0.4860**	**0.5645**	**0.2839**	**0.1745**	**0.1774**	**0.2061**	**0.1036**
J04	Antimycobacterials	Public	0.8146	0.8127	0.7890	0.8375	0.2973	0.2966	0.2880	0.3057
		Private	0.0801	0.0734	0.1174	0.0930	0.0292	0.0268	0.0428	0.0339
		Total	**0.8947**	**0.8861**	**0.9064**	**0.9305**	**0.3266**	**0.3234**	**0.3308**	**0.3396**
J05	Antivirals for systemic use	Public	0.7009	0.9237	0.8101	1.1961	0.2558	0.3371	0.2957	0.4366
		Private	0.1902	0.1676	0.1815	0.1966	0.0694	0.0612	0.0663	0.0717
		Total	**0.8911**	**1.0913**	**0.9917**	**1.3927**	**0.3253**	**0.3983**	**0.3620**	**0.5083**
J06	Immune sera and immunoglobulins	Public	0.0023	0.0038	0.0019	0.0029	0.0009	0.0014	0.0007	0.0011
		Private	0.0001	0.0001	0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0001
		Total	**0.0024**	**0.0039**	**0.0020**	**0.0031**	**0.0009**	**0.0014**	**0.0007**	**0.0011**
P01	Antiprotozoals	Public	0.0645	0.1375	0.1071	0.1192	0.0235	0.0502	0.0391	0.0435
		Private	0.0961	0.1008	0.0959	0.0693	0.0351	0.0368	0.0350	0.0253
		Total	**0.1606**	**0.2383**	**0.2030**	**0.1885**	**0.0586**	**0.0870**	**0.0741**	**0.0688**

Table 15.2: Use of antibacterials for systemic use from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01A	**Tetracyclines**									
J01AA	**Tetracyclines**	**Public**	**0.2408**	**0.2188**	**0.2186**	**0.2231**	**0.0879**	**0.0799**	**0.0798**	**0.0814**
		Private	**0.5071**	**0.5307**	**0.6651**	**0.7420**	**0.1851**	**0.1937**	**0.2428**	**0.2708**
		Total	**0.7479**	**0.7495**	**0.8837**	**0.9651**	**0.2730**	**0.2736**	**0.3226**	**0.3523**
J01AA02	Doxycycline	Public	0.2223	0.2088	0.2104	0.2153	0.0812	0.0762	0.0768	0.0786
		Private	0.4442	0.4593	0.5918	0.6315	0.1621	0.1676	0.2160	0.2305
		Total	**0.6665**	**0.6681**	**0.8022**	**0.8469**	**0.2433**	**0.2439**	**0.2928**	**0.3091**
J01AA06	Oxytetracycline	Public	-	-	-	-	-	-	-	-
		Private	0.0001	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-
		Total	**0.0001**	**< 0.0001**	**< 0.0001**	**-**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**-**
J01AA07	Tetracycline	Public	0.0179	0.0097	0.0079	0.0074	0.0066	0.0035	0.0029	0.0027
		Private	0.0595	0.0681	0.0700	0.1084	0.0217	0.0249	0.0256	0.0396
		Total	**0.0775**	**0.0778**	**0.0779**	**0.1157**	**0.0283**	**0.0284**	**0.0284**	**0.0422**
J01AA08	Minocycline	Public	0.0004	0.0002	0.0003	0.0003	0.0001	0.0001	0.0001	0.0001
		Private	0.0031	0.0031	0.0030	0.0019	0.0011	0.0011	0.0011	0.0007
		Total	**0.0035**	**0.0033**	**0.0032**	**0.0022**	**0.0013**	**0.0012**	**0.0012**	**0.0008**
J01AA12	Tigecycline	Public	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
		Total	**0.0003**	**0.0003**	**0.0003**	**0.0004**	**0.0001**	**0.0001**	**0.0001**	**0.0001**
J01B	**Amphenicols**									
J01BA	**Amphenicols**									
J01BA01	Chloramphenicol	Public	0.0004	0.0004	0.0001	< 0.0001	0.0002	0.0001	< 0.0001	< 0.0001
		Private	0.0011	-	-	-	0.0004	-	-	-
		Total	**0.0015**	**0.0004**	**0.0001**	**< 0.0001**	**0.0006**	**0.0001**	**< 0.0001**	**< 0.0001**
J01C	**Beta-lactam antibacterials, penicillins**	**Public**	**2.0845**	**2.2566**	**2.3467**	**2.4591**	**0.7609**	**0.8236**	**0.8566**	**0.8976**
		Private	**2.6902**	**3.3833**	**3.2234**	**3.3911**	**0.9819**	**1.2349**	**1.1766**	**1.2377**
		Total	**4.7747**	**5.6398**	**5.5702**	**5.8502**	**1.7428**	**2.0585**	**2.0331**	**2.1353**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01CA	**Penicillins with extended spectrum**	**Public**	**1.0691**	**1.1404**	**1.2403**	**1.3129**	**0.3902**	**0.4162**	**0.4527**	**0.4792**
		Private	**1.6651**	**2.1981**	**1.9370**	**1.9847**	**0.6077**	**0.8023**	**0.7070**	**0.7244**
		Total	**2.7341**	**3.3385**	**3.1774**	**3.2975**	**0.9980**	**1.2185**	**1.1597**	**1.2036**
J01CA01	Ampicillin	Public	0.0655	0.0530	0.0475	0.0426	0.0239	0.0193	0.0173	0.0156
		Private	0.0284	0.0415	0.0396	0.0325	0.0104	0.0151	0.0145	0.0119
		Total	**0.0939**	**0.0944**	**0.0871**	**0.0751**	**0.0343**	**0.0345**	**0.0318**	**0.0274**
J01CA04	Amoxicillin	Public	0.8925	1.0149	1.1424	1.2215	0.3258	0.3704	0.4170	0.4459
		Private	1.6031	1.9800	1.7263	1.8316	0.5851	0.7227	0.6301	0.6685
		Total	**2.4956**	**2.9949**	**2.8687**	**3.0531**	**0.9109**	**1.0931**	**1.0471**	**1.1144**
J01CA06	Bacampicillin	Public	0.1110	0.0725	0.0504	0.0487	0.0405	0.0265	0.0184	0.0178
		Private	0.0336	0.1766	0.1711	0.1206	0.0123	0.0645	0.0624	0.0440
		Total	**0.1446**	**0.2492**	**0.2215**	**0.1693**	**0.0528**	**0.0909**	**0.0808**	**0.0618**
J01CA12	Piperacillin	Public	-	-	-	-	-	-	-	-
		Private	-	-	< 0.0001	-	-	-	< 0.0001	-
		Total	**-**	**-**	**< 0.0001**	**-**	**-**	**-**	**< 0.0001**	**-**
J01CE	**Beta-lactamase sensitive penicillins**	**Public**	**0.1424**	**0.1533**	**0.1189**	**0.1172**	**0.0520**	**0.0560**	**0.0434**	**0.0428**
		Private	**0.0431**	**0.0298**	**0.0354**	**0.0260**	**0.0157**	**0.0109**	**0.0129**	**0.0095**
		Total	**0.1855**	**0.1832**	**0.1543**	**0.1432**	**0.0677**	**0.0669**	**0.0563**	**0.0523**
J01CE01	Benzylpenicillin	Public	0.0166	0.0191	0.0195	0.0229	0.0060	0.0070	0.0071	0.0084
		Private	0.0015	0.0011	0.0015	0.0018	0.0005	0.0004	0.0005	0.0007
		Total	**0.0180**	**0.0202**	**0.0210**	**0.0247**	**0.0066**	**0.0074**	**0.0077**	**0.0090**
J01CE02	Phenoxymethylpenicillin	Public	0.1119	0.1075	0.0857	0.0929	0.0408	0.0393	0.0313	0.0339
		Private	0.0416	0.0287	0.0340	0.0242	0.0152	0.0105	0.0124	0.0088
		Total	**0.1535**	**0.1362**	**0.1197**	**0.1171**	**0.0560**	**0.0497**	**0.0437**	**0.0427**
J01CE09	Procaine benzylpenicillin	Public	0.0139	0.0267	0.0137	0.0014	0.0051	0.0098	0.0050	0.0005
		Private	-	-	-	-	-	-	-	-
		Total	**0.0139**	**0.0267**	**0.0137**	**0.0014**	**0.0051**	**0.0098**	**0.0050**	**0.0005**
J01CF	**Beta-lactamase resistant penicillins**									
J01CF02	Cloxacillin	Public	0.6263	0.6748	0.6748	0.6671	0.2286	0.2463	0.2463	0.2435
		Private	0.1256	0.1353	0.1460	0.1968	0.0459	0.0494	0.0533	0.0718
		Total	**0.7520**	**0.8102**	**0.8208**	**0.8639**	**0.2745**	**0.2957**	**0.2996**	**0.3153**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01CR	**Combinations of penicillins, including beta-lactamase inhibitors**	**Public**	**0.2468**	**0.2880**	**0.3127**	**0.3620**	**0.0901**	**0.1051**	**0.1141**	**0.1321**
		Private	**0.8564**	**1.0201**	**1.1050**	**1.1836**	**0.3126**	**0.3723**	**0.4033**	**0.4320**
		Total	**1.1032**	**1.3081**	**1.4176**	**1.5456**	**0.4027**	**0.4774**	**0.5174**	**0.5641**
J01CR01	Ampicillin and enzyme inhibitor	Public	0.0273	0.0406	0.0336	0.0474	0.0100	0.0148	0.0123	0.0173
		Private	0.0092	0.0109	0.0120	0.0113	0.0034	0.0040	0.0044	0.0041
		Total	**0.0365**	**0.0515**	**0.0456**	**0.0587**	**0.0133**	**0.0188**	**0.0166**	**0.0214**
J01CR02	Amoxicillin and enzyme inhibitor	Public	0.1865	0.1978	0.2333	0.2544	0.0681	0.0722	0.0852	0.0928
		Private	0.7983	0.9563	1.0404	1.1208	0.2914	0.3490	0.3798	0.4091
		Total	**0.9849**	**1.1541**	**1.2738**	**1.3751**	**0.3595**	**0.4212**	**0.4649**	**0.5019**
J01CR04	Sultamicillin	Public	0.0257	0.0383	0.0350	0.0478	0.0094	0.0140	0.0128	0.0174
		Private	0.0473	0.0509	0.0506	0.0493	0.0173	0.0186	0.0185	0.0180
		Total	**0.0730**	**0.0892**	**0.0856**	**0.0971**	**0.0266**	**0.0326**	**0.0312**	**0.0354**
J01CR05	Piperacillin and enzyme inhibitor	Public	0.0073	0.0113	0.0107	0.0125	0.0027	0.0041	0.0039	0.0046
		Private	0.0015	0.0020	0.0020	0.0022	0.0006	0.0007	0.0007	0.0008
		Total	**0.0088**	**0.0133**	**0.0127**	**0.0147**	**0.0032**	**0.0048**	**0.0046**	**0.0054**
J01D	**Other beta-lactam antibacterials**	**Public**	**0.3734**	**0.4453**	**0.4670**	**0.5154**	**0.1363**	**0.1625**	**0.1705**	**0.1881**
		Private	**0.9512**	**1.1700**	**1.2538**	**1.1421**	**0.3472**	**0.4270**	**0.4576**	**0.4169**
		Total	**1.3246**	**1.6153**	**1.7208**	**1.6575**	**0.4835**	**0.5896**	**0.6281**	**0.6050**
J01DB	**First-generation cephalosporins**	**Public**	**0.0765**	**0.0817**	**0.0864**	**0.0996**	**0.0279**	**0.0298**	**0.0315**	**0.0363**
		Private	**0.4342**	**0.5701**	**0.5809**	**0.4635**	**0.1585**	**0.2081**	**0.2120**	**0.1692**
		Total	**0.5108**	**0.6519**	**0.6673**	**0.5631**	**0.1864**	**0.2379**	**0.2436**	**0.2055**
J01DB01	Cefalexin	Public	0.0759	0.0807	0.0846	0.0976	0.0277	0.0295	0.0309	0.0356
		Private	0.3643	0.4671	0.5339	0.3965	0.1330	0.1705	0.1949	0.1447
		Total	**0.4402**	**0.5478**	**0.6185**	**0.4941**	**0.1607**	**0.2000**	**0.2257**	**0.1803**
J01DB04	Cefazolin	Public	0.0007	0.0010	0.0018	0.0020	0.0002	0.0004	0.0007	0.0007
		Private	0.0007	0.0008	0.0009	0.0009	0.0003	0.0003	0.0003	0.0003
		Total	**0.0014**	**0.0018**	**0.0027**	**0.0028**	**0.0005**	**0.0007**	**0.0010**	**0.0010**
J01DB05	Cefadroxil	Public	-	-	-	-	-	-	-	-
		Private	0.0692	0.1022	0.0461	0.0662	0.0253	0.0373	0.0168	0.0242
		Total	**0.0692**	**0.1022**	**0.0461**	**0.0662**	**0.0253**	**0.0373**	**0.0168**	**0.0242**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01DC	**Second-generation cephalosporins**	**Public**	**0.2183**	**0.2775**	**0.2874**	**0.3021**	**0.0797**	**0.1013**	**0.1049**	**0.1103**
		Private	**0.4563**	**0.5235**	**0.5889**	**0.5932**	**0.1665**	**0.1911**	**0.2149**	**0.2165**
		Total	**0.6745**	**0.8010**	**0.8763**	**0.8953**	**0.2462**	**0.2924**	**0.3198**	**0.3268**
J01DC02	Cefuroxime	Public	0.2182	0.2775	0.2874	0.3021	0.0797	0.1013	0.1049	0.1103
		Private	0.4137	0.4810	0.5545	0.5571	0.1510	0.1755	0.2024	0.2033
		Total	**0.6320**	**0.7585**	**0.8419**	**0.8591**	**0.2307**	**0.2768**	**0.3073**	**0.3136**
J01DC04	Cefaclor	Public	< 0.0001	-	-	-	< 0.0001	-	-	-
		Private	0.0425	0.0426	0.0344	0.0362	0.0155	0.0155	0.0126	0.0132
		Total	**0.0426**	**0.0426**	**0.0344**	**0.0362**	**0.0155**	**0.0155**	**0.0126**	**0.0132**
J01DD	**Third-generation cephalosporins**	**Public**	**0.0557**	**0.0585**	**0.0639**	**0.0718**	**0.0203**	**0.0214**	**0.0233**	**0.0262**
		Private	**0.0517**	**0.0672**	**0.0742**	**0.0751**	**0.0189**	**0.0245**	**0.0271**	**0.0274**
		Total	**0.1075**	**0.1257**	**0.1381**	**0.1469**	**0.0392**	**0.0459**	**0.0504**	**0.0536**
J01DD01	Cefotaxime	Public	0.0029	0.0028	0.0031	0.0030	0.0011	0.0010	0.0011	0.0011
		Private	0.0005	0.0005	0.0004	0.0003	0.0002	0.0002	0.0001	0.0001
		Total	**0.0034**	**0.0033**	**0.0035**	**0.0033**	**0.0013**	**0.0012**	**0.0013**	**0.0012**
J01DD02	Ceftazidime	Public	0.0088	0.0093	0.0101	0.0121	0.0032	0.0034	0.0037	0.0044
		Private	0.0016	0.0017	0.0016	0.0013	0.0006	0.0006	0.0006	0.0005
		Total	**0.0104**	**0.0110**	**0.0118**	**0.0133**	**0.0038**	**0.0040**	**0.0043**	**0.0049**
J01DD04	Ceftriaxone	Public	0.0353	0.0374	0.0418	0.0478	0.0129	0.0137	0.0153	0.0175
		Private	0.0231	0.0253	0.0290	0.0302	0.0084	0.0092	0.0106	0.0110
		Total	**0.0584**	**0.0627**	**0.0708**	**0.0780**	**0.0213**	**0.0229**	**0.0258**	**0.0285**
J01DD08	Cefixime	Public	-	-	-	< 0.0001	-	-	-	< 0.0001
		Private	0.0064	0.0127	0.0133	0.0122	0.0023	0.0046	0.0049	0.0045
		Total	**0.0064**	**0.0127**	**0.0133**	**0.0122**	**0.0023**	**0.0046**	**0.0049**	**0.0045**
J01DD12	Cefoperazone	Public	0.0069	0.0073	0.0071	0.0074	0.0025	0.0027	0.0026	0.0027
		Private	0.0002	0.0003	0.0003	0.0003	0.0001	0.0001	0.0001	0.0001
		Total	**0.0071**	**0.0075**	**0.0074**	**0.0077**	**0.0026**	**0.0028**	**0.0027**	**0.0028**
J01DD14	Ceftibuten	Public	-	-	-	-	-	-	-	-
		Private	0.0117	0.0149	0.0165	0.0158	0.0043	0.0054	0.0060	0.0058
		Total	**0.0117**	**0.0149**	**0.0165**	**0.0158**	**0.0043**	**0.0054**	**0.0060**	**0.0058**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01DD15	Cefdinir	Public	-	-	-	-	-	-	-	-
		Private	0.0040	0.0073	0.0081	0.0103	0.0015	0.0027	0.0029	0.0038
		Total	**0.0040**	**0.0073**	**0.0081**	**0.0103**	**0.0015**	**0.0027**	**0.0029**	**0.0038**
J01DD62	Cefoperazone, combinations	Public	0.0018	0.0017	0.0018	0.0015	0.0007	0.0006	0.0006	0.0006
		Private	0.0041	0.0045	0.0049	0.0047	0.0015	0.0017	0.0018	0.0017
		Total	**0.0059**	**0.0062**	**0.0067**	**0.0063**	**0.0022**	**0.0023**	**0.0024**	**0.0023**
J01DE	**Fourth-generation cephalosporins**									
J01DE01	Cefepime	Public	0.0083	0.0113	0.0096	0.0219	0.0030	0.0041	0.0035	0.0080
		Private	0.0008	0.0007	0.0005	0.0006	0.0003	0.0002	0.0002	0.0002
		Total	**0.0091**	**0.0120**	**0.0100**	**0.0225**	**0.0033**	**0.0044**	**0.0037**	**0.0082**
J01DH	**Carbapenems**	**Public**	**0.0145**	**0.0162**	**0.0197**	**0.0200**	**0.0053**	**0.0059**	**0.0072**	**0.0073**
		Private	**0.0082**	**0.0085**	**0.0093**	**0.0094**	**0.0030**	**0.0031**	**0.0034**	**0.0034**
		Total	**0.0227**	**0.0248**	**0.0291**	**0.0294**	**0.0083**	**0.0090**	**0.0106**	**0.0107**
J01DH02	Meropenem	Public	0.0094	0.0107	0.0139	0.0135	0.0034	0.0039	0.0051	0.0049
		Private	0.0048	0.0053	0.0060	0.0064	0.0018	0.0019	0.0022	0.0023
		Total	**0.0142**	**0.0160**	**0.0199**	**0.0199**	**0.0052**	**0.0059**	**0.0073**	**0.0073**
J01DH03	Ertapenem	Public	0.0007	0.0009	0.0014	0.0019	0.0003	0.0003	0.0005	0.0007
		Private	0.0019	0.0017	0.0019	0.0019	0.0007	0.0006	0.0007	0.0007
		Total	**0.0026**	**0.0026**	**0.0033**	**0.0038**	**0.0009**	**0.0009**	**0.0012**	**0.0014**
J01DH04	Doripenem	Public	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	0.0002	0.0003	0.0003	0.0001	0.0001	0.0001	0.0001	< 0.0001
		Total	**0.0003**	**0.0004**	**0.0003**	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**0.0001**
J01DH51	Imipenem and enzyme inhibitor	Public	0.0044	0.0046	0.0044	0.0045	0.0016	0.0017	0.0016	0.0017
		Private	0.0012	0.0012	0.0012	0.0011	0.0004	0.0004	0.0004	0.0004
		Total	**0.0056**	**0.0057**	**0.0055**	**0.0056**	**0.0020**	**0.0021**	**0.0020**	**0.0020**
J01DI	**Other cephalosporins and penems**									
J01DI02	Ceftaroline fosamil	Public	-	-	-	< 0.0001	-	-	-	< 0.0001
		Private	-	-	0.0001	0.0002	-	-	< 0.0001	0.0001
		Total	**-**	**-**	**0.0001**	**0.0002**	**-**	**-**	**< 0.0001**	**0.0001**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01E	**Sulfonamides and trimethoprim**	**Public**	**0.1479**	**0.1137**	**0.1608**	**0.1181**	**0.0540**	**0.0415**	**0.0587**	**0.0431**
		Private	**0.1922**	**0.1436**	**0.1503**	**0.1511**	**0.0701**	**0.0524**	**0.0549**	**0.0551**
		Total	**0.3400**	**0.2573**	**0.3112**	**0.2692**	**0.1241**	**0.0939**	**0.1136**	**0.0982**
J01EA	**Trimethoprim and derivatives**									
J01EA01	Trimethoprim	Public	0.0009	0.0011	0.0010	0.0012	0.0003	0.0004	0.0004	0.0004
		Private	-	-	-	-	-	-	-	-
		Total	**0.0009**	**0.0011**	**0.0010**	**0.0012**	**0.0003**	**0.0004**	**0.0004**	**0.0004**
J01EE	**Combinations of sulfonamides and trimethoprim, including derivatives**	**Public**	**0.1469**	**0.1126**	**0.1598**	**0.1169**	**0.0536**	**0.0411**	**0.0583**	**0.0427**
		Private	**0.1922**	**0.1436**	**0.1503**	**0.1511**	**0.0701**	**0.0524**	**0.0549**	**0.0551**
		Total	**0.3391**	**0.2562**	**0.3102**	**0.2680**	**0.1238**	**0.0935**	**0.1132**	**0.0978**
J01EE01	Sulfamethoxazole and trimethoprim	Public	0.1469	0.1126	0.1598	0.1169	0.0536	0.0411	0.0583	0.0427
		Private	0.1921	0.1434	0.1494	0.1511	0.0701	0.0523	0.0545	0.0551
		Total	**0.3390**	**0.2559**	**0.3093**	**0.2680**	**0.1237**	**0.0934**	**0.1129**	**0.0978**
J01EE02	Sulfadiazine and trimethoprim	Public	-	-	-	-	-	-	-	-
		Private	0.0001	0.0003	0.0009	-	< 0.0001	0.0001	0.0003	-
		Total	**0.0001**	**0.0003**	**0.0009**	**-**	**< 0.0001**	**0.0001**	**0.0003**	**-**
J01F	**Macrolides, lincosamides and streptogramins**	**Public**	**0.4608**	**0.4758**	**0.3900**	**0.3818**	**0.1682**	**0.1737**	**0.1424**	**0.1394**
		Private	**1.1418**	**1.2056**	**1.2005**	**1.0644**	**0.4167**	**0.4400**	**0.4382**	**0.3885**
		Total	**1.6026**	**1.6814**	**1.5905**	**1.4462**	**0.5850**	**0.6137**	**0.5805**	**0.5279**
J01FA	**Macrolides**	**Public**	**0.4554**	**0.4682**	**0.3802**	**0.3715**	**0.1662**	**0.1709**	**0.1388**	**0.1356**
		Private	**1.1236**	**1.1894**	**1.1874**	**1.0525**	**0.4101**	**0.4341**	**0.4334**	**0.3842**
		Total	**1.5791**	**1.6576**	**1.5676**	**1.4241**	**0.5764**	**0.6050**	**0.5722**	**0.5198**
J01FA01	Erythromycin	Public	0.4021	0.3959	0.3186	0.2881	0.1468	0.1445	0.1163	0.1052
		Private	0.3427	0.3175	0.1876	0.1979	0.1251	0.1159	0.0685	0.0722
		Total	**0.7448**	**0.7135**	**0.5063**	**0.4860**	**0.2718**	**0.2604**	**0.1848**	**0.1774**
J01FA02	Spiramycin	Public	-	-	-	-	-	-	-	-
		Private	0.0008	-	-	-	0.0003	-	-	-
		Total	**0.0008**	**-**	**-**	**-**	**0.0003**	**-**	**-**	**-**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01FA06	Roxithromycin	Public	-	-	-	-	-	-	-	-
		Private	0.0620	0.0389	0.0370	0.0377	0.0226	0.0142	0.0135	0.0138
		Total	**0.0620**	**0.0389**	**0.0370**	**0.0377**	**0.0226**	**0.0142**	**0.0135**	**0.0138**
J01FA09	Clarithromycin	Public	0.0182	0.0250	0.0243	0.0258	0.0066	0.0091	0.0089	0.0094
		Private	0.4003	0.4751	0.5016	0.4065	0.1461	0.1734	0.1831	0.1484
		Total	**0.4185**	**0.5000**	**0.5259**	**0.4322**	**0.1527**	**0.1825**	**0.1920**	**0.1578**
J01FA10	Azithromycin	Public	0.0352	0.0473	0.0373	0.0576	0.0128	0.0173	0.0136	0.0210
		Private	0.3179	0.3579	0.4611	0.4105	0.1160	0.1306	0.1683	0.1498
		Total	**0.3531**	**0.4052**	**0.4984**	**0.4682**	**0.1289**	**0.1479**	**0.1819**	**0.1709**
J01FF	**Lincosamides**	**Public**	**0.0054**	**0.0076**	**0.0098**	**0.0103**	**0.0020**	**0.0028**	**0.0036**	**0.0038**
		Private	**0.0181**	**0.0162**	**0.0131**	**0.0118**	**0.0066**	**0.0059**	**0.0048**	**0.0043**
		Total	**0.0235**	**0.0238**	**0.0230**	**0.0221**	**0.0086**	**0.0087**	**0.0084**	**0.0081**
J01FF01	Clindamycin	Public	0.0054	0.0076	0.0098	0.0103	0.0020	0.0028	0.0036	0.0038
		Private	0.0123	0.0124	0.0099	0.0083	0.0045	0.0045	0.0036	0.0030
		Total	**0.0177**	**0.0200**	**0.0197**	**0.0186**	**0.0065**	**0.0073**	**0.0072**	**0.0068**
J01FF02	Lincomycin	Public	-	-	-	-	-	-	-	-
		Private	0.0058	0.0037	0.0032	0.0035	0.0021	0.0014	0.0012	0.0013
		Total	**0.0058**	**0.0037**	**0.0032**	**0.0035**	**0.0021**	**0.0014**	**0.0012**	**0.0013**
J01G	**Aminoglycoside antibacterials**	**Public**	**0.0192**	**0.0190**	**0.0195**	**0.0212**	**0.0070**	**0.0069**	**0.0071**	**0.0077**
		Private	**0.0077**	**0.0078**	**0.0066**	**0.0062**	**0.0028**	**0.0028**	**0.0024**	**0.0022**
		Total	**0.0268**	**0.0268**	**0.0261**	**0.0274**	**0.0098**	**0.0098**	**0.0095**	**0.0100**
J01GA	**Streptomycins**									
J01GA01	Streptomycin	Public	0.0070	0.0062	0.0061	0.0077	0.0025	0.0023	0.0022	0.0028
		Private	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0071**	**0.0063**	**0.0062**	**0.0078**	**0.0026**	**0.0023**	**0.0023**	**0.0028**
J01GB	**Other aminoglycosides**	**Public**	**0.0122**	**0.0128**	**0.0134**	**0.0135**	**0.0045**	**0.0047**	**0.0049**	**0.0049**
		Private	**0.0075**	**0.0077**	**0.0065**	**0.0060**	**0.0027**	**0.0028**	**0.0024**	**0.0022**
		Total	**0.0197**	**0.0205**	**0.0199**	**0.0196**	**0.0072**	**0.0075**	**0.0073**	**0.0071**
J01GB03	Gentamicin	Public	0.0090	0.0095	0.0092	0.0104	0.0033	0.0035	0.0034	0.0038
		Private	0.0050	0.0051	0.0045	0.0040	0.0018	0.0018	0.0016	0.0015
		Total	**0.0140**	**0.0146**	**0.0137**	**0.0145**	**0.0051**	**0.0053**	**0.0050**	**0.0053**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01GB04	Kanamycin	Public	0.0009	0.0014	0.0023	0.0009	0.0003	0.0005	0.0008	0.0003
		Private	0.0015	0.0017	0.0010	0.0012	0.0006	0.0006	0.0004	0.0005
		Total	**0.0024**	**0.0031**	**0.0033**	**0.0021**	**0.0009**	**0.0011**	**0.0012**	**0.0008**
J01GB06	Amikacin	Public	0.0022	0.0018	0.0018	0.0022	0.0008	0.0006	0.0007	0.0008
		Private	0.0006	0.0006	0.0007	0.0006	0.0002	0.0002	0.0003	0.0002
		Total	**0.0028**	**0.0024**	**0.0025**	**0.0027**	**0.0010**	**0.0009**	**0.0009**	**0.0010**
J01GB07	Netilmicin	Public	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001
		Private	0.0004	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
		Total	**0.0005**	**0.0004**	**0.0004**	**0.0002**	**0.0002**	**0.0001**	**0.0001**	**0.0001**
J01M	**Quinolone antibacterials**	**Public**	**0.0391**	**0.0479**	**0.0532**	**0.0569**	**0.0143**	**0.0175**	**0.0194**	**0.0208**
		Private	**0.5396**	**0.5943**	**0.6150**	**0.5052**	**0.1970**	**0.2169**	**0.2245**	**0.1844**
		Total	**0.5787**	**0.6422**	**0.6682**	**0.5621**	**0.2112**	**0.2344**	**0.2439**	**0.2052**
J01MA	**Fluoroquinolones**	**Public**	**0.0391**	**0.0479**	**0.0532**	**0.0569**	**0.0143**	**0.0175**	**0.0194**	**0.0208**
		Private	**0.5287**	**0.5860**	**0.6060**	**0.4972**	**0.1930**	**0.2139**	**0.2212**	**0.1815**
		Total	**0.5678**	**0.6339**	**0.6592**	**0.5541**	**0.2072**	**0.2314**	**0.2406**	**0.2022**
J01MA01	Ofloxacin	Public	0.0102	0.0131	0.0177	0.0154	0.0037	0.0048	0.0065	0.0056
		Private	0.0358	0.0417	0.0272	0.0270	0.0131	0.0152	0.0099	0.0099
		Total	**0.0460**	**0.0548**	**0.0449**	**0.0424**	**0.0168**	**0.0200**	**0.0164**	**0.0155**
J01MA02	Ciprofloxacin	Public	0.0273	0.0309	0.0316	0.0331	0.0100	0.0113	0.0115	0.0121
		Private	0.3800	0.4137	0.4298	0.3319	0.1387	0.1510	0.1569	0.1212
		Total	**0.4073**	**0.4446**	**0.4613**	**0.3651**	**0.1487**	**0.1623**	**0.1684**	**0.1333**
J01MA03	Pefloxacin	Public	0.0002	0.0002	-	-	0.0001	0.0001	-	-
		Private	0.0002	-	-	-	0.0001	-	-	-
		Total	**0.0004**	**0.0002**	**-**	**-**	**0.0002**	**0.0001**	**-**	**-**
J01MA06	Norfloxacin	Public	-	-	0.0002	0.0001	-	-	0.0001	< 0.0001
		Private	0.0355	0.0385	0.0430	0.0239	0.0129	0.0141	0.0157	0.0087
		Total	**0.0355**	**0.0385**	**0.0432**	**0.0240**	**0.0129**	**0.0141**	**0.0158**	**0.0088**
J01MA07	Lomefloxacin	Public	-	-	-	-	-	-	-	-
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01MA12	Levofloxacin	Public	0.0012	0.0034	0.0032	0.0077	0.0004	0.0012	0.0012	0.0028
		Private	0.0483	0.0631	0.0756	0.0835	0.0176	0.0230	0.0276	0.0305
		Total	**0.0495**	**0.0665**	**0.0788**	**0.0912**	**0.0181**	**0.0243**	**0.0288**	**0.0333**
J01MA14	Moxifloxacin	Public	0.0001	0.0003	0.0006	0.0005	< 0.0001	0.0001	0.0002	0.0002
		Private	0.0289	0.0289	0.0304	0.0308	0.0106	0.0106	0.0111	0.0113
		Total	**0.0290**	**0.0293**	**0.0309**	**0.0314**	**0.0106**	**0.0107**	**0.0113**	**0.0115**
J01MB	**Other quinolones**									
J01MB04	Pipemidic acid	Public	-	-	-	-	-	-	-	-
		Private	0.0109	0.0083	0.0090	0.0080	0.0040	0.0030	0.0033	0.0029
		Total	**0.0109**	**0.0083**	**0.0090**	**0.0080**	**0.0040**	**0.0030**	**0.0033**	**0.0029**
J01X	**Other antibacterials**	**Public**	**0.1274**	**0.0549**	**0.0524**	**0.0296**	**0.0465**	**0.0200**	**0.0191**	**0.0108**
		Private	**0.0633**	**0.0751**	**0.0672**	**0.0630**	**0.0231**	**0.0274**	**0.0245**	**0.0230**
		Total	**0.1907**	**0.1300**	**0.1196**	**0.0926**	**0.0696**	**0.0474**	**0.0437**	**0.0338**
J01XA	**Glycopeptide antibacterials**	**Public**	**0.0038**	**0.0040**	**0.0043**	**0.0049**	**0.0014**	**0.0015**	**0.0016**	**0.0018**
		Private	**0.0004**	**0.0003**	**0.0003**	**0.0003**	**0.0002**	**0.0001**	**0.0001**	**0.0001**
		Total	**0.0042**	**0.0042**	**0.0046**	**0.0052**	**0.0015**	**0.0015**	**0.0017**	**0.0019**
J01XA01	Vancomycin	Public	0.0038	0.0040	0.0043	0.0049	0.0014	0.0015	0.0016	0.0018
		Private	0.0002	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0040**	**0.0041**	**0.0044**	**0.0050**	**0.0015**	**0.0015**	**0.0016**	**0.0018**
J01XA02	Teicoplanin	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
		Total	**0.0002**	**0.0002**	**0.0002**	**0.0002**	**0.0001**	**0.0001**	**0.0001**	**0.0001**
J01XB	**Polymyxins**	**Public**	**0.0012**	**0.0018**	**0.0013**	**0.0030**	**0.0004**	**0.0006**	**0.0005**	**0.0011**
		Private	**-**	**-**	**-**	**0.0001**	**-**	**-**	**-**	**< 0.0001**
		Total	**0.0012**	**0.0018**	**0.0013**	**0.0031**	**0.0004**	**0.0006**	**0.0005**	**0.0011**
J01XB01	Colistin	Public	0.0009	0.0016	0.0013	0.0029	0.0003	0.0006	0.0005	0.0011
		Private	-	-	-	0.0001	-	-	-	< 0.0001
		Total	**0.0009**	**0.0016**	**0.0013**	**0.0030**	**0.0003**	**0.0006**	**0.0005**	**0.0011**
J01XB02	Polymyxin B	Public	0.0003	0.0002	< 0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001
		Private	-	-	-	< 0.0001	-	-	-	< 0.0001
		Total	**0.0003**	**0.0002**	**< 0.0001**	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**

Table 15.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J01XC	**Steroid antibacterials**									
J01XC01	Fusidic acid	Public	0.0103	0.0116	0.0088	0.0122	0.0037	0.0042	0.0032	0.0044
		Private	0.0009	0.0011	0.0011	0.0010	0.0003	0.0004	0.0004	0.0004
		Total	**0.0112**	**0.0127**	**0.0099**	**0.0132**	**0.0041**	**0.0046**	**0.0036**	**0.0048**
J01XD	**Imidazole derivatives**	**Public**	**0.1079**	**0.0327**	**0.0349**	**0.0073**	**0.0394**	**0.0119**	**0.0127**	**0.0027**
		Private	**0.0561**	**0.0662**	**0.0594**	**0.0530**	**0.0205**	**0.0242**	**0.0217**	**0.0193**
		Total	**0.1639**	**0.0989**	**0.0943**	**0.0603**	**0.0598**	**0.0361**	**0.0344**	**0.0220**
J01XD01	Metronidazole	Public	0.1079	0.0327	0.0349	0.0073	0.0394	0.0119	0.0127	0.0027
		Private	0.0538	0.0644	0.0581	0.0523	0.0196	0.0235	0.0212	0.0191
		Total	**0.1617**	**0.0971**	**0.0930**	**0.0597**	**0.0590**	**0.0355**	**0.0339**	**0.0218**
J01XD02	Tinidazole	Public	-	-	-	-	-	-	-	-
		Private	0.0022	0.0018	0.0013	0.0007	0.0008	0.0007	0.0005	0.0002
		Total	**0.0022**	**0.0018**	**0.0013**	**0.0007**	**0.0008**	**0.0007**	**0.0005**	**0.0002**
J01XE	**Nitrofuran derivatives**									
J01XE01	Nitrofurantoin	Public	0.0039	0.0045	0.0028	0.0018	0.0014	0.0016	0.0010	0.0007
		Private	0.0021	0.0035	0.0023	0.0040	0.0008	0.0013	0.0008	0.0014
		Total	**0.0060**	**0.0080**	**0.0051**	**0.0058**	**0.0022**	**0.0029**	**0.0019**	**0.0021**
J01XX	**Other antibacterials**	**Public**	**0.0005**	**0.0003**	**0.0004**	**0.0004**	**0.0002**	**0.0001**	**0.0001**	**0.0001**
		Private	**0.0038**	**0.0040**	**0.0042**	**0.0046**	**0.0014**	**0.0015**	**0.0015**	**0.0017**
		Total	**0.0042**	**0.0043**	**0.0045**	**0.0050**	**0.0016**	**0.0016**	**0.0016**	**0.0018**
J01XX01	Fosfomycin	Public	-	-	< 0.0001	-	-	-	< 0.0001	-
		Private	0.0033	0.0034	0.0035	0.0038	0.0012	0.0013	0.0013	0.0014
		Total	**0.0033**	**0.0034**	**0.0035**	**0.0038**	**0.0012**	**0.0013**	**0.0013**	**0.0014**
J01XX04	Spectinomycin	Public	-	-	-	-	-	-	-	-
		Private	-	< 0.0001	-	-	-	< 0.0001	-	-
		Total	**-**	**< 0.0001**	**-**	**-**	**-**	**< 0.0001**	**-**	**-**
J01XX08	Linezolid	Public	0.0004	0.0003	0.0003	0.0003	0.0002	0.0001	0.0001	0.0001
		Private	0.0004	0.0005	0.0006	0.0007	0.0002	0.0002	0.0002	0.0003
		Total	**0.0009**	**0.0008**	**0.0009**	**0.0011**	**0.0003**	**0.0003**	**0.0003**	**0.0004**
J01XX09	Daptomycin	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**< 0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**

Table 15.3: Use of antimycotics from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J02A	**Antimycotics for systemic use**	**Public**	**0.0501**	**0.0583**	**0.0564**	**0.0631**	**0.0183**	**0.0213**	**0.0206**	**0.0230**
		Private	**0.4280**	**0.4277**	**0.5082**	**0.2208**	**0.1562**	**0.1561**	**0.1855**	**0.0806**
		Total	**0.4781**	**0.4860**	**0.5645**	**0.2839**	**0.1745**	**0.1774**	**0.2061**	**0.1036**
J02AA	**Antibiotics**									
J02AA01	Amphotericin B	Public	0.0023	0.0028	0.0028	0.0040	0.0008	0.0010	0.0010	0.0014
		Private	0.0001	0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0001
		Total	**0.0024**	**0.0029**	**0.0028**	**0.0041**	**0.0009**	**0.0010**	**0.0010**	**0.0015**
J02AB	**Imidazole derivatives**									
J02AB02	Ketoconazole	Public	0.0110	0.0130	0.0091	0.0101	0.0040	0.0047	0.0033	0.0037
		Private	0.3708	0.3708	0.4454	0.1604	0.1354	0.1353	0.1626	0.0585
		Total	**0.3818**	**0.3838**	**0.4545**	**0.1705**	**0.1394**	**0.1401**	**0.1659**	**0.0622**
J02AC	**Triazole derivatives**	**Public**	**0.0364**	**0.0420**	**0.0439**	**0.0482**	**0.0133**	**0.0153**	**0.0160**	**0.0176**
		Private	**0.0570**	**0.0567**	**0.0626**	**0.0601**	**0.0208**	**0.0207**	**0.0228**	**0.0219**
		Total	**0.0934**	**0.0987**	**0.1065**	**0.1083**	**0.0341**	**0.0360**	**0.0389**	**0.0395**
J02AC01	Fluconazole	Public	0.0162	0.0194	0.0225	0.0218	0.0059	0.0071	0.0082	0.0080
		Private	0.0331	0.0343	0.0398	0.0379	0.0121	0.0125	0.0145	0.0138
		Total	**0.0494**	**0.0537**	**0.0623**	**0.0597**	**0.0180**	**0.0196**	**0.0228**	**0.0218**
J02AC02	Itraconazole	Public	0.0196	0.0220	0.0210	0.0258	0.0071	0.0080	0.0077	0.0094
		Private	0.0236	0.0221	0.0225	0.0219	0.0086	0.0081	0.0082	0.0080
		Total	**0.0431**	**0.0441**	**0.0435**	**0.0476**	**0.0157**	**0.0161**	**0.0159**	**0.0174**
J02AC03	Voriconazole	Public	0.0005	0.0005	0.0004	0.0006	0.0002	0.0002	0.0002	0.0002
		Private	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001	0.0001	0.0001
		Total	**0.0008**	**0.0007**	**0.0006**	**0.0008**	**0.0003**	**0.0003**	**0.0002**	**0.0003**
J02AC04	Posaconazole	Public	< 0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	0.0001	0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**0.0001**
J02AX	**Other antimycotics for systemic use**	**Public**	**0.0004**	**0.0005**	**0.0006**	**0.0008**	**0.0001**	**0.0002**	**0.0002**	**0.0003**
		Private	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
		Total	**0.0005**	**0.0006**	**0.0007**	**0.0009**	**0.0002**	**0.0002**	**0.0002**	**0.0003**

Table 15.3: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J02AX01	Flucytosine	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	-	-	-	-	-	-	-	-
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
J02AX04	Caspofungin	Public	0.0003	0.0003	0.0003	0.0004	0.0001	0.0001	0.0001	0.0002
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0003**	**0.0003**	**0.0004**	**0.0005**	**0.0001**	**0.0001**	**0.0001**	**0.0002**
J02AX06	Anidulafungin	Public	0.0001	0.0002	0.0002	0.0003	0.0001	0.0001	0.0001	0.0001
		Private	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0002**	**0.0003**	**0.0003**	**0.0003**	**0.0001**	**0.0001**	**0.0001**	**0.0001**

Table 15.4: Use of drugs for treatment of tuberculosis from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J04A	**Drugs for treatment of tuberculosis**	**Public**	**0.7471**	**0.7655**	**0.7309**	**0.7560**	**0.2727**	**0.2794**	**0.2668**	**0.2759**
		Private	**0.0775**	**0.0701**	**0.1121**	**0.0856**	**0.0283**	**0.0256**	**0.0409**	**0.0312**
		Total	**0.8245**	**0.8356**	**0.8430**	**0.8416**	**0.3010**	**0.3050**	**0.3077**	**0.3072**
J04AB	**Antibiotics**	**Public**	**0.2062**	**0.2461**	**0.2572**	**0.2577**	**0.0753**	**0.0898**	**0.0939**	**0.0940**
		Private	**0.0187**	**0.0157**	**0.0194**	**0.0047**	**0.0068**	**0.0057**	**0.0071**	**0.0017**
		Total	**0.2248**	**0.2618**	**0.2766**	**0.2624**	**0.0821**	**0.0955**	**0.1009**	**0.0958**
J04AB01	Cycloserine	Public	0.0020	0.0019	0.0024	0.0026	0.0007	0.0007	0.0009	0.0009
		Private	-	-	-	-	-	-	-	-
		Total	**0.0020**	**0.0019**	**0.0024**	**0.0026**	**0.0007**	**0.0007**	**0.0009**	**0.0009**
J04AB02	Rifampicin	Public	0.2042	0.2442	0.2548	0.2550	0.0745	0.0891	0.0930	0.0931
		Private	0.0187	0.0157	0.0194	0.0047	0.0068	0.0057	0.0071	0.0017
		Total	**0.2229**	**0.2599**	**0.2742**	**0.2597**	**0.0813**	**0.0948**	**0.1001**	**0.0948**
J04AB04	Rifabutin	Public	-	-	-	0.0001	-	-	-	< 0.0001
		Private	< 0.0001	-	-	-	< 0.0001	-	-	-
		Total	**< 0.0001**	**-**	**-**	**0.0001**	**< 0.0001**	**-**	**-**	**< 0.0001**

Table 15.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J04AC	**Hydrazides**									
J04AC01	Isoniazid	Public	0.3418	0.2965	0.2966	0.3163	0.1248	0.1082	0.1083	0.1155
		Private	0.0033	0.0090	0.0349	0.0330	0.0012	0.0033	0.0127	0.0121
		Total	**0.3452**	**0.3055**	**0.3315**	**0.3494**	**0.1260**	**0.1115**	**0.1210**	**0.1275**
J04AD	**Thiocarbamide derivatives**									
J04AD03	Ethionamide	Public	0.0010	0.0025	0.0028	0.0044	0.0004	0.0009	0.0010	0.0016
		Private	-	-	-	< 0.0001	-	-	-	< 0.0001
		Total	**0.0010**	**0.0025**	**0.0028**	**0.0044**	**0.0004**	**0.0009**	**0.0010**	**0.0016**
J04AK	**Other drugs for treatment of tuberculosis**	**Public**	**0.1681**	**0.1535**	**0.1013**	**0.0750**	**0.0613**	**0.0560**	**0.0370**	**0.0274**
		Private	**0.0331**	**0.0204**	**0.0237**	**0.0207**	**0.0121**	**0.0074**	**0.0087**	**0.0076**
		Total	**0.2011**	**0.1739**	**0.1250**	**0.0957**	**0.0734**	**0.0635**	**0.0456**	**0.0349**
J04AK01	Pyrazinamide	Public	0.0885	0.0800	0.0592	0.0347	0.0323	0.0292	0.0216	0.0127
		Private	0.0181	0.0076	0.0113	0.0106	0.0066	0.0028	0.0041	0.0039
		Total	**0.1066**	**0.0876**	**0.0705**	**0.0453**	**0.0389**	**0.0320**	**0.0258**	**0.0165**
J04AK02	Ethambutol	Public	0.0795	0.0734	0.0420	0.0403	0.0290	0.0268	0.0153	0.0147
		Private	0.0150	0.0128	0.0124	0.0100	0.0055	0.0047	0.0045	0.0037
		Total	**0.0945**	**0.0863**	**0.0544**	**0.0504**	**0.0345**	**0.0315**	**0.0199**	**0.0184**
J04AM	**Combinations of drugs for treatment of tuberculosis**	**Public**	**0.0300**	**0.0670**	**0.0731**	**0.1027**	**0.0109**	**0.0245**	**0.0267**	**0.0375**
		Private	**0.0224**	**0.0250**	**0.0341**	**0.0271**	**0.0082**	**0.0091**	**0.0124**	**0.0099**
		Total	**0.0524**	**0.0920**	**0.1072**	**0.1297**	**0.0191**	**0.0336**	**0.0391**	**0.0474**
J04AM02	Rifampicin and isoniazid	Public	0.0010	0.0001	0.0001	0.0141	0.0004	0.0001	< 0.0001	0.0051
		Private	0.0090	0.0080	0.0188	0.0117	0.0033	0.0029	0.0069	0.0043
		Total	**0.0101**	**0.0081**	**0.0189**	**0.0258**	**0.0037**	**0.0030**	**0.0069**	**0.0094**
J04AM05	Rifampicin, pyrazinamide and isoniazid	Public	0.0013	0.0013	0.0025	0.0012	0.0005	0.0005	0.0009	0.0004
		Private	0.0103	0.0112	0.0084	0.0037	0.0038	0.0041	0.0031	0.0013
		Total	**0.0117**	**0.0125**	**0.0109**	**0.0049**	**0.0043**	**0.0046**	**0.0040**	**0.0018**
J04AM06	Rifampicin, pyrazinamide, ethambutol and isoniazid	Public	0.0276	0.0656	0.0705	0.0874	0.0101	0.0239	0.0257	0.0319
		Private	0.0031	0.0058	0.0069	0.0117	0.0011	0.0021	0.0025	0.0043
		Total	**0.0307**	**0.0714**	**0.0774**	**0.0990**	**0.0112**	**0.0260**	**0.0282**	**0.0361**

Table 15.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J04B	**Drugs for treatment of lepra**									
J04BA	**Drugs for treatment of lepra**	**Public**	**0.0675**	**0.0472**	**0.0581**	**0.0815**	**0.0246**	**0.0172**	**0.0212**	**0.0297**
		Private	**0.0026**	**0.0033**	**0.0053**	**0.0074**	**0.0010**	**0.0012**	**0.0019**	**0.0027**
		Total	**0.0701**	**0.0505**	**0.0634**	**0.0889**	**0.0256**	**0.0184**	**0.0231**	**0.0324**
J04BA01	Clofazimine	Public	0.0015	0.0022	0.0024	0.0023	0.0006	0.0008	0.0009	0.0009
		Private	-	-	-	-	-	-	-	-
		Total	**0.0015**	**0.0022**	**0.0024**	**0.0023**	**0.0006**	**0.0008**	**0.0009**	**0.0009**
J04BA02	Dapsone	Public	0.0660	0.0449	0.0557	0.0791	0.0241	0.0164	0.0203	0.0289
		Private	0.0026	0.0033	0.0053	0.0074	0.0010	0.0012	0.0019	0.0027
		Total	**0.0686**	**0.0483**	**0.0610**	**0.0866**	**0.0250**	**0.0176**	**0.0223**	**0.0316**

Table 15.5: Use of antivirals from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J05A	**Direct acting antivirals**	**Public**	**0.7009**	**0.9237**	**0.8101**	**1.1961**	**0.2558**	**0.3371**	**0.2957**	**0.4366**
		Private	**0.1902**	**0.1676**	**0.1815**	**0.1966**	**0.0694**	**0.0612**	**0.0663**	**0.0717**
		Total	**0.8911**	**1.0913**	**0.9917**	**1.3927**	**0.3253**	**0.3983**	**0.3620**	**0.5083**
J05AB	**Nucleosides and nucleotides excluding reverse transcriptase inhibitors**	**Public**	**0.0099**	**0.0116**	**0.0136**	**0.0186**	**0.0036**	**0.0042**	**0.0049**	**0.0068**
		Private	**0.0605**	**0.0493**	**0.0528**	**0.0508**	**0.0221**	**0.0180**	**0.0193**	**0.0185**
		Total	**0.0704**	**0.0608**	**0.0663**	**0.0694**	**0.0257**	**0.0222**	**0.0242**	**0.0253**
J05AB01	Aciclovir	Public	0.0089	0.0110	0.0129	0.0179	0.0033	0.0040	0.0047	0.0065
		Private	0.0527	0.0422	0.0456	0.0453	0.0193	0.0154	0.0167	0.0165
		Total	**0.0617**	**0.0532**	**0.0585**	**0.0632**	**0.0225**	**0.0194**	**0.0214**	**0.0231**
J05AB04	Ribavirin	Public	0.0005	0.0001	0.0001	< 0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001
		Private	0.0049	0.0042	0.0039	0.0033	0.0018	0.0015	0.0014	0.0012
		Total	**0.0054**	**0.0043**	**0.0040**	**0.0033**	**0.0020**	**0.0016**	**0.0015**	**0.0012**
J05AB06	Ganciclovir	Public	0.0003	0.0003	0.0003	0.0003	0.0001	0.0001	0.0001	0.0001
		Private	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0004**	**0.0004**	**0.0004**	**0.0004**	**0.0001**	**0.0001**	**0.0001**	**0.0001**

Table 15.5: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J05AB11	Valaciclovir	Public	-	-	< 0.0001	-	-	-	< 0.0001	-
		Private	0.0026	0.0027	0.0030	0.0020	0.0010	0.0010	0.0011	0.0007
		Total	**0.0026**	**0.0027**	**0.0031**	**0.0020**	**0.0010**	**0.0010**	**0.0011**	**0.0007**
J05AB14	Valganciclovir	Public	0.0002	0.0002	0.0002	0.0004	0.0001	0.0001	0.0001	0.0001
		Private	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	0.0001
		Total	**0.0003**	**0.0003**	**0.0003**	**0.0005**	**0.0001**	**0.0001**	**0.0001**	**0.0002**
J05AD	**Phosphonic acid derivatives**									
J05AD01	Foscarnet	Public	0.0001	0.0002	-	< 0.0001	< 0.0001	0.0001	-	< 0.0001
		Private	-	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-
		Total	**0.0001**	**0.0002**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**
J05AE	**Protease inhibitors**	**Public**	**0.0069**	**0.0063**	**0.0033**	**0.0039**	**0.0025**	**0.0023**	**0.0012**	**0.0014**
		Private	**0.0014**	**0.0013**	**0.0014**	**0.0008**	**0.0005**	**0.0005**	**0.0005**	**0.0003**
		Total	**0.0082**	**0.0077**	**0.0048**	**0.0048**	**0.0030**	**0.0028**	**0.0017**	**0.0017**
J05AE01	Saquinavir	Public	-	-	-	-	-	-	-	-
		Private	0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
J05AE02	Indinavir	Public	0.0040	0.0048	0.0012	0.0002	0.0015	0.0017	0.0004	0.0001
		Private	0.0012	0.0010	0.0007	0.0003	0.0004	0.0004	0.0003	0.0001
		Total	**0.0052**	**0.0057**	**0.0019**	**0.0004**	**0.0019**	**0.0021**	**0.0007**	**0.0002**
J05AE03	Ritonavir	Public	0.0009	0.0011	0.0011	0.0004	0.0003	0.0004	0.0004	0.0001
		Private	0.0001	0.0001	0.0002	0.0001	< 0.0001	< 0.0001	0.0001	0.0001
		Total	**0.0010**	**0.0011**	**0.0013**	**0.0005**	**0.0004**	**0.0004**	**0.0005**	**0.0002**
J05AE08	Atazanavir	Public	0.0018	0.0002	0.0006	0.0024	0.0007	0.0001	0.0002	0.0009
		Private	-	-	-	-	-	-	-	-
		Total	**0.0018**	**0.0002**	**0.0006**	**0.0024**	**0.0007**	**0.0001**	**0.0002**	**0.0009**
J05AE10	Darunavir	Public	0.0001	0.0002	0.0004	0.0009	< 0.0001	0.0001	0.0001	0.0003
		Private	< 0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0002**	**0.0003**	**0.0005**	**0.0010**	**0.0001**	**0.0001**	**0.0002**	**0.0004**
J05AE12	Boceprevir	Public	-	< 0.0001	< 0.0001	0.0001	-	< 0.0001	< 0.0001	< 0.0001
		Private	-	0.0001	0.0004	0.0003	-	< 0.0001	0.0001	0.0001
		Total	**-**	**0.0001**	**0.0004**	**0.0003**	**-**	**0.0001**	**0.0001**	**0.0001**

Table 15.5: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J05AF	**Nucleoside and nucleotide reverse transcriptase inhibitors**	**Public**	**0.1728**	**0.2307**	**0.3325**	**0.4455**	**0.0631**	**0.0842**	**0.1213**	**0.1626**
		Private	**0.0961**	**0.0790**	**0.0808**	**0.0993**	**0.0351**	**0.0288**	**0.0295**	**0.0362**
		Total	**0.2689**	**0.3096**	**0.4132**	**0.5448**	**0.0982**	**0.1130**	**0.1508**	**0.1989**
J05AF01	Zidovudine	Public	0.0074	0.0123	0.1681	0.2714	0.0027	0.0045	0.0613	0.0991
		Private	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0074**	**0.0123**	**0.1681**	**0.2714**	**0.0027**	**0.0045**	**0.0613**	**0.0991**
J05AF02	Didanosine	Public	0.0068	0.0080	0.0051	0.0027	0.0025	0.0029	0.0019	0.0010
		Private	-	-	-	-	-	-	-	-
		Total	**0.0068**	**0.0080**	**0.0051**	**0.0027**	**0.0025**	**0.0029**	**0.0019**	**0.0010**
J05AF04	Stavudine	Public	0.0356	0.0294	0.0179	0.0001	0.0130	0.0107	0.0065	< 0.0001
		Private	-	-	-	-	-	-	-	-
		Total	**0.0356**	**0.0294**	**0.0179**	**0.0001**	**0.0130**	**0.0107**	**0.0065**	**< 0.0001**
J05AF05	Lamivudine	Public	0.0743	0.0949	0.0570	0.0316	0.0271	0.0346	0.0208	0.0116
		Private	0.0054	0.0042	0.0035	0.0031	0.0020	0.0015	0.0013	0.0011
		Total	**0.0797**	**0.0991**	**0.0605**	**0.0348**	**0.0291**	**0.0362**	**0.0221**	**0.0127**
J05AF06	Abacavir	Public	0.0011	0.0018	0.0023	0.0045	0.0004	0.0006	0.0008	0.0017
		Private	0.0001	0.0001	0.0002	0.0002	< 0.0001	0.0001	0.0001	0.0001
		Total	**0.0012**	**0.0019**	**0.0025**	**0.0047**	**0.0004**	**0.0007**	**0.0009**	**0.0017**
J05AF07	Tenofovir disoproxil	Public	0.0143	0.0319	0.0373	0.0777	0.0052	0.0117	0.0136	0.0284
		Private	0.0073	0.0111	0.0105	0.0121	0.0027	0.0041	0.0038	0.0044
		Total	**0.0216**	**0.0431**	**0.0479**	**0.0898**	**0.0079**	**0.0157**	**0.0175**	**0.0328**
J05AF08	Adefovir dipivoxil	Public	0.0140	0.0162	0.0097	0.0080	0.0051	0.0059	0.0035	0.0029
		Private	0.0110	0.0075	0.0064	0.0063	0.0040	0.0027	0.0023	0.0023
		Total	**0.0249**	**0.0237**	**0.0161**	**0.0143**	**0.0091**	**0.0086**	**0.0059**	**0.0052**
J05AF10	Entecavir	Public	0.0171	0.0317	0.0290	0.0400	0.0063	0.0116	0.0106	0.0146
		Private	0.0640	0.0487	0.0533	0.0692	0.0234	0.0178	0.0194	0.0253
		Total	**0.0811**	**0.0804**	**0.0823**	**0.1092**	**0.0296**	**0.0294**	**0.0300**	**0.0399**
J05AF11	Telbivudine	Public	0.0021	0.0044	0.0061	0.0094	0.0008	0.0016	0.0022	0.0034
		Private	0.0083	0.0073	0.0069	0.0084	0.0030	0.0027	0.0025	0.0031
		Total	**0.0105**	**0.0117**	**0.0130**	**0.0178**	**0.0038**	**0.0043**	**0.0047**	**0.0065**

Table 15.5: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J05AG	**Non-nucleoside reverse transcriptase inhibitors**	**Public**	**0.2493**	**0.3384**	**0.3184**	**0.4455**	**0.0910**	**0.1235**	**0.1162**	**0.1626**
		Private	**0.0128**	**0.0153**	**0.0167**	**0.0177**	**0.0047**	**0.0056**	**0.0061**	**0.0065**
		Total	**0.2621**	**0.3537**	**0.3350**	**0.4632**	**0.0957**	**0.1291**	**0.1223**	**0.1691**
J05AG01	Nevirapine	Public	0.0621	0.0903	0.0942	0.1060	0.0227	0.0330	0.0344	0.0387
		Private	0.0001	0.0002	< 0.0001	0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
		Total	**0.0622**	**0.0905**	**0.0943**	**0.1061**	**0.0227**	**0.0330**	**0.0344**	**0.0387**
J05AG03	Efavirenz	Public	0.1872	0.2481	0.2241	0.3394	0.0683	0.0906	0.0818	0.1239
		Private	0.0127	0.0151	0.0166	0.0176	0.0046	0.0055	0.0061	0.0064
		Total	**0.2000**	**0.2632**	**0.2407**	**0.3570**	**0.0730**	**0.0961**	**0.0879**	**0.1303**
J05AG04	Etravirine	Public	-	-	-	< 0.0001	-	-	-	< 0.0001
		Private	-	-	-	< 0.0001	-	-	-	< 0.0001
		Total	**-**	**-**	**-**	**< 0.0001**	**-**	**-**	**-**	**< 0.0001**
J05AH	**Neuraminidase inhibitors**	**Public**	**0.0001**	**0.0001**	**0.0010**	**0.0096**	**< 0.0001**	**< 0.0001**	**0.0004**	**0.0035**
		Private	**0.0071**	**0.0089**	**0.0132**	**0.0105**	**0.0026**	**0.0032**	**0.0048**	**0.0038**
		Total	**0.0073**	**0.0089**	**0.0142**	**0.0201**	**0.0026**	**0.0033**	**0.0052**	**0.0073**
J05AH01	Zanamivir	Public	-	-	-	-	-	-	-	-
		Private	0.0001	< 0.0001	0.0001	0.0002	< 0.0001	< 0.0001	< 0.0001	0.0001
		Total	**0.0001**	**< 0.0001**	**0.0001**	**0.0002**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**0.0001**
J05AH02	Oseltamivir	Public	0.0001	0.0001	0.0010	0.0096	< 0.0001	< 0.0001	0.0004	0.0035
		Private	0.0070	0.0088	0.0131	0.0104	0.0026	0.0032	0.0048	0.0038
		Total	**0.0072**	**0.0089**	**0.0141**	**0.0200**	**0.0026**	**0.0033**	**0.0052**	**0.0073**
J05AR	**Antivirals for treatment of HIV infections, combinations**	**Public**	**0.2615**	**0.3363**	**0.1387**	**0.2688**	**0.0955**	**0.1227**	**0.0506**	**0.0981**
		Private	**0.0122**	**0.0137**	**0.0164**	**0.0168**	**0.0045**	**0.0050**	**0.0060**	**0.0061**
		Total	**0.2737**	**0.3499**	**0.1551**	**0.2857**	**0.0999**	**0.1277**	**0.0566**	**0.1043**
J05AR01	Zidovudine and lamivudine	Public	0.1878	0.2063	0.0074	0.0324	0.0686	0.0753	0.0027	0.0118
		Private	0.0066	0.0060	0.0043	0.0041	0.0024	0.0022	0.0016	0.0015
		Total	**0.1944**	**0.2123**	**0.0117**	**0.0365**	**0.0710**	**0.0775**	**0.0043**	**0.0133**
J05AR02	Lamivudine and abacavir	Public	-	0.0012	0.0084	0.0221	-	0.0004	0.0031	0.0081
		Private	-	0.0005	0.0015	0.0011	-	0.0002	0.0005	0.0004
		Total	**-**	**0.0018**	**0.0099**	**0.0232**	**-**	**0.0006**	**0.0036**	**0.0085**

Table 15.5: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
J05AR03	Tenofovir disoproxil and emtricitabine	Public	0.0156	0.0737	0.0843	0.1650	0.0057	0.0269	0.0308	0.0602
		Private	0.0030	0.0039	0.0055	0.0064	0.0011	0.0014	0.0020	0.0023
		Total	**0.0186**	**0.0776**	**0.0898**	**0.1714**	**0.0068**	**0.0283**	**0.0328**	**0.0626**
J05AR06	Emtricitabine, tenofovir disoproxil and efavirenz	Public	-	-	-	0.0016	-	-	-	0.0006
		Private	-	-	-	-	-	-	-	-
		Total	**-**	**-**	**-**	**0.0016**	**-**	**-**	**-**	**0.0006**
J05AR07	Stavudine, lamivudine and nevirapine	Public	0.0413	0.0329	0.0174	0.0091	0.0151	0.0120	0.0064	0.0033
		Private	-	-	-	-	-	-	-	-
		Total	**0.0413**	**0.0329**	**0.0174**	**0.0091**	**0.0151**	**0.0120**	**0.0064**	**0.0033**
J05AR10	Lopinavir and ritonavir	Public	0.0143	0.0180	0.0212	0.0361	0.0052	0.0066	0.0077	0.0132
		Private	0.0026	0.0032	0.0051	0.0053	0.0010	0.0012	0.0019	0.0019
		Total	**0.0169**	**0.0212**	**0.0263**	**0.0414**	**0.0062**	**0.0077**	**0.0096**	**0.0151**
J05AR12	Lamivudine and tenofovir disoproxil	Public	0.0024	0.0042	-	0.0024	0.0009	0.0015	-	0.0009
		Private	-	-	-	-	-	-	-	-
		Total	**0.0024**	**0.0042**	**-**	**0.0024**	**0.0009**	**0.0015**	**-**	**0.0009**
J05AX	**Other antivirals**									
J05AX08	Raltegravir	Public	0.0003	0.0001	0.0026	0.0041	0.0001	< 0.0001	0.0010	0.0015
		Private	0.0001	0.0002	0.0003	0.0005	< 0.0001	0.0001	0.0001	0.0002
		Total	**0.0004**	**0.0003**	**0.0030**	**0.0046**	**0.0001**	**0.0001**	**0.0011**	**0.0017**

Table 15.6: Use of antiprotoazoal agents from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
P01A	**Agents against amoebiasis and other protozoal diseases**	**Public**	**0.0318**	**0.0935**	**0.0916**	**0.1021**	**0.0116**	**0.0341**	**0.0334**	**0.0373**
		Private	**0.0787**	**0.0904**	**0.0826**	**0.0654**	**0.0287**	**0.0330**	**0.0302**	**0.0239**
		Total	**0.1105**	**0.1838**	**0.1742**	**0.1675**	**0.0403**	**0.0671**	**0.0636**	**0.0611**
P01AB	**Nitroimidazole derivatives**									
P01AB01	Metronidazole	Public	0.0318	0.0935	0.0916	0.1021	0.0116	0.0341	0.0334	0.0373
		Private	0.0787	0.0904	0.0826	0.0654	0.0287	0.0330	0.0302	0.0239
		Total	**0.1105**	**0.1838**	**0.1742**	**0.1675**	**0.0403**	**0.0671**	**0.0636**	**0.0611**
P01AX	**Other agents against amoebiasis and other protozoal diseases**									
P01AX06	Atovaquone	Public	-	-	-	< 0.0001	-	-	-	< 0.0001
		Private	-	-	-	-	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**	**-**	**-**	**-**	**< 0.0001**
P01B	**Antimalarials**	**Public**	**0.0325**	**0.0439**	**0.0153**	**0.0170**	**0.0119**	**0.0160**	**0.0056**	**0.0062**
		Private	**0.0174**	**0.0104**	**0.0133**	**0.0039**	**0.0064**	**0.0038**	**0.0049**	**0.0014**
		Total	**0.0500**	**0.0543**	**0.0286**	**0.0209**	**0.0182**	**0.0198**	**0.0104**	**0.0076**
P01BA	**Aminoquinolines**	**Public**	**0.0293**	**0.0386**	**0.0108**	**0.0102**	**0.0107**	**0.0141**	**0.0039**	**0.0037**
		Private	**0.0143**	**0.0038**	**0.0020**	**0.0007**	**0.0052**	**0.0014**	**0.0007**	**0.0003**
		Total	**0.0436**	**0.0424**	**0.0128**	**0.0109**	**0.0159**	**0.0155**	**0.0047**	**0.0040**
P01BA01	Chloroquine	Public	0.0103	0.0232	0.0009	0.0024	0.0038	0.0085	0.0003	0.0009
		Private	0.0002	0.0006	-	-	0.0001	0.0002	-	-
		Total	**0.0105**	**0.0238**	**0.0009**	**0.0024**	**0.0038**	**0.0087**	**0.0003**	**0.0009**
P01BA03	Primaquine	Public	0.0190	0.0154	0.0099	0.0078	0.0069	0.0056	0.0036	0.0028
		Private	0.0141	0.0033	0.0020	0.0007	0.0052	0.0012	0.0007	0.0003
		Total	**0.0331**	**0.0187**	**0.0119**	**0.0085**	**0.0121**	**0.0068**	**0.0043**	**0.0031**
P01BB	**Biguanides**									
P01BB51	Proguanil, combinations	Public	< 0.0001	-	-	-	< 0.0001	-	-	-
		Private	0.0011	0.0015	0.0014	0.0014	0.0004	0.0005	0.0005	0.0005
		Total	**0.0011**	**0.0015**	**0.0014**	**0.0014**	**0.0004**	**0.0005**	**0.0005**	**0.0005**
P01BC	**Methanolquinolines**	**Public**	**0.0001**	**0.0005**	**0.0001**	**0.0002**	**< 0.0001**	**0.0002**	**< 0.0001**	**0.0001**
		Private	**0.0001**	**0.0003**	**0.0002**	**< 0.0001**	**< 0.0001**	**0.0001**	**0.0001**	**< 0.0001**
		Total	**0.0001**	**0.0009**	**0.0003**	**0.0003**	**< 0.0001**	**0.0003**	**0.0001**	**0.0001**

Table 15.6: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
P01BC01	Quinine	Public	0.0001	0.0005	0.0001	0.0002	< 0.0001	0.0002	< 0.0001	0.0001
		Private	< 0.0001	0.0002	0.0001	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0007**	**0.0002**	**0.0002**	**< 0.0001**	**0.0003**	**0.0001**	**0.0001**
P01BC02	Mefloquine	Public	< 0.0001	< 0.0001	-	< 0.0001	< 0.0001	< 0.0001	-	< 0.0001
		Private	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
P01BD	**Diaminopyrimidines**	**Public**	**0.0024**	**0.0030**	**0.0038**	**0.0055**	**0.0009**	**0.0011**	**0.0014**	**0.0020**
		Private	**0.0019**	**0.0047**	**0.0097**	**0.0016**	**0.0007**	**0.0017**	**0.0035**	**0.0006**
		Total	**0.0043**	**0.0077**	**0.0135**	**0.0071**	**0.0016**	**0.0028**	**0.0049**	**0.0026**
P01BD01	Pyrimethamine	Public	0.0005	0.0011	0.0004	0.0022	0.0002	0.0004	0.0001	0.0008
		Private	-	-	-	-	-	-	-	-
		Total	**0.0005**	**0.0011**	**0.0004**	**0.0022**	**0.0002**	**0.0004**	**0.0001**	**0.0008**
P01BD51	Pyrimethamine, combinations	Public	0.0018	0.0020	0.0035	0.0033	0.0007	0.0007	0.0013	0.0012
		Private	0.0019	0.0047	0.0097	0.0016	0.0007	0.0017	0.0035	0.0006
		Total	**0.0038**	**0.0067**	**0.0131**	**0.0049**	**0.0014**	**0.0024**	**0.0048**	**0.0018**
P01BE	**Artemisinin and derivatives, plain**									
P01BE03	Artesunate	Public	0.0001	0.0003	0.0001	0.0004	< 0.0001	0.0001	< 0.0001	0.0001
		Private	-	-	-	-	-	-	-	-
		Total	**0.0001**	**0.0003**	**0.0001**	**0.0004**	**< 0.0001**	**0.0001**	**< 0.0001**	**0.0001**
P01BF	**Artemisinin and derivatives, combinations**	**Public**	**0.0007**	**0.0015**	**0.0006**	**0.0008**	**0.0002**	**0.0005**	**0.0002**	**0.0003**
		Private	**< 0.0001**	**0.0001**	**0.0001**	**0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
		Total	**0.0007**	**0.0016**	**0.0007**	**0.0009**	**0.0003**	**0.0006**	**0.0002**	**0.0003**
P01BF01	Artemether and lumefantrine	Public	0.0003	0.0006	0.0006	0.0005	0.0001	0.0002	0.0002	0.0002
		Private	< 0.0001	0.0001	0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0004**	**0.0007**	**0.0007**	**0.0006**	**0.0001**	**0.0002**	**0.0002**	**0.0002**
P01BF02	Artesunate and mefloquine	Public	0.0004	0.0009	-	0.0003	0.0001	0.0003	-	0.0001
		Private	-	-	-	-	-	-	-	-
		Total	**0.0004**	**0.0009**	**-**	**0.0003**	**0.0001**	**0.0003**	**-**	**0.0001**
P01C	**Agents against leishmaniasis and trypanosomiasis**									
P01CX	**Other agents against leishmaniasis and trypanosomiasis**									
P01CX01	Pentamidine isethionate	Public	0.0002	0.0001	0.0002	0.0002	0.0001	< 0.0001	0.0001	0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0002**	**0.0001**	**0.0002**	**0.0002**	**0.0001**	**< 0.0001**	**0.0001**	**0.0001**

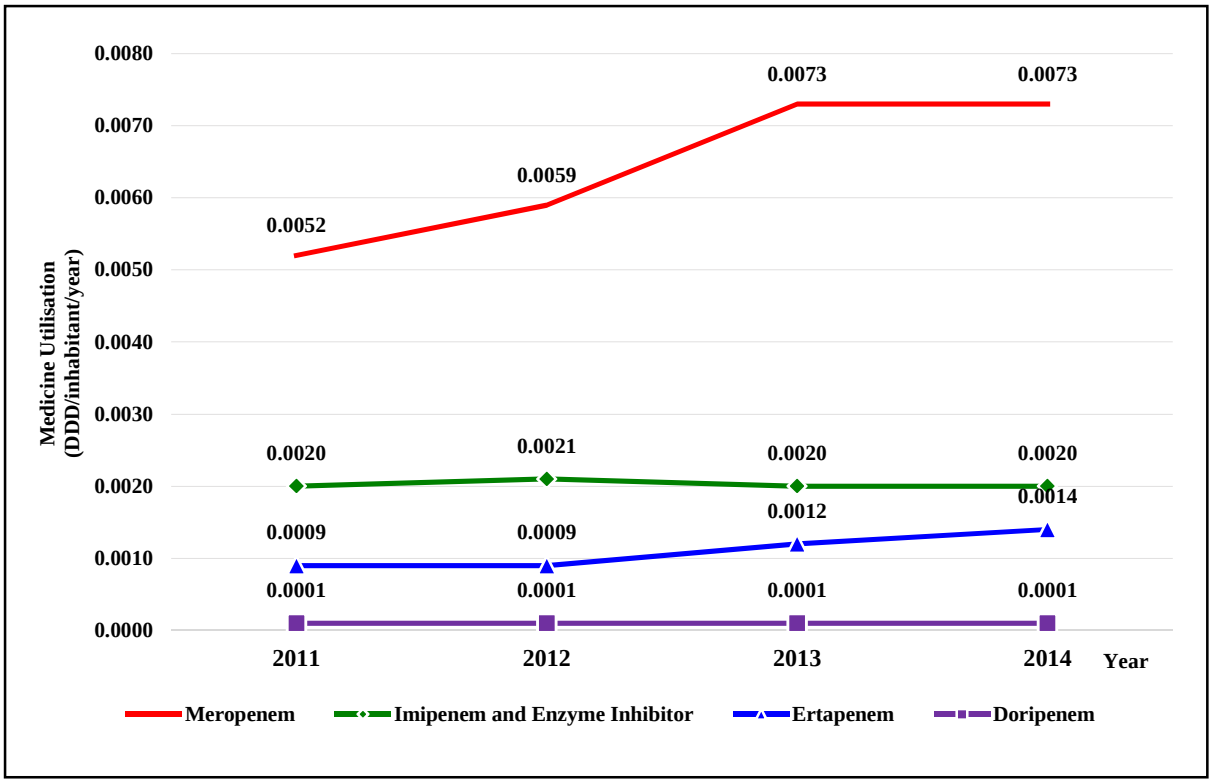

Figure 15.1: Carbapenems usage in DDD/inhabitant/year from year 2011 to 2014.

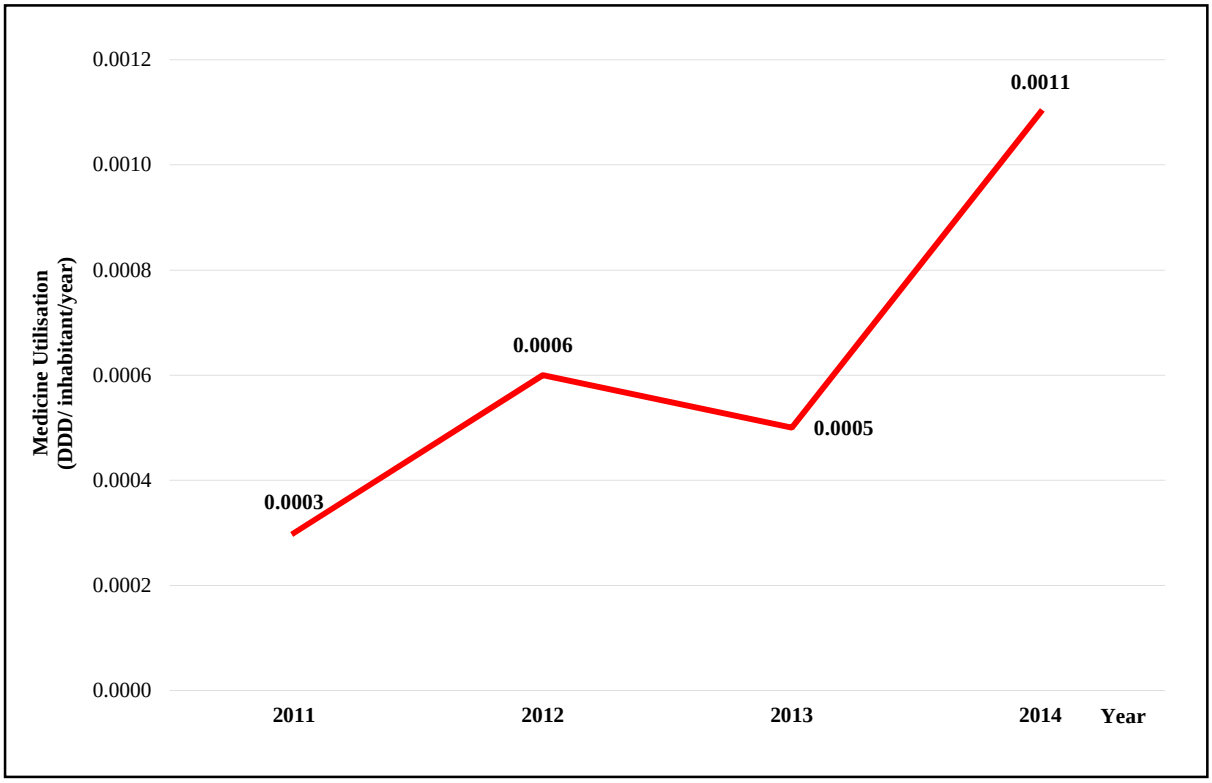

Figure 15.2: Colistin usage in DDD/inhabitant/year from year 2011 to 2014.

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CHAPTER 16: USE OF ANTINEOPLASTIC AGENTS, TARGETTED THERAPY AND ENDOCRINE THERAPY

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GLOBOCAN 2012 reported 14.1 million new cancer cases, 8.2 million cancer deaths and 32.6 million people living with cancer (within 5 years of diagnosis) in 2012 worldwide[1]. In Malaysia, a total number of 103,507 new cancer cases were diagnosed during the period of 2007 to 2011[2]. The five commonest cancer were breast (17.7%), colorectal (13.2%), lung (10.2%), lymphoma (5.2%) and nasopharynx (4.9%). Cancer was the fourth (13%) common cause of death in Ministry of Health facilities and second (25.5%) most common cause of death in private hospital.

The top 10 antineoplastic and targeted therapy being used in Malaysia were cyclophosphamide, 5-Fluorouracil, carboplatin, cisplatin, epirubicin, oxaliplatin, paclitaxel, doxorubicin, docetaxel and vincristine. From 2011 to 2014, the most astounding increment in usage was docetaxel, 147% in public hospitals. The introduction of docetaxel in adjuvant setting of node positive breast cancer patient may partly explained this[3]. Improvement of 5% in five year disease free survival and 4% in overall survival rate when sequential 3 cycles FEC (5-Fluorouracil, Epirubicin, Cyclophosphamide) and 3 cycles docetaxel was compared to 6 cycles FEC only for node positive breast cancer patients. Moreover, introduction of generic docetaxel since 2013 also contributed to this increment (Table 16.1).

Carboplatin usage surged by 34.3% in public facilities. This is not surprising as it is commonly used in breast, lung, nasopharynx and gynecological malignancies. Similarly, oxaliplatin usage also increased by 42.7% as it is being used both in the adjuvant and metastatic setting of colorectal cancer.

There is an increment of 50.3% in private hospital and 9.7% in public hospital in term of 5-Flourouracil usage. It is commonly used in breast, colorectal and head and neck cancer.

A reduction of 38.3% in public and 5% in private hospitals were recorded for cyclophosphamide.

Targeted Therapy

The top five targeted therapy being used in Malaysia during 2011-2014 were trastuzumab, bevacizumab, erlotinib, gefitinib and imatinib.

Trastuzumab usage jumped by more than 200% in public hospital compared to 71.7% in private hospitals. For 2014 alone, the total cost incurred by trastuzumab to public hospital was RM 14 million.

Private hospital has increased usage of bevacizumab by 59.9% from 2014 as compared to 4 years earlier, while public hospital usage remained stable. The current indications for bevacizumab are metastatic colorectal cancer and ovarian cancer, in combination with chemotherapy, although current evidence showed no overall survival advantage.

There were increased in usage of erlotinib (609% in public and 60% in private) and gefitinib (524% in public and 42% in private) since the introduction of these Tyrosine Kinase Inhibitor in 2011 and 2012 in Ministry of Health drug formulary. Incidence of lung cancer has also increased. Furthermore, the frequency of EGFR mutations was reported as 30% in Asian population. It is higher among female and never smokers compared to male and occasional or previous smokers.

Imatinib is currently being prescribed for both Gastrointestinal Stromal Tumour and Chronic Myeloid Leukemia and its usage is higher in public hospital compared to private hospital. The number of patient being treated in public has increased to 88% within 4 years duration[4].

Endocrine Therapy

Endocrine therapy is divided into hormones, hormone antagonists and gonadotropin releasing hormone analogues (Table 16.2).

Tamoxifen is at top of the list and is indicated as first line endocrine therapy in breast cancer patients.

Leuprorelin use increased by 92% in public hospital. Its usage in prostate cancer is three times higher compared to goserelin although its mechanism of action is similar which is to reduce the testosterone levels in prostate cancer patients. Other endocrine therapy that is commonly used includes anastrazole and letrozole.

Immunostimulants

Colony stimulating factors usage has increased by more than 60% in both public and private hospital. This important agent is indicated for both bone marrow stimulation in post chemotherapy neutropenic patient and for stem cell mobilization in transplant patient. The commonest agent used was filgrastim (Table 16.3).

Antiemetics

Various types of antiemetics are used regularly in chemotherapy premedication and treatment of chemotherapy induced nausea and vomiting.

There is an increased in serotonin antagonist usage by more than 60% in both public and private hospitals. The commonest were granisetron and ondansetron (Table 16.4).

Though there was huge increment in usage of aprepitant in public hospitals, it is still half of the usage compared to private hospitals.

Table 16.1: Use of antineoplastic agents from 2011 to 2014.

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01	**Antineoplastic agents**				**Public**	**57.6780**	**74.4432**	**70.3666**	**78.3924**	**701,579**	**1,109,061**	**653,552**	**740,467**
					Private	**37.0706**	**43.7462**	**47.3913**	**38.8237**	**87,475**	**165,727**	**99,164**	**77,978**
					Total	**94.7486**	**118.1895**	**117.7579**	**117.2161**	**789,055**	**1,274,788**	**752,715**	**818,445**
L01A	**Alkylating agents**				**Public**	**2.9612**	**2.1487**	**1.8552**	**1.8061**	**26,175**	**19,896**	**17,357**	**18,821**
					Private	**0.6523**	**0.5779**	**0.6256**	**0.6073**	**5,720**	**5,173**	**5,682**	**5,291**
					Total	**3.6135**	**2.7266**	**2.4808**	**2.4134**	**31,895**	**25,069**	**23,039**	**24,112**
L01AA	**Nitrogen mustard analogues**				**Public**	**2.7608**	**2.0377**	**1.6885**	**1.6506**	**24,300**	**18,778**	**15,938**	**17,538**
					Private	**0.6039**	**0.5249**	**0.5602**	**0.5454**	**5,462**	**4,890**	**5,325**	**4,958**
					Total	**3.3646**	**2.5626**	**2.2487**	**2.1960**	**29,762**	**23,668**	**21,263**	**22,496**
L01AA01	Cyclophosphamide	750mg/m^2	1,300	mg	Public	2.7516	2.0275	1.6788	1.6306	22,452	16,799	14,101	13,854
					Private	0.6000	0.5215	0.5567	0.5444	4,896	4,321	4,676	4,625
					Total	**3.3516**	**2.5490**	**2.2355**	**2.1750**	**27,348**	**21,120**	**18,777**	**18,480**
L01AA02	Chlorambucil	10mg d1-d14	140	mg	Public	0.0042	0.0051	0.0065	0.0074	319	389	506	584
					Private	0.0025	0.0020	0.0018	-	193	153	142	-
					Total	**0.0067**	**0.0071**	**0.0083**	**0.0074**	**511**	**543**	**648**	**584**
L01AA03	Melphalan	30mg/m^2	50	mg	Public	0.0039	0.0037	0.0016	0.0097	825	796	342	2,144
					Private	0.0012	0.0012	0.0014	0.0009	247	261	314	197
					Total	**0.0051**	**0.0049**	**0.0030**	**0.0106**	**1,072**	**1,057**	**656**	**2,341**
L01AA06	Ifosfamide	1,500mg/m^2 x 5/7	12.9	g	Public	0.0009	0.0010	0.0012	0.0011	704	794	990	955
					Private	0.0002	0.0002	0.0002	0.0002	126	155	192	136
					Total	**0.0010**	**0.0011**	**0.0014**	**0.0013**	**831**	**949**	**1,182**	**1,091**
L01AA09	Bendamustine				Public	0.0002	0.0005	0.0005	0.0018	-	-	-	-
					Private	-	-	-	-	-	-	-	-
					Total	**0.0002**	**0.0005**	**0.0005**	**0.0018**	**-**	**-**	**-**	**-**
L01AB	**Alkyl sulfonates**												
L01AB01	Busulfan	0.8mg/kg QID x 4/7	800	mg	Public	0.0067	0.0046	0.0057	0.0091	89	62	78	126
					Private	0.0017	0.0013	0.0017	0.0008	22	18	23	11
					Total	**0.0083**	**0.0059**	**0.0074**	**0.0099**	**111**	**80**	**101**	**137**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01AC	**Ethylene imines**												
L01AC01	Thiotepa	45mg/m^2 weekly	80	mg	Public	0.0008	0.0015	0.0010	-	103	208	135	-
					Private	-	-	-	< 0.0001	-	-	-	4
					Total	**0.0008**	**0.0015**	**0.0010**	**< 0.0001**	**103**	**208**	**135**	**4**
L01AD	**Nitrosoureas**				**Public**	**0.0062**	**0.0046**	**0.0046**	**0.0054**	**215**	**135**	**121**	**159**
					Private	**-**	**-**	**0.0001**	**-**	**-**	**-**	**2**	**-**
					Total	**0.0062**	**0.0046**	**0.0047**	**0.0054**	**215**	**135**	**123**	**159**
L01AD01	Carmustine	300mg/m^2 x 1/7	500	mg	Public	0.0038	0.0035	0.0040	0.0043	80	76	87	96
					Private	-	-	0.0001	-	-	-	2	-
					Total	**0.0038**	**0.0035**	**0.0041**	**0.0043**	**80**	**76**	**89**	**96**
L01AD02	Lomustine	110mg/m^2 d1	190	mg	Public	0.0024	0.0010	0.0006	0.0011	135	59	34	63
					Private	-	-	-	-	-	-	-	-
					Total	**0.0024**	**0.0010**	**0.0006**	**0.0011**	**135**	**59**	**34**	**63**
L01AX	**Other alkylating agents**				**Public**	**0.1868**	**0.1003**	**0.1555**	**0.1410**	**1,469**	**714**	**1,085**	**999**
					Private	**0.0468**	**0.0516**	**0.0636**	**0.0610**	**236**	**265**	**332**	**318**
					Total	**0.2335**	**0.1519**	**0.2190**	**0.2020**	**1,705**	**978**	**1,417**	**1,316**
L01AX03	Temozolomide	75mg/m^2 d1-d5 x 6 weeks	3,600	mg	Public	0.0106	0.0222	0.0411	0.0368	31	66	125	113
					Private	0.0279	0.0307	0.0376	0.0370	82	92	114	113
					Total	**0.0385**	**0.0529**	**0.0787**	**0.0737**	**113**	**158**	**239**	**226**
L01AX04	Dacarbazine	375mg/m^2 d1+d15	1,300	mg	Public	0.1762	0.0781	0.1144	0.1043	1,437	647	961	886
					Private	0.0189	0.0209	0.0259	0.0240	154	173	218	204
					Total	**0.1950**	**0.0990**	**0.1403**	**0.1283**	**1,592**	**820**	**1,179**	**1,090**
L01B	**Antimetabolites**				**Public**	**18.3603**	**23.1468**	**27.9590**	**26.9642**	**25,024**	**28,036**	**25,348**	**29,435**
					Private	**19.3345**	**23.5012**	**24.2471**	**22.3973**	**8,084**	**9,694**	**11,705**	**11,244**
					Total	**37.6947**	**46.6479**	**52.2061**	**49.3615**	**33,108**	**37,730**	**37,053**	**40,679**
L01BA	**Folic acid analogues**				**Public**	**0.3970**	**0.4426**	**0.7428**	**0.4852**	**1,296**	**1,608**	**2,569**	**1,863**
					Private	**0.1133**	**0.1896**	**0.1530**	**0.1169**	**767**	**1,077**	**1,059**	**900**
					Total	**0.5103**	**0.6322**	**0.8958**	**0.6021**	**2,063**	**2,684**	**3,628**	**2,763**
L01BA01	Methotrexate	2,000mg/m^2	3,500	mg	Public	0.3870	0.4166	0.7165	0.4510	1,173	1,282	2,235	1,423
					Private	0.0677	0.1374	0.0922	0.0621	205	423	288	196
					Total	**0.4548**	**0.5540**	**0.8087**	**0.5131**	**1,378**	**1,705**	**2,523**	**1,619**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01BA04	Pemetrexed	500mg/m^2	860	mg	Public	0.0100	0.0260	0.0263	0.0342	123	326	334	440
					Private	0.0455	0.0522	0.0607	0.0548	562	654	771	704
					Total	**0.0555**	**0.0782**	**0.0870**	**0.0890**	**685**	**979**	**1,105**	**1,143**
L01BB	**Purine analogues**				**Public**	**0.5942**	**0.5156**	**0.2949**	**0.5012**	**7,655**	**6,620**	**4,013**	**6,905**
					Private	**0.0167**	**0.0027**	**0.0252**	**0.0987**	**247**	**73**	**374**	**1,320**
					Total	**0.6109**	**0.5182**	**0.3201**	**0.5999**	**7,902**	**6,693**	**4,387**	**8,225**
L01BB02	Mercaptopurine	100mg/m^2 d1-d5	860	mg	Public	0.5543	0.4736	0.2734	0.4663	6,837	5,932	3,471	5,988
					Private	0.0141	-	0.0218	0.0973	174	-	276	1,250
					Total	**0.5685**	**0.4736**	**0.2951**	**0.5636**	**7,012**	**5,932**	**3,747**	**7,238**
L01BB03	Tioguanine	100mg/m^2 d1-d5	860	mg	Public	0.0311	0.0377	0.0147	0.0233	384	472	186	299
					Private	0.0014	0.0016	0.0020	-	17	20	26	-
					Total	**0.0325**	**0.0393**	**0.0167**	**0.0233**	**401**	**492**	**212**	**299**
L01BB04	Cladribine	0.2mg/kg d1-d5	60	mg	Public	< 0.0001	< 0.0001	0.0001	0.0001	4	4	12	22
					Private	-	-	< 0.0001	< 0.0001	-	-	4	2
					Total	**< 0.0001**	**< 0.0001**	**0.0001**	**0.0001**	**4**	**4**	**17**	**24**
L01BB05	Fludarabine	25mg/m^2 d1-d5	215	mg	Public	0.0087	0.0042	0.0068	0.0116	430	212	344	596
					Private	0.0011	0.0011	0.0013	0.0013	55	53	68	68
					Total	**0.0098**	**0.0053**	**0.0081**	**0.0129**	**485**	**265**	**412**	**664**
L01BB06	Clofarabine				Public	-	< 0.0001	< 0.0001	-	-	-	-	-
					Private	< 0.0001	< 0.0001	0.0001	< 0.0001	-	-	-	-
					Total	**< 0.0001**	**< 0.0001**	**0.0001**	**< 0.0001**	**-**	**-**	**-**	**-**
L01BC	**Pyrimidine analogues**				**Public**	**17.3691**	**22.1886**	**26.9213**	**25.9778**	**16,073**	**19,809**	**18,765**	**20,667**
					Private	**19.2045**	**23.3089**	**24.0689**	**22.1818**	**7,071**	**8,544**	**10,273**	**9,024**
					Total	**36.5736**	**45.4975**	**50.9902**	**48.1595**	**23,143**	**28,353**	**29,038**	**29,691**
L01BC01	Cytarabine	1,500mg/m^2 b BD x 4/7	20,640	mg	Public	1.2278	1.3884	1.9364	2.0719	631	725	1,024	1,109
					Private	0.1887	0.2267	0.2349	0.2784	97	118	124	149
					Total	**1.4165**	**1.6151**	**2.1713**	**2.3503**	**728**	**843**	**1,149**	**1,258**
L01BC02	Fluorouracil	1,000mg/m^2 d1-d2	3,400	mg	Public	3.8425	4.2048	3.5948	4.0487	11,988	13,321	11,545	13,153
					Private	0.6418	0.7548	1.0363	0.9263	2,002	2,391	3,328	3,009
					Total	**4.4843**	**4.9596**	**4.6311**	**4.9750**	**13,991**	**15,712**	**14,873**	**16,162**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01BC05	Gemcitabine	1,000mg/m^2 d1+d8	3,440	mg	Public	0.4317	0.9275	0.7358	0.8967	1,331	2,904	2,335	2,879
					Private	0.5164	0.5887	0.7442	0.4988	1,592	1,843	2,362	1,602
					Total	**0.9481**	**1.5162**	**1.4800**	**1.3955**	**2,924**	**4,748**	**4,698**	**4,481**
L01BC06	Capecitabine	1,250mg/m^2 BD d1-d4	60,200	mg	Public	11.8655	15.6669	20.6531	18.9604	2,091	2,803	3,746	3,479
					Private	17.8533	21.7314	22.0447	20.4691	3,146	3,888	3,998	3,756
					Total	**29.7188**	**37.3982**	**42.6978**	**39.4295**	**5,237**	**6,691**	**7,745**	**7,235**
L01BC07	Azacitidine				Public	0.0011	0.0002	-	-	-	-	-	-
					Private	0.0032	0.0055	0.0058	0.0048	-	-	-	-
					Total	**0.0043**	**0.0057**	**0.0058**	**0.0048**	**-**	**-**	**-**	**-**
L01BC08	Decitabine	20mg/m^2/d x 5 days	172	mg	Public	0.0004	0.0009	0.0010	-	23	56	60	-
					Private	0.0004	0.0007	0.0005	0.0010	25	45	32	63
					Total	**0.0008**	**0.0016**	**0.0015**	**0.0010**	**48**	**101**	**92**	**63**
L01BC53	Tegafur, combinations	100mg tds x 28 days	8,400	mg	Public	< 0.0001	-	0.0002	0.0002	8	-	54	48
					Private	0.0007	0.0010	0.0025	0.0033	208	258	428	445
					Total	**0.0007**	**0.0010**	**0.0027**	**0.0035**	**217**	**258**	**482**	**493**
L01C	**Plant alkaloids and other natural products**				**Public**	**0.2046**	**0.2384**	**0.2580**	**0.3193**	**10,153**	**11,192**	**13,507**	**16,130**
					Private	**0.1372**	**0.1585**	**0.2224**	**0.1774**	**7,750**	**8,575**	**10,589**	**9,405**
					Total	**0.3418**	**0.3969**	**0.4805**	**0.4967**	**17,903**	**19,767**	**24,096**	**25,535**
L01CA	**Vinca alkaloids and analogues**				**Public**	**0.0059**	**0.0093**	**0.0122**	**0.0144**	**4,853**	**4,881**	**6,250**	**6,839**
					Private	**0.0118**	**0.0126**	**0.0140**	**0.0097**	**2,403**	**2,621**	**3,004**	**2,574**
					Total	**0.0177**	**0.0220**	**0.0262**	**0.0240**	**7,256**	**7,502**	**9,254**	**9,413**
L01CA01	Vinblastine	10mg d1+d15	20	mg	Public	0.0022	0.0016	0.0023	0.0026	1,168	878	1,273	1,433
					Private	0.0005	0.0006	0.0007	0.0006	290	315	370	313
					Total	**0.0027**	**0.0022**	**0.0030**	**0.0032**	**1,458**	**1,193**	**1,643**	**1,745**
L01CA02	Vincristine	2mg d1+d8	4	mg	Public	0.0013	0.0012	0.0015	0.0015	3,428	3,313	4,064	4,280
					Private	0.0004	0.0004	0.0005	0.0005	959	1,049	1,229	1,306
					Total	**0.0017**	**0.0016**	**0.0019**	**0.0020**	**4,386**	**4,361**	**5,293**	**5,586**
L01CA03	Vindesine				Public	< 0.0001	< 0.0001	-	< 0.0001	-	-	-	-
					Private	-	-	-	-	-	-	-	-
					Total	**< 0.0001**	**< 0.0001**	**-**	**< 0.0001**	**-**	**-**	**-**	**-**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01CA04	Vinorelbine	30mg/m^2 d1+d8	100	mg	Public	0.0024	0.0064	0.0084	0.0102	258	691	913	1,126
					Private	0.0109	0.0117	0.0129	0.0087	1,154	1,257	1,406	955
					Total	**0.0133**	**0.0181**	**0.0212**	**0.0188**	**1,413**	**1,948**	**2,319**	**2,082**
L01CB	**Podophyllotoxin derivatives**												
L01CB01	Etoposide	100mg/m^2 d1-d5	860	mg	Public	0.1125	0.1260	0.1370	0.1700	1,388	1,579	1,739	2,184
					Private	0.0296	0.0332	0.0718	0.0368	365	416	911	473
					Total	**0.1421**	**0.1592**	**0.2087**	**0.2069**	**1,753**	**1,994**	**2,650**	**2,657**
L01CD	**Taxanes**				**Public**	**0.0861**	**0.1030**	**0.1088**	**0.1349**	**3,912**	**4,733**	**5,518**	**7,107**
					Private	**0.0958**	**0.1127**	**0.1367**	**0.1309**	**4,982**	**5,538**	**6,673**	**6,358**
					Total	**0.1820**	**0.2157**	**0.2455**	**0.2658**	**8,894**	**10,271**	**12,191**	**13,465**
L01CD01	Paclitaxel	175mg/m^2	300	mg	Public	0.0674	0.0810	0.0762	0.0905	2,383	2,908	2,773	3,331
					Private	0.0613	0.0809	0.1010	0.0990	2,169	2,903	3,676	3,645
					Total	**0.1288**	**0.1619**	**0.1772**	**0.1895**	**4,552**	**5,812**	**6,449**	**6,976**
L01CD02	Docetaxel	75mg/m^2	130	mg	Public	0.0187	0.0220	0.0326	0.0444	1,529	1,824	2,740	3,776
					Private	0.0345	0.0318	0.0357	0.0319	2,812	2,635	2,997	2,713
					Total	**0.0532**	**0.0538**	**0.0683**	**0.0764**	**4,341**	**4,459**	**5,737**	**6,489**
L01CD04	Cabazitaxel	25mg/m^2	40	mg	Public	-	-	< 0.0001	-	-	-	5	-
					Private	-	-	-	-	-	-	-	-
					Total	**-**	**-**	**< 0.0001**	**-**	**-**	**-**	**5**	**-**
L01CX	**Other plant alkaloids and natural products**												
L01CX01	Trabectedin				Public	-	-	-	-	-	-	-	-
					Private	< 0.0001	< 0.0001	-	-	-	-	-	-
					Total	**< 0.0001**	**< 0.0001**	**-**	**-**	**-**	**-**	**-**	**-**
L01D	**Cytotoxic antibiotics and related substances**				**Public**	**0.1379**	**0.1284**	**0.1756**	**0.1668**	**606,957**	**1,006,780**	**554,299**	**616,024**
					Private	**0.0403**	**0.0470**	**0.0583**	**0.0435**	**37,068**	**105,282**	**26,726**	**4,427**
					Total	**0.1782**	**0.1754**	**0.2339**	**0.2103**	**644,025**	**1,112,062**	**581,024**	**620,451**
L01DA	**Actinomycines**												
L01DA01	Dactinomycin	15mcg/kg	1	mcg	Public	0.0001	0.0001	< 0.0001	0.0001	592,500	993,000	536,000	597,500
					Private	< 0.0001	< 0.0001	< 0.0001	-	32,500	100,000	20,500	-
					Total	**0.0001**	**0.0001**	**0.0001**	**0.0001**	**625,000**	**1,093,000**	**556,500**	**597,500**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01DB	**Anthracyclines and related substances**				**Public**	**0.1291**	**0.1195**	**0.1639**	**0.1558**	**11,656**	**10,882**	**15,099**	**14,414**
					Private	**0.0360**	**0.0434**	**0.0532**	**0.0402**	**3,469**	**4,136**	**5,060**	**4,020**
					Total	**0.1651**	**0.1629**	**0.2171**	**0.1961**	**15,125**	**15,018**	**20,159**	**18,434**
L01DB01	Doxorubicin	50mg/m^2	90	mg	Public	0.0351	0.0336	0.0403	0.0397	4,142	4,018	4,887	4,872
					Private	0.0140	0.0151	0.0161	0.0165	1,647	1,812	1,953	2,022
					Total	**0.0491**	**0.0487**	**0.0564**	**0.0562**	**5,789**	**5,830**	**6,840**	**6,894**
L01DB02	Daunorubicin	45mg/m^2 d1-d3	230	mg	Public	0.0080	0.0095	0.0076	0.0127	371	447	360	608
					Private	0.0010	0.0017	0.0013	0.0011	45	78	64	55
					Total	**0.0090**	**0.0112**	**0.0089**	**0.0138**	**415**	**525**	**424**	**663**
L01DB03	Epirubicin	75mg/m^2	130	mg	Public	0.0837	0.0749	0.1141	0.1017	6,831	6,207	9,581	8,637
					Private	0.0204	0.0260	0.0351	0.0222	1,661	2,155	2,950	1,882
					Total	**0.1041**	**0.1009**	**0.1492**	**0.1238**	**8,492**	**8,361**	**12,530**	**10,520**
L01DB06	Idarubicin	12mg/m^2 d1-d3	105	mg	Public	0.0009	0.0007	0.0011	0.0005	95	69	111	50
					Private	0.0002	0.0003	0.0003	0.0003	22	27	27	30
					Total	**0.0012**	**0.0009**	**0.0013**	**0.0008**	**116**	**96**	**138**	**80**
L01DB07	Mitoxantrone	12mg/m^2 d1-d3	60	mg	Public	0.0012	0.0008	0.0009	0.0013	217	141	160	247
					Private	0.0005	0.0004	0.0004	0.0002	96	64	66	31
					Total	**0.0018**	**0.0011**	**0.0012**	**0.0015**	**312**	**205**	**226**	**278**
L01DC	**Other cytotoxic antibiotics**				**Public**	**0.0088**	**0.0088**	**0.0117**	**0.0109**	**2,801**	**2,898**	**3,200**	**4,109**
					Private	**0.0042**	**0.0036**	**0.0051**	**0.0033**	**1,099**	**1,146**	**1,166**	**407**
					Total	**0.0130**	**0.0124**	**0.0168**	**0.0142**	**3,900**	**4,044**	**4,366**	**4,517**
L01DC01	Bleomycin	30mg/m^2 d1, d8 & d15	90	mg	Public	0.0065	0.0065	0.0094	0.0074	761	772	1,143	909
					Private	0.0035	0.0026	0.0044	0.0033	409	314	539	402
					Total	**0.0099**	**0.0091**	**0.0139**	**0.0107**	**1,170**	**1,087**	**1,682**	**1,311**
L01DC03	Mitomycin		12	mg	Public	0.0023	0.0024	0.0023	0.0035	2,040	2,126	2,057	3,201
					Private	0.0008	0.0009	0.0007	< 0.0001	690	832	627	5
					Total	**0.0031**	**0.0033**	**0.0029**	**0.0035**	**2,731**	**2,958**	**2,684**	**3,206**
L01X	**Other antineoplastic agents**				**Public**	**36.0141**	**48.7810**	**40.1188**	**49.1360**	**33,271**	**43,156**	**43,041**	**60,058**
					Private	**16.9063**	**19.4617**	**22.2379**	**15.5982**	**28,853**	**37,003**	**44,462**	**47,611**
					Total	**52.9204**	**68.2427**	**62.3567**	**64.7342**	**62,124**	**80,159**	**87,503**	**107,669**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01XA	**Platinum compounds**				**Public**	**0.4437**	**0.3663**	**0.4737**	**0.5739**	**16,657**	**15,912**	**19,097**	**22,238**
					Private	**0.2660**	**0.2951**	**0.3163**	**0.2888**	**10,188**	**11,199**	**12,909**	**11,648**
					Total	**0.7097**	**0.6615**	**0.7900**	**0.8626**	**26,845**	**27,111**	**32,006**	**33,886**
L01XA01	Cisplatin	75mg/m^2	130	mg	Public	0.0849	0.0783	0.0881	0.0882	6,931	6,488	7,397	7,492
					Private	0.0339	0.0358	0.0407	0.0431	2,770	2,969	3,417	3,658
					Total	**0.1189**	**0.1141**	**0.1288**	**0.1312**	**9,701**	**9,457**	**10,815**	**11,150**
L01XA02	Carboplatin		500	mg	Public	0.3160	0.2240	0.3214	0.4078	6,705	4,825	7,018	9,008
					Private	0.1816	0.2067	0.2075	0.1960	3,853	4,453	4,531	4,330
					Total	**0.4977**	**0.4307**	**0.5288**	**0.6038**	**10,558**	**9,278**	**11,549**	**13,338**
L01XA03	Oxaliplatin	85mg/m^2	150	mg	Public	0.0427	0.0640	0.0643	0.0779	3,022	4,599	4,681	5,737
					Private	0.0504	0.0526	0.0682	0.0497	3,564	3,778	4,961	3,661
					Total	**0.0931**	**0.1166**	**0.1325**	**0.1276**	**6,586**	**8,376**	**9,643**	**9,398**
L01XB	**Methylhydrazines**												
L01XB01	Procarbazine	100mg/m^2 d1-d14 [max 150mg]	2,100	mg	Public	0.0252	0.0023	0.0300	0.0349	127	12	156	183
					Private	0.0238	0.0046	0.0014	0.0195	120	24	7	102
					Total	**0.0490**	**0.0070**	**0.0314**	**0.0543**	**248**	**36**	**163**	**286**
L01XC	**Monoclonal antibodies**				**Public**	**0.1424**	**0.1873**	**0.1702**	**0.2648**	**3,165**	**4,386**	**3,965**	**6,077**
					Private	**0.2244**	**0.2280**	**0.2908**	**0.2837**	**5,234**	**5,531**	**7,500**	**7,503**
					Total	**0.3668**	**0.4153**	**0.4610**	**0.5485**	**8,399**	**9,917**	**11,465**	**13,580**
L01XC02	Rituximab	375mg/m^2	500	mg	Public	0.1037	0.0980	0.0990	0.1365	2,201	2,110	2,162	3,015
					Private	0.0725	0.0765	0.0938	0.0899	1,538	1,648	2,049	1,986
					Total	**0.1762**	**0.1745**	**0.1928**	**0.2264**	**3,739**	**3,758**	**4,210**	**5,001**
L01XC03	Trastuzumab	6mg/kg	400	mg	Public	0.0308	0.0767	0.0597	0.0903	816	2,065	1,629	2,493
					Private	0.0511	0.0527	0.0743	0.0843	1,355	1,418	2,027	2,327
					Total	**0.0819**	**0.1293**	**0.1339**	**0.1745**	**2,171**	**3,483**	**3,656**	**4,819**
L01XC06	Cetuximab	500mg/m^2 d1	800	mg	Public	0.0059	0.0109	0.0108	0.0361	78	147	148	499
					Private	0.0553	0.0482	0.0457	0.0367	734	649	624	507
					Total	**0.0612**	**0.0591**	**0.0566**	**0.0728**	**812**	**796**	**772**	**1,006**
L01XC07	Bevacizumab	5mg/kg	300	mg	Public	0.0020	0.0018	0.0007	0.0019	69	64	27	70
					Private	0.0455	0.0506	0.0769	0.0698	1,608	1,816	2,800	2,571
					Total	**0.0474**	**0.0524**	**0.0777**	**0.0717**	**1,677**	**1,881**	**2,827**	**2,641**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01XC08	Panitumumab	6mg/kg	300	mg	Public	-	-	-	-	-	-	-	-
					Private	-	-	-	0.0031	-	-	-	113
					Total	**-**	**-**	**-**	**0.0031**	**-**	**-**	**-**	**113**
L01XD	**Sensitizers used in photodynamic/ radiation therapy**												
L01XD04	Aminolevulinic acid				Public	0.0007	0.0022	-	0.0027	-	-	-	-
					Private	-	-	-	-	-	-	-	-
					Total	**0.0007**	**0.0022**	**-**	**0.0027**	**-**	**-**	**-**	**-**
L01XE	**Protein kinase inhibitors**				**Public**	**0.8991**	**4.5838**	**1.8952**	**2.4873**	**1,081**	**7,382**	**5,374**	**12,986**
					Private	**3.0310**	**3.3241**	**3.3095**	**3.9917**	**7,533**	**13,216**	**16,154**	**22,609**
					Total	**3.9301**	**7.9080**	**5.2047**	**6.4790**	**8,614**	**20,598**	**21,529**	**35,594**
L01XE01	Imatinib	400mg od x 28 days	11,200	mg	Public	0.5396	2.6476	0.7539	0.9723	511	2,546	735	959
					Private	0.5209	0.4506	0.4852	0.5655	493	433	473	558
					Total	**1.0606**	**3.0983**	**1.2391**	**1.5378**	**1,004**	**2,980**	**1,208**	**1,517**
L01XE02	Gefitinib	250mg od x 28 days	7,000	mg	Public	0.0573	0.1776	0.3077	0.3443	87	273	480	543
					Private	0.6561	0.7806	0.7487	0.8936	994	1,201	1,168	1,410
					Total	**0.7134**	**0.9581**	**1.0564**	**1.2378**	**1,081**	**1,474**	**1,648**	**1,953**
L01XE03	Erlotinib	100mg od x 28 days	2,800	mg	Public	0.0420	0.1148	0.1455	0.2860	159	441	567	1,128
					Private	0.2284	0.2181	0.2914	0.3513	865	839	1,136	1,386
					Total	**0.2704**	**0.3328**	**0.4368**	**0.6373**	**1,024**	**1,280**	**1,704**	**2,514**
L01XE04	Sunitinib	37.5mg x 4/52, rest 2/52	1,050	mg	Public	0.0056	0.0015	0.0038	0.0088	57	15	40	92
					Private	0.0166	0.0067	0.0082	0.0081	167	69	86	85
					Total	**0.0222**	**0.0082**	**0.0121**	**0.0169**	**224**	**84**	**125**	**177**
L01XE05	Sorafenib	400mg bd x 28 days	22,400	mg	Public	0.0045	0.0267	-	0.0239	2	13	-	12
					Private	0.2930	0.2963	0.2594	0.3227	139	143	126	159
					Total	**0.2975**	**0.3231**	**0.2594**	**0.3466**	**141**	**155**	**126**	**171**
L01XE06	Dasatinib	70mg bd x 28 days	3,920	mg	Public	0.0031	0.0110	0.0008	-	8	30	2	-
					Private	-	-	-	-	-	-	-	-
					Total	**0.0031**	**0.0110**	**0.0008**	**-**	**8**	**30**	**2**	**-**
L01XE07	Lapatinib	1,250mg od x 21 days	2,650	mg	Public	0.0412	0.3607	0.4215	0.1980	17	148	175	83
					Private	0.8777	0.9066	0.7661	0.8350	355	372	319	351
					Total	**0.9189**	**1.2673**	**1.1876**	**1.0330**	**371**	**520**	**494**	**435**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01XE08	Nilotinib	400mg bd x 28 days	38,528	mg	Public	0.1922	0.9915	0.0262	0.0454	53	277	7	13
					Private	0.2143	0.2284	0.2422	0.2979	59	64	69	85
					Total	**0.4065**	**1.2198**	**0.2684**	**0.3432**	**112**	**341**	**76**	**98**
L01XE09	Temsirolimus	25mg per week x 4	100	mg	Public	0.0001	-	-	-	7	-	-	-
					Private	0.0003	0.0001	0.0001	0.0003	28	8	13	31
					Total	**0.0003**	**0.0001**	**0.0001**	**0.0003**	**35**	**8**	**13**	**31**
L01XE10	Everolimus		10	mg	Public	-	0.0002	0.0001	0.0016	-	240	150	1,800
					Private	0.0014	0.0040	0.0054	0.0063	1,485	4,260	5,903	6,975
					Total	**0.0014**	**0.0042**	**0.0055**	**0.0079**	**1,485**	**4,500**	**6,053**	**8,775**
L01XE11	Pazopanib		800	mg	Public	0.0136	0.2523	0.2357	0.6051	180	3,398	3,218	8,355
					Private	0.2223	0.4328	0.5028	0.7045	2,948	5,828	6,863	9,728
					Total	**0.2359**	**0.6852**	**0.7385**	**1.3097**	**3,128**	**9,225**	**10,080**	**18,083**
L01XE13	Afatinib		40	mg	Public	-	-	-	-	-	-	-	-
					Private	-	-	-	0.0067	-	-	-	1,841
					Total	**-**	**-**	**-**	**0.0067**	**-**	**-**	**-**	**1,841**
L01XE18	Ruxolitinib				Public	-	-	-	0.0018	-	-	-	-
					Private	-	-	-	-	-	-	-	-
					Total	**-**	**-**	**-**	**0.0018**	**-**	**-**	**-**	**-**
L01XX	**Other antineoplastic agents**				**Public**	**34.5030**	**43.6389**	**37.5496**	**45.7725**	**12,241**	**15,465**	**14,449**	**18,574**
					Private	**13.3612**	**15.6098**	**18.3200**	**11.0145**	**5,777**	**7,032**	**7,890**	**5,749**
					Total	**47.8641**	**59.2488**	**55.8696**	**56.7870**	**18,018**	**22,497**	**22,340**	**24,323**
L01XX01	Amsacrine				Public	0.0006	0.0009	0.0008	0.0005	-	-	-	-
					Private	-	-	-	-	-	-	-	-
					Total	**0.0006**	**0.0009**	**0.0008**	**0.0005**	**-**	**-**	**-**	**-**
L01XX02	Asparaginase	10,000iu/m^2	20,000	mg	Public	2.2625	2.9978	3.3840	3.4675	1,200	1,615	1,848	1,915
					Private	0.7909	1.3313	0.9680	-	420	717	529	-
					Total	**3.0535**	**4.3292**	**4.3520**	**3.4675**	**1,620**	**2,332**	**2,376**	**1,915**
L01XX05	Hydroxycarbamide	500mg tds x 28 days	42,000	mg	Public	31.8874	39.8193	33.9772	42.0804	8,054	10,212	8,833	11,067
					Private	12.4627	14.1535	17.3091	10.9592	3,148	3,630	4,500	2,882
					Total	**44.3502**	**53.9729**	**51.2864**	**53.0396**	**11,201**	**13,842**	**13,333**	**13,949**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01XX09	Miltefosine				Public	-	-	-	-	-	-	-	-
					Private	0.0002	-	-	-	-	-	-	-
					Total	**0.0002**	-	-	-	-	-	-	-
L01XX11	Estramustine	280mg tds d1-d5	4,200	mg	Public	-	-	-	-	-	-	-	-
					Private	0.0739	0.0858	0.0064	0.0266	187	220	17	70
					Total	**0.0739**	**0.0858**	**0.0064**	**0.0266**	**187**	**220**	**17**	**70**
L01XX14	Tretinoin	45mg/m^2 d1-d15 q12 weeks	1,160	mg	Public	0.0287	0.0287	0.0380	0.0326	262	266	358	310
					Private	0.0071	0.0082	0.0065	-	65	76	61	-
					Total	**0.0357**	**0.0369**	**0.0445**	**0.0326**	**327**	**342**	**419**	**310**
L01XX17	Topotecan	1.25mg/m^2 d2-d6	10	mg	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001	30	26	6	47
					Private	0.0001	0.0002	0.0002	0.0001	121	166	172	116
					Total	**0.0001**	**0.0002**	**0.0002**	**0.0001**	**151**	**193**	**178**	**162**
L01XX19	Irinotecan	180mg/m^2	310	mg	Public	0.0267	0.0356	0.0340	0.0607	913	1,237	1,198	2,164
					Private	0.0235	0.0267	0.0247	0.0247	805	928	868	882
					Total	**0.0502**	**0.0623**	**0.0587**	**0.0855**	**1,718**	**2,165**	**2,067**	**3,045**
L01XX23	Mitotane	10g per day x 28 days	280,000	mg	Public	0.2922	0.7520	0.1099	0.1222	111	289	43	48
					Private	-	-	-	-	-	-	-	-
					Total	**0.2922**	**0.7520**	**0.1099**	**0.1222**	**111**	**289**	**43**	**48**
L01XX24	Pegaspargase				Public	-	-	-	0.0010	-	-	-	-
					Private	-	-	-	-	-	-	-	-
					Total	-	-	-	**0.0010**	-	-	-	-
L01XX27	Arsenic trioxide	10mg od x 42 days	420	mg	Public	0.0010	0.0004	0.0010	0.0007	25	11	25	19
					Private	0.0001	-	0.0001	0.0002	3	-	3	5
					Total	**0.0011**	**0.0004**	**0.0011**	**0.0009**	**28**	**11**	**28**	**24**
L01XX32	Bortezomib	1.3mg/m^2 d1, d4, d8, d11 q21 days	9	mg	Public	0.0003	0.0003	0.0003	0.0004	305	314	421	519
					Private	0.0001	0.0002	0.0002	0.0003	96	184	275	341
					Total	**0.0003**	**0.0004**	**0.0006**	**0.0007**	**401**	**498**	**696**	**860**
L01XX35	Anagrelide	0.5mg bd x 28 days	28	mg	Public	0.0035	0.0039	0.0044	0.0063	1,341	1,495	1,718	2,486
					Private	0.0025	0.0029	0.0036	0.0034	930	1,096	1,398	1,325
					Total	**0.0060**	**0.0067**	**0.0080**	**0.0097**	**2,271**	**2,591**	**3,116**	**3,811**

Table 16.1: (*continued*)

ATC	Therapeutic Group/ Drug	Dose and Duration	Average Dose per Treatment Cycle	Unit	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (Number of cycles/year)			
						2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
L01XX38	Vorinostat				Public	-	-	-	-	-	-	-	-
					Private	-	0.0011	0.0011	-	-	-	-	-
					Total	**-**	**0.0011**	**0.0011**	**-**	**-**	**-**	**-**	**-**
L01XX41	Eribulin	1.4mg/m^2 d1, d8	4	mg	Public	-	-	-	-	-	-	-	-
					Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001	4	14	66	129
					Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**4**	**14**	**66**	**129**

Table 16.2: Use of agents for endocrine therapy from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
L02	**Endocrine therapy**		**Public**	**0.2335**	**0.2632**	**0.3381**	**0.3379**
			Private	**0.1376**	**0.1647**	**0.1794**	**0.1904**
			Total	**0.3710**	**0.4280**	**0.5175**	**0.5283**
L02A	**Hormones and related agents**		**Public**	**0.0475**	**0.0526**	**0.0621**	**0.0779**
			Private	**0.0566**	**0.0604**	**0.0694**	**0.0689**
			Total	**0.1041**	**0.1129**	**0.1316**	**0.1468**
L02AB	**Progestogens**		**Public**	**0.0005**	**0.0008**	**0.0003**	**0.0005**
			Private	**0.0054**	**0.0070**	**0.0062**	**0.0081**
			Total	**0.0059**	**0.0078**	**0.0066**	**0.0086**
L02AB01	Megestrol	g	Public	< 0.0001	0.0005	0.0002	0.0004
			Private	0.0054	0.0070	0.0062	0.0081
			Total	**0.0054**	**0.0075**	**0.0064**	**0.0084**
L02AB02	Medroxyprogesterone	g	Public	0.0004	0.0003	0.0002	0.0001
			Private	< 0.0001	< 0.0001	< 0.0001	-
			Total	**0.0004**	**0.0003**	**0.0002**	**0.0001**
L02AE	**Gonadotropin releasing hormone analogues**		**Public**	**0.0470**	**0.0518**	**0.0618**	**0.0774**
			Private	**0.0512**	**0.0533**	**0.0632**	**0.0608**
			Total	**0.0983**	**0.1051**	**0.1250**	**0.1382**
L02AE01	Buserelin	mg	Public	-	-	-	-
			Private	0.0016	0.0017	0.0016	0.0016
			Total	**0.0016**	**0.0017**	**0.0016**	**0.0016**
L02AE02	Leuprorelin	mg	Public	0.0314	0.0400	0.0464	0.0603
			Private	0.0350	0.0353	0.0429	0.0379
			Total	**0.0664**	**0.0753**	**0.0893**	**0.0981**
L02AE03	Goserelin	mg	Public	0.0149	0.0109	0.0142	0.0150
			Private	0.0132	0.0125	0.0133	0.0140
			Total	**0.0281**	**0.0234**	**0.0275**	**0.0289**
L02AE04	Triptorelin	mg	Public	0.0008	0.0008	0.0012	0.0022
			Private	0.0014	0.0038	0.0055	0.0074
			Total	**0.0022**	**0.0046**	**0.0066**	**0.0096**
L02B	**Hormone antagonists and related agents**		**Public**	**0.1860**	**0.2107**	**0.2759**	**0.2600**
			Private	**0.0809**	**0.1044**	**0.1100**	**0.1215**
			Total	**0.2669**	**0.3151**	**0.3859**	**0.3815**
L02BA	**Anti-estrogens**		**Public**	**0.1390**	**0.1550**	**0.2093**	**0.2050**
			Private	**0.0490**	**0.0710**	**0.0735**	**0.0794**
			Total	**0.1880**	**0.2260**	**0.2828**	**0.2844**
L02BA01	Tamoxifen	mg	Public	0.1390	0.1550	0.2093	0.2050
			Private	0.0489	0.0709	0.0732	0.0790
			Total	**0.1879**	**0.2259**	**0.2824**	**0.2839**
L02BA03	Fulvestrant	mg	Public	-	< 0.0001	-	-
			Private	0.0001	0.0001	0.0003	0.0004
			Total	**0.0001**	**0.0001**	**0.0003**	**0.0004**
L02BB	**Anti-androgens**		**Public**	**0.0134**	**0.0153**	**0.0186**	**0.0158**
			Private	**0.0090**	**0.0102**	**0.0085**	**0.0092**
			Total	**0.0224**	**0.0255**	**0.0271**	**0.0251**
L02BB01	Flutamide	g	Public	0.0005	0.0006	0.0006	0.0007
			Private	0.0007	0.0014	0.0017	0.0008
			Total	**0.0012**	**0.0019**	**0.0022**	**0.0015**

Table 16.2: (*continued*)

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
L02BB03	Bicalutamide	mg	Public	0.0129	0.0147	0.0181	0.0151
			Private	0.0082	0.0088	0.0068	0.0084
			Total	**0.0211**	**0.0235**	**0.0249**	**0.0235**
L02BG	**Aromatase inhibitors**		**Public**	**0.0335**	**0.0404**	**0.0480**	**0.0391**
			Private	**0.0230**	**0.0231**	**0.0272**	**0.0315**
			Total	**0.0565**	**0.0635**	**0.0752**	**0.0706**
L02BG03	Anastrozole	mg	Public	0.0098	0.0162	0.0088	0.0112
			Private	0.0105	0.0105	0.0121	0.0140
			Total	**0.0203**	**0.0267**	**0.0209**	**0.0252**
L02BG04	Letrozole	mg	Public	0.0212	0.0207	0.0356	0.0246
			Private	0.0095	0.0099	0.0121	0.0143
			Total	**0.0307**	**0.0306**	**0.0477**	**0.0388**
L02BG06	Exemestane	mg	Public	0.0025	0.0035	0.0035	0.0033
			Private	0.0029	0.0027	0.0030	0.0032
			Total	**0.0055**	**0.0061**	**0.0065**	**0.0065**
L02BX	**Other Hormone Antagonists And Related Agents**		**Public**	**-**	**-**	**< 0.0001**	**0.0001**
			Private	**-**	**0.0001**	**0.0008**	**0.0014**
			Total	**-**	**0.0001**	**0.0008**	**0.0014**
L02BX02	Degarelix	mg	Public	-	-	-	-
			Private	-	-	-	0.0002
			Total	**-**	**-**	**-**	**0.0002**
L02BX03	Abiraterone	g	Public	-	-	< 0.0001	0.0001
			Private	-	0.0001	0.0008	0.0012
			Total	**-**	**0.0001**	**0.0008**	**0.0013**

Table 16.3: Use of immunostimulants (L03) from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
L03A	**Immunostimulants**		**Public**	**0.0141**	**0.0147**	**0.0227**	**0.0194**
			Private	**0.0141**	**0.0111**	**0.0104**	**0.0109**
			Total	**0.0282**	**0.0257**	**0.0331**	**0.0303**
L03AA	**Colony stimulating factors**		**Public**	**0.0035**	**0.0039**	**0.0046**	**0.0058**
			Private	**0.0030**	**0.0038**	**0.0045**	**0.0050**
			Total	**0.0065**	**0.0076**	**0.0091**	**0.0108**
L03AA02	Filgrastim	mg	Public	0.0031	0.0037	0.0045	0.0056
			Private	0.0008	0.0008	0.0008	0.0015
			Total	**0.0039**	**0.0045**	**0.0053**	**0.0071**
L03AA10	Lenograstim	mg	Public	< 0.0001	-	-	-
			Private	0.0003	0.0004	0.0005	0.0003
			Total	**0.0004**	**0.0004**	**0.0005**	**0.0003**
L03AA13	Pegfilgrastim	mg	Public	0.0003	0.0002	0.0001	0.0002
			Private	0.0019	0.0025	0.0032	0.0033
			Total	**0.0022**	**0.0027**	**0.0033**	**0.0035**
L03AB	**Interferons**		**Public**	**0.0107**	**0.0108**	**0.0181**	**0.0136**
			Private	**0.0111**	**0.0073**	**0.0059**	**0.0059**
			Total	**0.0218**	**0.0181**	**0.0240**	**0.0195**
L03AB04	Interferon alfa-2a	MU	Public	0.0001	0.0001	0.0073	0.0002
			Private	< 0.0001	< 0.0001	< 0.0001	0.0001
			Total	**0.0001**	**0.0001**	**0.0073**	**0.0002**

Table 16.3: (*continued*)

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
L03AB05	Interferon alfa-2b	MU	Public	0.0017	0.0013	0.0020	0.0013
			Private	0.0001	0.0001	0.0001	0.0001
			Total	**0.0017**	**0.0014**	**0.0021**	**0.0014**
L03AB07	Interferon beta-1a	mcg	Public	0.0035	0.0033	0.0034	0.0047
			Private	0.0031	0.0014	0.0006	0.0010
			Total	**0.0066**	**0.0047**	**0.0041**	**0.0057**
L03AB08	Interferon beta-1b	MU	Public	0.0001	0.0003	0.0004	0.0007
			Private	0.0006	0.0003	0.0002	0.0001
			Total	**0.0007**	**0.0006**	**0.0005**	**0.0008**
L03AB10	Peginterferon alfa-2b	mcg	Public	0.0019	0.0024	0.0031	0.0031
			Private	0.0036	0.0028	0.0022	0.0023
			Total	**0.0055**	**0.0052**	**0.0053**	**0.0053**
L03AB11	Peginterferon alfa-2a	mcg	Public	0.0034	0.0034	0.0019	0.0036
			Private	0.0037	0.0028	0.0028	0.0025
			Total	**0.0071**	**0.0062**	**0.0047**	**0.0061**
L03AX	**Other immunostimulants**						
L03AX16	Plerixafor	mg	Public	-	< 0.0001	-	-
			Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
			Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**

Table 16.4: Use of antiemetics and antinauseants for chemotherapy (A04) from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
A04A	**Antiemetics and antinauseants**		**Public**	**0.0069**	**0.0105**	**0.0104**	**0.0122**
			Private	**0.0077**	**0.0098**	**0.0091**	**0.0119**
			Total	**0.0146**	**0.0203**	**0.0194**	**0.0240**
A04AA	**Serotonin (5HT3) antagonists**		**Public**	**0.0066**	**0.0098**	**0.0094**	**0.0110**
			Private	**0.0059**	**0.0077**	**0.0068**	**0.0098**
			Total	**0.0124**	**0.0175**	**0.0162**	**0.0207**
A04AA01	Ondansetron	mg	Public	0.0007	0.0009	0.0007	0.0010
			Private	0.0030	0.0047	0.0039	0.0036
			Total	**0.0037**	**0.0056**	**0.0046**	**0.0046**
A04AA02	Granisetron	mg	Public	0.0058	0.0089	0.0087	0.0100
			Private	0.0024	0.0025	0.0022	0.0053
			Total	**0.0083**	**0.0114**	**0.0109**	**0.0153**
A04AA03	Tropisetron	mg	Public	-	-	-	-
			Private	0.0004	0.0004	0.0003	-
			Total	**0.0004**	**0.0004**	**0.0003**	**-**
A04AA05	Palonosetron	mg	Public	-	< 0.0001	< 0.0001	< 0.0001
			Private	-	0.0002	0.0004	0.0009
			Total	**-**	**0.0002**	**0.0004**	**0.0009**
A04AD	**Other antiemetics**						
A04AD12	Aprepitant	mg	Public	0.0003	0.0007	0.0009	0.0012
			Private	0.0018	0.0020	0.0022	0.0021
			Total	**0.0022**	**0.0027**	**0.0032**	**0.0033**

References:

1. GLOBOCAN 2012: Estimated cancer incidence, mortality and prevalence worldwide in 2012; International Agency for Research on Cancer, World Health Organization. http://globocan.iarc.fr/Pages/fact_sheets_cancer.aspx.

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3. *Ministry of Health Systemic Therapy Protocol 2016*; National Cancer Institute, Ministry of Health Malaysia.

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CHAPTER 17: USE OF SYSTEMIC CORTICOSTEROIDS AND IMMUNOSUPPRESIVE AGENTS

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The list of drugs in this chapter includes mineralocorticoids, glucocorticoids and immunosuppressants such as selective immunosupressants, tumor necrosis factor-α inhibitors, interleukin inhibitors, calcineurin inhibitors, antimetabolites and other immunosuppressants.

Systemic Corticosteroids

Systemic corticosteroids usage in Malaysia for 2011 was 4.9919 DDD/1,000 inhabitants/day (Table 17.1). However, there was an increase of 53.8% to 7.6772 DDD/1,000 inhabitants/day in 2012. In 2013, there was a reduction in the usage by 19.8 % to 6.1609 DDD/1,000 inhabitants/day which subsequently remained stable in 2014. The increased usage of systemic corticosteroids in 2012 was largely contributed by the private sector with a steep rise of 77.9%. However, the usage showed a decline in 2013 and 2014 to 3.7256 DDD/1,000 inhabitants/day and 3.4932 DDD/1,000 inhabitants/day respectively. With regards to the public sector, there was a gradual rise in systemic corticosteroids usage from 2011 to 2014 from 2.0067 DDD/1,000 inhabitants/day to 2.7012 DDD/1,000 inhabitants/day which constituted a 34.6% rise. Despite the increased usage of systemic corticosteroids over the last four years, it is still much lower than that reported in Finland[1] where the DDD/1,000 inhabitants/day for systemic corticosteroids ranged from 18.87 to 19.28.

Glucocorticoids remained the most commonly used corticosteroids from 2011 to 2014 accounted for more than 99% of all systemic corticosteroids used in this country. Prednisolone was the most frequently used glucocorticoids and contributed to more than 60% of the total glucocorticoids usage from 2011 to 2014 with DDD/1,000 inhabitants/day ranging from 3.6878 to 5.7259. However, there was an overall reduction in the use of prednisolone from 74.7% in 2012 to 68.1% in 2013 and reduced further to 63.5% in 2014 (Figure 17.1). This is predominantly contributed by the reduction of prednisolone usage in the private sector. In the public sector, the use of prednisolone gradually increased during the same period (Table 17.1). Dexamethasone remained the second most commonly used glucocorticoids from 2011 to 2014 with an increase from 11.1% in 2011 to 19.5% in 2014. Hydrocortisone is the third most commonly used glucocorticoids and the usage has remain stable from 2011 to 2014 with levels ranging from 7.2% to 10.3%. The usage of bethamethasone, methylprednisolone and triamcinolone remained low accounting for less than 10% of the total glucocorticoid used.

The use of mineralocorticoids remained extremely low.

Immunosuppressive Agents

The immunosuppressive agents commonly used in Malaysia include calcineurin inhibitors (Tacrolimus and Cyclosporin), anti-metabolites (Azathioprine, Mycophenolic Acid and Leflunomide) and Proliferator Signaling Inhibitors (Sirolimus and Everolimus).

The use of immunosuppressive agents in Malaysia has remained low in comparison to Finland[1].

This vast difference in the usage of immunosuppressive agents is partly contributed by the very low usage of calcineurin inhibitors (CNI), especially cyclosporine A and tacrolimus, as the number of solid organ transplant recipients were less than 1900 in the Malaysia during that period. In 2014, the usage of CNI in Finland is 11 fold higher than in Malaysia[1].

Nevertheless, the usage of immunosuppressants from 2011 to 2014 has shown an increasing trend from 0.4569 DDD/1,000 inhabitants/day to 0.6300 DDD/1,000 inhabitants/day, indicating a 37.9% rise (Table 17.2).

For calcineurin inhibitors, there was no increase in the usage of tacrolimus despite being the preferred choice of CNI for solid organ transplantation. This may be due to the low number of new cases of solid organ transplant[2].

The usage of mycophenolic acid has shown an increase by 26.4% from 2011 to 2014. As the number of transplant recipients remained relatively unchanged[2] during this period, this increase is most likely due to the usage of mycophenolic acid for non transplant indications especially lupus nephritis[3], extra-renal lupus involvement and other autoimmune diseases.

There has also been a rise in the usage of azathioprine, methotrexate and leflunomide from 2011 to 2014 by 41.6%, 35.6% and 66% respectively. The use of methotrexate is 2 fold higher in the public sector in comparison to the private sector, while the use of leflunomide was 4 to 6 fold higher.

In regards to proliferator signalling inhibitors, the use of sirolimus has remained low and unchanged over the four year period. However, the use of everolimus has shown a dramatic increase from 0.0010 to 0.0033 DDD/1,000 inhabitants/day. In 2014, the use of everolimus is 9 fold higher than sirolimus.

Due to the high cost, the overall usage of tumor necrosis factor-α inhibitors, interleukin inhibitors and rabbit anti-human thymocyte immunoglobulin remained low and relatively unchanged over the last 4 years.

The usage of biologic agents has dramatically increased from 2011 to 2014, recording a rise of 106%. The most frequently used biologic agents are ustekinumab, adalimumab, etarnercept and infliximab.

Table 17.1: Use of corticosteroids for systemic use (H02) from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
H02A	**Corticosteroids for systemic use, plain**	**Public**	**2.0067**	**2.3662**	**2.4353**	**2.7012**
		Private	**2.9852**	**5.3110**	**3.7256**	**3.4932**
		Total	**4.9919**	**7.6772**	**6.1609**	**6.1944**
H02AA	**Mineralocorticoids**					
H02AA02	Fludrocortisone	Public	0.0069	0.0101	0.0166	0.0108
		Private	-	-	-	-
		Total	**0.0069**	**0.0101**	**0.0166**	**0.0108**
H02AB	**Glucocorticoids**	**Public**	**1.9998**	**2.3561**	**2.4187**	**2.6904**
		Private	**2.9852**	**5.3110**	**3.7256**	**3.4932**
		Total	**4.9850**	**7.6671**	**6.1442**	**6.1836**
H02AB01	Betamethasone	Public	< 0.0001	-	-	-
		Private	0.0283	0.0899	0.0799	0.1253
		Total	**0.0283**	**0.0899**	**0.0799**	**0.1253**
H02AB02	Dexamethasone	Public	0.2791	0.3863	0.3615	0.4547
		Private	0.2716	0.6983	0.6683	0.7493
		Total	**0.5507**	**1.0846**	**1.0299**	**1.2040**
H02AB04	Methylprednisolone	Public	0.0463	0.0706	0.0900	0.0684
		Private	0.0328	0.0357	0.0351	0.0372
		Total	**0.0791**	**0.1063**	**0.1251**	**0.1056**
H02AB06	Prednisolone	Public	1.2885	1.4946	1.5120	1.6576
		Private	2.3993	4.2312	2.6719	2.2679
		Total	**3.6878**	**5.7259**	**4.1840**	**3.9256**
H02AB08	Triamcinolone	Public	0.0085	0.0061	0.0066	0.0142
		Private	0.1162	0.1041	0.1166	0.1633
		Total	**0.1247**	**0.1102**	**0.1231**	**0.1775**
H02AB09	Hydrocortisone	Public	0.3773	0.3985	0.4485	0.4955
		Private	0.1370	0.1518	0.1538	0.1503
		Total	**0.5143**	**0.5503**	**0.6023**	**0.6458**

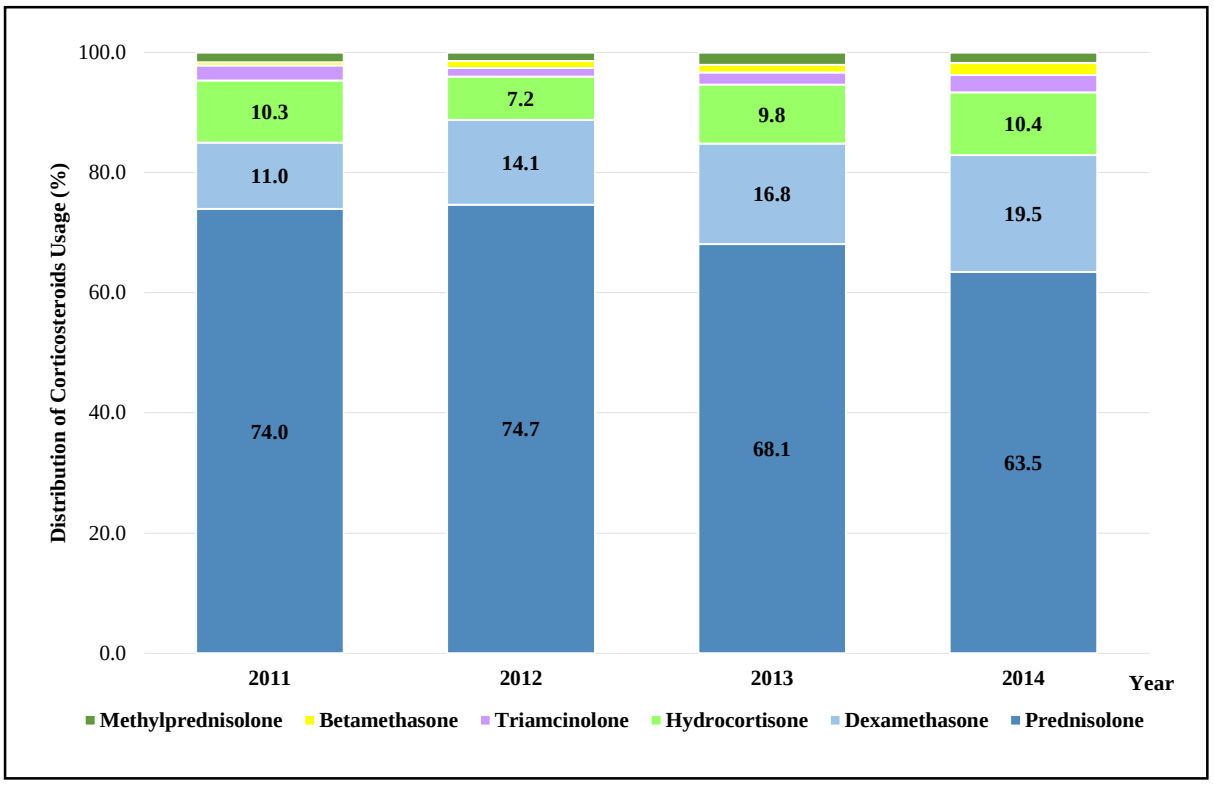

Figure 17.1: Proportion of corticosteroid usage, 2011-2014. Distribution of usage for triamcinolone, betamethasone and methylprednisolone in the same years in sequence are: Triamcinolone: 2.5%, 1.4%, 2.0%, 2.9%: Betamethasone: 0.6%, 1.2%, 1.3%, 2.0%; Methylprednisolone: 1.6%, 1.4%, 2.0%, 1.7%.

Table 17.2: Use of immunosuppressants (L04) from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
L04A	**Immunosuppressants**	**Public**	**0.3185**	**0.3845**	**0.4509**	**0.4721**
		Private	**0.1384**	**0.1388**	**0.1547**	**0.1579**
		Total	**0.4569**	**0.5233**	**0.6056**	**0.6300**
L04AA	**Selective immunosuppressants**	**Public**	**0.0477**	**0.0681**	**0.0939**	**0.0775**
		Private	**0.0267**	**0.0281**	**0.0291**	**0.0294**
		Total	**0.0743**	**0.0962**	**0.1229**	**0.1069**
L04AA03	Antilymphocyte immunoglobulin (horse)	Public	0.0001	0.0001	0.0002	0.0002
		Private	-	-	-	-
		Total	**0.0001**	**0.0001**	**0.0002**	**0.0002**
L04AA04	Antithymocyte immunoglobulin (rabbit)	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	-	-	-	-
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
L04AA06	Mycophenolic acid	Public	0.0228	0.0329	0.0375	0.0326
		Private	0.0174	0.0179	0.0183	0.0181
		Total	**0.0401**	**0.0508**	**0.0558**	**0.0507**
L04AA10	Sirolimus	Public	0.0002	0.0003	0.0002	0.0002
		Private	0.0003	0.0002	0.0001	0.0001
		Total	**0.0004**	**0.0005**	**0.0003**	**0.0004**
L04AA13	Leflunomide	Public	0.0239	0.0340	0.0552	0.0424
		Private	0.0073	0.0083	0.0092	0.0094
		Total	**0.0312**	**0.0423**	**0.0644**	**0.0518**
L04AA18	Everolimus	Public	< 0.0001	0.0004	0.0008	0.0017
		Private	0.0009	0.0013	0.0013	0.0016
		Total	**0.0010**	**0.0018**	**0.0021**	**0.0033**
L04AA23	Natalizumab	Public	-	-	-	0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**0.0001**
L04AA25	Eculizumab	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
L04AA26	Belimumab	Public	-	-	-	0.0001
		Private	-	-	0.0001	0.0001
		Total	**-**	**-**	**0.0001**	**0.0002**
L04AA27	Fingolimod	Public	-	-	< 0.0001	0.0002
		Private	-	-	< 0.0001	0.0001
		Total	**-**	**-**	**0.0001**	**0.0003**
L04AA34	Alemtuzumab	Public	0.0007	0.0003	-	-
		Private	0.0008	0.0003	-	-
		Total	**0.0015**	**0.0006**	**-**	**-**
L04AB	**Tumor necrosis factor alpha (TNF-a) inhibitors**	**Public**	**0.0014**	**0.0018**	**0.0026**	**0.0045**
		Private	**0.0042**	**0.0044**	**0.0052**	**0.0059**
		Total	**0.0055**	**0.0062**	**0.0078**	**0.0104**
L04AB01	Etanercept	Public	0.0005	0.0009	0.0009	0.0011
		Private	0.0007	0.0010	0.0013	0.0014
		Total	**0.0012**	**0.0019**	**0.0022**	**0.0025**
L04AB02	Infliximab	Public	0.0005	0.0002	0.0003	0.0013
		Private	0.0027	0.0027	0.0021	0.0022
		Total	**0.0032**	**0.0029**	**0.0024**	**0.0035**
L04AB04	Adalimumab	Public	0.0003	0.0007	0.0014	0.0018
		Private	0.0007	0.0007	0.0014	0.0015
		Total	**0.0010**	**0.0014**	**0.0028**	**0.0033**

Table 17.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
L04AB05	Certolizumab pegol	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
L04AB06	Golimumab	Public	-	-	< 0.0001	0.0003
		Private	-	< 0.0001	0.0003	0.0008
		Total	**-**	**< 0.0001**	**0.0003**	**0.0011**
L04AC	**Interleukin inhibitors**	**Public**	**0.0001**	**0.0003**	**0.0012**	**0.0032**
		Private	**0.0006**	**0.0013**	**0.0022**	**0.0023**
		Total	**0.0007**	**0.0016**	**0.0034**	**0.0055**
L04AC02	Basiliximab	Public	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Private	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**< 0.0001**	**< 0.0001**	**< 0.0001**	**< 0.0001**
L04AC05	Ustekinumab	Public	-	0.0001	0.0010	0.0028
		Private	0.0001	0.0007	0.0012	0.0012
		Total	**0.0001**	**0.0008**	**0.0022**	**0.0040**
L04AC07	Tocilizumab	Public	0.0001	0.0001	0.0003	0.0004
		Private	0.0005	0.0006	0.0010	0.0012
		Total	**0.0006**	**0.0008**	**0.0012**	**0.0016**
L04AD	**Calcineurin inhibitors**	**Public**	**0.0435**	**0.0444**	**0.0517**	**0.0495**
		Private	**0.0062**	**0.0066**	**0.0071**	**0.0073**
		Total	**0.0497**	**0.0511**	**0.0588**	**0.0569**
L04AD01	Ciclosporin	Public	0.0290	0.0282	0.0344	0.0310
		Private	0.0032	0.0032	0.0037	0.0040
		Total	**0.0322**	**0.0313**	**0.0381**	**0.0350**
L04AD02	Tacrolimus	Public	0.0145	0.0163	0.0173	0.0186
		Private	0.0030	0.0035	0.0034	0.0033
		Total	**0.0175**	**0.0197**	**0.0208**	**0.0219**
L04AX	**Other immunosuppressants**	**Public**	**0.2260**	**0.2699**	**0.3015**	**0.3374**
		Private	**0.1007**	**0.0983**	**0.1112**	**0.1129**
		Total	**0.3267**	**0.3682**	**0.4127**	**0.4502**
L04AX01	Azathioprine	Public	0.0832	0.0886	0.0931	0.1197
		Private	0.0163	0.0174	0.0207	0.0211
		Total	**0.0995**	**0.1059**	**0.1137**	**0.1409**
L04AX02	Thalidomide	Public	0.0049	0.0096	0.0048	0.0083
		Private	0.0025	0.0032	0.0040	0.0032
		Total	**0.0075**	**0.0128**	**0.0087**	**0.0115**
L04AX03	Methotrexate	Public	0.1377	0.1716	0.2037	0.2093
		Private	0.0816	0.0774	0.0863	0.0881
		Total	**0.2193**	**0.2490**	**0.2899**	**0.2974**
L04AX04	Lenalidomide	Public	0.0001	0.0001	< 0.0001	< 0.0001
		Private	0.0002	0.0003	0.0003	0.0004
		Total	**0.0004**	**0.0004**	**0.0003**	**0.0004**

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CHAPTER 18: USE OF DRUGS FOR MUSCULOSKELETAL AND BONE DISORDERS

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Drugs that are used for musculoskeletal and bone disorders generally can be classified under:

1) Anti-inflammatory and antirheumatic products
2) Drugs for treatment of bone disease
3) Muscle relaxants

Anti-inflammatory and muscle relaxants drugs usage were ranked as 11th and 36th respectively in top 50 therapeutic groups in Malaysia in 2014 (12.77431 DDD/1,000 inhabitants/day and 1.0929 DDD/1,000 inhabitants/day respectively) with estimated 1.28% and 0.11% population utilising them (Table 18.2). Whereas, drugs for treatment of bone disease was ranked as 41 in top 50 therapeutic groups in Malaysia in 2014 (0.9230 DDD/1,000 inhabitants/day) estimated 0.09% population utilising it.

Overall, the usage of drugs for musculoskeletal and bone disorders generally showed an increasing trend from 2010 to 2014. Anti-inflammatory and antirheumatic drugs have the highest increment followed by muscle relaxant and drugs for treatment of bone disease.

NSAIDs are usually used for the treatment of acute or chronic conditions where pain and inflammation are present. Use of NSAIDs increases the risk of having a range of gastrointestinal problems thus limits its use as long term treatment. The top three drugs used in 2014 were diclofenac (3.9591 DDD/1,000 inhabitants/day), followed by mefenamic acid (2.7791 DDD/1,000 inhabitants/day) and celecoxib (1.5577 DDD/1,000 inhabitants/day).

In contrast with Malaysian Statistics On Medicines 2009-2010[1], the trend of Coxibs usage from 2011 to 2014 has been increasing with parecoxib show the highest increment of 92.3% and this mostly contributed by the private sector. Similar trend also shown by the use of indomethacin in private sector which shows an increment of 40.6%, however, indomethacin usage decreases 51.4% in public sector. Thus, the overall decrement for indomethacin usage is 29.4%. The use of meloxicam also shows increasing trend with 34.7% increment, mainly contributed by the private sector.

Drugs for treatment of bone diseases that are commonly used are vitamin D and analogues, bisphosphonates and biphospohonates, combinations groups. In vitamin D and analogues group, calcitriol is the commonly used with double increment trend from year 2011 to 2014 (0.5330 to 0.9002 DDD/1,000 inhabitants/day) (Table 18.1). Whilst in bisphosphonates, combinations group, the most commonly used drug in 2014 is alendronic acid and colecalciferol (0.3481 DDD/1,000 inhabitants/day). Latest product that was introduced in 2012 is denosumab which shows tremendous increase of usage within 3 years (0.0052 to 0.1366 DDD/1,000 inhabitants/day). In Australia the top three drugs used for treatment of bone disease are denosumab, biphosphonate and calcitriol whereby in Malaysia the usage is reciprocally[2].

The most commonly muscle relaxant used were eperisone followed by baclofen and orphenadrine. Both eperisone and baclofen shows an increment while orphenadrine shows decreasing trend over 4 years. Baclofen has highest increment about 60.4% (0.0676 to 0.1084 DDD/1,000 inhabitants/day), whilst eperisone increment was 27.6% (0.1770 to 0.2259 DDD/1,000 inhabitants/day). Orphenadrine showed a decreasing trend about 42.7% (0.0947 to 0.0542 DDD/1,000 inhabitants/day).

The overall usage of anti-inflammatory and antirheumatic products, non-steroid (M01A) in Malaysia is the lowest among OECD countries as shown in the Figure 18.1. In comparison to Australia 22.3 DDD/1,000 inhabitants/day and Finland 79 DDD/1,000 inhabitants/day the usage in Malaysia was only 12.77 DDD/1,000 inhabitants/day[2,3].

Table 18.1: Use of vitamin D and analogues, selective oestrogen receptor modulators and agents for calcium homeostasis from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
A11	**Vitamins**									
A11C	**Vitamin A and D, including combinations of the two**									
A11CC	**Vitamin D and analogues**	**Public**	**0.7486**	**0.7766**	**1.0260**	**1.1424**	**0.2732**	**0.2835**	**0.3745**	**0.4170**
		Private	**0.1002**	**0.1124**	**0.1003**	**0.1195**	**0.0366**	**0.0410**	**0.0366**	**0.0436**
		Total	**0.8488**	**0.8890**	**1.1263**	**1.2619**	**0.3098**	**0.3245**	**0.4111**	**0.4606**
A11CC03	Alfacalcidol	Public	0.2774	0.2856	0.2918	0.3132	0.1013	0.1042	0.1065	0.1143
		Private	0.0369	0.0383	0.0223	0.0236	0.0135	0.0140	0.0081	0.0086
		Total	**0.3143**	**0.3239**	**0.3141**	**0.3367**	**0.1147**	**0.1182**	**0.1146**	**0.1229**
A11CC04	Calcitriol	Public	0.4697	0.4870	0.7318	0.8043	0.1715	0.1778	0.2671	0.2936
		Private	0.0633	0.0740	0.0780	0.0959	0.0231	0.0270	0.0285	0.0350
		Total	**0.5330**	**0.5610**	**0.8098**	**0.9002**	**0.1946**	**0.2048**	**0.2956**	**0.3286**
A11CC05	Colecalciferol	Public	0.0015	0.0040	0.0023	0.0250	0.0005	0.0015	0.0009	0.0091
		Private	-	-	-	-	-	-	-	-
		Total	**0.0015**	**0.0040**	**0.0023**	**0.0250**	**0.0005**	**0.0015**	**0.0009**	**0.0091**
G03	**Sex hormones and modulators of the genital system**									
G03X	**Other sex hormones and modulators of the genital system**									
G03XC	**Selective estrogen receptor modulators**									
G03XC01	Raloxifene	Public	0.0545	0.0479	0.0334	0.0404	0.0199	0.0175	0.0122	0.0147
		Private	0.0653	0.0596	0.0607	0.0517	0.0238	0.0217	0.0222	0.0189
		Total	**0.1198**	**0.1075**	**0.0942**	**0.0921**	**0.0437**	**0.0392**	**0.0344**	**0.0336**
H05	**Calcium homeostasis**	**Public**	**0.0041**	**0.0061**	**0.0027**	**0.0028**	**0.0015**	**0.0022**	**0.0010**	**0.0010**
		Private	**0.0133**	**0.0144**	**0.0169**	**0.0172**	**0.0049**	**0.0053**	**0.0062**	**0.0063**
		Total	**0.0174**	**0.0205**	**0.0196**	**0.0200**	**0.0064**	**0.0075**	**0.0072**	**0.0073**
H05A	**Parathyroid hormones and analogues**									
H05AA	**Parathyroid hormones and analogues**									
H05AA02	Teriparatide	Public	-	0.0001	0.0001	0.0001	-	< 0.0001	< 0.0001	< 0.0001
		Private	0.0102	0.0113	0.0139	0.0152	0.0037	0.0041	0.0051	0.0055
		Total	**0.0102**	**0.0114**	**0.0140**	**0.0153**	**0.0037**	**0.0041**	**0.0051**	**0.0056**

Table 18.1: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
H05B	**Anti-parathyroid agents**									
H05BA	**Calcitonin preparations**									
H05BA01	Calcitonin (salmon synthetic)	Public	0.0041	0.0060	0.0026	0.0027	0.0015	0.0022	0.0010	0.0010
		Private	0.0031	0.0031	0.0030	0.0020	0.0011	0.0011	0.0011	0.0007
		Total	**0.0073**	**0.0091**	**0.0056**	**0.0048**	**0.0027**	**0.0033**	**0.0020**	**0.0017**

Table 18.2: Use of agents for neuromuscular and bone disease disorders from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M01	**Antiinflammatory and antirheumatic products**	**Public**	**2.8995**	**2.8779**	**3.0119**	**3.1336**	**1.0583**	**1.0504**	**1.0993**	**1.1438**
		Private	**8.2631**	**10.1383**	**10.0552**	**9.6405**	**3.0160**	**3.7005**	**3.6702**	**3.5188**
		Total	**11.1626**	**13.0162**	**13.0671**	**12.7741**	**4.0743**	**4.7509**	**4.7695**	**4.6626**
M01A	**Antiinflammatory and antirheumatic products, non-steroids**	**Public**	**2.8975**	**2.8751**	**3.0073**	**3.1308**	**1.0576**	**1.0494**	**1.0977**	**1.1427**
		Private	**8.2619**	**10.1367**	**10.0537**	**9.6389**	**3.0156**	**3.6999**	**3.6696**	**3.5182**
		Total	**11.1594**	**13.0118**	**13.0610**	**12.7697**	**4.0732**	**4.7493**	**4.7673**	**4.6609**
M01AB	**Acetic acid derivatives and related substances**	**Public**	**1.2783**	**1.1273**	**1.3074**	**1.2981**	**0.4666**	**0.4115**	**0.4772**	**0.4738**
		Private	**2.4292**	**3.4260**	**2.9035**	**2.8072**	**0.8867**	**1.2505**	**1.0598**	**1.0246**
		Total	**3.7075**	**4.5533**	**4.2109**	**4.1054**	**1.3532**	**1.6620**	**1.5370**	**1.4985**
M01AB01	Indometacin	Public	0.1270	0.0953	0.0659	0.0617	0.0463	0.0348	0.0241	0.0225
		Private	0.0396	0.0453	0.0345	0.0557	0.0144	0.0165	0.0126	0.0203
		Total	**0.1665**	**0.1406**	**0.1005**	**0.1175**	**0.0608**	**0.0513**	**0.0367**	**0.0429**
M01AB05	Diclofenac	Public	1.1511	1.0312	1.2404	1.2343	0.4202	0.3764	0.4527	0.4505
		Private	2.3560	3.3514	2.8426	2.7248	0.8599	1.2233	1.0376	0.9945
		Total	**3.5071**	**4.3827**	**4.0830**	**3.9591**	**1.2801**	**1.5997**	**1.4903**	**1.4451**
M01AB11	Acemetacin	Public	-	-	-	-	-	-	-	-
		Private	0.0336	0.0292	0.0263	0.0267	0.0123	0.0107	0.0096	0.0098
		Total	**0.0336**	**0.0292**	**0.0263**	**0.0267**	**0.0123**	**0.0107**	**0.0096**	**0.0098**

Table 18.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M01AB15	Ketorolac	Public	0.0002	0.0008	0.0011	0.0021	0.0001	0.0003	0.0004	0.0008
		Private	< 0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0002**	**0.0008**	**0.0012**	**0.0021**	**0.0001**	**0.0003**	**0.0004**	**0.0008**
M01AC	**Oxicams**	**Public**	**0.0525**	**0.0315**	**0.0768**	**0.0565**	**0.0192**	**0.0115**	**0.0280**	**0.0206**
		Private	**1.0504**	**1.1346**	**1.5019**	**1.3049**	**0.3834**	**0.4141**	**0.5482**	**0.4763**
		Total	**1.1029**	**1.1661**	**1.5787**	**1.3614**	**0.4025**	**0.4256**	**0.5762**	**0.4969**
M01AC01	Piroxicam	Public	0.0029	0.0031	0.0006	-	0.0010	0.0011	0.0002	-
		Private	0.4513	0.2788	0.5288	0.4941	0.1647	0.1018	0.1930	0.1804
		Total	**0.4542**	**0.2819**	**0.5295**	**0.4941**	**0.1658**	**0.1029**	**0.1933**	**0.1804**
M01AC02	Tenoxicam	Public	-	-	-	-	-	-	-	-
		Private	0.0150	0.0232	0.0172	0.0132	0.0055	0.0085	0.0063	0.0048
		Total	**0.0150**	**0.0232**	**0.0172**	**0.0132**	**0.0055**	**0.0085**	**0.0063**	**0.0048**
M01AC06	Meloxicam	Public	0.0496	0.0284	0.0761	0.0565	0.0181	0.0104	0.0278	0.0206
		Private	0.5841	0.8326	0.9558	0.7975	0.2132	0.3039	0.3489	0.2911
		Total	**0.6337**	**0.8610**	**1.0320**	**0.8541**	**0.2313**	**0.3143**	**0.3767**	**0.3117**
M01AE	**Propionic acid derivatives**	**Public**	**0.1447**	**0.1373**	**0.1506**	**0.1406**	**0.0528**	**0.0501**	**0.0550**	**0.0513**
		Private	**0.9718**	**0.9403**	**1.2649**	**1.2535**	**0.3547**	**0.3432**	**0.4617**	**0.4575**
		Total	**1.1165**	**1.0776**	**1.4155**	**1.3941**	**0.4075**	**0.3933**	**0.5167**	**0.5089**
M01AE01	Ibuprofen	Public	0.1069	0.1034	0.1101	0.1027	0.0390	0.0377	0.0402	0.0375
		Private	0.5155	0.4424	0.5804	0.5229	0.1882	0.1615	0.2119	0.1909
		Total	**0.6224**	**0.5459**	**0.6905**	**0.6256**	**0.2272**	**0.1992**	**0.2520**	**0.2283**
M01AE02	Naproxen	Public	0.0378	0.0339	0.0406	0.0380	0.0138	0.0124	0.0148	0.0139
		Private	0.4537	0.3895	0.5348	0.5693	0.1656	0.1422	0.1952	0.2078
		Total	**0.4916**	**0.4234**	**0.5753**	**0.6073**	**0.1794**	**0.1545**	**0.2100**	**0.2216**
M01AE03	Ketoprofen	Public	-	-	-	-	-	-	-	-
		Private	0.0025	0.0007	0.0002	-	0.0009	0.0003	0.0001	-
		Total	**0.0025**	**0.0007**	**0.0002**	**-**	**0.0009**	**0.0003**	**0.0001**	**-**
M01AE17	Dexketoprofen	Public	-	-	-	-	-	-	-	-
		Private	-	-	0.0067	0.0100	-	-	0.0025	0.0036
		Total	**-**	**-**	**0.0067**	**0.0100**	**-**	**-**	**0.0025**	**0.0036**

Table 18.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M01AE52	Naproxen and esomeprazole	Public	-	-	-	-	-	-	-	-
		Private	-	0.1077	0.1428	0.1514	-	0.0393	0.0521	0.0553
		Total	**-**	**0.1077**	**0.1428**	**0.1514**	**-**	**0.0393**	**0.0521**	**0.0553**
M01AG	**Fenamates**									
M01AG01	Mefenamic acid	Public	0.7549	0.7930	0.7795	0.8528	0.2755	0.2894	0.2845	0.3113
		Private	1.8615	2.4657	2.0062	1.9263	0.6794	0.9000	0.7322	0.7031
		Total	**2.6164**	**3.2587**	**2.7856**	**2.7791**	**0.9550**	**1.1894**	**1.0168**	**1.0144**
M01AH	**Coxibs**	**Public**	**0.6671**	**0.7860**	**0.6930**	**0.7827**	**0.2435**	**0.2869**	**0.2529**	**0.2857**
		Private	**1.9490**	**2.1702**	**2.3773**	**2.3469**	**0.7114**	**0.7921**	**0.8677**	**0.8566**
		Total	**2.6161**	**2.9561**	**3.0703**	**3.1296**	**0.9549**	**1.0790**	**1.1206**	**1.1423**
M01AH01	Celecoxib	Public	0.4738	0.5331	0.4715	0.5786	0.1729	0.1946	0.1721	0.2112
		Private	0.7539	0.8909	0.9329	0.9791	0.2752	0.3252	0.3405	0.3574
		Total	**1.2277**	**1.4240**	**1.4045**	**1.5577**	**0.4481**	**0.5198**	**0.5126**	**0.5686**
M01AH04	Parecoxib	Public	0.0029	0.0036	0.0043	0.0046	0.0011	0.0013	0.0016	0.0017
		Private	0.0191	0.0256	0.0313	0.0377	0.0070	0.0094	0.0114	0.0138
		Total	**0.0220**	**0.0293**	**0.0356**	**0.0423**	**0.0080**	**0.0107**	**0.0130**	**0.0154**
M01AH05	Etoricoxib	Public	0.1904	0.2492	0.2172	0.1996	0.0695	0.0910	0.0793	0.0728
		Private	1.1760	1.2536	1.4130	1.3301	0.4293	0.4576	0.5157	0.4855
		Total	**1.3664**	**1.5028**	**1.6301**	**1.5296**	**0.4987**	**0.5485**	**0.5950**	**0.5583**
M01C	**Specific antirheumatic agents**									
M01CC	**Penicillamine and similar agents**									
M01CC01	Penicillamine	Public	0.0020	0.0028	0.0045	0.0028	0.0007	0.0010	0.0017	0.0010
		Private	0.0012	0.0016	0.0015	0.0016	0.0004	0.0006	0.0006	0.0006
		Total	**0.0032**	**0.0044**	**0.0061**	**0.0044**	**0.0012**	**0.0016**	**0.0022**	**0.0016**
M03	**Muscle relaxants**									
M03B	**Muscle relaxants, centrally acting agents**	**Public**	**0.1086**	**0.1286**	**0.1479**	**0.1779**	**0.0396**	**0.0470**	**0.0540**	**0.0649**
		Private	**0.7926**	**0.8925**	**0.9962**	**0.9150**	**0.2893**	**0.3258**	**0.3636**	**0.3340**
		Total	**0.9013**	**1.0211**	**1.1440**	**1.0929**	**0.3290**	**0.3727**	**0.4176**	**0.3989**

Table 18.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M03BB	**Oxazol, thiazine, and triazine derivatives**									
M03BB03	Chlorzoxazone	Public	-	-	-	-	-	-	-	-
		Private	0.0271	0.0804	0.1133	0.0958	0.0099	0.0294	0.0414	0.0350
		Total	**0.0271**	**0.0804**	**0.1133**	**0.0958**	**0.0099**	**0.0294**	**0.0414**	**0.0350**
M03BC	**Ethers, chemically close to antihistamines**	**Public**	**0.0024**	**0.0033**	**0.0033**	**0.0060**	**0.0009**	**0.0012**	**0.0012**	**0.0022**
		Private	**0.6271**	**0.6624**	**0.7164**	**0.6566**	**0.2289**	**0.2418**	**0.2615**	**0.2396**
		Total	**0.6296**	**0.6657**	**0.7196**	**0.6626**	**0.2298**	**0.2430**	**0.2627**	**0.2418**
M03BC01	Orphenadrine (citrate)	Public	0.0024	0.0033	0.0033	0.0060	0.0009	0.0012	0.0012	0.0022
		Private	0.0922	0.0567	0.0466	0.0481	0.0337	0.0207	0.0170	0.0176
		Total	**0.0947**	**0.0599**	**0.0499**	**0.0542**	**0.0346**	**0.0219**	**0.0182**	**0.0198**
M03BC51	Orphenadrine, combinations	Public	-	-	-	-	-	-	-	-
		Private	0.5349	0.6057	0.6698	0.6084	0.1952	0.2211	0.2445	0.2221
		Total	**0.5349**	**0.6057**	**0.6698**	**0.6084**	**0.1952**	**0.2211**	**0.2445**	**0.2221**
M03BX	**Other centrally acting agents**	**Public**	**0.1062**	**0.1254**	**0.1446**	**0.1719**	**0.0388**	**0.0458**	**0.0528**	**0.0627**
		Private	**0.1384**	**0.1496**	**0.1665**	**0.1626**	**0.0505**	**0.0546**	**0.0608**	**0.0594**
		Total	**0.2446**	**0.2750**	**0.3111**	**0.3345**	**0.0893**	**0.1004**	**0.1136**	**0.1221**
M03BX01	Baclofen	Public	0.0615	0.0693	0.0872	0.1035	0.0225	0.0253	0.0318	0.0378
		Private	0.0061	0.0057	0.0058	0.0049	0.0022	0.0021	0.0021	0.0018
		Total	**0.0676**	**0.0751**	**0.0930**	**0.1084**	**0.0247**	**0.0274**	**0.0339**	**0.0396**
M03BX02	Tizanidine	Public	-	-	-	0.0003	-	-	-	0.0001
		Private	-	-	-	-	-	-	-	-
		Total	**-**	**-**	**-**	**0.0003**	**-**	**-**	**-**	**0.0001**
M03BX09	Eperisone	Public	0.0447	0.0560	0.0574	0.0681	0.0163	0.0205	0.0210	0.0249
		Private	0.1323	0.1439	0.1608	0.1578	0.0483	0.0525	0.0587	0.0576
		Total	**0.1770**	**0.2000**	**0.2182**	**0.2259**	**0.0646**	**0.0730**	**0.0796**	**0.0824**
M04	**Antigout preparations**									
M04A	**Antigout preparations**	**Public**	**0.9254**	**0.8398**	**1.0477**	**1.0931**	**0.3378**	**0.3065**	**0.3824**	**0.3990**
		Private	**0.8085**	**0.9562**	**0.9497**	**1.1432**	**0.2951**	**0.3490**	**0.3466**	**0.4173**
		Total	**1.7339**	**1.7960**	**1.9973**	**2.2364**	**0.6329**	**0.6555**	**0.7290**	**0.8163**

Table 18.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M04AA	**Preparations inhibiting uric acid production**	**Public**	**0.8768**	**0.7284**	**0.8136**	**0.9519**	**0.3200**	**0.2659**	**0.2970**	**0.3474**
		Private	**0.4872**	**0.4800**	**0.5231**	**0.5089**	**0.1778**	**0.1752**	**0.1909**	**0.1858**
		Total	**1.3640**	**1.2083**	**1.3367**	**1.4608**	**0.4979**	**0.4410**	**0.4879**	**0.5332**
M04AA01	Allopurinol	Public	0.8768	0.7283	0.8133	0.9513	0.3200	0.2658	0.2969	0.3472
		Private	0.4806	0.4669	0.5049	0.4797	0.1754	0.1704	0.1843	0.1751
		Total	**1.3574**	**1.1951**	**1.3182**	**1.4310**	**0.4955**	**0.4362**	**0.4811**	**0.5223**
M04AA03	Febuxostat	Public	< 0.0001	0.0001	0.0002	0.0006	< 0.0001	< 0.0001	0.0001	0.0002
		Private	-	-	-	-	-	-	-	-
		Total	**< 0.0001**	**0.0001**	**0.0002**	**0.0006**	**< 0.0001**	**< 0.0001**	**0.0001**	**0.0002**
M04AA51	Allopurinol, combinations	Public	-	-	0.0001	-	-	-	0.0001	-
		Private	0.0066	0.0131	0.0182	0.0293	0.0024	0.0048	0.0067	0.0107
		Total	**0.0066**	**0.0131**	**0.0184**	**0.0293**	**0.0024**	**0.0048**	**0.0067**	**0.0107**
M04AB	**Preparations increasing uric acid excretion**	**Public**	**0.0009**	**0.0017**	**0.0022**	**0.0026**	**0.0003**	**0.0006**	**0.0008**	**0.0010**
		Private	**0.0077**	**0.0078**	**0.0097**	**0.0106**	**0.0028**	**0.0029**	**0.0035**	**0.0039**
		Total	**0.0086**	**0.0095**	**0.0119**	**0.0133**	**0.0031**	**0.0035**	**0.0043**	**0.0048**
M04AB01	Probenecid	Public	0.0009	0.0017	0.0022	0.0026	0.0003	0.0006	0.0008	0.0010
		Private	0.0077	0.0078	0.0089	0.0085	0.0028	0.0029	0.0033	0.0031
		Total	**0.0086**	**0.0095**	**0.0112**	**0.0111**	**0.0031**	**0.0035**	**0.0041**	**0.0040**
M04AB03	Benzbromarone	Public	-	-	-	-	-	-	-	-
		Private	-	-	0.0007	0.0022	-	-	0.0003	0.0008
		Total	**-**	**-**	**0.0007**	**0.0022**	**-**	**-**	**0.0003**	**0.0008**
M04AC	**Preparations with no effect on uric acid metabolism**									
M04AC01	Colchicine	Public	0.0477	0.1097	0.2318	0.1386	0.0174	0.0400	0.0846	0.0506
		Private	0.3136	0.4684	0.4169	0.6237	0.1145	0.1710	0.1522	0.2276
		Total	**0.3613**	**0.5781**	**0.6487**	**0.7623**	**0.1319**	**0.2110**	**0.2368**	**0.2782**
M05	**Drugs for treatment of bone diseases**									
M05B	**Drugs affecting bone structure and mineralization**	**Public**	**0.2307**	**0.2804**	**0.2992**	**0.3133**	**0.0842**	**0.1024**	**0.1092**	**0.1144**
		Private	**0.5829**	**0.5056**	**0.6074**	**0.6097**	**0.2128**	**0.1845**	**0.2217**	**0.2225**
		Total	**0.8136**	**0.7860**	**0.9066**	**0.9230**	**0.2970**	**0.2869**	**0.3309**	**0.3369**

Table 18.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M05BA	**Bisphosphonates**	**Public**	**0.0473**	**0.0636**	**0.1111**	**0.1219**	**0.0173**	**0.0232**	**0.0405**	**0.0445**
		Private	**0.2160**	**0.1417**	**0.1690**	**0.1666**	**0.0788**	**0.0517**	**0.0617**	**0.0608**
		Total	**0.2633**	**0.2053**	**0.2801**	**0.2886**	**0.0961**	**0.0749**	**0.1022**	**0.1053**
M05BA01	Etidronic acid	Public	-	-	-	-	-	-	-	-
		Private	-	-	< 0.0001	-	-	-	< 0.0001	-
		Total	**-**	**-**	**< 0.0001**	**-**	**-**	**-**	**< 0.0001**	**-**
M05BA02	Clodronic acid	Public	0.0007	0.0010	0.0018	0.0003	0.0002	0.0004	0.0007	0.0001
		Private	0.0021	0.0014	0.0010	0.0008	0.0008	0.0005	0.0004	0.0003
		Total	**0.0028**	**0.0024**	**0.0028**	**0.0011**	**0.0010**	**0.0009**	**0.0010**	**0.0004**
M05BA03	Pamidronic acid	Public	0.0003	0.0004	0.0007	0.0004	0.0001	0.0002	0.0002	0.0001
		Private	< 0.0001	0.0001	< 0.0001	0.0001	< 0.0001	< 0.0001	< 0.0001	< 0.0001
		Total	**0.0003**	**0.0005**	**0.0007**	**0.0005**	**0.0001**	**0.0002**	**0.0003**	**0.0002**
M05BA04	Alendronic acid	Public	0.0338	0.0431	0.0815	0.0909	0.0124	0.0157	0.0297	0.0332
		Private	0.1296	0.0627	0.0918	0.0821	0.0473	0.0229	0.0335	0.0300
		Total	**0.1634**	**0.1059**	**0.1733**	**0.1731**	**0.0597**	**0.0386**	**0.0633**	**0.0632**
M05BA06	Ibandronic acid	Public	0.0123	0.0188	0.0269	0.0299	0.0045	0.0069	0.0098	0.0109
		Private	0.0540	0.0556	0.0564	0.0619	0.0197	0.0203	0.0206	0.0226
		Total	**0.0663**	**0.0744**	**0.0833**	**0.0918**	**0.0242**	**0.0271**	**0.0304**	**0.0335**
M05BA07	Risedronic acid	Public	-	-	-	-	-	-	-	-
		Private	0.0298	0.0216	0.0194	0.0214	0.0109	0.0079	0.0071	0.0078
		Total	**0.0298**	**0.0216**	**0.0194**	**0.0214**	**0.0109**	**0.0079**	**0.0071**	**0.0078**
M05BA08	Zoledronic acid	Public	0.0002	0.0003	0.0003	0.0004	0.0001	0.0001	0.0001	0.0001
		Private	0.0003	0.0004	0.0003	0.0003	0.0001	0.0001	0.0001	0.0001
		Total	**0.0005**	**0.0006**	**0.0006**	**0.0007**	**0.0002**	**0.0002**	**0.0002**	**0.0002**
M05BB	**Bisphosphonates, combinations**									
M05BB03	Alendronic acid and colecalciferol	Public	0.1798	0.2071	0.1740	0.1781	0.0656	0.0756	0.0635	0.0650
		Private	0.2433	0.2095	0.1968	0.1700	0.0888	0.0765	0.0718	0.0620
		Total	**0.4231**	**0.4166**	**0.3708**	**0.3481**	**0.1544**	**0.1521**	**0.1353**	**0.1271**
M05BX	**Other drugs affecting bone structure and mineralization**	**Public**	**0.0035**	**0.0097**	**0.0141**	**0.0133**	**0.0013**	**0.0035**	**0.0052**	**0.0048**
		Private	**0.1236**	**0.1544**	**0.2416**	**0.2731**	**0.0451**	**0.0563**	**0.0882**	**0.0997**
		Total	**0.1272**	**0.1640**	**0.2557**	**0.2863**	**0.0464**	**0.0599**	**0.0933**	**0.1045**

Table 18.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
M05BX03	Strontium ranelate	Public	0.0035	0.0097	0.0141	0.0108	0.0013	0.0035	0.0052	0.0039
		Private	0.1236	0.1491	0.1636	0.1389	0.0451	0.0544	0.0597	0.0507
		Total	**0.1272**	**0.1588**	**0.1777**	**0.1497**	**0.0464**	**0.0580**	**0.0648**	**0.0546**
M05BX04	Denosumab	Public	-	-	< 0.0001	0.0025	-	-	< 0.0001	0.0009
		Private	-	0.0052	0.0780	0.1341	-	0.0019	0.0285	0.0490
		Total	**-**	**0.0052**	**0.0780**	**0.1366**	**-**	**0.0019**	**0.0285**	**0.0499**

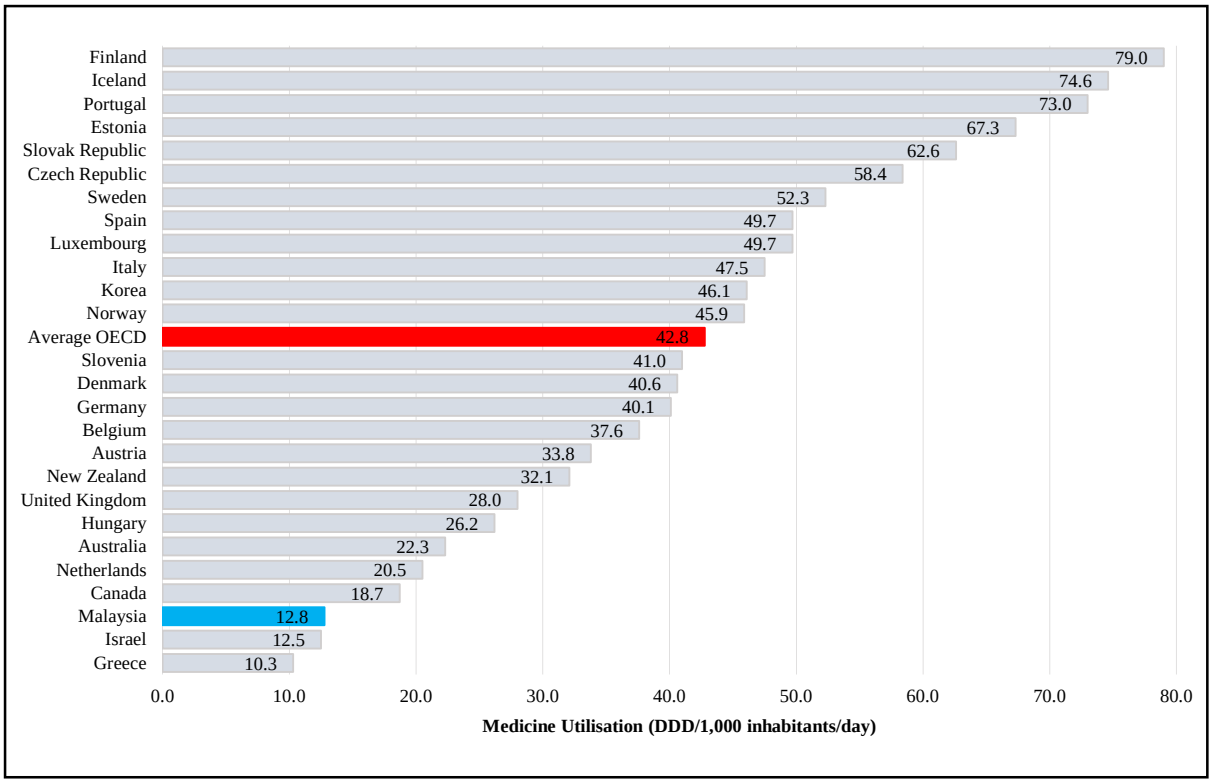

Figure 18.1: Utilisation of Anti-inflammatory and Antirheumatic products, non-steroids (M01A) in Malaysia and OECD Countries, 2014.

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CHAPTER 19: USE OF OPIOID ANALGESICS

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Drugs used for pain control belong to the following subgroups of the ATC classification: anti-inflammatory products, opioids, analgesics and antipyretics. This chapter covers only opioid analgesics.

The total opioid consumption in Malaysia had been fluctuating over the years, from 2011-2014. It has shown a drastic increase of 23.2% in 2012 compared to the year before (0.6061 and 0.4918 DDD/1,000 inhabitants/day, respectively). The usage has reduced by 4.5% in 2013 (0.5787 DDD/1,000 inhabitants/day) and increased again by 13.9% in 2014 (0.6594 DDD/1,000 inhabitants/day) (Table 19.1). Nevertheless, it is still very much lower than the opioid consumption in Norway, Finland and Australia, which recorded the usage of approximately 19.5, 16 and 10 DDD/1,000 inhabitants/day, respectively[1-9].

In year 2011 and 2012, the overall usage of opioid in both public and private sector were comparable (0.2429 vs. 0.2489 DDD/1,000 inhabitants/day and 0.3037 vs. 0.3024 DDD/1,000 inhabitants/day, respectively). However, a reducing trend in opioid use was seen in the private sector starting from 2013 while the usage in the public sector was rising.

Weak opioids (dihydrocodeine, tramadol and tramadol combinations) were more commonly used than strong opioids (morphine, oxycodone, pethidine and fentanyl) in Malaysia, comprised of approximately 87% of the total opioid consumption. A similar pattern was observed in Finland and Norway, where the consumption of weak opioids was much higher than strong opioids at an average of 78% and 73%, respectively[5-9]. However, an opposite trend of usage was seen with Australia, where the strong opioid use accounted for 60% of the total opioid consumption[1-4]. In Malaysia, the total amount of weak opioids consumed had gradually increased from 2011 to 2014 (0.4290 to 0.5788 DDD/1,000 inhabitants/day), except for a slight reduction of 6.3% seen in 2013 (0.5328 DDD/1,000 inhabitants/day in 2012 and 0.4990 DDD/1,000 inhabitants/day in 2013). This reduction was mainly due to the decrease in the use of dihydrocodeine in the private sector by 51.4%.

Tramadol and tramadol combinations are the most commonly used weak opioid product in this country where the consumption had been increased from 80% to 92.5% of the total weak opioid consumption over the 4 years. One possible reason that tramadol is the most commonly used weak opioid in Malaysia may be attributed by the fact that tramadol and its combinations are not controlled under the Dangerous Drugs Act (DDA) which makes it more accessible in public and private hospitals, clinics and retail pharmacies. However, a different trend was observed for Finland and Norway where the dihydrocodeine was accounted as the main weak opioid consumption, 76.5% and 73.5% of total weak opioid consumption, respectively[5-9].

While the strong opioid use remained low in Malaysia, the consumption trend had increased steadily from 2011 to 2014 with 0.0613, 0.0716, 0.0778 and 0.0790 DDD/1,000 inhabitants/day, respectively. A similar trend was observed in Finland and Norway[5-9]. Morphine is the most commonly used product for strong opioid, but the usage had reduced from 66% to 54.5% of the total strong opioid use over the 4 years. The factor that could contribute to this decrease is the availability of the newer strong opioid (oxycodone) where its consumption has increased by 52% in 2012 compared to the year before (0.0144 compared to 0.0094 DDD/1,000 inhabitants/day). The consumption of oxycodone & its combinations continued to rise further in 2013 and 2014 (0.0179 and 0.0187 DDD/1,000 inhabitants/day, respectively) with the availability of the new combination product with Naloxone, where it can help to reduce the gastrointestinal side effects. Both oxycodone and its combination has accounted for approximately 20% of the total strong opioid consumption. Unexpectedly, in year 2012, there was a sudden increase in another strong opioid, pethidine in the private sector (0.0040 to 0.0091 DDD/1,000 inhabitants/day) and it continued to increase to 0.0103 DDD/1,000 inhabitants/day in year 2014. This may be due to the lack of awareness in the safety profile of the drug especially with chronic use.

In conclusion, the overall usage of opioids in Malaysia is still very low compared to the first world countries. As there are few legal barriers to the use of opioids in Malaysia, this difference is most likely due to differences in the prescribing practices of physicians in Malaysia; the reasons for these differences may be related to education and awareness, myths and negative perceptions of opioid and fear of addiction. However, the consumption has increased steadily from 2011 to 2014, likely due to the increase in the number of the palliative care physicians and the expanded pain management services in the country.

Table 19.1: Use of opiod analgesics (N02A) from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N02A	**Opioids**	**Public**	**0.2429**	**0.3037**	**0.3175**	**0.3681**
		Private	**0.2489**	**0.3024**	**0.2612**	**0.2913**
		Total	**0.4918**	**0.6061**	**0.5787**	**0.6594**
N02AA	**Natural opium alkaloids**	**Public**	**0.0514**	**0.0523**	**0.0588**	**0.0580**
		Private	**0.0849**	**0.0731**	**0.0427**	**0.0473**
		Total	**0.1363**	**0.1254**	**0.1014**	**0.1053**
N02AA01	Morphine	Public	0.0365	0.0349	0.0389	0.0390
		Private	0.0041	0.0053	0.0047	0.0041
		Total	**0.0405**	**0.0402**	**0.0435**	**0.0431**
N02AA05	Oxycodone	Public	0.0056	0.0083	0.0099	0.0108
		Private	0.0038	0.0059	0.0071	0.0050
		Total	**0.0094**	**0.0143**	**0.0169**	**0.0158**
N02AA08	Dihydrocodeine	Public	0.0093	0.0090	0.0100	0.0071
		Private	0.0770	0.0618	0.0300	0.0365
		Total	**0.0863**	**0.0708**	**0.0400**	**0.0436**
N02AA55	Oxycodone, combinations	Public	-	-	0.0001	0.0012
		Private	-	0.0001	0.0009	0.0017
		Total	**-**	**0.0001**	**0.0010**	**0.0029**
N02AB	**Phenylpiperidine derivatives**	**Public**	**0.0066**	**0.0071**	**0.0067**	**0.0060**
		Private	**0.0048**	**0.0099**	**0.0097**	**0.0112**
		Total	**0.0114**	**0.0170**	**0.0164**	**0.0172**
N02AB02	Pethidine	Public	0.0052	0.0052	0.0048	0.0039
		Private	0.0040	0.0091	0.0089	0.0103
		Total	**0.0092**	**0.0143**	**0.0137**	**0.0142**
N02AB03	Fentanyl	Public	0.0014	0.0019	0.0020	0.0021
		Private	0.0008	0.0008	0.0008	0.0009
		Total	**0.0022**	**0.0027**	**0.0027**	**0.0030**
N02AF	**Morphinan derivatives**					
N02AF02	Nalbuphine	Public	0.0010	0.0010	0.0011	0.0009
		Private	0.0004	0.0007	0.0007	0.0008
		Total	**0.0015**	**0.0018**	**0.0018**	**0.0017**
N02AX	**Other opioids**	**Public**	**0.1839**	**0.2433**	**0.2509**	**0.3031**
		Private	**0.1588**	**0.2187**	**0.2082**	**0.2320**
		Total	**0.3427**	**0.4620**	**0.4590**	**0.5352**
N02AX02	Tramadol	Public	0.1839	0.2433	0.2508	0.3030
		Private	0.0585	0.1115	0.1033	0.1183
		Total	**0.2424**	**0.3548**	**0.3542**	**0.4214**
N02AX52	Tramadol, combinations	Public	< 0.0001	< 0.0001	< 0.0001	0.0001
		Private	0.1003	0.1072	0.1048	0.1137
		Total	**0.1003**	**0.1072**	**0.1049**	**0.1138**

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CHAPTER 20: USE OF DRUGS FOR NEUROLOGICAL DISORDERS

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Four major categories of neurological drugs were analysed from 2011 to 2014. These include drugs for epilepsy, Parkinson's disease, migraine and other nervous system disorders. In general, antiepileptic drugs remained the most frequently prescribed group analysed. This is comparable to the pattern of procurement reported by the Finnish group[1]. Anti-vertigo preparations formed the second largest group of procured drugs followed by drugs for Parkinson disease.

Antiepileptic Drugs

The three most commonly prescribed antiepileptic drugs (AED) used from 2011 to 2014 were valproate acid, phenytoin and carbamazepine. Valproate acid and phenytoin showed a steady uptrend in usage. All three AEDs are well established as 1st line therapy and are widely available for both neurologists and physicians alike[2]. Valproate acid continues to be used not only for epilepsy, but also as prophylaxis for migraine and treatment for mood stabilization[3-5].

Among the 2nd line AEDs, gabapentin and levetiracetam lead the pack. Gabapentin however is even more widely utilised for neuropathic pain compared to epilepsy. Unfortunately the data is unable to differentiate the usage for the two indications[6]. Levetiracetam has seen a steady annual increase in usage, both in the private and public sector which may be attributed to its broad spectrum efficacy and specific mode of action unlike the other AEDs in this group[7]. The lowest usage of AEDs was noted to be ethosuximide, retigabine and sultiame.

Drugs ForParkinson's Disease

The main classes of parkinsonian drugs were levodopa (plus peripheral dopamine decarboxylase inhibitors), enzyme inhibitors (catechol-O-methyltransferase inhibitors and monoamine oxidase inhibitors) and dopamine agonists (ergot and non-ergot)[8]. While levodopa is the gold standard for antiparkinsonian therapy, however, anticholinergics top the group in terms of usage as it is recommended in tremor-predominant parkinsonism as well as dystonia and drug-induced extrapyramidal disorders[8,9].

Dopamine agonists remain the class of anti-parkinsonian drugs with the widest choice of formulations (immediate-release, controlled-release, patch formulation) and is the recommended first line therapy for young-onset early Parkinson's[8]. Among the dopamine agonists, pramipexole is the most commonly prescribed while the least used was apomorphine, being an injectable form it used either as rescue therapy or continuous infusion in advanced Parkinson's disease. Contrary to the increasing usage of most anti-parkinsonian drugs, piribedil has been an exception, showing a gentle decline from 2012 (0.0150 DDD/1,000 inhabitants/day) to 2014 (0.0066 DDD/1,000 inhabitants/day). This may be reflective of the prescribing practice based on available evidence.

Anti-Migraine Preparations

The usage of anti-migraine drugs in Malaysia dropped from 2011 to 2014. In acute therapy for migraine, sumatriptan utilisation has shown a reducing trend in from 2012 to 2014, while ergotamine was only prescribed in the private sector. Clonidine, as an off-label indication, is rarely used as a migraine prophylaxis in Malaysia.

For prophylaxis, flunarizine, a preferred drug, showed a reduction in usage over the years, while pizotifen showed a steady increment from 2011 to 2013, before reducing in 2014.

Other Nervous System Drugs

Other nervous system drugs were categorised as immunostimulants, anti-dementia drugs, anticholinesterases, anti-vertigo preparations, riluzole and tetrabenazine.

The total usage of both interferon beta 1a (Rebif) and interferon beta 1b (Betaferon) has remained relatively same over the years of 2011 to 2014. However, on closer review, a drop in usage in the private sector has seen a

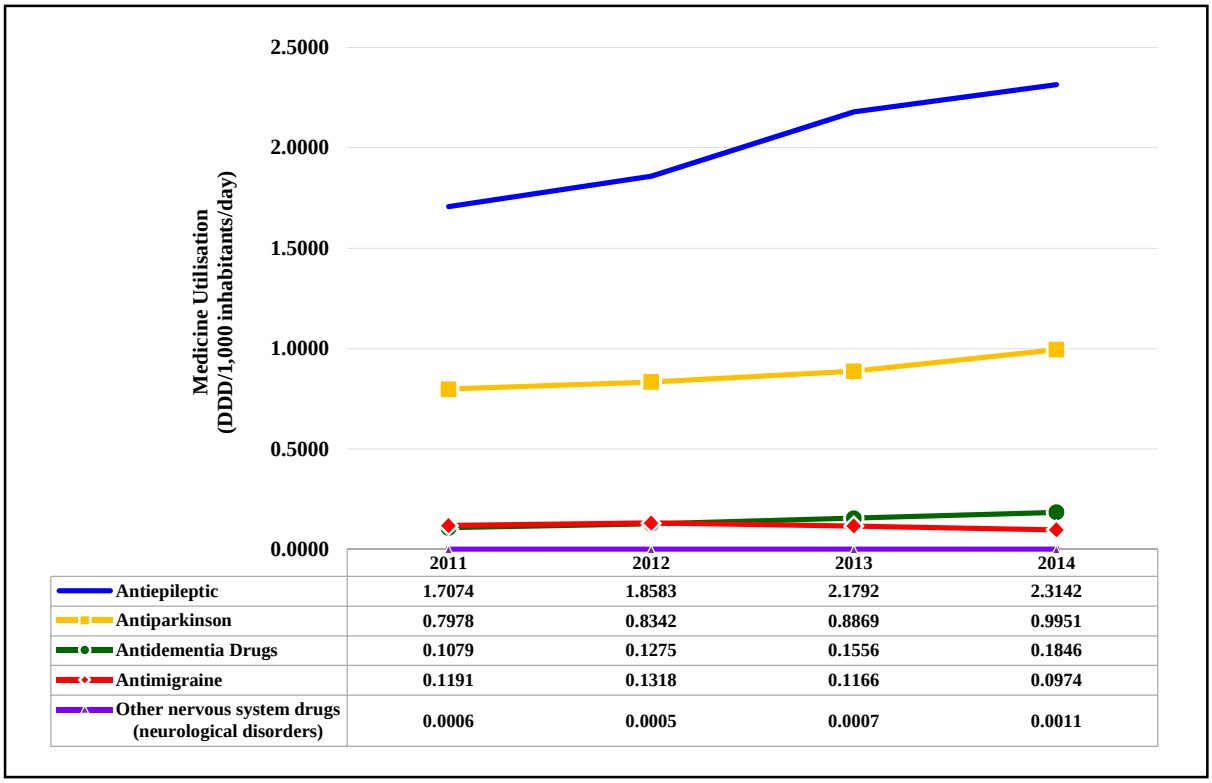
corresponding increase in usage in the public sector, reflective of economics influencing patients' decision to switch to public sector follow-up. This is consistent over the time period being analysed.

Anti-dementia drugs have shown a steady increase in usage in the 4 years analysed. This is seen in both public and private sectors, reflecting the aging population and treatment available for early dementia. Among the cholinesterase inhibitors, donepezil is the most prescribed, followed by rivastigmine. Galantamine is only available and used in the private sector. Memantine, as an adjunct, has also gradually increased, but more in the private sector than the public sector.

Among the anticholinesterase group, parenteral neostigmine usage in myasthenia gravis remained constant throughout the period analysed. This similar trend was also seen with pyridostigmine.

The anti-vertigo agent, betahistine, ranked higher than cinnarizine, despite it being prescribed only by specialists.

Usage of riluzole for motor neuron disease stood at 0.0001DDD/1,000 inhabitants/day in Malaysia from 2011 to 2013 and increased slightly in 2014 (0.0003 DDD/1,000 inhabitants/day) for the public sector. Tetrabenazine for hyperkinetic movement disorders and fampridine used in multiple sclerosis for improvement of gait, both showed 0.0001 DDD/1,000 inhabitants/day in 2014.



	2011	2012	2013	2014
Antiepileptic	1.7074	1.8583	2.1792	2.3142
Antiparkinson	0.7978	0.8342	0.8869	0.9951
Antidementia Drugs	0.1079	0.1275	0.1556	0.1846
Antimigraine	0.1191	0.1318	0.1166	0.0974
Other nervous system drugs (neurological disorders)	0.0006	0.0005	0.0007	0.0011

Figure 20.1: Use of drugs for neurological disorders.

Table 20.1: Use of drugs for neurological disorders, by therapeutic groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
L03	Immunostimulants	Public	0.0036	0.0036	0.0038	0.0054
		Private	0.0037	0.0016	0.0008	0.0010
		Total	**0.0073**	**0.0053**	**0.0046**	**0.0064**
N02	Analgesics	Public	0.0188	0.0324	0.0387	0.0260
		Private	0.1002	0.0993	0.0780	0.0714
		Total	**0.1191**	**0.1318**	**0.1166**	**0.0974**
N03	Antiepileptics	Public	1.4066	1.5104	1.8256	1.7866
		Private	0.3009	0.3479	0.3536	0.5276
		Total	**1.7074**	**1.8583**	**2.1792**	**2.3142**
N04	Anti-parkinson drugs	Public	0.6678	0.7081	0.7518	0.8481
		Private	0.1300	0.1261	0.1351	0.1471
		Total	**0.7978**	**0.8342**	**0.8869**	**0.9951**
N06	Psychoanaleptics	Public	0.0714	0.0826	0.1035	0.1282
		Private	0.0365	0.0449	0.0521	0.0564
		Total	**0.1079**	**0.1275**	**0.1556**	**0.1846**
N07	Other nervous system drugs	Public	0.4070	0.4829	0.4495	0.3475
		Private	0.6611	0.7990	0.8867	0.8471
		Total	**1.0681**	**1.2819**	**1.3362**	**1.1946**

Table 20.2: Use of drugs for treatment of migraine from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N02C	**Antimigraine preparations**	**Public**	**0.0188**	**0.0324**	**0.0387**	**0.0260**
		Private	**0.1002**	**0.0993**	**0.0780**	**0.0714**
		Total	**0.1191**	**0.1318**	**0.1166**	**0.0974**
N02CA	**Ergot alkaloids**					
N02CA52	Ergotamine, combinations excluding psycholeptics	Public	-	-	-	-
		Private	0.0833	0.0785	0.0554	0.0551
		Total	**0.0833**	**0.0785**	**0.0554**	**0.0551**
N02CC	**Selective serotonin (5HT1) agonists**					
N02CC01	Sumatriptan	Public	0.0026	0.0117	0.0083	0.0064
		Private	0.0070	0.0073	0.0083	0.0082
		Total	**0.0097**	**0.0190**	**0.0166**	**0.0147**
N02CX	**Other antimigraine preparations**	**Public**	**0.0162**	**0.0207**	**0.0303**	**0.0196**
		Private	**0.0099**	**0.0136**	**0.0143**	**0.0080**
		Total	**0.0261**	**0.0343**	**0.0446**	**0.0276**
N02CX01	Pizotifen	Public	0.0162	0.0206	0.0303	0.0195
		Private	0.0099	0.0136	0.0143	0.0080
		Total	**0.0261**	**0.0342**	**0.0446**	**0.0275**
N02CX02	Clonidine	Public	-	0.0001	-	0.0001
		Private	-	-	-	-
		Total	**-**	**0.0001**	**-**	**0.0001**

Table 20.3: Use of drugs for treatment of epilepsy from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N03A	**Antiepileptics**	**Public**	**1.4066**	**1.5104**	**1.8256**	**1.7866**
		Private	**0.3009**	**0.3479**	**0.3536**	**0.5276**
		Total	**1.7074**	**1.8583**	**2.1792**	**2.3142**
N03AA	**Barbiturates and derivatives**	**Public**	**0.0686**	**0.0609**	**0.0610**	**0.0650**
		Private	**0.0032**	**0.0107**	**0.0088**	**0.0022**
		Total	**0.0718**	**0.0716**	**0.0698**	**0.0672**
N03AA02	Phenobarbital	Public	0.0686	0.0603	0.0605	0.0649
		Private	0.0028	0.0106	0.0087	0.0020
		Total	**0.0714**	**0.0709**	**0.0692**	**0.0669**
N03AA03	Primidone	Public	0.0001	0.0006	0.0005	0.0001
		Private	0.0004	0.0001	0.0001	0.0002
		Total	**0.0004**	**0.0007**	**0.0006**	**0.0003**
N03AB	**Hydantoin derivatives**					
N03AB02	Phenytoin	Public	0.3996	0.4068	0.4354	0.4789
		Private	0.0559	0.0537	0.0490	0.0451
		Total	**0.4555**	**0.4606**	**0.4844**	**0.5240**
N03AD	**Succinimide derivatives**					
N03AD01	Ethosuximide	Public	-	-	< 0.0001	-
		Private	-	-	-	-
		Total	**-**	**-**	**< 0.0001**	**-**
N03AE	**Benzodiazepine derivatives**					
N03AE01	Clonazepam	Public	0.0519	0.0611	0.0626	0.0596
		Private	0.0333	0.0595	0.0507	0.0512
		Total	**0.0853**	**0.1206**	**0.1133**	**0.1108**
N03AF	**Carboxamide derivatives**	**Public**	**0.2525**	**0.2472**	**0.2546**	**0.2776**
		Private	**0.0344**	**0.0315**	**0.0277**	**0.0281**
		Total	**0.2869**	**0.2787**	**0.2823**	**0.3058**
N03AF01	Carbamazepine	Public	0.2519	0.2462	0.2529	0.2765
		Private	0.0294	0.0262	0.0218	0.0225
		Total	**0.2814**	**0.2724**	**0.2746**	**0.2990**
N03AF02	Oxcarbazepine	Public	0.0006	0.0008	0.0017	0.0009
		Private	0.0049	0.0053	0.0059	0.0056
		Total	**0.0055**	**0.0061**	**0.0075**	**0.0065**
N03AF03	Rufinamide	Public	-	0.0001	0.0001	0.0002
		Private	-	-	-	-
		Total	**-**	**0.0001**	**0.0001**	**0.0002**
N03AG	**Fatty acid derivatives**	**Public**	**0.4281**	**0.4813**	**0.5228**	**0.5772**
		Private	**0.0519**	**0.0562**	**0.0603**	**0.2316**
		Total	**0.4800**	**0.5375**	**0.5831**	**0.8088**
N03AG01	Valproic acid	Public	0.4278	0.4802	0.5214	0.5754
		Private	0.0517	0.0559	0.0601	0.2314
		Total	**0.4794**	**0.5361**	**0.5815**	**0.8068**
N03AG04	Vigabatrin	Public	0.0003	0.0010	0.0014	0.0018
		Private	0.0003	0.0003	0.0002	0.0002
		Total	**0.0006**	**0.0013**	**0.0016**	**0.0020**
N03AX	**Other antiepileptics**	**Public**	**0.2058**	**0.2531**	**0.4891**	**0.3283**
		Private	**0.1222**	**0.1363**	**0.1571**	**0.1694**
		Total	**0.3280**	**0.3894**	**0.6463**	**0.4977**

Table 20.3: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N03AX03	Sultiame	Public	-	-	0.0002	0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**0.0002**	**0.0001**
N03AX09	Lamotrigine	Public	0.0481	0.0369	0.3071	0.0486
		Private	0.0068	0.0071	0.0067	0.0076
		Total	**0.0550**	**0.0440**	**0.3138**	**0.0561**
N03AX11	Topiramate	Public	0.0372	0.0390	0.0161	0.0198
		Private	0.0026	0.0024	0.0025	0.0026
		Total	**0.0398**	**0.0415**	**0.0186**	**0.0224**
N03AX12	Gabapentin	Public	0.0727	0.1012	0.0657	0.1328
		Private	0.0444	0.0418	0.0398	0.0415
		Total	**0.1171**	**0.1430**	**0.1055**	**0.1742**
N03AX14	Levetiracetam	Public	0.0449	0.0672	0.0854	0.1050
		Private	0.0232	0.0233	0.0323	0.0357
		Total	**0.0681**	**0.0905**	**0.1176**	**0.1406**
N03AX15	Zonisamide	Public	-	-	0.0004	0.0007
		Private	0.0016	0.0023	0.0026	0.0021
		Total	**0.0016**	**0.0023**	**0.0031**	**0.0027**
N03AX16	Pregabalin	Public	0.0028	0.0087	0.0140	0.0206
		Private	0.0435	0.0594	0.0725	0.0790
		Total	**0.0463**	**0.0681**	**0.0865**	**0.0995**
N03AX17	Stiripentol	Public	< 0.0001	0.0001	0.0002	0.0004
		Private	-	-	-	-
		Total	**< 0.0001**	**0.0001**	**0.0002**	**0.0004**
N03AX18	Lacosamide	Public	-	-	< 0.0001	0.0004
		Private	-	-	0.0007	0.0011
		Total	**-**	**-**	**0.0007**	**0.0015**
N03AX21	Retigabine	Public	-	-	-	-
		Private	-	-	< 0.0001	-
		Total	**-**	**-**	**< 0.0001**	**-**

Table 20.4: Use of drugs for treatment of Parkinson disease from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N04A	**Anticholinergic agents**					
N04AA	**Tertiary amines**	**Public**	**0.4153**	**0.4509**	**0.4480**	**0.4948**
		Private	**0.0519**	**0.0407**	**0.0437**	**0.0483**
		Total	**0.4673**	**0.4916**	**0.4917**	**0.5430**
N04AA01	Trihexyphenidyl	Public	0.4150	0.4505	0.4478	0.4944
		Private	0.0519	0.0407	0.0437	0.0483
		Total	**0.4670**	**0.4912**	**0.4915**	**0.5427**
N04AA04	Procyclidine	Public	0.0003	0.0004	0.0002	0.0003
		Private	-	-	-	-
		Total	**0.0003**	**0.0004**	**0.0002**	**0.0003**
N04B	**Dopaminergic agents**	**Public**	**0.2524**	**0.2572**	**0.3038**	**0.3533**
		Private	**0.0781**	**0.0854**	**0.0914**	**0.0988**
		Total	**0.3305**	**0.3426**	**0.3952**	**0.4521**
N04BA	**Dopa and dopa derivatives**	**Public**	**0.1512**	**0.1465**	**0.1856**	**0.2282**
		Private	**0.0391**	**0.0473**	**0.0511**	**0.0536**
		Total	**0.1903**	**0.1938**	**0.2368**	**0.2818**

Table 20.4: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N04BA02	Levodopa and decarboxylase inhibitor	Public	0.1493	0.1419	0.1803	0.2217
		Private	0.0345	0.0422	0.0460	0.0486
		Total	**0.1838**	**0.1841**	**0.2263**	**0.2703**
N04BA03	Levodopa, decarboxylase inhibitor and COMT inhibitor	Public	0.0019	0.0047	0.0053	0.0065
		Private	0.0046	0.0051	0.0052	0.0051
		Total	**0.0065**	**0.0098**	**0.0105**	**0.0115**
N04BB	**Adamantane derivatives**					
N04BB01	Amantadine	Public	0.0106	0.0085	0.0167	0.0137
		Private	0.0077	0.0060	0.0074	0.0068
		Total	**0.0183**	**0.0145**	**0.0241**	**0.0205**
N04BC	**Dopamine agonists**	**Public**	**0.0206**	**0.0337**	**0.0325**	**0.0294**
		Private	**0.0133**	**0.0136**	**0.0138**	**0.0155**
		Total	**0.0339**	**0.0473**	**0.0464**	**0.0450**
N04BC04	Ropinirole	Public	0.0063	0.0074	0.0083	0.0039
		Private	0.0030	0.0038	0.0040	0.0060
		Total	**0.0093**	**0.0113**	**0.0124**	**0.0098**
N04BC05	Pramipexole	Public	0.0099	0.0136	0.0166	0.0195
		Private	0.0064	0.0063	0.0059	0.0061
		Total	**0.0163**	**0.0200**	**0.0225**	**0.0256**
N04BC07	Apomorphine	Public	-	-	-	< 0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**< 0.0001**
N04BC08	Piribedil	Public	0.0045	0.0120	0.0066	0.0039
		Private	0.0034	0.0030	0.0031	0.0027
		Total	**0.0079**	**0.0150**	**0.0096**	**0.0066**
N04BC09	Rotigotine	Public	-	0.0006	0.0010	0.0021
		Private	0.0005	0.0004	0.0009	0.0007
		Total	**0.0005**	**0.0010**	**0.0019**	**0.0029**
N04BD	**Monoamine oxidase B inhibitors**					
N04BD01	Selegiline	Public	0.0569	0.0537	0.0502	0.0648
		Private	0.0166	0.0174	0.0181	0.0221
		Total	**0.0735**	**0.0711**	**0.0683**	**0.0869**
N04BX	**Other dopaminergic agents**					
N04BX02	Entacapone	Public	0.0132	0.0148	0.0188	0.0172
		Private	0.0013	0.0011	0.0009	0.0008
		Total	**0.0145**	**0.0159**	**0.0197**	**0.0180**

Table 20.5: Use of drugs for treatment of dementia from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N06D	**Anti-dementia drugs**	**Public**	**0.0714**	**0.0826**	**0.1035**	**0.1282**
		Private	**0.0365**	**0.0449**	**0.0521**	**0.0564**
		Total	**0.1079**	**0.1275**	**0.1556**	**0.1846**
N06DA	**Anticholinesterases**	**Public**	**0.0676**	**0.0723**	**0.0889**	**0.1083**
		Private	**0.0233**	**0.0276**	**0.0305**	**0.0318**
		Total	**0.0909**	**0.0999**	**0.1195**	**0.1401**
N06DA02	Donepezil	Public	0.0371	0.0396	0.0598	0.0712
		Private	0.0142	0.0170	0.0197	0.0195
		Total	**0.0513**	**0.0566**	**0.0795**	**0.0907**
N06DA03	Rivastigmine	Public	0.0305	0.0327	0.0292	0.0372
		Private	0.0082	0.0098	0.0103	0.0120
		Total	**0.0387**	**0.0425**	**0.0395**	**0.0491**
N06DA04	Galantamine	Public	-	-	-	-
		Private	0.0009	0.0008	0.0005	0.0003
		Total	**0.0009**	**0.0008**	**0.0005**	**0.0003**
N06DX	**Other anti-dementia drugs**					
N06DX01	Memantine	Public	0.0038	0.0103	0.0146	0.0199
		Private	0.0132	0.0173	0.0216	0.0246
		Total	**0.0170**	**0.0276**	**0.0362**	**0.0445**

Table 20.6: Use of other drugs for treatment of neurological disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
L03A	**Immunostimulants**					
L03AB	**Interferons**	**Public**	**0.0036**	**0.0036**	**0.0038**	**0.0054**
		Private	**0.0037**	**0.0016**	**0.0008**	**0.0010**
		Total	**0.0073**	**0.0053**	**0.0046**	**0.0064**
L03AB07	Interferon beta-1a	Public	0.0035	0.0033	0.0034	0.0047
		Private	0.0031	0.0014	0.0006	0.0010
		Total	**0.0066**	**0.0047**	**0.0041**	**0.0057**
L03AB08	Interferon beta-1b	Public	0.0001	0.0003	0.0004	0.0007
		Private	0.0006	0.0003	0.0002	0.0001
		Total	**0.0007**	**0.0006**	**0.0005**	**0.0008**
N07A	**Parasympathomimetics**					
N07AA	**Anticholinesterases**	**Public**	**0.0769**	**0.0754**	**0.0786**	**0.0935**
		Private	**0.0137**	**0.0240**	**0.0186**	**0.0163**
		Total	**0.0905**	**0.0993**	**0.0972**	**0.1098**
N07AA01	Neostigmine	Public	0.0150	0.0155	0.0162	0.0191
		Private	0.0090	0.0177	0.0122	0.0081
		Total	**0.0240**	**0.0332**	**0.0284**	**0.0273**
N07AA02	Pyridostigmine	Public	0.0619	0.0599	0.0624	0.0743
		Private	0.0047	0.0062	0.0064	0.0082
		Total	**0.0666**	**0.0661**	**0.0688**	**0.0825**
N07C	**Antivertigo preparations**					
N07CA	**Antivertigo preparations**	**Public**	**0.3300**	**0.4075**	**0.3708**	**0.2536**
		Private	**0.6469**	**0.7746**	**0.8675**	**0.8302**
		Total	**0.9770**	**1.1821**	**1.2383**	**1.0838**

Table 20.6: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N07CA01	Betahistine	Public	0.2436	0.3199	0.3109	0.1804
		Private	0.3954	0.4983	0.6102	0.5368
		Total	**0.6390**	**0.8182**	**0.9210**	**0.7172**
N07CA02	Cinnarizine	Public	0.0686	0.0493	0.0451	0.0510
		Private	0.1629	0.1745	0.1888	0.2375
		Total	**0.2314**	**0.2239**	**0.2339**	**0.2886**
N07CA03	Flunarizine	Public	0.0179	0.0383	0.0148	0.0222
		Private	0.0886	0.1017	0.0686	0.0558
		Total	**0.1065**	**0.1400**	**0.0833**	**0.0780**
N07X	**Other nervous system drugs**					
N07XX	**Other nervous system drugs**	**Public**	**0.0001**	**-**	**0.0001**	**0.0005**
		Private	**0.0005**	**0.0005**	**0.0006**	**0.0006**
		Total	**0.0006**	**0.0005**	**0.0007**	**0.0011**
N07XX02	Riluzole	Public	0.0001	-	0.0001	0.0003
		Private	0.0005	0.0005	0.0006	0.0006
		Total	**0.0006**	**0.0005**	**0.0007**	**0.0009**
N07XX06	Tetrabenazine	Public	< 0.0001	-	-	0.0001
		Private	-	-	-	-
		Total	**< 0.0001**	**-**	**-**	**0.0001**
N07XX07	Fampridine	Public	-	-	-	0.0001
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**0.0001**

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CHAPTER 21: USE OF DRUGS FOR PSYCHIATRIC DISORDERS

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The National Health and Morbidity Survey (NHMS) 2015 showed a marked increase in prevalence of psychiatric morbidity, where 29.2% of adults suffered from mental health issues, a threefold increase from 10.6% in NHMS 1996[1]. Generally, in keeping with the increasing prevalence, there was an increased use of most drug classes being observed from 2011-2014, although the utilisation is still comparatively low. Antipsychotics are the main drugs being prescribed (3.3187 DDD/1,000 inhabitants/day) followed by antidepressants (2.2325 DDD/1,000 inhabitants/day) and anxiolytics hypnotics (1.0239 DDD/1,000 inhabitants/day).

The overall use of antipsychotics had increased by 23.1% in 2014 (3.3187 DDD/1,000 inhabitants/day) compared to 2011 (2.6966 DDD/1,000 inhabitants/day). Though typical antipsychotics predominates the pattern of utilisation, the trend is decreasing over 2011-2014 and the usage of atypical antipsychotics is increasing. It was noted that from 2011 to 2014, the most utilised antipsychotic was fluphenazine with DDD/1,000 inhabitants/day of 0.4865, 0.4935, 0.5440 and 0.5908 respectively, followed by risperidone. Usage of atypical antipsychotics also showed an increasing trend whereby utilisation in 2014 (1.3497 DDD/1,000 inhabitants/day) was 58.6% higher as compared to 2011 (0.8511/1,000 inhabitants/day). It was noted that risperidone was the most prescribed atypical antipsychotic with significant increase of 34.3% in 2014 compared to 2011.

Another interesting finding was that there was a steady increase in the utilisation of olanzapine. Its usage in 2014 was 55.2% higher compared to 2011. The increment was noted mainly in public as compared to private sector. This may be attributed to the reduction of the price of olanzapine in public sector during this period. Data from Australia in 2014 reported that the most used atypical antipsychotic was olanzapine (3.0919 DDD/1,000 inhabitants/day)[2] and it was also the most prescribed drug in Finland (5.96 DDD/1,000 inhabitants/day)[3].

In general, there was a drop of 5.8% in the overall usage of anxiolytics, hypnotics and sedatives class from 2011 (1.5635 DDD/1,000 inhabitants/day) to 2014 (1.4721 DDD/1,000 inhabitants/day). There was a surge of the drug use in 2012 (1.9960 DDD/1,000 inhabitants/day) before it came down again in the subsequent years. The private sector contributed to about three quarters (66.8% to 79.8%) of the total drug usage. However, the use in private sector had declined from 1.2470 DDD/1,000 inhabitants/day in 2011 to 0.9830 DDD/1,000 inhabitants/day in 2014. It was likely that this reduction was associated with effective enforcement to curb misuse.

Overall, alprazolam was the most commonly prescribed anxiolytic, hypnotics and sedatives drugs for the year 2011-2014. In addition, in 2011, the top three drugs, other than alprazolam were hydroxyzine, midazolam and zolpidem; while it was diazepam, hydroxyzine and zolpidem for the year 2012 to 2014. The use of anxiolytics, hypnotics and sedatives were very low compared to other developed countries. For example, in Finland, the DDD/1,000 inhabitants/day for 2014 for anxiolytics and hypnotics were 23 and 39 respectively[3].

Depressive and anxiety disorders are highly prevalent psychiatric illnesses, continually climbing up to be one of the leading causes of disease burden. Consumption of antidepressants from 2011-2014 might have reflected this increasing prevalence, by showing a steady increase of use; from 1.6027 DDD/1,000 inhabitants/day in 2011 to 2.2325 DDD/1,000 inhabitants/day in 2014. The proportion contributed by antidepressants was 22.8% in 2011 compared to 26.3% in 2014.

Overall, there is an increasing trend in the use of newer antidepressants namely Selective Serotonin Reuptake Inhibitors (SSRIs), Noradrenaline & Specific Serotonergic Antidepressant (NASSA), Serotonin-Norepinephrine Reuptake Inhibitor (SNRI) and Melatonergic Antidepressant. The use of much older antidepressants i.e. Tricyclic Antidepressant (TCA) and Monoamine Oxidase A Inhibitor (MAOI) groups showed either a decline or remained almost plateau.

Selective Serotonin Reuptake Inhibitors (SSRIs) was the leading antidepressant; the top three antidepressants were sertraline, fluvoxamine or escitalopram. In 2014, sertraline (0.5044 DDD/1,000 inhabitants/day) was the most used antidepressant followed by fluvoxamine (0.4327 DDD/1,000 inhabitants/day) and escitalopram

(0.4215 DDD/1,000 inhabitants/day). Fluoxetine use was lesser in comparison to these three SSRIs (0.2412 DDD/1,000 inhabitants/day) in 2014. Sertraline and fluvoxamine were used mainly in public compared to private sectors (e.g. 0.4339 vs 0.0705 DDD/1,000 inhabitants/day and 0.3904 vs 0.0423 DDD/1,000 inhabitants/day in 2014 respectively) while escitalopram seemed to be the SSRI of choice mainly in private more than in public sector (0.2518 vs 0.1697 DDD/1,000 inhabitants/day). This trend can be explained by the fact that sertraline and fluvoxamine are generically dispensed and available in all public health clinics. Both medications had been listed as 'B' in the category of prescribers in Ministry of Health Medicines Formulary where medical officers are authorized to initiate the prescription[4]. Sertraline's profile as one of the SSRIs with the least drug-drug interaction might have encouraged its use in special population such as the medically ill, and it is also being prescribed by non-psychiatric professionals.

For the non-SSRI, the top three most-used antidepressants in the year 2011-2014 were amitriptyline followed by mirtazapine and duloxetine. The high use of amitriptyline may be due to the fact that it is also used by many non-psychiatrists for various indications such as in neuropathic pain and migraine; alongside its use for psychiatric illnesses.

As a whole, utilisation of antidepressants is still very much lower in Malaysia (2.2325 DDD/1,000 inhabitants/day) as compared to developed countries such as Australia (100.215 DDD/1,000 inhabitants/day)[2] and Finland (68.8 DDD/1,000 inhabitants/day)[3] in 2014. Overall, 73.1% of Malaysian usage were for SSRI as compared to 57.7% of usage in Australia in 2014. Besides SSRI, usage of newer antidepressants were lesser, which may be explained by cost and access when only psychiatrists are authorized to prescribe.

Lithium usage was low in Malaysia. This was shown by the DDD/1,000 inhabitants/day ranging from 0.0019 to 0.0031 from 2011-2014. This observation might be due to the relatively poor accessibility for serum lithium monitoring in many hospitals. In addition, Malaysian psychiatrists also prefer to use sodium valproate as mood stabilizers. As a comparison, in Australia, for year 2014, the utilisation for lithium was 1.2773 DDD/1,000 inhabitants/day[2].

For the treatment of Attention Deficit Hyperactivity Disorder (ADHD), two groups of medications were compared in this survey i.e. methylphenidate and atomoxetine (0.0498 DDD/1,000 inhabitants/day). The usage of both had shown an increasing trend over the 4 years; and was much higher in the public sector. Methylphenidate was the main prescribed drug during this period and was showing an upward trend: from 0.0347 DDD/1,000 inhabitants/day in 2011 to 0.0450 DDD/1,000 inhabitants/day in 2014 which is a 29.7% increment. However, this is much lower than the 2014 usage in Australia (2.62 DDD/1,000 inhabitants/day)[2] and Finland (2.19 DDD/1,000 inhabitants/day)[3]. Atomoxetine was being used at a much lower rate in Malaysia; with 0.0048 DDD/1,000 inhabitants/day in 2014. This was also lower when comparing to 2014 data for Australia (0.106 DDD/1,000 inhabitants/day)[2] and Finland (0.11 DDD/1,000 inhabitants/day)[3]. In general, usage of medications of ADHD is very low. This may be contributed by the reluctance of parents to allow their children to take medications on a long-term basis.

Anti-dementia drugs showed a steady increment from 2011 to 2014 with overall increase of 71.1% (0.1079 DDD/1,000 inhabitants/day in 2011; 0.1846 DDD/1,000 inhabitants/day in 2014) in its consumption. In 2014, the most commonly utilised anti-dementia drug was donepezil (0.0907 DDD/1,000 inhabitants/day) followed by rivastigmine (0.0491 DDD/1,000 inhabitants/day), memantine (0.0445 DDD/1,000 inhabitants/day) and galantamine (0.0003 DDD/1,000 inhabitants/day). Galantamine was found to have reduction in its usage within the four-year period. In Australia, for the year 2014, donepezil also was most commonly used (1.1792 DDD/1,000 inhabitants/day) followed by galantamine (0.2956 DDD/1,000 inhabitants/day) and rivastigmine (0.1620 DDD/1,000 inhabitants/day)[2].

As a group, usage of drugs for addictive disorders had shown an increasing trend; from 1.0104 DDD/1,000 inhabitants/day in 2011 to 1.2417 DDD/1000 populaton/day in 2014. Methadone is the most widely prescribed agent in Addictive Disorders throughout the 4 years. The usage of public sector is much higher for example, in 2014 public sector contributed 83.8% (1.0075 DDD/1,000 inhabitants/day). This is rather high compared to Australia (0.37293 DDD/1,000 inhabitants/day)[2] and Finland (0.24 DDD/1,000 inhabitants/day)[3]. This may reflect the higher prevalence of heroin dependence in Malaysia compared to these countries. Medications for nicotine dependence is the second most-used group of drugs for addictive disorders; which is represented by Nicotine and Varenicline in this report. Usage of nicotine appears to be decreasing markedly from 2011 (0.0816 DDD/1,000 inhabitants/day) to 2014 (0.0191 DDD/1,000 inhabitants/day). It was also noted that the private sector contributed 92% (0.0175 DDD/1,000 inhabitants/day) of nicotine usage in 2014. In comparison, other countries have much higher usage: Australia (0.62651 DDD/1,000 inhabitants/day)[2]; and Finland (10.50

DDD/1,000 inhabitants/day)[3]. Varenicline usage had not shown much variation over the 4 years, though there is a slight downward trend (from 0.0190 DDD/1,000 inhabitants/day in 2011 to 0.0173 DDD/1,000 inhabitants/day in 2014). This is also lower than Australia (1.33 DDD/1,000 inhabitants/day)[2]; and Finland (0.23 DDD/1,000 inhabitants/day)[3]. Naltrexone (0.0029 DDD/1,000 inhabitants/day in 2014) is used at much lower rate. Meanwhile buprenorphine derivatives, which was mainly used by private sector, had shown a decreasing trend 0.0599 DDD/1,000 inhabitants/day in 2011 to nil in 2014.

In conclusion, psychiatric drug usage showed an increasing trend but it is still below what is seen in developed countries and low compared to high psychiatric morbidity in the country.

Table 21.1: Use of antipsychotics, anxiolytics, hypnotic and sedatives, by therapeutic group from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
N05	**Psycholeptics**	**Public**	**2.7776**	**3.3280**	**3.1591**	**3.5112**
		Private	**1.4825**	**1.7566**	**1.4250**	**1.2796**
		Total	**4.2601**	**5.0847**	**4.5841**	**4.7908**
N05A	**Antipsychotics**	**Public**	**2.4612**	**2.8015**	**2.6795**	**3.0222**
		Private	**0.2355**	**0.2872**	**0.2797**	**0.2965**
		Total	**2.6966**	**3.0887**	**2.9592**	**3.3187**
N05AA	Phenothiazines with aliphatic side-chain	Public	0.2591	0.2692	0.2394	0.2757
		Private	0.0109	0.0132	0.0117	0.0108
		Total	**0.2700**	**0.2824**	**0.2511**	**0.2865**
N05AB	Phenothiazines with piperazine structure	Public	0.7447	0.8038	0.8340	0.9196
		Private	0.1183	0.1474	0.1465	0.1747
		Total	**0.8630**	**0.9512**	**0.9805**	**1.0942**
N05AD	Butyrophenone derivatives	Public	0.3431	0.3040	0.2639	0.2202
		Private	0.0027	0.0168	0.0037	0.0012
		Total	**0.3458**	**0.3209**	**0.2676**	**0.2214**
N05AE	Indole derivatives	Public	0.0005	0.0004	0.0002	0.0004
		Private	0.0029	0.0019	0.0020	0.0017
		Total	**0.0034**	**0.0023**	**0.0022**	**0.0021**
N05AF	Thioxanthene derivatives	Public	0.1824	0.1707	0.1671	0.1754
		Private	0.0226	0.0214	0.0213	0.0199
		Total	**0.2049**	**0.1921**	**0.1885**	**0.1953**
N05AH	Diazepines, oxazepines, thiazepines and oxepines	Public	0.3410	0.4456	0.4617	0.5759
		Private	0.0385	0.0386	0.0393	0.0356
		Total	**0.3795**	**0.4842**	**0.5010**	**0.6115**
N05AL	Benzamides	Public	0.1704	0.2162	0.2043	0.2287
		Private	0.0148	0.0141	0.0137	0.0137
		Total	**0.1852**	**0.2302**	**0.2180**	**0.2423**
N05AN	Lithium	Public	0.0019	0.0031	0.0019	0.0018
		Private	-	-	-	0.0003
		Total	**0.0019**	**0.0031**	**0.0019**	**0.0022**
N05AX	Other antipsychotics	Public	0.4180	0.5884	0.5070	0.6244
		Private	0.0248	0.0338	0.0415	0.0388
		Total	**0.4428**	**0.6221**	**0.5485**	**0.6632**
N05B	**Anxiolytics**	**Public**	**0.2064**	**0.3709**	**0.3044**	**0.3283**
		Private	**0.8597**	**1.0788**	**0.7848**	**0.6955**
		Total	**1.0661**	**1.4497**	**1.0892**	**1.0239**
N05BA	Benzodiazepine derivatives	Public	0.1658	0.3178	0.2434	0.2573
		Private	0.6533	0.8249	0.5690	0.5459
		Total	**0.8190**	**1.1427**	**0.8124**	**0.8032**

Table 21.1: (*continued*)

ATC	Therapeutic Group	Sector	2011	2012	2013	2014
N05BB	Diphenylmethane derivatives	Public	0.0406	0.0531	0.0610	0.0710
		Private	0.2064	0.2539	0.2158	0.1496
		Total	**0.2470**	**0.3070**	**0.2768**	**0.2207**
N05C	**Hypnotics and sedatives**	**Public**	**0.1101**	**0.1556**	**0.1752**	**0.1607**
		Private	**0.3873**	**0.3907**	**0.3604**	**0.2875**
		Total	**0.4974**	**0.5463**	**0.5356**	**0.4482**
N05CD	Benzodiazepine derivatives	Public	0.0646	0.1015	0.1240	0.0869
		Private	0.2186	0.1447	0.1318	0.1125
		Total	**0.2832**	**0.2461**	**0.2558**	**0.1993**
N05CF	Benzodiazepine related drugs	Public	0.0411	0.0538	0.0477	0.0646
		Private	0.1686	0.2458	0.2285	0.1750
		Total	**0.2097**	**0.2997**	**0.2762**	**0.2395**
N05CH	Melatonin receptor agonists	Public	0.0041	-	0.0030	0.0087
		Private	-	-	-	-
		Total	**0.0041**	**-**	**0.0030**	**0.0087**
N05CM	Other hypnotics and sedatives	Public	0.0003	0.0003	0.0005	0.0006
		Private	0.0001	0.0002	0.0001	0.0001
		Total	**0.0004**	**0.0005**	**0.0006**	**0.0006**

Table 21.2: Use of antipsychotics, anxiolytics, hypnotic and sedatives from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N05A	**Antipsychotics**					
N05AA	**Phenothiazines with aliphatic side-chain**					
N05AA01	Chlorpromazine	Public	0.2591	0.2692	0.2394	0.2757
		Private	0.0109	0.0132	0.0117	0.0108
		Total	**0.2700**	**0.2824**	**0.2511**	**0.2865**
N05AB	**Phenothiazines with piperazine structure**	**Public**	**0.7447**	**0.8038**	**0.8340**	**0.9196**
		Private	**0.1183**	**0.1474**	**0.1465**	**0.1747**
		Total	**0.8630**	**0.9512**	**0.9805**	**1.0942**
N05AB02	Fluphenazine	Public	0.4845	0.4811	0.5346	0.5604
		Private	0.0019	0.0125	0.0094	0.0304
		Total	**0.4865**	**0.4935**	**0.5440**	**0.5908**
N05AB03	Perphenazine	Public	0.0306	0.0222	0.0178	0.0112
		Private	0.0399	0.0298	0.0309	0.0233
		Total	**0.0704**	**0.0520**	**0.0487**	**0.0345**
N05AB04	Prochlorperazine	Public	0.1790	0.2686	0.2430	0.3027
		Private	0.0745	0.1033	0.1045	0.1135
		Total	**0.2536**	**0.3718**	**0.3475**	**0.4162**
N05AB06	Trifluoperazine	Public	0.0506	0.0320	0.0386	0.0452
		Private	0.0020	0.0019	0.0017	0.0074
		Total	**0.0526**	**0.0338**	**0.0403**	**0.0527**
N05AD	**Butyrophenone derivatives**					
N05AD01	Haloperidol	Public	0.3431	0.3040	0.2639	0.2202
		Private	0.0027	0.0168	0.0037	0.0012
		Total	**0.3458**	**0.3209**	**0.2676**	**0.2214**
N05AE	**Indole derivatives**	**Public**	**0.0005**	**0.0004**	**0.0002**	**0.0004**
		Private	**0.0029**	**0.0019**	**0.0020**	**0.0017**
		Total	**0.0034**	**0.0023**	**0.0022**	**0.0021**

Table 21.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N05AE03	Sertindole	Public	-	-	-	-
		Private	0.0007	0.0004	0.0004	< 0.0001
		Total	**0.0007**	**0.0004**	**0.0004**	**< 0.0001**
N05AE04	Ziprasidone	Public	0.0005	0.0004	0.0002	0.0004
		Private	0.0022	0.0015	0.0016	0.0017
		Total	**0.0027**	**0.0019**	**0.0018**	**0.0021**
N05AF	**Thioxanthene derivatives**	**Public**	**0.1824**	**0.1707**	**0.1671**	**0.1754**
		Private	**0.0226**	**0.0214**	**0.0213**	**0.0199**
		Total	**0.2049**	**0.1921**	**0.1885**	**0.1953**
N05AF01	Flupentixol	Public	0.0711	0.0792	0.0884	0.1037
		Private	0.0139	0.0133	0.0129	0.0121
		Total	**0.0849**	**0.0925**	**0.1013**	**0.1158**
N05AF05	Zuclopenthixol	Public	0.1113	0.0916	0.0787	0.0717
		Private	0.0087	0.0081	0.0085	0.0078
		Total	**0.1200**	**0.0997**	**0.0871**	**0.0796**
N05AH	**Diazepines, oxazepines, thiazepines and oxepines**	**Public**	**0.3410**	**0.4456**	**0.4617**	**0.5759**
		Private	**0.0385**	**0.0386**	**0.0393**	**0.0356**
		Total	**0.3795**	**0.4842**	**0.5010**	**0.6115**
N05AH02	Clozapine	Public	0.0878	0.1180	0.0951	0.1361
		Private	0.0013	0.0017	0.0015	0.0012
		Total	**0.0890**	**0.1197**	**0.0967**	**0.1374**
N05AH03	Olanzapine	Public	0.1865	0.2254	0.2487	0.3073
		Private	0.0206	0.0190	0.0188	0.0141
		Total	**0.2071**	**0.2444**	**0.2675**	**0.3215**
N05AH04	Quetiapine	Public	0.0668	0.1021	0.1175	0.1316
		Private	0.0165	0.0154	0.0155	0.0167
		Total	**0.0833**	**0.1175**	**0.1330**	**0.1482**
N05AH05	Asenapine	Public	-	<0.0001	0.0003	0.0009
		Private	0.0001	0.0025	0.0035	0.0035
		Total	**0.0001**	**0.0026**	**0.0038**	**0.0044**
N05AL	**Benzamides**	**Public**	**0.1704**	**0.2162**	**0.2043**	**0.2287**
		Private	**0.0148**	**0.0141**	**0.0137**	**0.0137**
		Total	**0.1852**	**0.2302**	**0.2180**	**0.2423**
N05AL01	Sulpiride	Public	0.1515	0.1755	0.1579	0.1621
		Private	0.0082	0.0071	0.0064	0.0073
		Total	**0.1597**	**0.1827**	**0.1643**	**0.1694**
N05AL05	Amisulpride	Public	0.0189	0.0406	0.0464	0.0665
		Private	0.0066	0.0069	0.0072	0.0064
		Total	**0.0255**	**0.0475**	**0.0537**	**0.0729**
N05AN	**Lithium**					
N05AN01	Lithium	Public	0.0019	0.0031	0.0019	0.0018
		Private	-	-	-	0.0003
		Total	**0.0019**	**0.0031**	**0.0019**	**0.0022**
N05AX	**Other antipsychotics**	**Public**	**0.4180**	**0.5884**	**0.5070**	**0.6244**
		Private	**0.0248**	**0.0338**	**0.0415**	**0.0388**
		Total	**0.4428**	**0.6221**	**0.5485**	**0.6632**
N05AX08	Risperidone	Public	0.3588	0.4977	0.3832	0.4777
		Private	0.0197	0.0283	0.0350	0.0307
		Total	**0.3785**	**0.5260**	**0.4181**	**0.5085**

Table 21.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N05AX12	Aripiprazole	Public	0.0433	0.0520	0.0697	0.0803
		Private	0.0010	0.0010	0.0016	0.0026
		Total	**0.0443**	**0.0531**	**0.0713**	**0.0829**
N05AX13	Paliperidone	Public	0.0159	0.0386	0.0541	0.0664
		Private	0.0041	0.0045	0.0050	0.0054
		Total	**0.0199**	**0.0431**	**0.0591**	**0.0718**
N05B	**Anxiolytics**	**Public**	**0.2064**	**0.3709**	**0.3044**	**0.3283**
		Private	**0.8597**	**1.0788**	**0.7848**	**0.6955**
		Total	**1.0661**	**1.4497**	**1.0892**	**1.0239**
N05BA	**Benzodiazepine derivatives**	**Public**	**0.1658**	**0.3178**	**0.2434**	**0.2573**
		Private	**0.6533**	**0.8249**	**0.5690**	**0.5459**
		Total	**0.8190**	**1.1427**	**0.8124**	**0.8032**
N05BA01	Diazepam	Public	0.0286	0.1277	0.0575	0.0630
		Private	0.1025	0.2707	0.1892	0.1745
		Total	**0.1312**	**0.3984**	**0.2468**	**0.2375**
N05BA05	Potassium clorazepate	Public	-	-	-	-
		Private	0.0019	0.0013	0.0002	-
		Total	**0.0019**	**0.0013**	**0.0002**	**-**
N05BA06	Lorazepam	Public	0.0446	0.0697	0.0629	0.0516
		Private	0.0633	0.1040	0.0792	0.0891
		Total	**0.1079**	**0.1737**	**0.1421**	**0.1407**
N05BA08	Bromazepam	Public	0.0014	0.0020	0.0012	0.0012
		Private	0.0337	0.0350	0.0262	0.0257
		Total	**0.0351**	**0.0371**	**0.0274**	**0.0269**
N05BA09	Clobazam	Public	0.0043	0.0091	0.0125	0.0241
		Private	0.0380	0.0320	0.0312	0.0346
		Total	**0.0422**	**0.0411**	**0.0438**	**0.0587**
N05BA12	Alprazolam	Public	0.0868	0.1093	0.1093	0.1174
		Private	0.4139	0.3819	0.2429	0.2220
		Total	**0.5007**	**0.4912**	**0.3522**	**0.3394**
N05BB	**Diphenylmethane derivatives**					
N05BB01	Hydroxyzine	Public	0.0406	0.0531	0.0610	0.0710
		Private	0.2064	0.2539	0.2158	0.1496
		Total	**0.2470**	**0.3070**	**0.2768**	**0.2207**
N05C	**Hypnotics and sedatives**	**Public**	**0.1101**	**0.1556**	**0.1752**	**0.1607**
		Private	**0.3873**	**0.3907**	**0.3604**	**0.2875**
		Total	**0.4974**	**0.5463**	**0.5356**	**0.4482**
N05CD	**Benzodiazepine derivatives**	**Public**	**0.0646**	**0.1015**	**0.1240**	**0.0869**
		Private	**0.2186**	**0.1447**	**0.1318**	**0.1125**
		Total	**0.2832**	**0.2461**	**0.2558**	**0.1993**
N05CD02	Nitrazepam	Public	0.0043	0.0047	0.0066	0.0049
		Private	0.0083	0.0348	0.0571	0.0323
		Total	**0.0126**	**0.0396**	**0.0637**	**0.0372**
N05CD05	Triazolam	Public	-	-	-	-
		Private	0.0579	0.0764	0.0445	0.0521
		Total	**0.0579**	**0.0764**	**0.0445**	**0.0521**
N05CD08	Midazolam	Public	0.0603	0.0967	0.1174	0.0820
		Private	0.1524	0.0334	0.0302	0.0280
		Total	**0.2127**	**0.1302**	**0.1477**	**0.1100**

Table 21.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N05CF	**Benzodiazepine related drugs**	**Public**	**0.0411**	**0.0538**	**0.0477**	**0.0646**
		Private	**0.1686**	**0.2458**	**0.2285**	**0.1750**
		Total	**0.2097**	**0.2997**	**0.2762**	**0.2395**
N05CF01	Zopiclone	Public	-	-	-	-
		Private	0.0508	0.0908	0.0993	0.0647
		Total	**0.0508**	**0.0908**	**0.0993**	**0.0647**
N05CF02	Zolpidem	Public	0.0411	0.0538	0.0477	0.0646
		Private	0.1178	0.1551	0.1292	0.1103
		Total	**0.1589**	**0.2089**	**0.1769**	**0.1748**
N05CH	**Melatonin receptor agonists**					
N05CH01	Melatonin	Public	0.0041	-	0.0030	0.0087
		Private	-	-	-	-
		Total	**0.0041**	**-**	**0.0030**	**0.0087**
N05CM	**Other hypnotics and sedatives**	**Public**	**0.0003**	**0.0003**	**0.0005**	**0.0006**
		Private	**0.0001**	**0.0002**	**0.0001**	**0.0001**
		Total	**0.0004**	**0.0005**	**0.0006**	**0.0006**
N05CM05	Scopolamine	Public	-	<0.0001	-	-
		Private	< 0.0001	<0.0001	-	-
		Total	**< 0.0001**	**<0.0001**	**-**	**-**
N05CM18	Dexmedetomidine	Public	0.0003	0.0003	0.0005	0.0006
		Private	0.0001	0.0002	0.0001	0.0001
		Total	**0.0004**	**0.0005**	**0.0006**	**0.0006**

Table 21.3: Use of antidepressants, drugs for treatment of ADHD and other drugs for dementia from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N06	**Psychoanaleptics**	**Public**	**1.0664**	**1.2077**	**1.4740**	**1.6227**
		Private	**0.6824**	**0.7826**	**0.8309**	**0.8442**
		Total	**1.7488**	**1.9903**	**2.3049**	**2.4669**
N06A	**Antidepressants**	**Public**	**0.9686**	**1.0929**	**1.3360**	**1.4578**
		Private	**0.6341**	**0.7259**	**0.7655**	**0.7747**
		Total	**1.6027**	**1.8188**	**2.1015**	**2.2325**
N06AA	**Non-selective monoamine reuptake inhibitors**	**Public**	**0.1744**	**0.1546**	**0.1779**	**0.1990**
		Private	**0.0916**	**0.1227**	**0.0839**	**0.0928**
		Total	**0.2660**	**0.2772**	**0.2619**	**0.2918**
N06AA02	Imipramine	Public	0.0172	0.0143	0.0088	0.0110
		Private	0.0241	0.0330	0.0114	0.0099
		Total	**0.0413**	**0.0473**	**0.0202**	**0.0209**
N06AA04	Clomipramine	Public	0.0072	0.0064	0.0119	0.0093
		Private	0.0049	0.0039	0.0032	0.0041
		Total	**0.0121**	**0.0103**	**0.0150**	**0.0133**
N06AA09	Amitriptyline	Public	0.0880	0.0894	0.1051	0.1413
		Private	0.0584	0.0663	0.0570	0.0635
		Total	**0.1463**	**0.1557**	**0.1620**	**0.2048**
N06AA10	Nortriptyline	Public	-	-	< 0.0001	< 0.0001
		Private	0.0003	-	-	-
		Total	**0.0003**	**-**	**< 0.0001**	**< 0.0001**

Table 21.3: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N06AA16	Dosulepin	Public	0.0522	0.0435	0.0522	0.0374
		Private	0.0014	0.0116	0.0120	0.0153
		Total	**0.0537**	**0.0551**	**0.0642**	**0.0527**
N06AA21	Maprotiline	Public	0.0097	0.0009	-	-
		Private	0.0025	0.0078	0.0004	-
		Total	**0.0123**	**0.0088**	**0.0004**	**-**
N06AB	**Selective serotonin reuptake inhibitors**	**Public**	**0.7138**	**0.8303**	**0.8608**	**1.1251**
		Private	**0.4217**	**0.4444**	**0.5117**	**0.5069**
		Total	**1.1356**	**1.2746**	**1.3725**	**1.6321**
N06AB03	Fluoxetine	Public	0.0910	0.1054	0.1625	0.1311
		Private	0.0465	0.0478	0.1043	0.1101
		Total	**0.1375**	**0.1532**	**0.2668**	**0.2412**
N06AB04	Citalopram	Public	-	-	-	-
		Private	0.0092	0.0072	0.0074	0.0060
		Total	**0.0092**	**0.0072**	**0.0074**	**0.0060**
N06AB05	Paroxetine	Public	-	-	-	-
		Private	0.0225	0.0211	0.0298	0.0262
		Total	**0.0225**	**0.0211**	**0.0298**	**0.0262**
N06AB06	Sertraline	Public	0.2532	0.2315	0.2269	0.4339
		Private	0.1054	0.1211	0.1009	0.0705
		Total	**0.3586**	**0.3527**	**0.3278**	**0.5044**
N06AB08	Fluvoxamine	Public	0.2655	0.3799	0.3359	0.3904
		Private	0.0521	0.0477	0.0520	0.0423
		Total	**0.3175**	**0.4276**	**0.3879**	**0.4327**
N06AB10	Escitalopram	Public	0.1041	0.1135	0.1354	0.1697
		Private	0.1861	0.1995	0.2173	0.2518
		Total	**0.2902**	**0.3130**	**0.3528**	**0.4215**
N06AF	**Monoamine oxidase inhibitors, non-selective**					
N06AF04	Tranylcypromine	Public	-	-	-	0.0003
		Private	-	-	-	-
		Total	**-**	**-**	**-**	**0.0003**
N06AG	**Monoamine oxidase A inhibitors**					
N06AG02	Moclobemide	Public	0.0071	0.0082	0.0068	0.0044
		Private	0.0010	0.0008	0.0004	0.0006
		Total	**0.0081**	**0.0090**	**0.0072**	**0.0051**
N06AX	**Other antidepressants**	**Public**	**0.0732**	**0.0998**	**0.2904**	**0.1288**
		Private	**0.1198**	**0.1582**	**0.1694**	**0.1743**
		Total	**0.1931**	**0.2580**	**0.4598**	**0.3031**
N06AX03	Mianserin	Public	0.0002	0.0001	0.0001	0.0001
		Private	0.0020	0.0010	0.0003	0.0004
		Total	**0.0022**	**0.0012**	**0.0004**	**0.0005**
N06AX11	Mirtazapine	Public	0.0390	0.0535	0.0643	0.0590
		Private	0.0477	0.0523	0.0576	0.0620
		Total	**0.0868**	**0.1059**	**0.1220**	**0.1209**
N06AX12	Bupropion	Public	-	-	-	-
		Private	-	0.0016	0.0042	0.0040
		Total	**-**	**0.0016**	**0.0042**	**0.0040**
N06AX14	Tianeptine	Public	< 0.0001	<0.0001	-	-
		Private	0.0065	0.0128	0.0070	0.0060
		Total	**0.0065**	**0.0128**	**0.0070**	**0.0060**

Table 21.3: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N06AX16	Venlafaxine	Public	0.0220	0.0266	0.2003	0.0309
		Private	0.0167	0.0195	0.0184	0.0182
		Total	**0.0388**	**0.0461**	**0.2188**	**0.0491**
N06AX21	Duloxetine	Public	0.0120	0.0196	0.0247	0.0280
		Private	0.0255	0.0259	0.0313	0.0308
		Total	**0.0375**	**0.0455**	**0.0559**	**0.0588**
N06AX22	Agomelatine	Public	-	-	0.0010	0.0086
		Private	0.0062	0.0191	0.0261	0.0289
		Total	**0.0062**	**0.0191**	**0.0271**	**0.0375**
N06AX23	Desvenlafaxine	Public	-	-	0.0001	0.0023
		Private	0.0151	0.0258	0.0245	0.0241
		Total	**0.0151**	**0.0258**	**0.0246**	**0.0264**
N06B	**Psychostimulants, agents used for ADHD and nootropics**					
N06BA	**Centrally acting sympathomimetics**	**Public**	**0.0264**	**0.0322**	**0.0344**	**0.0367**
		Private	**0.0118**	**0.0118**	**0.0133**	**0.0131**
		Total	**0.0382**	**0.0440**	**0.0478**	**0.0498**
N06BA04	Methylphenidate	Public	0.0248	0.0300	0.0318	0.0329
		Private	0.0099	0.0107	0.0119	0.0120
		Total	**0.0347**	**0.0407**	**0.0437**	**0.0450**
N06BA09	Atomoxetine	Public	0.0016	0.0022	0.0026	0.0038
		Private	0.0019	0.0011	0.0014	0.0010
		Total	**0.0035**	**0.0033**	**0.0041**	**0.0048**
N06D	**Anti-dementia drugs**	**Public**	**0.0714**	**0.0826**	**0.1035**	**0.1282**
		Private	**0.0365**	**0.0449**	**0.0521**	**0.0564**
		Total	**0.1079**	**0.1275**	**0.1556**	**0.1846**
N06DA	**Anticholinesterases**	**Public**	**0.0676**	**0.0723**	**0.0889**	**0.1083**
		Private	**0.0233**	**0.0276**	**0.0305**	**0.0318**
		Total	**0.0909**	**0.0999**	**0.1195**	**0.1401**
N06DA02	Donepezil	Public	0.0371	0.0396	0.0598	0.0712
		Private	0.0142	0.0170	0.0197	0.0195
		Total	**0.0513**	**0.0566**	**0.0795**	**0.0907**
N06DA03	Rivastigmine	Public	0.0305	0.0327	0.0292	0.0372
		Private	0.0082	0.0098	0.0103	0.0120
		Total	**0.0387**	**0.0425**	**0.0395**	**0.0491**
N06DA04	Galantamine	Public	-	-	-	-
		Private	0.0009	0.0008	0.0005	0.0003
		Total	**0.0009**	**0.0008**	**0.0005**	**0.0003**
N06DX	**Other anti-dementia drugs**					
N06DX01	Memantine	Public	0.0038	0.0103	0.0146	0.0199
		Private	0.0132	0.0173	0.0216	0.0246
		Total	**0.0170**	**0.0276**	**0.0362**	**0.0445**

Table 21.4: Use of other drugs on nervous system from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
N07	**Other nervous system drugs**					
N07B	**Drugs used in addictive disorders**	**Public**	**0.8567**	**0.8845**	**0.7160**	**1.0209**
		Private	**0.1537**	**0.2380**	**0.2385**	**0.2208**
		Total	**1.0104**	**1.1225**	**0.9544**	**1.2417**
N07BA	**Drugs used in nicotine dependence**	**Public**	**0.0130**	**0.0210**	**0.0111**	**0.0109**
		Private	**0.0876**	**0.0663**	**0.0517**	**0.0255**
		Total	**0.1006**	**0.0873**	**0.0628**	**0.0364**
N07BA01	Nicotine	Public	0.0022	0.0114	0.0020	0.0016
		Private	0.0794	0.0584	0.0453	0.0175
		Total	**0.0816**	**0.0698**	**0.0473**	**0.0191**
N07BA03	Varenicline	Public	0.0108	0.0096	0.0091	0.0093
		Private	0.0082	0.0078	0.0064	0.0080
		Total	**0.0190**	**0.0175**	**0.0155**	**0.0173**
N07BB	**Drugs used in alcohol dependence**					
N07BB04	Naltrexone	Public	0.0022	0.0028	0.0029	0.0024
		Private	0.0001	0.0010	0.0005	0.0005
		Total	**0.0024**	**0.0038**	**0.0034**	**0.0029**
N07BC	**Drugs used in opioid dependence**	**Public**	**0.8415**	**0.8607**	**0.7020**	**1.0076**
		Private	**0.0659**	**0.1708**	**0.1862**	**0.1948**
		Total	**0.9074**	**1.0315**	**0.8883**	**1.2024**
N07BC02	Methadone	Public	0.8414	0.8606	0.7020	1.0075
		Private	0.0061	0.1659	0.1862	0.1948
		Total	**0.8475**	**1.0265**	**0.8882**	**1.2024**
N07BC51	Buprenorphine, combinations	Public	0.0001	0.0001	0.0001	0.0001
		Private	0.0598	0.0049	-	-
		Total	**0.0599**	**0.0050**	**0.0001**	**0.0001**

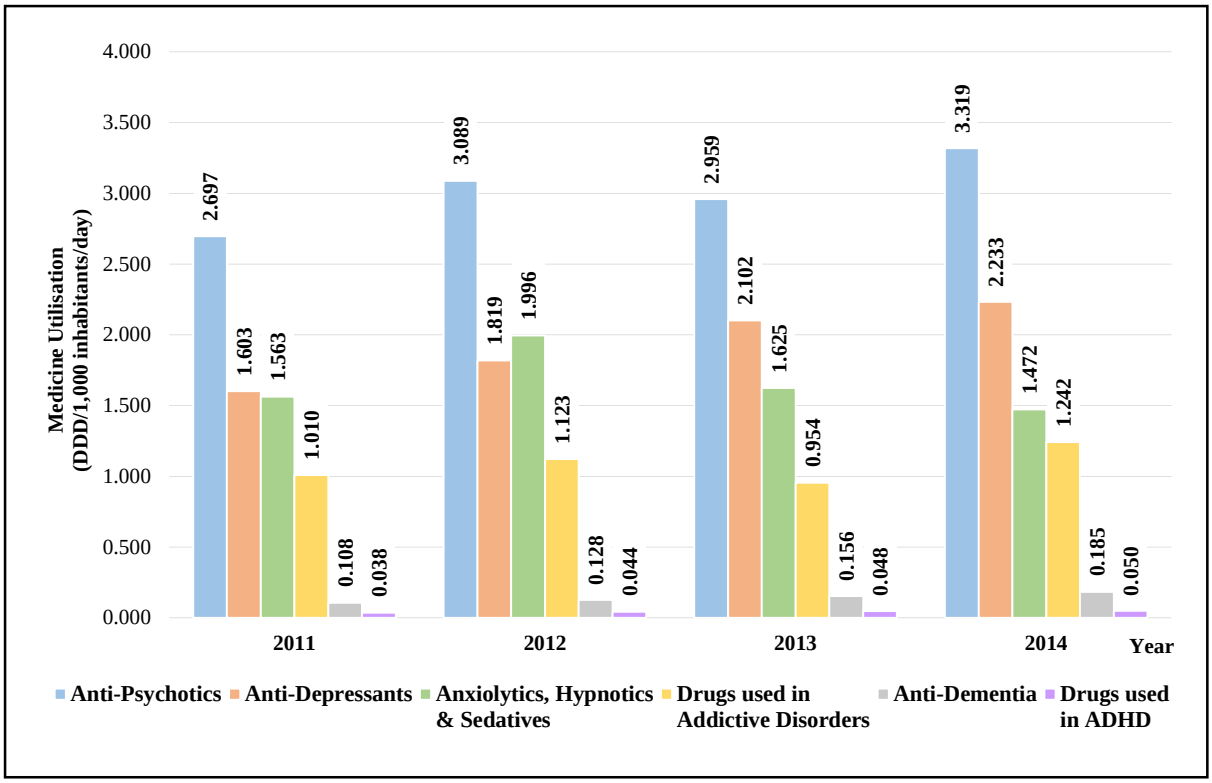

Figure 21.1: Comparison of Drugs Used in Treatment of Psychiatric Disorders from 2011 to 2014.

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CHAPTER 22: USE OF DRUGS FOR OBSTRUCTIVE AIRWAY DISEASES

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This drug utilisation analysis for obstructive airway disease is based on procurement data obtained between years 2011-2014. The data does not differentiate between drugs used in asthma and COPD. The estimated prevalence of COPD in Malaysia has increased from 4.7%[1] in year 2009 to 6.5%[2] in year 2013. It is expected to rise further based on the current high smoking rates of 22.8%[3]. The prevalence of asthma amongst children aged 13-14 years old is 6.8-12.3%[2] whilst that in adults is 4.5%[4].

From 2011 to 2014, the usage of drugs for obstructive airways diseases has increased from 13.5133 to 16.1881 DDD/1,000 inhabitants/day. The top two drugs used in the treatment of obstructive airway disease are inhaled salbutamol and budesonide, both of which appear in the top 50 drugs utilised in 2011-2014. In the most recent available data (2014), inhaled salbutamol ranks 12th and budesonide 31st, by DDD/1,000 inhabitants/day. During this period, the use of inhaled salbutamol in private sector doubled whilst utilisation in the public sector remained relatively stable. Inhaled budesonide usage increased by 50%; this was driven almost entirely by increased utilisation in the public sector.

The third highest utilised respiratory medication was oral theophylline; however its utilisation shows a decline during this period from 1.2178 to 1.0806 DDD/1,000 inhabitants/day. Oral and parenteral salbutamol usage meanwhile declined from 0.8142 to 0.7306 DDD/1,000 inhabitants/ day. Oral montelukast usage increased from 0.4558 to 0.6316 DDD/1,000 inhabitants/day.

Combination inhalers containing adrenergic and corticosteroids such as salmeterol/fluticasone, salmeterol/beclomethasone and formoterol/budesonide continue to show increased utilisation (1.0380 to 1.3722 DDD/1,000 inhabitants/day). The use of single drug preparation of inhaled corticosteroids and selective beta-2-adrenoreceptor agonists also increased from 2.7855 to 3.9285 and 4.6361 to 6.6050 DDD/1,000 inhabitants/day respectively. Inhaled adrenergics in combination with anticholinergics usage showed slight decline from 1.9411 to 1.1633 DDD/1,000 inhabitants/day.

Inhaled tiotropium bromide utilisation doubled from 0.1129 to 0.2215 DDD/1,000 inhabitants/day during this period. Utilisation of new drugs such as glycopyrronium bromide and roflumilast remained low (0.0022 and 0.0045 DDD/1,000 inhabitants/day respectively). Their utilisation was confined exclusively to the private sector before year 2014.

The data suggest a shift away from oral therapy to increased prescription of inhaled therapies in the management of obstructive airway disease. Of note, it is encouraging to see the increased use of inhaled maintenance therapy, namely, inhaled corticosteroid, corticosteroid/long-acting beta adrenergic agents and long-acting anti-muscarinic agents. The increased utilisation of inhaled salbutamol may be partially explained by the switch from oral preparation to inhaled one as well as the switch from inhaled salbutamol/ipratropium bromide to salbutamol, for symptomatic use, when patients are prescribed a long-acting anti-muscarinic agent as maintenance therapy in COPD.

A comparison with other OECD countries suggests that the utilisation of drugs for obstructive airway diseases in Malaysia is amongst the lowest at 16.2 DDD/1,000 inhabitants/day, with only Korea being lower at 14.1 (Figure 22.2). The average drug utilisation for obstructive airways disease amongst OECD countries is at 43.7 DDD/1,000 inhabitants/day.

Trend analysis of drug utilisation from 2011 to 2014 in other develop countries such as Austria, Australia, Iceland and Denmark[5], showed steady decline in drug usage, in contrast with Malaysia showing an increase from 13.5133 to 16.1881 DDD/1,000 inhabitants/day in the same period of time.

Table 22.1: Use of drugs for obstructive airway diseases and by therapeutic group from 2011 to 2014 (DDD/1,000 inhabitants/day).

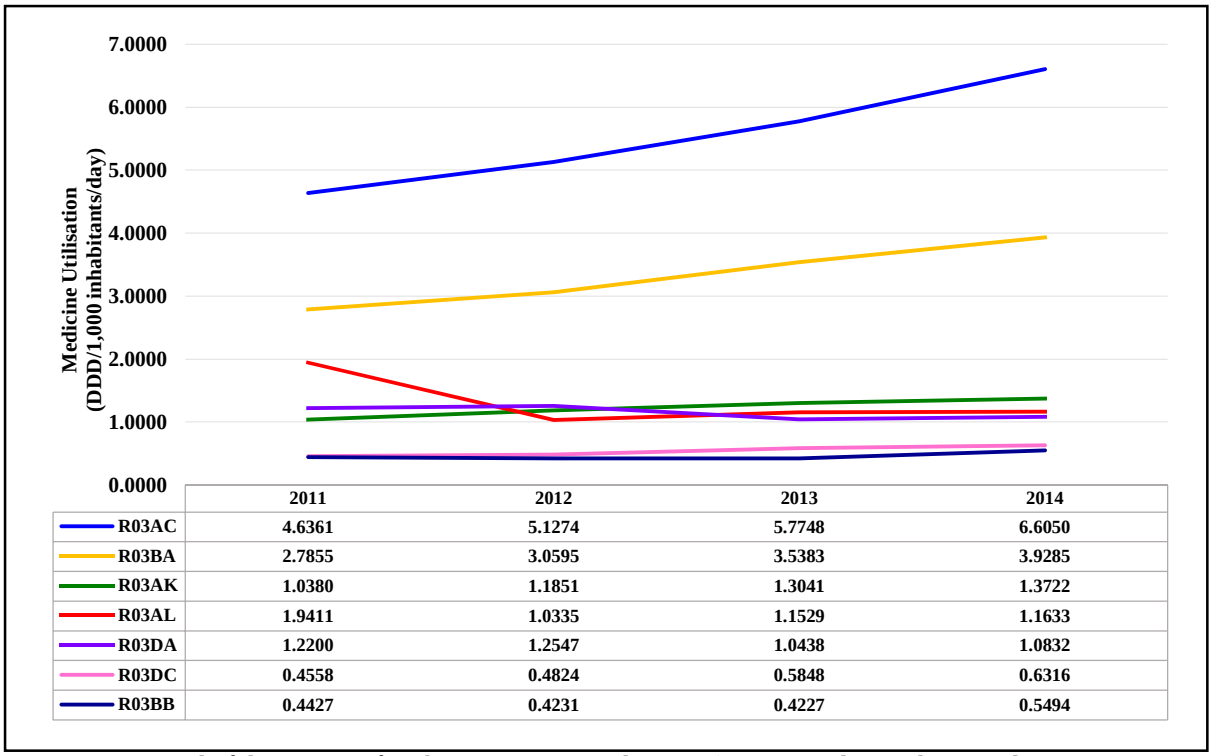
ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
R03	**Drugs for obstructive airway diseases**	**Public**	**9.3762**	**8.6524**	**9.5353**	**10.5817**
		Private	**4.1371**	**4.8363**	**5.1714**	**5.6064**
		Total	**13.5133**	**13.4887**	**14.7067**	**16.1881**
R03A	**Adrenergics, inhalants**	**Public**	**5.2109**	**4.3012**	**4.8185**	**5.2448**
		Private	**2.4044**	**3.0447**	**3.4133**	**3.8957**
		Total	**7.6153**	**7.3459**	**8.2318**	**9.1405**
R03AC	**Selective beta-2-adrenoreceptor agonists**	**Public**	**3.1303**	**2.9566**	**3.2585**	**3.5830**
		Private	**1.5058**	**2.1708**	**2.5163**	**3.0220**
		Total	**4.6361**	**5.1274**	**5.7748**	**6.6050**
R03AC02	Salbutamol	Public	3.0730	2.9001	3.1975	3.5311
		Private	1.4407	2.1024	2.4435	2.9587
		Total	**4.5137**	**5.0026**	**5.6410**	**6.4898**
R03AC03	Terbutaline	Public	0.0459	0.0456	0.0479	0.0360
		Private	0.0274	0.0246	0.0264	0.0205
		Total	**0.0732**	**0.0702**	**0.0743**	**0.0565**
R03AC04	Fenoterol	Public	-	-	-	-
		Private	0.0363	0.0376	0.0382	0.0322
		Total	**0.0363**	**0.0376**	**0.0382**	**0.0322**
R03AC13	Formoterol	Public	0.0114	0.0109	0.0097	0.0083
		Private	0.0015	0.0016	0.0013	0.0011
		Total	**0.0129**	**0.0125**	**0.0110**	**0.0094**
R03AC18	Indacaterol	Public	-	-	0.0033	0.0077
		Private	-	0.0046	0.0070	0.0095
		Total	**-**	**0.0046**	**0.0103**	**0.0172**
R03AK	**Adrenergics in combination with corticosteroids or other drugs, excluding anticholinergics**	**Public**	**0.3941**	**0.5242**	**0.6357**	**0.7177**
		Private	**0.6439**	**0.6609**	**0.6684**	**0.6545**
		Total	**1.0380**	**1.1851**	**1.3041**	**1.3722**
R03AK00	Salbutamol and beclometasone	Public	-	-	0.0005	-
		Private	-	-	-	-
		Total	**-**	**-**	**0.0005**	**-**
R03AK06	Salmeterol and fluticasone	Public	0.2594	0.3425	0.4284	0.4510
		Private	0.4052	0.4197	0.4122	0.3823
		Total	**0.6646**	**0.7623**	**0.8406**	**0.8332**
R03AK07	Formoterol and budesonide	Public	0.1347	0.1817	0.2068	0.2647
		Private	0.2388	0.2401	0.2474	0.2624
		Total	**0.3734**	**0.4218**	**0.4542**	**0.5271**
R03AK08	Formoterol and beclometasone	Public	-	-	-	0.0019
		Private	-	0.0011	0.0039	-
		Total	**-**	**0.0011**	**0.0039**	**0.0019**
R03AK09	Formoterol and mometasone	Public	-	-	-	< 0.0001
		Private	-	-	0.0049	0.0099
		Total	**-**	**-**	**0.0049**	**0.0099**
R03AL	**Adrenergics in combination with anticholinergics**	**Public**	**1.6865**	**0.8204**	**0.9243**	**0.9441**
		Private	**0.2547**	**0.2131**	**0.2286**	**0.2192**
		Total	**1.9411**	**1.0335**	**1.1529**	**1.1633**
R03AL01	Fenoterol and ipratropium bromide	Public	0.2786	0.5450	0.6134	0.6441
		Private	0.1891	0.1413	0.1560	0.1544
		Total	**0.4677**	**0.6863**	**0.7694**	**0.7985**

Table 22.1: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
R03AL02	Salbutamol and ipratropium bromide	Public	1.4079	0.2754	0.3109	0.3000
		Private	0.0655	0.0717	0.0726	0.0648
		Total	**1.4734**	**0.3471**	**0.3835**	**0.3648**
R03B	**Other drugs for obstructive airway diseases, inhalants**	**Public**	**2.9159**	**3.1952**	**3.6505**	**4.1583**
		Private	**0.3123**	**0.2875**	**0.3105**	**0.3196**
		Total	**3.2282**	**3.4826**	**3.9609**	**4.4779**
R03BA	**Glucocorticoids**	**Public**	**2.5506**	**2.8490**	**3.3050**	**3.6906**
		Private	**0.2349**	**0.2105**	**0.2333**	**0.2379**
		Total	**2.7855**	**3.0595**	**3.5383**	**3.9285**
R03BA01	Beclometasone	Public	0.4637	0.3969	0.3859	0.3506
		Private	0.0162	0.0151	0.0168	0.0122
		Total	**0.4799**	**0.4120**	**0.4027**	**0.3628**
R03BA02	Budesonide	Public	1.9683	2.3136	2.7192	3.0829
		Private	0.0958	0.0688	0.0805	0.0996
		Total	**2.0640**	**2.3824**	**2.7996**	**3.1825**
R03BA05	Fluticasone	Public	0.1033	0.1245	0.1849	0.2422
		Private	0.0764	0.0882	0.0941	0.0902
		Total	**0.1797**	**0.2126**	**0.2790**	**0.3324**
R03BA08	Ciclesonide	Public	0.0153	0.0141	0.0150	0.0149
		Private	0.0466	0.0384	0.0419	0.0359
		Total	**0.0619**	**0.0525**	**0.0569**	**0.0507**
R03BB	**Anticholinergics**	**Public**	**0.3653**	**0.3461**	**0.3455**	**0.4677**
		Private	**0.0774**	**0.0770**	**0.0772**	**0.0817**
		Total	**0.4427**	**0.4231**	**0.4227**	**0.5494**
R03BB01	Ipratropium bromide	Public	0.2869	0.2312	0.1927	0.2831
		Private	0.0429	0.0421	0.0427	0.0426
		Total	**0.3298**	**0.2733**	**0.2353**	**0.3257**
R03BB04	Tiotropium bromide	Public	0.0784	0.1149	0.1528	0.1846
		Private	0.0345	0.0349	0.0345	0.0369
		Total	**0.1129**	**0.1499**	**0.1873**	**0.2215**
R03BB06	Glycopyrronium bromide	Public	-	-	-	-
		Private	-	-	-	0.0022
		Total	**-**	**-**	**-**	**0.0022**
R03C	**Adrenergics for systemic use**					
R03CC	**Selective beta-2-adrenoreceptor agonists**	**Public**	**0.3842**	**0.2506**	**0.2472**	**0.2550**
		Private	**0.6097**	**0.6707**	**0.6338**	**0.5948**
		Total	**0.9939**	**0.9213**	**0.8811**	**0.8498**
R03CC02	Salbutamol	Public	0.3191	0.2064	0.2196	0.2374
		Private	0.4951	0.5561	0.4984	0.4932
		Total	**0.8142**	**0.7625**	**0.7180**	**0.7306**
R03CC03	Terbutaline	Public	0.0652	0.0441	0.0277	0.0176
		Private	0.0958	0.0550	0.0760	0.0595
		Total	**0.1609**	**0.0991**	**0.1036**	**0.0770**
R03CC04	Fenoterol	Public	-	-	-	-
		Private	0.0064	0.0093	0.0095	0.0065
		Total	**0.0064**	**0.0093**	**0.0095**	**0.0065**
R03CC08	Procaterol	Public	-	-	-	-
		Private	0.0096	0.0072	0.0068	0.0020
		Total	**0.0096**	**0.0072**	**0.0068**	**0.0020**

Table 22.1: (*continued*)

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
R03CC13	Clenbuterol	Public	-	-	-	-
		Private	0.0029	0.0431	0.0432	0.0337
		Total	**0.0029**	**0.0431**	**0.0432**	**0.0337**
R03D	**Other systemic drugs for obstructive airway diseases**	**Public**	**0.8652**	**0.9055**	**0.8192**	**0.9236**
		Private	**0.8107**	**0.8334**	**0.8137**	**0.7963**
		Total	**1.6759**	**1.7388**	**1.6329**	**1.7199**
R03DA	**Xanthines**	**Public**	**0.7684**	**0.7981**	**0.6353**	**0.6968**
		Private	**0.4516**	**0.4566**	**0.4085**	**0.3864**
		Total	**1.2200**	**1.2547**	**1.0438**	**1.0832**
R03DA04	Theophylline	Public	0.7664	0.7960	0.6333	0.6944
		Private	0.4514	0.4562	0.4082	0.3862
		Total	**1.2178**	**1.2523**	**1.0415**	**1.0806**
R03DA05	Aminophylline	Public	0.0020	0.0020	0.0020	0.0024
		Private	0.0002	0.0004	0.0003	0.0002
		Total	**0.0022**	**0.0024**	**0.0023**	**0.0026**
R03DC	**Leukotriene receptor antagonists**					
R03DC03	Montelukast	Public	0.0968	0.1074	0.1836	0.2262
		Private	0.3590	0.3751	0.4013	0.4055
		Total	**0.4558**	**0.4824**	**0.5848**	**0.6316**
R03DX	**Other systemic drugs for obstructive airway diseases**	**Public**	**< 0.0001**	**0.0001**	**0.0003**	**0.0006**
		Private	**< 0.0001**	**0.0017**	**0.0040**	**0.0045**
		Total	**0.0001**	**0.0017**	**0.0042**	**0.0051**
R03DX05	Omalizumab	Public	< 0.0001	0.0001	0.0003	0.0004
		Private	< 0.0001	0.0001	0.0002	0.0002
		Total	**0.0001**	**0.0002**	**0.0004**	**0.0006**
R03DX07	Roflumilast	Public	-	-	-	0.0003
		Private	-	0.0015	0.0038	0.0042
		Total	**-**	**0.0015**	**0.0038**	**0.0045**



	2011	2012	2013	2014
R03AC	4.6361	5.1274	5.7748	6.6050
R03BA	2.7855	3.0595	3.5383	3.9285
R03AK	1.0380	1.1851	1.3041	1.3722
R03AL	1.9411	1.0335	1.1529	1.1633
R03DA	1.2200	1.2547	1.0438	1.0832
R03DC	0.4558	0.4824	0.5848	0.6316
R03BB	0.4427	0.4231	0.4227	0.5494

Figure 22.1: Trend of drugs usage for obstructive airway diseases.(R03AC, Selective beta-2-adrenoreceptor agonists; R03BA, Glucocorticoids; R03AK, Adrenergics in combination with corticosteroids or other drugs, excluding anticholinergics; R03AL, Adrenergics in combination with anticholinergics; R03DA, Xanthines; R03DC, Leukotriene receptor antagonists; R03BB, Anticholinergics)

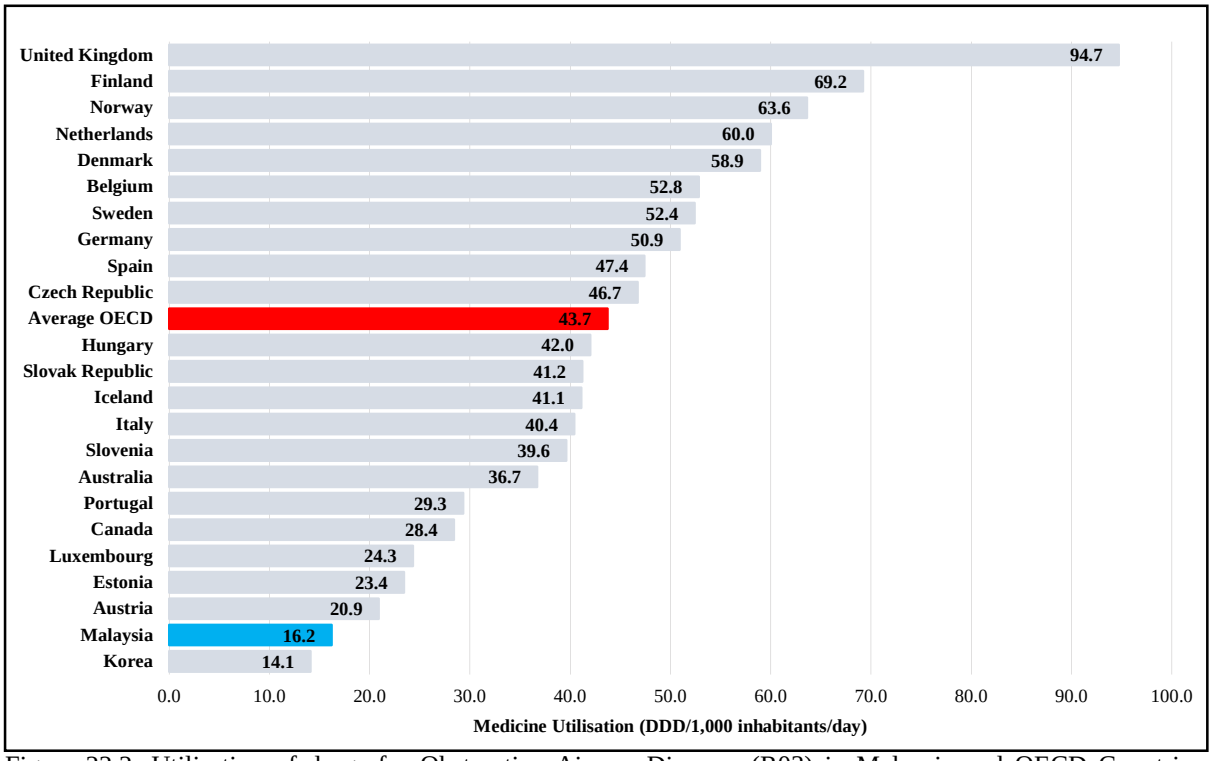


Figure 22.2: Utilisation of drugs for Obstructive Airway Diseases (R03) in Malaysia and OECD Countries, 2014.

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CHAPTER 23: USE OF ANTIHISTAMINES AND NASAL DECONGESTANTS

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Nasal preparations and antihistamines are drugs commonly used for allergy and nasal symptoms in otorhinolaryngology clinics in Malaysia. Allergy disorders such as allergic rhinitis is a global health problem, affecting 10 – 20% of population[1]. Gary *et. al.* reported an overall prevalence of 8.7% for allergic rhinitis in Asia Pacific region which includes Malaysia and it will continue to rise in the next two decades[2]. This can be seen in the data collected from 2011 to 2014, which shows an increasing trend of use of 'decongestants and other nasal preparations for topical use' (R01A) and 'antihistamines for systemic use' (R06A) as shown in Table 23.1 and 23.2, respectively.

Further analysis of the drugs under R01A demonstrated an increased use of nasal steroid preparations from 2011 to 2014. The most commonly used nasal steroid preparations in both the public and private sectors are mometasone, budesonide and fluticasone furoate (Table 23.1). In 2014, the use of mometasone was highest followed by budesonide and fluticasone furoate. Use of mometasone in Malaysia is lower when compared to Finland[3] (0.9669 vs 7.61 DDD/1,000 inhabitants/day respectively).

Of the two nasal decongestants available (oxymetazoline and xylometazoline), the more commonly used was oxymetazoline. There was no significant changes in the trend of use of oxymetazoline through 2011 to 2014 in both the public and private sectors. However, the use of oxymetazoline is notably higher in the private sectors; mainly due to it being easily available as over-the-counter medication. Use of oxymetazoline in Malaysia in 2014 is comparable to the Finnish report (0.7308 vs 0.79 DDD/1,000 inhabitants/day)[3].

Antihistamines (R06A) can be divided into sedative (first generation) or non-sedative (second generation) antihistamines. From Table 23.2, the most common sedative antihistamines used in Malaysia were chlorpheniramine, diphenhydramine combinations and dexchlorpheniramine while cetirizine, loratadine, desloratadine and fexofenadine were the commonest non-sedative antihistamines. As a whole, use of sytemic antihistamines in Malaysia of 24.9539 DDD/1,000 inhabitants/day was lower in comparison to Finland (53.99 DDD/1,000 inhabitants/day)[3]. It is also interesting to note that there was no sedative antihistamines used in Finland based on the Finnish study.

Table 23.1: Use of topical and systemic agents for nasal congestion from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	2012	2013	2014	2011	2012	2013	2014
R01	**Nasal preparations**	**Public**	**0.9970**	**1.1777**	**1.1722**	**1.2839**	**0.3639**	**0.4299**	**0.4279**	**0.4686**
		Private	**3.6741**	**3.8864**	**3.9081**	**3.7139**	**1.3410**	**1.4185**	**1.4265**	**1.3556**
		Total	**4.6711**	**5.0641**	**5.0804**	**4.9977**	**1.7049**	**1.8484**	**1.8543**	**1.8242**
R01A	**Decongestants and other nasal preparations for topical use**	**Public**	**0.7838**	**0.9496**	**0.9692**	**1.1087**	**0.2861**	**0.3466**	**0.3537**	**0.4047**
		Private	**2.1235**	**2.2507**	**2.2246**	**2.2577**	**0.7751**	**0.8215**	**0.8120**	**0.8241**
		Total	**2.9072**	**3.2003**	**3.1937**	**3.3664**	**1.0611**	**1.1681**	**1.1657**	**1.2287**
R01AA	**Sympathomimetics, plain**	**Public**	**0.0357**	**0.0302**	**0.0287**	**0.0329**	**0.0130**	**0.0110**	**0.0105**	**0.0120**
		Private	**0.6073**	**0.6777**	**0.6648**	**0.7348**	**0.2217**	**0.2474**	**0.2427**	**0.2682**
		Total	**0.6431**	**0.7079**	**0.6935**	**0.7677**	**0.2347**	**0.2584**	**0.2531**	**0.2802**
R01AA05	Oxymetazoline	Public	0.0357	0.0302	0.0287	0.0329	0.0130	0.0110	0.0105	0.0120
		Private	0.5656	0.6217	0.6261	0.6979	0.2064	0.2269	0.2285	0.2547
		Total	**0.6013**	**0.6518**	**0.6548**	**0.7308**	**0.2195**	**0.2379**	**0.2390**	**0.2667**
R01AA07	Xylometazoline	Public	-	-	-	-	-	-	-	-
		Private	0.0418	0.0561	0.0387	0.0369	0.0153	0.0205	0.0141	0.0135
		Total	**0.0418**	**0.0561**	**0.0387**	**0.0369**	**0.0153**	**0.0205**	**0.0141**	**0.0135**
R01AC	**Antiallergic agents, excluding corticosteroids**									
R01AC01	Cromoglicic acid	Public	-	-	-	-	-	-	-	-
		Private	0.0002	0.0004	-	< 0.0001	0.0001	0.0002	-	< 0.0001
		Total	**0.0002**	**0.0004**	**-**	**< 0.0001**	**0.0001**	**0.0002**	**-**	**< 0.0001**
R01AD	**Corticosteroids**	**Public**	**0.7481**	**0.9194**	**0.9405**	**1.0758**	**0.2730**	**0.3356**	**0.3433**	**0.3927**
		Private	**1.5159**	**1.5726**	**1.5597**	**1.5229**	**0.5533**	**0.5740**	**0.5693**	**0.5559**
		Total	**2.2640**	**2.4920**	**2.5002**	**2.5987**	**0.8263**	**0.9096**	**0.9126**	**0.9485**
R01AD01	Beclometasone	Public	0.0821	0.1038	0.1041	0.0290	0.0300	0.0379	0.0380	0.0106
		Private	0.1048	0.0963	0.0602	0.0394	0.0382	0.0351	0.0220	0.0144
		Total	**0.1868**	**0.2001**	**0.1643**	**0.0684**	**0.0682**	**0.0730**	**0.0600**	**0.0249**
R01AD05	Budesonide	Public	0.3375	0.2789	0.2628	0.3325	0.1232	0.1018	0.0959	0.1214
		Private	0.5054	0.4495	0.4151	0.3974	0.1845	0.1641	0.1515	0.1451
		Total	**0.8430**	**0.7284**	**0.6779**	**0.7299**	**0.3077**	**0.2659**	**0.2474**	**0.2664**

Table 23.1: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R01AD08	Fluticasone	Public	-	-	-	-	-	-	-	-
		Private	0.2726	0.2827	0.2456	0.2687	0.0995	0.1032	0.0897	0.0981
		Total	**0.2726**	**0.2827**	**0.2456**	**0.2687**	**0.0995**	**0.1032**	**0.0897**	**0.0981**
R01AD09	Mometasone	Public	0.3273	0.5087	0.5070	0.6100	0.1195	0.1857	0.1850	0.2227
		Private	0.3103	0.3609	0.3840	0.3569	0.1132	0.1317	0.1402	0.1303
		Total	**0.6376**	**0.8696**	**0.8910**	**0.9669**	**0.2327**	**0.3174**	**0.3252**	**0.3529**
R01AD11	Triamcinolone	Public	-	-	-	-	-	-	-	-
		Private	0.0758	0.0931	0.1382	0.1435	0.0277	0.0340	0.0505	0.0524
		Total	**0.0758**	**0.0931**	**0.1382**	**0.1435**	**0.0277**	**0.0340**	**0.0505**	**0.0524**
R01AD12	Fluticasone furoate	Public	0.0011	0.0280	0.0666	0.1043	0.0004	0.0102	0.0243	0.0381
		Private	0.2029	0.2425	0.2552	0.2506	0.0741	0.0885	0.0931	0.0915
		Total	**0.2040**	**0.2705**	**0.3217**	**0.3549**	**0.0745**	**0.0987**	**0.1174**	**0.1295**
R01AD13	Ciclesonide	Public	-	-	-	-	-	-	-	-
		Private	0.0441	0.0475	0.0614	0.0665	0.0161	0.0174	0.0224	0.0243
		Total	**0.0441**	**0.0475**	**0.0614**	**0.0665**	**0.0161**	**0.0174**	**0.0224**	**0.0243**
R01B	**Nasal decongestants for systemic use**									
R01BA	**Sympathomimetics**	**Public**	**0.2132**	**0.2281**	**0.2031**	**0.1752**	**0.0778**	**0.0833**	**0.0741**	**0.0639**
		Private	**1.5506**	**1.6357**	**1.6835**	**1.4561**	**0.5660**	**0.5970**	**0.6145**	**0.5315**
		Total	**1.7638**	**1.8638**	**1.8866**	**1.6313**	**0.6438**	**0.6803**	**0.6886**	**0.5954**
R01BA02	Pseudoephedrine	Public	-	-	-	-	-	-	-	-
		Private	0.0207	-	-	-	0.0075	-	-	-
		Total	**0.0207**	**-**	**-**	**-**	**0.0075**	**-**	**-**	**-**
R01BA52	Pseudoephedrine, combinations	Public	0.2132	0.2281	0.2031	0.1752	0.0778	0.0833	0.0741	0.0639
		Private	1.4957	1.6008	1.6265	1.4065	0.5459	0.5843	0.5937	0.5134
		Total	**1.7089**	**1.8289**	**1.8296**	**1.5817**	**0.6237**	**0.6675**	**0.6678**	**0.5773**
R01BA53	Phenylephrine, combinations	Public	-	-	-	-	-	-	-	-
		Private	0.0343	0.0349	0.0570	0.0496	0.0125	0.0127	0.0208	0.0181
		Total	**0.0343**	**0.0349**	**0.0570**	**0.0496**	**0.0125**	**0.0127**	**0.0208**	**0.0181**

Table 23.2: Use of systemic antihistamines (R06) from 2011 to 2014.

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R06A	**Antihistamines for systemic use**	**Public**	**5.3622**	**5.7048**	**6.1154**	**7.2201**	**1.9572**	**2.0822**	**2.2321**	**2.6353**
		Private	**12.9081**	**16.1294**	**18.2013**	**17.7338**	**4.7115**	**5.8872**	**6.6435**	**6.4728**
		Total	**18.2703**	**21.8342**	**24.3167**	**24.9539**	**6.6687**	**7.9695**	**8.8756**	**9.1082**
R06AA	**Aminoalkyl ethers**	**Public**	**1.6464**	**1.6786**	**1.6966**	**2.0202**	**0.6009**	**0.6127**	**0.6192**	**0.7374**
		Private	**1.3682**	**1.3661**	**2.0706**	**2.3107**	**0.4994**	**0.4986**	**0.7558**	**0.8434**
		Total	**3.0146**	**3.0448**	**3.7671**	**4.3309**	**1.1003**	**1.1113**	**1.3750**	**1.5808**
R06AA04	Clemastine	Public	-	-	-	-	-	-	-	-
		Private	0.0219	0.0180	0.0170	0.0139	0.0080	0.0066	0.0062	0.0051
		Total	**0.0219**	**0.0180**	**0.0170**	**0.0139**	**0.0080**	**0.0066**	**0.0062**	**0.0051**
R06AA08	Carbinoxamine	Public	-	-	-	-	-	-	-	-
		Private	0.0007	-	-	0.0040	0.0002	-	-	0.0015
		Total	**0.0007**	**-**	**-**	**0.0040**	**0.0002**	**-**	**-**	**0.0015**
R06AA52	Diphenhydramine, combinations	Public	1.6464	1.6786	1.6966	2.0202	0.6009	0.6127	0.6192	0.7374
		Private	1.3457	1.3482	2.0535	2.2927	0.4912	0.4921	0.7495	0.8368
		Total	**2.9920**	**3.0268**	**3.7501**	**4.3129**	**1.0921**	**1.1048**	**1.3688**	**1.5742**
R06AB	**Substituted alkylamines**	**Public**	**2.0451**	**2.1105**	**2.2191**	**2.6851**	**0.7465**	**0.7703**	**0.8100**	**0.9801**
		Private	**3.0312**	**3.3540**	**3.5574**	**3.5244**	**1.1064**	**1.2242**	**1.2985**	**1.2864**
		Total	**5.0763**	**5.4645**	**5.7765**	**6.2096**	**1.8528**	**1.9945**	**2.1084**	**2.2665**
R06AB01	Brompheniramine	Public	-	-	-	-	-	-	-	-
		Private	0.0072	0.0036	-	-	0.0026	0.0013	-	-
		Total	**0.0072**	**0.0036**	**-**	**-**	**0.0026**	**0.0013**	**-**	**-**
R06AB02	Dexchlorpheniramine	Public	0.0166	0.0168	0.0121	0.0101	0.0061	0.0061	0.0044	0.0037
		Private	1.0365	1.0187	1.0852	1.1660	0.3783	0.3718	0.3961	0.4256
		Total	**1.0532**	**1.0355**	**1.0973**	**1.1762**	**0.3844**	**0.3779**	**0.4005**	**0.4293**
R06AB04	Chlorphenamine	Public	2.0285	2.0937	2.2070	2.6750	0.7404	0.7642	0.8056	0.9764
		Private	1.9765	2.3090	2.4325	2.3167	0.7214	0.8428	0.8879	0.8456
		Total	**4.0049**	**4.4027**	**4.6395**	**4.9917**	**1.4618**	**1.6070**	**1.6934**	**1.8220**
R06AB54	Chlorphenamine, combinations	Public	-	-	-	-	-	-	-	-
		Private	0.0110	0.0228	0.0397	0.0417	0.0040	0.0083	0.0145	0.0152
		Total	**0.0110**	**0.0228**	**0.0397**	**0.0417**	**0.0040**	**0.0083**	**0.0145**	**0.0152**

Table 23.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R06AD	**Phenothiazine derivatives**	**Public**	**0.1400**	**0.1372**	**0.1092**	**0.1039**	**0.0511**	**0.0501**	**0.0399**	**0.0379**
		Private	**0.3568**	**1.2205**	**1.3264**	**1.3587**	**0.1302**	**0.4455**	**0.4841**	**0.4959**
		Total	**0.4967**	**1.3578**	**1.4356**	**1.4626**	**0.1813**	**0.4956**	**0.5240**	**0.5339**
R06AD02	Promethazine	Public	0.1400	0.1372	0.1092	0.1039	0.0511	0.0501	0.0399	0.0379
		Private	0.3568	1.2189	1.3259	1.3587	0.1302	0.4449	0.4839	0.4959
		Total	**0.4967**	**1.3562**	**1.4351**	**1.4626**	**0.1813**	**0.4950**	**0.5238**	**0.5339**
R06AD07	Mequitazine	Public	-	-	-	-	-	-	-	-
		Private	-	0.0016	0.0005	-	-	0.0006	0.0002	-
		Total	**-**	**0.0016**	**0.0005**	**-**	**-**	**0.0006**	**0.0002**	**-**
R06AE	**Piperazine derivatives**	**Public**	**0.2562**	**0.3015**	**0.5407**	**0.5163**	**0.0935**	**0.1101**	**0.1974**	**0.1884**
		Private	**4.8966**	**6.5733**	**7.3838**	**7.0349**	**1.7873**	**2.3993**	**2.6951**	**2.5677**
		Total	**5.1528**	**6.8748**	**7.9245**	**7.5511**	**1.8808**	**2.5093**	**2.8924**	**2.7562**
R06AE01	Buclizine	Public	-	-	-	-	-	-	-	-
		Private	0.0395	0.0151	0.0133	0.0196	0.0144	0.0055	0.0048	0.0072
		Total	**0.0395**	**0.0151**	**0.0133**	**0.0196**	**0.0144**	**0.0055**	**0.0048**	**0.0072**
R06AE07	Cetirizine	Public	0.2331	0.2443	0.4301	0.4337	0.0851	0.0892	0.1570	0.1583
		Private	4.4615	5.8801	6.6352	6.1596	1.6285	2.1463	2.4218	2.2482
		Total	**4.6947**	**6.1245**	**7.0653**	**6.5933**	**1.7135**	**2.2354**	**2.5788**	**2.4066**
R06AE09	Levocetirizine	Public	0.0185	0.0491	0.0750	0.0767	0.0068	0.0179	0.0274	0.0280
		Private	0.3837	0.6621	0.7173	0.8374	0.1401	0.2417	0.2618	0.3057
		Total	**0.4023**	**0.7112**	**0.7922**	**0.9141**	**0.1468**	**0.2596**	**0.2892**	**0.3337**
R06AE55	Meclozine, combinations	Public	0.0045	0.0081	0.0356	0.0058	0.0016	0.0030	0.0130	0.0021
		Private	0.0119	0.0160	0.0180	0.0182	0.0043	0.0058	0.0066	0.0066
		Total	**0.0164**	**0.0241**	**0.0536**	**0.0241**	**0.0060**	**0.0088**	**0.0196**	**0.0088**
R06AX	**Other antihistamines for systemic use**	**Public**	**1.2746**	**1.4769**	**1.5498**	**1.8945**	**0.4652**	**0.5391**	**0.5657**	**0.6915**
		Private	**3.2553**	**3.6155**	**3.8631**	**3.5052**	**1.1882**	**1.3196**	**1.4100**	**1.2794**
		Total	**4.5299**	**5.0923**	**5.4129**	**5.3997**	**1.6534**	**1.8587**	**1.9757**	**1.9709**
R06AX13	Loratadine	Public	1.2390	1.4214	1.4948	1.8025	0.4522	0.5188	0.5456	0.6579
		Private	2.4197	2.6724	2.8804	2.4858	0.8832	0.9754	1.0513	0.9073
		Total	**3.6586**	**4.0937**	**4.3752**	**4.2883**	**1.3354**	**1.4942**	**1.5969**	**1.5652**

Table 23.2: (*continued*)

ATC	Therapeutic Group/Drug	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
			2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R06AX17	Ketotifen	Public	-	-	-	-	-	-	-	-
		Private	0.1431	0.2042	0.1547	0.1429	0.0522	0.0745	0.0565	0.0522
		Total	**0.1431**	**0.2042**	**0.1547**	**0.1429**	**0.0522**	**0.0745**	**0.0565**	**0.0522**
R06AX26	Fexofenadine	Public	-	-	-	-	-	-	-	-
		Private	0.3232	0.3334	0.3750	0.3984	0.1180	0.1217	0.1369	0.1454
		Total	**0.3232**	**0.3334**	**0.3750**	**0.3984**	**0.1180**	**0.1217**	**0.1369**	**0.1454**
R06AX27	Desloratadine	Public	0.0356	0.0555	0.0550	0.0920	0.0130	0.0203	0.0201	0.0336
		Private	0.3694	0.4055	0.4531	0.4781	0.1348	0.1480	0.1654	0.1745
		Total	**0.4050**	**0.4610**	**0.5081**	**0.5701**	**0.1478**	**0.1683**	**0.1854**	**0.2081**

References:

1. Brozek, J.L.; et. al. Allergic Rhinitis and its Impact on Asthma (ARIA) guidelines: 2010 Revision. *J. Allergy Clin. Immunol.* 2010, 126(3), 466-476.

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3. *Finnish Statistics on Medicines 2014*; Finnish Medicines Agency Fimea and Social Insurance Institution, Printing Office: Helsinki 2015.

CHAPTER 24: USE OF OPHTHALMOLOGICALS

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The use of ophthalmologicals in Malaysia followed the WHO ATC guidelines for which DDDs have been assigned for antiglaucoma preparations only. The DDDs are based on single dose (or single package) and adminstration frequencies. A single dose is defined as two eye drops (one in each eye) corresponding to 0.1ml. For eye drops administered once daily the DDD is 0.1ml, for eye drops administered twice daily the DDD is 0.2ml, etc. For single use packages one dose is the volume of one package. This also applies for combinations. In the eye ointments one dose corresponds to about 10mm (20mg) per eye this corresponding to 40mg for both eyes. Other ophthalmologicals were analysed based on observation trends in deviated DDDs[1].

Antiinfectives

There was an increasing trend in the overall use of antiinfectives from 2011 to 2014 (Table 24.2). The public sector showed a marked increase in its use from 2012 to 2013. This was attributed to chloramphenicol and gentamicin use in the public sector. In the private sector, a similar increase was seen one year later and this was due to chloramphenicol usage only. However in the private sector there was a declining trend of fusidic acid use from 2012 to 2014. The usage of chlortetracycline showed an overall declining trend. The newer generation fluoroquinolones were only used in the private sector during this period. Antiviral usage increased from 2011 to 2012 and gradually declined up to 2014.

Anti-Inflammatory Agents

There was a 3 fold increase in the usage of corticosteroid anti-inflammatory agents in the public sector from 2013 to 2014 which was mainly contributed by dexamethasone (Table 24.3). Loteprednol was only used in the private sector and increased 5 folds over the 4 years. The usage of diclofenac stopped in 2014 being replaced by newer NSAIDs such as ketorolac and nepafenac, both of which have increased approximately 2 fold. The usage of combination anti-inflammatory and anti-infectives in the public sector doubled from 2011 to 2014 with a marked increase seen in 2013. In the private sector no increase was seen over the years.

Anti-Glaucoma Preparations And Miotics

All anti-glaucoma preparations showed an increasing trend in usage from 2011 to 2014 (Table 24.4).

Mydriatics And Cycloplegics

There was increasing trend of usage of with a spike in 2012 attributed to the increase use of atropine and homatropine in the public sector (Table 24.5).

Decongestants And Antiallergics

The overall usage of decongestants and antiallergics did not increase much from 2011 to 2014 (Table 24.6).

Local Anesthetics

Local anesthetic showed an increased in trend comparing 2011 to 2014 (Table 24.6).

Ocular Vascular Disorders Agents

Antineovascular agents show a two fold increase from 2011 to 2014 contributed by both the private and public sector (Table 24.6). Verteporfin show a gradual overall increase in use with the public sector not showing an increasing trend. Overall, ranibizumab shows a 3 fold increase in usage. Aflibercept marked its introduction in 2014 in the public sector.

Other Ophthalmologicals

The main other ophthalmologicals are ciclosporin and ocriplasmin. Ciclosporin showed an increase in trend over the 4 years however ocriplasmin was only introduced to the private sector in 2014 (Table 24.6).

Table 24.1: Use of ophthalmological agents, by therapeutic groups from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Sector	2011	2012	2013	2014
S01	**Ophthalmologicals**	**Public**	2.0611	2.3701	3.2135	3.7216
		Private	1.9255	2.0432	2.2903	2.6968
		Total	**3.9866**	**4.4133**	**5.5038**	**6.4184**
S01A	Antiinfectives	Public	0.7085	0.7156	1.2432	1.3156
		Private	0.5800	0.5742	0.7326	1.0613
		Total	**1.2884**	**1.2898**	**1.9758**	**2.3769**
S01B	Antiinflammatory agents	Public	0.0255	0.0461	0.0210	0.0645
		Private	0.1182	0.1233	0.1255	0.1394
		Total	**0.1436**	**0.1694**	**0.1465**	**0.2039**
S01C	Antiinflammatory agents and antiinfectives in combination	Public	0.0341	0.0491	0.0705	0.0633
		Private	0.1546	0.1800	0.1653	0.1611
		Total	**0.1886**	**0.2291**	**0.2358**	**0.2244**
S01E	Antiglaucoma preparations and miotics	Public	1.2119	1.4274	1.7994	2.1877
		Private	0.5852	0.6304	0.7133	0.7442
		Total	**1.7970**	**2.0579**	**2.5127**	**2.9318**
S01F	Mydriatics and cycloplegics	Public	0.0190	0.0272	0.0190	0.0252
		Private	0.0102	0.0099	0.0104	0.0103
		Total	**0.0292**	**0.0371**	**0.0294**	**0.0356**
S01G	Decongestants and antiallergics	Public	0.0405	0.0526	0.0350	0.0324
		Private	0.4456	0.4934	0.5077	0.5460
		Total	**0.4862**	**0.5460**	**0.5427**	**0.5785**
S01H	Local anesthetics	Public	0.0213	0.0516	0.0250	0.0320
		Private	0.0253	0.0248	0.0268	0.0256
		Total	**0.0466**	**0.0764**	**0.0518**	**0.0576**
S01L	Ocular vascular disorder agents	Public	0.0001	0.0002	0.0001	0.0003
		Private	0.0006	0.0008	0.0011	0.0013
		Total	**0.0007**	**0.0010**	**0.0012**	**0.0016**
S01X	Other ophthalmologicals	Public	0.0003	0.0003	0.0002	0.0004
		Private	0.0059	0.0064	0.0075	0.0076
		Total	**0.0062**	**0.0067**	**0.0077**	**0.0080**
S03	**Ophthalmological and otological preparations**	**Public**	**0.0739**	**0.0868**	**0.0718**	**0.0683**
		Private	**0.5701**	**0.7849**	**0.8885**	**1.2008**
		Total	**0.6440**	**0.8718**	**0.9603**	**1.2691**
S03A	Antiinfectives	Public	0.0046	0.0104	0.0039	0.0045
		Private	0.0681	0.0818	0.0997	0.1282
		Total	**0.0727**	**0.0922**	**0.1036**	**0.1327**
S03B	Corticosteroids	Public	0.0108	0.0149	0.0051	0.0083
		Private	0.0027	0.0167	0.0147	0.0066
		Total	**0.0135**	**0.0316**	**0.0198**	**0.0149**
S03C	Corticosteroids and antiinfectives in combination	Public	0.0585	0.0615	0.0628	0.0555
		Private	0.4993	0.6865	0.7741	1.0660
		Total	**0.5578**	**0.7480**	**0.8369**	**1.1215**

Table 24.2: Use of antibiotics for ophthalmology diseases from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S01AA	**Antibiotics**		**Public**	**0.6838**	**0.6884**	**1.1953**	**1.2807**
			Private	**0.5241**	**0.5190**	**0.6763**	**1.0104**
			Total	**1.2079**	**1.2074**	**1.8717**	**2.2910**
S01AA01	Chloramphenicol	g/ml/cc	Public	0.6572	0.6618	1.1576	1.2363
			Private	0.3564	0.3291	0.5426	0.8641
			Total	**1.0136**	**0.9908**	**1.7003**	**2.1004**
S01AA02	Chlortetracycline	g/ml/cc	Public	0.0028	0.0001	0.0001	0.0001
			Private	0.0004	0.0003	0.0001	-
			Total	**0.0032**	**0.0004**	**0.0002**	**0.0001**
S01AA10	Natamycin	g/ml/cc	Public	0.0002	0.0002	0.0002	0.0002
			Private	0.0001	0.0001	0.0002	0.0001
			Total	**0.0003**	**0.0003**	**0.0003**	**0.0004**
S01AA11	Gentamicin	g/ml/cc	Public	0.0057	0.0062	0.0144	0.0128
			Private	0.0519	0.0713	0.0398	0.0677
			Total	**0.0576**	**0.0775**	**0.0542**	**0.0806**
S01AA12	Tobramycin	g/ml/cc	Public	-	-	-	-
			Private	0.0029	0.0026	0.0023	0.0027
			Total	**0.0029**	**0.0026**	**0.0023**	**0.0027**
S01AA13	Fusidic acid	g/ml/cc	Public	0.0122	0.0156	0.0186	0.0249
			Private	0.0533	0.0551	0.0341	0.0135
			Total	**0.0654**	**0.0706**	**0.0527**	**0.0384**
S01AA17	Erythromycin	g/ml/cc	Public	-	-	-	-
			Private	0.0025	0.0035	0.0027	0.0022
			Total	**0.0025**	**0.0035**	**0.0027**	**0.0022**
S01AA30	Combinations of different antibiotics	g/ml/cc	Public	0.0058	0.0046	0.0044	0.0062
			Private	0.0565	0.0571	0.0545	0.0600
			Total	**0.0623**	**0.0617**	**0.0589**	**0.0662**
S01AD	**Antivirals**						
S01AD03	Aciclovir	g/ml/cc	Public	0.0017	0.0032	0.0019	0.0020
			Private	0.0032	0.0026	0.0025	0.0018
			Total	**0.0049**	**0.0057**	**0.0045**	**0.0037**
S01AE	**Fluoroquinolones**		**Public**	**0.0229**	**0.0240**	**0.0460**	**0.0330**
			Private	**0.0526**	**0.0526**	**0.0537**	**0.0492**
			Total	**0.0755**	**0.0767**	**0.0997**	**0.0822**
S01AE02	Norfloxacin	g/ml/cc	Public	0.0002	-	< 0.0001	-
			Private	0.0050	0.0052	0.0007	-
			Total	**0.0052**	**0.0052**	**0.0007**	**-**
S01AE03	Ciprofloxacin	g/ml/cc	Public	0.0187	0.0184	0.0374	0.0218
			Private	-	-	-	-
			Total	**0.0187**	**0.0184**	**0.0374**	**0.0218**
S01AE04	Lomefloxacin	g/ml/cc	Public	-	-	-	-
			Private	0.0035	-	-	-
			Total	**0.0035**	**-**	**-**	**-**
S01AE05	Levofloxacin	g/ml/cc	Public	-	-	-	-
			Private	0.0007	0.0011	0.0019	0.0012
			Total	**0.0007**	**0.0011**	**0.0019**	**0.0012**
S01AE07	Moxifloxacin	g/ml/cc	Public	0.0040	0.0057	0.0086	0.0112
			Private	0.0434	0.0464	0.0499	0.0473
			Total	**0.0474**	**0.0521**	**0.0584**	**0.0585**
S01AE08	Besifloxacin	g/ml/cc	Public	-	-	-	-
			Private	-	-	0.0013	0.0006
			Total	**-**	**-**	**0.0013**	**0.0006**

Table 24.3: Use of corticosteroids and non-steroidal antiinflammattory agents for ophthalmology diseases from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S01BA	**Corticosteroids, plain**		**Public**	**0.0206**	**0.0399**	**0.0143**	**0.0530**
			Private	**0.0897**	**0.0913**	**0.0894**	**0.0986**
			Total	**0.1103**	**0.1313**	**0.1038**	**0.1516**
S01BA01	Dexamethasone	g/ml/cc	Public	0.0179	0.0247	0.0101	0.0431
			Private	0.0248	0.0263	0.0277	0.0284
			Total	**0.0427**	**0.0510**	**0.0378**	**0.0715**
S01BA04	Prednisolone	g/ml/cc	Public	-	< 0.0001	0.0001	0.0001
			Private	0.0316	0.0316	0.0317	0.0393
			Total	**0.0316**	**0.0317**	**0.0318**	**0.0394**
S01BA07	Fluorometholone	g/ml/cc	Public	0.0027	0.0152	0.0041	0.0097
			Private	0.0317	0.0306	0.0234	0.0253
			Total	**0.0345**	**0.0458**	**0.0275**	**0.0350**
S01BA14	Loteprednol	g/ml/cc	Public	-	-	-	-
			Private	0.0015	0.0028	0.0066	0.0057
			Total	**0.0015**	**0.0028**	**0.0066**	**0.0057**
S01BC	**Antiinflammatory agents, non-steroids**		**Public**	**0.0048**	**0.0061**	**0.0067**	**0.0115**
			Private	**0.0284**	**0.0320**	**0.0360**	**0.0408**
			Total	**0.0333**	**0.0381**	**0.0427**	**0.0523**
S01BC03	Diclofenac	g/ml/cc	Public	-	-	-	-
			Private	0.0009	0.0008	< 0.0001	-
			Total	**0.0009**	**0.0008**	**< 0.0001**	**-**
S01BC05	Ketorolac	g/ml/cc	Public	0.0047	0.0059	0.0062	0.0106
			Private	0.0095	0.0088	0.0090	0.0120
			Total	**0.0141**	**0.0147**	**0.0153**	**0.0227**
S01BC10	Nepafenac	g/ml/cc	Public	0.0002	0.0003	0.0004	0.0009
			Private	0.0181	0.0224	0.0270	0.0287
			Total	**0.0183**	**0.0226**	**0.0274**	**0.0297**
S01CA	**Corticosteroids and antiinfectives in combination**		**Public**	**0.0341**	**0.0491**	**0.0705**	**0.0633**
			Private	**0.1546**	**0.1800**	**0.1653**	**0.1611**
			Total	**0.1886**	**0.2291**	**0.2358**	**0.2244**
S01CA01	Dexamethasone and antiinfectives	g/ml/cc	Public	0.0339	0.0491	0.0689	0.0589
			Private	0.1486	0.1733	0.1561	0.1477
			Total	**0.1825**	**0.2224**	**0.2249**	**0.2066**
S01CA05	Betamethasone and antiinfectives	g/ml/cc	Public	0.0002	< 0.0001	0.0016	0.0044
			Private	0.0060	0.0066	0.0093	0.0134
			Total	**0.0062**	**0.0066**	**0.0109**	**0.0178**

Table 24.4: Use of agents for treatment of glaucoma from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S01EA	**Sympathomimetics in glaucoma therapy 1**						
S01EA05	Brimonidine	ml	Public	0.0524	0.0816	0.1160	0.1786
			Private	0.0603	0.0618	0.0791	0.0925
			Total	**0.1126**	**0.1434**	**0.1951**	**0.2712**
S01EB	**Parasympathomimetics**		**Public**	**0.0218**	**0.0251**	**0.0423**	**0.0301**
			Private	**-**	**-**	**-**	**-**
			Total	**0.0218**	**0.0251**	**0.0423**	**0.0301**
S01EB01	Pilocarpine	ml	Public	0.0170	0.0194	0.0244	0.0255
			Private	-	-	-	-
			Total	**0.0170**	**0.0194**	**0.0244**	**0.0255**
S01EB02	Carbachol	ml	Public	0.0048	0.0057	0.0179	0.0046
			Private	-	-	-	-
			Total	**0.0048**	**0.0057**	**0.0179**	**0.0046**
S01EC	**Carbonic anhydrase inhibitors**		**Public**	**0.1506**	**0.1959**	**0.1864**	**0.2745**
			Private	**0.0620**	**0.0643**	**0.0711**	**0.0783**
			Total	**0.2127**	**0.2602**	**0.2576**	**0.3528**
S01EC01	Acetazolamide	g	Public	0.0034	0.0082	0.0110	0.0129
			Private	0.0080	0.0091	0.0079	0.0063
			Total	**0.0114**	**0.0173**	**0.0189**	**0.0192**
S01EC03	Dorzolamide	ml	Public	0.1472	0.1877	0.1749	0.2611
			Private	0.0120	0.0113	0.0105	0.0128
			Total	**0.1593**	**0.1991**	**0.1854**	**0.2739**
S01EC04	Brinzolamide	ml	Public	-	-	0.0005	0.0005
			Private	0.0420	0.0438	0.0527	0.0591
			Total	**0.0420**	**0.0438**	**0.0532**	**0.0596**
S01ED	**Beta blocking agents 1**		**Public**	**0.6193**	**0.6683**	**0.7555**	**1.0009**
			Private	**0.3927**	**0.4351**	**0.4775**	**0.4856**
			Total	**1.0120**	**1.1034**	**1.2331**	**1.4865**
S01ED01	Timolol	ml	Public	0.5164	0.5759	0.6294	0.8644
			Private	0.1607	0.1691	0.1769	0.1585
			Total	**0.6771**	**0.7450**	**0.8064**	**1.0229**
S01ED02	Betaxolol	ml	Public	0.1001	0.0849	0.0967	0.1079
			Private	0.0379	0.0338	0.0336	0.0302
			Total	**0.1380**	**0.1188**	**0.1303**	**0.1380**
S01ED51	Timolol, combinations	ml	Public	0.0029	0.0075	0.0294	0.0285
			Private	0.1940	0.2322	0.2670	0.2970
			Total	**0.1969**	**0.2397**	**0.2964**	**0.3255**
S01EE	**Prostaglandin analogues 1**		**Public**	**0.3678**	**0.4565**	**0.6992**	**0.7036**
			Private	**0.0702**	**0.0692**	**0.0856**	**0.0878**
			Total	**0.4380**	**0.5258**	**0.7847**	**0.7913**
S01EE01	Latanoprost	ml	Public	0.3402	0.4185	0.6454	0.6344
			Private	0.0702	0.0692	0.0856	0.0878
			Total	**0.4104**	**0.4877**	**0.7310**	**0.7222**
S01EE03	Bimatoprost	ml	Public	0.0263	0.0340	0.0509	0.0619
			Private	-	-	-	-
			Total	**0.0263**	**0.0340**	**0.0509**	**0.0619**
S01EE04	Travoprost	ml	Public	0.0012	0.0040	0.0029	0.0073
			Private	-	-	-	-
			Total	**0.0012**	**0.0040**	**0.0029**	**0.0073**

Table 24.5: Use of other agents for treatment of glaucoma from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S01FA	**Anticholinergics**		**Public**	**0.0173**	**0.0252**	**0.0171**	**0.0221**
			Private	**0.0090**	**0.0087**	**0.0091**	**0.0089**
			Total	**0.0264**	**0.0338**	**0.0262**	**0.0310**
S01FA01	Atropine	g/ml/cc	Public	0.0067	0.0078	0.0050	0.0080
			Private	0.0012	0.0012	0.0013	0.0013
			Total	**0.0079**	**0.0090**	**0.0063**	**0.0093**
S01FA04	Cyclopentolate	g/ml/cc	Public	0.0033	0.0042	0.0032	0.0035
			Private	0.0033	0.0028	0.0031	0.0032
			Total	**0.0066**	**0.0070**	**0.0063**	**0.0067**
S01FA05	Homatropine	g/ml/cc	Public	0.0020	0.0077	0.0023	0.0037
			Private	0.0012	0.0012	0.0012	0.0011
			Total	**0.0032**	**0.0090**	**0.0035**	**0.0048**
S01FA06	Tropicamide	g/ml/cc	Public	0.0039	0.0041	0.0046	0.0048
			Private	0.0025	0.0026	0.0028	0.0029
			Total	**0.0064**	**0.0067**	**0.0074**	**0.0076**
S01FA54	Cyclopentolate, combinations	g/ml/cc	Public	0.0015	0.0014	0.0019	0.0021
			Private	0.0008	0.0008	0.0007	0.0004
			Total	**0.0023**	**0.0022**	**0.0026**	**0.0025**
S01FB	**Sympathomimetics excluding antiglaucoma preparations**						
S01FB01	Phenylephrine	g/ml/cc	Public	0.0016	0.0020	0.0019	0.0031
			Private	0.0012	0.0013	0.0014	0.0014
			Total	**0.0028**	**0.0032**	**0.0032**	**0.0046**

Table 24.6: Use of agents for treatment of other ophthalmological disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S01GA	**Sympathomimetics Used As Decongestants**		**Public**	**0.0140**	**0.0254**	**0.0112**	**0.0051**
			Private	**0.3513**	**0.4022**	**0.4377**	**0.4544**
			Total	**0.3654**	**0.4276**	**0.4489**	**0.4594**
S01GA02	Tetryzoline	g/ml/cc	Public	-	-	-	-
			Private	0.0088	0.0280	0.0280	0.0310
			Total	**0.0088**	**0.0280**	**0.0280**	**0.0310**
S01GA05	Phenylephrine	g/ml/cc	Public	-	-	-	-
			Private	0.0129	0.0122	0.0125	0.0129
			Total	**0.0129**	**0.0122**	**0.0125**	**0.0129**
S01GA51	Naphazoline, Combinations	g/ml/cc	Public	-	-	-	-
			Private	0.2354	0.2651	0.2971	0.3388
			Total	**0.2354**	**0.2651**	**0.2971**	**0.3388**
S01GA52	Tetryzoline, Combinations	g/ml/cc	Public	0.0140	0.0254	0.0112	0.0051
			Private	0.0943	0.0970	0.1001	0.0717
			Total	**0.1083**	**0.1224**	**0.1113**	**0.0767**
S01GX	**Other antiallergics**		**Public**	**0.0265**	**0.0272**	**0.0238**	**0.0274**
			Private	**0.0943**	**0.0911**	**0.0700**	**0.0917**
			Total	**0.1208**	**0.1183**	**0.0938**	**0.1191**
S01GX01	Cromoglicic acid	g/ml/cc	Public	0.0203	0.0221	0.0191	0.0218
			Private	0.0597	0.0557	0.0343	0.0543
			Total	**0.0800**	**0.0778**	**0.0534**	**0.0761**
S01GX05	Lodoxamide	g/ml/cc	Public	-	-	-	-
			Private	0.0023	0.0008	-	-
			Total	**0.0023**	**0.0008**	**-**	**-**
S01GX06	Emedastine	g/ml/cc	Public	-	-	-	-
			Private	0.0041	0.0039	0.0032	0.0029
			Total	**0.0041**	**0.0039**	**0.0032**	**0.0029**

Table 24.6: (*continued*)

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S01GX08	Ketotifen	g/ml/cc	Public	-	-	-	-
			Private	0.0067	0.0073	0.0048	0.0046
			Total	**0.0067**	**0.0073**	**0.0048**	**0.0046**
S01GX09	Olopatadine	g/ml/cc	Public	0.0062	0.0051	0.0048	0.0056
			Private	0.0215	0.0215	0.0231	0.0237
			Total	**0.0277**	**0.0265**	**0.0278**	**0.0292**
S01GX10	Epinastine	g/ml/cc	Public	-	-	-	-
			Private	-	0.0020	0.0045	0.0062
			Total	**-**	**0.0020**	**0.0045**	**0.0062**
S01HA	**Local anesthetics**		**Public**	**0.0213**	**0.0516**	**0.0250**	**0.0320**
			Private	**0.0253**	**0.0248**	**0.0268**	**0.0256**
			Total	**0.0466**	**0.0764**	**0.0518**	**0.0576**
S01HA03	Tetracaine	g/ml/cc	Public	< 0.0001	< 0.0001	-	-
			Private	0.0008	0.0008	0.0010	0.0012
			Total	**0.0008**	**0.0008**	**0.0010**	**0.0012**
S01HA04	Proxymetacaine	g/ml/cc	Public	0.0213	0.0516	0.0250	0.0320
			Private	0.0245	0.0240	0.0258	0.0245
			Total	**0.0458**	**0.0756**	**0.0508**	**0.0565**
S01LA	**Antineovascularisation agents**		**Public**	**0.0001**	**0.0002**	**0.0001**	**0.0003**
			Private	**0.0006**	**0.0008**	**0.0011**	**0.0013**
			Total	**0.0007**	**0.0010**	**0.0012**	**0.0016**
S01LA01	Verteporfin	mg	Public	< 0.0001	0.0001	0.0001	0.0001
			Private	0.0002	0.0003	0.0004	0.0004
			Total	**0.0002**	**0.0004**	**0.0004**	**0.0005**
S01LA04	Ranibizumab	g/ml/cc	Public	< 0.0001	0.0001	0.0001	0.0002
			Private	0.0004	0.0005	0.0007	0.0010
			Total	**0.0004**	**0.0006**	**0.0008**	**0.0012**
S01LA05	Aflibercept	g/ml/cc	Public	-	-	-	< 0.0001
			Private	-	-	-	-
			Total	**-**	**-**	**-**	**< 0.0001**
S01XA	**Other ophthalmologicals**		**Public**	**0.0003**	**0.0003**	**0.0002**	**0.0004**
			Private	**0.0059**	**0.0064**	**0.0075**	**0.0076**
			Total	**0.0062**	**0.0067**	**0.0077**	**0.0080**
S01XA18	Ciclosporin	g/ml/cc	Public	0.0003	0.0003	0.0002	0.0004
			Private	0.0059	0.0064	0.0075	0.0076
			Total	**0.0062**	**0.0067**	**0.0077**	**0.0080**
S01XA22	Ocriplasmin	g/ml/cc	Public	-	-	-	-
			Private	-	-	-	< 0.0001
			Total	**-**	**-**	**-**	**< 0.0001**

Table 24.7: Use of other preparations for treatment of ophthalmological disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S03AA	**Antiinfectives**						
S03AA06	Gentamicin	g/ml/cc	Public	0.0046	0.0104	0.0039	0.0045
			Private	0.0681	0.0818	0.0997	0.1282
			Total	**0.0727**	**0.0922**	**0.1036**	**0.1327**
S03BA	**Corticosteroids**						
S03BA03	Betamethasone	g/ml/cc	Public	0.0108	0.0149	0.0051	0.0083
			Private	0.0027	0.0167	0.0147	0.0066
			Total	**0.0135**	**0.0316**	**0.0198**	**0.0149**
S03CA	**Corticosteroids and antiinfectives in combination**		**Public**	**0.0585**	**0.0615**	**0.0628**	**0.0555**
			Private	**0.4993**	**0.6865**	**0.7741**	**1.0660**
			Total	**0.5578**	**0.7480**	**0.8369**	**1.1215**
S03CA01	Dexamethasone and antiinfectives	g/ml/cc	Public	0.0357	0.0402	0.0425	0.0418
			Private	0.4770	0.6302	0.6993	0.9893
			Total	**0.5126**	**0.6704**	**0.7418**	**1.0311**
S03CA06	Betamethasone and antiinfectives	g/ml/cc	Public	0.0229	0.0213	0.0203	0.0137
			Private	0.0223	0.0563	0.0748	0.0767
			Total	**0.0452**	**0.0775**	**0.0951**	**0.0904**

References:

1. Guidelines for ATC classification and DDD assignment 2015. WHO collaborating centre for drug statistic methodology. Printing Office: Oslo, 2014

CHAPTER 25: USE OF OTOLOGICALS

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Drug utilisation statistics are generally expressed as Defined Daily Dose (DDD), the assumed average dose per day of a drug used for its main indication by adult, as standard unit for reference[1]. However, no DDD have been assigned yet by WHO for otologicals. Thus, for the purpose of this chapter report, the total usage for otological drugs is expressed in gram or ml or cc, per 1,000 inhabitants, per day, irrespective of the strength of the preparations.

Otological preparations used in Malaysia are classified into local antiinfectives ear drops, local corticosteroid ear drops and combination of antiinfectives and corticosteroid ear drops. There are two types of otological drugs that are mainly used, corticosteroid and non-corticosteroid antiinfective preparations. The most widely used antiinfective is chloramphenicol (S02AA01) which is easily available in peripheral government clinics and private general practitioners. The usage of newer generation antiinfective ear drops such as ofloxacin shows an increasing trend (Table 25.1). This is maybe due to the product discontinuation of antiinfectives corticosteroids.

Table 25.1: Use of agents for treatment of otological disorders from 2011 to 2014 (DDD/1,000 inhabitants/day).

ATC	Therapeutic Group/Drug	Unit	Sector	2011	2012	2013	2014
S02	**Otologicals**	**g/ml/cc**	**Public**	**0.1386**	**0.1441**	**0.2674**	**0.2257**
			Private	**0.0613**	**0.0575**	**0.0574**	**0.0667**
			Total	**0.1999**	**0.2016**	**0.3248**	**0.2924**
S02A	**Antiinfectives**						
S02AA	**Antiinfectives**	**g/ml/cc**	**Public**	**0.1380**	**0.1431**	**0.2667**	**0.2250**
			Private	**0.0505**	**0.0294**	**0.0190**	**0.0225**
			Total	**0.1885**	**0.1725**	**0.2857**	**0.2475**
S02AA01	Chloramphenicol	g/ml/cc	Public	0.1297	0.1359	0.2580	0.2146
			Private	0.0414	0.0159	0.0045	0.0001
			Total	**0.1711**	**0.1518**	**0.2625**	**0.2147**
S02AA11	Polymyxin B	g/ml/cc	Public	-	-	-	-
			Private	0.0027	0.0062	0.0062	0.0145
			Total	**0.0027**	**0.0062**	**0.0062**	**0.0145**
S02AA16	Ofloxacin	g/ml/cc	Public	0.0083	0.0072	0.0088	0.0104
			Private	0.0063	0.0073	0.0083	0.0080
			Total	**0.0147**	**0.0145**	**0.0170**	**0.0184**
S02C	**Corticosteroids and antiinfectives in combination**						
S02CA	**Corticosteroids and antiinfectives in combination**						
S02CA03	Hydrocortisone and antiinfectives	g/ml/cc	Public	0.0006	0.0010	0.0006	0.0007
			Private	0.0108	0.0281	0.0385	0.0442
			Total	**0.0114**	**0.0291**	**0.0391**	**0.0449**

References:

1. *Guidelines for ATC classification and DDD assignment 2015*. WHO collaborating centre for drug statistic methodology. Printing Office: Oslo, 2014.

CHAPTER 26: USE OF DRUGS FOR COUGH AND COLD

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Upper respiratory tract infection (URTI) is one of the leading causes of medical consultations in primary care. The National Medical Care Survey 2010 reported that the prevalence of URTI was 29.64% in all age groups[1]. Earlier data from the National Health and Morbidity Survey 2006 showed that acute respiratory illness (ARI) affected daily activities of 30.8% of the population with 60.6% of those having ARI sought treatment for the illness. Common cold was the commonest illness reported among those with ARI (16.9%)[2].

Cough and cold medicines are commonly used to treat upper respiratory tract symptoms in children and adults. These medicines do not cure the infection, but aim to reduce symptoms such as runny nose and cough. Drugs commonly used for symptomatic relief of URTI include antihistamines, nasal decongestants, cough suppressants, expectorants and mucolytics, in single or multiple-ingredients preparations.

Cough and cold combination products reported in this chapter has been coded according to the standard rules for ATC coding based on WHO guidelines, as shown in Figure 26.1. There is no specific defined daily dose (DDD) assigned by WHO for combinations of cough and cold preparations, though it does recommend that fixed DDDs based on the product's recommended dosage to be assigned[3]. For the purpose of comparing usage between the preparations, estimation of the DDDs were done using the standard dose for the main indication in adults, based on average dosage regimen of three times daily. For this report, the DDD adopted for combination of cough and cold preparations are 30 ml (oral liquid formulation) and 6 tablets (tablets/capsules/caplets).

Drugs used for cough and cold were categorised by drug class and agents. Overall, systemic antihistamines (R06A) were the most commonly used in year 2011 to 2014 (Table 26.4). In 2014, the second commonest use medicine was other systemic drugs for obstructive airway diseases (R03D), followed by nasal decongestants for systemic use (R01B). Of these main drug classes, total utilisation of antihistamines for systemic use (R06A) increased from 2011 to 2014 but nasal decongestants for systemic use (R01B) showed decreasing trend in total utilisation.

As shown in Table 26.4, overall utilisation of antihistamines for systemic use increased by 36.6% from 2011 to 2014. Among the non-sedating antihistamines, cetirizine and loratadine reported highest utilisation. Comparison between sectors showed that non-sedating antihistamines were used more frequently in private sector. The usage of cetirizine was 6.5933 DDD/1,000 inhabitants/day in 2014, the highest in its class of antihistamines for systemic use. The utilisation of this agent showed an increasing trend. Their usage was also much higher in the private sector. If we compared the 2014 data, the consumption of cetirizine was much higher in Finland (25.38 DDD/1,000 inhabitants/day) compared to Malaysia[4]. However, the usage of cetirizine was much lower in Australia (0.04 DDD/1,000 inhabitants/day) as their preferred antihistamine was fexofenadine (0.35 DDD/1,000 inhabitants/day)[5].

As for sedating antihistamines, chlorphenamine and diphenhydramine combinations reported the highest utilisation. In general, chlorphenamine was the second most used antihistamine in 2014 and their utilisation showed an increasing trend. As compared to Malaysia, Finland did not use any sedating antihistamine[4]. Diphenhydramine combinations was the third commonly used drugs in 2014 and their utilisation showed an increasing trend from 2011 to 2014. Nevertheless, it is important to note that usage of systemic antihistamines in this report also include their use for other indications. Hence this does not reflect the usage for systemic antihistamines for treatment of cough and cold alone.

In conclusion, cough and cold preparations are widely used in Malaysia for symptomatic relief. The use of non-sedating antihistamines such as cetirizine and loratadine was preferred as compared to the sedating antihistamines. This may be related to increasing awareness about the safety profile of these agents, which discourage the prescribing of sedating antihistamines especially for children below two years old. While the data presented in this chapter represented majority of the drugs used for cough and cold, the usage reported was based partially on procurement data which may not accurately reflect total consumption pattern in Malaysia.

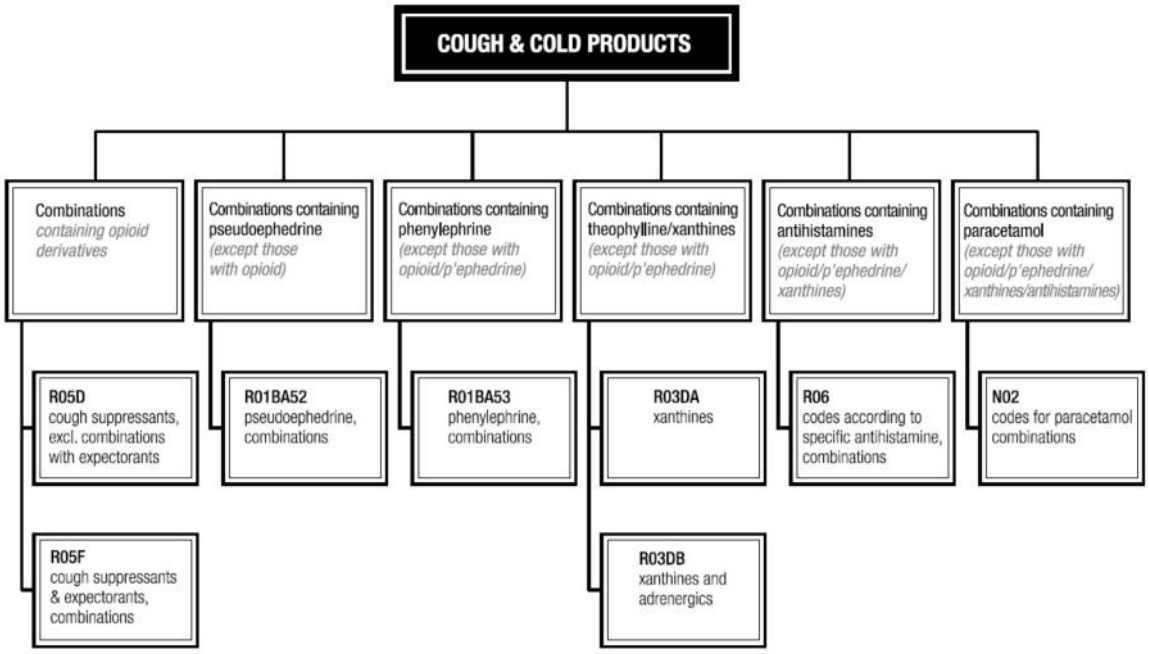

Figure 26.1: Guide for ATC coding of cough and cold combination preparations

Table 26.1: Use of systemic nasal descongestants from 2011 to 2014.

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R01	**Nasal preparations**										
R01B	**Nasal decongestants for systemic use**										
R01BA	**Sympathomimetics**		**Public**	**0.2132**	**0.2281**	**0.2031**	**0.1752**	**0.0778**	**0.0833**	**0.0741**	**0.0639**
			Private	**1.5506**	**1.6357**	**1.6835**	**1.4561**	**0.5660**	**0.5970**	**0.6145**	**0.5315**
			Total	**1.7638**	**1.8638**	**1.8866**	**1.6313**	**0.6438**	**0.6803**	**0.6886**	**0.5954**
R01BA02	Pseudoephedrine	0.24g	Public	-	-	-	-	-	-	-	-
			Private	0.0207	-	-	-	0.0075	-	-	-
			Total	**0.0207**	**-**	**-**	**-**	**0.0075**	**-**	**-**	**-**
R01BA52	Pseudoephedrine, combinations	0.24g	Public	0.2132	0.2281	0.2031	0.1752	0.0778	0.0833	0.0741	0.0639
			Private	1.4957	1.6008	1.6265	1.4065	0.5459	0.5843	0.5937	0.5134
			Total	**1.7089**	**1.8289**	**1.8296**	**1.5817**	**0.6237**	**0.6675**	**0.6678**	**0.5773**
R01BA53	Phenylephrine, combinations	6 tablet/ 30ml	Public	-	-	-	-	-	-	-	-
			Private	0.0343	0.0349	0.0570	0.0496	0.0125	0.0127	0.0208	0.0181
			Total	**0.0343**	**0.0349**	**0.0570**	**0.0496**	**0.0125**	**0.0127**	**0.0208**	**0.0181**

Table 26.2: Use of agents for treatment of obstructive airway diseases from 2011 to 2014.

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R03	**Drugs for obstructive airway diseases**										
R03D	**Other systemic drugs for obstructive airway diseases**		**Public**	**0.8652**	**0.9055**	**0.8192**	**0.9236**	**0.3158**	**0.3305**	**0.2990**	**0.3371**
			Private	**0.8107**	**0.8334**	**0.8137**	**0.7963**	**0.2959**	**0.3042**	**0.2970**	**0.2907**
			Total	**1.6759**	**1.7388**	**1.6329**	**1.7199**	**0.6117**	**0.6347**	**0.5960**	**0.6278**
R03DA	Xanthines		Public	0.7684	0.7981	0.6353	0.6968	0.2805	0.2913	0.2319	0.2543
			Private	0.4516	0.4566	0.4085	0.3864	0.1648	0.1667	0.1491	0.1410
			Total	**1.2200**	**1.2547**	**1.0438**	**1.0832**	**0.4453**	**0.4580**	**0.3810**	**0.3954**
R03DC	Leukotriene receptor antagonists		Public	0.0968	0.1074	0.1836	0.2262	0.0353	0.0392	0.0670	0.0826
			Private	0.3590	0.3751	0.4013	0.4055	0.1310	0.1369	0.1465	0.1480
			Total	**0.4558**	**0.4824**	**0.5848**	**0.6316**	**0.1664**	**0.1761**	**0.2135**	**0.2305**
R03DX	Other systemic drugs for obstructive airway diseases		Public	< 0.0001	0.0001	0.0003	0.0006	< 0.0001	< 0.0001	0.0001	0.0002
			Private	< 0.0001	0.0017	0.0040	0.0045	< 0.0001	0.0006	0.0014	0.0016
			Total	**0.0001**	**0.0017**	**0.0042**	**0.0051**	**< 0.0001**	**0.0006**	**0.0015**	**0.0019**

Table 26.3: Use of agents for treatment of cough and cold from 2011 to 2014.

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	2012	2013	2014	2011	2012	2013	2014
R05	**Cough and cold preparations**		**Public**	**0.7273**	**0.7443**	**1.0071**	**1.0727**	**0.2655**	**0.2717**	**0.3676**	**0.3915**
			Private	**2.3049**	**2.2242**	**2.2931**	**2.2570**	**0.8413**	**0.8118**	**0.8370**	**0.8238**
			Total	**3.0323**	**2.9685**	**3.3002**	**3.3297**	**1.1068**	**1.0835**	**1.2046**	**1.2153**
R05C	**Expectorants, excluding combinations with cough suppressants**		**Public**	**0.7273**	**0.7441**	**1.0070**	**1.0727**	**0.2655**	**0.2716**	**0.3676**	**0.3915**
			Private	**0.3776**	**0.4007**	**0.4263**	**0.3942**	**0.1378**	**0.1462**	**0.1556**	**0.1439**
			Total	**1.1049**	**1.1448**	**1.4333**	**1.4669**	**0.4033**	**0.4178**	**0.5231**	**0.5354**
R05CA	**Expectorants**										
R05CA10	Combinations	30ml	Public	-	-	-	-	-	-	-	-
			Private	0.1175	0.1668	0.1586	0.1559	0.0429	0.0609	0.0579	0.0569
			Total	**0.1175**	**0.1668**	**0.1586**	**0.1559**	**0.0429**	**0.0609**	**0.0579**	**0.0569**
R05CB	**Mucolytics**		**Public**	**0.7273**	**0.7441**	**1.0070**	**1.0727**	**0.2655**	**0.2716**	**0.3676**	**0.3915**
			Private	**0.2601**	**0.2339**	**0.2677**	**0.2383**	**0.0949**	**0.0854**	**0.0977**	**0.0870**
			Total	**0.9875**	**0.9779**	**1.2747**	**1.3110**	**0.3604**	**0.3569**	**0.4653**	**0.4785**
R05CB01	Acetylcysteine	0.5g	Public	0.0013	0.0018	0.0010	0.0040	0.0005	0.0006	0.0004	0.0015
			Private	-	-	-	-	-	-	-	-
			Total	**0.0013**	**0.0018**	**0.0010**	**0.0040**	**0.0005**	**0.0006**	**0.0004**	**0.0015**
R05CB02	Bromhexine	24mg	Public	0.7260	0.7423	1.0060	1.0682	0.2650	0.2709	0.3672	0.3899
			Private	-	-	-	-	-	-	-	-
			Total	**0.7260**	**0.7423**	**1.0060**	**1.0682**	**0.2650**	**0.2709**	**0.3672**	**0.3899**
R05CB03	Carbocisteine	1.5g	Public	-	< 0.0001	-	-	-	< 0.0001	-	-
			Private	0.0004	-	-	-	0.0002	-	-	-
			Total	**0.0004**	**< 0.0001**	**-**	**-**	**0.0002**	**< 0.0001**	**-**	**-**
R05CB06	Ambroxol	0.12g	Public	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-	-
			Private	-	-	-	-	-	-	-	-
			Total	**< 0.0001**	**< 0.0001**	**-**	**-**	**< 0.0001**	**< 0.0001**	**-**	**-**
R05CB10	Combinations	30ml	Public	-	-	-	0.0004	-	-	-	0.0002
			Private	0.2597	0.2339	0.2677	0.2383	0.0948	0.0854	0.0977	0.0870
			Total	**0.2597**	**0.2339**	**0.2677**	**0.2388**	**0.0948**	**0.0854**	**0.0977**	**0.0872**

Table 26.3: (*continued*)

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	2012	2013	2014	2011	2012	2013	2014
R05D	**Cough suppressants, excluding combinations with expectorants**		**Public**	**-**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**-**	**< 0.0001**	**< 0.0001**	**< 0.0001**
			Private	**1.6949**	**1.5942**	**1.5890**	**1.6002**	**0.6186**	**0.5819**	**0.5800**	**0.5841**
			Total	**1.6949**	**1.5942**	**1.5890**	**1.6002**	**0.6186**	**0.5819**	**0.5800**	**0.5841**
R05DA	**Opium alkaloids and derivatives**		**Public**	**-**	**< 0.0001**	**< 0.0001**	**< 0.0001**	**-**	**< 0.0001**	**< 0.0001**	**< 0.0001**
			Private	**1.4621**	**1.3403**	**1.4017**	**1.3860**	**0.5337**	**0.4892**	**0.5116**	**0.5059**
			Total	**1.4621**	**1.3403**	**1.4017**	**1.3860**	**0.5337**	**0.4892**	**0.5116**	**0.5059**
R05DA08	Pholcodine	50mg	Public	-	-	-	-	-	-	-	-
			Private	0.0920	0.1096	0.0850	0.1020	0.0336	0.0400	0.0310	0.0372
			Total	**0.0920**	**0.1096**	**0.0850**	**0.1020**	**0.0336**	**0.0400**	**0.0310**	**0.0372**
R05DA09	Dextromethorphan	90mg	Public	-	-	-	< 0.0001	-	-	-	< 0.0001
			Private	0.5849	0.4364	0.5060	0.4539	0.2135	0.1593	0.1847	0.1657
			Total	**0.5849**	**0.4364**	**0.5060**	**0.4539**	**0.2135**	**0.1593**	**0.1847**	**0.1657**
R05DA20	Combinations	6 tablet/ 30 ml	Public	-	< 0.0001	< 0.0001	-	-	< 0.0001	< 0.0001	-
			Private	0.7852	0.7943	0.8107	0.8301	0.2866	0.2899	0.2959	0.3030
			Total	**0.7852**	**0.7943**	**0.8107**	**0.8301**	**0.2866**	**0.2899**	**0.2959**	**0.3030**
R05DB	**Other cough suppressants**										
R05DB21	Cloperastine	60mg	Public	-	-	-	-	-	-	-	-
			Private	0.2328	0.2539	0.1873	0.2141	0.0850	0.0927	0.0684	0.0782
			Total	**0.2328**	**0.2539**	**0.1873**	**0.2141**	**0.0850**	**0.0927**	**0.0684**	**0.0782**
R05F	**Cough suppressants and expectorants, combinations**										
R05FA	**Opium derivatives and expectorants**		**Public**	**-**	**0.0003**	**0.0001**	**-**	**-**	**0.0001**	**< 0.0001**	**-**
			Private	**0.2324**	**0.2293**	**0.2778**	**0.2626**	**0.0848**	**0.0837**	**0.1014**	**0.0959**
			Total	**0.2324**	**0.2296**	**0.2779**	**0.2626**	**0.0848**	**0.0838**	**0.1014**	**0.0959**
R05FA01	Opium derivatives and mucolytics	30ml	Public	-	0.0003	0.0001	-	-	0.0001	< 0.0001	-
			Private	0.1556	0.1505	0.1959	0.1755	0.0568	0.0549	0.0715	0.0641
			Total	**0.1556**	**0.1507**	**0.1959**	**0.1755**	**0.0568**	**0.0550**	**0.0715**	**0.0641**
R05FA02	Opium derivatives and expectorants	30ml	Public	-	-	-	-	-	-	-	-
			Private	0.0768	0.0788	0.0819	0.0871	0.0280	0.0288	0.0299	0.0318
			Total	**0.0768**	**0.0788**	**0.0819**	**0.0871**	**0.0280**	**0.0288**	**0.0299**	**0.0318**

Table 26.4: Use of systemic antihistamines (R06) from 2011 to 2014.

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	2012	2013	2014	2011	2012	2013	2014
R06A	**Antihistamines for systemic use**		**Public**	**5.3622**	**5.7048**	**6.1154**	**7.2201**	**1.9572**	**2.0822**	**2.2321**	**2.6353**
			Private	**12.9081**	**16.1294**	**18.2013**	**17.7338**	**4.7115**	**5.8872**	**6.6435**	**6.4728**
			Total	**18.2703**	**21.8342**	**24.3167**	**24.9539**	**6.6687**	**7.9695**	**8.8756**	**9.1082**
R06AA	**Aminoalkyl ethers**		**Public**	**1.6464**	**1.6786**	**1.6966**	**2.0202**	**0.6009**	**0.6127**	**0.6192**	**0.7374**
			Private	**1.3682**	**1.3661**	**2.0706**	**2.3107**	**0.4994**	**0.4986**	**0.7558**	**0.8434**
			Total	**3.0146**	**3.0448**	**3.7671**	**4.3309**	**1.1003**	**1.1113**	**1.3750**	**1.5808**
R06AA04	Clemastine	2mg	Public	-	-	-	-	-	-	-	-
			Private	0.0219	0.0180	0.0170	0.0139	0.0080	0.0066	0.0062	0.0051
			Total	**0.0219**	**0.0180**	**0.0170**	**0.0139**	**0.0080**	**0.0066**	**0.0062**	**0.0051**
R06AA08	Carbinoxamine	16mg	Public	-	-	-	-	-	-	-	-
			Private	0.0007	-	-	0.0040	0.0002	-	-	0.0015
			Total	**0.0007**	**-**	**-**	**0.0040**	**0.0002**	**-**	**-**	**0.0015**
R06AA52	Diphenhydramine, combinations	30ml	Public	1.6464	1.6786	1.6966	2.0202	0.6009	0.6127	0.6192	0.7374
			Private	1.3457	1.3482	2.0535	2.2927	0.4912	0.4921	0.7495	0.8368
			Total	**2.9920**	**3.0268**	**3.7501**	**4.3129**	**1.0921**	**1.1048**	**1.3688**	**1.5742**
R06AB	**Substituted alkylamines**		**Public**	**2.0451**	**2.1105**	**2.2191**	**2.6851**	**0.7465**	**0.7703**	**0.8100**	**0.9801**
			Private	**3.0312**	**3.3540**	**3.5574**	**3.5244**	**1.1064**	**1.2242**	**1.2985**	**1.2864**
			Total	**5.0763**	**5.4645**	**5.7765**	**6.2096**	**1.8528**	**1.9945**	**2.1084**	**2.2665**
R06AB01	Brompheniramine	24mg	Public	-	-	-	-	-	-	-	-
			Private	0.0072	0.0036	-	-	0.0026	0.0013	-	-
			Total	**0.0072**	**0.0036**	**-**	**-**	**0.0026**	**0.0013**	**-**	**-**
R06AB02	Dexchlorpheniramine	6mg	Public	0.0166	0.0168	0.0121	0.0101	0.0061	0.0061	0.0044	0.0037
			Private	1.0365	1.0187	1.0852	1.1660	0.3783	0.3718	0.3961	0.4256
			Total	**1.0532**	**1.0355**	**1.0973**	**1.1762**	**0.3844**	**0.3779**	**0.4005**	**0.4293**
R06AB04	Chlorphenamine	12mg	Public	2.0285	2.0937	2.2070	2.6750	0.7404	0.7642	0.8056	0.9764
			Private	1.9765	2.3090	2.4325	2.3167	0.7214	0.8428	0.8879	0.8456
			Total	**4.0049**	**4.4027**	**4.6395**	**4.9917**	**1.4618**	**1.6070**	**1.6934**	**1.8220**
R06AB54	Chlorphenamine, combinations	6 table/ 30 ml	Public	-	-	-	-	-	-	-	-
			Private	0.0110	0.0228	0.0397	0.0417	0.0040	0.0083	0.0145	0.0152
			Total	**0.0110**	**0.0228**	**0.0397**	**0.0417**	**0.0040**	**0.0083**	**0.0145**	**0.0152**

Table 26.4: (*continued*)

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	2012	2013	2014	2011	2012	2013	2014
R06AD	**Phenothiazine derivatives**		**Public**	**0.1400**	**0.1372**	**0.1092**	**0.1039**	**0.0511**	**0.0501**	**0.0399**	**0.0379**
			Private	**0.3568**	**1.2205**	**1.3264**	**1.3587**	**0.1302**	**0.4455**	**0.4841**	**0.4959**
			Total	**0.4967**	**1.3578**	**1.4356**	**1.4626**	**0.1813**	**0.4956**	**0.5240**	**0.5339**
R06AD02	Promethazine	25mg	Public	0.1400	0.1372	0.1092	0.1039	0.0511	0.0501	0.0399	0.0379
			Private	0.3568	1.2189	1.3259	1.3587	0.1302	0.4449	0.4839	0.4959
			Total	**0.4967**	**1.3562**	**1.4351**	**1.4626**	**0.1813**	**0.4950**	**0.5238**	**0.5339**
R06AD07	Mequitazine	10mg	Public	-	-	-	-	-	-	-	-
			Private	-	0.0016	0.0005	-	-	0.0006	0.0002	-
			Total	**-**	**0.0016**	**0.0005**	**-**	**-**	**0.0006**	**0.0002**	**-**
R06AE	**Piperazine derivatives**		**Public**	**0.2562**	**0.3015**	**0.5407**	**0.5163**	**0.0935**	**0.1101**	**0.1974**	**0.1884**
			Private	**4.8966**	**6.5733**	**7.3838**	**7.0349**	**1.7873**	**2.3993**	**2.6951**	**2.5677**
			Total	**5.1528**	**6.8748**	**7.9245**	**7.5511**	**1.8808**	**2.5093**	**2.8924**	**2.7562**
R06AE01	Buclizine	50mg	Public	-	-	-	-	-	-	-	-
			Private	0.0395	0.0151	0.0133	0.0196	0.0144	0.0055	0.0048	0.0072
			Total	**0.0395**	**0.0151**	**0.0133**	**0.0196**	**0.0144**	**0.0055**	**0.0048**	**0.0072**
R06AE07	Cetirizine	10mg	Public	0.2331	0.2443	0.4301	0.4337	0.0851	0.0892	0.1570	0.1583
			Private	4.4615	5.8801	6.6352	6.1596	1.6285	2.1463	2.4218	2.2482
			Total	**4.6947**	**6.1245**	**7.0653**	**6.5933**	**1.7135**	**2.2354**	**2.5788**	**2.4066**
R06AE09	Levocetirizine	5mg	Public	0.0185	0.0491	0.0750	0.0767	0.0068	0.0179	0.0274	0.0280
			Private	0.3837	0.6621	0.7173	0.8374	0.1401	0.2417	0.2618	0.3057
			Total	**0.4023**	**0.7112**	**0.7922**	**0.9141**	**0.1468**	**0.2596**	**0.2892**	**0.3337**
R06AE55	Meclozine, combinations	4 tablet	Public	0.0045	0.0081	0.0356	0.0058	0.0016	0.0030	0.0130	0.0021
			Private	0.0119	0.0160	0.0180	0.0182	0.0043	0.0058	0.0066	0.0066
			Total	**0.0164**	**0.0241**	**0.0536**	**0.0241**	**0.0060**	**0.0088**	**0.0196**	**0.0088**
R06AX	**Other antihistamines for systemic use**		**Public**	**1.2746**	**1.4769**	**1.5498**	**1.8945**	**0.4652**	**0.5391**	**0.5657**	**0.6915**
			Private	**3.2553**	**3.6155**	**3.8631**	**3.5052**	**1.1882**	**1.3196**	**1.4100**	**1.2794**
			Total	**4.5299**	**5.0923**	**5.4129**	**5.3997**	**1.6534**	**1.8587**	**1.9757**	**1.9709**
R06AX13	Loratadine	10mg	Public	1.2390	1.4214	1.4948	1.8025	0.4522	0.5188	0.5456	0.6579
			Private	2.4197	2.6724	2.8804	2.4858	0.8832	0.9754	1.0513	0.9073
			Total	**3.6586**	**4.0937**	**4.3752**	**4.2883**	**1.3354**	**1.4942**	**1.5969**	**1.5652**
R06AX17	Ketotifen	2mg	Public	-	-	-	-	-	-	-	-
			Private	0.1431	0.2042	0.1547	0.1429	0.0522	0.0745	0.0565	0.0522
			Total	**0.1431**	**0.2042**	**0.1547**	**0.1429**	**0.0522**	**0.0745**	**0.0565**	**0.0522**

Table 26.4: (*continued*)

ATC	Therapeutic Group/Drug	DDD	Sector	**Utilisation** (DDD/1,000 inhabitants/day)				**Utilisation** (DDD/inhabitant/year)			
				2011	**2012**	**2013**	**2014**	**2011**	**2012**	**2013**	**2014**
R06AX26	Fexofenadine	0.12g	Public	-	-	-	-	-	-	-	-
			Private	0.3232	0.3334	0.3750	0.3984	0.1180	0.1217	0.1369	0.1454
			Total	**0.3232**	**0.3334**	**0.3750**	**0.3984**	**0.1180**	**0.1217**	**0.1369**	**0.1454**
R06AX27	Desloratadine	5mg	Public	0.0356	0.0555	0.0550	0.0920	0.0130	0.0203	0.0201	0.0336
			Private	0.3694	0.4055	0.4531	0.4781	0.1348	0.1480	0.1654	0.1745
			Total	**0.4050**	**0.4610**	**0.5081**	**0.5701**	**0.1478**	**0.1683**	**0.1854**	**0.2081**

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CHAPTER 27: USE OF VACCINES

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Vaccination is an important strategy in public health. It is a well-known cost effective and safe method in disease control. Ensuring high immunization coverage for each vaccine used in the National Immunisation Programme (NIP) is essential in order to achieve the goals in Global Vaccine Action Plan (GVAP) with targets by 2020[1]. Understanding the epidemiology of infectious disease in local setting can help to identify and prioritise areas of immunisation needs. The use of new formulated vaccines with less adverse events has contributed to increase acceptability and compliance by children and parents, postulated from increase numbers of consumption. Knowing the consumption patterns of vaccines in the country can identify wastage and contribute to immunization planning and cost saving. Furthermore, knowledge of private sector vaccine consumption can contribute to understanding the impact of new vaccines that have not been introduced in the public sector, such as pneumococcal vaccination for preventing invasive pneumococcal disease (IPD) and rotavirus vaccination for severe acute gastroenteritis.

This report served to indicate the procurement and consumption trend of vaccines in the country in year 2011 until 2014. For the purpose of this report, trend of vaccine usage was used rather than DDD (number of vaccine doses for complete vaccination for the defined population). An estimated coverage was calculated based on number of vaccine consumed for a course per birth cohort with an estimated birth cohort each year about 500,000[1]. For example, DTaP-IPV//Hib vaccination (J07CA06) consists of 4 doses which represent a complete course for children below 2 years, while a course of hepatitis B vaccination (J07BC01) consists of 3 doses indicated for children given at birth, aged 1 and 6 months old.

Overall, the trend of bacterial vaccines consumptions was more as compared to viral vaccines or combined bacterial-viral vaccines with marked increase in procurement by public sector; especially for tetanus toxoid (Table 27.1 and 27.2). Procurement of tuberculosis vaccine had shown a cyclical trend, with a peak every three years. This might be due to minimum ordering quantity of product and the long shelf life of this frozen vaccine of three (3) years. The procurement of Haemophilus influenzae type b monovalent vaccine showed a significant down trend in 2013 and 2014 especially in the private market as the preference to combined vaccine with diphtheria-pertussis-polio-tetanus with or without hepatitis B. The used of conjugated meningococcal vaccine in private sector increased significantly in 2014 with the reduction of polysaccharide vaccine usage. In public sector, procurement of polysaccharide meningococcal vaccine drop by 37.0% in 2011 as compared to 2012 following policy of providing this services to those going for hajj only; meanwhile those going for umrah have to get the vaccination from private sector (Table 27.2).

Hepatitis B vaccines, Human papillomavirus (HPV), measles monovalent as well as measles-mumps-rubella (MMR) vaccines were the most used viral vaccines (Table 27.3). Measles monovalent usage was high in 2011 and 2012 following measles outbreak in Sabah, Selangor and Federal Territory of Kuala Lumpur. The usage dropped the subsequent 2 years as the situation was well controlled. However, in 2014, its consumption increased again following its usage in School Health Programme to replace MMR multidose which has stopped its market in Malaysia. The consumption of MMR and MMRV has been constant over the past 4 years but in 2014, there was significant drop of MMRV usage in private sector. There might be disruption of supply of this combined vaccine as evidence by increased on varicella monovalent vaccine consumption in the same year. Yellow fever vaccine consumption in public sector doubled in 2014 as compared to 2013, probably due to additional three (3) new vaccination centres to the list. At the same time there was a reduction of usage in private market by 17.0%, probably because of accessibility of services with the additional centres and lower cost provided by public sector.

The consumption of influenza vaccine (J07BB02) was high in 2013 and 2014 as compared to the previous two (2) years following. It was probably following the pandemic influenza H1N1 which occurred in 2010 and the highlighted facts that influenza H1N1 cases did happen in Malaysia. The intake of viral vaccines such as influenza, rotavirus, varicella and hepatitis A were higher in private sector as compared to public sector because they were not in NIP.

Typhoid vaccine (J07AP03) showed a marked increase in consumption in 2010, reaching seven (7) million doses[2]. It was following the gazzettment and enforcement of Food Hygiene Regulation 2009. Since then, the

yearly usage of this vaccine was between 300,000 to 400,000 doses with slight reduction in 2013 following shortage of supply and regain similar numbers in 2014 (Figure 27.3).

The most frequently used combined vaccine in the public sector was diphtheria-pertussis-tetanus-poliomyelitis-Haemophilus influenzae type b (DTaP-IPV//Hib) (J07CA06) as the government started using this vaccine in the NIP since 2008 (Table 27.4). This 5-in-1 vaccine was given to children at the aged of 2, 3, 5 and 18 months. The trend was stable over 2011 to 2013 with slight increment in the public sector in 2014. This might be caused by preference usage of 6-in-1vaccine in private sector, combination of diphtheria-pertussis-tetanus-poliomyelitis-Hepatitis B-Haemophilus influenzae Type b (J07CA09). Earlier, in 2011 until 2013, there was a slight reduction in 6-in-1 vaccine usage, probably because many mothers brought their child to government facilities as the services given was free and the vaccine gave similar protection.

Meanwhile, there was a significant reduction of diphtheria-pertussis-tetanus-polio vaccine usage in private market in 2014 as compared to 2013 by 65.5%. This vaccine was given as a booster to older children and adults.

In this report, procurement data does not reflects its consumption. It was noted that some vaccines were procured in big amount for various reasons; i.e. as buffer stock for up to two to three months for high usage vaccine such as DTaP-IPV//Hib and usage in the early year as HPV vaccine. Cyclical trend in procurement was also observed with vaccines in multidose preparation and in a large minimum-order-quantity (MOQ) requirement e.g. BCG and tetanus. These vaccines were usually with long expiry date of at least three (3) years. The number bought of multidose also took into consideration the 20% wastage when it was used.

In conclusion, the consistent trend of presumed consumption of vaccines in the health services; i.e. private and public sectors was in accordance to policy changes, enforcement of Act and Regulations, and local landscape of vaccine preventable diseases. The consumptions data also gave some ideas on the acceptability of vaccines by pubic and the coverage of vaccination.

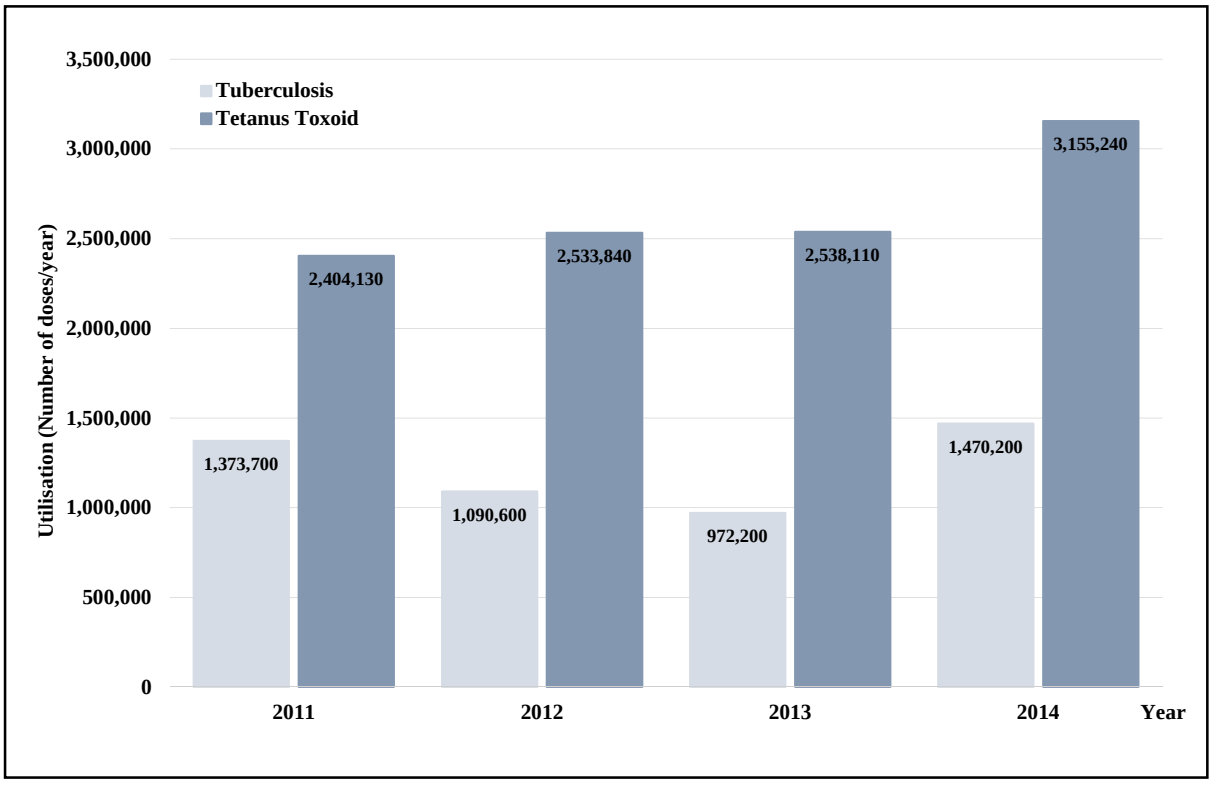

Figure 27.1: Comparison trend of consumption of BCG and tetanus vaccine, 2011 – 2014.

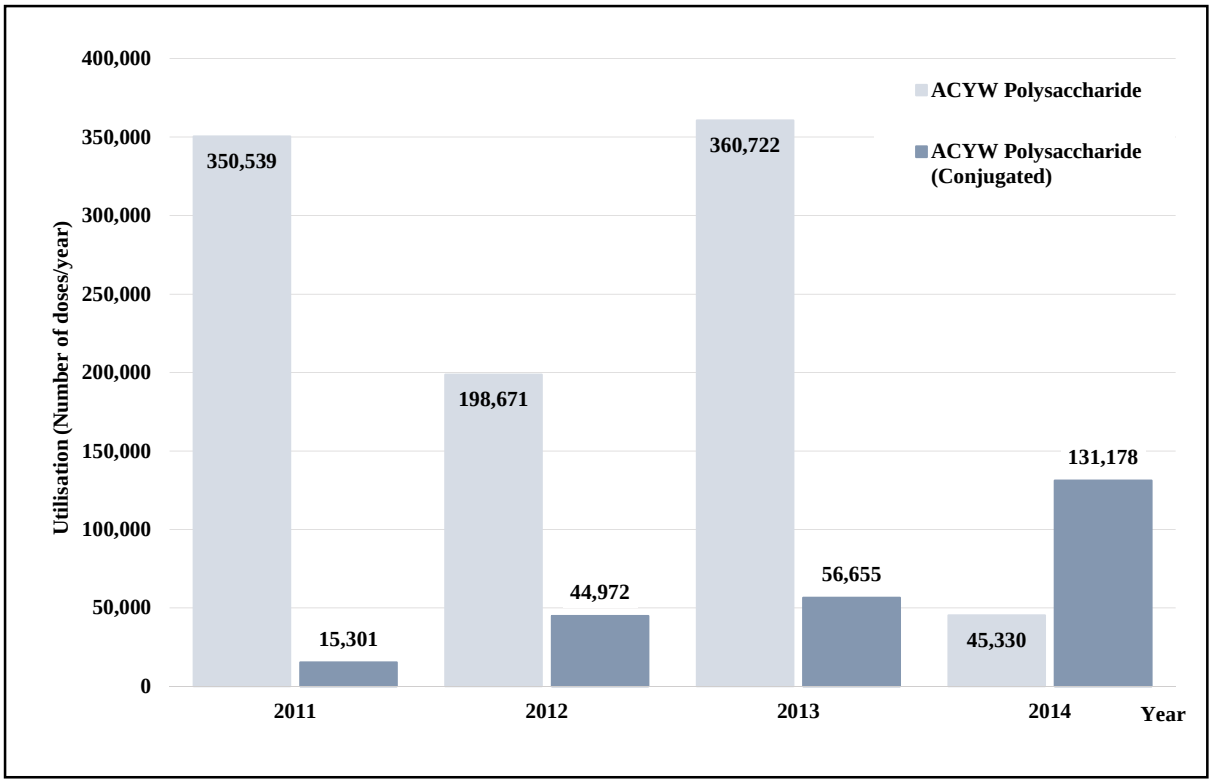

Figure 27.2: Comparison trend of consumption ACWY vaccine, polysaccharide versus conjugated, 2011-2014

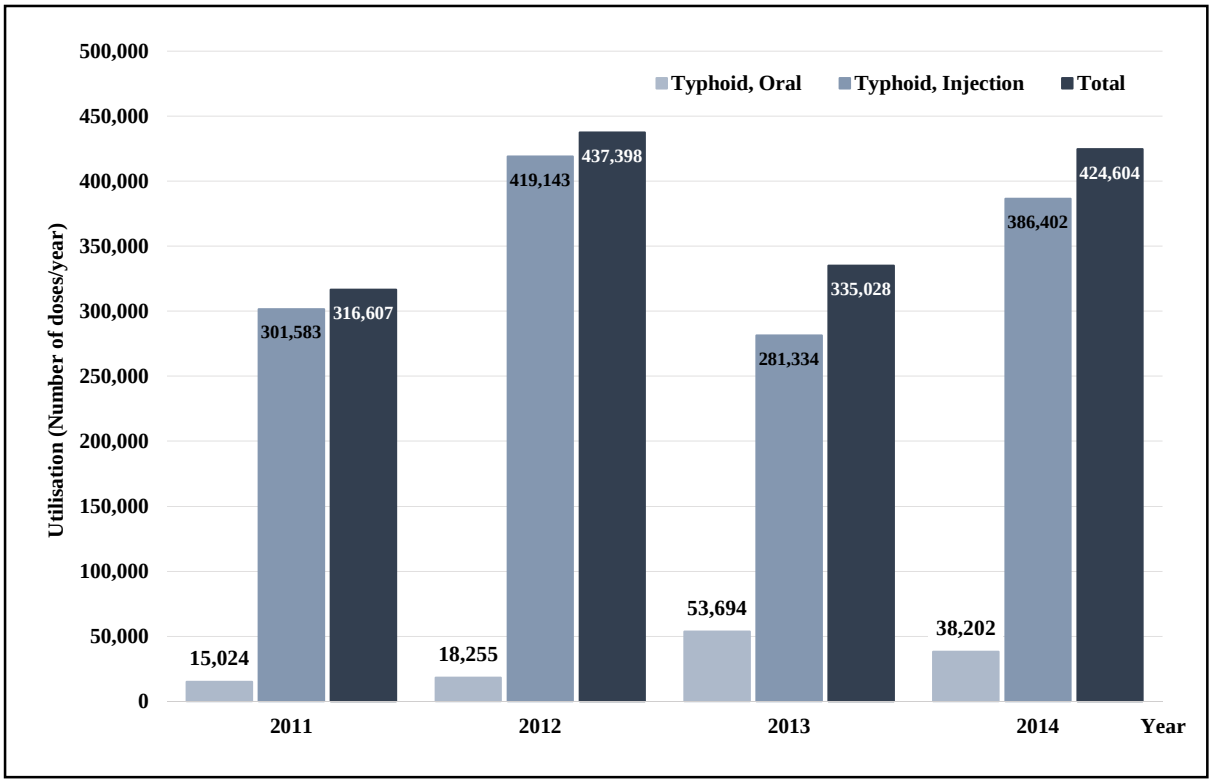

Figure 27.3: Comparison trend of consumption oral and injection typhoid vaccine, 2011-2014.

Table 27.1: Use of bacterial, viral and the combination of bacterial and viral vaccines from 2011 to 2014.

ATC	Therapeutic Group	Sector	**Utilisation** (Number of doses/year)			
			2011	**2012**	**2013**	**2014**
J07	**Vaccines**	**Public**	**8,975,935**	**9,255,203**	**9,065,937**	**11,189,880**
		Private	**2,828,396**	**2,753,586**	**2,634,966**	**2,347,109**
		Total	**11,804,331**	**12,008,789**	**11,700,903**	**13,536,989**
J07A	Bacterial vaccines	Public	3,732,615	3,877,218	3,675,560	5,000,003
		Private	1,436,589	1,126,745	1,290,934	1,164,860
		Total	**5,169,204**	**5,003,963**	**4,966,494**	**6,164,863**
J07B	Viral vaccines	Public	3,879,701	3,756,585	3,762,428	4,042,333
		Private	1,038,260	1,264,447	1,032,594	924,592
		Total	**4,917,961**	**5,021,032**	**4,795,022**	**4,966,925**
J07C	Bacterial and viral vaccines, combined	Public	1,363,619	1,621,400	1,627,949	2,147,544
		Private	353,547	362,394	311,438	257,657
		Total	**1,717,166**	**1,983,794**	**1,939,387**	**2,405,201**

Table 27.2: Use of bacterial vaccines from 2011 to 2014.

ATC	Therapeutic Group/Drug	Defined Population	Number of Doses	Sector	**Utilisation** (Number of doses/year)			
					2011	**2012**	**2013**	**2014**
J07AE	**Cholera vaccines**							
J07AE01	Cholera, inactivated, whole cell	General	1	Public	-	-	-	-
				Private	6,257	-	3,536	5,140
				Total	**6,257**	**-**	**3,536**	**5,140**
J07AG	**Hemophilus influenzae B vaccines**			**Public**	**992**	**1,088**	**1,255**	**1,354**
				Private	**17,480**	**19,041**	**11,352**	**3,280**
				Total	**18,472**	**20,129**	**12,607**	**4,634**
J07AG01	Hemophilus influenzae B, purified antigen conjugated	Children below 1-year-old	1	Public	992	1,088	1,255	1,354
				Private	17,179	19,041	11,352	3,280
				Total	**18,171**	**20,129**	**12,607**	**4,634**
J07AG52	Hemophilus influenzae B, combinations with pertussis and toxoids	Children below 1-year-old	1	Public	-	-	-	-
				Private	301	-	-	-
				Total	**301**	**-**	**-**	**-**
J07AH	**Meningococcal vaccines**			**Public**	**38,972**	**24,485**	**23,825**	**32,386**
				Private	**326,868**	**219,158**	**393,552**	**144,122**
				Total	**365,840**	**243,643**	**417,377**	**176,508**
J07AH04	Meningococcus A,C,Y,W-135, tetravalent purified polysaccharides antigen	General	1	Public	38,972	24,485	23,565	32,206
				Private	311,567	174,186	337,157	13,124
				Total	**350,539**	**198,671**	**360,722**	**45,330**
J07AH08	Meningococcus A,C,Y,W-135, tetravalent purified polysaccharides antigen conjugated	General	1	Public	-	-	260	180
				Private	15,301	44,972	56,395	130,998
				Total	**15,301**	**44,972**	**56,655**	**131,178**
J07AJ	**Pertussis vaccines**							
J07AJ52	Pertussis, purified antigen, combinations with toxoids	Children 1 to less than 2-year-old	1	Public	38,603	27,500	-	-
				Private	2,446	1,945	1,839	548
				Total	**41,049**	**29,445**	**1,839**	**548**
J07AL	**Pneumococcal vaccines**			**Public**	**2,613**	**3,080**	**3,549**	**2,563**
				Private	**147,706**	**176,708**	**165,178**	**170,866**
				Total	**150,319**	**179,788**	**168,727**	**173,429**

Table 27.2: (*continued*)

ATC	Therapeutic Group/Drug	Defined Population	Number of Doses	Sector	**Utilisation** (Number of doses/year)			
					2011	**2012**	**2013**	**2014**
J07AL01	Pneumococcus, purified polysaccharides antigen	General	1	Public	2,571	3,031	3,526	2,337
				Private	22,731	15,690	16,960	25,073
				Total	25,302	18,721	20,486	27,410
J07AL02	Pneumococcus, purified polysaccharides antigen conjugated	Children less than 2-year-old	3+1	Public	3	31	23	224
				Private	74,985	112,435	110,863	119,889
				Total	**74,988**	**112,466**	**110,886**	**120,113**
J07AL52	Pneumococcus purified polysaccharides antigen and Haemophilus influenzae, conjugated	Children less than 2-year-old	3+1	Public	39	18	-	2
				Private	49,990	48,583	37,355	25,904
				Total	**50,029**	**48,601**	**37,355**	**25,906**
J07AM	**Tetanus vaccines**			**Public**	**2,504,200**	**2,648,500**	**2,569,800**	**3,662,500**
				Private	**392,760**	**354,460**	**485,380**	**247,300**
				Total	**2,896,960**	**3,002,960**	**3,055,180**	**3,909,800**
J07AM01	Tetanus toxoid	General	1	Public	2,072,000	2,221,500	2,114,500	2,920,500
				Private	332,130	312,340	423,610	234,740
				Total	**2,404,130**	**2,533,840**	**2,538,110**	**3,155,240**
J07AM51	Tetanus toxoid, combinations with diphtheria toxoid	Children 7-year-old	1	Public	432,200	427,000	455,300	742,000
				Private	60,630	42,120	61,770	12,560
				Total	**492,830**	**469,120**	**517,070**	**754,560**
J07AN	**Tuberculosis vaccines**							
J07AN01	Tuberculosis, live attenuated	Live brith	1	Public	1,017,400	1,022,000	935,000	1,061,000
				Private	356,300	68,600	37,200	409,200
				Total	**1,373,700**	**1,090,600**	**972,200**	**1,470,200**
J07AP	**Typhoid vaccines**			**Public**	**129,835**	**150,565**	**142,131**	**240,200**
				Private	**186,772**	**286,833**	**192,897**	**184,404**
				Total	**316,607**	**437,398**	**335,028**	**424,604**
J07AP01	Typhoid, oral, live attenuated	Above 18-year-old	3	Public	-	111	-	-
				Private	15,024	18,144	53,694	38,202
				Total	**15,024**	**18,255**	**53,694**	**38,202**
J07AP03	Typhoid, purified polysaccharide antigen	General	1	Public	129,835	150,454	142,131	240,200
				Private	171,748	268,689	139,203	146,202
				Total	**301,583**	**419,143**	**281,334**	**386,402**

Table 27.3: Use of viral vaccines from 2011 to 2014.

ATC	Therapeutic Group/Drug	Defined Population	Number of Doses	Sector	**Utilisation** (Number of doses/year)			
					2011	**2012**	**2013**	**2014**
J07BA	**Encephalitis vaccines**			**Public**	**81,240**	**66,421**	**61,588**	**51,067**
				Private	**22,374**	**27,578**	**26,053**	**15,593**
				Total	**103,614**	**93,999**	**87,641**	**66,660**
J07BA02	Encephalitis, Japanese, inactivated, whole virus	Children below 15-year-old (Sarawak only)	7	Public	81,240	66,421	-	-
				Private	-	-	-	-
				Total	**81,240**	**66,421**	**-**	**-**
J07BA03	Encephalitis, Japanese, live attenuated	Children below 15-year-old (Sarawak only)	7	Public	-	-	61,588	51,067
				Private	22,374	27,578	26,053	15,593
				Total	**22,374**	**27,578**	**87,641**	**66,660**
J07BB	**Influenza vaccines**			**Public**	**4,343**	**15,566**	**12,850**	**23,381**
				Private	**148,305**	**134,852**	**174,663**	**175,255**
				Total	**152,648**	**150,418**	**187,513**	**198,636**
J07BB01	Influenza, inactivated, whole virus	General	1	Public	450	1	110	7,413
				Private	36,831	18,750	17,674	23,192
				Total	**37,281**	**18,751**	**17,784**	**30,605**
J07BB02	Influenza, inactivated, split virus or surface antigen	General	1	Public	3,893	15,565	12,740	15,968
				Private	111,474	116,102	156,989	152,063
				Total	**115,367**	**131,667**	**169,729**	**168,031**
J07BC	**Hepatitis vaccines**			**Public**	**1,210,427**	**1,325,187**	**1,325,947**	**1,627,297**
				Private	**543,442**	**617,750**	**538,324**	**488,376**
				Total	**1,753,869**	**1,942,937**	**1,864,271**	**2,115,673**
J07BC01	Hepatitis B, purified antigen	Children below 1-year-old	3	Public	1,148,155	1,259,237	1,268,412	1,565,885
				Private	302,583	332,710	300,116	284,566
				Total	**1,450,738**	**1,591,947**	**1,568,528**	**1,850,451**
		Above 18-year-old	3	Public	62,272	65,948	57,515	61,372
				Private	127,075	148,389	130,343	117,933
				Total	**189,347**	**214,337**	**187,858**	**179,305**
J07BC02	Hepatitis A, inactivated, whole virus	General	2	Public	-	2	20	40
				Private	75,213	92,413	78,785	67,798
				Total	**75,213**	**92,415**	**78,805**	**67,838**

Table 27.3: (*continued*)

ATC	Therapeutic Group/Drug	Defined Population	Number of Doses	Sector	Utilisation (Number of doses/year)			
					2011	2012	2013	2014
J07BC20	Hepatitis A and Hepatitis B, combinations	General	3	Public	-	-	-	-
				Private	38,571	44,238	29,080	18,079
				Total	**38,571**	**44,238**	**29,080**	**18,079**
J07BD	**Measles vaccines**			**Public**	**1,283,714**	**1,005,132**	**1,006,118**	**914,792**
				Private	**108,437**	**244,585**	**104,764**	**85,054**
				Total	**1,392,151**	**1,249,717**	**1,110,882**	**999,846**
J07BD01	Measles, live attenuated	Children below 1-year-old (Sabah only)	1	Public	858,850	674,600	594,720	344,100
				Private	-	-	-	-
				Total	**858,850**	**674,600**	**594,720**	**344,100**
J07BD52	Measles, combinations with mumps and rubella, live attenuated	Children 1 and 8-year-old	2	Public	424,864	330,432	411,378	541,492
				Private	77,562	205,891	68,120	80,470
				Total	**502,426**	**536,323**	**479,498**	**621,962**
J07BD53	Measles, combinations with rubella, live attenuated	Children 7-year-old	1	Public	-	-	-	29,200
				Private	-	-	-	-
				Total	**-**	**-**	**-**	**29,200**
J07BD54	Measles, combinations with mumps, rubella and varicella, live attenuated	Children below 2-year-old	2	Public	-	100	20	-
				Private	30,875	38,694	36,644	4,584
				Total	**30,875**	**38,794**	**36,664**	**4,584**
J07BF	**Poliomyelitis vaccines**							
J07BF02	Poliomyelitis oral, trivalent, live attenuated	Children 2, 3, 5, 18-month-old and 7-year-old	4+1	Public	533,500	455,600	445,900	746,500
				Private	1,450	4,730	3,400	-
				Total	**534,950**	**460,330**	**449,300**	**746,500**
J07BG	**Rabies vaccines**							
J07BG01	Rabies, inactivated, whole virus	General (0, 7, 14, 21 or 18-day post bite)	4	Public	604	931	1,218	924
				Private	1,250	2,012	1,409	1,309
				Total	**1,854**	**2,943**	**2,627**	**2,233**
J07BH	**Rota virus diarrhea vaccines**							
J07BH01	Rota virus, live attenuated	Children below 1-year-old	3	Public	270	262	163	302
				Private	70,204	98,020	84,128	69,499
				Total	**70,474**	**98,282**	**84,291**	**69,801**

Table 27.3: (*continued*)

ATC	Therapeutic Group/Drug	Defined Population	Number of Doses	Sector	**Utilisation** (Number of doses/year)			
					2011	**2012**	**2013**	**2014**
J07BJ	**Rubella vaccines**							
J07BJ01	Rubella, live attenuated	General (Female)	1	Public	1,930	820	2,110	2,710
				Private	-	-	-	-
				Total	**1,930**	**820**	**2,110**	**2,710**
J07BK	**Varicella zoster vaccines**							
J07BK01	Varicella, live attenuated	Children 1 to less than 2-year-old	1	Public	568	308	65	154
				Private	43,965	39,291	17,223	40,816
				Total	**44,533**	**39,599**	**17,288**	**40,970**
J07BL	**Yellow fever vaccines**							
J07BL01	Yellow fever, live attenuated	General	1	Public	95	675	800	1,460
				Private	5,517	5,242	5,744	4,786
				Total	**5,612**	**5,917**	**6,544**	**6,246**
J07BM	**Papillomavirus vaccines**			**Public**	**763,010**	**885,683**	**905,669**	**673,746**
				Private	**93,316**	**90,387**	**76,886**	**43,904**
				Total	**856,326**	**976,070**	**982,555**	**717,650**
J07BM01	Papillomavirus (human types 6, 11, 16, 18)	General (Female)	3	Public	763,010	771,965	744,084	673,746
				Private	45,473	46,979	50,966	35,262
				Total	**808,483**	**818,944**	**795,050**	**709,008**
J07BM02	Papillomavirus (human types 16, 18)	General (Female)	3	Public	-	113,718	161,585	-
				Private	47,843	43,408	25,920	8,642
				Total	**47,843**	**157,126**	**187,505**	**8,642**

Table 27.4: Use of combinations of bacterial and viral vaccines from 2011 to 2014.

ATC	Therapeutic Group/Drug	Defined Population	Number of Doses	Sector	**Utilisation** (Number of doses/year)			
					2011	**2012**	**2013**	**2014**
J07CA	**Bacterial and viral vaccines, combined**			**Public**	**1,363,619**	**1,621,400**	**1,627,949**	**2,147,544**
				Private	**353,547**	**362,394**	**311,438**	**257,657**
				Total	**1,717,166**	**1,983,794**	**1,939,387**	**2,405,201**
J07CA02	Diphtheria-pertussis-poliomyelitis-tetanus	Children 1 to less than 2-year-old	1	Public	-	-	-	-
				Private	32,541	35,635	24,282	8,379
				Total	**32,541**	**35,635**	**24,282**	**8,379**
J07CA06	Diphtheria-hemophilus influenzae B-pertussis-poliomyelitis-tetanus	Children below 1-year-old	3	Public	1,363,619	1,621,400	1,627,949	2,147,544
				Private	253,567	260,596	232,185	151,321
				Total	**1,617,186**	**1,881,996**	**1,860,134**	**2,298,865**
J07CA09	Diphtheria-hemophilus influenzae B-pertussis-poliomyelitis-tetanus-hepatitis B	Children below 2-year-old	4	Public	-	-	-	-
				Private	67,439	66,163	54,971	97,957
				Total	**67,439**	**66,163**	**54,971**	**97,957**

References:

1. *WHO Global Vaccine Action Plan*. World Health Organisation.

2. *Malaysian Statistics On Medicines 2009 & 2010*. Pharmaceutical Services Division & Clinical Research Centre, Ministry of Health Printing Office: Malaysia 2014.

3. Department of Statistics Malaysia, Population Dataset 2008, 2009 & 2010.