INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD • INDIA

Research and Publications

Preliminary analysis of claims data to understand relationship between disease patterns and quality of care and its implications for health insurance in India

Ramesh Bhat
Srikanth Rajagopal

W.P. No. 2005-09-03
September 2005

INDIAN INSTITUTE OF MANAGEMENT
AHMEDABAD-380 015
INDIA

Abstract

This paper provides preliminary analysis of claims data of Mediclaim insurance scheme to understand the relationship between disease pattern and the quality of health care. We use length of stay (LOS) and average length of stay (ALS) as one of the indicators of quality of care. We use the Diagnostic Related Grouping (DRG) based ALS as the benchmark to make this evaluation and comparison. It is observed that the reimbursements in insurance system are tied to hospital inputs and resource use and not to diagnostic related groups or outputs. Therefore the current system of reimbursements and provider payment system influences the length of stay and there is significant variation in ALS observed across disease groups and its sub-groups. There is no consistency observed in ALS as the severity of diseases under each group increases. This reflects lack of standards/protocols and unintended consequences of current practice of provider payment system. Implementing systems like Diagnosis Related Grouping would be an attempt to link it with outcomes. The paper provides insights into whether there is a significant mismatch in the premium that insurance companies charge in comparison to the risk insurer undertake while issuing policies. It was also found that after adjusting for the purchasing power parity, the claims data suggest that healthcare costs reimbursed for medical insurance to private providers in India are actually higher than healthcare costs reimbursed to providers of healthcare in the US under DRG system. The paper argues that under less regulated private healthcare providers market and health insurance market, cost based reimbursement is highly undesirable. The regulators should put in place a system of pre-determined rates for reimbursements in health insurance.

Preliminary analysis of claims data to understand relationship between disease patterns and quality of care and its implications for health insurance in India

Introduction

Voluntary medical insurance Mediclaim is an indemnity based scheme, in which policyholders, on payment of a fixed premium, are covered for insurance up to a certain amount of sum assured. The policy is renewed every year. The premium is based on age of the policy holder and amount of sum assured. On hospitalisation, the policyholder is expected to first bear the complete cost of payment out-of-pocket and later they are reimbursed after verification of the claim submitted to the insurance company. It is only recently some insurance companies with the help of third party administrators are providing cash less facility.

This system of reimbursement is cost based and is rife with shortcomings, the primary among them being: (a) moral hazard which implies high probability of collusion between healthcare providers and patients to increase service provision and thereby affecting billing amounts, with lack of any overseeing authority to prevent the same; (b) absence of standardisation of medical diagnosis and treatment implying that even in the absence of moral hazard, due to a diverse array of diagnosis and treatment practices for the same disease across different healthcare providers all over India, verification of reimbursement claims took inordinately long periods of time, introducing inefficiency into the system; and (c) adverse selection implying that the system does not appear to have adequate screening for assessing the risk of contracting a particular disease. Currently, insurance premiums are a factor of two independent variables sum insured and age profile. The diversity of health insurance products which can take care of these problems and address the needs of consumers are lacking. For example, one finds that no premium is attached to the presence or absence of definite risk factors of an individual. This in turn increases risk of adverse selection to the insurance company. This is further accentuated by the fact there are serious information asymmetry problems. It seems that these shortcomings are perhaps the primary reasons for the reluctance of foreign insurance companies to enter into the Indian health insurance market, in spite of its huge potential. The estimated annual healthcare expenditure in India is Rs. 1030 billion (Bhat and Babu 2004). The presence of more players is likely to help the consumers as it increases the competition leading to increased and wider choice of products to consumers.

To facilitate development and move towards more mature insurance systems the Insurance Regulatory and Development Authority (IRDA) has recognised the need for third party administrators (TPAs) to act as an intermediary in the insurance sector, facilitating the coordination between insurance company, healthcare provider and consumer. This has entailed the concept of cashless hospitalisation. This system currently is facing a large number of teething problems, with opposition from healthcare providers due to tardiness in reimbursements.

Before liberalisation of insurance industry, Mediclaim has been the sole health insurance product with a large number of exclusions and shortcomings, such as non-coverage of OPD based treatment. Not many variations in product offering exist which can meet need of different persons. There is a need for introducing novel insurance products, which deal with specific health concerns of a large section of the population. The variations could be in terms of variables such as: diseases covered, types of treatment covered, type of individual risks covered and so on. The introduction of such products would definitely increase risks such as adverse selection by narrowing the selection pool. This can in turn be supported by: (a) more rigorous screening procedures, (b) minimising the risk premium mismatch that occurs in blanket policies by customizing risk premium according to degree of perceived risk on screening, and (c) standardising norms and requirements of diagnosis and treatment.

The objective of this paper is to examine the relationship between disease pattern and quality of care. We use one simple indicator of quality of care and it has been measured in terms of average length of stay (ALS). We use the Diagnostic Related Grouping (DRG) based ALS as the benchmark to make this evaluation. Using this information the paper provides some insights into whether there is a significant mismatch in the premium that insurance companies charge in comparison to the benefits consumers gain and the risk insurer undertake while issuing policies. The paper makes an attempt to explore what modifications can be made with respect to present insurance scheme in terms of modifying the product characteristics so as to increase the benefit and decrease the risk without having implications for number of policies issued or amount of sum insured. The analysis presented in this paper may provide insights into the possibility of designing and introducing health insurance products.

Methodology and data analysis

The primary analysis presented in this paper is based on data of 621 claims, reimbursements, medical records and socio-economic indicators pertaining to policy initiation years 1997-1998 and 1998-1999 of the Ahmedabad branch of GIC's subsidiary. This data was manually collected in 2001-02. The raw data, mostly hand-written by doctors, contained a large amount of variation in describing the disease and illness. In some cases the information presented could not be clearly translated in exact illness. Some written prescriptions were having factual inaccuracies and at times the description was misleading. A large number of discrepancies in the medical terms used for the final diagnosis of the disease showed up in the data. For example, a case of Cerebrovascular Accident (commonly known as a Stroke) was variously termed as intracranial bleed, intracranial haemorrhage, stroke, UMN lesion and so on. Similar instances existed for most diseases, across all disease groups.

All diseases were segregated and renamed according to a standard nomenclature system followed by hospitals in the Municipal Corporation of Greater Mumbai. Information of the amount of insurance premium paid by policy holders also threw up some inconsistencies or omissions. As far as possible, such instances have been corrected, but data which could not be cleaned has been eliminated for the purpose of further analysis. A total of 579 cases were found to be valid for further analysis. The data were classified and presented in a standard format.

Data reclassification in Diagnosis Related Grouping (DRG): The data provided was in need of a mode of classification for analysis. Secondary research revealed a few systems for classification/grouping of disease, such as ICD-10 and DRG. Diagnosis Related Grouping (DRG) is a system created by the Federal Government of the USA in 1983 as a way to assess payment requirements for Medicare patients. A DRG is a 3 digit number that describes a particular medical diagnosis. Under the DRG system, a hospital receives the same fee for all patients diagnosed under a particular DRG disease, irrespective of how sick the patient is, how costly it is to treat the patient or how long the duration of stay of the patient is. This gives hospitals an incentive to reduce the cost of treatment and length of stay in the hospital. The DRG system has been adopted by many private insurance companies in the USA and Australia.

The DRG system provides a standardized diagnosis nomenclature, an *Average Length of Stay (ALS)* and a standard average C*ost Ceiling* for each disease. For example, Epistaxis (commonly known as bleeding from the nose) is classified as DRG 66, with an ALS of 3.2 hospital days and an average cost ceiling of USD 964.

Length of stay (LOS) and average length of stay (ALS) has been one important indicator to measure the hospital performance. It is considered to have significant influence on cost of care and can also be used as surrogate measure for cost. Generally hospitals having long ALS may be relatively inefficient in the use of resources and those with low ALS are considered to be efficient. Sometimes, however, LOS is assumed to relate to quality (Thomas, Guire and Horvat 1997). Reducing length of hospital stay (LOS) is a policy aim in many countries to regulate their health

care systems and is thought to indicate efficiency. For example, it is generally viewed that longer than expected LOS is indication of poor quality of care. In this study we use the LOS and ALS as indicators of quality of care.

Diseases from the primary data of 579 reimbursement cases were reclassified using the nomenclature followed by the Municipal Corporation of Greater Mumbai (MCGM). These were subsequently grouped according to disease groups such as Central Nervous System (CNS) for all diseases related to the brain and nervous system, Cardiovascular System (CVS) for all diseases related to the heart and the circulatory system and so on. Diseases with similar nomenclature were grouped together and each group then matched to its respective DRG nomenclature disease. The average of the actual length of hospitalization of each group was calculated, as also the average cost incurred. This enabled us to compare the Average Length of Stay and the Average Cost prescribed by the DRG classification system vis-à-vis the *Average Actual Length of Stay* undergone and *Average Costs* incurred by the patients in the 579 cases. An illustrative example is provided in Table 1.

Table 1: Illustrative example of ALS and average cost

	Cases			
	1	2	3	4
Diagnosis (Disease)	Fever	Fever with Cough	Fever with Chills	High Grade Fever
MCGM Diagnosis (Disease Group)	PUO*	PUO	PUO	PUO
Actual Length of Stay	7	3	4	10
Average Actual Length of Stay				6
DRG Length of Stay				10
Actual Cost of Treatment	1000	1600	900	500
Average Actual Cost of Treatment				1000

* Pyrexia of unknown origin (requiring hospitalisation)

Other variables used in the analysis of data include: (a) the presence of risk factors associated with the disease, (b) the ratio of the premium paid to sum assured, (c) age and gender of the patient (data regarding other socio-economic status was unavailable), and (d) days taken to settle the claim.

The classified data was subjected to a graphical analysis of average length of stay (DRG-ALS) and actual length of stay for each disease system. Diseases within each disease system are grouped in the ascending order of their average lengths of stay. The graphs on each disease system are provided in Exhibits 1 to 15 covering the following disease systems: Central Nervous System, Ophthalmology (Eye Diseases), Otorhinolaryngology (ENT), Respiratory System, Cardiovascular System, Gastrointestinal System, Hepatobiliary System (Liver and Pancreas Diseases), Orthopaedics (Bone diseases), Breast Diseases, Dermatology (Skin Disease), Endocrine System, Renal System (Kidney and Urinary Disease), Male Reproductive System, Obstetric & Gynaecological Disease, and Infectious Disease. The standard deviations of the actual duration of hospitalisation stay of each diagnosed disease group (within each disease system) are provided in Exhibit 16. The time duration (in days) between submissions of the indemnity claim (date of discharge from hospital) and claim reimbursement per disease group is provided Table 2. The table is arranged in descending order of claim settlement period.

Table 2: Disease systems and claim settlement period

Disease System	Claim settlement period
Endocrine System (ES)	182
Central Nervous System (CNS)	180
Orthopaedics (OR)	142
Cardiovascular System (CS)	140
Breast Diseases (BD)	138
Otorhinolaryngology (ENT)	135
Respiratory System (RS)	132
Hepatobiliary System* (HS)	129
Obstetric & Gynaecological Disease (OG)	126
Renal System (RS)	112
Dermatology (D)	107
Infectious Disease (ID)	103
Gastrointestinal System (GS)	101
Male Reproductive System (MRS)	101
Ophthalmology (OP)	99

* Liver and Pancreas Diseases

From the above table, it is clear that while the claim reimbursement process is inordinately long across all disease systems, the average claim settlement period was 128 days. Descriptive Statistics for claim settlement period are provided in Exhibit 18. We carried out the following correlation analysis: (a) correlation between time taken to settle the claim and ALS, and (b) time taken to settle the claim and amount claimed across all disease groups. The results are presented in Table 3.

Table 3: Relationships

Disease System	Claim Settlement Period (A)	ALS (B)	Amount Claimed Per Day (C)	Correlation A and B	Correlation A and C	Correlation B and C
ES	182	4.0	3398	-0.24	0.32	0.61
CNS	180	5.3	4446	-0.56	0.59	0.03
OR	142	4.0	4783	-0.11	0.35	0.58
CS	140	7.0	6351	0.00	0.13	0.70
BD	138	1.9	10489	-0.35	-0.09	0.89
ENT	135	1.8	5596	-0.13	0.11	0.68
RS	132	7.0	1640	0.41	0.34	0.45
HS	129	4.9	5183	0.09	0.38	0.74
OG	126	6.0	3170	-0.25	0.22	0.32
RS	112	8.0	2032	-0.09	-0.30	0.72
D	107	3.9	2099	-0.05	0.01	0.82
ID	103	4.0	1862	-0.16	0.21	0.25
GS	101	4.0	2346	0.01	-0.10	0.42
MRS	101	3.0	3934	0.10	0.41	0.70
OP	99	0.7	18397	0.20	NA	0.10

The correlation between ALS and amount claimed per day was very high and statistically significant from zero. This correlation was extremely high (>0.66) in case of 7 of the 15 disease systems under analysis. This indicates that the reimbursements are cost based. It was observed

that the correlation between ALS and claim settlement period and amount claimed and claim settlement period were not significant.

We carried out the correlation between Length of Stay (DRG) and Actual Length of Stay of our reimbursement cases. The results are provided in Table 4.

Table 4: ALS correlation

Disease Group	Correlation Coefficient DRG and ALS
ES	-0.07
CNS	0.20
OR	0.04
CS	0.31
BD	0.21
ENT	0.14
RS	0.43
HS	0.24
OG	0.29
RS	0.02
D	-0.24
ID	-0.04
GS	0.37
MRS	0.29
OP	-0.02

There appeared to be no definite pattern in correlation between the DRG Length of Stay and actual observed ALS across similar disease groups. In reference to a DRG system which is well classified and standardised system the actual data do not indicate any consistent pattern across different groups of illnesses. The lack of correlations across different disease groups may also indicate difference in morbidity patterns in the US and India. However, the results signify the need for a new system of standardised reference system for Indian healthcare insurance claim verification. The disease-wise relationship between ALS as per DRG and actual ALS of our sample displayed a significant variation (see Exhibit 16).

The duration of time between discharge and claim settlement, one of the major cited problems with the current indemnity based health insurance process implemented by GIC appeared to be due to nature of disease itself, apart from the obvious systemic inefficiency in settling health insurance claims. This interpretation coincides with the observation that treatment of each different disease system, and even within each disease system varies greatly in terms of the following:

- Methods and cost of diagnosis,
- Duration of therapy (hospitalised and post hospitalisation),
- Methods and cost of therapy (medical, surgical, physical etc),
- In order to eliminate systemic inefficiency in claim processing, it is necessary to increase the accuracy of data provided for analysis of claims,
- Number and efficiency of personnel involved in claim reimbursement verification

There was high degree of correlation between length of stay and claim amount indicated that the longer time a patient spends in the hospital, the higher is the claim amount. While this sounds intuitively logical, it is pertinent to point out that this variable i.e., length of stay is most critical and is subject to manipulation by both consumers and providers to increase reimbursement claim amounts. More so this is also cost based and significant variation can take place in this across

different providers. This suggests towards the need for a standardised system of claim verification and reimbursement that should be based on properly researched data and medical practice.

Further the analysis of the data suggests that there is an immediate need for an insurance regulatory body IRDA and healthcare regulatory body such as the Medical Council of India or a leading healthcare providing organization such as AIIMS to formulate a set of rules and guidelines for standardised nomenclature of disease. Varied nomenclature of disease makes it extremely difficult for other medical practitioners and health insurance agencies to gauge the type, severity and /or complexity of a particular disease diagnosis, resulting in inability to assess the validity of insurance claims, in terms of necessity of hospitalisation, number of days hospitalised and cost of treatment accruing thereon. A standardised number of days of hospitalisation for each disease group, and a fixed payment for the same, similar to the DRG could be instituted and adopted by the MCI and recognised healthcare organisations. This, as mentioned before, will encourage healthcare providers to keep costs under control and provide quality healthcare at an affordable cost. At present, as displayed in the primary data findings, the large variance in days of hospitalisation results may result in highly inefficient system of insurance. This may result in high cost health care. Delay and difficulty in assessing health insurance claims also result in increased time gap between the dates of discharge to actual date of reimbursement (under the erstwhile indemnity form of health insurance). Disease System wise data regarding time gap between date of discharge and date of claim reimbursement is provided in Exhibit 17.

A standardised system of diagnosis and treatment for each disease , similar to 'critical care pathway' adopted at American hospitals such as Massachusetts General Hospital, Boston for CABG can be adopted by healthcare providers to minimise costs of healthcare delivery, especially in the case of commonly encountered ailments.

The data was further analysed based on the following three parameters: (a) gender, (b) presence or absence of risk factors contributing to disease, and (c) presence or absence of associated disease. The data segmentation is provided in Exhibits 18. This data was then subjected to observation for trends, regression and correlation analysis. The following observations were found to be significant. The significant findings and their possible interpretations are provided below.

Gender based morbidity patterns: Males appeared to have a higher predilection towards Gastrointestinal disease, Orthopaedic disease, Infectious disease, Opthalmologic disease and Cardiovascular disease in that order. Females, on the other hand, showed a higher predilection towards Opthalmologic, Orthopaedic, Gastronintestinal, Obstetric and Infectious diseases. Given the dominance of a particular set of diseases towards each gender, this indicates the need for similar analysis across a larger cross section of data to determine nationwide trends of gender based morbidity. Special gender based health insurance products could be an outcome of this. The average length of stay across all disease groups appears to be lower in the case of female patients. This may indicate a social bias, more than a higher morbidity pattern for male patients.

Fig 1: Distribution of Disease Groups

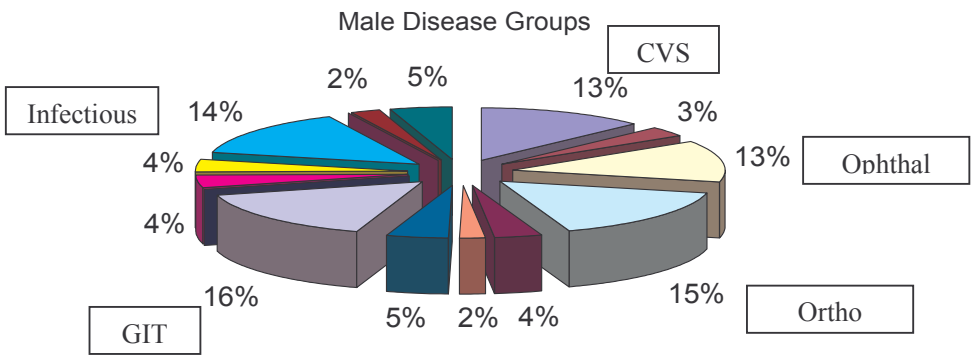
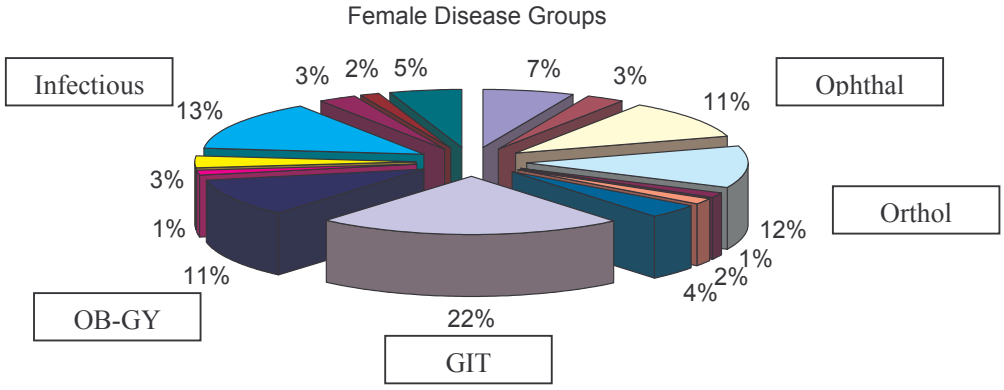


Fig 2: Distribution of Disease Groups – Female patients



Risk factor based analysis: It is observed that the difference in both the Sum Insured and the *Amount Claimed* between patients who possessed definite risk factors for a particular disease is higher across most disease groups. We plotted the sum assured and amount claimed after classifying the cases in high risk and low risk cases. The data suggested difference (see Figures 3 and 4). The premiums in Mediclaim health insurance scheme are determined by two factors and these are (a) age profile of the policyholder (premiums increase with increasing age, with 6 well defined risk groups (5-45, 46-55, 56-65, 66-70, 71-75 and 76 and above), and (b) amount of sum assured (lower the amount insured for, lower is the premium in proportion terms). An analysis of the primary data showed that within the same age group policy holder were charged the same premium/sum insured rate. The experience in disease pattern however had been different as they suffered from different ailments entailing different cost of treatment, claims and reimbursements. While this is a definite consequence of the fundamental 'pooling of risk' of insurance, there exist very definite cases in which the ailment of the individual could be predicted on the basis of the presence of r*isk factors* for that particular disease. For example, within the Central Nervous System disease group, an individual in the 46-55 age group, who suffered from a hypodense lesion in the brain (for which no definite risk factor can be ascertained) has been charged the same premium as an individual who suffered from a cardiovascular accident (which has definite risk factors such as hypertension, diabetes and atherosclerosis).

Fig 3

The amount paid by the insurance company as reimbursement was 7.8 times more in the case of the latter policy holders. Ideally, the insurer should have been able to charge a higher premium from the latter individual, given the definite presence of certain risk factors in their medical

history. Numerous other examples exist in the data. A complete analysis could not be made without the presence of medical records of each case. The development of insurance products and their coverage and pricing need to take this analysis into account. The claims data can be used to make comprehensive post-facto analysis of the mismatch between risk premium and claim amount. Other attributes, such as occupation of the policy holder, gender etc., should ideally be taken into consideration for assessing the health insurance premium to be paid by a potential policy holder.

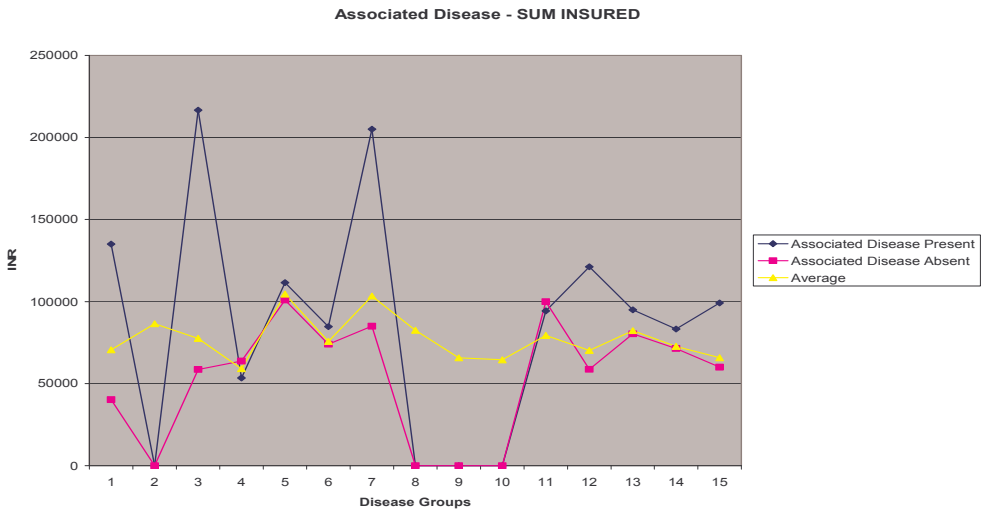
Fig 4

This observation leads to two possible inferences: (a) presence/knowledge of disease specific risk factors is incentive for patients to hide the same during filling of insurance forms, but at the same time insure themselves for higher amounts - an example of moral hazard in insurance, and (b) this can be avoided by providing for a comprehensive medical examination by an independent panel for all cases of sum insured above a particular amount in the absence of any compelling reason. Thus, while simple risk perception and disposability of income cannot be ruled out as causes for high sum insured, presence of disease specific risk factors must be ruled out

Associated disease based analysis: Similar to the above, the presence of associated disease increases the value of the sum insured across most disease groups (see Fig 5).

The data appear to indicate a similar inference as that provided in risk factors scenario as discussed above, that presence of associated disease tends to increase the tendency to insure for a higher amount.

Fig 5



We also carried out regression analysis of days taken to settle the claim and average length of stay. We used ALS as independent variable. Table 5 shows the results of regression analysis.

Table 5: Regression results

Disease Group	R^2 value
Central Nervous System	0.3114
Ophthalmology (Eye Diseases)	0.0412
Otorhinolaryngology (ENT)	0.0159
Respiratory System	0.1648
Cardiovascular System	0.0000
Gastrointestinal System	0.0002
Hepatobiliary System (Liver and Pancreas Diseases)	0.0053
Orthopaedics (Bone diseases)	0.0113
Breast Diseases	0.1213
Dermatology (Skin Disease)	0.0027
Endocrine System	0.0508
Renal System (Kidney and Urinary Disease)	0.0071
Male Reproductive System	0.0074
Obstetric & Gynaecological Disease	0.0633
Infectious Disease	0.0261

There appears to be no correlation between the dependent and the independent variable.

Comparison of the cost of treatment: We made a comparison of cost using DRG statistics and the actual amount of money claimed for hospitalisation in the Mediclaim scheme. Firstly, a comparison between average healthcare costs pre disease system (viz. CNS, Opthalmology etc.) as prescribed by DRG (adjusted for Purchasing Power Parity) with the average costs of hospitalisation undergone by Indian patients claiming reimbursement from Mediclaim was made. Next, the analysis is performed one step further to study trends at a disease subsystem (e.g., Meningitis, Epilepsy and Cerebrovascular Accident in CNS) level.

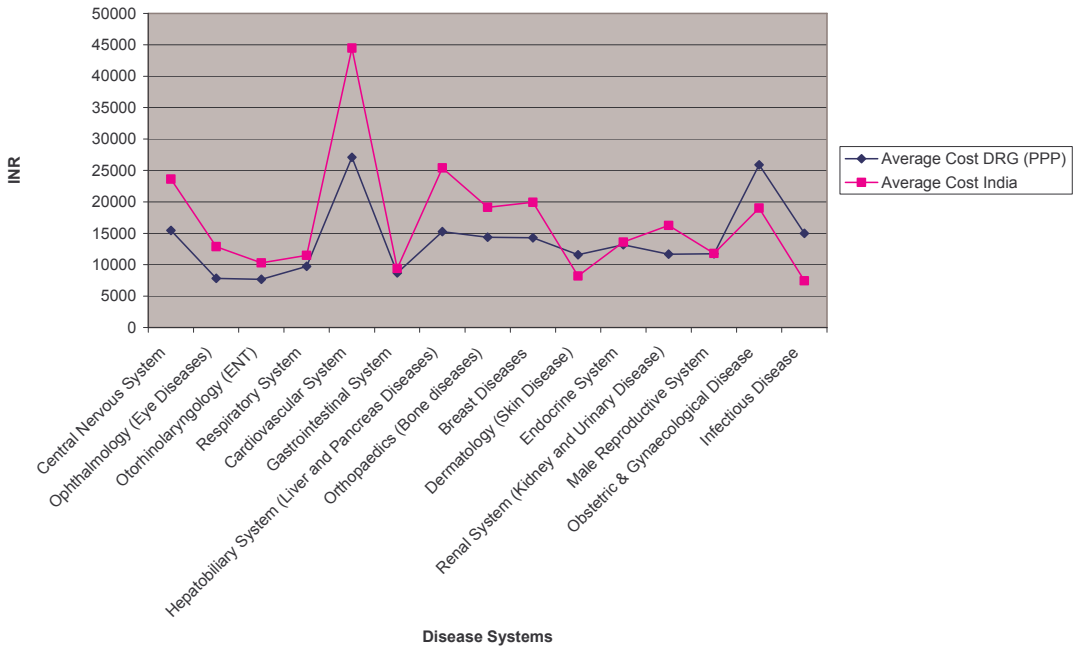
As depicted in the chart below, healthcare costs in the USA and India appear to show similar patterns, with the most expensive disease systems, in descending order adjusted for purchasing power parity are shown in Table 6.

Table 6: Comparison of costs

Rank	USA	India
1	Cardiovascular Disease	Cardiovascular Disease
2	Obstetrics & Gynaecological Disease	Hepatobiliary Disease
3	Central Nervous System Disease	Central Nervous System Disease
4	Hepatobiliary Disease	Breast Disease
5	Infectious Disease	Orthopaedic Disease

From the table it appears that Cardiovascular System disease, Central Nervous System disease and Hepatobiliary System disease appear to be amongst the most expensive across both countries in terms of hospitalisation costs. Also visible from the chart is the fact that, after adjusting for purchasing power parity (assuming 1USD in the USA = 4.5 USD in India), it is observed that healthcare costs reimbursed for medical insurance to private providers in India are actually more than healthcare costs reimbursed to providers of healthcare in the US under DRG system (see Fig 6). This is contrary to popular perception that medical services are expensive in the US than in India. This also suggests that in India the cost based reimbursement is expensive and we need some standardisation of reimbursement system which should be based on pre-determined rates than cost based reimbursement. There also appears to be an economic anomaly arising due to various demand and supply factors the private providers face. Data pertaining to individual disease system and cost comparisons are provided in Exhibits 18 onwards.

Fig 6
DRG vs Indian Data Costs



Conclusion and implications

There is an immediate need for insurance regulatory body and healthcare regulatory body such as the Medical Council of India or a leading healthcare providing organisation such as AIIMS to formulate a set of rules and guidelines for standardised nomenclature of disease. Varied nomenclature of disease makes it extremely difficult for other medical practitioners and health insurance agencies to gauge the type, severity and/or complexity of a particular disease diagnosis, resulting in inability to assess the validity of insurance claims, in terms of necessity of hospitalisation, number of days hospitalised and cost of treatment accruing thereon. Third Part Administrators face a challenge in regulating costs of care in health insurance system. A standardised number of days of hospitalisation for each disease group, and a fixed payment for the same, similar to the DRG could be instituted and adopted by the MCI and recognised healthcare organisations. This, as mentioned before, encourages healthcare providers to cut costs and provide quality healthcare at an affordable cost. At present, as displayed in the primary data findings, the findings suggest the following.

The existing system promotes cost based reimbursement leading to high cost of healthcare. This will make insurance systems vulnerable to high cost and affect viability of schemes. In less regulatory health insurance regime like ours, cost based reimbursements in insurance will cause health care cost inflation. Hospital's revenue is function of cost. Once they spend more and if insurance is paying they get more. Health insurance therefore will encourage over use of resources making health care cost high. Capital costs will become dominant and there would less incentive to substitute capital for labour. In developing countries where *per se* the need for spending on health is high, high levels of private health expenditures through insurance pose serious challenge. The sheer size of these expenditures once it has risen to high levels can impede control of health expenditures itself. This also leads to exploitation of patients by healthcare providers for monetary gain. Delay and difficulty in assessing health insurance claims, resulting in increased time gap between the dates of discharge to actual date of reimbursement (under indemnity form of health insurance). Disease system wise data regarding time gap between date of discharge and date of claim reimbursement is provided in Exhibit 17.

A standardised system of diagnosis and treatment for each disease , similar to 'critical care pathway' adopted at American hospitals such as Massachusetts General Hospital, Boston for CABG can be adopted by healthcare providers to minimise costs of healthcare delivery, especially in the case of commonly encountered ailments such as Malaria and URTI. The American DRG system cannot be implemented directly in India, given the difference in morbidity patterns between the two countries. A modification of the same could however be implemented. This should take into account both statistical data collated over a significant period of time to arrive at reasonable *Length of Stay* and *Average Cost of Treatment* at different level hospitals (primary, secondary and tertiary)

The analysis of claims data suggests that the disease profile is the most important criterion governing: (a) duration, modality and cost of treatment, and (b) time delay between discharge and reimbursement of claim amount. It is suggested that new health insurance products, with disease specific coverage may be introduced. For example, the product option may include products which provide coverage for specific illnesses. Individuals, depending on their risk profiles, desirous of insuring themselves against specific diseases such as cardiovascular disease can be provided with a policy which requires them to pay a higher premium for the same. The premium amount would be a function of number of policy holders for that disease and data provided on standard costs of treatment for cardiovascular diseases. Similarly insurers can think of having bundled health insurance policies. Individuals perceived to be at risk of diseases belonging to different disease systems (e.g., employees in IT companies are at risk of developing lifestyle diseases such as hypertension, obesity, computer vision syndrome etc.) can avail of health insurance schemes targeted towards these diseases. A basic premium would cover care for these diseases, and an extra amount could be charged per disease not in the basket of diseases. Being

targeted towards segments *at risk* such as occupational segments, companies can avail of larger enrolment, and thus pooling of risk will occur. Similarly, insurers can think of region based health insurance policies. Morbidity patterns in India differ from region to region. Differential premiums across regions, with higher premiums charged in areas of higher susceptibility to a particular disease can be instituted. Customised health insurance policies can be other option to introduce the products in India. Current blanket insurance schemes can be replaced by customised insurance policies in which consumers pick and choose from a basket of disease and disease solutions, with varying risk premiums for each based on individual probability of morbidity and anticipated cost of treatment. Rigorous screening is of course necessary for implementation of such customised products. There are also opportunities to use treatment and disease information to make clinical determinations in connection with health care coverage decisions for policyholders. Polices can be written on selected clinical issues, especially addressing new technologies, new treatment approaches, and procedures. Actual clinical determinations in connection with coverage decisions can be made on a case-by-case basis. These are possibilities provided there are well accepted diagnostic and treatment parameters for a particular disease, both clinically and diagnostic test wise. This will also promote standardisation in healthcare benefits disbursement, something lacking in the current health insurance system.

There are also opportunities to develop health insurance products which cover some specific diseases. For example, these can include chronic diseases requiring prolonged OPD based therapy and support such as asthma, diabetes, low back pain and coronary heart disease. Alternatively, health insurance policies may include add-on options which provide concessional rates for alternative healthcare services focusing on preventive care and services such as ayurveda/ homeopathic systems of medicine, fitness clinics, massages etc. Insurance companies can tie-up with pharmaceutical companies and retail chains to provide medicines at lowest possible cost. This would be an innovative way of expanding the customer base by enticing potential policy holders with lifestyle products and benefits. There can also be people specific benefits in insurance schemes. These can include focus on schemes such as (a) women's health programmes, (b) mental health policies, (c) vision and dental programmes, and (d) students benefits schemes – designed specifically for students, covering adolescent health problems and commonly diseases faced by students. Individual/group plans are other opportunity. These plans can be designed specifically for groups of 20 to 50 people, offering them concessional rates and add-on benefits.

Exhibit 1: Average Length of Stay v/s Actual Length of Stay - CNS

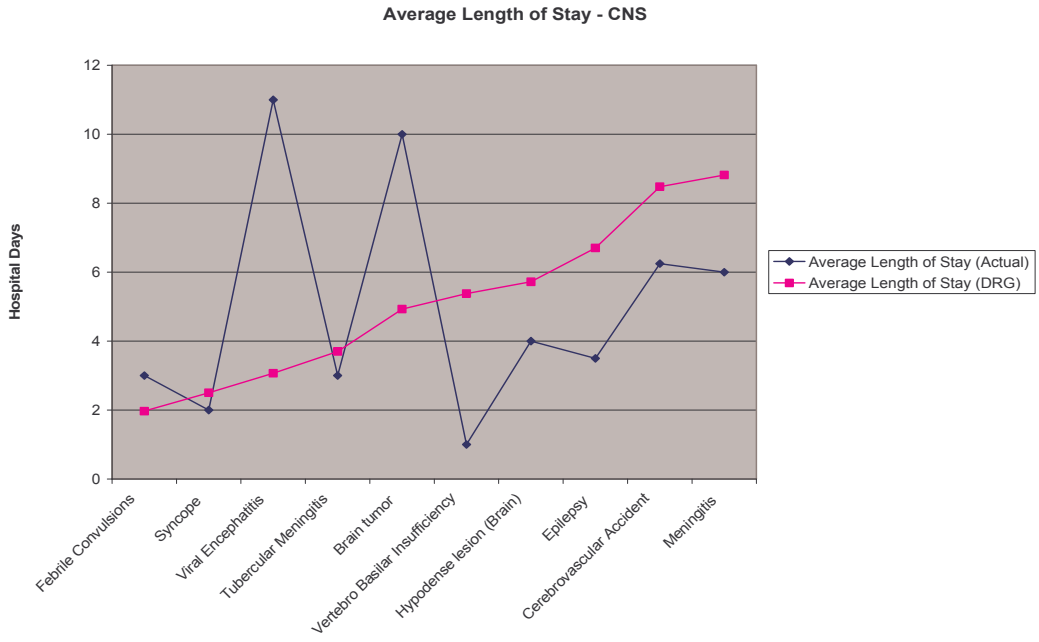


Exhibit 2: Average Length of Stay v/s Actual Length of Stay – Ophthalmology

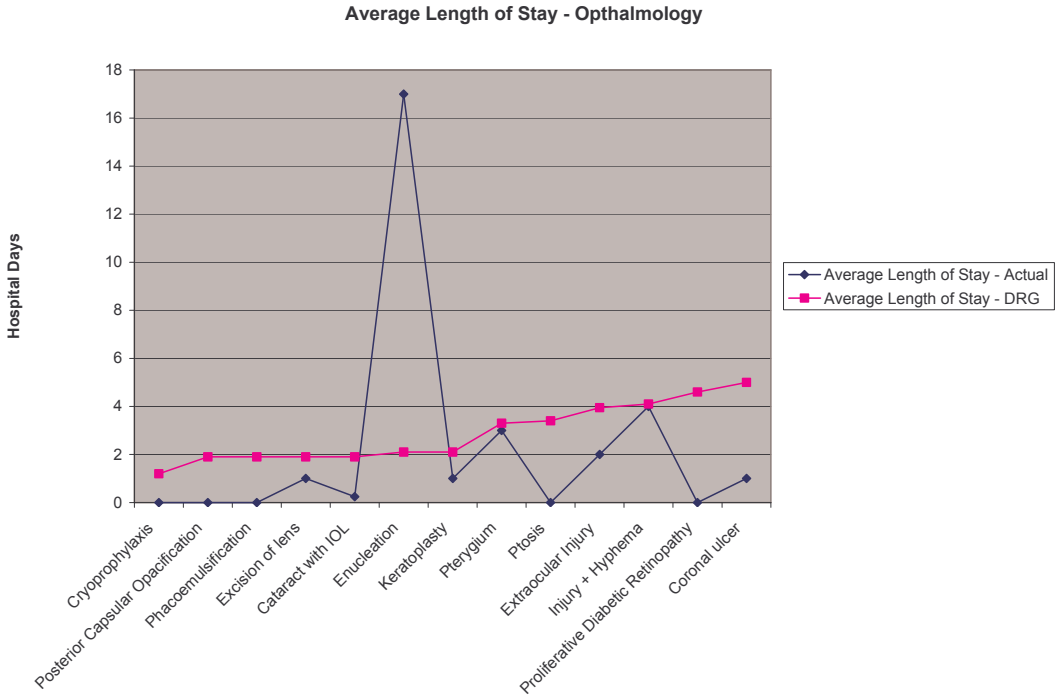


Exhibit 3: Average Length of Stay v/s Actual Length of Stay – ENT

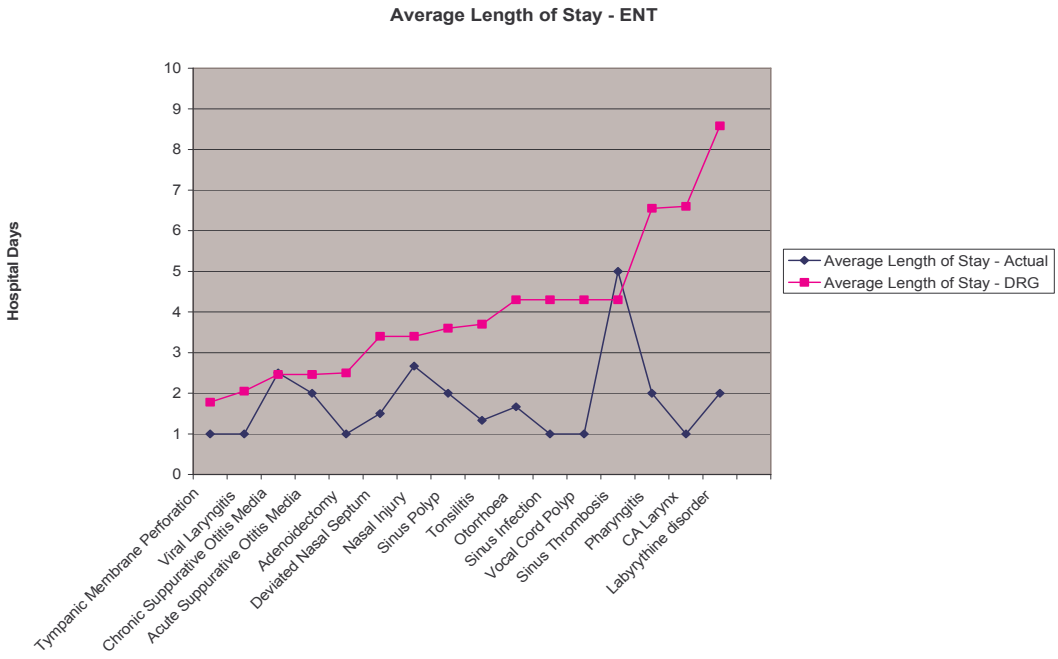


Exhibit 4: Average Length of Stay v/s Actual Length of Stay – Respiratory

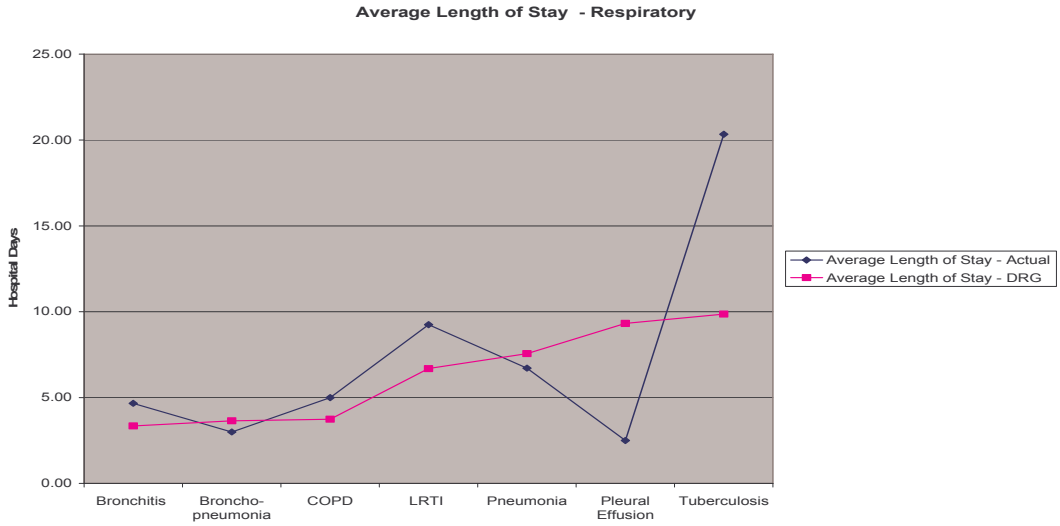


Exhibit 5: Average Length of Stay v/s Actual Length of Stay – CVS

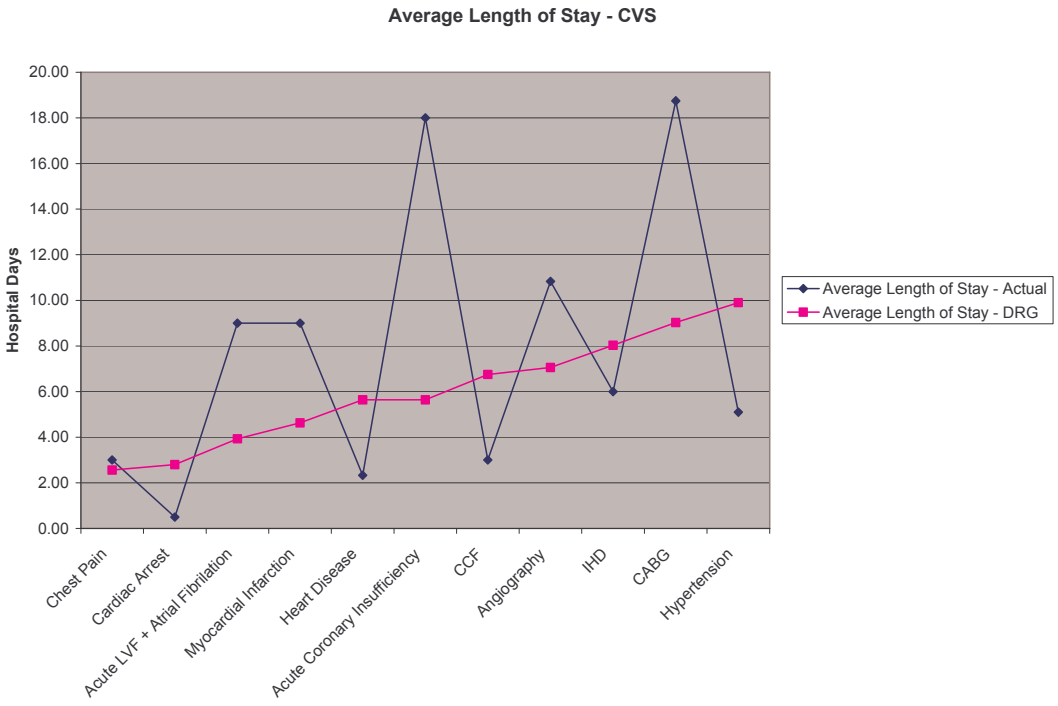


Exhibit 6: Average Length of Stay v/s Actual Length of Stay – GIT

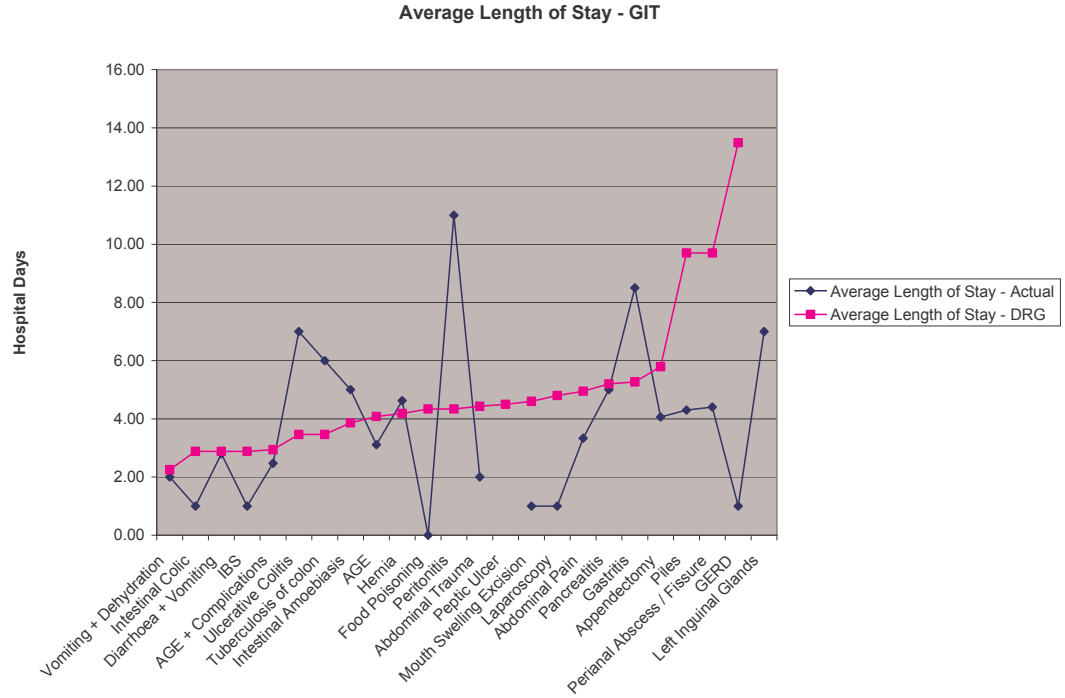


Exhibit 7: Average Length of Stay v/s Actual Length of Stay – Hepatobiliary System

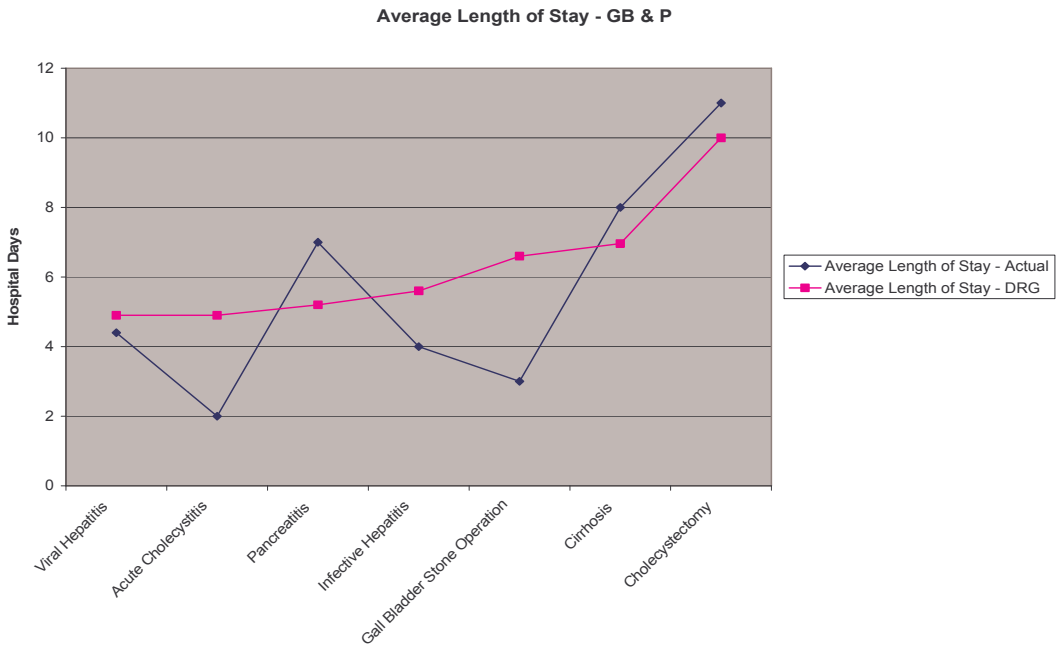


Exhibit 8: Average Length of Stay v/s Actual Length of Stay – Orthopaedics

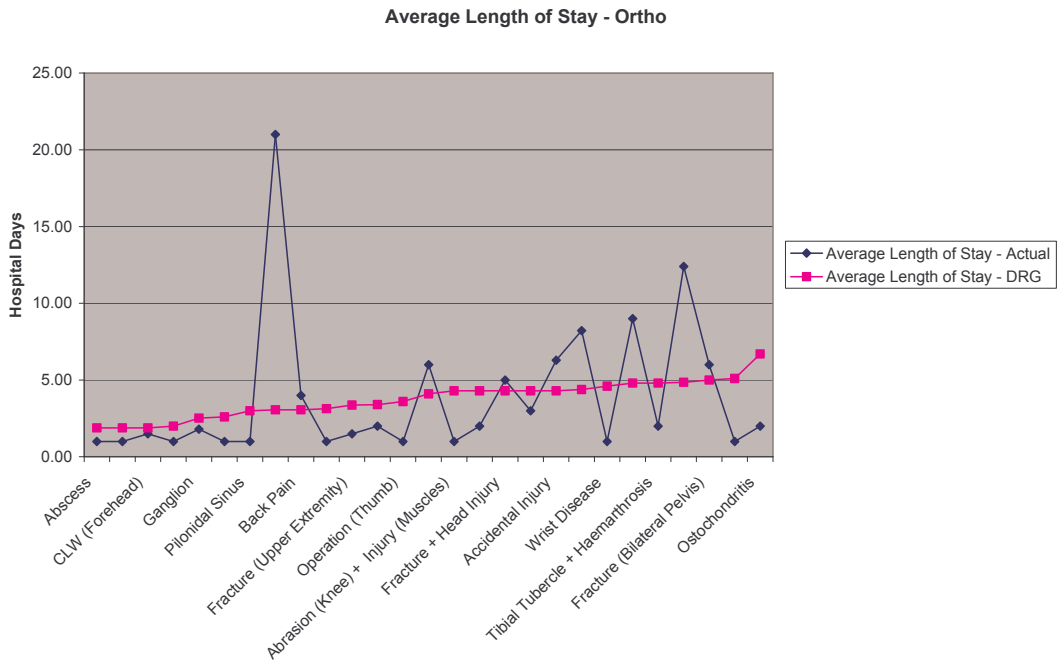


Exhibit 9: Average Length of Stay v/s Actual Length of Stay – Breast Disease

Exhibit 10: Average Length of Stay v/s Actual Length of Stay – Dermatology

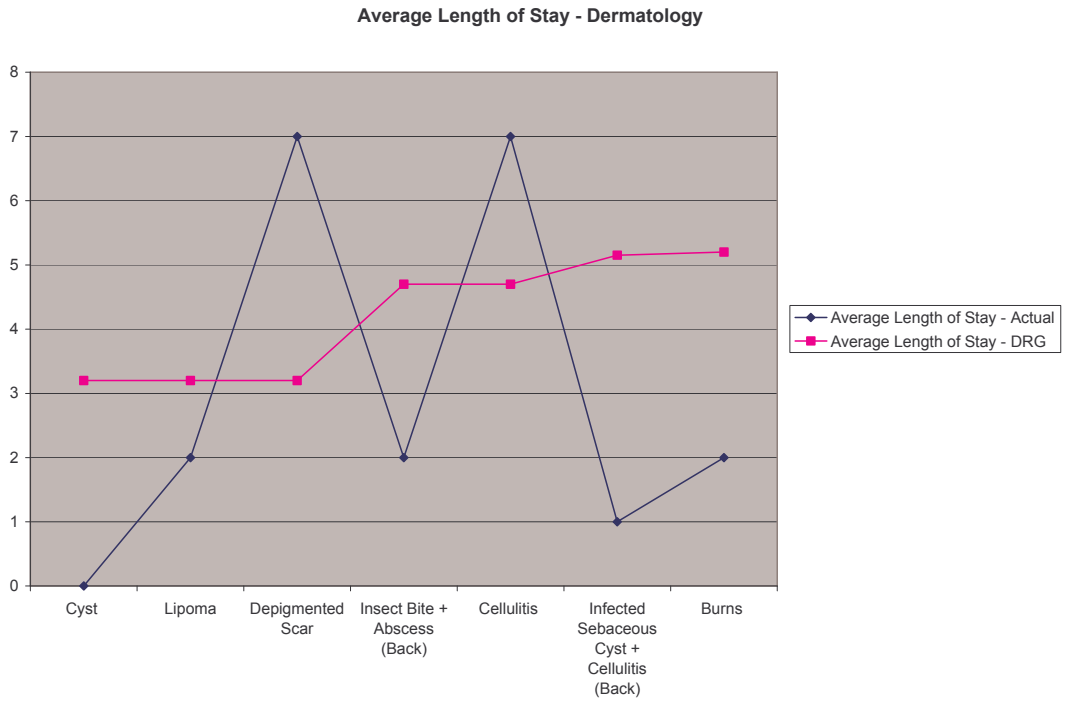


Exhibit 11: Average Length of Stay v/s Actual Length of Stay – Endocrine

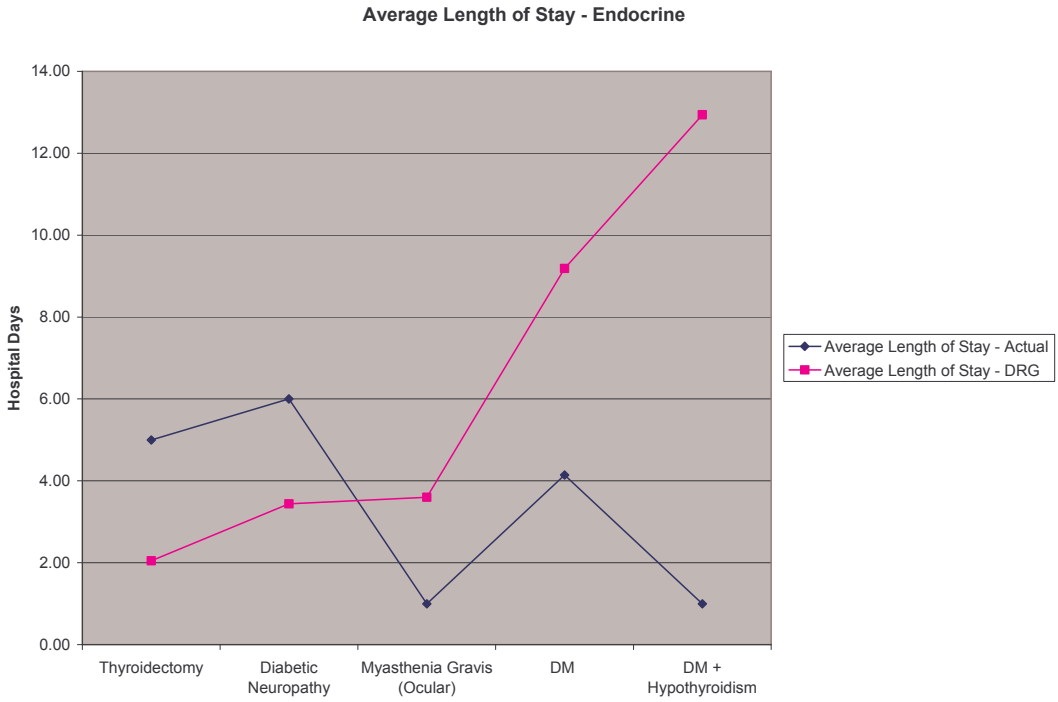


Exhibit 12: Average Length of Stay v/s Actual Length of Stay – Renal

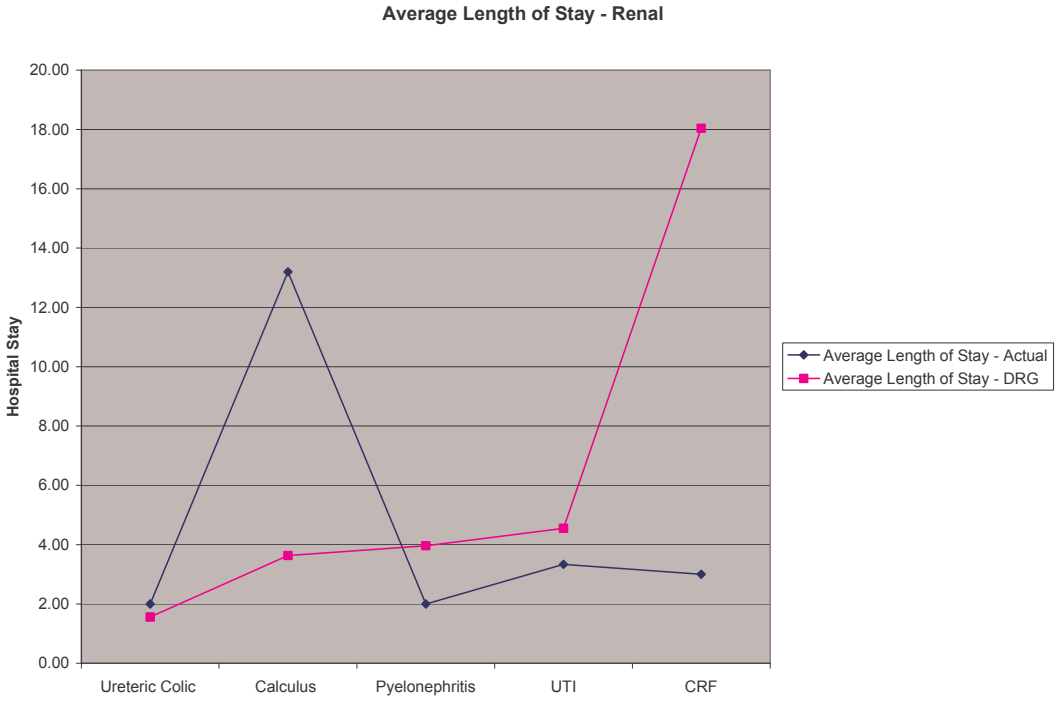


Exhibit 13: Average Length of Stay v/s Actual Length of Stay – Male Reproductive System

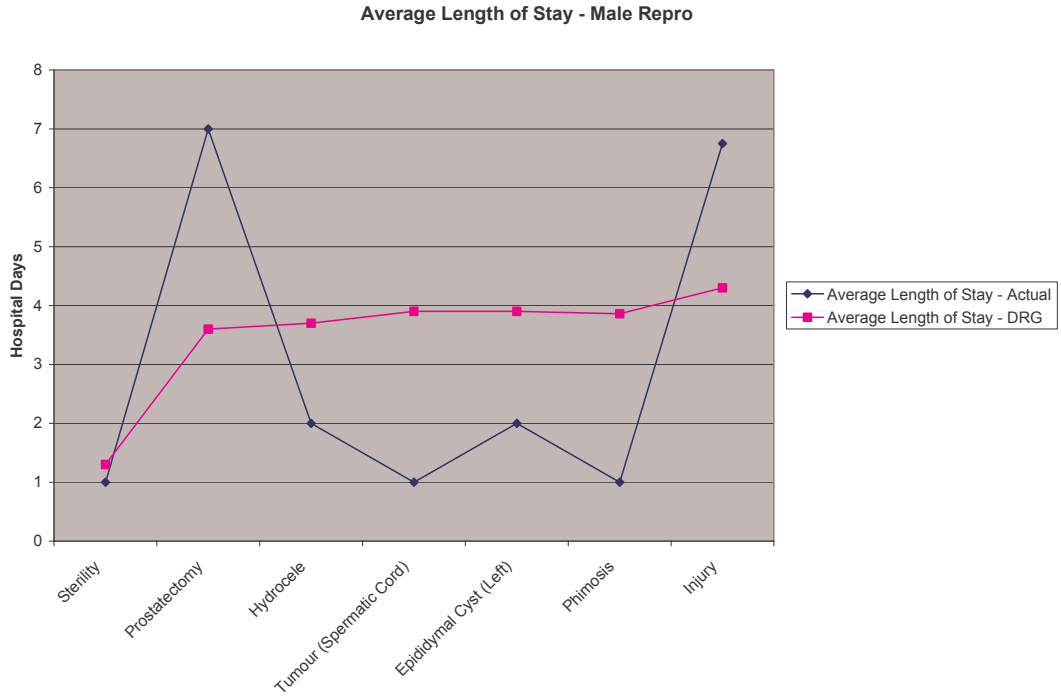


Exhibit 14: Average Length of Stay v/s Actual Length of Stay – Obstetrics & Gynaecology

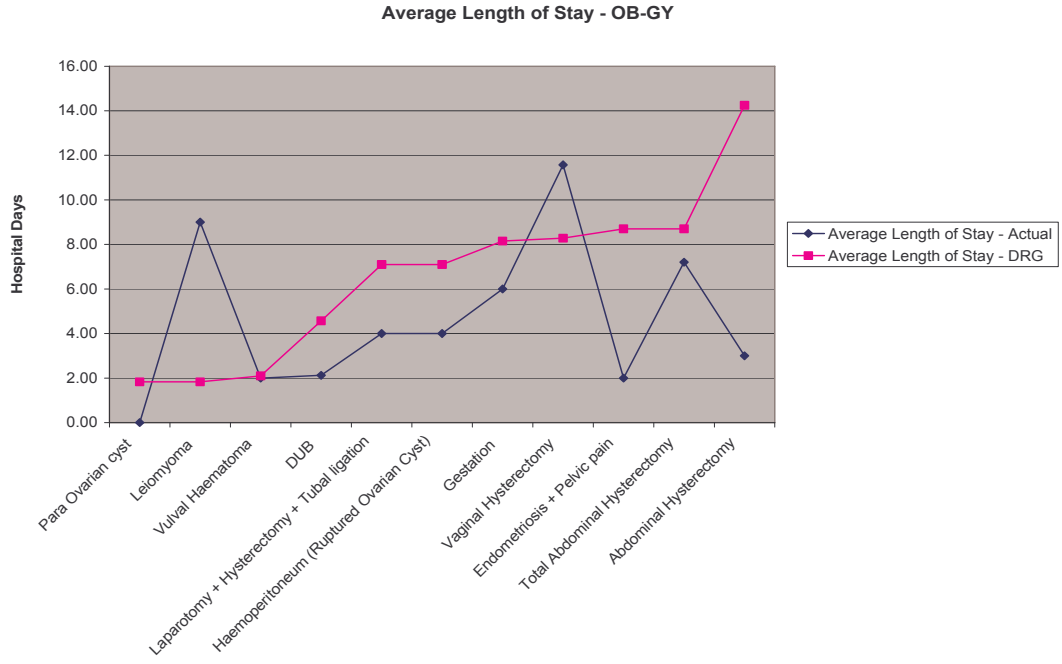


Exhibit 15: Average Length of Stay v/s Actual Length of Stay Infectious Disease

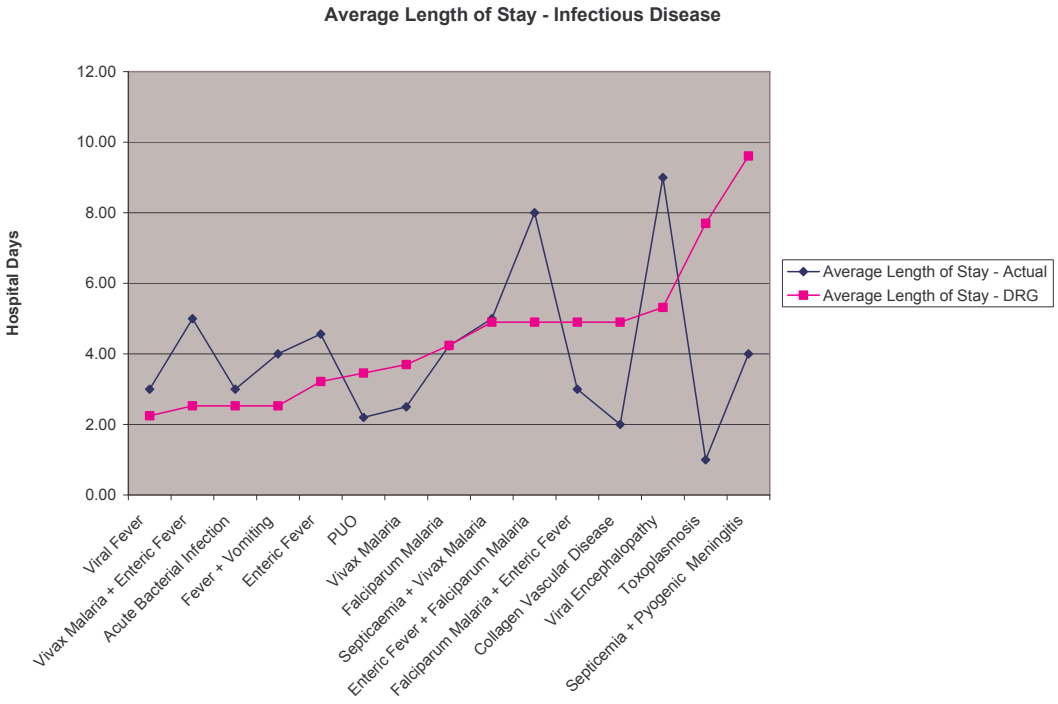


Exhibit 16: Disease Group: Actual Duration of Stay - Standard Deviations

No	Disease System	Disease Group	Standard Deviation
1	CNS	Febrile Convulsions	na
		Syncope	na
		Viral Encephatitis	0
		Tubercular Meningitis	na
		Brain tumor	na
		Vertebro Basilar Insufficiency	na
		Hypodense lesion (Brain)	na
		Epilepsy	0.71
		Cerebrovascular Accident	3.86
		Meningitis	4.24
2	Ophthalmology	Cryoprophylaxis	na
		Posterior Capsular Opacification	na
		Phacoemulsification	na
		Excision of lens	na
		Cataract with IOL	0.47
		Enucleation	Na
		Keratoplasty	0
		Pterygium	4.24
		Ptosis	na
		Extraocular Injury	1.41
		Injury + Hyphema	na
		Proliferative Diabetic Retinopathy	na
		Coronal ulcer	na
3	ENT	Tympanic Membrane Perforation	na
		Viral Laryngitis	na
		Chronic Suppurative Otitis Media	2.12
		Acute Suppurative Otitis Media	na
		Adenoidectomy	na
		Deviated Nasal Septum	0.71
		Nasal Injury	0.58
		Sinus Polyp	na
		Tonsilitis	0.58
		Otorrhoea	1.15
		Sinus Infection	na
		Vocal Cord Polyp	na
		Sinus Thrombosis	na
		Pharyngitis	na
		CA Larynx	na
		Labyrythine disorder	0
4	Respiratory	Bronchitis	5.24
		Broncho-pneumonia	1.73
		COPD	na
		LRTI	9.5
		Pneumonia	6.52
		Pleural Effusion	2.12
		Tuberculosis	26.63
5	CVS	Chest Pain	4.40

		Cardiac Arrest	0.71
		Acute LVF + Atrial Fibrilation	na
		Myocardial Infarction	2.83
		Heart Disease	3.21
		Acute Coronary Insufficiency	na
		CCF	2.83
		Angiography	12.48
		IHD	4.85
		CABG	13.94
		Hypertension	6.15
6	GIT	Vomiting + Dehydration	0.00
		Intestinal Colic	na
		Diarrhoea + Vomiting	1.30
		IBS	na
		AGE + Complications	1.01
		Ulcerative Colitis	na
		Tuberculosis of colon	na
		Intestinal Amoebiasis	na
		AGE	2.53
		Hernia	2.72
		Food Poisoning	na
		Peritonitis	na
		Abdominal Trauma	na
		Peptic Ulcer	na
		Mouth Swelling Excision	na
		Laparoscopy	na
		Abdominal Pain	1.53
		Pancreatitis	na
		Gastritis	na
		Appendectomy	2.05
		Piles	6.07
		Perianal Abscess / Fissure	5.64
		GERD	na
		Left Inguinal Glands	na
7	Hepatobiliary	Viral Hepatitis	2.61
		Acute Cholecystitis	na
		Pancreatitis	2.83
		Infective Hepatitis	4.12
		Gall Bladder Stone Operation	1.41
		Cirrhosis	na
		Cholecystectomy	na
8	Orthopaedics	Abscess	0.00
		Ingrowing of Toe Nail	na
		CLW (Forehead)	0.71
		Operation for Manipulation of Left Shoulder	na
		Ganglion	1.10
		Dislocation	na
		Pilonidal Sinus	na
		PID	25.46
		Back Pain	2.24

		Injury (Upper Extremity)	0.00
		Fracture (Upper Extremity)	0.97
		Arthritis	na
		Operation (Thumb)	na
		Medial Meniscus Injury	na
		Abrasion (Knee) + Injury (Muscles)	na
		Injury (HNF)	1.85
		Fracture + Head Injury	na
		Fracture (HNF)	na
		Accidental Injury	4.72
		Fracture (Lower Extremity)	6.67
		Wrist Disease	0.00
		Necrosis of Head of Femur	na
		Tibial Tubercle + Haemarthrosis	na
		Joint Replacement	5.46
		Fracture (Bilateral Pelvis)	na
		Muscular Sprain	na
		Ostochondritis	na
9	Breast Disease	Breast Lump	0
		Breast Hyperplasia	na
		Breast Cancer	3.70
10	Dermatology	Cyst	na
		Lipoma	na
		Depigmented Scar	na
		Insect Bite + Abscess (Back)	na
		Cellulitis	4.90
		Infected Sebaceous Cyst + Cellulitis (Back)	0
		Burns	na
11	Endocrine	Thyroidectomy	Na
		Diabetic Neuropathy	Na
		Myasthenia Gravis (Ocular)	Na
		DM	1.68
		DM + Hypothyroidism	Na
12	Renal	Ureteric Colic	0.00
		Calculus	33.78
		Pyelonephritis	Na
		UTI	3.93
		CRF	Na
13	Male Reproductive	Sterility	0
		Prostatectomy	na
		Hydrocele	na
		Tumour (Spermatic Cord)	na
		Epididymal Cyst (Left)	na
		Phimosis	0
		Injury	3.59
14	Obstetrics & Gynaecology	Para Ovarian cyst	na
		Leiomyoma	na
		Vulval Haematoma	na
		DUB	2.30

		Laparotomy + Hysterectomy + Tubal ligation	na
		Haemoperitoneum (Ruptured Ovarian Cyst)	na
		Gestation	na
		Vaginal Hysterectomy	10.37
		Endometriosis + Pelvic pain	na
		Total Abdominal Hysterectomy	3.19
		Abdominal Hysterectomy	na
15	Infectious Disease	Viral Fever	1.41
		Vivax Malaria + Enteric Fever	na
		Acute Bacterial Infection	na
		Fever + Vomiting	na
		Enteric Fever	3.63
		PUO	1.30
		Vivax Malaria	1.73
		Falciparum Malaria	3.49
		Septicaemia + Vivax Malaria	na
		Enteric Fever + Falciparum Malaria	na
		Falciparum Malaria + Enteric Fever	na
		Collagen Vascular Disease	na
		Viral Encephalopathy	na
		Toxoplasmosis	na
		Septicemia + Pyogenic Meningitis	na

Exhibit 17: Date of Discharge to Date of Claim Reimbursement

Disease System	Average Time Gap	Standard Deviation	Maximum	Minimum
CNS	177	96	387	23
Ophthalmology	99	56	276	29
ENT	135	73	261	50
Respiratory	132	74	295	38
CVS	140	72	358	43
GIT	101	59	429	21
Hepatobiliary	129	54	247	50
Orthopaedic	142	65	363	7
Breast Disease	138.4	86	268	35
Dermatology	107	46	214	50
Endocrine	182.4	72	308	117
Renal	112.2	79	361	26
Male Reproductive	101	40.1	186	46
Obstetrics and Gynaecology	126	78	420	51
Infectious Disease	103.6	64.9	363	25

Exhibit 18: Disease System Cost Comparison - DRG and Actual

Disease System	*Average Costs DRG*	*Average Cost DRG - PPP*	*RANK DRG*	*Average Costs India*	*RANK INDIA*
	USD	*INR (PPP=4.5)*		*INR*	
Central Nervous System	3436	15461	3	23617	3
Ophthalmology (Eye Diseases)	1738	7823	14	12878	9
Otorhinolaryngology (ENT)	1709	7691	15	10297	12
Respiratory System	2162	9729	12	11480	11
Cardiovascular System	6022	27101	1	44460	1
Gastrointestinal System	1934	8701	13	9385	13
Hepatobiliary System	3394	15274	4	25397	2
Orthopaedics (Bone diseases)	3197	14388	6	19130	5
Breast Diseases	3175	14286	7	19931	4
Dermatology (Skin Disease)	2575	11585	11	8187	14
Endocrine System	2927	13170	8	13594	8
Renal System (Kidney and Urinary Disease)	2595	11678	10	16257	7
Male Reproductive System	2608	11734	9	11802	10
Obstetric & Gynaecological Disease	5756	25902	2	19020	6
Infectious Disease	3333	14999	5	7446	15
Standard Deviation		***5730***		***9426***	

Exhibit 19: Disease Subsystem Cost Comparisons - DRG and Actual

Disease System	*Disease Subsystem*	*Average Costs DRG*	*Average Cost DRG - PPP*	*RANK DRG*	*Average Costs India*	*RANK INDIA*
		USD	*INR (PPP=4.5)*		*INR*	
CNS	Febrile Convulsions	1818	8181	7	5304	10
	Syncope	1656	7452	9	57260	2
	Viral Encephatitis	1312	5904	10	5935	9
	Tubercular Meningitis	5370	24165	1	53796	3
	Brain tumor	5037	22666	3	91025	1
	Vertebro Basilar Insufficiency	2560	11520	6	9320	6
	Hypodense lesion (Brain)	3586	16137	5	7006	7
	Epilepsy	1673	7530	8	6004.5	8
	Cerebrovascular Accident	5156	23205	2	24412	4
	Meningitis	4174	18783	4	16315	5
Ophthalmology	Cryoprophylaxis	1809	8140	8	1679	12
	Posterior Capsular Opacification	2167	9751.5	5	2033	11
	Phacoemulsification	1548	6966	9	19000	3
	Excision of lens	1548	6966	9	1287	13
	Cataract with IOL	1548	6966	9	14082.11	4
	Enucleation	6492	29214	1	25438	1
	Keratoplasty	2167	9751.5	5	14042	5
	Pterygium	2382	10719	4	2990	10
	Ptosis	1847	8311.5	7	8200	6
	Extraocular Injury	1471	6619.5	13	3054.5	8
	Injury + Hyphema	1475	6637.5	12	3037	9
	Proliferative Diabetic Retinopathy	3026	13617	3	7838	7
	Coronal ulcer	4410	19845	2	19431	2
Otorhinolaryngology	Tympanic Membrane Perforation	2588	11646	4	5968	13
	Viral Laryngitis	1115	5017.5	12	1939	16
	Chronic Suppurative Otitis Media	2177	9796.5	6	16139.5	3
	Acute Suppurative Otitis Media	1123	5053.5	11	9072	6
	Adenoidectomy	779	3505.5	16	4700	15
	Deviated Nasal Septum	1265	5692.5	9	6584	10
	Nasal Injury	1379	6205.5	8	9678	5
	Sinus Polyp	2535	11407.5	5	20034	2
	Tonsilitis	992	4464	14	6186.667	11
	Otorrhoea	992	4464	14	14996	4
	Sinus Infection	1522	6849	7	7147	8
	Vocal Cord Polyp	4700	21150	2	5933	14
	Sinus Thrombosis	2624	11808	3	36944	1

	Pharyngitis	1089	4900.5	13	6111	12
	CA Larynx	5332	23994	1	7094	9
	Labyrythine disorder	1174	5283	10	7227.5	7
Respiratory System	Bronchitis	1256	5652	7	3425	6
	Broncho-pneumonia	2898	13041	4	1549	7
	COPD	2227	10021.5	5	14973	2
	LRTI	2078	9351	6	5565	4
	Pneumonia	3928	17676	1	5675	3
	Pleural Effusion	3679	16555.5	2	4587	5
	Tuberculosis	2916	13122	3	20117	1
Cardiovascular System	Chest Pain	1348	6066	9	8127.6	9
	Cardiac Arrest	12565	56542.5	2	24505.2	6
	Heart Disease	4579	20605.5	4	54931	4
	Acute Coronary Insufficiency	4579	20605.5	4	88551	3
	CCF	4579	20605.5	4	12810.5	8
	Angiography	12074.83	54336.75	3	119794	2
	IHD	3555.059	15997.76	7	26209.35	5
	CABG	20562	92529	1	192423.8	1
	Hypertension	3039.1	13675.95	8	16190.4	7
Gastrointestinal System	Vomiting + Dehydration	1161	5224.5	23	3978	20
	Intestinal Colic	1554	6993	16	5135	16
	Diarrhoea + Vomiting	1193	5368.5	20	3241.8	21
	IBS	2118	9531	10	5610	15
	AGE + Complications	1586	7137	14	4975.235	17
	Ulcerative Colitis	2598	11691	9	20234	2
	Tuberculosis of colon	3749	16870.5	4	7511	10
	Intestinal Amoebiasis	1193	5368.5	20	7305	12
	AGE	1286.926	5791.167	19	6915.667	14
	Hernia	1656.25	7453.125	13	17988.13	3
	Food Poisoning	3749	16870.5	4	1067	23
	Peritonitis	3749	16870.5	4	27028	1
	Abdominal Trauma	11357	51106.5	1	4348	18
	Peptic Ulcer	1457	6556.5	17	4300	19
	Mouth Swelling Excision	2038	9171	11	1287	22
	Laparoscopy	4616	20772	3	9144	7
	Abdominal Pain	1193	5368.5	20	7306.667	11
	Pancreatitis	1955	8797.5	12	8329	9
	Gastritis	1373.5	6180.75	18	11466	6
	Appendectomy	2883.438	12975.47	8	17760.94	4
	Piles	1560	7020	15	8598.2	8
	GERD	8119	36535.5	2	7019	13
	Left Inguinal Glands	3401	15304.5	7	17234	5
Hepatobiliary System	Viral Hepatitis	1471	6619.5	7	6182.2	7
	Acute Cholecystitis	1696	7632	6	32789	3
	Pancreatitis	1955	8797.5	5	28441.75	4
	Infective Hepatitis	4544	20448	3	20812.8	6
	Gall Bladder Stone	5894	26523	1	28237	5

	Operation					
	Cirrhosis	4339	19525.5	4	60310	2
	Cholecystectomy	5894	26523	1	90325	1
Orthopaedics	Abscess	1652	7434	19	3638	20
	Ingrowing of Toe Nail	1892	8514	12	2473	24
	CLW (Forehead)	239	1075.5	26	3715	19
	Operation for Manipulation of Left Shoulder	4465	20092.5	8	3326	22
	Ganglion	1501	6754.5	22	7062	12
	Dislocation	2707	12181.5	9	15261	8
	Pilonidal Sinus	1567	7051.5	21	4862	17
	PID	4741	21334.5	6	11709	9
	Back Pain	1706	7677	18	10233.4	10
	Injury (Upper Extremity)	2108	9486	11	5372	16
	Fracture (Upper Extremity)	941	4234.5	24	6096.9	14
	Arthritis	4474	20133	7	8392	11
	Operation (Thumb)	1881	8464.5	14	3589	21
	Medial Meniscus Injury	1603	7213.5	20	15940	7
	Abrasion (Knee) + Injury (Muscles)	1789	8050.5	16	2033	25
	Injury (HNF)	1892	8514	12	5935	15
	Fracture + Head Injury	8739	39325.5	2	16034	6
	Accidental Injury	1804	8118	15	24158.43	4
	Fracture (Lower Extremity)	5838	26271	5	29845.11	3
	Wrist Disease	1734	7803	17	4145.25	18
	Necrosis of Head of Femur	7304	32868	4	134960	1
	Tibial Tubercle + Haemarthrosis	2288	10296	10	6760	13
	Joint Replacement	12234	55053	1	113953.4	2
	Fracture (Bilateral Pelvis)	7846	35307	3	20284	5
	Muscular Sprain	524	2358	25	1846	26
	Ostochondritis	1287	5791.5	23	3042	23
Breast Disease	Breast Lump	1824	8208	2	9157.5	2
	Breast Hyperplasia	1222	5499	3	7708	3
	Breast Cancer	4338	19521	1	28372.75	1
Skin Disease	Cyst	1267	5701.5	6	3852	7
	Lipoma	1267	5701.5	6	4550	5
	Depigmented Scar	2623	11803.5	3	7540	2
	Insect Bite + Abscess (Back)	2623	11803.5	3	4595	4
	Cellulitis	1484	6678	5	15862.33	1
	Infected Sebaceous Cyst + Cellulitis	4485	20182.5	2	4108	6
	Burns	5634	25353	1	5532	3

Endocrine Disease	Thyroidectomy	5538	24921	1	25346	1
	Diabetic Neuropathy	3652	16434	3	17807	2
	Myasthenia Gravis (Ocular)	3871	17419.5	2	12094	3
	DM	2391.5	10761.75	4	11785.38	4
Renal System	Ureteric Colic	1445	6502.5	5	6423.667	5
	Calculus	2833.1	12748.95	3	20513.4	2
	Pyelonephritis	3636	16362	2	6975	4
	UTI	1894	8523	4	14309.33	3
	CRF	6829	30730.5	1	24155	1
Male Reproductive	Sterility	1029	4630.5	5	10471	5
	Prostatectomy	2558	11511	4	40903	1
	Hydrocele	740	3330	7	7305	6
	Tumour (Spermatic Cord)	2790	12555	3	15131	3
	Epididymal Cyst (Left)	1029	4630.5	5	12238	4
	Phimosis	3135	14107.5	2	3411.2	7
	Injury	3566	16047	1	15863.5	2
	Para Ovarian cyst	2440	10980	6	10728	6
Female Reproductive	Leiomyoma	5530	24885	4	17377	4
	Vulval Haematoma	1853	8338.5	8	3415	10
	DUB	748	3366	10	10162.38	7
	Laparotomy + Hysterectomy + Tubal ligation	7929	35680.5	3	13783	5
	Haemoperitoneum (Ruptured Ovarian Cyst)	5080	22860	5	10028	8
	Gestation	1829	8230.5	9	9877	9
	Vaginal Hysterectomy	9131	41089.5	2	24712.86	3
	Endometriosis + Pelvic pain	2050	9225	7	28661	2
	Total Abdominal Hysterectomy	10759	48415.5	1	30731.33	1
Infectious Disease	Viral Fever	1194	5373	11	5257	9
	Vivax Malaria + Enteric Fever	4301	19354.5	2	7965	4
	Acute Bacterial Infection	4301	19354.5	2	5683	8
	Fever + Vomiting	2297	10336.5	8	10387	2
	Enteric Fever	2464.615	11090.77	7	7316.513	7
	PUO	4301	19354.5	2	8323.6	3
	Vivax Malaria	4301	19354.5	2	7512.931	6
	Collagen Vascular Disease	2269	10210.5	9		
	Viral Encephalopathy	4301	19354.5	2	17876	1
	Toxoplasmosis	2269	10210.5	9	2400	10
	Septicemia + Pyogenic Meningitis	8834	39753	1	7694	5

References

Papers and Reports

- Bhat, R and Reuben, E.B. [2002]. *Management of Claims and Reimbursements: The case of Mediclaim Insurance Policy.* Vikalpa Vol 27/Number 4 (October – December 2002)
- Bhat, R and Babu. S.K. [2003]. *Health Insurance and Third Party Administrators: Issues and Challenges.* IIM Ahmedabad Working Paper No. 2003-05-02
- Economic Times Healthcare Report 2002
- ICRA Indian Insurance Industry Report – May 2003
- Jain. P & Sarkar. S.S [2003]. A study in the Indian Health Insurance Industry: Structure, Issues and Recommendations. Independent Project submitted to Prof. Ramesh Bhat. IIM Ahmedabad
- Thomas JW, Guire KE, Horvat GG. 1997. Is patient length of stay related to quality of care? Hosp Health Serv Adm. 1997 Winter;42(4):489-507

Websites

- www.irdaindia.org (Insurance Regulatory & Development Authority of India)
- www.bupa.org
- www.aahp.org
- www.healthinsuranceinfo.net
- www.hic.gov.au
- www.cigna.com
- www.aetna.com