Length of Stay and Occupancy

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Private hospitals are often cited in healthcare cost debates. They are also accused of having spare capacity while the public sector is buckling under under-funding and hospital queues. While the public sector requires revitalisation to give quality service, it is necessary to understand the underlying cost drivers in both the public and private systems so that direct and meaningful decisions can be made.

No doubt, some of the main cost drivers are hospital occupancy and capacity. Some authorities quote occupancy rates without disclosing the underlying basis for determining the occupancy rate or the applicability of a benchmark occupancy rate. Presently, there is no standard measure for occupancy. This article discusses the definition of occupancy, and length of stay.

We hope stakeholders can use this to develop occupancy measures to better understand hospitals.

A standard measure, we hope, will sharpen future healthcare debates and steer healthcare away from perceptions based on retrospectively-deduced snippets of information. Our analysis is based on 2006 and 2007 data farmed from multi-disciplinary hospitals including the major groups.

Further, we present research relating to the determination of occupancy and the factors influencing it. We show that the private hospitals occupancy is increasing. Our research suggests longer length of stay (LOS) making it clearer that private hospital occupancy levels are the result of increased use and a changed case mix. The population using private hospitals is getting both older and sicker.

DEFINING LENGTH OF STAY AND OCCUPANCY

The occupancy of a hospital provides a measure of utilisation. Occupancy can be measured as the relationship between the total LOS and the hospital capacity, which is defined as the total number of available beds in a period. The total LOS is the total time spent in the hospital by patients. Analysis of the LOS provides insight into utilisation, which includes the stay in wards and the use of theatres.

FIGURE 1: OCCUPANCY RATE

$$\text{Occupancy rate} = \frac{\text{Beds occupied in year, in days (Utilisation x average LOS)}}{\text{Beds available in year (Number of beds x number of days in year)}}$$

FIGURE 2: TOTAL LENGTH OF STAY

Total length of stay = Sum of billed days
= Number of patients admitted × average LOS per patient
(ie, utilisation × average LOS)

FIGURE 3: CAPACITY OF THEATRES

Capacity of theatres = 60 min × 8 hours × 7 days × 52 weeks × number of theatres
(or minutes per day × days per year × number of theatres)

METHODOLOGY UNDERLYING THE CALCULATIONS

The occupancy rate for wards is calculated as the number of beds occupied during a year (capacity) relative to the number of beds available in a year (see Figure 1). The capacity is therefore based on the total number of beds multiplied by the total number of days in the year (ie 365,25). This constitutes the denominator.

The numerator in the calculation is the number of beds occupied during a year or the total billed LOS over the same period. This total billed LOS is a consolidation of the days billed for each patient, based on prescribed billing practices.

The total LOS can be expressed in terms of average LOS and is illustrated in Figure 2.

The average LOS measures how long, on average, a patient spends in the hospital. It is simply the total LOS divided by the number of unique patient admissions in the period under investigation.

The data we have used excludes outpatients and ambulatory and emergency cases. However, we have included day cases. Day cases are patients who have been admitted and discharged on the same day.

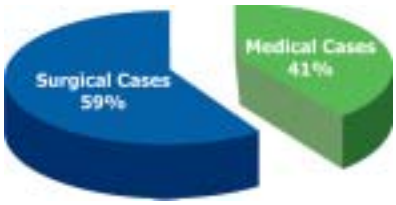
The definition of theatre occupancy and capacity differs to wards. Theatre occupancy is calculated by counting the total time in theatre (in minutes) divided by the total theatre time available (theatre capacity). For this purpose, we used theatre time as the difference between theatre start time and theatre end time. In order to provide a more accurate measure of theatre utilisation we have also added an additional 10 minutes per theatre event for time required to clean the theatre. Our analysis excludes delivery rooms and catheterisation laboratories. (See Figure 3). We have assumed that the theatre will operate for seven days per week. The average time in theatre is calculated as the total theatre time divided by the number of theatre cases.

FINDINGS

Utilisation

Hospital utilisation is measured by the number of patients admitted to the hospital in the period. For this purpose, the periods under investigation are the calendar years 2006 and 2007. There was a 3% increase in the number of patients admitted into the hospitals between 2006 and 2007. A large portion of admissions are surgical cases (see Figure 4).

FIGURE 4: SPLIT BETWEEN MEDICAL AND SURGICAL CASES - 2007

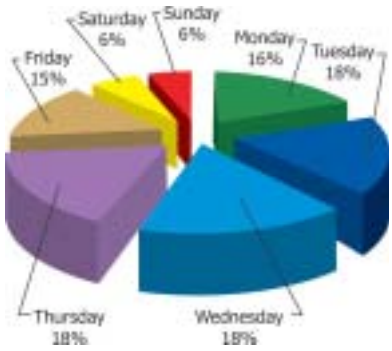


Surgical cases are the cases that experience a theatre event. Medical cases do not have a theatre event. Surgical events are influenced by the availability of surgeons and the willingness of patients to undergo surgical procedures. Hospital utilisation is, therefore, influenced by these two factors.

Admission rates are higher on weekdays. This may be due to medical practitioners not being available over weekends, or patients preferring not to be

admitted over weekends (See Figure 5).

FIGURE 5: PROPORTION OF ADMISSIONS PER WEEKDAY



While utilisation drops over weekends, there is further seasonality in utilisation through the year. Figure 6 shows clear dips in utilisation in April and December, with September experiencing a slight dip. These months are associated with school holidays and general holidays, which affects doctor availability and the willingness of patients to undergo surgery.

KEY FINDINGS

- Utilisation is higher on weekdays than on weekends.
- Utilisation dips during the holiday months, although consistent throughout the year.

AVERAGE LENGTH OF STAY

As the average LOS is a key component of the occupancy rate, understanding the factors that influence it will also sharpen our understanding of the occupancy rate. Patients admitted on weekends tend to have a higher LOS (4,10 days), more than a day longer than patients admitted during the week (3,07 days). Sunday has the highest LOS. Monday has the highest LOS for weekdays. (Figure 7.)

Breaking down the LOS between medical and surgical cases provides some explanation for the differences. The mix between the medical and surgical cases influences the LOS. The average LOS for medical cases was higher (4,02 days) than the average LOS for surgical cases (2,65 days) in 2007.

Surgical procedure patients are in a relatively good state of health to be able to undergo an operation, which would, of course, influence their recovery time. This may explain the shorter LOS for the surgical cases. Likewise, medical patients who are admitted to the hospital will be the more serious medical cases. The patients cannot be treated at home or at the consulting rooms of a medical practitioner. In contrast, surgical cases are admitted to make use of the theatre facilities, and so there is some planning and expectations.

Figure 8 suggests that

FIGURE 6: ADMISSIONS PER MONTH - 2006 VS 2007

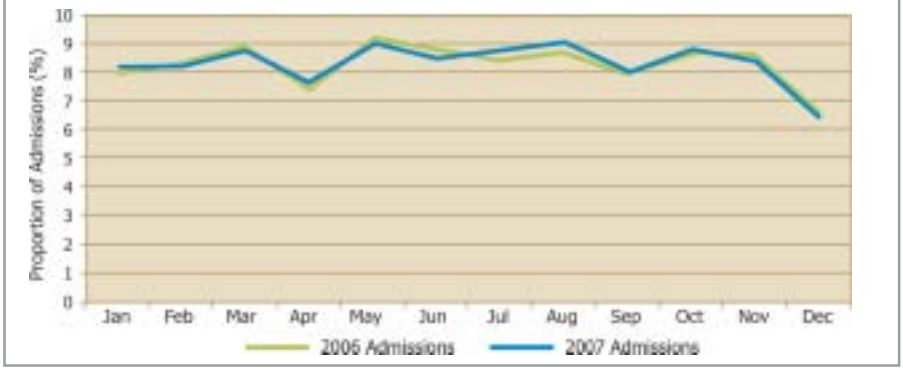


FIGURE 7: AVERAGE LOS PER DAY OF THE WEEK - 2006 VS 2007

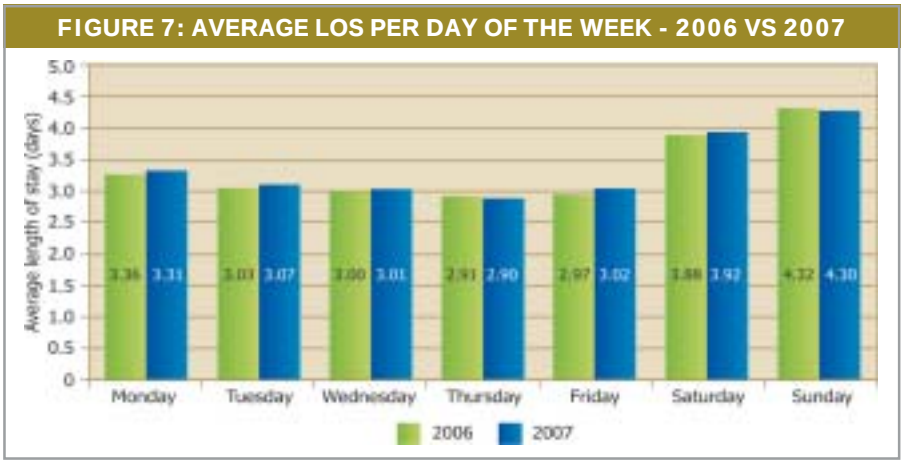
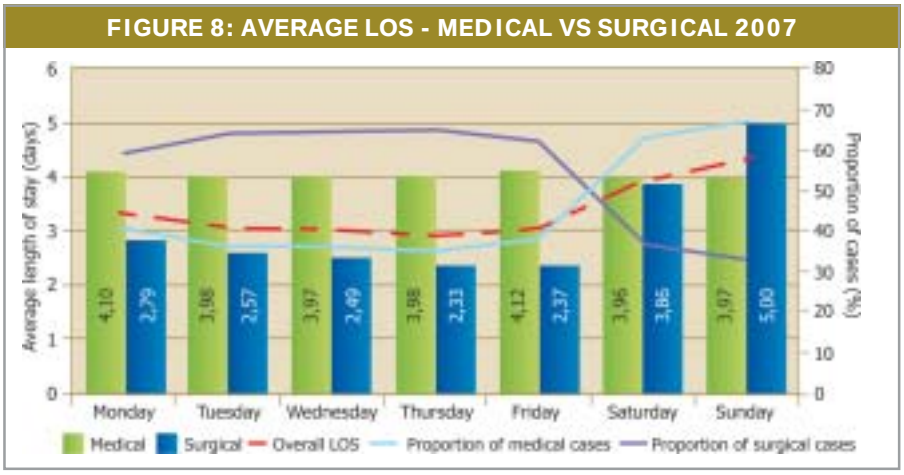


FIGURE 8: AVERAGE LOS - MEDICAL VS SURGICAL 2007



surgical cases admitted on weekends are more severe. These are mainly trauma cases rather than elective admissions. This is mirrored by theatre time. See Figure 9.

We have investigated the relationship between time spent in theatre relative to the complexity of the theatre procedure, using the Relative Value Unit (RVU) underlying the Current Procedural Terminology (CPT) code as an indicator of the relative morbidity or acuity of the patient.

The higher the RVU, the greater the resources required to care for patients. Figure 10 plots the average LOS in theatre per RVU band.

The average LOS is influenced by the day of admissions.

The LOS for weekend admission is higher, particularly due to the surgical cases admitted on weekends, which tend to be more complicated. Interestingly, seasons don't seem to have a major impact on LOS. (See Figure 11.)

Like ward LOS, theatre LOS does not show seasonality. This is not the case with different ward types. Despite neonatal units having the lowest occupancy rate, patients admitted to these wards have the longest average LOS. (See Figure 12.)

In other words, a neonate can be expected to stay in hospital for approximately six days. As expected, day ward patients spend, on average, one day in the hospital.

Gender influences the LOS of patients. The 2007 LOS for males is higher (3,28 days)

FIGURE 9: AVERAGE LOS PER WEEKDAY - 2006 VS 2007

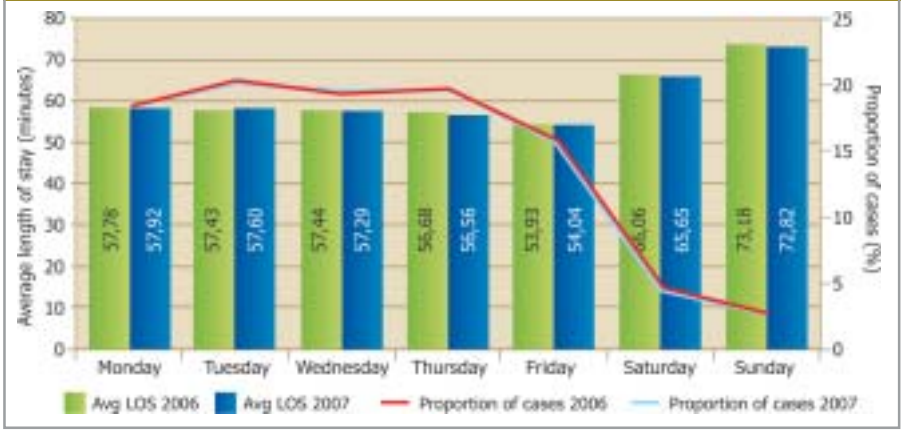


FIGURE 10: AVERAGE THEATRE LOS BY RVU BAND

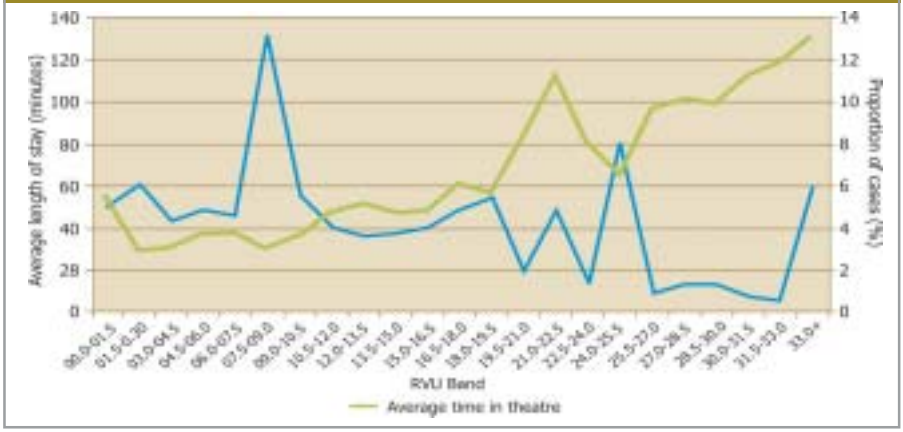
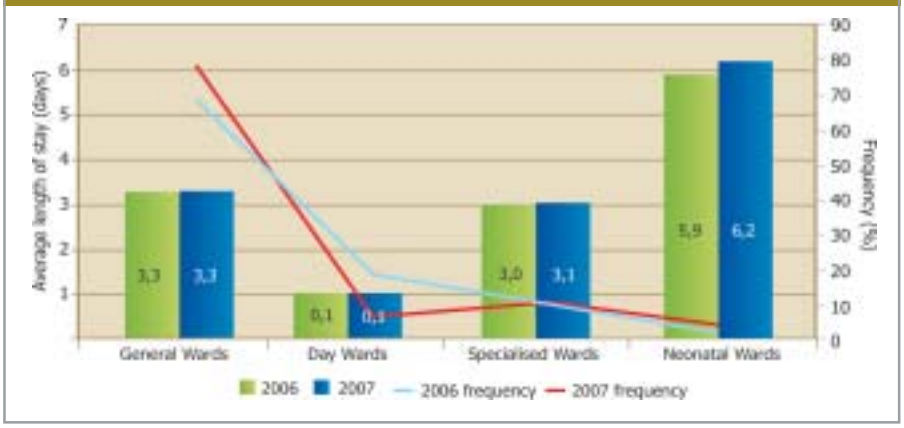


FIGURE 11: AVERAGE WARD LENGTH PER MONTH - 2006 VS 2007

FIGURE 12: AVERAGE LOS PER WARD TYPE



than for females (3,13 days). Figure 13 gives a clearer picture by age category.

Females have higher LOS in both the younger and older ages. Males exhibit longer LOS from their early twenties and through most of the middle-age years. These peaks may be a result of accidents. The LOS for young adult females (20 to 30 years) includes a large proportion of maternity cases which results in a higher average LOS, as can be seen in Figure 14.

In the maternity age bands, the non-maternity cases have a shorter LOS. The average LOS over these maternity age bands (15 to 44) shows that the LOS for all females is 2,75 days compared with the average LOS for females excluding maternity of 2,69 days. This implies that maternity cases have higher LOS compared to non maternity cases. This may be attributed to the large proportion of caesarean cases, which have slightly longer LOS.

The impact of maternity cases on theatre LOS can be seen by the proportion of females in the age group 15 to 40 that undergo theatre events. It is interesting to note that average time in theatre increases with age, though it tapers off in the older ages. The likelihood of a patient undergoing a theatre procedure decreases in the older ages for both males and females (see Graph 15).

Overall, the average LOS of a patient in hospital was 3,19 days in 2007, an increase of 0,02 days from the average of 3,17 in 2006.

FIGURE 13: AVERAGE LOS PER BAND - MALES VS FEMALES - 2007

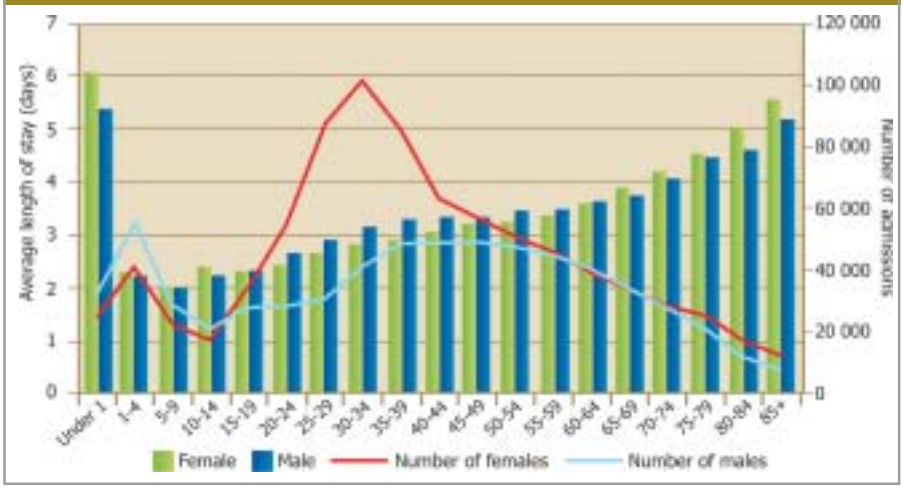


FIGURE 14: AVERAGE LOS PER BAND - FEMALES - 2007

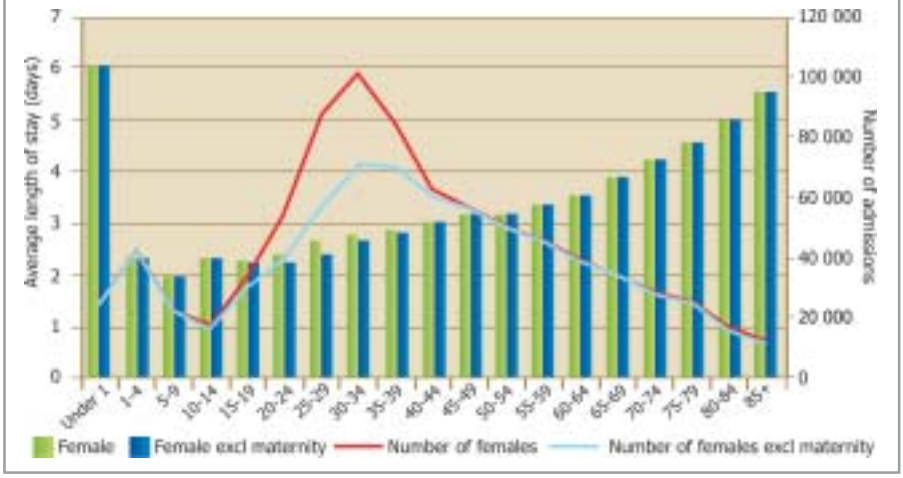
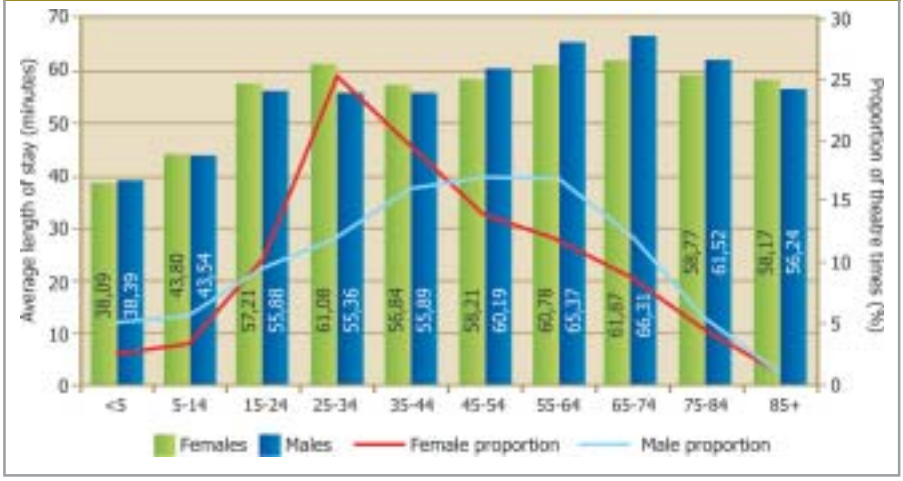


FIGURE 15: AVERAGE THEATRE LOS PER AGE BAND - MALES VS FEMALES - 2006 & 2007



KEY FINDINGS

- Length of stay is longer on weekends compared to weekdays.
- This may be due to more severe surgical cases being admitted on weekends.
- The length of stay across all wards have increased from 2006 to 2007.

OCCUPANCY

The occupancy is influenced by utilisation and the average LOS. The effect of these on occupancy rates is now investigated (see Graph 16).

FIGURE 16: OCCUPANCY PER WEEKDAY - 2006 VS 2007

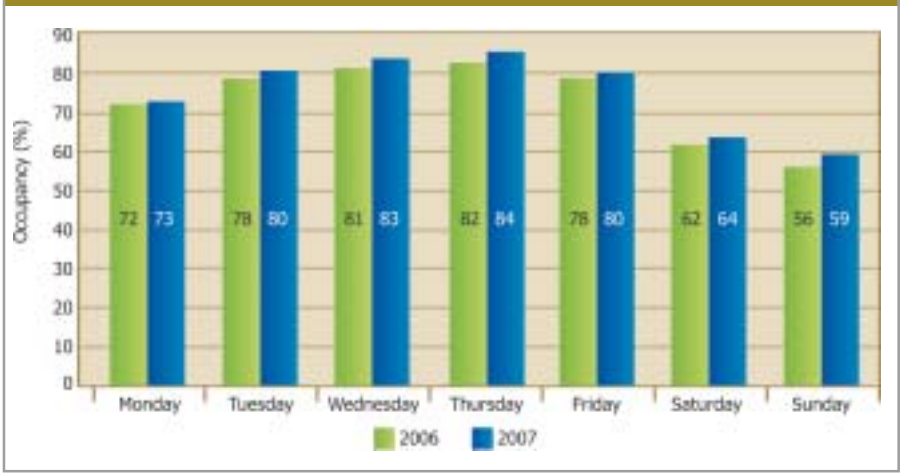
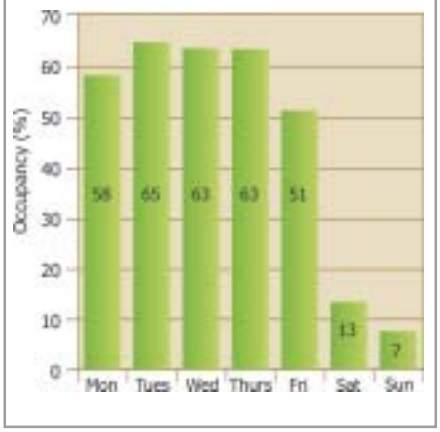


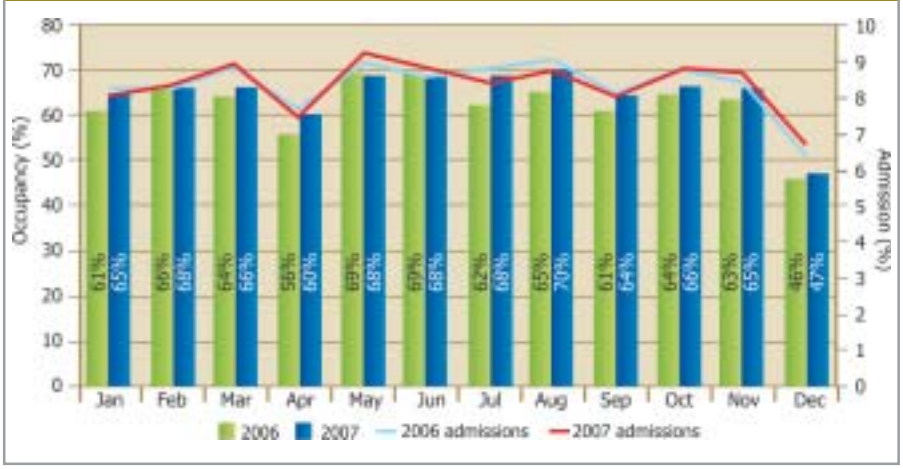
FIGURE 17: OVERALL THEATRE OCCUPANCY BY WEEKDAY 2007



The reason for the lower theatre occupancy is, as with wards, driven by utilisation (see Figure 17). The relationship between theatre occupancy and ward occupancy, especially within the surgical wards, is expected. Utilisation will influence the seasonality of ward occupancy, as seen in Figure 18.

The occupancy rates are distinctly lower during holiday months and weekends. While theatre and ward occupancy rates display similar seasonal effects, the LOS of patients admitted do not display this trend. This is an indication that the occupancy in this instance is influenced by the utilisation and not the average LOS for these seasonal effects.

FIGURE 18: OCCUPANCY PER MONTH - 2006 VS 2007



The occupancy rate was 64,52% in 2007, up from 62,09% in 2006. The 2,43% increase in 2007 is mostly attributable to an increase in utilisation. This can be seen when the difference between the occupancies (64,52% - 62,09% = 2,43%) is analysed. Figure 19 provides a breakdown of the differences. As mentioned above, a larger proportion of the increase is attributable to an increase in utilisation (1,91% of the 2,43%). The increase in the occupancy is to a lesser extent (0,52% of the

FIGURE 19

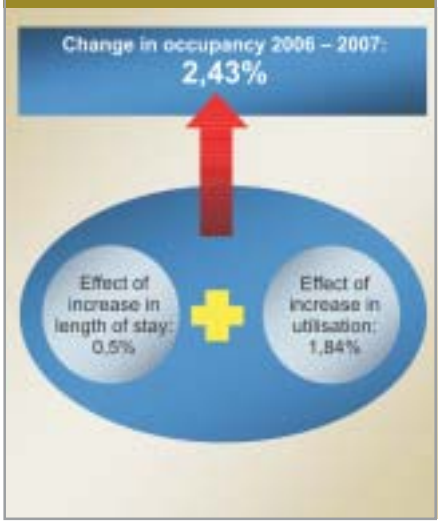
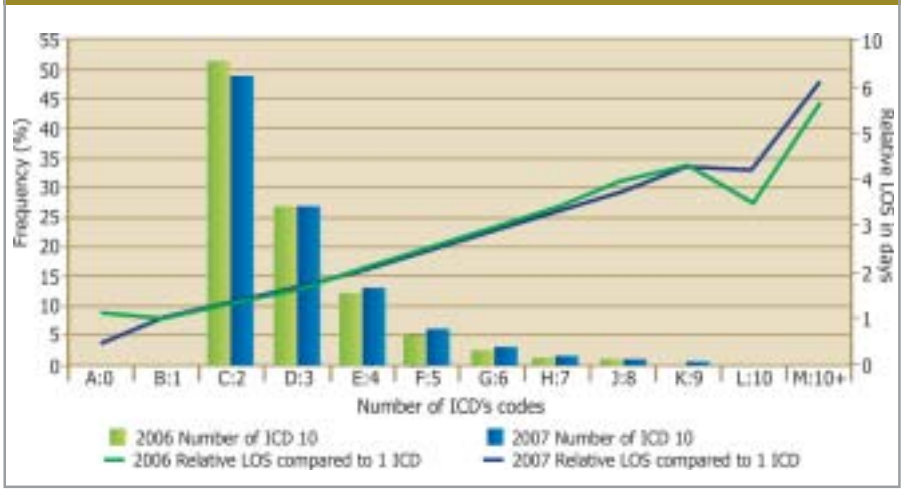


FIGURE 20: RELATIVE LOS AND FREQUENCY FOR THE NUMBER OF ICD 10 CODES PER PATIENT - 2006 VS 2007



2,43%) attributed to the increase in the LOS. In order to understand the reason for the longer LOS in 2007, we look at the frequency of cases admitted into hospital with different number of ICD-10 (International Classification of Diseases version 10) codes and their average LOS for 2006.

The number of ICD-10 codes is used as a measure of the level of acuity of a patient – patients with a higher number of ICD-10 codes are regarded as having a higher level of morbidity.

Figure 20 demonstrates the proportion of cases per number of ICD-10 codes for each year. The LOS increases as the level of acuity increases. As can be seen, 2007 has a higher proportion of patients with higher acuities. Thus, the increase in the occupancy between 2006 and 2007 is as a result of an increase in the number of patients admitted and an increase in the acuity of these patients.

CONCLUSION

This analysis was based on data for 2006 and 2007 admissions from the multi-disciplinary hospitals of the major hospital groups and some independent hospitals.

The study concludes that the increase in hospital occupancy from 2006 to 2007 is mainly due to an increase in utilisation and the increase in the acuity of patients. This latter has resulted in an increase in the average LOS. In particular, patients admitted for non surgical reasons (medical cases) have higher LOS and thus an increase in the acuity of patients implies that medical cases are getting more severe every year.

The analysis, based on an understanding of the methodology with which it was derived, provides a better understanding of the reasons that influence hospital occupancy rates. These factors can be used as a basis to fuel meaningful discussions around the private hospital industry.