

# Successful Introduction of Ring-Fenced Inpatient Surgical Beds in a General Hospital Setting

## Abstract:

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## Abstract

This study aimed to assess the impact of ring-fenced inpatient general surgical beds on day of surgery (DOS) admission, duration of elective inpatient stay (DEIS), and cancellation rates over a 6 month period. In June 2010 17 of 60 surgical inpatient beds were decommissioned. The remainder (43) were ring-fenced for general surgery patients only. Comparative analysis examining admission rates, cancellation rates, and theatre activity was performed between a reference period (January-June 2010) and the study period (July-December 2010). Complexity of all operations was graded according to an index schedule of procedures. There was no difference between the reference and study periods in volumes of elective admissions (472 [53.03%] vs. 418 [47.97%]) and emergency admissions (928 [50.03%] vs. 927 [49.97%]). DOS admissions increased 5-fold during the study period (38 [8.1%] vs. 190 [45.5%],  $P < 0.001$ ). Average duration of elective inpatient stay reduced from 4.3 days to 3.06 days in the study period ( $P < 0.001$ ). No difference was observed in volume of operations performed at all levels of complexity. There were 78 (58.2%) cancellations during the reference period and 56 (41.8%) during the study period with patient non-attendance the most common cause for cancellation in both periods. Ring-fenced surgical beds facilitated higher DOS admission rates and shorter duration of elective inpatient stay, leading to more efficient use of hospital resources.

## Introduction

Day-of-surgery (DOS) and day case (DC) surgical admissions have an important role in the efficient delivery of surgical services. They allow more effective use of limited hospital resources, minimise unnecessary exposure of elective surgical patients to hospital-acquired pathogens, and frequently are more accommodating of patient lifestyle. An ever-increasing combined burden of emergency surgical admissions and acute medical patients admitted to surgical inpatient beds leads to cancellation of elective cases. This in turn may lead to increased cost of hospitalisation due to unnecessary day prior to surgery elective admissions. Cancellation of elective surgery as a consequence of this competing environment is frequently at short notice, interrupting patient preparation and potentially leading to higher morbidity. In addition, the management of outlier medical patients on surgical wards may lead to prolonged duration of inpatient stay for these medical patients compared to those admitted to medical wards.

Ring-fenced surgical inpatient beds have a likely role in facilitating more efficient use of surgical beds. This strategy is commonly implemented in orthopaedic units throughout Ireland and the UK, and has been shown to be beneficial in reducing cancellation rates, reducing incidence of nosocomial infection, and removing a barrier to DOS and DC admissions. Despite this, there is little published evidence supporting the use of ring-fenced beds in general surgical practice. It has been shown that ring-fenced beds may have positive effects on costs and technical efficiency given certain conditions of case-mix and demand for elective surgery. A national programme to promote ring-fencing of elective general surgical beds is due to commence in Ireland. Known as the 'Model of care for elective surgery', this initiative will be rolled out in a co-ordinated manner with a supervising team led by Professor Frank Keane, consultant surgeon. In anticipation of this project a policy of ring-fencing a significant percentage of inpatient surgical beds at Mayo General Hospital (MGH) was introduced during the summer of 2010. In this study we therefore examined the preliminary effects of ring-fenced inpatient surgical beds on elective and emergency general surgical services at MGH over a 6 month period.

The primary aim of this study was to assess the impact of ring-fenced inpatient surgical beds on the volume of elective surgical cases at each level of surgical complexity admitted to our institution over a 6 month period. Secondary aims included quantifying the effects of ring-fenced beds on patient attendance for elective procedures, cancellation rates, and the duration of elective inpatient stay (DEIS).

## Methods

MGH is a general hospital with approximately 325 beds across all specialities including general surgery, medicine, paediatrics, obstetrics & gynaecology, intensive care and orthopaedics. It serves a catchment population of 125,000. Towards the end of June 2010 17 of the 60 existing inpatient surgical beds were decommissioned due to the ongoing need to achieve greater efficiency and hospital financial constraints. The remaining 43 beds were ring-fenced to general surgical patients only. During this period a pre-assessment clinic was instituted to facilitate outpatient pre-operative evaluation and admission of selected patients with medical co-morbidity, and to identify suitable patients for entry into an enhanced recovery programme for colorectal surgery.

The study period under examination is from July to December 2010, with the reference period designated January to June 2010, during which time beds were not ring-fenced. Prospectively collected data pertaining to all surgical admissions (source and nature of admission, duration of inpatient stay) and cancellations for the year 2010 was retrieved using patient administration system software (Powertermfi Pro, Ericom Software). Admissions were categorised as elective admissions, or emergency admissions which include all admissions through the emergency department, transfers from other healthcare institutions, and unexpected admissions through clinic and medical assessment units. Cancellations were defined as any unexpected rescheduling, cancellation or non-attendance for a booked surgical admission. A complete audit of general surgical theatre logbooks was performed. The level of surgical complexity of all procedures recorded was graded according to the British United Provident Association Schedule of Procedures (BUPA schedule of procedures v.2.2) as either minor, intermediate, major, major +. Descriptive and comparative statistical analyses of admission and cancellation data were carried out using standard statistical software packages (Microsoft Office Excel 2007, SPSS Statistics v.17.0).

## Results

### Admission data

There were 3,449 inpatient surgical admissions in 2010 to our institution, of which 1,855 (53.78%) were emergency cases and 1,594 (46.22%) were elective cases (table 1). During the reference period there were 472 elective and 928 emergency inpatient admissions, compared to the study period with 418 elective and 927 emergency admissions. There was no difference in the number of admissions between the study and reference periods for both elective and emergency cases (Pearson's  $\chi^2$ ,  $P = 0.14$ ). DOS elective inpatient admissions increased during the study period compared with the reference period (190 [45.5%] vs. 38 [8.1%],  $P < 0.001$ ). Of note this increase continued to be observed in the category of patients undergoing major or major+ elective procedures (48 [35.6%] vs. 11 [6.8%],  $P < 0.001$ ). The number of elective cases admitted on the day prior to surgery reduced from 434 (91.95%) during the reference period to 228 (54.55%) during the study period.

\*= $P < 0.001$ .

Figure 1: Bar chart comparing volume of operative procedures at all levels of complexity between reference and study periods.

### Complexity of surgery

In total, 2,215 operations were carried out in 2010, 1,142 in the reference period, and 1,073 in the study period. There was no difference between the reference and study periods in the number of operations carried out at each level of complexity ( $P = 0.428$ , figure 1).

### Duration of inpatient stay

The average duration of elective inpatient stay (DEIS) during the study period was 3.06 days (range 1-39 days, St. Dev. 3.928 days), while it was significantly greater during the reference period, at 4.3 days (range 1-52 days, St. Dev. 5.565 days,  $P < 0.001$ ,  $t = 3.791$ , table 1). For patients who underwent major or major+ elective surgery there was no significant difference in the average DEIS between the two periods under examination (5.85 days [reference group] vs. 5.09 days [study group],  $P = 0.356$ ). There was no difference between the reference and study periods in the average

duration of emergency inpatient (P=0.117, t=0.993, table 1).

#### **Cancellations**

There were 134 cancellations during 2010, with 78 (58.2%) cancellations occurring during the reference period and 56 (41.8%) occurring during the study period. The most common cause of cancellation was patient non-attendance, accounting for 44% of all cancellations. During the reference period 38 cancellations (46%) were due to 'Did not attend' episodes. The proportion of cancellations accounted for by such episodes during the study period was less at 21 (37.5%). The frequency of occurrence for all other causes of cancellation can be seen in table 2. No cases were cancelled due to non-availability of a hospital bed during either the reference or study periods. Cholecystectomy was the most commonly cancelled elective procedure during both periods, accounting for 32.1% of cancellations.

#### **Discussion**

The national initiative for elective surgery in Ireland is directed towards one which facilitates day of surgery admission, shorter duration of inpatient stay, and more day case procedures. Protection of elective inpatient beds by means of ring-fencing is an important component of this initiative, which is aimed at improving access and quality while reducing costs associated with the elective surgery programme. We have demonstrated a reduction of one day in average duration of elective inpatient stay due primarily to our policy of DOS admission which increased five-fold following the introduction of a ring-fencing strategy. These findings are supported by studies postulating a role for ring-fenced inpatient beds in improving the cost efficiency of a surgical unit, in large part by their facilitation of increased day case and DOS admissions. Some authors have placed emphasis on co-ordinated bed management, integrating efforts from anaesthetic, surgical and medical departments, pre-assessment clinics, and nursing staff, giving rise to better use of surgical beds to the benefit of both elective and emergency patients. In the context of this study, all approaches have been employed successfully. During 2011 our DOS admission rate now approaches 70%.

Emergency admissions are a factor which negatively impinges on elective activity. Our study demonstrates that the volume of emergency admissions remains relatively constant across the year and that emergency admissions should therefore be accommodated in a bed management strategy accordingly. While the rate of elective case cancellation due to bed shortages has been low in our institution, the reduction in rates of non-attendance for elective procedures during the study period may be a reflection of patient preference for the improved convenience offered by DOS admission to hospital.

Our study differs from other studies looking at ring-fenced inpatient surgical beds in that numerous studies define ring-fencing as separation of elective and emergency surgical patients into parallel hospital production lines. Elective patients were not distinguished from those admitted emergently in our bed protection strategy, and progression to such an approach is supported by the positive results we have obtained. A high level of co-operation between clinical teams is necessary on a daily basis in order to achieve the results seen in our study. The continued support of hospital management is also vital in order to facilitate such a streamlined programme. We stress the importance of co-ordination between surgical, nursing and anaesthetic teams, as well as utilisation of pre-assessment clinics, thereby promoting DOS admission as the admission type of choice for most elective surgery. Preservation of the overall volume of elective cases at all levels of complexity despite a 28% reduction in inpatient capacity using our ring-fencing strategy is highly encouraging. It is also crucial in maintaining adequate exposure of surgical trainees to a case-mix of varying complexity, which is an important consideration in a teaching hospital setting.

Further improvements in the efficiency with which elective surgical services are delivered may be achieved by progressing DOS admission rates in conjunction with an expanded role for pre-assessment clinics. Such clinics can be expected to identify increasing numbers of patients suitable for enhanced recovery programmes. Critically, expansion of day ward bed capacity will facilitate increasing numbers of day case procedures, something which cannot be achieved with the ring-fencing of inpatient surgical beds. It will be interesting to note if the overall pattern of results in our study can be reproduced elsewhere during the roll-out of the elective surgery programme. A simultaneous phased introduction of the acute medicine programme can be expected to gradually facilitate the healthcare needs of all patients in Ireland during these economically challenging times.

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