The Impact of Changes in Work Practice and Service Delivery on Surgical Infection Rates in a General Surgical Unit

Abstract:
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Abstract
Ring-fencing of elective orthopaedic beds has been shown to significantly reduce surgical site infection (SSI) rates. There are fewer studies in general surgical practice. Comparison of overall surgical workload in 2007 and 2011 was performed. Data pertaining to SSI were collected and analysis of this prospectively maintained database was performed on SSI diagnosed in 2007 and 2011. There was a significant reduction in the crude SSI rate from 117 cases in 2007 (8%) to 42 cases in 2011 (3.5%). A statistically significant reduction in SSI rate for elective surgery was observed, 7.6% vs. 2.5% (p<0.001 Chi-square test). Apart from the introduction of ring fencing, all other contributory variables remained unchanged. Ring-fencing of inpatient general surgical beds has been associated with a significant reduction in SSI rates. These data provide timely supportive evidence that ring-fencing of inpatient beds is an appropriate patient-oriented strategy.

Introduction
The Centre for Disease Control and Prevention (CDC) defines a Surgical Site Infection (SSI) as an infection occurring within 30 days of an operative procedure involving the surgical incision with at least one of the following present: signs of infection, purulent discharge or isolation of an organism from an aseptic site. Improvements in antiseptic techniques, operating theatre design and prophylactic use of antibiotics have led to sustained reduction in rates of SSI. However SSI remain the third most common hospital acquired infection amongst surgical patients, account for 15% of all hospital acquired infections in the UK and Ireland. SSI result in increased morbidity, mortality and cost for affected patients, and increases the duration of hospital admission and costs of treatment. Ring-fencing of surgical beds and its impact on infection rates has yet to be evaluated in the general surgical setting. The benefits of ring-fencing are well described in the orthopaedic setting with regard to multiple factors including the overall incidence of SSI, and effects on productivity. Prior to ring-fencing of general surgical beds in our institution, medical and surgical patients were nursed side by side on open wards. The primary aim was to establish the impact of ring-fencing general surgical inpatient beds on rates of SSI. The secondary aim was to examine the range of pathogens isolated from surgical wounds.

Methods
Mayo General Hospital serves a catchment population of 131,000. It has 325 inpatient beds and departments include general surgery, medicine, paediatrics, obstetrics and gynaecology and orthopaedic surgery. Ring-fencing of general surgical beds at our institution was implemented in June 2010. 17 of the 60 existing surgical beds were decommissioned due to financial constraints and the remaining 43 were ring fenced to emergency and elective general surgical patients with prioritisation of emergency admissions.

A prospective database of all wound infections was established in 2007 and is maintained by a microbiology surveillance scientist (MS). Data recorded for all patients include demographics, source of admission, procedure performed, ward location, organisms isolated, specimen site and responsible consultant. This prospective database also captured all relevant post-hospital discharge wound swabs submitted from the community or the out-patient setting. The incidence of SSI and range of organisms was extracted from the database with reference to two study periods – 2007 and 2011 (January to December inclusive). Exclusion criteria applied to patients who underwent primary surgery in another institution, had wound swabs taken beyond a 30-day period after inpatient surgery or from non-surgical wound sites i.e. chronic leg ulcers. Day case procedures performed in our institution were also excluded from analysis, as they were not impacted by the introduction of ring-fenced inpatient surgical beds. Statistical analysis was performed using IBM SPSS Version 20 software and the Chi-square test in order to compare SSI rates.

Hospital in-patient enquiry (HIPE) is a computer-based system designed to collect demographic, clinical and administrative data pertaining to hospital admissions nationally. This database was used to correlate patient details for all SSI at our institution. Patient details were further verified using hospital specific patient administration systems. Improvement in the incorporation of general surgical theatre registers. Other potentially contributory variables were compared between study periods. These included microbiology input, visiting policy, hand washing and antibiotic prophylaxis policy.

Results
The overall admissions of surgical patients during 2007 and 2011 were broadly similar with 2581 and 2662 patients admitted respectively despite a 28% reduction in bed availability. During 2007 61% of patients obtained specimen. Improvements in antiseptic techniques, operating theatre design and prophylactic use of antibiotics have led to sustained reduction in rates of SSI. However SSI remain the third most common hospital acquired infection amongst surgical patients, account for 15% of all hospital acquired infections in the UK and Ireland. SSI result in increased morbidity, mortality and cost for affected patients, and increases the duration of hospital admission and cost of treatment. Ring-fencing of surgical beds and its impact on infection rates has yet to be evaluated in the general surgical setting. The benefits of ring-fencing are well described in the orthopaedic setting with regard to multiple factors including the overall incidence of SSI, and effects on productivity. Prior to ring-fencing of general surgical beds in our institution, medical and surgical patients were nursed side by side on open wards. The primary aim was to establish the impact of ring-fencing general surgical inpatient beds on rates of SSI. The secondary aim was to examine the range of pathogens isolated from surgical wounds.

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A summary of the most common operative procedures performed in the institution and length of stay can be seen in Table 1. For each study period, procedures were categorized according to the National Academy of Sciences wound classification into – clean, clean–contaminated, contaminated and dirty. A statistically significant difference in compliance achieved during the study period was 50 years. During 2007, 1465 inpatient operative procedures were performed (844 elective, 326 emergency). Clinically significant wound infections were recorded for 161 patients in 2007 and 75 patients in 2011. Haematology data for 2007 were collated from the laboratory information system. Analysis of HIPE data showed that 2011 admitted versus 2007. The rate of SSI was significantly higher in the elective admission group during 2007 (7.6%) to 2011 (2.5%; 21/844) (Chi-square, p < 0.001).

The range of organisms cultured during both study periods are presented in Table 2. The prevalence of each organism is showed minimal improvement.

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Discussion

A positive impact has been observed with respect to changes in work practice and service delivery on SSI rates in our unit. The present data set demonstrates a clinically relevant reduction in overall SSI rates from 8% (2007) to 3.5% (2011) which falls in line with international guidelines for SSI. The statistically significant reduction in SSI rates observed for elective admissions is of particular interest to the surgical community. No changes occurred with regards to hospital visiting policy, compliance with hand hygiene or antibiotic prophylaxis.

Although telephone advice can be sought in selected circumstances from a consultant microbiologist, there was no formal microbiology service on site for either time period examined thus providing further uniformity in practice. The antibiotic prophylaxis guidelines, as issued by our governing university hospital within our clinical network, were closely adhered to throughout both study periods. We acknowledge that elective workload reduced from 2007 to 2011 and have established three potential reasons for this: 1) Ring fencing resulted in a 28% reduction in bed capacity 2) Seasonal theatre closures for six weeks a year was implemented by hospital management in 2011 with a cessation of elective operating 3) Increase in emergency admissions resulted in a resultant decrease in elective bed availability. The results of this study are similar to those previously demonstrated in the Orthopaedic setting1. Little supporting evidence currently exists in the general surgical literature since ring fencing of inpatient beds is difficult to achieve in a specialty with increasing emergency workloads. Implementation of changes in work practice and service delivery requires a high level of co-operation and support from hospital management in an era where hospital budgets are reducing.

Increasing attention is paid to the importance of SSI rates worldwide. Reporting in this country will soon be formalized through the introduction of the National Audit Office of the Royal College of Surgeons in Ireland3. SSI is now flagged as a key performance indicator (since it directly adversely affects length of hospital stay) and may in the future be linked to allocation of hospital funding. If this country is to adapt a system of Diagnosis Related Groups (DRGs), employed by Medicare in the USA, SSI rates will be included in a formula to calculate hospital funding. While this is potentially controversial as a method of resource allocation, it will be mandatory for US hospitals to report rates of SSI in colon cancer surgery from 2014 and likely that it will become a reality on this side of the Atlantic within the next decade. Ring fencing of beds is an important strategy going forward in healthcare delivery because it promotes efficient use of resources in an era of diminishing availability of funds. The present series demonstrates a significant reduction in overall SSI rates. This finding has important implications for the Irish Health Service as funding arrangements may be influenced by key performance indicators such as SSI rates in the future.

References


