Improving Surgical Site Infection Prevention Practices through a Multifaceted Educational Intervention

Abstract:

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Abstract

As part of the National Clinical Programme on healthcare-associated infection prevention, a Royal College of Surgeons in Ireland (RCSI) and Royal College of Physicians of Ireland (RCPI) working group developed a quality improvement tool for prevention of surgical site infection (SSI). We aimed to validate the effectiveness of an educational campaign, which utilises this quality improvement tool to prevent SSI in a tertiary hospital. Prior to the SSI educational campaign, surgical patients were prospectively audited and details of antibiotic administration recorded. Prophylactic antibiotic administration recommendations were delivered via poster and educational presentations. Post-intervention, the audit was repeated. 50 patients were audited pre-intervention, 45 post-intervention. Post-intervention, prophylaxis within 60 minutes prior to incision increased from 54% to 68% (p=0.266). Appropriate postoperative prescribing improved from 71% to 92% (p=0.075). A multifaceted educational program may be effective in changing SSI prevention practices.

Introduction

Healthcare associated infection (HCAI) causes considerable morbidity and mortality. The total number of patients acquiring HCAI in Europe each year is estimated at 4.1 million, equating to an average prevalence of 7.1%[1]. A 2012 study reported prevalence of HCAI in Ireland of 5.2%, with SSI being the most common infection reported, accounting for 18.2%[2]. Numerous studies have documented independent risk factors associated with increased SSI incidence. These include increasing age, presence of co-morbid disease, obesity, smoking and increased National Academy of Sciences (NAS) wound classification index[3,4]. Patients who develop SSI have a 60% increased risk of requiring intensive care, are five times more likely to be readmitted to hospital, and are twice as likely to die compared to patients without a SSI5. Furthermore, overall costs are substantially increased for patients with SSI[5-8]. It is estimated that up to 30% of HCAI are preventable through improved infection prevention practices[9,10]. Educational interventions have previously been multifaceted, utilising educational posters, feedback of audit data, lectures and provision of online information[11-15]. These varied initiatives have been successful in improving adherence to guidelines. However, although the benefits of surgeon-led SSI prevention educational interventions have been previously demonstrated[16], there exists a paucity of infection prevention programmes aimed directly at surgeons[17]. We aimed to utilise a multifaceted educational intervention targeting surgical teams to improve SSI prevention processes. As part of the National Clinical Programme for HCAI prevention, the Royal College of Surgeons in Ireland (RCSI) and the Royal College of Physicians of Ireland (RCPI) established a working group in 2012 to develop a quality improvement tool for SSI prevention (Figure 1). The tool outlined a number of evidence-based recommendations to optimise practice (pre, intra and post-operatively). These included measures of appropriate surgical antibiotic prophylaxis, additional dosing if longer duration of surgery or excessive blood loss, and a minimum period for wound dressings to remain in situ post-operatively. The aim of this prospective study was to assess the effectiveness of our educational intervention in improving adherence to these recommendations.

Methods

This five week study was carried out in a single tertiary centre and included surgical patients from vascular, breast, colorectal and general surgery specialties. Patients were selected via consecutive sampling. We performed an initial two weeks audit to establish baseline compliance with the key recommendations, followed by a week long educational initiative , before re-auditing for a further two weeks to determine effectiveness. The educational initiative continued during this post-intervention audit period. Education included both poster campaign and face to face educational sessions. The newly developed SSI quality improvement tool was printed as a laminated poster and placed in high visibility areas within general surgery theatres and on all surgical wards (Figure 1). The posters were positioned following feedback regarding locations for optimal poster visibility from surgeons and nursing staff. The key recommendations from the SSI quality improvement tool, against which the authors assessed compliance following the education programme, included the following: ¾ Prophylaxis given within 60 minutes before skin incision; ¾ Single dose prophylaxis used unless there is intra-operative blood loss greater than 1.5L in adults or otherwise indicated; and ¾ Wound dressings to remain in-situ for a minimum of 48 hours post-operatively unless clinically indicated.

The study was highlighted at surgical grand rounds, where the evidence base for the quality improvement tool and rational for SSI prevention was presented. Also, single informal teaching sessions were provided by the audit group to the relevant consultants and their surgical teams. Education sessions were delivered to theatre Nurse Managers. Awareness was raised with nursing staff on surgical wards via meetings and the placing of posters in high visibility areas. Initial baseline audit results were presented at the hospital surgical morbidity and mortality meeting, and implications for SSI acquisition discussed. The SSI quality improvement tool was used at each educational opportunity to illustrate the SSI prevention guidelines. The pre-and post-intervention audit was carried out by a single observer (PO). Patient and procedural demographics were recorded, in addition to antibiotic prophylaxis use, timing and duration. Surgical dressings were inspected at 24 and 48 hours post-procedure and patient notes reviewed with regard to whether they remained in-situ for the initial 48 hours post-surgery as recommended. All data were collected prospectively, both at the time of surgery and by reviewing the anaesthetic and operative notes immediately post-procedure supported by discussion with the operating surgeons and anaesthetists. Data was collated on Microsoft Excel 2007 and exported to SPSS Version 20 for statistical analysis. Chi squared and independent samples t-test analyses were performed as appropriate and in accordance with Levene’s Test for Equality of Variances, with $p<0.05$ considered statistically significant.

Results

Patient and procedure characteristics are outlined in Table 1. Of the 50 patients assessed pre-intervention, 24 (48%) received antibiotic prophylaxis, while 25 out of 45 patients (56%) in the post-intervention group received antibiotic prophylaxis. There were no significant differences between pre and post-intervention patient or procedural demographics with regard to age, gender, urgency of the procedure or National Academy of Sciences wound classification index (clean, clean-contaminated, contaminated or dirty) (p=0.177 , p=0.193, p=0.418, p=0.162 respectively). Pre-intervention, 13 (54%) of patients received antibiotics within 60 minutes prior to incision, with seven (29%) receiving prophylaxis at incision and the remaining four (17%) post-incision. Of those who didnâ t receive antibiotic prophylaxis, it was not indicated in two patients (4%) and 24 had been previously commenced on intravenous antibiotic therapy. Following the educational initiative, 17 (68%) received antibiotics within 60 minutes prior to incision, seven (28%) at incision, with one patient (4%) receiving prophylaxis post-incision. This represents a 14% improvement in the appropriate timing of antibiotic administration (54% pre-intervention, 68% post-intervention) (p=0.266).

In terms of appropriate antibiotic duration, 14 patients (58%) in the pre-intervention group received single dose prophylaxis, seven (29%) received antibiotics for up to 24 hours post-operatively, and the remainder (n=3, 13%) for more than 24 hours. 17 patients (71%) received the recommended duration of antibiotic prophylaxis. This compares to 22 patients (88%) in the post-intervention group, who received single dose antibiotic prophylaxis, two patients (8%) who received antibiotics for up to 24 hours post-surgery and one remaining patient (4%) who received greater than 24 hours of antibiotics. 23 out of 25 patients (92%) in the post-intervention group were prescribed antibiotic prophylaxis for the appropriate duration, representing an overall improvement of 21% (p=0.075). In the pre-intervention cohort, 43 of 50 (86%) patientâ s wound dressings were left in-situ for greater than 48 hours as compared with 39 of 45 (87%) patients in the post-intervention group.

Discussion

This is the first trial of the RCSI/RCPI national quality improvement tool for SSI prevention in Ireland. Though not statistically significant, we report encouraging trends over a short period of time with respect to improvements in appropriateness (timing and duration) of surgical antibiotic prophylaxis. A 2001 UK study reported the consequences of SSI to be an average additional hospital stay of 6.5 days at a cost of £3,246 per patient[18]. One review estimates the annual cost to the UK National Health Service as over one billion British pounds in revision surgeries, nursing care, medicines and dressings[19]. Extrapolating from this data on a population basis, implies a cost to the Irish Healthcare System of approximately 73,000,000 per annum. Multiple previous education programmes have been reported in peer-reviewed literature. Educational posters have also previously been used as an effective part of educational interventions. A study by Lange et al combined posters with teaching sessions in an intensive care unit (ICU) in an effort to decrease catheter-related bloodstream infection (CRBSI)[20]. As a result, CRBSI rates among infants on surgical services decreased from 15.46 to 6.67 BSI per 1000 catheter days. Similarly, an educational initiative to decrease ventilator associated pneumonia (VAP) utilised educational posters to effect a decrease in VAP rate in a surgical ICU by 50%[21].

A study by McHugh et al reported on the impact of a poster campaign with an online educational platform specific to SSI prevention[16]. In this study, authors noted a significant improvement in the administration of prophylactic antibiotics administered prior to incision and a significant decrease in inappropriate dressing changes during the initial 48 hours following surgery. Our educational intervention utilised similar methods employing both a high visibility poster campaign supported with face to face educational sessions. There are many modifiable parameters to consider when assessing best practice in relation to SSI prevention. A systematic review of meta-analyses published between 1990 and 2006 concluded that compliance with antibiotic prophylaxis policies was an accurate surrogate marker for SSI prevention, while being reasonably independent of the type of surgery[22]. As a result, we focused particularly on antibiotic prophylaxis in our educational initiative, with repeated emphasis on giving the â right drug, at the right time, for the right durationâ . Improvements in key areas of practice were demonstrated in the post-intervention audit. The percentage of patients receiving prophylaxis in the 60 minutes prior to incision increased from 54% to 68%. Furthermore there was an improvement from 71% to 92% in prescribing antibiotics for the appropriate post-operative duration. Our poster design was taken from the RCSI/RCPI working group on SSI prevention, a group developing national SSI guidelines for those working in Irish hospitals. Traditionally, Ireland has utilised international SSI prevention guidelines[23-25], however, there is a requirement for the production and implementation of guidelines specific to the needs of our own healthcare system.

The authors acknowledge a number of limitations associated with this work. Notably, this study was undertaken in a single centre, is prospective in nature and all observations were recorded by a single observer. We report relatively smaller numbers to those being reported in international literature. While we accept that our results were not statistically significant, the recorded improvement in practice is promising. However, this is a novel pilot study providing preliminarily reports on the use of a planned national quality improvement tool designed to reduce rates of SSI in Ireland. Further audit, with an increased sample size, in collaboration with other Irish sites, is required to contribute conclusive evidence towards the efficacy of this multifaceted educational intervention. To conclude, national guidelines are necessary for prevention of SSI in an Irish hospital setting. A multifaceted educational intervention, comprising educational posters and face to face educational sessions may be effective in improving SSI prevention practices.

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