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Surgical Site Infections: Incidence and Impact on Healthcare Resources

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ABSTRACT

Introduction: *Surgical site infections (SSIs) are infections of the incision, organ or space that occur in the 30 days following surgery. 5% of patients undergoing surgery develop SSIs. They are associated with significant morbidity and mortality. SSIs pose a heavy financial burden, prolong inpatient stay, and negatively impact quality on life. Numerous factors such as obesity, ASA score, operation duration and contaminated/dirty wounds are associated with SSIs. Attention therefore to pre, intra, and postoperative risk factors are essential in reducing their incidence. The purpose of this audit is to identify the incidence of SSIs occurring in general, vascular colorectal and breast surgery over a 1 year period (1st Jan – 31st Dec) and to identify techniques that may reduce occurrence.*

Methods: *Retrospective data were collected on surgical patients that developed SSIs in 2018. Independent predictors of SSIs were evaluated including type of operation performed and use of intra/post-operative antibiotics. Consequences of SSIs were then reviewed involving wound swab utilisation, antibiotic duration, use of further imaging, subsequent surgical intervention and prolongation of hospital stay.*

Results: *3996 operations were performed. 58 SSJs were identified (incidence of 0.015%). 79% received intraoperative antibiotics. 51% of patients had wound swabs taken. 11 patients had antibiotics prescribed according to sensitives. 30 readmissions, 12 further operations and 27 additional scans were identified. 143 extra bed days were calculated. 402 days of antibiotics were prescribed.*

Conclusion: *The consequences of SSIs are multifactorial. More focussed antibiotic prescribing is needed according to wound swab results and sensitivities. The duration/ indication for antibiotics and inclusion of SSIs on discharge summaries require improved documentation. Follow up of patients discharged is recommended to identify SSIs treated in the community, a potential source of bias in this study.*

Keywords

Surgical site infection, Intraoperative/postoperative, Antibiotics, Wound swabs, Readmission.

Introduction

Surgical site infections (SSIs) are infections of the incision, organ or space that occur in the 30 days following surgery [1]. National data suggests the cumulative incidence of inpatient and readmission detected SSIs ranged from 8.7% for large bowel surgery to <1.0% for hip and knee replacement surgery from April 2013 to March 2018 [2].

SSIs are associated with significant morbidity and mortality and impose increasing demands on limited healthcare resources. They constitute to a substantial financial burden, longer postoperative hospital stays, additional surgical procedures and negatively impact on patient quality of life [3]. The number of surgical procedures performed in the United Kingdom continues to rise and surgical patients are increasingly seen with complex comorbidities [4]. Numerous patient and surgery related characteristic have been identified as increasing the risk of developing a SSIs including ASA score, obesity, operation duration and a contaminated/dirty wound [2]. Close attention to pre, intra and post-operative risk factors is therefore essential in reducing the incidence of SSIs.

Aims

The first aim of this audit is to identify the incidence of surgical site infections over a 1 year period (1st January – 31st December 2018) at Milton Keynes University Hospital (MKUH) occurring in general, vascular, colorectal and breast surgery (including both emergency and elective cases).

Secondly, this audit aims to recognise areas which require improvement and implement recommendations in order to reduce the incidence of SSIs and the morbidity/ mortality associated with them.

Objectives

The objectives of this audit are as follows: to identify SSIs occurring in general, vascular, colorectal and breast surgery (including both emergency and elective cases, to assess if antibiotics were given intraoperatively/ post operatively; to establish if wound swabs were obtained and the correct antibiotics were prescribed and/or tailored appropriated according to wound swab sensitivities; to assess the prolongation of hospital stay as a consequence of developing a SSI; to ascertain further consequences of SSI including further imaging carried out, repeat admission and/or surgical intervention, requirement for drain insertion or VAC dressing and the duration of further antibiotic treatment.

Standards

The standards from this audit have been selected from the National Institute for Health and Care Excellence (NICE) guidelines; Surgical site infections prevention and treatment published in April 2019 [5]. This guideline covers the prevention and treatment of SSIs and focuses on methods used before, during and after surgery to minimise the risk of infection [5].

Methods

The information department at MKUH were contacted and a list of patients were generated that were coded as developing SSIs from January 1st"2018 to December 31st 2018 as well as the total number of operations that were performed and the number of elective and emergency cases.

The hospital systems of eCARE and EDM (electronic document management) were utilised and the following data was collected: the surgical speciality; the type of operation performed; the use of intra/post operative antibiotics; the duration of antibiotics prescribed; the use of wound swabs and accuracy of prescribing based on wound swab sensitivities; the use of further imaging; VAC or drain insertion; the requirement for readmission and/ or further surgical intervention and the prolongation of hospital stay as consequence of developing a SSI.

Results

A total of 3996 operations were completed from 1st January – 31st December 2018. 3084 were elective cases and 918 were emergency procedures. A total of 58 SSIs were identified, 0 occurring in vascular surgery, 3 in breast, 15 in colorectal and 40 in general surgery. 27 SSIs occurred following emergency surgery and 31 SSIs occurred following elective surgery.

Intraoperative antibiotics were used in 79% of cases. Wound swabs were taken in 31 cases (51%), of these 22 had a positive wound swab result and only 11 of these had correct antibiotic prescribing according to sensitivities. The total duration of antibiotics was 402 days, this was not evenly distributed among the patients involved.

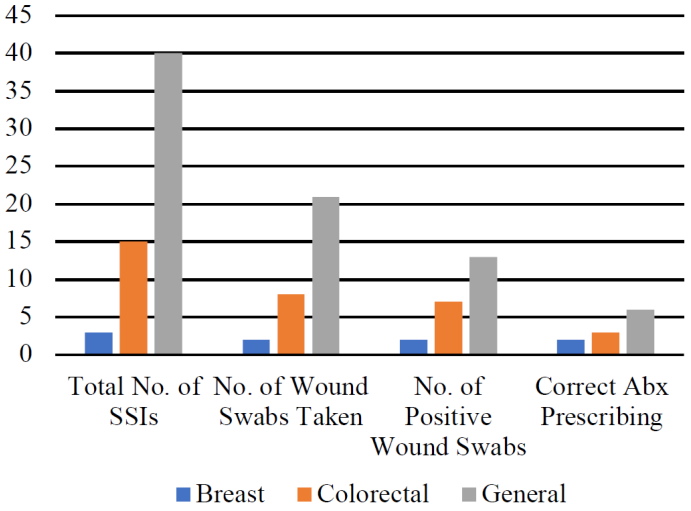

Figure 1: Bar chart showing the total number of SSIs, number of wound swabs obtained, number of positive wound swabs and correct antibiotic prescribing in relation to sensitivities as per surgical speciality.

A total of 30 readmissions were identified as a result of developing a SSI and a total of 12 further operations were performed as a result. 27 further scans (including US, CT and MRI) were carried out. A further 143 hospital bed days were calculated as a consequence of readmission / prolongation of stay, costing an estimate of £57200 (£400 per hospital bed day). 4 drains and 2 VAC dressing were required.

Discussion

Overall, the audit revealed that the incidence of SSIs was low (0.015%) when compared to national figures 2. With the current trends favouring a shortened post-operative stay and same day surgery, it is likely more SSIs are occurring following discharge away from hospital, thus a potential bias of this study [6]. It is possible a number of patients that develop SSIs are being treated in the community and therefore not requiring readmission to hospital or representing to secondary care services. An important modification for a further audit would therefore need to include follow up of these patients through questionnaires at 30 days post operatively to establish if a SSI has occurred within this defining period.

A further finding from this audit was the prolonged duration of antibiotics being prescribed. A total of 402 days of antibiotics were calculated. This was not evenly spread amongst the 58 patients that developed SSIs. In a number of cases patients had received more than 14 days of antibiotics. Additionally, there was

poor documentation as to why antibiotics had been originally commenced. This provides a difficult platform for important medical decisions to be made particularly on weekend ward rounds/ for on call teams who may not be familiar with the patients. This inevitably prolongs the time in which patient remain on potentially unnecessary antibiotics. A solution to this would be firstly improved and concise documentation in patient notes and management plans and to feature the start date and indication for commencing antibiotics on handover lists.

Just over half of patients had wound swabs taken (53%). A total of 19% of patients had correct antibiotics prescribed according to sensitivities as per positive wound swab results. Undoubtedly the broad-spectrum antibiotic of choice selected for most patients (coamoxiclav) would likely cover many of the causative organisms however with growing antibiotic resistance and increasing emphasis on antibiotic stewardship programs, a more specific approach may be beneficial. The encouragement of not only taking wound swabs but following up on these results should also be highlighted to junior doctors and could be easily incorporated into induction programs.

Much of the published data regarding SSIs involves the analysis of pre-operative factors affecting post-operative outcomes. ASA score, obesity, diabetes and malnutrition (defined as significant weight loss 6 months prior to surgery) have been found to be significant preoperative risks factors for developing SSIs [7]. Therefore, comprehensive pre-operative assessments should be made to optimise patients before undertaking surgery and to recognise patients with potential wound healing problems.

Finally, the inclusion or discussion of 'surgical site infections' in discharge summaries was poor. This is not only important for good communication with primary care but also is imperative for the accuracy of patient records. Again. informative induction programs to foundation doctors could address this issue.

The consequences of SSIs are multifactorial. The human and financial costs of treating SSIs are clearly evident. Implementing the above recommendations could play a significant role in their reduction.

Audit authorisation

Clinical Governance and Risk Department, Milton Keynes University Hospital, Milton Keynes, United Kingdom – Audit Identification Number: 20

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