Title: Post-surgery wound assessment and management practices: A chart audit.

Aims and Objectives: To examine wound assessment and management in patients following surgery and to compare these practices with current evidence-based guidelines for prevention of surgical site infection across one health services district in Queensland, Australia.

Background: Despite innovations in surgical techniques, technological advances and environmental improvements in the operating room, and the use of prophylactic antibiotics, surgical site infections remain a major source of morbidity and mortality in patients following surgery.

Design: A retrospective clinical chart audit.

Methods: A random sample of 200 medical records of patients who had undergone surgery was undertaken over a two year period (2010-12). An audit tool was developed to collect the data on wound assessment and practice. The study was undertaken across one health district in Australia.

Results: Of the 200 records that were randomly identified, 152 (78%) met the inclusion criteria. The excluded records were either miscoded or did not involve a surgical incision. Of the 152 records included, 87 (57.2%) procedures were classified as ‘clean’ and 106 (69.7%) were elective. Wound assessments were fully documented in 63/152 (41.4%) of cases, and 59/152 (38.8%) charts had assessments documented on a change of patient condition. Of the 15/152 (9.9%) patients with charted postoperative wound complications, 7/152 (4.7%) developed clinical signs of wound infection, which were diagnosed on days 3 to 5.

Conclusions: The timing, content and accuracy of wound assessment documentation is variable. Standardising documentation will increase consistency and clarity, and contribute to multidisciplinary communication.

Relevance to Clinical Practice: These results suggest that postoperative wound care practices are not consistent with evidence-based guidelines. Consequently it is important to involve clinicians in identifying possible challenges within the clinical environment that may curtail guideline use.

Key Words: primary intention; clinical guideline; quantitative approaches; surgical nursing; wound care.

"The author(s) declare that they have no conflict of interests".

What does this paper contribute to the wider global community?

- There is inconsistency and variation in the occasions when wound assessment is documented.
- Incorrectly coded wound classifications suggest the need for additional education of operating room clinicians in the CDC guidelines on wound classification.
- Contextual influences on work environments that act as barriers and enablers to guideline use need to be identified in collaboration with key stakeholders.

Introduction

Despite innovations in refining surgical techniques, technological advances and environmental improvements in the operating room (OR), and the use of prophylactic antibiotics, surgical site infections (SSI) remain a significant source of morbidity and mortality in patients following surgery (Leape *et al.* 1991, Nathens *et al.* 2006). In the United States, up to 1.4 million cases of SSI occur per year, affecting 2% to 5% of all surgeries and result in hospital costs of in excess of 1 billion US dollars per annum (de Lissovoy *et al.* 2009a, Engemann *et al.* 2003). In Europe, the estimated incidence of SSI ranges from 1.5% up to 20%, and costs somewhere between € 1.5 to 19 billion (Leaper *et al.* 2004). A prevalence survey of SSI undertaken in 2006 suggested that approximately 5% of surgical patients in the United Kingdom developed a SSI (Smyth *et al.* 2008), with costs estimated to be between £814 and £6,626 million per year (Coello *et al.* 2005, Plowman *et al.* 2001). In Australia, the incidence of SSI ranges anywhere between 10% and 30% (ACHS 2011, Friedman *et al.* 2007), at a cost of AU$6.7 billion (Australian Institute of Health and Welfare 2010). In addition to accruing increased hospital costs, SSI account for longer length of hospital stays, increased resources for patient care, and a significant reduction in the patient's quality of life (Andersson *et al.* 2010, de Lissovoy *et al.* 2009b, Friedman *et al.* 2007).

Most SSI are preventable, and appropriate clinical management is based on clinical guidelines that inform the pre, -intra, and postoperative phases of care can reduce the risk of infection (Health 2009, NICE 2008). Notwithstanding the imperative to implement preventative measures to reduce the risk of SSI, their incidence and significant human and economic impact remains an international concern for frontline clinicians and hospital administrators alike (ACHS 2011, Coello *et al.* 2005, Kassavin *et al.* 2011, Leaper *et al.* 2004). There is an abundance of literature on chronic wound management; however, there is limited research that has examined the documented postoperative management of surgical wounds—that is, wounds that heal by primary intention. The purpose of this study was to describe current wound care practices in postoperative patients using chart audit methods across one health services district and to compare these practices with evidence-based guidelines for prevention of surgical site infection.

Background

In the context of SSI pathophysiology, the term 'risk factor' refers to a characteristic that has a significant, independent association with the development of a SSI after a particular operation (Mangram *et al.* 1999). Patient risk factors include age, underlying illness severity (i.e., American Society of Anaesthesiologists [ASA] status), obesity, smoking, malnutrition and their associated hospital length of stay [HLOS] (Astagneau *et al.* 2009, Mangram *et al.* 1999, NICE 2008). Risk factors associated with the surgery itself include; site and complexity of the procedure (e.g., type of surgery, length of procedure, use of implants), presence of surgical drains, wound classification (e.g., clean, clean-contaminated, contaminated, and dirty), and operating room environment (Astagneau *et al.* 2009, Mangram *et al.* 1999). Clearly a patient with an ASA preoperative assessment score of 3, 4 or 5 who is undergoing a procedure classed as contaminated and lasts for longer than 2 hours, is at increased risk of developing a SSI during the postoperative period (NICE 2008). Importantly knowledge of risk factors before particular operations may allow for the implementation of targeted measures to reduce SSI risk (Mangram *et al.* 1999, NICE 2008).

The recommendations drawn from clinical guidelines published by the Centres of Disease Control and Prevention [CDC] (Mangram *et al.* 1999), the National Institute for Health and Clinical Excellence (NICE 2008), and practice standards and position statements endorsed by professional associations such as the Australian Wound Management Association (AWMA 2011, Health 2009) and the European Wound Management Association have been developed for clinicians involved in wound care. Table 1 distils the key evidence-based recommendations pertaining to each phase of patient care. There is clear guidance in relation to hair removal, antibiotic administration and timing, management of the perioperative environment, patient/wound assessment, postoperative incision management, and wound documentation. Despite international promulgation of these guidelines, there is emerging evidence to suggest that there is variability In relation to postoperative wound assessment practices (Gillespie *et al.* in press, 2013, Gillespie *et al.* 2012), documentation practices (Birchall & Taylor 2003, Gartlan *et al.* 2010), and clinicians' knowledge of national wound care guidelines (Gillespie *et al.* in press, 2013).

METHODS

Aim

To describe documented wound care practices in patients following surgery across one health services district, and compare these with the recommendations of evidence-based guidelines on SSI prevention. The exploratory nature of this study precluded the use of a hypothesis-testing approach. In the current study a surgical wound was defined as one that healed by primary intention, that is, where the wound edges are closed directly using sutures, staples or glue, or a combination of these materials (NICE 2008). Subsumed in this aim were the following research questions:

1. What are the documented wound assessment practices of healthcare professionals in patients following surgery?
2. What are the documented wound care practices of healthcare professionals in patients following surgery?
3. What is the occurrence of wound complications (i.e., SSI, bleeding, further surgical intervention) in patients following surgery?

Setting and Sample

This study was conducted in three metropolitan hospital sites across one health services district in Queensland, Australia that catered for all surgical specialties except cardiac and transplant surgeries. At the time of the study, over 30,000 surgical procedures were performed annually across these facilities. Inclusion criteria incorporated the following: patients undergoing surgery from January 2010 through to May 2012; and, procedures that were classified as either 'clean' or 'clean-contaminated' according to the CDC definition (Mangram *et al.* 1999). Patients were excluded if they had: endoscopic procedures not involving a surgical incision (e.g., endoscopy, flexible cystoscopy, colonoscopy); and non-surgical procedures requiring general or regional anaesthesia (e.g., electro-convulsive therapy, closed reductions, regional pain injections).

Audit Tool Development and Data Collection

A clinical audit tool based on a literature review and best-practice guidelines (AWMA 2011, Health 2009, Mangram *et al.* 1999, NICE 2008) was specifically developed for this study. During tool development, several experts in wound care and research provided feedback, and minor revisions made. The audit tool consisted of four sections, containing a total of 48 items and a section for writing free text. The first section sought patients' demographic and clinical information including age, gender, admission diagnosis, presence of co-morbidities, current medications and hospital length of stay. The second section included intra-operative data such as ASA status (underlying illness severity), antibiotic administration, type of surgery and anaesthetic, and length of surgery (measured in minutes). Section three incorporated postoperative care information on the following; antibiotic use, frequency of wound assessment and documentation, and dressing selection and use. The last section included information regarding clinical incidents and adverse events such as unplanned return to the OR, documentation of SSI signs and symptoms, and methods of wound debridement (where applicable). In this study, wound debridement was defined as the removal of non-viable, infected tissue or foreign material from or adjacent to a wound with the aim of exposing healthy tissue (Carville 2012).

A list of procedures using the International Statistical Classification of Diseases and Related Health Problems (ICD) codes during the pre-specified audit period was randomly generated based on 'clean' and 'clean-contaminated' procedures by the Operating Management Information Systems (ORMIS) Administrator using an Excel spreadsheet format. This list of ICD codes, drawn randomly, was used to access patients' medical records. Data were collected over a four month period using either Electronic Medical

Records (EMR) or hard copy charts. EMR was adopted across the health services district in November 2011. Therefore, the medical records of surgical patients who met the eligibility criteria subsequent to this period were accessed electronically rather than through hard copy charts. Each record was carefully reviewed and the variables recorded using an a priori coding scheme. Interrater reliability checks were performed by the lead author on a subset of randomly selected charts, and any discrepancies were discussed and a decisions made by consensus.

Ethical Clearance

Institutional approval was given by the university and the hospital Human Research Ethics Committees. As the data were collected retrospectively, there was no requirement to seek patients' permission to access their medical records. Following ethics approval, permission to release charts was sought from the Director-General, Queensland Health, as required by the Public Health Act (2005). Patients' personal information such as names and dates of birth was not recorded during the audit.

Data Analysis

The data were analysed using Predictive Analysis Software Statistics (Version 20; IBM, Chicago, IL, USA) for Windows. The level of data and its distribution determined the statistics used. Descriptive statistics were used to describe patients' demographic and clinical characteristics. The data were analysed using absolute (n) and relative (%) values for categorical data while medians and interquartile ranges were used for continuous data. Where appropriate, bar graphs have been used to present the results.

Two authors independently assessed interrater agreement on a randomly selected subset of medical records. The proportion of agreement was measured with the intraclass correlation coefficient (ICC) and a coefficient of ≥0.70 was considered adequate (Polit 2010).

RESULTS

Patient Demographics and Clinical Characteristics

Of the 200 patient charts that were randomly identified through the ORMIS database, 48 (24%) were subsequently excluded because procedures were either miscoded or did not involve a surgical incision (e.g., hysteroscopy, cystoscopy, endoscopy). Figure 1 details the flow of charts included in our sample. Patients' demographic and clinical characteristics and risk factors are presented in Table 2. Just over half (80/152, 52.6%) of the surgical procedures were performed in the largest district facility. One hundred and six (69.7%) procedures were elective. Of the 152 records included, 87 (57.2%) were categorised as 'clean' procedures. Over half of the patients were female (n=81, 53.3%). The median age across the sample was 41 years (IQR 37.0, range 1 to 90 years). The median HLOS was 1 day (IQR 2, range 1 to 93 days). Hypertension was the leading comorbidity for 26/152(17.1%) of patients while 28/152 (18.4%) patients were prescribed 5 or more regular medications.

In relation to fitness for surgery, the majority (110/152, 72.4%) of patients were charted as having an ASA status of either 1 (healthy) or 1E (healthy emergency). The median length of surgery was 70 minutes (1QR=84, range 10-364 minutes). Of the 11 surgical specialties included, one third (50/152, 32.9%) of patients underwent orthopaedic surgery (Table 2). Intraoperative antibiotic prophylaxis was reportedly given to 88/152 (57.9%) patients (Figure 2), however, the precise timing of antibiotic administration relative to the start of procedure was not consistently documented. Of the 152 patients where data were available, 10 (6.6%) had a documented unplanned return to the OR during their surgical admission. Bleeding and washout for SSI were main contributors to unplanned return to OR (Table 2).

Postoperative Wound Care Practices

Completion rates for charting wound assessment information varied according to surgical specialty, type of surgery, ward unit and HLOS. Wound assessment was charted either using the patient's clinical pathway form, a daily care plan, or progress notes. Figure 3 illustrates the completion rates. Of the 152 charts with available data, 63 (41.4%) included a specific wound assessment tool that was fully completed. In 28 (18.4%) charts, postoperative wound assessments were documented in the progress notes rather than with a specific tool. These 28 surgeries were coded as 'Day Cases' and included cataract extractions, laparoscopy, removal of teeth, and tonsils and adenoid removal. Occasions of wound assessment also varied with surgical specialty, location of wound/incision, and HLOS. Figure 4 details the frequency of wound assessment occasions during the patient's admission, through to their follow up in the Out-Patients' Department (OPD). Approximately one fifth (32/152, 28.3%) of patients had their dressing changed at least once during their surgical admission. Less than half (59/152, 38.8%) of the patients in this sample had documented assessments made upon a change of their condition as an inpatient. Figure 5 graphs postoperative wound complication/event rates across the sample.

Of the 15/152 (9.9%) patients with charted postoperative complications, 7/152 (4.7%) developed clinical signs of SSI (redness, swelling, tenderness, warmth, fever or pain). Slightly over half (8/15; 53.3%) of this subset of patients were males. Five of these 7 (71.4%) patients were documented as having a superficial SSI. Diagnosis of SSI occurred between postoperative days 3 and 5. Table 3 details the clinical characteristics of the subset of the 15 (9.95%) patients that had developed one or more wound complication/event (i.e., mechanical debridement and/or surgical debridement and/or SSI). Notably, these 13/15 (86.7%) patients had undergone orthopaedic procedures, and their HLOS ranged from 1 to 44 days. Nearly half (6/15; 40%) of the patients included in this subgroup had surgical wounds that were classified as 'clean-contaminated.'

Interrater Agreement

To assess interrater reliability, two authors independently reviewed 16 randomly selected charts. Data across 17 variables including documentation of co-morbidities, current prescribed medications, intraoperative care (antibiotics, ASA status, length of surgery), and postoperative wound management (antibiotics, dressing assessments/changes) were cross-checked. An ICC coefficient of 0.75 (p = 0.005) was achieved and indicated acceptable interrater agreement.

DISCUSSION

This retrospective clinical audit adds to the limited body of literature that examines postoperative wound management practices, specifically in relation to assessment and documentation. While this study is exploratory, the findings are useful in describing current clinical practice across a health services district and may have wider applicability beyond the district. Additionally, this audit is one of the largest undertaken in the field of surgical wound management, as opposed to including wounds that heal by secondary intention (i.e., where the wound edges are left open and not sutured together). Previous studies in this field have included single hospital sites with sample sizes ranging from 49 to 80 patient records (Birchall & Taylor 2003, Gartlan *et al.* 2010). The results from the current audit will inform future interventional research which will target suboptimal wound care practices.

Of the 124 surgical patients where a specific wound assessment tool was used, nearly 50% (61) were either partially completed or not completed at all. Documenting practices and/or treatments acts as a risk-management strategy (Brown 2006). Inadequate or incomplete documentation has patient safety implications in relation to continuity of care, as well as legal and health services ramifications. Wound documentation provides verification of the care provided, and as such, can be subpoenaed for use in legal proceedings (Bachand & McNicholas 1999, Brown 2006). While the importance of concise, accurate and contemporaneous documentation is highlighted when scrutinised in any legal context, its most important function comes from increasing the likelihood of delivering high quality, cost effective and safe patient care. Ensuring that documentation accurately and contemporaneously reflects that care provided is particularly imperative in those circumstances where an allegation that certain treatment was not provided, or not provided to an appropriate standard has been raised such as in civil proceedings for negligence. The failure to make any note of the care that was provided during delivery, represents a major departure from acceptable practice and means that the healthcare professional may be forced to rely on his/her memory when giving evidence. As there is often a significant delay between the time that care has been provided, and when a healthcare professional may be called upon to provide evidence of that care, reliance on what has previously been documented is paramount.

Our audit results show some inconsistency and variation in the occasions when wound assessment was documented. For instance, 52% of patients had wound assessments documented on 'any occasion' (i.e., any available opportunity) while 65.1% of patients had wound assessments documented 'on discharge'. Common problems identified by others in wound documentation include; inconsistency in the types of documents used (e.g., specific tool versus progress notes) (Gartlan *et al.* 2010, Keast *et al.* 2004), the different time intervals that wounds are assessed (Gartlan *et al.* 2010), the inconsistent use of terminology (Bachand & McNicholas 1999, Keast *et al.* 2004), the way in which notes were made (Bachand & McNicholas 1999) and positioned throughout the chart (Gartlan *et al.* 2010), limited space available for multiple assessments (Bachand & McNicholas 1999, Gartlan *et al.* 2010), and the inconsistency in completion rates (Gartlan *et al.* 2010, Keast *et al.* 2004). Specifically in this study, varying time intervals of wound assessment, space constraints, different document formats and their positioning in the chart and incomplete documentation were encountered throughout the conduct of our audit. This discrepancy in findings suggests that these aspects of wound assessment and documentation warrant further research.

Of the 152 patient charts included in our audit, 15 patients (9.9%) had developed some type of postoperative complication, while 11 of these patients had a documented return to OR. Notably, 7/10 of these patients had undergone an orthopaedic procedure. Published rates of SSI following orthopaedic surgery range from 0.68% for low risk patients undergoing hip or knee replacement to as high as 7.9% for high risk patients having spinal fusion surgery (CDC 1996, HISWA 2011, Ridgeway *et al.* 2005). Surprisingly, the majority (86.7%) of the patients that had developed a postoperative wound complication had undergone orthopaedic surgery. Of these patients, just under half 40%) had wounds that were classified as 'clean-contaminated.' According to the CDC guidelines, clean-contaminated wounds include those in which respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without evidence of infection (Mangram *et al.* 1999). Surgical orthopaedic wounds that heal by primary intention would almost always be classified as 'clean' (Greene *et al.* 2010, Mangram *et al.* 1999). It is probable that some of these orthopaedic wounds were misclassified during the coding process. As part of routine EMR management in the OR, the task of coding the category of wounds is usually left to the circulating or instrument nurse. In our study, the incorrectly entered wound classifications suggest the need for additional education of scout/scrub nurses in the CDC guidelines on wound classification. Although this clerical issue would not necessarily impact on the direct care given to this group of patients, misclassification reduces the accuracy and reliability of the data derived through EMR and chart audit

Limitations

The findings herein were based on a retrospective audit of medical records rather than a prospective examination of postoperative wound management practices. Therefore, there are caveats in the interpretation of these results. First, we relied on secondary source data, which may be misclassified or incomplete. Wound management documentation may not truly reflect how healthcare practitioners actually practice in real clinical environments. Further, during the nominated chart audit period (2010-12), the district changed over from the conventional hard copy medical chart to EMR, thus there was the chance that some information may have been lost throughout this transition. It was not always possible to identify from the charts or EMR whether postoperative wounds had been assessed as this information may have been reported verbally. Therefore, the number of wound assessments made may have conceivably been higher that indicated by the audit. Observation of nurses' wound assessment and management strategies may be more useful to examine nurses' actual practice. Second, the study was conducted across one heath service district, which may in some way be idiosyncratic in respect to the case mix of surgical patients, nurse-to-patient ratios and organisational culture. That said, the three hospital sites included catered for a diverse mix of surgeries and patient populations, and our findings are consistent with previous research. Where the findings are not generalisable to other settings, this study will inform further work in this important area. Finally, only one author categorised and entered information for data collection, so there was the potential for misclassification. This was minimised through using a priori classifications and regular meetings with two other study authors to discuss data management and analysis. Additionally, 10% of the medical records included in this audit were independently cross-checked by the lead author, which yielded acceptable interrater reliability levels.

CONCLUSIONS

Through the results of this study, important questions have raised around the timing and completeness of documented wound assessments. Clearly, documentation of wound assessment and management practices is integral to wound care. Provision of an integrated electronic database and standardisation of wound care documentation that encompasses wound assessment and wound management interventions may reduce inconsistencies and/or omissions in the timing and detail of wound assessments, and the terminologies used (Keast *et al.* 2004, Kinnunen *et al.* 2012). Ultimately, consistency in documentation will go some way to enhancing multidisciplinary communication in wound care.

Relevance to Clinical Practice

Our findings suggest that wound assessment and documentation practices are inconsistent with evidence-based guidelines. Nonetheless, we cannot assume that the gap between evidence and practice is evident. While it is essential that practice reflects existing evidence-based guidelines, the next crucial steps in addressing the issues raised here will involve observing what is actually happening in clinical practice. Contextual nuances in the clinical environment may potentially impact on clinicians' ability to optimally perform patient care activities—and hence fully utilise CPG. As part of this exploration, we will engage stakeholders in identifying existing barriers and enablers that underpin the use of evidence-based postoperative wound management strategies. Once these are known, we will collaborate with stakeholders in developing translational interventions that are contextually responsive to ensure greater success in using EBP (Michie *et al.* 2011) in postoperative wound management.

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Table 1: Recommendations for the prevention of SSI drawn from existing clinical guidelines, practice standards, and position statements

Recommendation	Guideline / Standard / Position Statement
Pre and Intraoperative phases:	
A. Appropriate hair removal I. Use of clippers or depilatory cream B. Antibiotic prophylaxis for: I. Clean surgery with implant II. Clean-contaminate surgery III. Contaminated surgery IV. Single IV dose during induction	• SQuIRe 2 CPI Guide: SSI Prevention (Health 2009) • AWMA Standard 4.6.11 (2011) • CDC Guideline for Prevention of SSI (1999) • EWMA Position Statement, Part 4 (2006) • NICE Clinical Guideline 74, Chapter 5/6 (NICE 2008)
C. Patient assessment I. Holistic patient assessment II. Patient history III. Keep patients and caregivers informed	• AWMA Standards 3.1 & 5.1 (2011) • EWMA Position Statement, Part 4 (2006) • NICE Clinical Guideline 74, Chapter 5/6 (NICE 2008)
Postoperative phase:	
D. Wound Assessment I. Based on patient factors, determine wound management strategy either using aseptic or clean technique II. If SSI is suspected (i.e., cellulites), give antibiotics to cover infection	• AWMA Standards 3.1 & 5.1 (2011) • EWMA Position Statement, Part 4 (2006) • NICE Clinical Guideline 74, Chapters 5, 6 & 7 (NICE 2008) • SQuIRe 2 CPI Guide: SSI Prevention (Health 2009)
E. Incision management / dressing selection & wound cleansing I. Assess the benefit & cost effectiveness of dressings II. Leave dressing intact for at least 48hrs in the postoperative period III. Use sterile normal saline to cleanse wound up to 48hrs IV. Tap water may be used to cleanse surgical site after first 48hrs	• AWMA Standards 3.1 & 5.1 (2011) • CDC Guideline for Prevention of SSI (1999) • EWMA Position Statement, Part 4 (2006) • NICE Clinical Guideline 74, Chapter 6 (NICE 2008)
F. Wound Debridement I. Avoid eusol, saline soaked gauze, dextranomer or enzymatic treatments to manage wound infections II. Use appropriate interactive dressings	• NICE Clinical Guideline 74, Chapter 7 (NICE 2008)
G. Documentation I. Initial and ongoing wound assessments II. Environmental assessment III. Documented care plan IV. Integrated care pathway for management of wound complications V. Collaborative multidisciplinary approach to patient care	• AWMA Standards 3.3 & 5.1 (2011) • NICE Clinical Guideline 74, Chapter 4 (NICE 2008) • SQuIRe 2 CPI Guide: SSI Prevention (Health 2009)

Table 2: Demographic and clinical characteristics of patients for the percentage of the total sample (n=152)

Demographics	n*	%
Hospital Site		
A – 450 bed hospital	76	50.0
B – 130 bed satellite hospital	28	18.4
C – Stand alone Day Surgery Unit	47	31.0
Surgical Specialty		
General	26	17.1
Vascular	2	1.3
Plastics	4	2.6
Orthopaedics	50	32.9
Paediatric	2	1.3
Obstetrics and Gynaecology	13	8.6
Facial Maxillary	24	15.8
Ear, Nose and Throat	8	5.3
Neurosurgery	7	4.6
Ophthalmology	12	7.9
Urology	3	2.0
ASA Status		
ASA 1&1E	110	72.4
ASA 2 & 2E	36	23.7
ASA 5 & 5E	6	4.0
Comorbidities		
Chronic Heart Failure	2	1.3
IHD	8	5.3
COPD	23	15.1
Hypertension	26	17.1
Diabetes Mellitus	15	9.9
Hypercholesterolemia	15	9.9
Renal disease	8	5.3
Metastatic carcinoma/Malignancy	8	5.3
Stroke	5	3.3
Immuno-compromised	5	3.3
Reason for return to OR		
Bleeding/ Haemorrhage at incision site	3	2.1
Wound Exploration	1	0.7
SSI — Washout	3	2.1
Undergoing further surgery	1	0.7
Removal of prosthesis	1	0.7
Not stated	2	1.3

*Missing values not replaced

Table 3: Demographic and Clinical Characteristics of Patients with Postoperative Wound Complications (*n=15)

Demographic / Clinical Characteristic	Results	
	Median	*IQR*
Age		
Years	55.0	33.0
Length of Surgery		
Minutes	70.5	77.0
HLOS		
Days	2.0	5.0
Wound Assessment Occasions	4.7	0.0
	n	*%*
Number of Co-morbidities		
≥ 3	4	26.6
> Medications		
Yes	4	26.6
Surgical Specialty		
Orthopaedic	13	86.6
General	1	6.6
Facial Maxillary	1	6.6
Wound Classification		
Clean	9	60.0
Clean Contaminated	6	40.0
Antibiotic Administration		
Preoperative	4	26.6
Intraoperative	12	80.0
Postoperative	4	46.6
†*Postoperative Complications*	*n*	*%*
Mechanical debridement	6	40.0
Surgical debridement	1	6.6
Mechanical Debridement for SSI	2	13.3
Surgical Debridement for SSI	1	6.6
Mechanical & Surgical Debridement	2	13.3
SSI	4	26.6

* 4 patients developed more than 1 postoperative wound complication

† Postoperative events: 1) Surgical debridement – used in surgery to extend healthy tissue; 2) Mechanical debridement – uses force (hydrosurgery, wet-to-dry gauze)

FIGURES

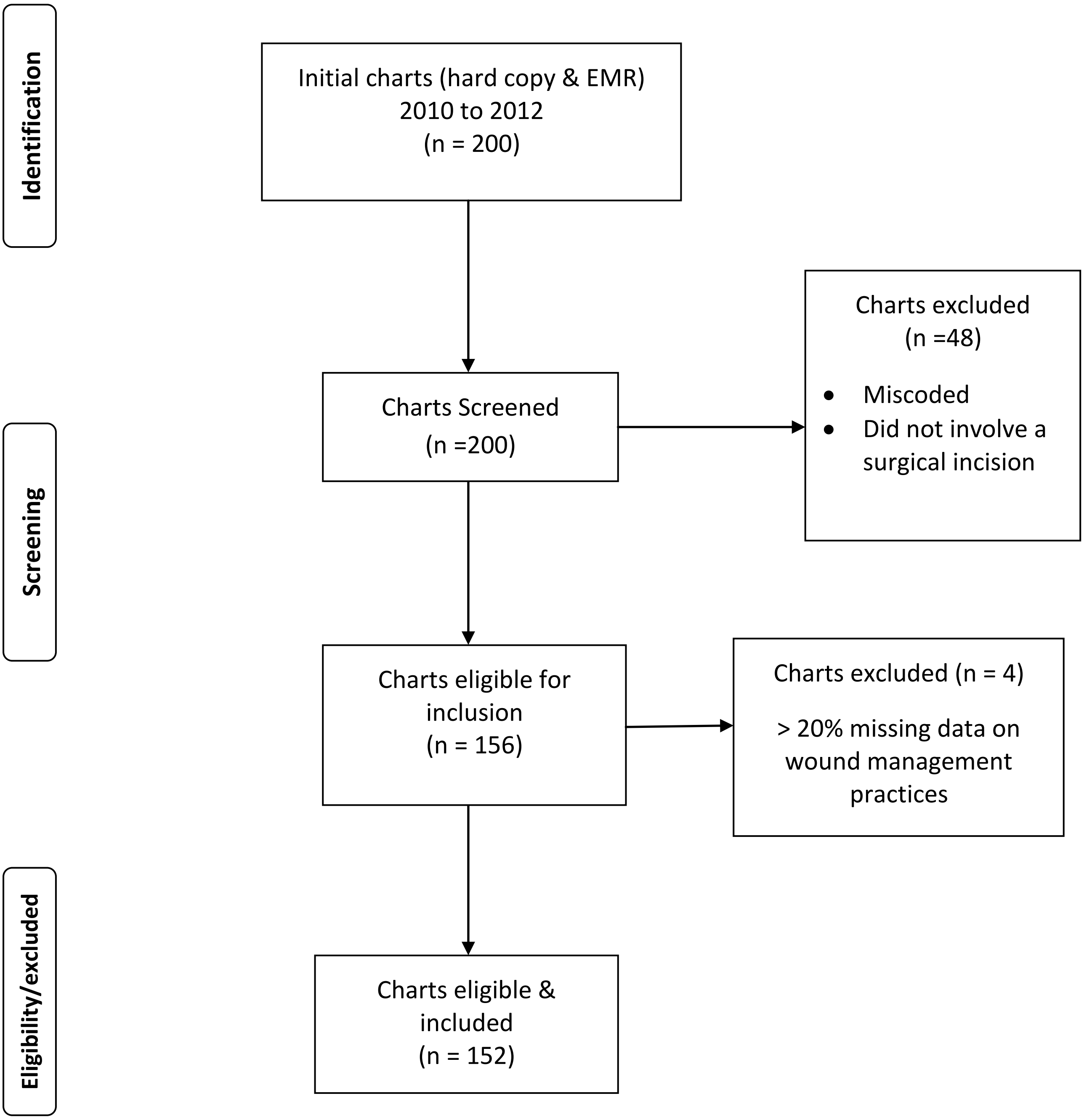

Figure 1: Sample flow diagram of EMR/chart inclusion.

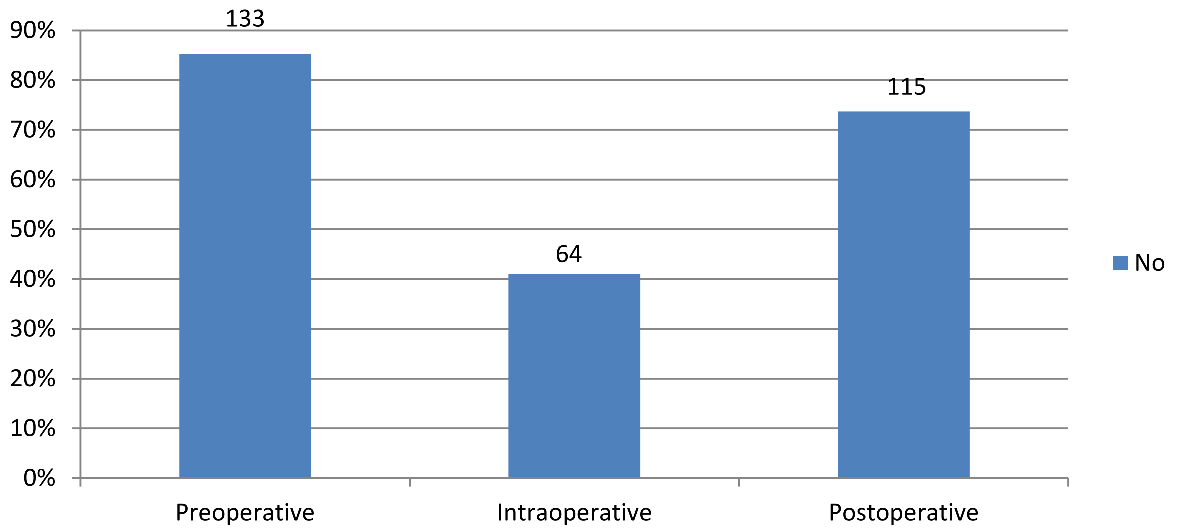

Figure 2: Antibiotic administration and timing (n=152)

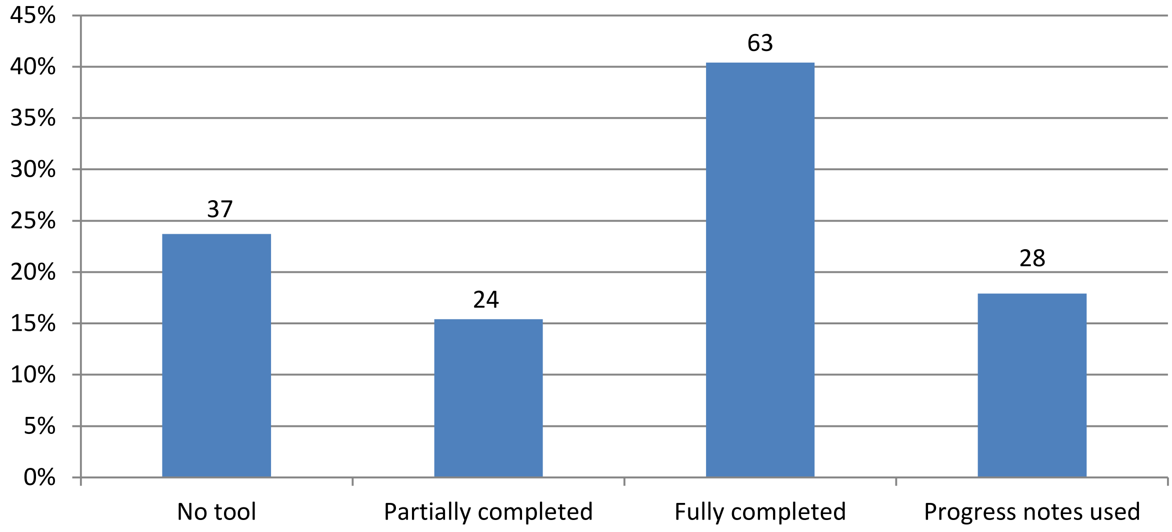

Figure 3: Wound assessment documentation completion rates (n=152)

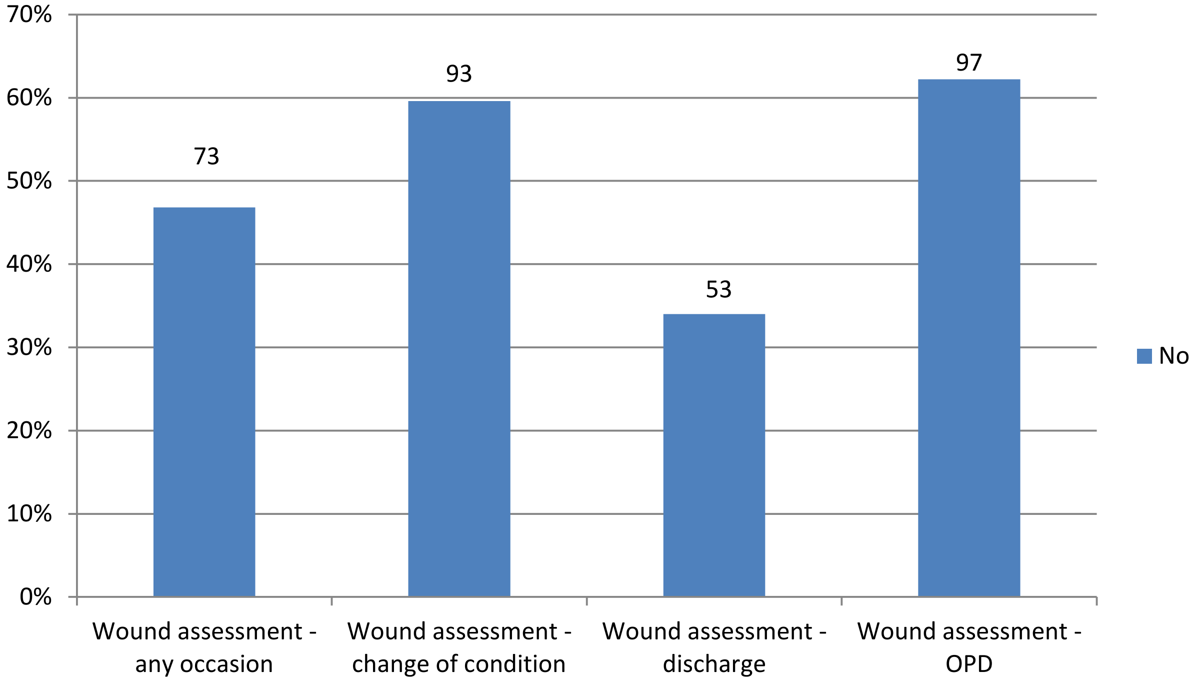

Figure 4: Documented wound assessment occasions (n=152)

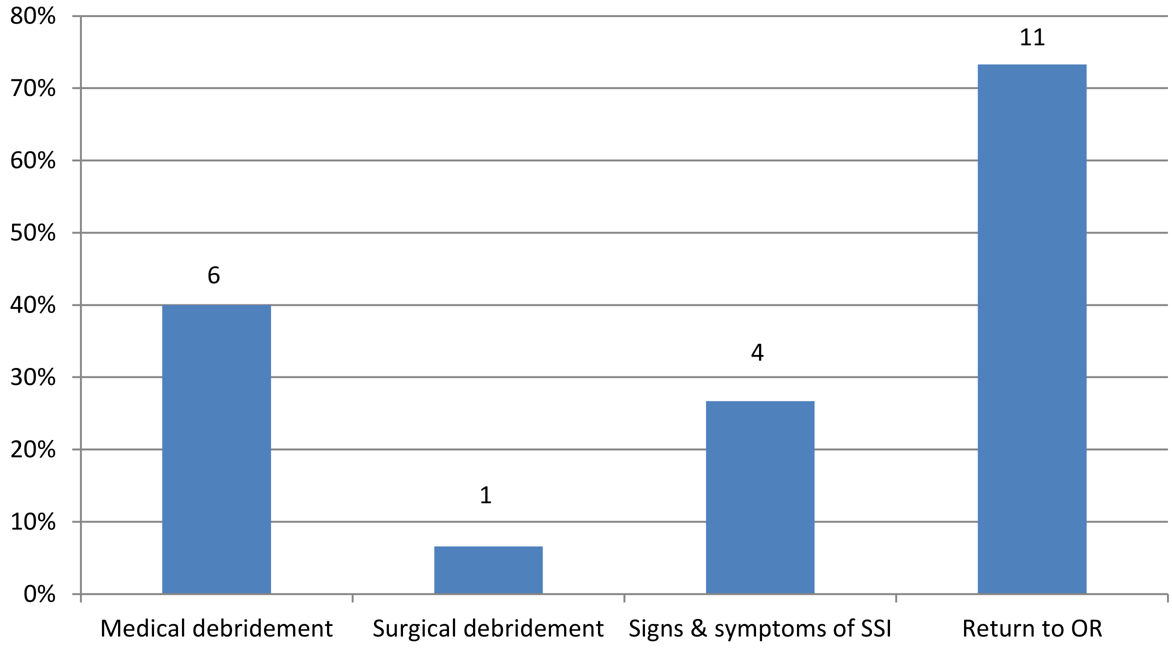

Figure 5: Documented wound complication rates (n=15 patients*)

*Some patients were documented as having more than one wound complication.