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An Audit of Wound Healing Complications Including Surgical Site Infection Following Laparoscopic Surgery

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Abstract

Introduction: Surgical site infections (SSIs) are one of the most common healthcare-associated infections. Wound concerns not due to SSI, such as redness, swelling, comfort, odour and exudate are often reported. Although these symptoms may not be due to SSI *per se*, they can nevertheless negatively affect patient experience. The aim of this audit was to evaluate the incidence of surgical site infection and patient reported wound healing concerns following laparoscopic surgery.

Methods: This was a prospective audit of all patients undergoing laparoscopic surgery between January to March 2020. Patients were telephoned at 14 and 30 days post-operatively and completed the Post Discharge Questionnaire.

Results: 136 (73.9%) and 107 (58.2%) patients completed telephone follow-up by day 14 and 30 respectively. By day 14, 18 patients reported wound healing concerns in the absence of SSI (incidence 13.2%; 95% CI 8.0-20.1). Eight women had SSI's (incidence 5.9%; 95% CI 2.6-11.3). By day 30, a further six patients reported wound healing concerns not due to SSI (incidence 5.6%; 95%CI 2.1-11.8). Four women had SSI's (incidence 3.7%; 95%CI 1.0-9.3).

Conclusions: In conclusion, this audit has highlighted that a high number of patients experience wound concerns in the absence of SSI following laparoscopic surgery.

Keywords: Laparoscopic surgery; Surgical site infection; Wounds and injury; Wound healing; Wound infection.

Abbreviations: SSI: Surgical Site Infection; ECDC: European Centre for Disease Prevention and Control; NICE: National Institute for Health and Care Excellence; PDQ: Post Discharge Questionnaire; NHSN: National Healthcare Safety Network.

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Introduction

Surgical site infections (SSIs) are defined as infections affecting an operation site up to 30 days post-operatively (or up to one year if an implant is left in place) [1]. SSIs are one of the most common healthcare-associated infections [2,3]. They have been reported by the European Centre for Disease Prevention and Control (ECDC) to account for 19.6% of all health care-associated infections in Europe between 2011-12 [3]. In 2016 the ECDC annual epidemiological report showed that 34 % of the SSIs were diagnosed in hospitals and 52% after discharge [4]. SSI can negatively impact the physical and mental health of patients as they are associated with a longer post-operative hospital stay, re-operation and higher mortality [5,6]. As a result, due to additional investigations, treatment and re-operation, SSI poses a significant economic burden to a health service [6]. The annual cost to the NHS for managing wounds has been estimated to be £4.8 billion, with surgical wounds being one of the largest contributors [7].

Although laparoscopic surgery is associated with lower rates of SSI compared to open surgery, this complication remains a challenge for surgeons [8]. Wound healing concerns which are not due to SSI, such as wound appearance; redness or swelling, comfort, odour and exudate are often reported by patients [9]. These symptoms can be as a result of normal wound healing, as following haemostasis, vasodilation occurs to allow blood, fluid and inflammatory cells entry into a wound which clears local debris and bacteria [10,11]. As a result wound erythema, heat and oedema can occur. Although these symptoms may not be due to SSI, they can still negatively affect the patient experience [9]. Due to barriers such as time pressures, limited staff and resource allocation, often information provided to patients post-operatively in regards to their wounds and wound care is inconsistent [12]. Therefore, for SSI and any other wound healing concerns, patients predominantly rely on health professionals within the community such as their general practitioner, practice nurse and community nurse [7].

There is an abundance of evidence in the literature reporting the incidence of SSI following laparoscopic surgery [13-15]. However, there is a paucity of evidence describing the incidence of other associated wound healing problems that patients may experience in the absence of infection. The aim of this audit was to evaluate the incidence of surgical site infection and patient reported wound healing concerns following laparoscopic surgery.

Materials and methods

This was a prospective single-centre audit of all patients undergoing emergency or elective laparoscopic surgery during a three-month period; January to March 2020. Daily review of theatre IT systems was undertaken. A data collection tool was created using the National Institute for Health and Care Excellence (NICE) as the standard [16]. Information including patient demographics, co-morbidities and American Society of Anesthesiologists (ASA) grade was collected [17]. In addition, intra-operative details such as antibiotic use, skin preparation (anti-sepsis and hair removal), laparoscopic port characteristics (port number, size and site), closure method and suture type. Surgical wounds were classified using the National Healthcare Safety Network (NHSN) classification grades(I-IV); Clean; I, Clean Contaminated; II, Contaminated; III and Infected/Dirty; IV [18]. The procedure, surgical specialty, grade of operating surgeon and procedure length was recorded. Post-operative data including antibiotic use and length of stay was also collected.

Table 1: Diagnostic criteria for surgical site infection.

Site of surgical infection	Tool	Criteria
Superficial/ deep incisional	PDQ	At least one of the following criteria: - Criterion 1: discharge pus AND antibiotics prescribed - Criterion 2: clinical signs* AND dehiscence - Criterion 3: Clinical signs* AND antibiotics prescribed
Superficial incisional	CDC definition	1) Purulent drainage from superficial incision 2) Culture of organism and pus cells present: - Fluid/tissue from superficial incision/Wound swab from superficial incision 3) At least 2 symptoms of inflammation: - Pain, tenderness, localised swelling, redness, heat
Deep incisional	CDC definition	1) Purulent drainage from deep incision 2) Culture of organism and pus cells present: - Fluid/tissue from superficial incision/ Wound swab from superficial incision 3) Deep incision dehisces or deliberately opened and patient has at least 1 symptom of: - Fever or localised pain/tenderness 4) Abscess or other evidence of infection in deep incision: - Re-operation/histopathology/radiology
Organ/Space	CDC definition	1) Purulent drainage from drain into organ space 2) Culture of organism and pus cells present: - Fluid/tissue from superficial incision/ Wound swab from superficial incision 3) Abscess or other evidence of infection in organ/space; - re-operation/ histopathology/radiology

*Clinical signs: at least 2 of the following must be present: pain, heat, redness or swelling
PDQ- Post Discharge Questionnaire
CDC- Centers for Disease Control and Prevention

Patients were telephoned at 14 days and 30 days post-operatively and completed the Post Discharge Questionnaire (PDQ) to review any signs and symptoms of surgical site infection (SSI) experienced within those time-points. At least three attempts were made to contact the patient. The Health Protection Agency PDQ was published by Public Health England for Surgical Site Infection (SSI) Surveillance [19] high quality and is in line with the internationally agreed definitions of SSI by the Centers for Disease Control and Prevention (CDC); including superficial, deep incision and organ/space SSI [1]. If any clinically relevant information was obtained on telephone review, the patient was advised to seek medical advice. Also, in order to capture events following discharge, all recorded interactions (telephone consultations/clinic visits/hospital records from IT systems), with patients in the 30 days postoperatively were analysed. The criteria used to diagnose SSI from the PDQ and recorded interactions following application of the CDC definitions is outlined in (Table 1). A laparoscopy was defined as therapeutic if intra-abdominal surgical treatment (repair or resection) was performed.

Institutional approval was obtained and the audit was registered with Croydon University Hospital Quality Safety and Experience Team (Registration number 2019/176). Further review by a UK Research Ethics Committee was not deemed necessary by the Institutional Research and Development board.

Table 2: Patient demographics.

	Median (IQR)
Age	37.0 (29.0-51.0)
BMI	26.5 (23.1-32.0)
ASA grade	**N (%)**
1	87 (47.3)
2	84 (45.7)
3	13 (7.1)
Gender	**N (%)**
Female	145 (78.8)
Male	39 (21.2)
Co-morbidities	**N (%)**
Diabetes	11 (6.0)
Thyroid dysfunction	5 (2.7)
Current Smoker	29 (15.8)
Malignancy	1 (0.5)
IHD	19 (10.3)
Anaemia	1 (0.5)
CKD	1 (0.5)
Alcohol-use disorder	1 (0.5)

IQR: Interquartile Range; BMI: Body Mass Index; ASA: American Society of Anesthesiologists; IHD: Ischaemic heart Disease; CKD: Chronic Kidney Disease.

Statistical analysis

The data was analysed using SPSS version 26.0.0.0. Descriptive analysis was used to describe patient demographic, pre-operative, intra-operative and post-operative variables. Nominal data is presented as number (N) and percent. For continuous data, the median and interquartile range (IQR)/(Range) were calculated. Multivariate analysis was then performed, calculating the odds ratios (ORs) and the corresponding 95% confidence intervals (CIs). A p-value <0.05 was considered statistically significant.

Results

During the data collection period: January to March 2020, 184 patients underwent laparoscopic surgery. Baseline patient characteristics are listed in (Table 2). The median patient age was 37 years (IQR 29.0-51.0) with a median body mass index of 26.5 (IQR 23.1-32.0). 78.8% of patients were women. with regards to pre-operative performance status, most patients were ASA class 1; 87 (47.3), followed by ASA class 2; 84 (45.7%) and ASA class 3; 13 (7.1%). In addition, 29 (15.8%) of patients were current smokers and ischaemic heart disease and diabetes mellitus were the most common co-morbidities in 10.3% and 6.0% respectively.

Table 3: Surgical procedure characteristics.

Specialty	**N (%)**
Gynaecology	97 (52.7)
General Surgery	87 (47.3)
Procedure	
Emergency	44 (23.9)
Elective	140 (76.1)
Diagnostic	35 (19.0)
Therapeutic	149 (81.0)
Appendicectomy	27 (14.7)
Salpingectomy/Salpingo-oophorectomy	9 (4.9)
Cystectomy	8 (4.3)
Sterilisation	7 (3.8)
Hernia repair(inguinal/incisional)	10 (5.4)
Nissan fundoplication	2 (1.1)
Myomectomy	1 (0.5)
Hysterectomy	8 (4.3)
Cholecystectomy	47 (25.5)
Colostomy	2 (1.1)
Large bowel resection	3 (1.6)
Adhesiolysis	7 (3.8)
Endometriosis	15 (8.15)
Laparoscopy and dye test*	3 (1.6)
Ovarian drilling	3 (1.6)
Diagnostic	32 (17.4)
Grade of surgeon	
SHO/ST1-2	10 (5.4)
SpR/ST3+	89 (48.4)
Consultant	84 (45.7)
Unknown	1 (0.5)
NHSN class	
1	174 (94.6)
2	8 (4.3)
3	2 (1.1)
Time Median (IQR)	
Procedure length(minutes)	60.0 (41.8-85.3)
Post-operative length of stay (days)	2.0 (1.0-3.0)

SHO: Senior House Officer; SpR: Specialist Registrar; ST: Specialist Trainee; NHSN: National Healthcare Safety Network.

*As laparoscopy and dye test did not involve repair or resection of any internal organs it was classified as a diagnostic procedure.

Surgery

Surgical procedures are presented in (Table 3). Of the 184 patients, 97 (52.7%) were completed by gynaecologists and 87 (47.3 %) by general surgeons, majority of whom were registrars (48.4%) followed by consultants (45.7%). Most of the procedures performed were elective (76.1%) and assigned NHSN wound class 1 (94.6%). Laparoscopic cholecystectomy was the most commonly performed procedure in 25.5% of cases, followed by diagnostic laparoscopy in 17.4%. Median operating time was 60 minutes (IQR 41.8-85.3).

Table 4: Intra-operative practices.

Skin anti-sepsis solution	N (%)
Chlorhexidine	158 (85.9)
Betadine	9 (4.9)
Unknown	17 (9.2)
Hair removal	
Y	19 (10.3)
N	160 (87.0)
Unknown	5 (2.7)
Number of ports	
1	9 (4.9)
2	35 (19.0)
3	91 (49.5)
4	43 (23.4)
5	2 (1.1)
Not documented	4 (2.2)
Port size	**Median (Range)**
Umbilical (n=173)	10.0 (5.0-40.0)
Suprapubic (n=43)	5.0 (5.0-10.0)
RIF (n=62)	5.0
LIF (n=111)	5.0 (5.0-10.0)
LUQ (n=9)	5.0 (5.0-12.0)
Epigastrium (n=31)	10.0 (5.0-12.0)
RUQ (n=28)	5.0
Suture type	**N (%)**
Vicryl rapide® (Polyglycolic Acid)	52 (28.3)
Vicryl® (Polyglycolic Acid)	15 (8.2)
Monocryl® (Poliglecaprone 25)	104 (56.5)
Staples	0 (0)
Steri-strips	1 (0.5)
Unknown	12 (6.5)
Suture Technique	**N (%)**
Interrupted	13 (7.1)
Mattress	1(0.5)
Subcuticular	27(14.7)
Unknown	143(77.7)
IV Antibiotics	**57(31.0)**
Co-amoxiclav	20(35.1)
Co-amoxiclav + Metronidazole	5(8.8)
Cefuroxime + Metronidazole	23(40.4)
Ciprofloxacin + Metronidazole	1(1.8)
Tazocin	6(10.5)
Meropenam	1(1.8)
Teicoplanin	1(1.8)
Blood transfusion	3(1.6)
Implant/Drain insertion	14(7.6)

n/N: Number; RIF: Right iliac fossa; LIF: Left iliac fossa; LUQ: Left upper quadrant; RUQ: Right upper quadrant.

Intraoperative practices

Hair removal was performed in 10.3% of cases. Skin anti-sepsis was completed with chlorhexidine in 158 (85.9%) patients and betadine in 9 (4.9%). A three-port-technique was used most frequently in 91 (49.5%) of cases. For skin closure, Monocryl (Poliglecaprone 25) was used most in 104 (56.5) patients, Vicryl rapide (Polyglycolic Acid) in 52 (28.3%) patients and Vicryl (Polyglycolic Acid) in 15 (8.2%). Intravenous antibiotics were given intraoperatively in 31.0% of surgical cases; with a combination of Cefuroxime and Metronidazole or Co-amoxiclav being used most commonly in 40.4% and 35.1% of patients respectively. Additional intraoperative practices are described further in (Table 4).

Wound healing complications

Median length of hospital stay was 2 days (IQR 1.0-3.0) (Table 3). On day 14 post-operatively, a total of 136 (73.9%) of patients were successfully evaluated using telephone follow-up. On day 30 post-operatively, a total of 107 (58.2%) of patients completed telephone follow-up.

Table 5 describes the incidence of SSI and wound healing concerns in the absence of infection, using the PDQ and CDC criteria. On review at day 14; 18 patients reported wound healing concerns in the absence of SSI (incidence 13.2%; 95% CI 8.0-20.1), 83.3% (n=15) were following a therapeutic procedure. Eight women had SSIs (incidence 5.9%; 95% CI 2.6-11.3); 62.5% were superficial incisional, 1.3% were deep incisional and 2.5% organ/space. All cases of SSI were following a therapeutic procedure. Of the eight patients with SSI, seven had been prescribed antibiotics and three patients had been re-admitted to hospital for further management. Wound swab was performed in three cases and the detected micro-organisms were *Staphylococcus spp*. in two women, *Corynebacterium spp.* in two women, *Streptococcus sp*. in two women and *Enterococcus spp.* in one woman. The median time taken for onset of symptoms was 10 days (IQR 3.8-12.0). Eighteen patients had seen a health care worker because of their symptoms; in 11 (61.1%) their general practitioner, 4 (22.2%) a district nurse and in 3 (16.7%) a hospital doctor. Those three patients were subsequently re-admitted for further management.

On review at day 30; the patients with wound healing concerns or SSI reported on day 14 symptoms had been managed and resolved. However, a further six patients reported wound healing concerns not due to SSI (incidence 5.6%; 95%CI 2.1-11.8), 66.7% (n=4) were following a therapeutic procedure. Four women had experienced SSI (incidence 3.7%; 95%CI 1.0-9.3), 75% (n=3) were following a therapeutic procedure. SSI was superficial incisional in all cases. All of the four patients with SSI, had been prescribed antibiotics (Table 5). Wound swab was performed in one case and the detected micro-organisms was *Staphylococcus spp*. The median time taken for onset of symptoms was 23.0 days (IQR 17.8-26.3). Five patients had seen a health care worker because of their symptoms; in 3(60.0%) their general practitioner and in 2 (40.0%) a hospital doctor.

Table 6 describes the symptoms reported by patients who experienced wound healing concerns. Symptoms most frequently reported by patients by day 14 included pain in 69.2%, fluid discharge in 61.5%; which was clear/blood stained (50%) or purulent (43.8%) and redness in 50.0%. Five (71.4%) of the patients with purulent discharge had a SSI. However, all of the patients who reported wound dehiscence (n=4) had an SSI. Symptoms most frequently reported by the patients with wound healing concerns by day 30 included pain and redness in 80%. Four (50%) of the patients with pain or redness had an SSI. All of the patients who reported wound dehiscence (n=3) had an SSI.

Table 5: Rates of wound healing concerns including surgical site infection reported using the Post Discharge Questionnaire (PDQ).

Day 14 N=136	Incidence (95% CI)	Days taken for symptom onset (median [IQR])	Procedure type		Hospital Readmission N(%)	Antibiotics N(%)
			Diagnostic N(%)	Therapeutic N(%)		
Any wound concerns (n=26)	19.1 (12.9-26.7)	10 (3.8-12.0)	-	-	0 (0)	0 (0)
Not SSI (n=18)	13.2 (8.0-20.1)	10.0 (7.0-12.0)	3 (16.7)	15 (83.3)	0 (0)	0 (0)
SSI (n=8)	5.9 (2.6-11.3)	9.5 (3.3-13.0)	0 (0)	8 (100)	3 (37.5)	7 (87.5)
Day 30 N=107	**Incidence (95% CI)**	**Days taken for symptom onset (median [IQR])**	**Procedure type**		**Hospital Readmission N (%)**	**Antibiotics N (%)**
			Diagnostic N (%)	**Diagnostic N (%)**		
Any wound concerns (n=10)	9.3 (4.6-16.5)	23.0 (17.8-26.3)	-	-	0 (0)	0 (0)
Not SSI (n=6)	5.6 (2.1-11.8)	25.0 (21.0-27.0)	2 (33.3)	4 (66.7)	0 (0)	0 (0)
SSI (n=4)	3.7 (1.0-9.3)	18.5 (15.0-27.3)	1 (25.0)	3 (75.0)	0 (0)	4 (100)

SSI: Surgical Site Infection; N: Number

Table 6: Symptoms reported by patients using the Post Discharge Questionnaire (PDQ).

Day 14 symptoms reported (n=26)	N (%)	SSI N (%)	No SSI N (%)	Day 30 symptoms reported (n=10)	N (%)	SSI N (%)	No SSI N (%)
Fluid discharge	16 (61.5)	6 (37.5)	10 (63.5)	Fluid discharge	6 (60.0)	3 (50.0)	3 (50.0)
Clear/Blood Stained	8 (50.0)	1 (12.5)	7 (87.5)	Clear/Blood Stained	2 (33.3)	0 (0)	2 (100)
Pus	7 (43.8)	5 (71.4)	2 (28.6)	Pus	4 (66.6)	3 (75.0)	1 (25.0)
Other	1 (6.3)	0 (0)	1 (100.0)	Other	0 (0.0)	0 (0)	0 (0)
Pain	18 (69.2)	7 (38.9)	11 (62.1)	Pain	8 (80.0)	4 (50.0)	4 (50.0)
Redness	13 (50.0)	4 (30.8)	9 (69.2)	Redness	8 (80.0)	4 (50.0)	4 (50.0)
Heat	3 (11.5)	0 (0)	3 (100)	Heat	2 (20.0)	1 (50.0)	1 (50.0)
Swelling	4 (15.3)	1 (25.0)	3 (75.0)	Swelling	4 (40.0)	2 (50.0)	2 (50.0)
Dehiscence	4 (15.3)	4 (100.0)	0 (0)	Dehiscence	3 (3.0)	3 (100.0)	0 (0.0)
Smell	4 (15.3)	2 (50.0)	2 (50.0)	Smell	1 (10.0)	1 (100.0)	0 (0.0)
Fever	0 (0)	0 (0)	0 (0)	Fever	1 (1.0)	1 (100.0)	0 (0.0)

SSI: Surgical Site Infection; n/N: Number

On multivariate analysis (Table 7), no modifiable or non-modifiable risk factors were associated with post-operative wound healing concerns. Although the incidence of wound healing concerns was lower in diagnostic procedures, this difference was not significant (OR 0.27 (95% CI 0.06-1.12) (p=0.07)).

Table 7: Modifiable and non-modifiable risk factors and their relationship with patients reporting post-operative wound healing concerns including surgical site infection within 30 days.

Modifiable Variables	OR (95%CI)	p. value
Number of ports	0.68 (0.31-1.26)	0.22
Solution for cleaning		
Chlorhexidine	0.60 (0.07-5.18)	0.64
Betadine (reference category)	-	-
Hair removal	3.75 (0.47-30.21)	0.22
Intraoperative antibiotics	1.50 (0.63-3.55)	0.36
Non-modifiable variables	**OR (95%CI)**	**p. value**
Age	1.01 (0.97-1.05)	0.72
BMI	1.00 (0.99-1.00)	0.54
Co-morbidities (including smoking)	1.01 (0.35-3.11)	0.93
ASA		
1	0.91 (0.41-2.07)	0.84
2	0.58 (0.11-2.91)	0.50
3 (reference category)	-	-
Procedure urgency		
Emergency	2.17 (6.3-7.44)	0.22
Elective (reference category)	-	-
Procedure length	1.00 (0.98-1.01)	0.71
Grade of surgeon		
SHO/ST1-2	2.62 (0.37-18.39)	0.33
SpR/ST3+	1.07 (0.47-2.45)	0.87
Consultant	-	
Procedure type		
Diagnostic	0.27 (0.06-1.12)	0.07
Therapeutic (reference category)	-	-

OR: Odds Ratio; BMI: Body Mass Index; ASA: American Society of Anesthesiologists; SHO: Senior House Officer; ST: Specialist Trainee; SpR: Specialist Registrar.

Discussion

This audit was designed to assess the incidence of wound healing complications following laparoscopic surgery using a validated questionnaire. This was undertaken to identify problems that may not be identified by standard surgical audit. The strengths of this clinical audit include its prospective design and the assessment of wound healing outcomes by using a validated questionnaire as the audit tool. It addresses a gap in the literature about the current incidence and reporting of wound healing concerns in the absence of infection that patients may experience following laparoscopic surgery. In addition, this is the first study to compare the incidence of laparoscopic SSI in diagnostic and therapeutic procedures. However, our audit is limited by its sample size; in particular the telephone response rate of 58.2% at 30 days. Reasons for the low response rate, could be attributed to the timing of the questionnaire as most patients would have returned to work.

The main findings of this study include that patient's commonly experience isolated wound problems such as exudate, pain and redness in the absence of wound infection following laparoscopic surgery. In addition, this study demonstrated that the incidence of patient reported wound concerns following laparoscopic surgery was 19.1% within 14 days and 9.3% within 30 days. This was due to SSI in 5.9% and 3.7% within 14 and 30 days respectively and in the absence of SSI; in 13.2% and 5.6%. The incidence of SSI in our study concurs with an analysis of a prospectively collected multi-speciality database of 254,009 patients, which showed that the incidence of SSI within 30 days following laparoscopic surgery ranged between 1.7-12.1% [14]. Wound complications in the absence of SSI including; exudate, odour, redness and swelling are also important measures reported by patients, as highlighted in a qualitative study by the Bluebelle Study Group [9]. However, to our knowledge, based on a PubMed search of the literature, no study has reported the incidence of other wound healing problems patients may face, in the absence of SSI.

No modifiable or non-modifiable risk factors for wound healing concerns following laparoscopic procedures were identified. However, the incidence of wound healing concerns was much higher with therapeutic procedures. With respect to SSI following laparoscopic surgery, bacteria can come from endogenous (patient skin, mucous membranes or organ) or exogenous sources (surgeon, surgical instruments, or room air) [20]. In most cases, bacteria causing SSI are from endogenous sources. Commonly isolated organisms include *Staphylococcus aureus, Enterococcus spp* and *Escherichia coli.* Commensals which colonise the skin normally include *Corynebacterium spp., Propionibacterium spp.* and *Staphylococcus spp.* However, in procedures involving the genitourinary tract or gastrointestinal tract include gram-negative bacilli, *Enterococcus, Group B streptococcus* and anaerobes [21]. This is in keeping with micro-organisms isolated in our study (*Staphylococcus spp, Corynebacterium spp. Streptococcus spp*. and *Enterococcus spp).* and may explain why the incidence of SSI was higher in therapeutic procedures due to the manipulation of internal organs and so transfer of micro-organisms to the port site.

There is a national drive to increase the number of surgical operations to either short stay or day case procedures and laparoscopic surgery allows more procedures to be performed in this manner [22,23]. This includes patients presenting acutely, requiring urgent surgery, in a semi-elective fashion [23]. Furthermore, it is recommended that telephone follow up the 24 hours following discharge is completed, however follow-up practices with the operating surgical team varies amongst surgeons and is not often always required or offered [23]. In this study, patients on average were discharged two days post-operatively and reported experiencing symptoms between 10-25 days post-operatively, meaning that with conventional clinical audit (where data is drawn from electronic or traditional patient records) these wound problems would be missed. Moreover, based on the present study findings, if conventional clinical audit was used alone, only 16.7% of patients on day 14 and 20% of patients on day 30 developing wound concerns would have been identified, as they had been diagnosed with SSI by a hospital doctor. This is in keeping with the idea that the incidence of SSI is often underestimated as post-operative length of stay is often short and investigation usually focuses solely on inpatients [24].

The greatest patient concerns surrounding wound care on discharge from hospital include wound pain, being able to identify

wound complications and wound infection [25]. Sanger et al [26] completed a qualitative study investigation patient perspective surrounding post-discharge SSI. They found that approximately 60% of patients reported to have not received adequate wound management information on discharge. The patient information leaflet provided at Croydon University Hospital for patient being discharged following laparoscopic surgery was reviewed and was found to have inadequate information on wound care. Therefore, the design and content of the leaflet will be revised incorporating the findings from our study, with an aim to alleviate patients of their wound concerns. After routine surgery resumes following the Covid-19 pandemic we will complete a re-audit.

It has also been shown that wound complications even after minor surgical procedures can greatly affect the psychological wellbeing of patients [27]. Therefore, symptom severity, as judged by clinicians may not concur with the patient's own experience of the symptoms [27]. This highlights the importance of directly contacting the patient in order to improve the quality of care delivered. Moreover, it has been shown that patients are agreeable to telephone follow up and find the method valuable [28, 29]. However, at present there is heavy reliance on community services, with a high percentage of patients using resources such as general practitioners, practice nurses and community nurses for wound care management following discharge from hospital [7]. In our audit, two-thirds of patients saw their general practitioner at both day 14 and 30. A large wound care audit highlighted that in a patient group with mainly surgical wounds, 74% received treatment in the community; particularly by district nurses [30].

Conclusions

This study has highlighted that a large percentage of patients experience wound concerns following laparoscopic surgery. More research is required into the incidence of wound concerns following laparoscopic surgery and incidence rates from this study could guide future sample size and statistical power calculations. The present study is relevant to clinical practice as the use of telephone follow-up after hospital discharge could help identify important patient concerns, improve the patient experience and potentially reduce the burden on community services.

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