



A survey of patients with surgical wounds healing by secondary intention; an assessment of prevalence, aetiology, duration and management



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ABSTRACT

Background: Surgical wounds healing by secondary intention (SWHSI) are often difficult and costly to treat. There is a dearth of clinical and research information regarding SWHSI. The aim of this survey was to estimate the prevalence of SWHSI and to characterise the aetiology, duration and management of these wounds.

Methods: Anonymised data were collected from patients with SWHSI receiving treatment in primary, secondary and community settings. Over a two weeks period, data were collected on the patients, their SWHSI, clinical and treatment details.

Results: Data were collected from 187 patients with a median age of 58.0 (95% CI = 55 to 61) years. The prevalence of SWHSI was 0.41 (95% CI = 0.35 to 0.47) per 1000 population. More patients with SWHSI were being treated in community (109/187, 58.3%) than in secondary (56/187, 29.9%) care settings. Most patients (164/187, 87.7%) had one SWHSI and the median duration of wounds was 28.0 (95% CI = 21 to 35) days. The most common surgical specialities associated with SWHSI were colorectal (80/187, 42.8%), plastics (24/187, 12.8%) and vascular (22/187, 11.8%) surgery. Nearly half of SWHSI were planned to heal by secondary intention (90/187, 48.1%) and 77/187 (41.2%) were wounds that had dehisced. Dressings were the most common single treatment for SWHSI, received by 169/181 (93.4%) patients. Eleven (6.1%) patients were receiving negative pressure wound therapy.

Conclusions: This survey provides a previously unknown insight into the occurrence, duration, treatment and types of surgery that lead to SWHSI. This information will be of value to patients, health care providers and researchers.

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1. Introduction

More than six million surgical operations are performed annually in the United Kingdom (UK) National Health Service (NHS), with the vast majority involving an incision [1]. Whilst most incised surgical wounds will heal by primary intention, some will heal by secondary intention, usually because the wound has intentionally been left open or has dehisced following primary closure [2,3].

In the UK, surgical wounds healing by secondary intention (SWHSI) are thought to be common and have been estimated to

comprise between 26 and 28% of all prevalent surgical wounds [4,5]. They are potentially difficult and costly to treat as they may remain open for an extended time period and are prone to infection, require on-going treatment [6] and may result in prolonged hospitalisation, re-admission and further surgeries.

Despite the potentially large impact of SWHSI, there is a paucity of information regarding the characteristics of patients who have SWHSI, the duration of SWHSI, their surgical aetiology, treatment and management. This lack of information limits our understanding of the clinical and service requirements of this patient population [7,8] and also makes programmes of research difficult to prioritise, plan and implement.

We therefore conducted a cross-sectional survey in order to provide this information about SWHSI, which aimed to determine:

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- i) The characteristics of patients with SWHSI;
- ii) The number and prevalence of patients with SWHSI and the setting in which their wound care was delivered;
- iii) The proportion of SWHSI, which were intentional or resulted from dehiscence of a wound closed primarily;
- iv) The surgery that preceded the SWHSI (e.g. elective vs. emergency, surgical specialty and surgical procedure) and
- v) The duration of SWHSI and the types of treatments patients received for SWHSI.

2. Methods

This cross-sectional survey was conducted during a two-week period in community, primary and secondary care settings within Hull and East Riding of Yorkshire, UK.

2.1. Inclusion and exclusion criteria

Data were collected on patients aged 18 years and older, with at least one SWHSI being treated within Hull and East Riding. A SWHSI was defined as any wound resulting from a surgical incision, which was healing by secondary intention (a fully or partially open surgical wound healing from the bottom upwards) and where the fully or partially open nature of the wound necessitates its treatment.

This definition included patients with:

- i) wounds that had been left open due to contamination, swelling, infection or insufficient tissue to close the wound;
- ii) wounds that had been closed following surgery, but had partially or completely dehisced and
- iii) open wounds resulting from surgical debridement, even if these were non-surgical in origin prior to surgery (e.g. surgical debridement of a grade III/IV pressure ulcer).

Patients with the following wounds were excluded from this survey:

- i) closed wounds healing by primary intention or with delayed primary closure;
- ii) SWHSI which were surgically closed;
- iii) stoma;
- iii) split skin donor graft sites, nail avulsions or sockets resulting from dental extractions;
- iv) surgery which did not involve an incision on the skin surface (e.g. tonsillectomy, dilation and curettage);
- v) wounds resulting from operations involving the eyeball (i.e. cataract surgery and removal of the eyeball) and
- vi) wounds resulting from minor dermatology, plastics or diagnostic procedures.

2.2. Data collection

Data collection forms were distributed to health care providers treating patients with SWHSI and working within community, primary and secondary care settings. During the survey period, health care providers completed one form for each eligible patient on their caseload. Only those health care providers who were treating patients with SWHSI were requested to respond. Postage-paid pre-addressed envelopes were provided for the return of forms.

Patients could be at any stage of their wound treatment and be treated in any primary, secondary or community care setting (e.g.

in-patient hospital stay, out-patient clinic, community treatment centre, home visit, General Practitioner (GP) surgery) within the survey geographical area. Data collection forms included 18 questions regarding the job title of the health care provider, the patient and clinical details of their wound. Forms were designed and piloted in collaboration with Vascular and Tissue Viability Nurses located within Hull.

If a patient had more than one SWHSI, data were collected on the wound the health care provider considered to be the largest. Wound duration was defined as the length of time (in days) which had elapsed since: i) the surgical intervention which resulted in the planned SWHSI, ii) the closed wound had spontaneously either fully or partially dehisced, or iii) the primarily closed surgical wound had been re-opened and left to heal by secondary intention. The time to healing of wounds was not able to be assessed due to the cross-sectional nature of this survey.

All data were collected from routine data sources, i.e. patient's case notes or electronic sources such as SystmOne: both sources contain information about patient clinical details and treatments received. Data were collected away from the patient and no wounds were inspected for the purpose of the survey. To ensure patient confidentiality, no patient identifiable data were collected and the patients' current health care provider recorded all data.

To ensure the highest possible response rate for the return of forms from health care providers, a number of awareness raising methods and follow-up systems were employed.

Key senior nursing personnel were appointed to coordinate the study within each Trust and to inform relevant health care professionals of the survey. The Local Research Network publicised the survey via newsletters, flyers and verbally at relevant meetings. The survey was advertised at local Trust Committee meetings, nurse meetings in the area (senior nurse days, Tissue Viability group meetings, District Nursing team meetings, Team Leader meetings, Link nurse meetings) and flyers were mailed out to practice nurses at GP surgeries.

Once the survey was underway, follow-up contact included postal and email reminders to relevant staff. Additionally, a vascular research nurse (AO) made reminder telephone calls to treatment rooms and District Nursing Offices to remind them to check for eligible patients. Visits were also made to each GP practice within the area. The research nurse was also available to complete data capture forms for those unable to do so (due to heavy workloads).

2.3. Research approvals

The Research Ethics Committee (REC) advised that this survey did not require review as it was considered to be "Research limited to secondary use of information previously collected in the course of normal care (without an intention to use it for research at the time of collection), provided that the patients or service users are not identifiable to the research team carrying out the research" (National Research Ethics Service, 2011, p4 [9]). Approval for the survey was obtained from the appropriate NHS trusts and the Governance Committee of the coordinating centres Higher Educational Institution.

2.4. Data analysis

Duplicate cases were identified using patients age and ethnicity, and wound characteristics. Forms identified as duplicates were removed from the analysed dataset.

Data analyses were performed using IBM SPSS Statistics v21 (International Business Machines Corporation, Armonk, New York, USA). Categorical variables were summarised as a frequency (*n*) and proportion (%). Continuous variables were summarised

descriptively by the median and 95% confidence interval (95% CI) and minimum to maximum. No formal statistical analyses were conducted and no techniques were employed to deal with missing data.

We calculated the point prevalence of SWHSI using data from the 2011 census (the usual resident regional population aged 20 years and older) as the denominator [10].

A Consultant Vascular Surgeon (IC) and AO reviewed data outside of any named categories (i.e. data reported as 'other') to determine whether such data could be reclassified into one of the pre-existing categories. Therefore, data recorded as 'other' in questions pertaining to the job title of the health care provider, patient current treatment location and surgical speciality, which led to the SWHSI, were reclassified in this way.

3. Results

Within a two-week survey period, 200 forms were completed. Of these, 13 were excluded as they either did not fulfil the inclusion criteria ($n = 9$) or were considered to be duplicate cases ($n = 4$). Therefore, data from 187 patients with at least one SWHSI were analysed. The majority of responders were Community or District nurses (Table 1).

3.1. Study population

Using data from this survey, the point prevalence of SWHSI in the study region can be estimated as 0.41 per 1000 [187/(455842/1000)], (95% CI = 0.35 to 0.47 per 1000).

Patient demographics are shown in Table 2. 62% of the study population were men and the median age was 58.0 years. Twice as many patients with SWHSI were being treated in a community rather than a secondary care setting (Table 3). Almost half of SWHSI (89/187, 47.6%) were planned to heal by secondary intention and 77/187 (41.2%) were fully or partially dehisced SWHSI (Table 4). For dehisced wounds, the median time between surgery and wound breakdown was 9.0 (95% CI = 7 to 10) days. An equal number of wounds dehisced in the hospital (28/77, 36.4%) and community (28/77, 36.4%) settings. Approximately one third of patients (52/187, 27.8%) were receiving antibiotic therapy in relation to their SWHSI.

3.2. Wound duration at time of survey

The overall median duration of SWHSI at the time of the survey was 28.0 (95% CI = 21 to 35) days. Fully dehisced SWHSI had the longest median duration (35.0, 95% CI = 15–150 days). SWHSI of the longest duration were being treated within primary care and the community settings (Table 5).

Table 1

Job title of health care provider who completed the survey data collection form ($n = 187$).

Job title	<i>n</i>	%
Community or District Nurse	77	41.2
Research nurse	44	23.5
Treatment room nurse	18	9.6
Practice nurse	10	5.3
Student nurse	1	0.5
Hospital-based nurse (ward)	6	3.2
Hospital-based nurse (wound clinic)	15	8.0
Podiatrist	4	2.1
Nurse practitioner	1	0.5
Missing	11	5.9

3.3. Wounds by surgical speciality

The most common surgical specialities associated with SWHSI were colorectal, plastics and vascular surgery (Table 6). Wounds that were planned to heal by secondary intention accounted for nearly two-thirds of SWHSI in colorectal (51/80, 63.8%) and vascular (14/22, 63.6%). Forty-three different surgical procedures preceded the development of a SWHSI, the most common being surgery for pilonidal sinuses (28/187, 15.0%), lower limb amputations (19/187, 10.2%), laparotomy with bowel resections (19/187, 10.2%), excisions of skin lesions or cancer (11/187, 5.9%), debridement with or without washout (11/187, 5.9%), incision and drainage of abscesses (10/187, 5.3%) and surgery for perianal abscesses (10/187, 5.3%).

3.4. Treatments

Most (184/187, 98.4%) patients were reported as receiving a treatment for their wound. Of these, 181/184 (98.4%) patients were receiving one single type of treatment. The majority (169/181, 93.4%) were receiving dressings whilst 11/181 (6.1%) patients were receiving negative pressure wound therapy; 10 were being treated in an acute setting and one in a community setting. One patient (major amputation, planned to heal by secondary intention) (1/187, 0.5%) was receiving larval therapy.

4. Discussion

We have successfully collected data on patients receiving treatment for SWHSI from a large geographical area within the UK (total population of 590,585 within an area of 2550 km²). This is the first study in the international literature that characterises SWHSI patients and was stimulated by a basic absence of information. This study provides important data on patient demographics, number, duration, surgical and clinical details and treatment of SWHSI.

The prevalence of SWHSI in this survey is similar to that reported previously. The prevalence of SWHSI wounds in Bradford was reported to be 0.47 per 1000 (231 open, dehisced and post-surgical breakdown wounds/487975 population) [5] and in Hull and East Yorkshire 0.36 per 1000 (210 open and dehisced wounds/590000 population) [4]. A survey of complex wounds in Leeds reports a lower prevalence of SWHSI and dehisced wounds, 0.21 per 1000, 95% CI = 0.18 to 0.24 (156 dehisced wounds and SWHSI/751,485 population) [11]. This may be due to different wound classifications used between studies, or may reflect real geographical differences in the prevalence of SWHSI.

The majority (95.2%) of patients identified in this survey were white British, which is fairly representative of the reported local ethnic distribution as of March 2011 (89.7% white British [12]). SWHSI were more common in men than women, which may simply reflect a higher incidence of SWHSI associated surgical conditions (e.g. pilonidal sinus and non reconstructable critical lower limb ischaemia) in men [13–16].

Men also have a higher predisposition to developing a surgical site infection [17], which may lead to wound dehiscence. Whilst a number of risk factors, including infection, contribute to wound dehiscence [18–20], it is not possible to determine definitive causative factors for wound dehiscence within this study and further research is required to explore this.

There were slightly more SWHSI which were planned to heal by secondary intention compared to those which had dehisced. This finding may be due to a greater amount of surgeries such as pilonidal sinuses, amputations, bowel resections and excisions which result in clean contaminated wounds that have a higher probability of being intentionally left to heal by secondary intention.

Table 2
Patient demographics.

Gender	
Male (n)	116/187 (62.0%)
Female (n)	62/187 (33.2%)
Missing (n)	9/187 (4.8%)
Age (years)	
Median (95% CI)	58.0 (55–61)
Minimum - maximum	19.0–90.0
Missing (n)	3/187 (1.6%)
Ethnicity	
White British	(n = 178, 95.2%)
Asian Indian, Asian Other, Black other, Other mixed background, White other, White and Asian and Not specified	(n = 7, 3.7%)
Missing	2/187 (1.1%)
Number of SWHSI per patient	
1	164/187 (87.7%)
2	16/187 (8.6%)
3	4/187 (2.1%)
4	1/187 (0.5%)
Missing	2/187 (1.1%)

Table 5

Duration of surgical wounds healing by secondary intention within different patient treatment settings.

Wound duration ^a (days)	Treatment setting		
	Community	Secondary care	Primary care
n	89/109	56/56	7/8
Median (95% CI)	35.0 (28–56)	14.5 (6–21)	112.0 (21–469)
Minimum to maximum	1–560	1–238	21–896
Missing n (%)	20 (18.3)	0 (0)	1 (12.5)

^a Wound duration refers to the number of days elapsed between formation of the SWHSI and survey data collection.

acute setting. This reflects the arrangement of wound care within Hull and East Riding where patients with non-healing SWHSI are treated primarily within the community.

The cross-sectional nature of this survey meant we were unable to record time to healing, but the median duration of SWHSI was approximately one month and a small proportion (5/161, 3.1%) of SWHSI had been present for more than one year. Other prevalence studies do not report the duration of SWHSI [4,5] and time to healing data for SWHSI are sparse. Data from randomised controlled trials of treatments for SWHSI report median times to healing for pilonidal sinus as 66 (range 43–106) [21] and 68 (range 33–168 days) [22] days and 54 days for abdominal wounds [23].

Data from this survey can be used to inform the design of future research studies. Information on the care settings where SWHSI are likely to be encountered and common surgical specialties (within secondary care) which lead to SWHSI is useful for targeting patient recruitment. The number of patients captured during this survey period provides an approximation of potential recruitment rates. Data on SWHSI duration can be used to estimate how long patients in the cohort study need to be followed-up for in order to capture healing events. This survey also highlights areas for more detailed data collection e.g. the types of dressings patients with SWHSI receive.

There are some cautions with regards to the interpretation of data from this study. We deemed it appropriate to use a purposive, rather than random, sampling technique; thus the target population of health care professionals was pre-defined and the geographical area where the survey was conducted was restricted. It is possible that data from this survey may not provide generalisable information on patients with SWHSI [24,25]. However, our methodology is similar to that used in other wound prevalence surveys [4,5,11].

Table 3
Setting and treatment location where patients were being treated during the survey.

Setting	Treatment location	n
Community (n = 109, 58.3%)	Community clinic	51
	Own/another's home	48
	Podiatry clinic	4
	Day hospital	5
	Nursing/care home	1
Secondary care (n = 56, 29.9%)	Castle Hill Hospital outpatient	16
	Castle Hill Hospital Ward	20
	Hull Royal Infirmary Hospital Ward	16
	Hull Royal Infirmary outpatient	4
Primary care (n = 8, 4.3%)	GP practice	8
Other (n = 2, 1.1%)	Spire	1
	York District	1
Missing (n = 12, 6.4%)		

In this survey, there were a greater number of patients with SWHSI being treated within the community and these wounds were of longer duration compared to those being treated in an

Table 4
Patient treatment setting and wound duration classified according to wound category.

Treatment setting	Wound category							Total (n)
	Planned SWHSI	Partially dehisced ^a	Fully dehisced ^a	Surgically opened ^a	Other ^b	Not known	Missing	
Community	58	24	20	1	1	4	1	109
Secondary care	18	25	3	3	4	1	2	56
Primary care	5	1	1	1	–	–	–	8
Other	1	1	–	–	–	–	–	2
Missing	7	1	1	1	1	–	1	12
Total	89	52	25	6	6	5	4	187
Wound duration^c (days)								Overall
n	72/89	47/52	21/25	6/6	6/6	5/5	4/4	161/187
Median (95% CI)	28.0 (20–35)	26.0 (14–35)	35.0 (15–150)	21.5 (1–84)	34.5 (1–84)	35.0 (0–189)	47.5 (28–70)	28.0 [21–35]
Minimum - maximum	1–546	1–896	9–560	1–112	1–105	2–189	28–70	1–896

Key: 95% CI = 95% Confidence Interval.

^a These wounds were initially surgically closed before they dehisced or were surgically opened to become surgical wounds healing by secondary intention.^b Other details: Pressure sore requiring surgical debridement (n = 2) and n = 1 for each of the following: sutures removed in outpatient department and wound now left open to heal by secondary intention; skin graft which did not take; non-healing wound; necrotising fasciitis requiring surgical debridement.^c Wound duration refers to the number of days elapsed between formation of the SWHSI and survey data collection.

Table 6
Surgical wound healing by secondary intention categories according to type of surgical speciality.

Surgical speciality	Wound category						Total (n)	
	Planned (n)	Partially dehisced ^a (n)	Fully dehisced ^a (n)	Surgically opened ^a (n)	Other (n)	Not known (n)		Missing (n)
Colorectal	51	16	8	1	1	2	1	80
Plastics	5	10	5	–	4	–	–	24
Vascular	14	3	4	–	–	1	–	22
Orthopaedic	4	3	2	2	–	1	2	14
Upper GI	2	7	2	1	–	–	1	13
Cardiothoracic	2	6	–	1	–	1	–	10
Urology	–	3	3	–	–	–	–	6
Obstetrics and Gynaecology	2	2	–	1	–	–	–	5
Other ^b	5	–	1	–	–	–	–	6
Breast	–	2	–	–	–	–	–	2
Missing	4	–	–	–	1	–	–	5

^a These wounds were initially surgically closed before they dehisced or were surgically opened to become surgical wounds healing by secondary intention.

^b Other details: Pressure sore requiring surgical debridement (n = 2) and n = 1 for each of the following: sutures removed in OPD clinic and wound now left open to heal by secondary intention; skin graft which did not take; non-healing wound; necrotising fasciitis requiring surgical debridement.

We were also unable to collect information on the level of non-response to survey questionnaires, thus it is possible the conclusions drawn only represent patients who were under the care of those who responded to the survey. As we relied upon busy health care professionals to identify patients, this may have resulted in an underestimation of the number of eligible patients.

5. Conclusions

In conclusion, we have successfully characterised SWHSI and have been able to describe the characteristics of patients with SWHSI and identified the surgical procedures and surgical specialities which lead to SWHSI. The locations where patients with SWHSI are treated is also described. This information is important in itself and may facilitate the planning of further detailed SWHSI research regarding treatments, outcomes, costs and quality of life of patients.

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