CONSENSUSDOCUMENT

PREVENTION, IDENTIFICATION AND MANAGEMENT OF **SURGICAL WOUND DEHISCENCE (SWD)**

WOUNDS | UK

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Wounds UK
108 Cannon Street
London EC4N 6EU,UK
Tel: +44 (0)20 3735 8244
www.wounds-uk.com

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Expert panel

Rhidian Morgan-Jones (Chair), Consultant Orthopaedic Surgeon & Revision Knee Lead, Colchester Hospital, ESNEFT

Fiona Downie, Senior Lecturer, Tissue Viability, Anglia Ruskin University, Cambridge

Caroline Dowsett, Clinical Nurse Specialist Tissue Viability Services, East London NHS Foundation Trust

Jeanette Milne, Associate Director of Nursing Delivery, Northumbria Healthcare NHS Trust

Melissa Rochon, Trust Lead for SSI Surveillance, Research and Innovation, Directorate of Infection, Guy's and St Thomas' NHS Foundation Trust

Heidi Sandoz, Clinical Nurse Specialist Tissue Viability, Hertfordshire Community NHS Trust, Hertfordshire

Andrew Sharpe, Advanced Podiatrist, Wound Care, Salford Care Organisation, Salford

Reviewer

Kylie Sandy-Hodgetts, Associate Professor, Centre for Molecular Medicine & Innovative Therapeutics, Murdoch University; Director, Skin Integrity Research Institute, University of Western Australia; Honorary Senior Lecturer, School of Medicine, Cardiff University

Foreword

Surgical wound dehiscence (SWD) is a serious post-operative complication that affects patients, clinicians, and the wider community (Sandy-Hodgetts et al, 2013). Surgical wound complications (SWCs) in general have been shown to delay healing and result in significant morbidity and mortality, as well as increase demands on clinicians' time with related socioeconomic costs (Sandy-Hodgetts et al, 2020a). The impact of SWD can be substantial: increased mortality, delayed hospital discharge, readmission, further surgery, delayed adjuvant treatment, suboptimal aesthetic outcome and impaired psychosocial wellbeing (Sandy-Hodgetts et al, 2016; WUWHS, 2018).

The impact of SWD is almost certainly underreported and there is a lack of a standard definition for SWD. It is therefore vital to raise awareness and improve early detection, identification, diagnosis, prevention, and management of SWD and associated complications (Sandy-Hodgetts et al, 2020a). While considerable research has been conducted in the field of surgical site infection (SSI), a fundamental shift in mindset that encompasses a broader view of reducing all types of SWCs, including dehiscence, is needed.

Timely and sustained post-operative wound healing has a significant role to play in optimising a patient's post-operative recovery and rehabilitation (Sandy-Hodgetts et al, 2015). In the therapeutic management of the surgical patient, an understanding of the factors that elevate a patient's risk of SWD will guide the most appropriate prophylactic pre-, intra- and post-operative care (WUWHS, 2018). Use of risk assessment tools according to surgical domain is also needed to support clinicians to identify 'at-risk' patients, including patient-related comorbidities, and intra-operative and post-operative risk factors related to SWD (Sandy-Hodgetts et al, 2019).

To review the existing guidance from a UK perspective, a group of experts convened for an online meeting in April 2023 to develop this consensus document, focusing on the prevention, identification, and management of SWD.

This consensus document aims to:

- Review definitions of SWD and the current landscape of surgery and post-surgical wound complications in the UK
- Discuss how international guidance applies to UK practice
- Provide guidance on risk assessment and prevention
- Provide guidance on identifying SWD and assess use of the WUWHS Sandy Grading System
- Focus on management and follow-up.

The overall aim is to examine the current landscape of surgery and post-surgical wound complications in the UK, with the goal of improving patient experiences and outcomes.

Rhidian Morgan-Jones, Chair

What is surgical wound dehiscence?

Table 1. Variations in the definition of surgical wound dehiscence in the literature

Surgery type	Definition
General	• Complete disruption of the wound including the fascia closure after the index operation or by a significant gap between the edges of the fascia necessitating reoperation (Walming et al, 2017) • Separation of the sutured edges of the abdominal fascia after surgery (Ellis, 2010)
Cardiothoracic	• Process of separation of the body sternum, which often is accompanied by medical stinitis (infection of the deep soft tissues; Ryszard and Adam, 2013)
Orthopaedic	• Breaking open of the surgical incision along the stitch (Sazegari et al, 2017)
Vascular	• Wound separation that requires local wound care (McGillicuddy et al, 2016)

Surgical wound dehiscence (SWD) is a surgical wound complication [SWC; Box 1; Table 1] that is varied and multi-dimensional, and a lack of clarity and consistency around its definition exists in the literature (Sandy-Hodgetts et al, 2015; 2020a). It was agreed by the Expert Panel that the definition of SWD differs across the specialties of general, gynaecological, orthopaedic, vascular, and cardiothoracic surgery. To some healthcare professionals, SWD refers to the separation, rupture or splitting open of the margins of a previously closed surgical incision site that has been made in the skin, with or without exposure or protrusion of underlying tissue, organs or implants (WUWHS, 2018). SWD can be minor, occurring at single or multiple regions, or significant, impacting the full length of the wound, affecting some or all tissue layers and exposing internal structures and organs (Wounds UK, 2020a). Dehisced incisions may, or may not, display clinical signs and symptoms of infection, and the patient's treatment pathway will depend on whether the incision site is infected (Sandy-Hodgetts et al, 2013; WUWHS, 2018).

The Expert Panel agreed with the WUWHS (2018) definition of SWD; however, it was noted that this definition needs to consider the individual patient and their risk factors. It was discussed that it is important to differentiate between high- and low-risk patients and that there is a need for a definition of SWD that everyone recognises. Dehisced wounds can be common in obese people, including those with surgical wounds following a caesarean section (C-section; Gillespie et al, 2022).

Dehiscence may be associated with non-infectious causes (e.g. haematoma or seroma), disrupted

Box 1. Surgical wound complications

Surgical wound complication (SWC) is a broad umbrella term encompassing several diagnoses, including surgical wound dehiscence. Other post-operative SWCs include surgical site infection (SSI), seroma, haematoma, delayed healing, poor quality or abnormal scar formation, hypergranulation, periwound maceration, medical adhesive-related skin injury (MARSI) and incision hernia (Sandy-Hodgetts et al, 2020a; Table 2).

healing due to local and systemic factors, patient-related factors (e.g. obesity and diabetes), mechanical stress (e.g. abrupt or vigorous movement, fall, trauma, vomit and coughing spells), or technical factors (e.g. choice of thread, structures in the wound, incision and suture technique; Sandy-Hodgetts et al, 2013; 2018; WUWHS, 2018; Gomes et al, 2020). The Expert Panel agreed that dehisced wounds due to mechanical force tend to be less complicated and close more easily. There was a consensus that pre-operative measures (e.g. limb optimisation and management of oedema) can affect outcomes and occurrence of SWD, and that there needs to be emphasis on good closure technique among surgeons and surgical assistants – e.g. suturing and knotting, achieving 'good apposition' and closure of deep skin layers (Blencowe et al, 2019). Modern sutures can include anti-bacterial coatings and barbed filaments to minimise the need for irritant knots both deep and superficially. Both these innovations have the potential to reduce SWCs.

Other SWCs include wound/tissue loss and ischaemia. Where a significant amount of tissue is

Table 2. Surgical wound complications (Sandy-Hodgetts et al, 2020a; 2022)	
Type	**Definition**
Seroma	A common postoperative complication that refers to the abnormal collection of serous fluid that forms under the skin (Kazzam and Ng, 2022)
Haematoma	A collection of blood vessels in an extravascular space (Shikhman and Tuma, 2022)
Abnormal scar formation	Refers to the keloid and hypertrophic scars that develop as a result of aberrant wound healing (Grabowski et al, 2020)
Hypergranulation	Refers to the excess of granulation tissue that fills the wound bed and overgrows beyond the wound surface (Jaeger et al, 2016)
Periwound maceration	Refers to the softening and breaking down of skin as a result of prolonged exposure to moisture (Haryanto et al, 2017)
Medical adhesive-related skin injury	Refers to the occurrence of erythema and/or manifestation of another cutaneous abnormality (Wei et al, 2023)
Incisional hernia	A common complication of laparotomy incisions that refer to the abdominal wall hernia at the site of a previous surgical incision (Hope and Tuma, 2023)

lost or damaged during surgery, this is referred to as wound/tissue loss. Ischaemia is a severe condition in which the tissue experience inadequate perfusion, in which blood supply (including oxygen) to organs and tissues in interrupted and reduced (Zamorano et al, 2021). Ischaemia can occur as a result of improper technique or closure design (e.g. increased tension), inadequate haemostasis or infection (Delaney et al, 2011). Like SWD, tissue/wound loss and ischaemia require early detection and appropriate management to ensure healing is optimised and the risk of future complications is minimised.

The scope of the problem

Although most surgical wounds heal without complications or delay, some can be non-healing and present further complications, affecting clinical outcomes and patient quality of life. Therefore, raising awareness and improving identification, prevention, and management of SWD may help to save on patient distress, clinician time and associated costs. Moreover, surgical wound recommendations have noted that sub-optimal management of SWCs may at least partially be due to unwarranted variation of care, with under-use of evidence-based practice, over-use of therapies for which there is insufficient evidence and inadequate surveillance systems (Gray et al, 2018).

SWD risks, rates and potential severity will vary according to surgical discipline – e.g. orthopaedic surgery with metalwork may differ to other types of surgery. There is considerable variation in SWD rates and current estimates are 0.4–41.8% depending on surgical domain (WUWHS, 2018). A trend exists for earlier discharge of patients from hospital and reduced length of stay, meaning that SWD is more likely to occur in the community and may not be captured in hospital-based surveillance studies (WUWHS, 2018). Likewise, cases of SWD are unlikely to be reported by patients or clinicians, if it is considered to be minor.

In addition, a study of the annual costs to the National Health Service (NHS) of caring for surgical wounds in a primary care setting reported that surgical wounds were the most costly, and accounted for about 18.9–21.8% of total expenditure on wound care (Guest et al, 2017). However, a potential underreporting of SWD has been suggested (Sandy-Hodgetts et al, 2015) and healthcare costs associated with dehiscence are poorly reported globally (Sandy-Hodgetts et al, 2016).

There is a need for joined-up, integrated care and improved communication, especially between surgical and community settings to improve quality of care and deliver better outcomes (Sandy-Hodgetts et al, 2020a). Anecdotal evidence suggests that referral back to surgery can be difficult and there can be delayed communication between surgical and community care teams. In addition, many clinicians dealing with surgical

wounds (e.g. midwives and health visitors) receive little training and do not fully understand SWD or how to manage it. Therefore, there is a need for basic education of all healthcare professionals on the importance of wound healing.

Patients also need to be educated and transitioned from being passive recipients of care to active participants wherever possible. Patients can be empowered through education and information-sharing, ensuring that they are involved in their own care and feel comfortable to approach and inform their clinician of potential issues (WUWHS, 2020). Clinicians need to educate patients on identifying the signs and symptoms of a potential complication, which will help build a strong therapeutic relationship to prevent further fear and anxiety around self-care of the patient's acute wound. Where a patient lives in a rural area and has to travel long distances to the clinic, use of telemedicine can be deployed. Ultimately, clinicians and patients need to work in partnership to develop surgical wound management goals that accurately reflect the cultural and environmental factors that can influence the patient's healing.

Surveillance for surgical wound complications

There is a wealth of evidence to suggest that surveillance and data collection is essential to drive good clinical practice (Wilson, 2013; Sandy-Hodgetts et al, 2020a). However, active and prospective surveillance can be difficult to conduct in practice since data collection is a resource-heavy activity, and SWD is a severely underreported problem. In the UK, SWCs are only reported if there is an infection (and infection is not always reported); therefore, the true cost of SWD to the patient, clinician and wider healthcare organisation may be grossly underestimated.

Surveillance is good in the short term (e.g. during a patient's stay in hospital), but it often takes longer for SWD to develop, so tracking can become more complicated. The burden of non-healing wounds in the community is substantial (Dowsett et al, 2017), and a need exists for decreasing length of hospital stays, as well as earlier discharge from inpatient settings (WUWHS, 2018). As a result, SWD is increasingly likely to occur in the community, and for the majority of patients, dehiscence occurs following discharge from hospital (Sandy-Hodgetts et al, 2016; Hughes et al, 2021). Earlier discharge from hospital may mean that these wounds fail to be captured in hospital-based surveillance data. Dehisced wounds may or may not show signs of infection on assessment, leading to low report rates as dehiscence is missed by clinicians working in the community (WUWHS, 2018). Complications also tend to develop after the surveillance period and these are often 'lost' to follow-up.

It is frequently the case that the main problem is not so much SSI but instead dehiscence. 'Minor' dehiscence is often not considered serious but can be a portal for infection – thus increasing the risk of SSI and other complications. Moreover, anecdotal evidence suggests that in situations where SSI rates look low, complication rates may still be high – e.g. seroma and haematoma.

Data collection on SWD via prospective, active surveillance by trained personnel is the gold standard. In an ideal world, all data would be captured, so that outcomes from similar surgeries or types of surgeries can be compared (Wounds International, 2023). Where it isn't possible to conduct active surveillance by trained personnel, coding is essential to capture data accurately. The NHS ideal is that data is captured secondary to operational practice (Fletcher et al, 2021), so clinicians need to record incidence of SWCs in a way that can be coded by coders (in acute settings) or use terminology that can be extracted by data analysts. Any clinical language used should mirror the nationally recognised codes that 'coders' are familiar with [Table 3] – the codes in this table are only used by acute setting in the UK, so it is recommended to use Systematized Nomenclature of Medicine Clinical Terms for electronic patient records (SNOMED; NHS Digital, 2023). Furthermore, there is a need for acute and community reporting that is joined-up and can be identified at a patient level. This is especially true if patients are discharged from one trust to another for follow-up care.

It was discussed by the Expert Panel that since

Table 3. ICD-10 and ICD-11 codes for surgical wound complications	
ICD-10	**ICD-11**
T81.3 Wound dehiscence • Disruption of external operation (surgical) wound • NEC: dehiscence of amputation stump (T87.81) • Dehiscence of operation wound NOS • Disruption of operation wound NOS • Disruption or dehiscence of closure of cornea • Disruption or dehiscence of closure of mucosa • Disruption or dehiscence of closure of skin and subcutaneous tissue • Full-thickness skin disruption or dehiscence • Superficial disruption or dehiscence of operation wound **T81.40 to T81.43** Infection following a procedure, not elsewhere classified in ICD-10 guidelines **T81.44** Sepsis following a procedure or sepsis **O86.0** Infected caesarean section wound or perineal repair following delivery **Y95.X** A hospital-acquired (nosocomial) disease or complication	**NE81.1** Disruption of operational wound, dehiscence of operation wound not elsewhere classified **JB44.1** Wound dehiscence, perineal obstetric wound **JB44.0** Wound dehiscence of caesarean section **NE81.2** Surgical site infection • NE81.20 Superficial incisional site infection • NE81.21 Deep incisional site infection • NE81.22 Organ or organ space surgical site infection • JB40.1 Infection of obstetric surgical wound **NE81.2Y** Other specified surgical site infection **NE81.2Z** Surgical site infection, unspecified

minor dehiscence often affects a small area and does not usually require referral to a specialist, it is unlikely to be captured robustly. The group also agreed that it is not clinically appropriate to use lots of resources to report minor dehiscence. It was discussed that surveillance of minor dehiscence does not need to be escalated, as it should easily be treated by clinicians who may already have access to more advanced therapies to actively and appropriately treat the wound. Therefore, it was discussed that there is a 'so what' factor, and that there is an ongoing need to communicate the importance of conducting surveillance to clinicians. The Expert Panel suggested that data on SWD should be locally decided in regard to what is required – e.g. dehiscence requiring (i) additional wound closure material, such as re-suturing, (ii) negative pressure wound therapy (NPWT), (iii) admission and (iv) return to theatre. Furthermore, it was discussed by the group that before starting surveillance for SWD, an audit is needed to establish baseline data to support the business case for surveillance.

Systematic post-discharge surveillance programmes are vital to promote consistency in the patient care journey from surgery to community (Wounds International, 2023). For example, the notion of wound management digital systems (WMDS) has been developed, which allow for easy data capture. WMDS aim to provide a single long-term record of all wound-related events in community and hospital care settings and can be used to measure staff activity and product use, store patient details and wound information (NWCSP, 2021a).

Guidance for practice

A lot of useful international guidance exists, but there is a need for specific guidance/model for UK practice [Table 4]. There is also often a difference between healthcare systems and the resources available.

Enhanced Recovery After Surgery (ERAS)

Enhanced Recovery After Surgery (ERAS) protocols aim to optimise patients before, during and after surgery and can lead to improvements in clinical outcomes. They are patient-centred and evidence-based peri-operative care pathways designed to achieve early recovery following surgery and have been developed for a range of surgical specialties (ERAS Society, 2023). Informed patient consent needs to be obtained, and realistic medicines should be prescribed. Other key elements of ERAS protocols include pre-operative counselling, optimisation of nutrition, standardised analgesic and anaesthetic regimens and early mobilisation.

UK-specific guidance

Challenges in post-surgical care that are specific to the UK exist, and this can make applying international guidance to the UK difficult. In the UK, staff shortages are currently a problem (particularly among medics, operating department practitioners, occupational therapists and nurses), which relate to recruitment and retention and other operational pressures following the after-effects of the COVID-19 pandemic (Wounds UK, 2022). Issues with staffing have also had an impact on training and development. As a result, staff are so busy that assessment is a challenge and pathways cannot always be followed. It is evident that appropriate product selection and knowledge is needed, but it can be difficult for organisations to obtain some products, and even skin cleansers.

Table 4. International guidance available

Organisation	Guideline	Year	Notes
World Health Organization (WHO)	Global guidelines on the prevention of surgical site infection, 2nd ed.	2018	Surgical site infection focus
International Surgical Wound Complications Advisory Panel (ISWCAP)	International best practice recommendations for the early identification and prevention of surgical wound complications	2020	Surgical wound complications focus
International Surgical Wound Complications Advisory Panel (ISWCAP)	Optimising prevention of surgical wound complications: detection, diagnosis, surveillance and prediction	2022	Surgical wound complications focus
World Union of Wound Healing Societies (WUWHS)	Surgical wound dehiscence: Improving prevention and outcomes	2018	Surgical wound dehiscence focus

National Wound Care Strategy Programme

It is important that any England-specific guidance introduced on preventing, identifying and managing SWD is aligned with the aims of the National Wound Care Strategy Programme (NWCSP, 2021b) to improve patient outcomes. Wounds dehisce for a wide range of reasons, and it is evident that there is a need to move away from focusing solely or more heavily on SSI prevention. Therefore, at the time of writing, clinical recommendations from the NWCSP are currently being redrafted considering a change of focus to SWCs, to improve care of surgical wounds by:

- Improving the knowledge and skills of the workforce, patients and carers to recognise the early signs of surgical wound complications and take appropriate care
- Improving the clinical pathway between the surgical team and other providers of care following discharge from hospital
- Improving data and information to inform and sustain quality improvements.

Many of the current challenges in reporting infection rates are related to data that is not comprehensively or routinely collected in a standardised way, which affects both primary and community care. There is also a need to find less time-consuming ways of collecting data and publishing information in a timely manner.

Early intervention

The work conducted by the International Surgical Wound Complications Advisory Panel (ISWCAP) team states that accurate identification and early intervention of SWD is critical. To mitigate the impact of SWCs on patients, clinicians and healthcare systems, the focus is on prevention,

and where this is not possible, early identification to prevent any SWCs from escalating into a more serious issue. Early intervention should be facilitated through a comprehensive assessment of the wound bed to detect signs of infection, necrotic tissue and inflammation – e.g. oedema (Sandy-Hodgetts et al, 2017a). Where infection is suspected, antibiotics need to be prescribed if considered appropriate.

Early intervention can also take place through identification of level of risk (preoperative and intraoperative risk assessment) and monitoring the patient's wound in the post-discharge period (Sandy-Hodgetts et al, 2022). By taking these steps, clinicians can ensure that patients receive accurate and timely treatment to prevent escalation of severity and deterioration.

Antimicrobial stewardship

There is a misconception that SWC is synonymous with infection (WUWHS, 2018) which leads to misuse and overuse of antimicrobial agents, and subsequent resistance. Although pre-operative antibiotics are often given as part of care bundles to certain patients undergoing specific surgeries, anecdotal evidence suggests that some patients are also given prophylactic antibiotics 'just in case' that are usually not necessary; therefore, use of antibiotics needs to be considered on a case-by-case basis. The most important cause of increasing antibiotic resistance is the selection of resistant bacterial strains, as a result of widespread and indiscriminate antibiotic prescribing by clinicians (Peterson and Kaur, 2018). When antibiotics are used in non-infected wounds, selective pressures are exerted on the bacterial population, which favours the survival and multiplication of resistant strains of bacteria. This leads to the emergence of resistant bacteria that can be difficult or even impossible to treat (Davies and Davies, 2010).

It is also important for clinicians to follow strict infection prevention and control measures, and to avoid unnecessary hospital stays before or after surgery, to avoid exposing patients to the risk of hospital infection (Anderson, 2018; Figure 1). Moreover, an antimicrobial stewardship (AMS)-based approach, which includes optimal selection, dosage, and duration of antimicrobial treatment, needs to be used to combat the growing problem of antimicrobial resistance (AMR).

While there is no universally accepted way of identifying wound infection, various tools exist; however, it was shared by the Expert Panel that tools are missing to help clinicians identify infection at the bedside. Current AMS to reduce unnecessary antimicrobial use in wound management includes accurate identification of wound infection and simple infection prevention strategies (e.g. good hand hygiene, waste management, comprehensive documentation and management of the patient environment; Wounds UK, 2020b).

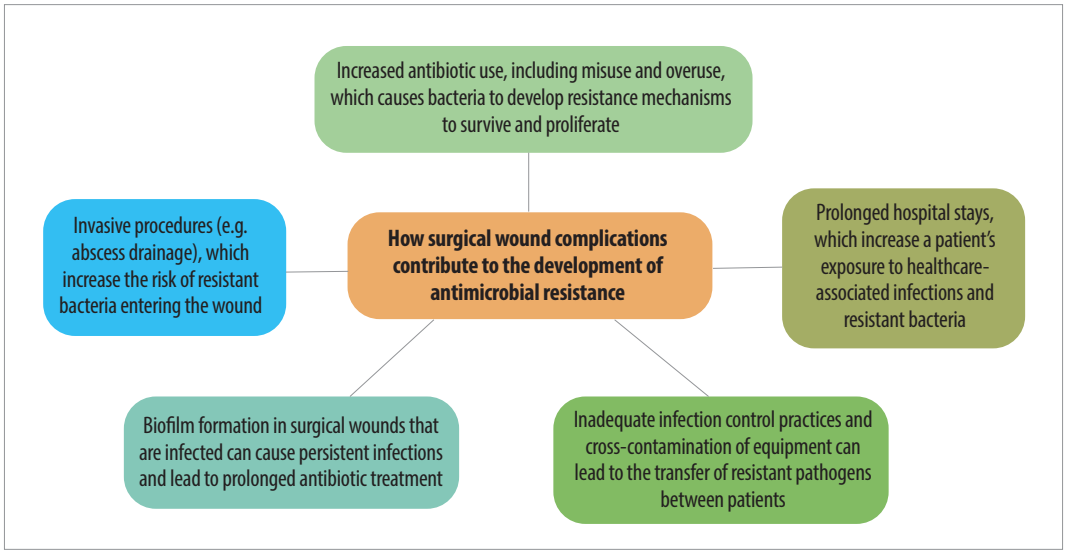

Figure 1: Impact of surgical wound complications on antimicrobial resistance.

Risk assessment and prevention

Two types of surgery exist depending on the patient and their circumstances – elective and emergency. Where surgery is planned, pre-operative consultations provide a useful opportunity for thorough risk assessment that can be used to plan risk reduction for patient-related modifiable risk factors (e.g. high body mass index [BMI] and smoking; WUWHS, 2018). In contrast, opportunities for discussion of risk levels may be limited with emergency surgery, which of itself increases a patient's risk of complications.

The fundamental premise of risk assessment is to consider each individual patient's unique circumstances and characteristics (Sandy-Hodgetts et al, 2023; SSERA Group, 2023). There is widespread agreement that standardised assessment tools play an important role in guiding risk reduction, and better planning in high-risk patients can reduce risk, and result in better outcomes.

Addressing SSI or SWC risk also means, as clinicians, being able to tell patients/families that we have done all we can – optimising the patient while making them aware of risk. Additionally, risk assessment and planning need to be integrated throughout all stages of the surgical journey, as risk factors can be identified at pre-operative assessment, in the operating room and post-operatively (Sandy-Hodgetts et al, 2020a). Importantly, reported risk and rates for infection vary in the literature and are not always correct, due to inaccuracies around long-term SSI surveillance; therefore, risk needs to be tailored to the individual patient.

Pre-operative planning

Optimisation pre-surgery is key – for elective surgeries, robust prognostic tools can be used to identify whether surgery would lead to an unacceptably high risk of SSI. This may provide a rationale for delaying or postponing surgery until such time that the patient has modified risk factors to reduce the likely risk of SWD (for example, comorbidities or lifestyle issues have been addressed). Intrinsic (patient-related) and extrinsic (procedure-related) factors are listed in Box 2, and the American Society of Anaesthesiologists (ASA) physical status classification system is described in Box 3.

Box 2. Intrinsic and extrinsic risk factors

Intrinsic (patient-related factors)

- Age
- Gender
- Functional dependence
- American Society of Anesthesiologists (ASA) score
- Mental health
- Smoking
- Substance use
- Diabetes
- Obesity
- BMI
- Malnutrition
- Prior surgery at infected site (Sandy-Hodgetts et al, 2019)
- Oedema
- Infection

Extrinsic (procedure-related factors)

- Procedure planning
- Duration of surgery
- Pre-operative length of hospital stay
- Wound classification
- Surgical urgency

Box 3. ASA physical status classification system

The American Society of Anaesthesiologists (ASA) physical status classification system:

ASA I A normal healthy patient
ASA II A patient with mild systemic disease
ASA III A patient with severe systemic disease
ASA IV A patient with severe systemic disease that is a constant threat to life
ASA V A moribund patient who is not expected to survive without the operation
ASA VI A declared brain-dead patient whose organs are being removed for donor purposes

Risk factors can be modifiable (e.g. stress, smoking, inappropriate alcohol consumption, malnutrition, obesity, diabetes, cardiovascular disease and lack of physical exercise) and non-modifiable (e.g. genetic diseases, age and previous injury; Avishai et al, 2017; Sandy-Hodgetts et al, 2018). While patient categorisation (e.g. major/moderate minor risk categories; Table 5) may be useful to a degree,

Table 5. Main general risk factors for SWD (WUWHS, 2018)

Category of risk factor	Patient-related modifiable risk factors	Pre-operative risk factors	Intra-operative risk factors	Post-operative risk factors
Major	• BMI ≥35.0kg/m^2 • Diabetes mellitus • Current or recent smoking	• Emergency surgery • Age >65 years	• Extended duration of surgery • Inadequate surgical closure • Peri-operative hypothermia*	• Wound infection (SSI)
Moderate	• COPD‡ • Malnutrition: hypoalbuminemia (serum albumin <3.0g/dl) • Anaemia • BMI 30.0–35.0kg/m^2 • Alcohol abuse	• Male gender • ASA Physical Status ≥2 • Previous dehiscence/ wound healing problems • Immunosuppression • Long-term steroid use • Malignant disease • Chemotherapy • Radiotherapy • Uraemia • Peripheral vascular disease • Suboptimal timing or omission of prophylactic antibiotics*	• Blood transfusion • Junior surgeon • High wound tension closure • Tissue trauma/ large area of dissection and/ or undermining	• Failure to wean from ventilator • One or more complication other than dehiscence • Premature suture removal
Minor	• BMI 25.0–29.9kg/m^2 • Congestive cardiac failure • Cardiovascular disease	• Extended pre-operative hospitalisation or residency in a nursing home*	• Failure to obliterate dead space	• Trauma across incision
Rare		• Alpha-1 antitrypsin deficiency • Ehler-Danlos syndrome • Behçet's disease • Bleeding disorders*		

‡ May be a risk factor in different types of surgery for different reasons, e.g. because of coughing in abdominal surgery and sternotomy and because of the adverse effects of chronic disease on wound healing in all types of surgery *These are risk factors for SSI or other surgical wound complications, e.g. haematoma and seroma, that may be associated with SWD. Other factors listed in the table have been reported to be associated with SWD specifically
ASA: American Society of Anesthesiologists; COPD: chronic obstructive pulmonary disease; SSI: surgical site infection

the move to individual assessment of personal risk factors should allow patients optimisation and improved care.

Patient support and education

Clinicians need to be realistic with patients about what their surgery will entail and how recovery will be different based on their individual risk factors and lifestyle choices. Conversations about expectations post-surgery can be difficult, but including patients in treatment plans may help. The clinician needs to consider individual patient capacity and what support the patient has available at home. Clinicians also need to be careful of the language they use and adapt tools to be patient-friendly where necessary. Post-operatively, advice and guidance should be given to patients on appropriate levels of activity, dressing/device care, signs and symptoms of SWD, and when and who to contact with problems (WUWHS, 2018). However, a pragmatic approach needs to be taken – e.g. it is not realistic to advise a woman who has just had a C-section to not lift her baby. Therefore, advice should be practical and consider the individual patient and their needs. Clinicians also need to make sure there are regular follow-up visits in place, so that individuals are not lost to follow-up after discharge into the community.

Assessment and early identification

If wound breakdown is identified or recognised early, outcomes can be improved. Therefore, accurate clinical assessment and novel diagnostic technology should be used to assess risk and identify SWCs at the earliest possible stage. Importantly, assessment of a patient with SWD includes medical and surgical history, nature of the surgical procedure, current health, lifestyle, current medication, pain levels and psychological status (WUWHS, 2018).

The importance of assessment

A comprehensive assessment should be carried out that includes a thorough inspection of the skin, and relevant documentation should be completed on at least a weekly basis. It is essential that wounds are reassessed at regular intervals and to change course of treatment if necessary. Normal wound assessment should include the aetiology of the wound where possible, wound dimensions in centimetres (including longest length, width and depth of the wound), percentage of tissue types visible (e.g. slough, necrosis, granulation and epithelial tissue), as well as presence of any foreign bodies (e.g. suture material, metal work and tracks). Assessment should also look at level, viscosity and colour of exudate, odour, pain level before and after dressing change, signs of infection and condition of the surrounding skin.

It is important to recognise that in order to conduct a wound assessment of the closed incision, increased consideration needs to be given to the skin surrounding the wound closure, as well as the entry points of the suture. Furthermore, signs of infection, erythema and skin pigmentation can manifest differently in dark skin tones – e.g. any initial 'redness' seen on light skin may not be present in dark skin and thus be missed in the initial assessment (Dhoonmoon et al, 2021). It can be difficult to predict infection in people with dark skin tones; therefore, clinicians should use other cardinal signs – e.g. pain, warmth, firmness and swelling (Wang et al, 2020).

The clinician needs to listen to the patient's concerns, both to aid accurate assessment and to understand their choices, needs and preferences. Many individuals want to be a part of the decision-making process, and active listening by the clinician can support this (WUWHS, 2020). Some individuals may be nervous of infection or complication; therefore, it is vital to listen and consider the individual's concerns. Box 4 contains a list of questions that can be useful to consider when undertaking a skin assessment (Wounds UK, 2021a).

Box 4. Questions to consider when conducting a skin assessment (Wounds UK, 2021a)

- What is the wound/periwound skin like in comparison to the surrounding skin?
- Are there any differences in colour?
- Does the skin feel warm/cool? Are there any changes in temperature?
- Does the skin feel spongy or firm to the touch?
- Does the skin look or feel shiny or tight?
- Is there any swelling or inflammation?
- Are there any changes in the texture of the skin and underlying tissue?
- How is the overall condition/integrity of the skin?
- Is there any pain, itchiness or change in sensation?

The terminology used to describe assessment of wounds is diverse; some instruments assess wounds of specific aetiology while others work more broadly. This can make assessing wounds difficult, and it was agreed that specific assessment tools for different types of wounds would be ideal – e.g. the Society of Vascular Surgery Wound, Ischaemia and foot Infection (WIfI) classification system for diabetic foot surgical wounds [Box 5].

Identifying infection

In the first few days following surgery, signs of inflammation – e.g. warmth, erythema, oedema,

Box 5. WIfI for diabetic foot surgical wounds (Wounds UK, 2021b)

The WIfI classification system is intended for any patient with a diabetic foot ulcer or non-healing foot ulcer. The WIfI classification system is clinically verified and takes a holistic approach to foot ulceration. It works by addressing the three main areas that need to be assessed and managed, and helps to identify the most dominant risk: foot infection, wound/tissue loss and ischaemia.

discolouration, pain – are normal and do not necessarily indicate an issue with wound healing (IWII, 2022). However, at-risk surgical wounds may show signs of inflammation beyond this time and extend beyond post-operative day 5. Consistent monitoring is therefore essential, as well as accurate and timely assessment to monitor progress.

Surgical site infections (SSIs) have been defined by the Centers for Disease Control and Prevention (CDC) as infection related to an operative procedure, that occurs at, or near, the surgical incision (CDC, 2023). SSIs usually develop within 30 days of the procedure (Horan et al, 2008); however, if non-human material is left in the wound, such as a prosthetic joint, infection can occur several months later (Tande and Patel, 2014). Clinical diagnosis of infection can further be supported by haematological, radiological, or microbiological

Table 6. Signs and symptoms of wound infection (IWII, 2022)	
Covert (subtle) signs and symptoms	Hypergranulation
	Bleeding, friable granulation
	Epithelial bridging and pocketing in granulation tissue
	Increasing exudate
	Delayed wound healing beyond expectations
Overt (classical) signs and symptoms	Erythema (or change in colour in dark skin tones)
	Local warmth
	Swelling
	Purulent discharge
	Wound breakdown and enlargement
	New or increasing pain
	Increasing malodour
Spreading infection signs and symptoms	Extending induration
	Lymphangitis (swelling of lymph glands)
	Crepitus
	Wound breakdown/dehiscence with or without satellite lesions
	Spreading inflammation or erythema (as above) greater than 2cm from the wound edge
Systemic signs and symptoms	Malaise
	Loss of appetite
	Pyrexia or hypothermia
	Tachycardia
	Tachypnoea
	Elevated C-reactive protein (CRP)
	Elevated or suppressed white blood cell count
	Severe sepsis
	Septic shock

investigations [Table 6].

Monitoring and early identification of complications

Patient education is essential, and guidance should be given on what to look out for, how to identify problems with wound healing, how to contact the clinician and how to care for their wound – e.g. dressing changes, taking care of stitches and bathing and showering safely. This needs to be tailored to the patient's needs and the clinician should encourage them to ask questions and make sure to check their understanding. Improving patients' digital literacy skills is vital as many organisations switch to using QR codes and providing content online. However, clinicians need to be careful of digital exclusion, as some patients are unable to access materials online – e.g. due to age, concerns about data privacy or lack of a smartphone.

Asking the patient to photograph their wound can also aid remote monitoring of wounds post-discharge from surgery (Wounds UK, 2020a). Digital remote wound monitoring is a proactive form of surveillance that involves patients submitting digital wound images and wound healing information to clinicians. Rochon et al (2023) found that using patient smartphones was an effective method to collect post-discharge surveillance. During the investigation, patients received secure SMS text messages at pre-programmed intervals asking them to upload images of their wound and provide information on wound healing. No gold standard method exists regarding the most appropriate way to capture data related to dehiscence; however, smartphone technology for surveillance purposes has shown high patient response rates and continued engagement. Therefore, the introduction of remote wound monitoring systems into routine clinical practice may help to improve patient and clinical outcomes.

Improving coordination between surgery and community

Safe and clear communication channels should be established to improve collaboration and coordination between surgical and community teams – e.g. utilisation of electronic patient records or alternative secure platforms to share data, treatment plans and outcomes. It is vital that every member of the multidisciplinary team is aware of their responsibilities. Surgical and community teams may also benefit from joint meetings to discuss complex cases, share best practice, ensure standardised protocols are in place, address discrepancies in care and provide education/fill gaps in knowledge. Telemedicine or virtual consultations may be of use to help facilitate these conversations and ensure information is shared properly and promptly between teams.

Classification: Use of the Sandy Grading System in practice

Structured assessment and classification help to guide and standardise clinical practice and optimise outcomes for patients (Sandy-Hodgetts et al, 2022). The WUWHS Sandy Grading system has been developed for SWD and – while it helps classify the type and severity of a clinical issue, and can be used to guide practice – there was a consensus from the Expert Panel that the grading system is capable of being simplified. In simple terms, the most important information to establish was concluded as follows:

- How deep is the wound?
- Is the wound infected or not?

How to use the Sandy Grading System

The WUWHS Sandy Grading System was developed where a classification system was previously lacking (Sandy-Hodgetts, 2017a; WUWHS, 2018; Table 7). The standardised system aids documentation and reporting of SWD, which can assist in describing and determining the prevalence of SWD. The grading system relates to the incisional wound dehiscence characteristics and is determined by the visible anatomical features at the incision site (Sandy-Hodgetts et al, 2020a). Grading should take place following a full assessment and results can be used to aid referral, where Grade 4 generally infers escalation of care.

The Expert Panel agreed that standardisation is important and that only one universal system is needed to avoid overwhelming staff. The WUWHS Sandy Grading System is used internationally but less in the UK; therefore, the use of an internationally accepted common definition and grading system for SWD is required to facilitate best practice. The Expert Panel agreed that it would be useful to see trends of SWD presented from a centre that is using the WUWHS Sandy Grading System in the real-world. One study evaluated a decision-making tool in practice that integrated the WUWHS Sandy Grading system into the T.I.M.E. pneumonic (Phelps et al, 2021). The SWD T.I.M.E. clinical decision support tool (CDST) was used to help clinicians manage wounds appropriately, and the study found that clinicians felt the tool was easy and quick to use, helped guide appropriate treatment and reduced the need to seek assistance from specialists. The clinicians also felt that the decision-making tool would help instil confidence and lead to better patient outcomes. While the WUWHS Sandy Grading System is based on current evidence, it does await peer review and clinical validation (Sandy-Hodgetts, 2017b).

Table 7. WUWHS Sandy Grading System (WUWHS 2018)

Definition: Surgical wound dehiscence (SWD) is the separation of the margins of a closed surgical incision that has been made in skin, with or without exposure or protrusion of underlying tissue, organs or implants. Separation may occur at single or multiple regions, or involve the full length of the incision, and may affect some or all tissue layers. A dehisced incision may, or may not, display clinical signs and symptoms of infection.

WUWHS SWD Grade*			Descriptors
Increasing severity	Single/multiple regions† or full-length separation of the margins of a closed surgical incision; occurring up to 30 days after the procedure‡	1	**Epidermis only, no visible subcutaneous tissue** ■ No clinical signs or symptoms of infection
		1a	As Grade 1 plus clinical signs and symptoms of infection
		2	**Subcutaneous layer exposed, fascia not visible** ■ No clinical signs or symptoms of infection
		2a	As Grade 2 plus clinical signs and symptoms of infection
		3	**Subcutaneous layers and fascia exposed** ■ No clinical signs and symptoms of infection
		3a	As Grade 3 plus clinical signs and symptoms of infection
		4^	**Any area of fascial dehiscence with organ space, vicera, implant or bone exposed** ■ No clinical signs or symptoms of infection
		4a^	As Grade 4 plus clinical signs and symptoms of infection= (e.g. organ/space SSI§)

**Grading should take place after full assessment including probing or exploration of the affected area as appropriate by a clinician with suitable competency*
†Where this is >1 region of separation of the wound margins, SWD should be graded according to the deepest point of separation
‡Where day 1 = the day of the procedure
§See Appendix 1, page 38, for the CDC definitions of the different types of SSI
^Grade 4/4a dehiscence of an abdominal incision may be called 'burst abdomen'

Classification: Use of the Sandy Grading System in practice *(Continued)*

Nonetheless, a study has shown that risk stratification using the WUWHS Sandy Grading System may be beneficial for use in high-risk cohorts for the prevention of wound dehiscence following surgery (Sandy-Hodgetts et al, 2020b). In a randomised multicentre trial, Sandy-Hodgetts and colleagues investigated the effectiveness of NPWT in preventing SWCs in at-risk patients undergoing a c-section. C-sections are becoming increasingly common procedures in Australia, with rates increasing from 25% in 2004 to 32% in 2020 (Australia Institute of Health and Welfare, 2022). In addition, SWCs have been identified as the most common and costly event following a c-section (Sandy-Hodgetts et al, 2020b), which demonstrates the urgency of identifying early those patients that are at risk of complications prior to surgery.

It was also discussed that in regard to surveillance, clinical coders only have codes for general descriptors (e.g. dehiscence, haematoma and infection) and not for each grade of the WUWHS Sandy Grading System. Therefore, if clinicians are to adopt this system, the Expert Panel agreed that guidance would be needed to advise clinicians as to what needs to be recorded for surveillance purposes, depending on the individual patient. It was also discussed that grading systems are in use for many medical conditions across several specialties; therefore, clinicians need to document clearly and reference the tool that was used [Box 6]. This will also help provide clarity for others reading the patient record.

Box 6. Top tips for reporting clinically relevant surgical wound dehiscence

- Determine categories and standardised descriptions of wound dehiscence, and accurately assess patients according to these indicators
- Conduct comprehensive assessments and identify risk factors that affect patients prior to surgery. Where appropriate, communicate with patients about any preventative measures to take in order to reduce their risk
- Assess for clinical signs and symptoms of infection, using gold standard microbiological testing if an infection is suspected, and document these carefully
- Educate patients on how to recognise changes to their wound and keep lines of communication open, so that patients feel comfortable to approach you
- Conduct surveillance to identify true rates of SWD and disseminate this information to all members of the multidisciplinary team and key stakeholders
- Engage in continual follow up of the patient's wound, health and wellbeing and ensure that records are kept up-to-date
- Assess compliance with surveillance protocols
- Provide information on data and feedback to clinicians so that they can use it to understand where improvements to clinical practice are needed. Present this data in a way that is both understandable and relevant, and make sure to celebrate successes when targets and goals have been achieved.

Dressing selection

Dressing selection plays an important role in surgical wound management and can help to prevent and minimise risk (WUWHS, 2016). To improve outcomes for incision care, appropriate dressing selection should be carried out according to local protocol, with consideration given to wound status, surgery type and individual circumstances (Sandy-Hodgetts and Morgan-Jones, 2022). Dressings are not the whole picture, but clinicians need to maintain good knowledge of appropriate dressings for individual patients, as suitable selection can benefit clinical practice, patient wellbeing and wound healing (Stephen-Haynes, 2015).

Dressing selection guidance

Dressing selection should be based on a full holistic assessment, including the individual's history, any comorbidities and infection risk. For example, use of antimicrobial dressings in wound management is recommended for preventing infection in patients at high risk of infection. A suggested list of requirements of the ideal post-surgical dressing based on expert international consensus (Sandy-Hodgetts and Morgan-Jones et al, 2022) includes:

- Flexible (not impede the patient's movement), providing elasticity to avoid pulling the skin or blistering (e.g. particularly over knee joints)
- Well-fixed to the skin on application, even if the wound has been disinfected shortly before
- Absorbent, able to handle exudate
- Skin protective (e.g. reduce the risk of blistering or irritation, not excessively adhesive)
- Waterproof: providing a good seal/barrier function and enabling the patient to shower
- Eliminate dead space where necessary.

There is a consensus that clinicians should select a dressing that keeps the wound occluded, provides a moist healing environment and is comfortable for the patient (NICE, 2016; Sandy-Hodgetts et al, 2022). A dressing that is waterproof (able to stay in situ beyond 48 hours), allows range of movement for daily activities of living and is easy to apply, and being atraumatic upon removal is also ideal.

Negative pressure wound therapy (NPWT)

There is growing evidence that the use of advanced active therapies, such as NPWT, can be effective and improve outcomes for patients when used earlier in the patient's care plan, rather than waiting for the wound to potentially deteriorate and become more difficult to treat or heal (Dowsett et al, 2017; Hampton et al, 2022). However, there are misconceptions that hamper the use of active treatments – e.g. they are viewed as more expensive. While active treatments can be more costly, they may reduce healing time with potential cost savings, if used correctly (Hampton et al, 2022). Therefore, active therapies may also reduce overall costs if used to reduce risk of complications, especially in cases where a wound is heavily exuding or there is a high risk of infection (Morgan-Jones et al, 2019).

Furthermore, NPWT is increasingly being used prophylactically on closed incisional wounds to prevent SWCs (De Vries et al, 2016; Norman, 2020), and on wounds healing by secondary intention (e.g. chronic or infected wounds; Dumville et al, 2015). In particular, the use of single-use NPWT (sNPWT) over closed surgical incisions has been shown to reduce rates of SSI, seroma and dehiscence, and to improve scar quality (Hyldig et al, 2016; Strugala and Martin, 2017; Saunders et al, 2021). In contrast, a systematic review found that there is little or no difference in wound reopening between people treated with NPWT and standard dressings after surgery (Norman et al, 2022). However, it is important to remember that mode of action differs between NPWT products.

NPWT in the community

Dehisced surgical wounds are often managed alongside other comorbidities in the community. This means that wound care is often a neglected aspect of care that takes a 'back seat', in regard to assessment and treatment (Hughes et al, 2021). However, following discharge into the community, dehisced wounds can cause significant issues that may lead to complications, with a proportion of these wounds being labelled as 'non-healing' (Guest et al, 2018).

Since patients are being discharged earlier from hospital, clinicians working in the community may be more likely, than their inpatient-based colleagues, to encounter patients with SWD who have been discharged with NPWT, or who have commenced NPWT post-discharge (Ousey and

Milne, 2014). A study by Hughes et al (2021) found that using sNPWT alongside a clinical pathway demonstrated benefits, and promoted either complete healing or a reduction in wound surface area in dehisced wounds that were previously considered 'non-healing'. Using a pathway also has potential to save time and money for healthcare organisations.

Challenges in dressing availability

A myriad of dressings is available to manage chronic wounds and, therefore, it can be overwhelming for the clinician to make a decision as to the 'best' dressing to use for an individual patient. Better access to dressings is needed – and particularly, access to more active therapies such as sNPWT – as well as easier ways of providing dressings to patients – e.g. an antimicrobial dressing may be needed quickly to manage infection early and prevent complications from escalating. In addition, some antimicrobials can be used under sNPWT, which facilitates benefits of negative pressure on infected wounds.

However, product availability differs across geographical regions, which can present issues for dressing choice and selection in clinical management (Sandy-Hodgetts and Morgan-Jones, 2022). Product availability is also influenced by supply routes. For example, the FP10 prescribing route often experiences delays and resource constraints due to disjointed diagnosis and prescribing approaches (NHS Business Services Authority, 2017; NHS Supply Chain, 2023).

It is important to acknowledge that clinicians may not be able to obtain access to dressings according to guidance or treatment pathways. It is possible that greater spend on wound care does not equate to better outcomes. Costs may escalate due to inappropriate management and, therefore, understanding the needs of the wound is of utmost importance, rather than investment in expensive therapy or selecting cheaper products with no wound progression. Studies have highlighted the potential for better patient management and product selection that would improve outcomes and reduce costs (Guest et al, 2012; Panca et al, 2013; Guest et al, 2015), so sub-optimal management of surgical wounds can be avoided with consistent guidance.

Summary and conclusions

It is evident that there is a need for practical guidance on preventing and treating dehiscence that applies to clinicians practising post-surgical wound care in the UK. While there has been a large amount of focus on SSI in recent years, gaps exist in the literature surrounding knowledge of other SWC types, including dehiscence.

Consistent care and standardisation across surgical settings is needed, including individual optimisation pre-, intra- and post-surgery and patient education to improve outcomes. Post-incisional care can vary according to geographical region based on healthcare systems and differing protocols. However, prevention and risk assessment are key to optimising patients before surgery and during all stages of the surgical journey (Sandy-Hodgetts et al, 2020). Furthermore, to prevent complications from escalating, accurate identification and early intervention are essential.

Successful outcomes for patients post-surgery are dependent on post-incision care, including dressing selection and protocol. Additionally, advanced wound care dressings play a pivotal role in protecting the wound to facilitate healing and prevent SWCs. It is important to note that advanced therapies, such as sNPWT, should be used early if possible/needed, and that they can be a cost-effective alternative to standard care for organisations (Murphy et al, 2021).

Taking a patient-centred approach that encompasses the patient's entire surgical journey is ideal. Patients need to be at the centre of all decision-making and educated on their individual risk. Involving patients in their own care and sharing information is fundamental to enable individuals to take responsibility for managing their wound where they are able to do so. Furthermore, implementation of post-surgical surveillance programmes should be viewed as a priority, to enable clinicians to gain an accurate picture of the true scale of the problem and increase their knowledge and awareness of SWD.

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