



**National Wound Care
Strategy Programme**



**Surgical
Wounds**

**Recommendations for
Preventing and
Managing
Surgical Wound
Complications**

Working in partnership with

**Health
Innovation
Network**



Please cite as: National Wound Care Strategy Programme (2024) Recommendations for Preventing and Managing Surgical Wound Complications.

Reviewed: May 2024

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Glossary

Abscess - a painful collection of pus, usually caused by a bacterial infection.

Anastomosis – a surgical connection between two structures. e.g., blood vessels or loops of intestine.

Catastrophic Dehiscence – full separation of previously sutured wounds, due to failure of proper healing. There may be internal organs/implants that are now exposed.

Dehiscence – surgical wound dehiscence (SWD) is when a surgical wound opens partially or fully, with or without exposure of underlying tissue, organs, or implants.

Desiccation - is the drying out of tissues or organs leading to tissue death.

Enhanced Recovery After Surgery (eERAS®) - a multimodal perioperative care pathway designed to achieve early recovery for patients undergoing major surgery.

Enterocutaneous Fistula - is an abnormal connection that develops between the intestinal tract or stomach and the skin. As a result, contents of the stomach or intestines leak through to the skin.

Epithelialised - growth of new epithelial cells to close a wound.

Fistula - a fistula is an abnormal connection between two body parts, such as an organ or blood vessel and another structure. Fistulas are usually the result of an injury or surgery.

Haematoma – is a collection of clotted or partially clotted blood within the wound bed.

Healing by primary intention – healing in which all tissues, including the skin, are closed with suture material, staples, glue, or adhesive strips after completion of the operation.

Healing by secondary intention – healing in which the surgical wound is left open and closes from the base of the wound upwards.

Healing by tertiary intention (delayed closure) – healing in which the wound is deliberately left open for several days or weeks and then surgically closed if it is found to be clean.

High-risk patients - patients at a higher risk of complications or death.

Hypergranulation – an excess of granulation tissue beyond the amount required to replace the tissue loss incurred because of wounding or surgery.

Incisional Negative Pressure Wound Therapy - is the use of NPWT as prophylaxis on surgically closed wounds.

Lower-risk patients – Patients at a lower risk of complications or death.

Multi-modal - using several modes, methods, or techniques.

Negative Pressure Wound Therapy - a unique and versatile system that delivers application of sub-atmospheric pressure to help reduce inflammatory exudate and promote granulation tissue.

Optimised – improving health to reach the best status prior to surgery to reduce risks.

Patient Initiated Follow Up (PIFU) – is when a patient initiates an appointment when they need one, based on their symptoms and individual circumstances.

Peri-operative - the practice of patient-centered, multidisciplinary, and integrated medical care of patients from the moment of contemplation of surgery until full recovery. It encompasses pre-operative, intra-operative and post-operative.



Peri-Stoma - The area of skin around the stoma is called peristomal skin.

Post-operative haemorrhage – bleeding after a surgical procedure, the haemorrhage can occur immediately after the surgery or be delayed.

Prehabilitation - care that aims to enhance general health and wellbeing prior to major surgery.

Pus - thick, opaque, usually yellowish-white, fluid matter that is typically associated with an infection.

Safety netting - is information given to a patient or carer, about actions to take if their condition fails to improve, changes or if they have further concerns.

Secondary intention healing - Wound deliberately left open due to either infection or deficit of available tissue to be managed until the point of healing, e.g., pilonidal sinus or patients with surgical wound dehiscence that are not able to be closed surgically.

Sepsis - is the body's overwhelming and life-threatening response to infection that can lead to tissue damage, organ failure and death.

Seroma - localised accumulation of serous fluid in a part of the body, occurring most commonly as a complication of a surgical procedure.

Sinus - an infected tract leading from a deep-seated infection and discharging pus to the surface.

Spreading Cellulitis – spreading of infection to other parts of the body, such as the deeper layers of tissue, blood, muscle, and bone.

Stoma - a surgically made hole in the abdomen that allows body waste to be removed from the body directly into a collection bag.

Supported self-management - means increasing the knowledge, skills, and confidence a person has in managing their own health and care by putting in place interventions.

Surgical Wound Dehiscence (SWD)– surgical wound dehiscence (SWD) is when a surgical wound opens partially or fully, with or without exposure of underlying tissue, organs, or implants.

Surgical Site Infection (SSI) - SSI is infection present at the site of surgery. Clinical signs and symptoms of infection include heat, redness, swelling, elevated body temperature and purulent exudate from the wound or the drain.

Surgical Wound - a cut or incision in the skin that is usually made by a scalpel during surgery.

Surgical Wound Complications (SWC's) - an unintended outcome following surgery that is directly related to the surgical wound and disrupts normal wound healing.

Viscera - the internal organs in the main cavities of the body, especially those in the abdomen, e.g., the intestines.



Introduction

The purpose of these recommendations is to provide clear advice to health and care practitioners, service managers and commissioners about the fundamentals of evidence-informed care for people with surgical wound complications treated in England. Implementing these recommendations will achieve better individual outcomes and more effective use of healthcare resources.

The recommendations describe a pathway of care that promotes early assessment and diagnosis, enabling fast access to evidence-informed therapeutic interventions, with escalation of treatment or service provision for people requiring more complex care. The recommendations thus offer a framework for the development of local delivery plans that include consideration of:

- Relevant research evidence to inform care.
- Configuration of services and deployment of workforce.
- Appropriate education for that workforce; and
- Relevant metrics to measure quality improvement.

These recommendations signpost to relevant clinical guidelines or outline evidence-informed care that will improve healing and optimise the use of healthcare resources. The recommendations do not replace existing evidence-informed clinical guidelines or replace clinical judgement and decision making in relation to the needs of the individual. They are intended for use in all clinical care settings and aim to support implementation of evidence-based clinical practice.

Background

What is a surgical wound complication?

A Surgical Wound Complication (SWC's) is defined as a disruption to normal incisional wound healing following surgery (1) that delays healing. It is estimated that surgical wound complications are one of the leading global causes of morbidity following surgery, with mortality affecting 1–4% of patients (2) (3). SWC encompasses more specific diagnoses including:

- Surgical site infection (SSI).
- Surgical wound dehiscence (SWD).
- Delayed Healing.
- Seroma/Haematoma.
- Hypergranulation.
- Peri-wound maceration/moisture associated skin damage (MASD).
- Abnormal Scarring.
- Medical adhesive-related skin injury (MARS) (1).

Many of these SWC's are preventable. They are usually reported around 7-9 days post-surgery (4) but can happen between day 1 to day 20 or even longer if there has been implant surgery (1).

Surgical site infection (SSI) is the most common SWC. SSI can lead to surgical wound dehiscence (SWD), but SWD may also be caused by non-microbial aetiologies such as haematoma, seroma or technical issues, mechanical stress, obesity, or pre-existing chronic disease states. Misdiagnosis of SWD as an SSI may lead to potentially severe follow-on consequences for the patient and clinical practice, including antibiotic resistance.



The burden of surgical wound complications

The estimated annual cost to the NHS of managing patients with wounds is between £4.5 billion - £5.1 billion (5). Of the 2.2 million people with a wound that has not healed within 4 weeks, 29% have an acute wound related to surgery, an abscess, burn or trauma (5). Some chronic wounds, such as diabetic foot ulcers, pressure ulcers and some types of leg ulcer, will also require surgical procedures.

Around 10 million surgical wounds are created each year (6). A fifth (21%) of surgical wounds fail to heal within 12 months leading to considerable patient suffering and NHS cost (5) (7). In the UK, the number of people having surgery is growing and so too is the complexity of the operations. The population is aging, and many have long term medical conditions that may increase the risk of surgery. Over 250,000 people at higher risk have surgery each year and this number is set to rise (8).

In addition, the push towards day case surgery, particularly post Covid, means that the burden of SWCs now mostly falls on primary and community services (9). Day surgery is seen to have significant benefits including improved patient care and satisfaction, cost-effectiveness, efficiency, staff retention and morale and reduced demand for inpatient beds (10). Currently Model Hospital demonstrates day case rates are between 60-85% of all surgical procedures across England, and this continues to grow. The aim is for 85% of all surgery to be completed as day cases (11).

Although most surgery occurs in secondary care, almost half (48%) of the NHS cost of caring for these patients is incurred in community services and primary care following discharge from hospital (5). due to surgical wound complications (SWC) such as a surgical site infection (SSI) or other unintended outcomes.

The main reason for sub-optimal management of SWCs is thought to be unwarranted variation in care with under-use of evidence-based care, over-use of therapies for which there is insufficient evidence (12) and insufficient surveillance systems for monitoring surgical site infection outside hospital care provision to inform quality improvement initiatives across the whole health and care sector.

Without adequate surveillance or data collection, the number of SWCs is a hidden but growing problem.

Scope of the recommendations

These recommendations are focused on preventing surgical **wound** complications so do not address other forms of surgical complications. They seek to provide a high-level overview of care to prevent and manage surgical wound complications but recognise that care will justifiably vary in relation to different types of surgical specialities or procedures, so do not describe specific care for the different types of surgery.

The process for developing and updating these recommendations

The original NWCSP surgical wound recommendations were developed using an evidence-informed approach, including consideration of research evidence, healthcare resources, clinical settings, and patients' preferences. Evidence was retrieved using a systematic approach to searching (as outlined in Appendix 1) and then sense-checked with academics, health practitioners and patients and carers before a wider consultation with those registered with the NWCSP stakeholder forums. This update has followed the same process. Where robust evidence is not available then other evidence has been used to inform the recommendation. The strength of the underpinning evidence is indicated by the wording of the recommendation. 'Should' indicates strong underpinning evidence such as high-quality research studies. 'Could' or 'consider' indicated weaker evidence such as consensus methods.



Recommendations

A. Pre-operative phase

Screening

1. As part of improving theatre flow and elective surgery recovery; all patients should be screened and optimised at the point they are listed for inpatient surgery, in addition, patients already on waiting lists must be prioritised for screening (13).
2. All patients should be screened for the risk of developing pressure ulcers and, if necessary, measures taken to reduce the risk (14).

Risk assessment

3. All patients, (except those undergoing emergency surgery) should undergo a pre-operative assessment (POA), whether this is remote (via telephone or video conferencing) or in person.
4. The use of an objective validated risk assessment tool relevant to the surgical speciality in conjunction with clinical judgement should be used to identify specific risk factors to surgical wound complications where available.
5. Patients identified at risk should see both the surgeon and the anaesthetist preoperatively to discuss therapy options for patients at high-risk of developing surgical wound complications and facilitate shared decision making (15) (16).

Optimisation

6. An **Enhanced Recovery After Surgery** (ERAS) programme targeted at reducing surgical wound complications (17) should be used for all high-risk patients and considered for all other surgical patients and its use documented.

As part of this, a programme of **prehabilitation** should be considered to optimise the patient for forthcoming surgery (18).

Shared decision making

7. Patients should receive education on the likely outcome of the wound to be created (primary, secondary, or tertiary closure) and the risks/benefits of the surgery to enable informed decision making about care following surgery and to prepare for possible outcomes (16).

Perioperative pathways

8. Consider the use of a pre-operative /pathways to reduce lengths of stay and surgical wound complications (19) (See Appendix 2).
9. In addition to the above recommendations, care should incorporate the relevant recommendations within the most recent versions of these publications:

- [NICE Perioperative care in adults NG180](#) (21)
- [NICE: Shared decision making NG197](#) (16)
- [NICE Surgical Site Infection: Prevention and treatment NG125](#) (22)
- [WHO: Global Guidelines for the prevention of surgical site infection](#) (23)
- [GIRFT: Operational Implementation and Support Guide for Early Screening, Risk Assessment and Optimisation for Adult Patients.](#) (13)



B. Intra-operative phase¹

Digital images

1. In theatre, immediately following surgery and before a dressing is applied, consider capturing a digital image of the wound in high-risk patients.

This image could be shared with the patient (if the patient wishes) and the health care provider responsible for ongoing care using NHS compliant digital technology (24).

Dressings

2. Cover surgical incisions with an appropriate waterproof interactive dressing at the end of the operation (22).

(Incisional) Negative Pressure Wound Therapy (INPWT/NPWT)

3. a. Consider using Incisional Negative Pressure Wound Therapy (INPWT) in high-risk patients on a case-by-case basis.
b. Consider using Negative Pressure Wound Therapy (NPWT) for patients healing by secondary or tertiary intention to manage exudate.

4. In addition to the above recommendations, care should incorporate the relevant recommendations within the most recent versions of these publications:

- [NICE Guideline: Surgical site infections: prevention and treatment NG125](#) (22).
- [WHO: Global guidelines for the prevention of surgical site infection](#) (23).
- [NICE: Perioperative care in adults NG180](#) (21).
- [WHO Surgical safety checklist](#) (25).
- [Association for Perioperative Practice: Infection control](#) (26).
- [And implement the relevant surgery specific GIRFT Recommendations](#) (27)

¹ Intraoperative Surgical technique will vary significantly for different surgical specialities, so the recommendations do not prescribe care for the different types of surgery.



C. Post-operative wound care

Patients at lower risk of surgical wound complications:

Assessment

1. Assessment of surgical wounds needs to be in accordance with the wound assessment minimum data set (28) with additional elements for all surgical wound patients (See appendix 3).

Screening

2. All patients should be screened for the risk of developing pressure ulcers, and, if necessary, measures taken to reduce the risk (14).

Supported self-management

3. Supported self-management should be considered and discussed with the patient: This may include advice on dressing changes, taking a digital image of their own wound to monitor healing, care of closure material and early signs of wound complications.
4. a. Prior to transfer from the surgical team to another healthcare provider (which may involve supported self-management), patients should be provided with enough dressings to care for their wound for one week if required.

b. Following transfer from the surgical team to another healthcare provider, patients should be advised as to who to contact if they have concerns about their wound.
5. The documented handover to the patient and the new care provider should fully document the treatment to date, (surgery undertaken, closure method and whether an implant is present), plan going forward to ensure continuity of care. It should also include any risk identified at the pre-operative assessment and what steps have been taken to ameliorate them.

Dressings

6. Usually at 48 hours, the dressing can be removed as the wound will have epithelialised and the patient may bathe or shower. However, this may differ between surgical wound types, so care should follow advice given by their local surgical team (22).

Digital images

7. If ongoing clinical care is required from a care provider, regularly record image(s) of the wound. Use digital images for monitoring of healing.

Remote monitoring

8. Consider using patient-led digital solutions for ongoing remote monitoring of wound healing by the surgical team (29).

Follow-up

9. Patient initiated follow-up (PIFU) should be considered for all low-risk patients, where appropriate (30).



Patients at higher risk of surgical wound complications:

Care should follow the recommendations for those at lower risk but **in addition**:

Adjunctive supports

10. Consider using interactive dressing materials and adjuncts that will additionally support the wound. For example, abdominal supports, chest supports, reduced lifting, offloading to reduce pressure in high pressure areas (e.g., foot) or use of adhesive strips to support the sutures.

Enhanced levels of care

11. Consider using a risk-based assessment to determine whether the patient requires an enhanced level of care (31).
12. In addition to the above recommendations, care should follow the most up to date version of these recommendations in relation to post-operative care:
 - [NICE Guideline: Surgical site infections: prevention and treatment NG125 \(22\)](#).
 - [WHO: Global Guidelines for the Prevention of Surgical Site Infection \(23\)](#).
 - [NICE Guideline for Sepsis: Recognition, Diagnosis and Early Management NG51 \(32\)](#).
 - [NICE: Perioperative care in adults NG180 \(21\)](#)

Care of open wounds

13. If the incision site is healing by **secondary/tertiary intention**, review progress weekly to monitor healing and evaluate effectiveness of treatment plan.

NPWT

14. Consider the use of NPWT to manage wounds with heavy exudate.

Dressings

15. For perianal abscesses, following removal of standard intraoperative wound packing, (for haemostasis) within the first post-operative 24 hours, do not repack but instead manage by using external absorbent dressings or pads (33).


Surgical wound complications

Review

16. If the incision site is healing by **primary intention** and fails to heal (epithelialise) as normal or dehisces with visible subcutaneous tissue, **arrange review** by a health professional with surgical wound expertise, who can escalate directly to surgical team as needed.
17. Reassure patient, address concerns, and manage expectations.



Early surgical wound complications:


 **Early Red Flags**

Treat as an emergency situation:

- **Post-Operative Haemorrhage**
 - **Call for help.**
 - **Lay the patient flat.**
 - Apply a clean/sterile dressing material and apply direct pressure to the bleeding site until help arrives.
- **Catastrophic dehiscence with newly exposed viscera with visible internal organs ('burst abdomen')**
 - **Immediately inform the surgical team.**
 - **Lay the patient flat.**
 - Cover the exposed viscera/organs with saline-soaked gauze until the patient can be taken to theatre. Change saline-soaked gauze hourly to prevent desiccation of viable tissue.

If the patient has been discharged from hospital, then call 999.

Intermediate surgical wound complications:

 **Intermediate Red Flags**

Immediate Treatment:

- **Systemic signs of infection/sepsis**
 - Arrange for immediate review by the senior clinical decision maker. Follow local guidelines and follow [NICE Guideline for Sepsis: Recognition, Diagnosis and Early Management \(32\)](#).

Immediate Referral:

- **Spreading infection** - spreading cellulitis (48).
 - Consider delaying antibiotics until microbiology is available.

Refer to the surgical team within 24 hours:

- **Local infection** - (e.g., increasing erythema (discolouration), swelling, pain, pus, heat) (48).
 - Arrange for immediate review by the senior clinical decision maker.
- **Dehiscence when surgery involved implants** (e.g., mesh, prosthesis) or an **aesthetically or functionally important surgical site** (e.g., face or joints).
- **Exposed Implant**

Refer to the surgical team within 72 hours:

- **Dehiscence with newly exposed subcutaneous layers and fascia.**
- **Suspected sinus / fistula tracking.**
- **Draining seromas.**
- **Enterocutaneous fistula formation.**
- **Peri-stoma wound dehiscence.**



18. Care should incorporate the recommendations relevant to surgical wound complications within the most recent versions of these publications:

- [NICE: Surgical site infections: prevention and treatment NG125](#). (22).
- [WUWHS Surgical wound dehiscence: Improving prevention and outcomes](#) (34).
- [ISWCAP International Best Practice Recommendations for the early identification and prevention of surgical wound complications](#) (1).

Surgical Site Infection

19. If surgical site infection (SSI) is suspected:

- a. Obtain relevant samples for culture and sensitivity testing.
- b. Consider prescribing an appropriate antibiotic that covers the likely causative organisms and considers local resistance patterns and the results of microbiological tests (22) (35).
- c. Monitor patient for **signs of sepsis** (32).
- d. If the patient has already been discharged from the surgical team, refer back to that team.

Surgical Wound Dehiscence

20. If there is surgical wound dehiscence (SWD):

- a. Investigate events leading to dehiscence e.g., coughing, vomiting, trauma, closure material removal, purulent drainage.
- b. Identify and address modifiable factors that may be hindering healing. e.g., local, or systemic infection.
- c. Consider whether further investigations are required.
- d. If the wound starts to dehisce, discuss wound management with the surgical team, and consider removal of remaining sutures/staples.

Grading tool

- e. Assess the condition of the dehisced area and consider using a grading tool (36) (34).
- f. Assess pain and offer appropriate analgesia.
- g. Ensure any abscess, haematoma, or seroma is drained by an appropriately qualified practitioner.
- h. Debride non-viable tissue.

Dressings

- i. Apply appropriate dressing or device (e.g., stoma/wound drainage bag, NPWT) for exudate level and depth/area of the wound to promote wound healing.
- j. Refer to the surgical team if post discharge.

Review

21. Review **at least weekly** for healing / further wound complications post discharge by community or primary care staff as required.
22. If there is a new complication (e.g., infection) seek review by the surgical team, via the locally agreed referral route.
23. If surgical closure is planned, **refer** to the surgical team for listing once the wound is clean and ready for surgery.



Conservative care

Although most surgical wounds will heal, for a few patients, healing may be unlikely due to underlying health issues. Decisions about appropriate care should be made in partnership with the patient and their carers, the surgical team and any health or care professionals involved in their care.

D. Aftercare following healing

1. Scarring that affects functionality or causes psychological distress should be reviewed by or referred to an appropriate specialist service. To help prevent this:
 - a. For all scars, patients should be encouraged, once the wound is fully healed, to apply emollient regularly (up to four times a day) to prevent dryness of the scar, which occurs due to loss of skin integrity. Massage may improve pain, itch, and tensile strength (37).
 - b. Patients should be advised to use sun protection (Factor 50) on the healed, affected scar for a minimum of 12 months and ideally up to 24 months (38).



Explanatory notes

A. Pre-operative phase

Screening

Given the significant challenges in scheduling theatre slots and providing timely “to come in” (TCI) dates for patients on elective surgical lists, it has been identified that early screening and optimisation would improve patient flow to surgery and improve recovery to elective care. This screening will help to identify the number of Pre-Operative Assessments (POAs) required, because the main reasons for postponements and cancellations on the day of surgery are due to lack of POA and therefore pre-operative planning and assessment (13).

Green - (Low-risk Pathway)- Identifies patients who are fit and well and require no optimisation and can be called at short notice to come for surgery and be offered universal optimisation advice.

Amber - (Medium-risk Pathway)- Identifies patients who have a long-term condition and/or other health challenges which requires pathway-guided optimisation alongside universal optimisation advice.

Red - (High-risk Pathway) - Identifies patients who have a significant long-term condition or multiple long-term conditions which require review by a senior decision-maker (surgeon or anaesthetist).

Patients undergoing surgical procedures are at high-risk of pressure ulcer development. Length of surgery, positioning, positioning devices, warming devices, anaesthetic agents, sedation, vasoactive medications instruments, type of surgery and intraoperative haemodynamics are all risk factors in pressure ulcer formation (39).

Risk assessment

Preoperative assessment to stratify risk of SSI /SWD is recommended to inform the consent process and reduce the risk of SSI /SWD. Where surgery is planned, pre-operative assessments (POAs) provide a useful opportunity for thorough risk assessment that can be used to plan risk reduction for patient-related modifiable risk factors.

Assessment of risk is complex and differs depending on the point of view of the assessor. The risk of a particular procedure may have a different value when considered by the surgeon, anaesthetist, intensivist, patient, or family member.

An accurate estimation of surgical risk is important in communication with patients and their families, to help them make informed decisions regarding the best possible care and to prepare them for the possibility of adverse events. Patients should be aware that surgical wounds may heal by primary, secondary, or tertiary closure which may impact on their quality of life and care arrangements following surgery.

There are several risk factors that may lead to surgical wound complications:

- Emergency surgery is known to significantly increase the risk of morbidity and mortality (40).
- The classification of the surgery, clean, clean-contaminated, contaminated, or dirty, is significant given that surgical wound dehiscence is more common in the contaminated or dirty categories (41). High-risk patients are defined by a predicted mortality of greater or equal to 5% (15) and assessment is made using several factors (Appendix 4).
- Risk assessment and optimisation of the patient in the pre-operative phase, where possible, could reduce patient morbidity and mortality. Optimisation is ensuring the patient



is in the best medical condition before surgery. Although complications cannot be eliminated there are often opportunities to optimise patients, so these risks can be minimised, and care provided is safe, and efficient quality of care.

- Risk is assessed to allow suitable targeting of therapeutic options and decision making regarding treatment choices so that a suitable balance of risks, often between the possible side effects and dangers of surgery and the potential success of treatment, can be made.

Validated preoperative risk stratification tools are freely available and can be completed rapidly. Although no risk stratification tool is 100% accurate, the evidence showed that validated tools are sufficiently accurate to be a useful supplement to clinical assessment (21).

However, many of the risk assessment tools available are surgery specific (cardiac, orthopaedic etc) and the risk factors vary according to the type of surgery being planned and the patient comorbidities. There is currently a lack of evidence as to which risk assessment tools are the most valid and reliable for different types of surgery. Therefore, these recommendations do not recommend any specific risk assessment tools.

When surgery is planned, pre-operative consultations provide a useful opportunity for thorough risk assessment than can be used to plan risk reduction for patient-related modifiable factors. Shared decision making is a collaborative process in which patients and family members make healthcare decisions together with their clinician.

Enhanced Recovery After Surgery (ERAS[®]) is a multimodal perioperative care pathway designed to achieve early recovery for patients undergoing major surgery. ERAS[®] represents a change in thinking in perioperative care in two ways. First, it re-examines traditional practices, replacing them with evidence-based best practices when necessary. Second, it is comprehensive in its scope, covering all areas of the patient's journey through the surgical process e.g., nutrition, mobility, pain management existing wounds etc.

- a. Prehabilitation is care that aims to enhance general health and wellbeing prior to major surgery. By intervening in the preoperative period to reduce behavioural and lifestyle risk factors, the 'physiological reserve' of the patient is enhanced to buffer the surgical stress response, this can include nutrition, exercise, and psychology. Commissioners are being urged to establish prehabilitation services which should include a comprehensive geriatric assessment and optimisation for older patients, which means that hopefully prehabilitation will be implemented across all aspects of surgery (42).

Shared decision making

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. 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. Shared decision making should be embedded through all perioperative pathways, beginning at the earliest point where surgery is contemplated, and involve discussion between the patient, surgeon, and broader multi-disciplinary team (42) (16).

Peri-operative pathways

Peri-operative pathways have a preventative effect aimed at reducing SSIs. Pathways with a higher proportion of evidence-based interventions are more beneficial to patients. Pathways reduce lengths of stay, reduce the use of intensive care after surgery, reduce complications after surgery and the associated costs without increasing complications rates (8) (See Appendix 2).



B. Intra-operative phase

Digital images

Given the drive for same-day surgery, consider taking a photograph in theatre which would provide a baseline of the surgical wound post-surgery, to assist ongoing carers who may be the first healthcare practitioners to see the wound post-operatively. Photo at Discharge is also important for patients who are not day cases. Again, this forms the basis for a baseline assessment (43). Patients or their carers can continue to capture digital images and regular photography will provide indication of wound progression and allow for clinical monitoring. There are a range of digital monitoring applications available, several of which are specific to surgical wounds. The NWCSPP developed a functional overview for the requirement of wound management digital systems WMDS (44).

Dressings

Wound product selection should seek to match wound symptoms with the characteristics of wound dressings or management systems and patient needs, while remaining mindful of patient comfort and dignity, clinician time and the cost of alternative products. Dressings should maintain a warm, moist environment.

Recent evidence has shown that perianal abscesses without wound packing have significantly less pain and less adverse events than those that were packed (33).

Wound cavities should not be tightly packed except when seeking to apply pressure to haemorrhage. However, depending on the amount of exudate present and the depth of the wound, wound fillers may be useful to absorb excess exudate, thus preventing pooling of blood or exudate, potentially causing maceration, and increasing the risk of infection (34).

(Incisional) INPWT/NPWT

Incisional negative wound pressure therapy (INPWT) remains a rapidly evolving area of research. Therefore, these recommendations do not recommend the widespread adoption of INPWT for prevention of surgical wound complications or promotion of healing, but INPWT should be considered for high-risk patients on a case-by-case basis.

In open surgical wounds, depending on the exudate levels, an appropriate dressing or device may include Negative Wound Pressure Therapy, a wound drainage bag or other dressing depending on the tissue within the wound and absence or presence of infection.

C. Post-operative wound care

Patients at lower risk of surgical wound complications:

Assessment

Accurate patient documentation across the whole patient care pathway is essential for accurate surveillance of SWC, including SSI. The wound care assessment minimum data set (28) is used for all wound types but it is missing elements that allow for indications that a surgical wound is developing any complications. These missing elements have been added (See Appendix 3) and should be completed for all patients with surgical wounds. For SSI, the data collected should be applied according to the UKHSA SSI protocol if being collected for surveillance purposed in England (45).



Screening

See Screening above.

Supported self-management

Patients and carers should be supported and encouraged to manage their own wounds with shared care/supported self-care. This enables patients to bathe and manage their wounds at a time that suits their lifestyle, whilst maintaining easy access to advice and support about any concerns. Written information on how to undertake wound care, care for their wound closure materials (e.g., tissue adhesive, adhesive strips), how to take a digital image of their wound and signs of early wound complications should be given (24). Safety netting is essential so the patient understands what possible problems may occur, the scale of the concern of these problems and what steps should be taken if these problems arise.

Providing a week's supply of dressing materials ensures each patient has the means to hand to redress their own wound with appropriate dressing materials.

For patients requiring ongoing wound care following discharge, a documented handover should fully cover the treatment to date and include a plan of care going forward. This should include any risks to wound healing that have been identified at the preoperative assessment so the team caring for the patient are aware of the risks. It should also include details on surgery undertaken, implants, tissue grafts and closure material used.

If ongoing care in primary care or community care is required, this could include supported self-care of the patient with weekly review of wound healing to determine progress.

Remote monitoring

Surgical teams should consider utilising patient-centred digital solutions for ongoing monitoring of surgical patients to enable early intervention should any complications arise (29) (46). Ongoing monitoring of pain and exudate levels will allow for early detection of surgical wound complications. As well as clinical monitoring it is possible to record a range of outcome measures such as antibiotic usage and incidence of SSI (47).

Follow-up

Often patients with small low-risk wounds are not reviewed post-surgery. However, some of these do develop problems, so offering them PIFU would give them an easier pathway back to the surgical team. Careful selection of patients is essential to ensure patients are not lost to follow-up.

Digital images

See Digital images above.

Higher risk patients

Enhanced levels of care

This is where patients are risk assessed to see whether they require additional nursing input alongside what they would usually receive post-surgery. In hospital, this could mean additional and more detailed observations or interventions and encompasses enhanced perioperative care (31). In the post-discharge setting, this could mean increased visits.

Care of open wounds

Surgical wound complications should be reported to the team responsible for the patient, even if they have been discharged. There is a need to assess the patient and manage the situation according to the type of surgery that has been conducted. For example, a discharge from a groin wound



post vascular surgery may be a sign of deep infection affecting the anastomosis and potentially life-threatening complication of bleeding in the near future.

Review

In SWD, given the consequences and speed of deterioration of surgical wounds, review should be **at least weekly** for healing / further wound complications. Any new complications should be reported back to the surgical team for their intervention if required. Patients who were planned to be managed by tertiary delayed closure should be referred to the surgical team for listing once the wound is clean and ready for surgery.

Early surgical wound complications

Early surgical wound complications would usually occur within 48 hours.

- **Haemorrhage** may be an early complication. As soon as haemorrhage has been identified, call for help to the surgeon or dial 999 and a clean preferably sterile piece of dressing material should be used to apply pressure to the wound until help arrives. This will be easier to do if the patient is lying flat.
- **Surgical wound dehiscence** prior to discharge may be due to technical difficulties with closure methods. Dehiscence can occur within the first few days and patients returned to theatre for renewal of closure methods. Catastrophic dehiscence is where the closure method has failed and newly exposed viscera with internal organs can be seen. Immediately inform the surgical team or if the patient has been discharged, ring 999. Lay the patient flat and cover the exposed viscera/organs with saline soaked gauze or clean damp cloth, until the patient can be taken to theatre, or an ambulance arrives.

Intermediate surgical wound complications

Intermediate complications usually happen within 48 hours to 30 days, (Up to a year for implant surgery). The senior decision maker will depend on the location of the patient. In hospital, this would be a member of the surgical team and in primary or community care, this would be the G.P.

Wound infection is the invasion of a wound by proliferating microorganisms to a level that invokes a local, spreading and/or systemic response in the host (48). Assessing wound infection in darker skin tones, means that classic signs of redness may not be present, but discolouration of surrounding skin should be apparent.

Sepsis/Systemic signs of Infection refers to the stage of infection in which microorganisms spread throughout the body, evoking a host response that affects the body as a whole (48). Systemic infection/Sepsis signs include malaise, lethargy or non-specific general deterioration, loss of appetite, fever/pyrexia, severe sepsis, septic shock, organ failure, death.

- **Spreading Infection** (also referred to as cellulitis) is where there is invasion of the surrounding tissue by infective microorganisms that have spread from a wound (48). Microorganisms proliferate and spread to a degree that signs and symptoms extend beyond the wound border.
In the absence of systemic illness, antibiotics should only be prescribed after discussion with the relevant clinical team responsible for the surgical treatment.
- **Local Infection:** is where the presence and proliferation of microorganisms within the wound that evoke a response from the host, often including a delay in wound healing (48). Local infection is contained within the wound and the immediate peri-wound region (less than 2cm).
- **Dehiscence when surgery involved implants:** May lead to systemic infection and necessitate the implant being removed or replaced.
- **Dehiscence with newly exposed subcutaneous layers and fascia:** most likely to occur within the first 1-2 weeks of surgery. It often results in the need for further additional surgical intervention.
- **Suspected sinus/fistula tracking:** See Glossary.



- **Draining seromas:** surgical procedures where extensive soft tissue dissection and dead space creation lead to seroma formation. These can occur around 7-10 days post wound closure or drain removal.
- **Enterocutaneous fistula formation (ECF):** A fistula between the small intestine and the skin, as a result the content of the intestines leaks through to the skin.
- **Peri-stoma wound dehiscence:** mucocutaneous dehiscence is where the stoma becomes partially or fully detached from the peristomal skin. This can lead to stoma retraction.

Surgical Site Infection

Surgical Site Infection (SSI) is a post-surgical infection that can affect either the incision or deep tissue at the operation site. They are categorised into three types (45):

- Superficial incisional infection: infection occurring in the skin and subcutaneous tissue.
- Deep incisional infection involving deep tissues (fascial and muscle layers).
- Organ/space incisional infection: involving any part of the anatomy (organ/space) other than the incision, which is opened or manipulated during the surgical procedure e.g., a joint or the peritoneum.

To be included in Surgical Site Infection Surveillance Service (SISS) the infection must be recorded within 30 days of the procedure (superficial incisional infection), or up to a year for patients receiving an implant Deep incisional or organ/space infection).

Wound sampling or swabbing should only be conducted if signs of clinical infection are present. Pus, if present, should be aspirated using a sterile syringe and needle and transferred to an appropriate specimen container (48). If spreading infection is apparent, then consider undertaking blood cultures.

In the absence of systemic illness, antibiotics should only be prescribed after discussion with the relevant clinical team responsible for the surgical treatment, ideally with access to microbiological swab results.

Signs of sepsis include slurred speech or confusion, extreme shivering, or muscle pain, passing no urine (18 hours), severe breathlessness, skin mottled or discoloured (32). If signs of sepsis are present, then community teams should use the Sepsis Trust Screening Tool to screen patients (49).

Referral back to the surgical team is important as deep infection may affect surgical anastomoses or implanted joint or device. If an infection is suspected in a wound related to implanted material such as a joint replacement or around a site of fracture, investigation and management must be undertaken by an appropriate specialist team (50) (51).

Surgical Wound Dehiscence (SWD)

SWD is the separation of the margins of a closed surgical incision, 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.

Dehiscence can be caused by several factors: technical, mechanical, and disrupted healing (local and systemic factors).

Abscesses should be drained to remove pus to prevent further infection. Many seromas and haematomas may resolve spontaneously but, depending on the size, location, some seromas, and haematomas may require aspiration or the insertion of a drain (52).

Grading tool

It is important to distinguish SWD with no clinical signs and symptoms of infection from SWD with clinical signs and symptoms of infection to identify the correct approach to management (52). Structured assessment and classification help to guide and standardise clinical practice and optimise outcomes for patients (53) (36). Therefore, the use of a grading tool could help to facilitate best practice. Coding of any grading tool adopted will need to be considered in the future.



INPWT/NPWT

See INPWT/NPWT above.

Review

See review above.

Conservative care

In some patients, their underlying comorbidities may mean they do not have the capacity to heal.

The capacity for the wound to heal should be decided by the surgical team, as they will understand the complexity of undertaking a surgical intervention for that patient. In addition, given the complexity of these patients, care should be delivered as close to home as possible. A more complex surgical wound complication which could be potentially life threatening, for example, systemic infection, dehiscence with newly exposed subcutaneous layers and fascia or development of sinus or fistula, should initiate referral back to the surgical team.

D. Aftercare following healing

1. There is emerging evidence that massage to surgical scars has a beneficial effect, with a variety of surgical specialities advocating this to improve scar outcome (54). The proposed benefits include improvement in tethering, tightness, pain, itch, and hypersensitivity (55) (56). It can be introduced 2-3 weeks post complete healing and is usually undertaken 2-3 times a day, either using circular, vertical, or horizontal movements once the healed tissue has gained sufficient strength to tolerate surface friction (57). In addition, the application of a simple emollient is essential for all scars and should be encouraged regularly as needed to prevent dryness of the skin.
2. UV radiation increases scar pigmentation and worsens clinical appearance (58).



Appendix 1: Search strategy for research evidence

The search strategy was limited to pre-appraised sources of research evidence, using a 4S approach² to structure a search strategy as shown.

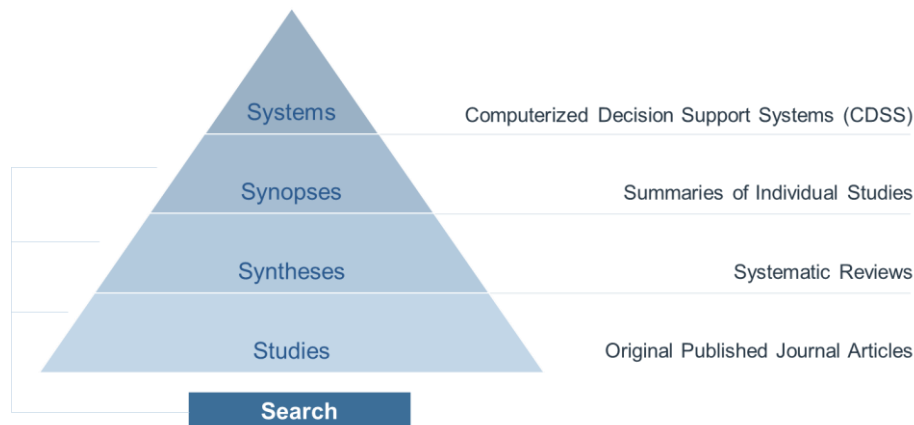


Figure 1 4S search strategy approach

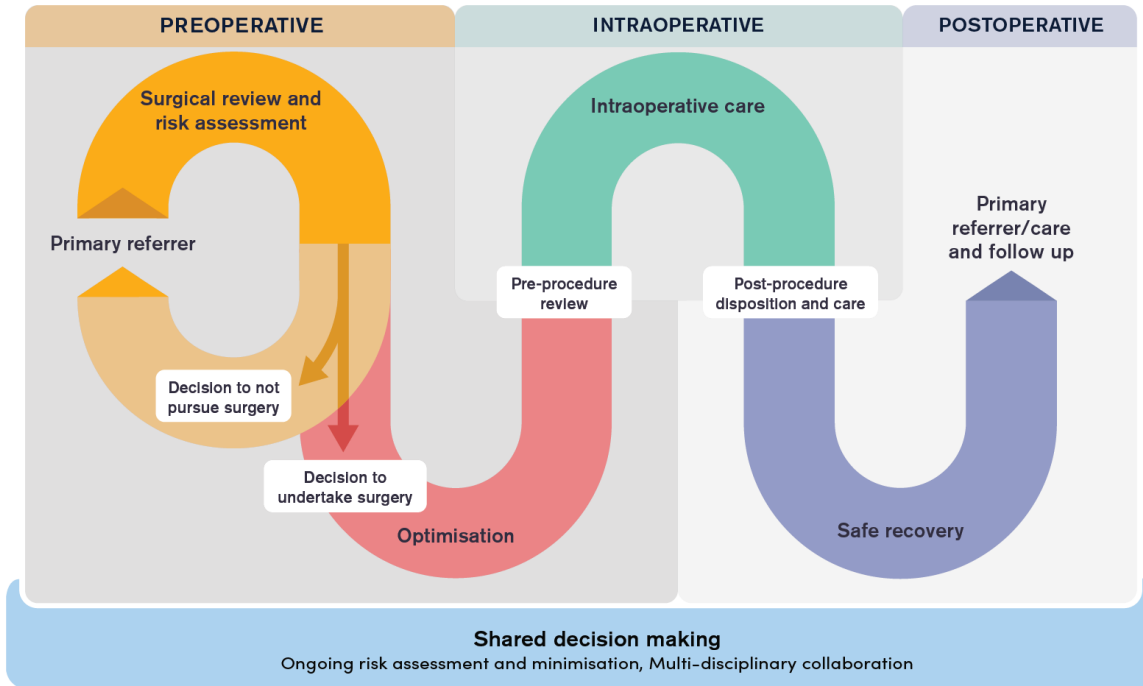
- **Systems:** searched UK computerised decision support systems for surgical wound complications.
- **Synopses:** searched for summaries of the current state of knowledge about the prevention and treatment of surgical wound complications.
- **Syntheses:** searched the Cochrane Library of Systematic Reviews to identify reviews for surgical wound complications prevention and treatment.
- **Studies:** searched the NIHR library for NIHR funded studies completed after publication of the relevant Cochrane systematic reviews for surgical wound complications.

² Haynes RB Of studies, syntheses, synopses, and systems: the “4S” evolution of services for finding current best evidence *BMJ Evidence-Based Medicine* 2001;6:36-38.



Appendix 2: Example of a perioperative care pathway

From the contemplation of surgery to optimal outcome



Published with kind permission from ANZCA (59).



Appendix 3: Surgical wound assessment essential criteria

The Surgical Wound Assessment Essential Criteria has been compiled using all the criteria from the NHS England [Leading Change Adding Value Framework Minimum Data Set](#) (28) and the assessment criteria from the [WUWHS Consensus Document - Surgical Wound Dehiscence](#) (34). These criteria are the **minimum** that should be documented in a surgical wound assessment.

The following should be assessed and recorded in the patient record:	
Domain	Data Item
General health information ^{1, a}	Risk factors for delayed healing ^b . Allergies. Skin sensitivities. Impact of the wound on quality of life (physical, social & emotional). Information provided to patient and carers.
Wound baseline information ^{1, 2}	Number of Surgical wounds. Wound location. Wound type/classification ^c - clean, clean-contaminated, contaminated dirty. Date of Surgery. Treatment aim ^d . Planned re-assessment date ^e .
Wound assessment parameters ^{1, 2}	Wound size (maximum length, width, and depth). Closure method - sutures, staples, glue, adhesive strips. Date of closure removal. Drain in situ / type of drain. Prosthesis / implant present. Undermining/tunnelling ^f Wound bed tissue type ^g Wound bed tissue amount ^h Description of wound margins/edges ⁱ Approximation of wound edges ^j Colour and condition of surrounding skin ^k Whether the wound has healed ^l
Wound symptoms ^{1, 2}	Presence of wound pain ^m Wound pain frequency Fluid collection beneath the wound closure (Abscess, Haematoma, Seroma) ⁿ Crepitus present ^o Dehiscence (size and number) ^p Healing ridge present ^q Exudate amount ^r Exudate consistency/type/colour ^s Odour occurrence ^t Signs of systemic infection ^u Signs of local wound infection ^v Whether a wound swab has been taken ^w
Surgical wound specific	Type of surgery ^x Emergency /Elective Surgery ^y Duration of surgery ^z Antibiotic prophylaxis given



Appendix 4: Risk factors leading to surgical wound complications:

Pre-operative

- Socioeconomic and lifestyle factors – smoking, alcohol, obesity, BMI, malnutrition, poverty.
- Pre-existing co-morbidities - diabetes cardiovascular disease.
- Previous infection or colonisation with remote pathogens e.g., MRSA.
- Psychological factors and anxiety.
- Cultural and ethnicity factors - beliefs around washing etc.
- Extended preoperative hospital stays or residency in a nursing home.
- Elective vs Emergency Surgery.
- Type of Surgery - surgical wound classification.
- Omission or sub optimal timing of antibiotic prophylaxis.
- Previous surgery in the same site.
- Gender
- Age
- Medication History and allergy status.
- Mental Health
- Dementia and cognitive function.
- Frailty
- Functional status
- Chronic pain

Intra-operative

Given the diversity of operational procedures, it is not possible for these recommendations to cover all the different surgical specialities, but these key elements of intra-operative care are considered to increase the risk of surgical wound complications:

- Peri-operative hypothermia
Healing process is affected by the occurrence of peri-operative hypothermia, immune defence cells are changed by the temperature decrease and tissue oxygen supply is reduced due to hypothermic construction (60). Use of warming devices should be considered.
- Length of intended surgery
Prolonged operative time can increase the risk of developing SSI (61).
- Inadequate surgical closure
Inadequate suturing techniques, such as loose knots or insufficient sutures, can compromise the integrity of the wound closure (62).
- Failure to obliterate dead space.
Failing to prevent dead space can lead to collection of fluid or air, which can lead to infection.
- Implant /prosthesis
There is higher risk of infection with an implant or prosthesis because these may serve as surfaces for bacterial colonisation, potentially slow wound healing processes, and/or lead to biofilm formation.
- Blood transfusion
Transfusion-related immunomodulation can lead to weakened immunity in response to blood transfusion and predispose patients to SSI's (63)
- High wound tension closure
If the wound edges are under excessive tension during the closure, it can increase the incision site's stress, making it more prone to separation.

Post-operative

- Wound infection
- Oedema
- Premature suture removal
- Failure to wean from ventilator
- One or more complications excluding dehiscence



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