Surgical Wound Dehiscence - Identification and Management

Prof Karen Ousey
Institute of Skin Integrity and Infection Prevention
University of Huddersfield

Consider……

- What does SWD mean to you?
  - Wound disruption
  - Wound separation
  - Wound opening
  - Wound rupture
  - Wound breakdown

- Wound failure
- Surgical site failure
- Post-operative wound dehiscence
- Burst abdomen
- Fascial dehiscence

What does SWD mean to you?

- Reserved exclusively for the serious event of evisceration of abdominal contents that may occur following failure of a large abdominal surgical incision.

- To others, meaning covers a spectrum of problems ranging from:

  - superficial separation of part of an incision
  - complete separation of the full depth of the incision with exposure of body organs or surgical implants

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.

What causes SWD?

- Technical issues with the closure of the incision – e.g. unravelling of suture knots
- Mechanical stress – e.g. coughing can cause breakage of the sutures or rupture of the healing incision after suture or clip removal/reabsorption
- Disrupted healing – e.g. due to comorbidities or treatments that hamper healing, or as a result of a surgical site infection (SSI)

Causes of SWD

- Major risk factors for SWD are:
  - Obesity (body mass index (BMI) ≥35kg/m2)
  - Diabetes mellitus
  - Current or recent smoking
  - Emergency surgery
  - Age >65 years
  - Extended duration of surgery
  - Inadequate surgical closure
  - Peri-operative hypothermia and wound infection

management

Surgical wound dehiscence: a conceptual framework for patient assessment

Abstract: This paper presents a conceptual framework which outlines the risk factors associated with surgical wound dehiscence (SWD) as identified in the literature. The purpose for the development of the conceptual framework was to derive an evidence-based, informed understanding of factors associated with SWD, in order to inform a programme of research on the aetiology and potential risk factors of SWD. Incorporated within the patient-centric conceptual framework are patient related comorbidities, intraoperative and postoperative risk factors related to SWD. These are categorised as either 'mechanical' or 'physiological mechanisms' posited to influence these relationships. The use of the conceptual model for assessment of patients has particular clinical relevance for identification of risk and the management of patients in the pre-, intra- and postoperative period.
Declaration of interest: The work was funded by the Wound Management Innovation CRC Project Grant 3.13. The authors have no interests to declare.

conceptual framework • risk factors • surgery • surgical site infection • surgical wound dehiscence • wound healing

Surgical wound dehiscence (SWD) is a potential complication following any surgical procedure,[1,2] and leads to increased health costs and reduced patient wellbeing.[1,3-5] SWD is defined as the separation of opposed or sutured margins following a surgical procedure.[6] It is most commonly reported to occur between days seven and 14 postoperatively.[1] Multiple authors report SWD occurring after abdominal surgery,[3,7-13] obstetric surgery,[14-17] cardiothoracic surgery,[18] and orthopaedic surgery.[19,20] Noted by researchers in the field is the delay in healing experienced by the patient, and the sometimes complex nature of the clinical problem.[4,5,21]

While the literature abounds with reports of surgical site infection (SSI), there is a restricted amount of publications directly reporting the scope and costs associated with SWD. It is, at times, reported in therapy (NPWT). Failure of the wound to heal may be due to a number of reasons, such as patient-related factors including the patient's age,[3] presence of cardiovascular disease (CVD),[3,7] mechanical reasons including suture breakage or knots slipping,[24] wound infection or dehiscence,[3,7,25,26] and if the patient is undergoing radiotherapy or chemotherapy.[1] SWD, as a complication to healing, may also be due to a number of reasons; most notably and frequently reported is SSI.[3,4,7,21,25,27-29] Microbial organisms commonly associated with SSI include *Staphylococcus aureus* and other flora common to the skin.[21,30] However, there may be non-microbial causes related to SWD, such as obesity,[31-33] previous surgery, or other related physiological factors,[5] such as age, gender and CVD.[3,7,27,34-37] Yet, despite the growing advances in antimicrobial agents, aseptic techniques, and patient management systems, wound complications such as

Risk factors for SWD

- Sandy-Hodgetts, et al. (2018) Surgical wound dehiscence: a conceptual framework for patient assessment. *Journal of Wound Care* 27(3):119-126.

How do we assess SWD?

- Prior to assessment of SWD, the events, leading to the dehiscence, e.g. coughing, vomiting, trauma, suture/clip removal, purulent drainage, should be ascertained.

- SWD occurring very soon after surgery and of very recent occurrence may be suitable for re-suturing.

- The entire length of an incision with SWD should be fully assessed: the factors that led to the SWD may also be affecting other regions of the incision that remain closed

How do we classify SWD?

Classification allows for a systematic and reproducible method for identifying, measuring and recording an event (i.e. pressure injury, skin tear)

Distinct absence of grading system for SWD describing wound characteristics to inform evidence based practice clinical management of SWD. The Sandy SWD Grading System came about from the doctoral research of Kylie Sandy-Hodgetts in 2017.

This grading system was adapted by the WUWHS SWD Consensus Document: prevention and outcomes.


Clinical practice

Wounds International

Clinical innovation: the Sandy Grading System for Surgical Wound Dehiscence Classification — a new taxonomy

The worldwide volume of surgery is considerable, with an estimated 234.2mn major surgical procedures carried out every year (Weiser et al, 2008). While contemporary surgical procedures are relatively safe, complications such as surgical wound dehiscence, although not commonplace, are a major disruptor to patient wellbeing and wound healing outcomes. Moreover, the importance of classification, documentation and reporting of this type of wound must not be underestimated. Accurate diagnosis and reporting of the type of dehiscence and underlying aetiology is key to understanding the extent of the problem. This paper presents a novel classification system that uses a systematic approach for the diagnosis of the type of dehiscence following surgery.

Sandy-Hodgetts, K. (2017) Clinical innovation: The Sandy Grading System for Surgical Wound Dehiscence Classification — a new taxonomy. *Wounds International* Vol 8 Issue 4 *www.woundsinternational.com*

Holistic Assessment

- Medical and surgical history
- Nature of the surgical procedure (e.g. elective/emergency, closing method, type of surgery)
- Current health
- Lifestyle
- Current medication
- Pain
- Psychosocial status e.g. care setting, occupation, concordance, QoL

Incision/wound assessment

- Prior to assessment of SWD, the events, leading to the dehiscence, e.g. coughing, vomiting, trauma, suture/clip removal, purulent drainage, should be ascertained.

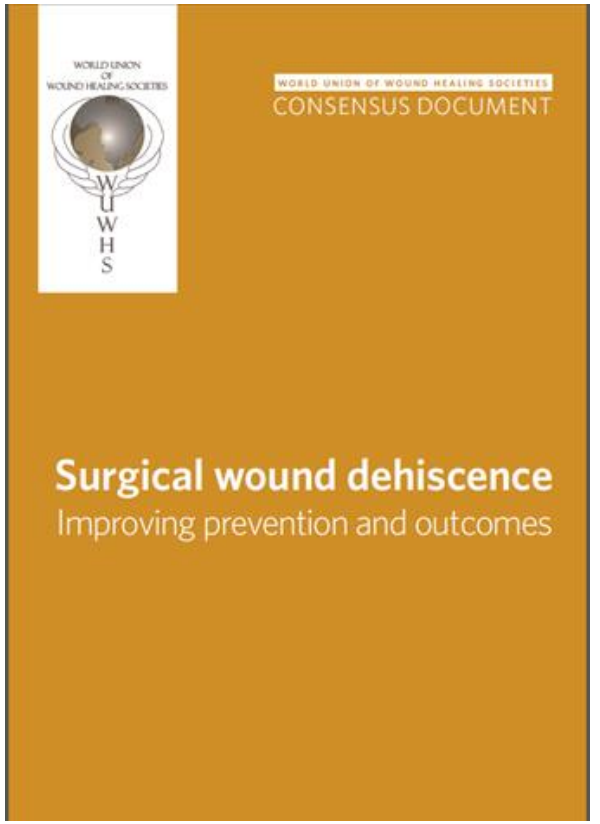
- SWD occurring very soon after surgery and of very recent occurrence may be suitable for re-suturing.

- The entire length of an incision with SWD should be fully assessed: the factors that led to the SWD may also be affecting other regions of the incision that remain closed

Remember

- If more than one area of dehiscence is present, each area should be assessed individually
- A short area of dehiscence is not necessarily only superficial and may extend deeply
- Probing should be undertaken very gently and carefully to avoid inadvertently exacerbating the dehiscence or causing other damage
- All general and wound assessments, further tests, interventions and referrals should be documented

www.woundsinternational.com



WORLD UNION OF WOUND HEALING SOCIETIES

CONSENSUS DOCUMENT

Table 10 | Proposed WUWHS SWD Grading System (adapted from Sandy SWD Grading System[110])

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** Figure 9a, page 19	**Dermal layer only involved; no visible subcutaneous fat** ■ No clinical signs and symptoms of infection
	1a Figure 9b, page 19	As Grade 1 plus clinical signs and symptoms of infection (e.g. superficial incisional SSI§)
	2 Figure 9c, page 19	**Subcutaneous layer exposed; fascia not visible** ■ No clinical signs and symptoms of infection
	2a Figure 9d, page 19	As Grade 2 plus clinical signs and symptoms infection (e.g. superficial incisional SSI§)
	3 Figure 9e, page 19	**Subcutaneous layers and fascia exposed** ■ No clinical signs and symptoms of infection
	3a Figure 9f, page 19	As Grade 3 plus clinical signs and symptoms infection (e.g. deep incisional SSI§)
	4^ Figure 9g, page 19	**Any area of fascial dehiscence with organ space, viscera, implant or bone exposed** ■ No clinical signs and symptoms infection
	4a^ Figure 9h, page 19	As Grade 4 plus clinical signs and symptoms 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'

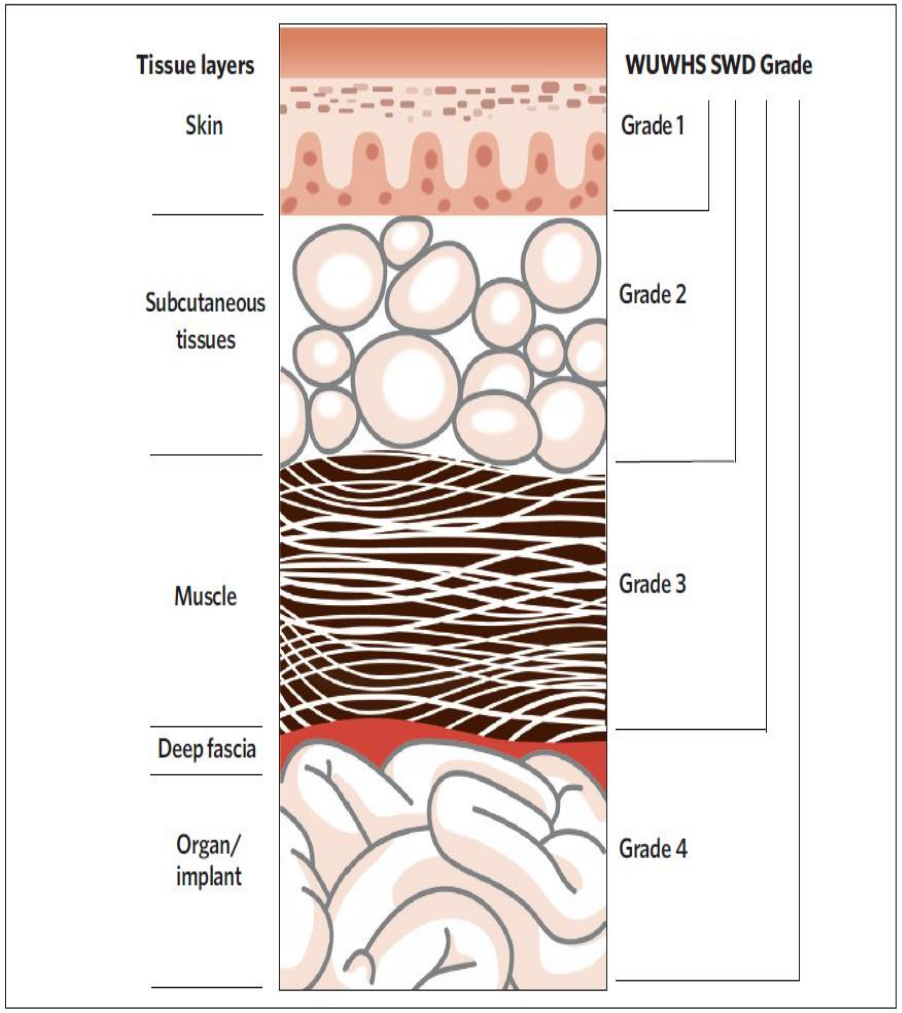


Figure 8 | Proposed WUWHS SWD Grade according to the tissue layers involved in the dehiscence

Proposed WUWHS SWD Grading

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	Dermal layer only involved; no visible subcutaneous fat • No clinical signs and symptoms of infection
		1a	As Grade 1 plus clinical signs and symptoms of infection (e.g. superficial incisional SSI)
		2	Subcutaneous layer exposed; fascia not visible • No clinical signs and symptoms of infection
		2a	As Grade 2 plus clinical signs and symptoms infection (e.g. superficial incisional SSI)
		3	Subcutaneous layers and fascia exposed • No clinical signs and symptoms of infection
		3a	As Grade 3 plus clinical signs and symptoms infection (e.g. deep incisional SSI)
		4^	Any area of fascial dehiscence with organ space, viscera, implant or bone exposed • No clinical signs and symptoms infection
		4a^	As Grade 4 plus clinical signs and symptoms 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 ^Grade 4/4a dehiscence of an abdominal incision may be called 'burst abdomen'

WUWHS SWD Classification

- WUWHS SWD Grade 1 - Small area of dermal separation

WUWHS SWD Classification

- WUWHS SWD Grade 1a
- Post-mastectomy: small areas of dermal separation with inflammation and infection

WUWHS SWD Classification

- WUWHS SWD Grade 2 - Obese patient with exposed subcutaneous tissue and tunnel into pannus following surgery for seatbelt trauma

WUWHS SWD Classification

- WUWHS SWD Grade 2a - Post-mammoplasty: dermal separation with exposure of subcutaneous tissue with inflammation and purulent exudate

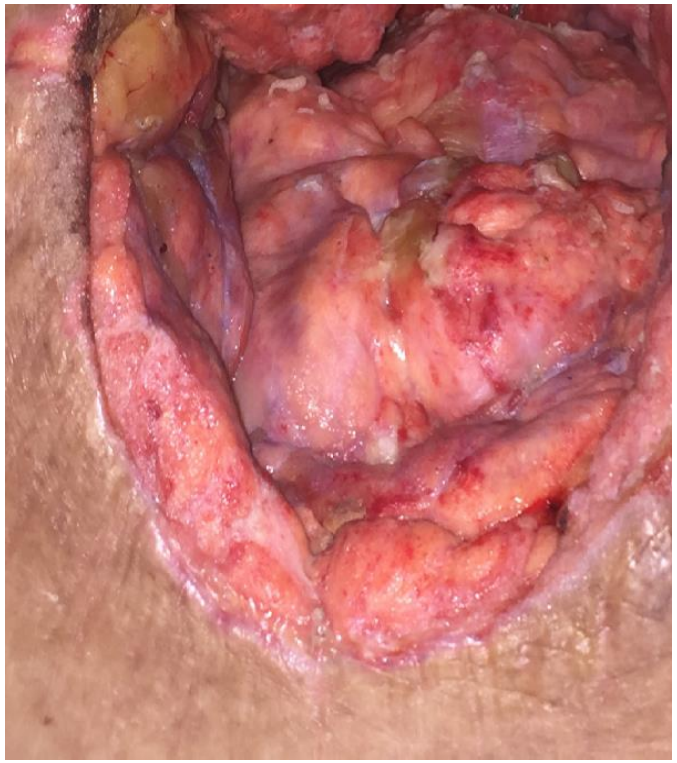
WUWHS SWD Classification

- WUWHS SWD Grade 3 - Post-spinal surgery: full length dehiscence with fascial exposure without signs of infection

WUWHS SWD Classification

- WUWHS SWD Grade 3a
  - Leg incision: dehiscence exposing muscle and fascia with pus and cellulitis

WUWHS SWD Classification



- WUWHS SWD Grade 4 - Post-laparotomy: dehiscence with abdominal organ exposure and no signs of infection

WUWHS SWD Classification

- WUWHS SWD Grade 4a - Separation of suture line with exposed hardware with inflammation and signs of infection

Is this SWD?

- Multiple small areas of superficial SWD with signs of infection following mastectomy

Is this SWD?

- SWD after reduction mammoplasty

SWD?

- SWD with abscess formation and draining pus following total knee arthroplasty

SWD?

- Abdominal wound dehiscence post-laparotomy

- Using TIME to assess SWD

Incisional healing and

Incisional parameter	Relationship to TIME framework
Incision colour	**T**issue
Healing ridge	
Peri-incisional area	**I**nfection/inflammation
Exudate	**M**oisture
Wound margins	**E**dge

Signs that incisional healing is

Relationship to TIME framework	Signs of healing progression
Tissue – incision colour	• Days 1–4: red • Days 5–14: bright pink • Day 15–1 year: pale pink, progressing to white or silver or darker than usual skin colour
Tissue – healing ridge	• Days 5–9: a healing ridge of thickened tissue indicating newly formed collagen can be felt about 1cm either side of the incision along its length, and persists into the remodelling phase
Infection/ inflammation – peri-incisional area	• Signs of inflammation: mild oedema, erythema, warmth or skin discolouration that resolves by day 5 • Pain
Moisture – exudate	• Days 1–4: decreasing volume from moderate to minimal and changing from sanguineous to serosanguineous to serous • Resolves by day 5
Edge – wound margins	• Epithelial closure should be seen by day 4 along the entire incision • Edges are approximated

Signs that incisional healing

Relationship to TIME framework	Signs of healing impairment
Tissue – incision colour	• Days 1–4: may be red; tension in the incision line • Days 5–9: edges may be well-approximated and the tension remains • Day 10–14 : if SWD does not occur, colour may remain red or progress to pink and may be followed ultimately by hypertrophic scarring
Tissue – healing ridge	• Lack of healing ridge
Infection/ inflammation – peri-incisional area	• Signs of inflammation may be absent in the first few days after surgery • Signs of inflammation and pain may be present for extended periods
Moisture – exudate	• Exudate persists beyond day 1–4 • Exudate may be serosanguineous, serous or purulent (e.g. cloudy, green, yellow or brown)
Edge – wound margins	• Epithelial resurfacing may be only partially present or entirely absent • Area(s) of separation (SWD) may be present by day 14

Assessment of SWD

Parameter	Assess	Specifics
Tissue	• Location and extent of dehiscence	• Location of the incision • Proportion of the incision affected • Number of areas of dehiscence • Presence of sutures/clips and condition (intact/broken)
	• Depth of dehiscence	• Partial or full-thickness dehiscence and tissue layers affected (WUWHS SWD Grade) • Extension to or exposure of organs/bone/implant • Presence of undermining/tunnelling • For abdominal SWD, presence of evisceration
	• Tissue viability	• Condition of exposed tissues • Wound bed tissue types and proportions – e.g. of necrotic/devitalised tissue, slough and granulation tissue
	• Dimensions	• Dimensions of the dehisced area(s): maximum length, width, depth
Infection (or inflammation)	• For local indicators of infection or inflammation	• Clinical signs and symptoms of acute or chronic infection • N.B. In patients who are immunosuppressed, signs and symptoms may be less obvious

Assessment of SWD

Parameter	Assess	Specifics
Moisture	• Exudate/drainage colour, consistency, type and odour	• Location of the incision • Proportion of the incision affected • Number of areas of dehiscence • Presence of sutures/clips and condition (intact/broken)
	• Exudate/drainage level	• Purulent (cream, yellow or green) or haemopurulent (red, brown) may indicate infection • Yellow or brown exudate may indicate a urinary or enteric fistula • Malodour may indicate infection or fistula
Edge	• Edges of dehisced area	• In long-standing areas of dehiscence, the edges may become undermined
	• Colour and condition of the surrounding skin	• Signs of dermatological conditions that may affect healing – e.g. radiation dermatitis • Signs of spreading infection – e.g. spreading erythema, warmth and oedema • Periwound maceration may indicate high exudate/drainage levels and/or inadequate absorbency of the dressing

Case study 1

WUWHS SWD Grade*		Descriptors
Increasing severity	1 Figure 9a, page 19	**Dermal layer only involved; no visible subcutaneous fat** ■ No clinical signs and symptoms of infection
Single/multiple regions† or full-length separation of the margins of a closed surgical incision; occurring up to 30 days after the procedure‡	1a Figure 9b, page 19	As Grade 1 plus clinical signs and symptoms of infection (e.g. superficial incisional SSI§)
	2 Figure 9c, page 19	**Subcutaneous layer exposed; fascia not visible** ■ No clinical signs and symptoms of infection
	2a Figure 9d, page 19	As Grade 2 plus clinical signs and symptoms infection (e.g. superficial incisional SSI§)
	3 Figure 9e, page 19	**Subcutaneous layers and fascia exposed** ■ No clinical signs and symptoms of infection
	3a Figure 9f, page 19	As Grade 3 plus clinical signs and symptoms infection (e.g. deep incisional SSI§)
	4^ Figure 9g, page 19	**Any area of fascial dehiscence with organ space, viscera, implant or bone exposed** ■ No clinical signs and symptoms infection
	4a^ Figure 9h, page 19	As Grade 4 plus clinical signs and symptoms infection (e.g. organ/space SSI§)

Photo courtesy of Caroline Dowsett

- 60-year-old woman
- 2cm section of incision dehicsed following laparotomy 10 days previously
- Local wound infection resolved with a topical antimicrobial dressing

WUWHS SWD Grade 1a

Case study 2

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** Figure 9a, page 19	**Dermal layer only involved; no visible subcutaneous fat** ■ No clinical signs and symptoms of infection
	1a Figure 9b, page 19	As Grade 1 plus clinical signs and symptoms of infection (e.g. superficial incisional SSI§)
	2 Figure 9c, page 19	**Subcutaneous layer exposed; fascia not visible** ■ No clinical signs and symptoms of infection
	2a Figure 9d, page 19	As Grade 2 plus clinical signs and symptoms infection (e.g. superficial incisional SSI§)
	3 Figure 9e, page 19	**Subcutaneous layers and fascia exposed** ■ No clinical signs and symptoms of infection
	3a Figure 9f, page 19	As Grade 3 plus clinical signs and symptoms infection (e.g. deep incisional SSI§)
	4^ Figure 9g, page 19	**Any area of fascial dehiscence with organ space, viscera, implant or bone exposed** ■ No clinical signs and symptoms infection
	4a^ Figure 9h, page 19	As Grade 4 plus clinical signs and symptoms infection (e.g. organ/space SSI§)

Photo courtesy of Risal Djohan

- 58-year-old man
- Full separation of opposed margins including full thickness of skin following spinal surgery 3 weeks previously
- Wound was clean and not infected

WUWHS SWD Grade 3

Case study 3

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** Figure 9a, page 19	**Dermal layer only involved; no visible subcutaneous fat** ■ No clinical signs and symptoms of infection
	1a Figure 9b, page 19	As Grade 1 plus clinical signs and symptoms of infection (e.g. superficial incisional SSI§)
	2 Figure 9c, page 19	**Subcutaneous layer exposed; fascia not visible** ■ No clinical signs and symptoms of infection
	2a Figure 9d, page 19	As Grade 2 plus clinical signs and symptoms infection (e.g. superficial incisional SSI§)
	3 Figure 9e, page 19	**Subcutaneous layers and fascia exposed** ■ No clinical signs and symptoms of infection
	3a Figure 9f, page 19	As Grade 3 plus clinical signs and symptoms infection (e.g. deep incisional SSI§)
	4^ Figure 9g, page 19	**Any area of fascial dehiscence with organ space, viscera, implant or bone exposed** ■ No clinical signs and symptoms infection
	4a^ Figure 9h, page 19	As Grade 4 plus clinical signs and symptoms infection (e.g. organ/space SSI§)

Photo courtesy of Fiona Downie

- Mechanical dehiscence of sternal incision following CABG 6 days previously
- Minimal serous exudate, no signs of local or systemic infection

WUWHS SWD Grade 4

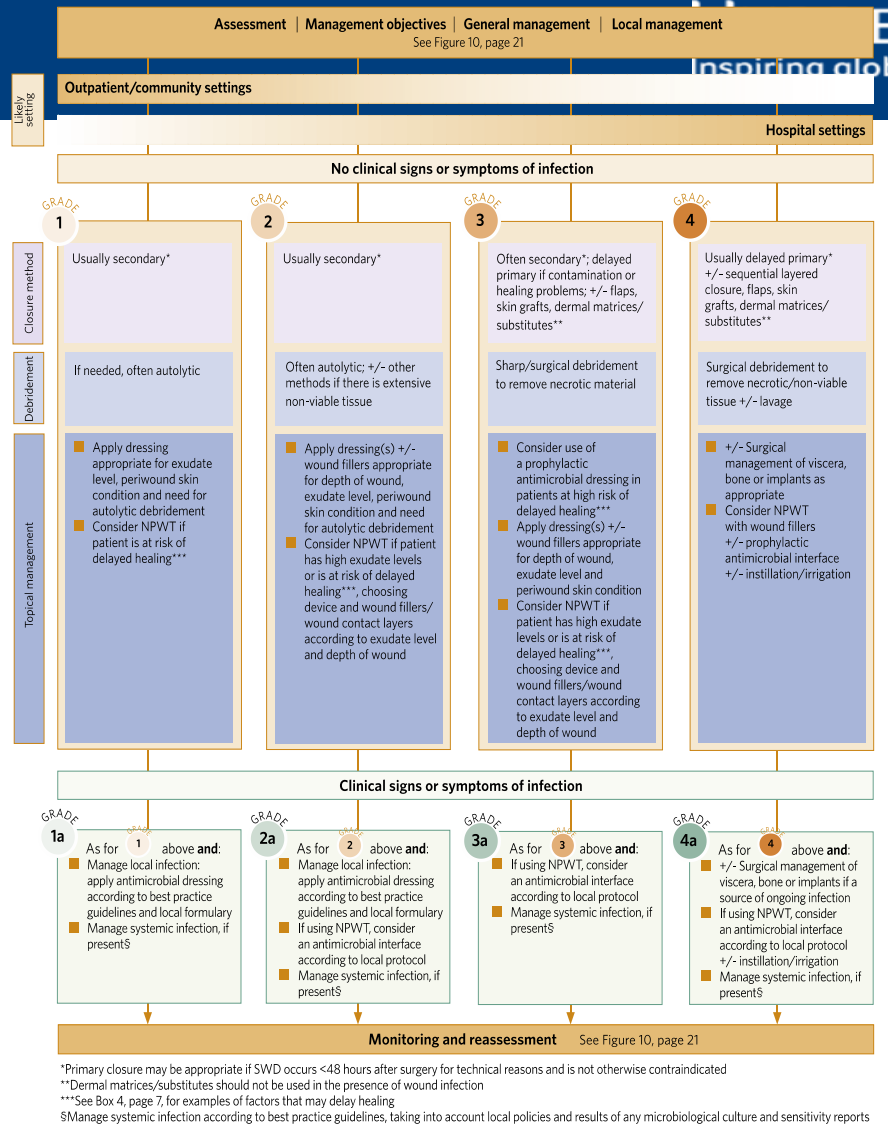
Assessment of SWD with TIME framework

Table 9 | Assessment of SWD using the TIME framework (adapted from[93,96,97,99])

Parameter	Assess	Specifics
Tissue	Location and extent of dehiscence	■ Location of the incision ■ Proportion of the incision affected ■ Number of areas of dehiscence ■ Presence of sutures/clips and condition (intact/broken)
	Depth of dehiscence	■ Partial or full-thickness dehiscence and tissue layers affected (see Figure 8, page 18); WUWHS SWD Grade (see Table 10, page 18) ■ Extension to or exposure of organs/bone/implant ■ Presence of undermining/tunnelling ■ For abdominal SWD, presence of evisceration
	Tissue viability	■ Condition of exposed tissues ■ Wound bed tissue types and proportions – e.g. of necrotic/devitalised tissue, slough and granulation tissue
	Dimensions	■ Dimensions of the dehisced area(s): maximum length, width, depth
Infection (or inflammation)	For local indicators of infection or inflammation	■ Clinical signs and symptoms ■ See Box 5 and Box 6, page 13, and Box 8, page 17, for signs and symptoms of acute and chronic infection ■ N.B. In patients who are immunosuppressed, signs and symptoms may be less obvious
Moisture	Exudate/drainage colour, consistency, type and odour	■ Purulent (cream, yellow or green) or haemopurulent (red, brown) may indicate infection ■ Yellow or brown exudate may indicate a urinary or enteric fistula ■ Malodour may indicate infection or fistula
	Exudate/drainage level	■ Indications of the level of exudate production can be gained from the condition of the current dressing (i.e. a dry dressing indicates low exudate levels; a saturated or leaking dressing indicates higher levels) and the appearance of the wound bed
Edge	Edges of dehisced area	■ In long-standing areas of dehiscence, the edges may become undermined
	Colour and condition of the surrounding skin	■ Signs of dermatological conditions that may affect healing – e.g. radiation dermatitis ■ Signs of spreading infection – e.g. spreading erythema, warmth and oedema ■ Periwound maceration may indicate high exudate/drainage levels and/or inadequate absorbency of the dressing

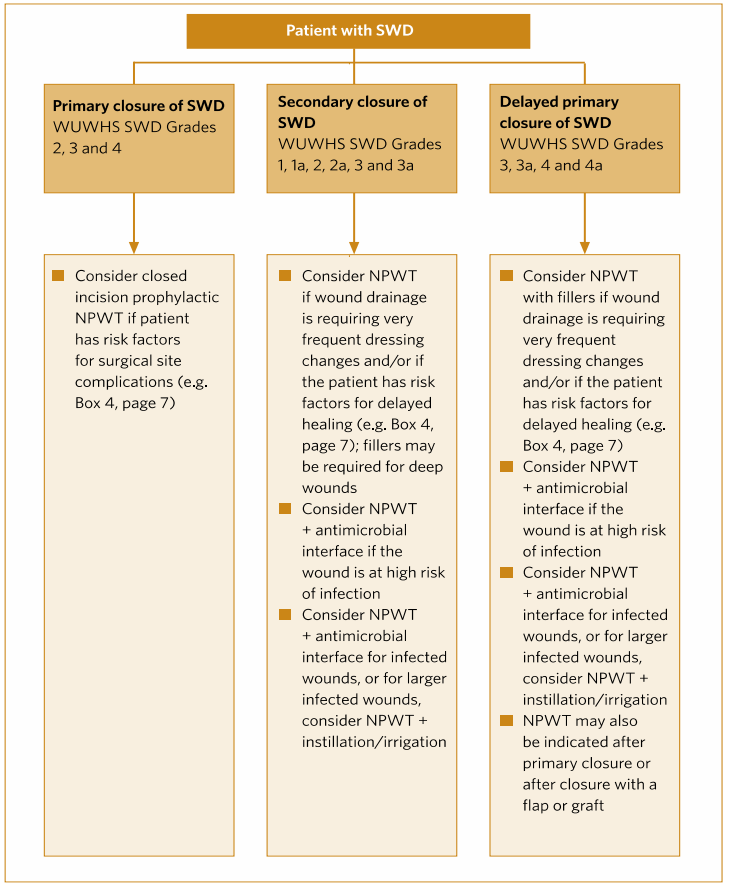
Local management

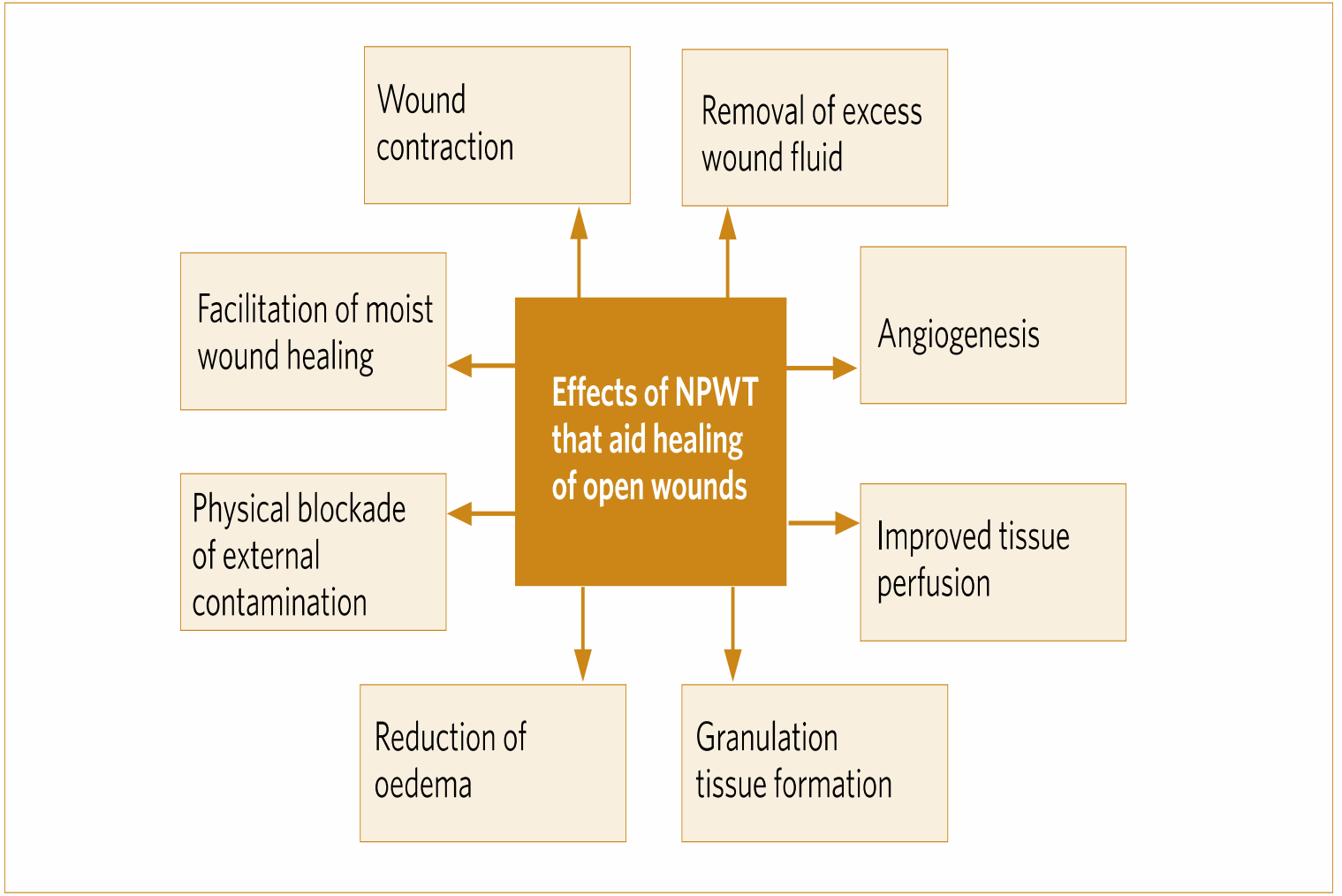
- Dependent on a range of factors including the:
  - Severity of the dehiscence – e.g. WUWHS SWD Grade and exposure of viscera, bone or implants
  - Presence of infection
  - Timing of the dehiscence in relation to the surgery that produced the incision
  - Presence of co-morbidities that increase the risk of surgical site complications and/or impair healing.



NPWT

- NPWT should be used in the context of holistic management of the patient
- Used only as an adjunctive treatment in the management of wound infection
- Suitable for highly exuding, deep or complex dehisced wounds.
- NPWT fulfils the needs for moist wound healing, exudate/drainage management, elimination of dead space and protection from external contamination in the facilitation of healing by secondary or tertiary healing after SWD.




Wound contraction
Removal of excess wound fluid
Facilitation of moist wound healing
Effects of NPWT that aid healing of open wounds
Angiogenesis
Physical blockade of external contamination
Improved tissue perfusion
Reduction of oedema
Granulation tissue formation

- Correct assessment and categorisation will lead to correct management

- Thank you for listening

References

- WUWHS. World Union of Wound Healing Societies (WUWHS) consensus document. Surgical Wound Dehiscence: Improving prevention and outcomes. Wounds Int. 2018