



INFECTION SIMPLIFIED

This Simplified Guide is intended to aid your clinical decisions and practice around infection.

Wound infection is often associated with delayed wound healing and an increase in morbidity. These infections are difficult to treat and can also add to complications and cause distress to the patient. Early detection/recognition, along with appropriate and effective intervention, is necessary to reduce the consequences, both health-wise and financially.

LEARNING OUTCOMES

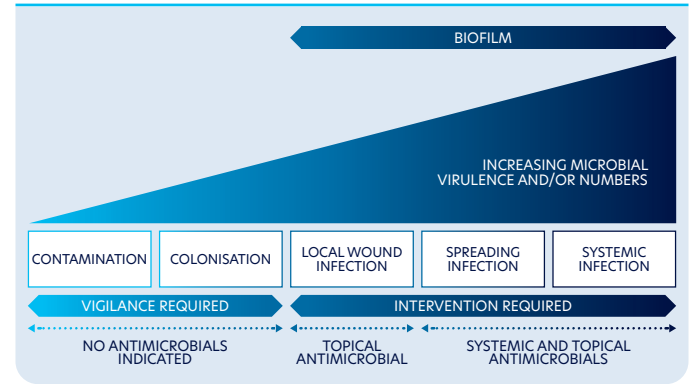
- ✓ Stages in the wound infection continuum
- ✓ Risk factors of infection
- ✓ Signs and symptoms of infection
- ✓ Managing infection

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. Microorganisms multiply within the wound, developing a range of virulence factors to overcome the host defences, leading to local tissue damage and impeding wound healing (IWII, 2022).

$$\text{Infection} = \frac{\text{Host Resistance}}{\text{Number of Bacteria} \times \text{Virulence}}$$

Infection results from a disturbance in the balance between host resistance and the number of bacteria and their virulence.

STAGES IN THE WOUND INFECTION CONTINUUM



CONTAMINATION

The presence of non-proliferating microbes within a wound at a level that does not evoke a host response, delay or impede wound healing. Virtually from the time of the wound occurring, all open wounds are contaminated with microbes. Wounds become contaminated from endogenous skin flora and exogenous microbial sources, such as poor general hand hygiene and environmental exposure. Unless compromised, the host defences respond swiftly to destroy the bacteria.

In contaminated wounds, microorganisms are present within the wound but are not proliferating.

There is no significant host reaction and no delay in healing (IWII, 2022).

COLONISATION

Refers to the presence within the wound of microbial organisms that undergo limited proliferation without evoking a host reaction. Microbial growth occurs at a non-critical level, and wound healing is not impeded or delayed. Sources for microorganisms may be natural flora, exogenous sources or because of environmental exposure.

In colonised wounds, microorganisms are present within the wound but are not proliferating. There is no significant host reaction and no delay in healing. (IWII, 2022)

LOCAL WOUND INFECTION

Occurs when bacteria or other microbes move deeper into the wound tissue and proliferate at a rate that invokes a response in the host. Local infection is contained within the wound and the immediate periwound region (less than 2cm). Local infection often presents as covert (subtle) signs and symptoms that may not be immediately recognised as a sign of infection.

Signs and symptoms

COVERT (subtle)

- ▶ Hypergranulation
- ▶ Bleeding, friable granulation
- ▶ Epithelial bridging and pocketing in granulation tissue
- ▶ Increasing exudate
- ▶ Delayed wound healing beyond expectations

OVERT (classic)

- ▶ Erythema
- ▶ Local warmth
- ▶ Swelling
- ▶ Pain
- ▶ Purulent discharge
- ▶ Wound breakdown and enlargement
- ▶ New and increasing pain
- ▶ Increasing malodour (IWII, 2022)

SPREADING INFECTION

Describes the invasion of the surrounding tissue by infective organisms that have a spread of <2 cm from a wound.

The multiplying micro-organisms within the wound overwhelm the individual's immune response, resulting in associated clinical signs and symptoms. Spreading infection may involve deep tissue, muscle, fascia, organs, or body cavities.

Signs and symptoms

- ▶ Extending induration
- ▶ Spreading erythema
- ▶ Pain
- ▶ Lymphangitis
- ▶ Crepitus
- ▶ Wound breakdown/dehiscence with or without satellite lesions
- ▶ Inflammation, swelling of lymph glands (IWII, 2022)

SYSTEMIC INFECTION

Systemic infection is the stage in which microorganisms have spread throughout the body via the vascular or lymphatic systems, that affects the body as a whole. In the context of wound infection, microorganisms spread from a locally infected wound. Systemic inflammatory response can also be triggered by a local wound infection through other pathways, for example release of toxins or a dysregulated immune system. Sepsis and organ dysfunction are signs of systemic infection.

Signs and symptoms

- ▶ Malaise
- ▶ Lethargy or non-specific general deterioration
- ▶ Loss of appetite

- ▶ Fever/pyrexia
- ▶ Pain
- ▶ Severe sepsis

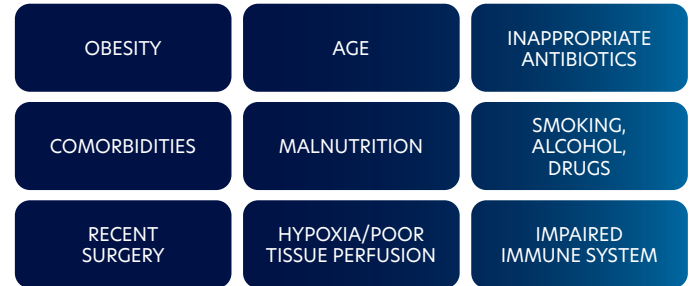
- ▶ Septic shock
- ▶ Organ failure
- ▶ Death (IWII, 2022)

EXAMPLE OF AN INFECTED WOUND



RISK OF INFECTION

Several factors can increase an individual's susceptibility to infection.



Other factors to consider include radiotherapy, and chemotherapy, peripheral neuropathy, neuroarthropathy, connective tissue disorder e.g. Ehlers-Danlos syndrome, and corticosteroid use. When reviewing the infection risk, the type of wound can have an influence.

Although there are those factors that affect both types of wounds, an acute wound will have different risk factors compared to a chronic wound.

The risk of infection of a surgical wound is influenced by the type and length of surgery combined with the individual's characteristics and environmental factors (IWII 2022).

ACUTE	ACUTE AND CHRONIC	CHRONIC
<ul style="list-style-type: none"> ▶ Contaminated or dirty wounds ▶ Traumatic injuries ▶ Operation is classified as contaminated or dirty ▶ Inappropriate hair removal ▶ Operative factors (e.g. prolonged surgery, blood transfusion or hypothermia) 	<ul style="list-style-type: none"> ▶ Foreign body presence ▶ Haematoma ▶ Necrotic or slightly sloughy wound tissue ▶ Impaired tissue perfusion ▶ Increased exudate and oedema that's not adequately managed ▶ Wounds over bony prominences or probing to bone ▶ Involvement of tissue deeper than skin and subcutaneous tissues 	<ul style="list-style-type: none"> ▶ Duration of wound ▶ Large wounds ▶ Anatomically located near a site of potential contamination (e.g. perineum or sacrum)

PREVENTION

Ideally prevention of wound infection is preferable, but this is not always possible. Prevention should be focused on introducing and applying strategies to reduce the individual's risk factors and establish clinical goals. Where appropriate, this should be done in conjunction with the individual, their family and/or caregivers (IWII, 2022).

For health care professionals, the foundation of preventing infection is

in a back-to-basics approach that includes the following:

- ✔ Hand hygiene/decontamination
- ✔ Use of personal protective equipment (PPE)
- ✔ Good waste management
- ✔ Comprehensive documentation
- ✔ Management of the patient's environment (Wounds UK, 2020)

SIGNS AND SYMPTOMS

Those caring for patients with or at risk of developing a wound need to be able to recognise the signs and symptoms of wound infection.

In acute wounds, an infection can typically manifest clinically with clear and obvious signs and symptoms, with diagnosis most frequently made by health care professionals. This is based on classic signs such as warmth, pain, swelling and redness. These signs can be mistaken for the general inflammation phase of wound healing, therefore attention to the individual's risk factors, wound type,

environment, and other less classic symptoms (for example exudate/ discharge and its amount and colour) should be considered.

Clinical signs and symptoms in chronic wound infections tend to be less obvious than in acute wound infections. They tend to be more subtle, such as delay in wound healing, delicate bleeding tissue, evidence of hyper-granulation, pocketing of the wound bed and bridging. Overt and subtle signs and symptoms are listed in the infection continuum section.

Acute Wounds	Chronic Wounds
Erythema - redness	Spreading erythema
Odour - often pungent	Distinct change in odour
Oedema	Periwound oedema
Static wound	Wound bed discolouration - increase in size
Pain - new or increasing	Pain - new, increased or altered
Heat - localised warmth	Heat - increase in localised temperature
Discharge/exudate - often purulent	Increased, altered or purulent exudate
Pyrexia - in surgical wounds	Pocketing or bridging
Wound breakdown - friable	Bleeding or friable granulation tissue

Adapted from IWII, 2022; Swanson et al., 2015

INVESTIGATIONS

Wound infection diagnosis can be difficult. Clinical judgement is required to understand the signs and symptoms. There is no single test that can identify an infection. Wound swabbing is a relatively simple tool that can assist in verifying sensitivities and/or resistance to current treatment, it does not determine if an infection is present (*Wounds UK 2020*).

It is important to note that the interpretation of the results should be in context with both the patient and the wound. Please refer to your local policy regarding obtaining a swab.

A full assessment of the patient and the wound can detect risk factors and when an infection is present. Some wounds may not exhibit any of the classic signs, in particular chronic and/or stagnating wounds.

MANAGING INFECTION

People living with infected wounds can experience limitations to their physical, social, and psychological functioning that can impact their quality of life. Promoting the person's health, immunity and wellbeing is imperative in preventing or treating wound infection.

A full assessment of the individual, their wound and the wound care environment is vital to achieving positive outcomes (*IWII, 2022; Wounds UK, 2020*).

The management plan should reflect the patient's individual situation. Effective management of infection may require a multidisciplinary approach. The aim is to readdress the balance in both the wound and the patient. This can be achieved by improving general health, reduction of the wound bioburden and general measures.

THE INDIVIDUAL	IMPROVE HEALTH
<ul style="list-style-type: none"> ▶ Involve the individual, their family/carer in wound care decisions ▶ Establish a management plan and encourage involvement in establishing goals ▶ Provide person-centred education ▶ Be sensitive to cultural and spiritual requirements 	<ul style="list-style-type: none"> ▶ Manage existing diseases ▶ Reduce/remove risk factors where possible ▶ Increase nutritional status and hydration ▶ Manage any other infections e.g. urinary ▶ Treat systemic symptoms e.g. pain ▶ Provide psychological support ▶ Where appropriate, initiate systemic antimicrobial therapy
REDUCE WOUND BIOBURDEN	GENERAL MEASURES
<ul style="list-style-type: none"> ▶ Implement universal precautions and aseptic technique ▶ Prevent cross infection ▶ Assist wound drainage ▶ Improve periwound hygiene and protection ▶ Provide appropriate exudate management ▶ Optimise wound bed preparation ▶ Selection of suitable dressing ▶ Consideration of antimicrobials (if selecting 2-week rule) 	<ul style="list-style-type: none"> ▶ Effectively manage symptoms ▶ Undertake wound care in a clean environment ▶ Establish appropriate aseptic technique ▶ Store equipment and supplies in line with local policy ▶ Implement regular reviews ▶ Referral to local policies and procedures

Adapted from IWII, 2022; Wounds, UK 2020; Swanson et al., 2015

Topical antimicrobials should only be used when signs and symptoms suggest that the wound bioburden is interfering with healing. Products vary according to their concentration, active ingredients, mode, and duration

of action, along with their ability to handle exudate, odour, and pain. The appropriate dressing should be selected according to the assessment of the wound. (Please see Biofilm, Bioburden and Antimicrobial Simplified Guide for more information).

RED FLAGS AND SEPSIS

Acute deterioration or sepsis is rare, but it is a potentially fatal condition. Recognising and treating infection early, before sepsis develops, is vital.

Within the UK, there is the National Early Warning Score (RCP, 2017), the purpose of which is to identify acutely ill patients, including those with sepsis. The warning score covers changes in:

- ▶ Respiration rate
- ▶ Oxygen saturation
- ▶ Systolic blood pressure
- ▶ Temperature
- ▶ Level of consciousness or new confusion

If changes have taken place, or if there are signs of infection, then the patient should be screened for sepsis.

Sepsis is a life-threatening complication where there is no single sign or symptom. It is characterised by a range of symptoms arising from an overwhelming host reaction and is a toxic response to infection.

Sepsis organisations have the following mnemonic to assist with recognising symptoms (Sepsis, 2023).

- S** lurred speech or confusion
- E** xtreme shivering or muscle pain
- P** assing no urine (in a day)
- S** evere breathlessness
- I** 'I feel I might die'
- S** kin mottled, ashen, blue, or very pale

With regards to level to confusion, the patient has new-onset confusion, disorientation and/or agitation, where previously their mental state was normal - this may be subtle.

If any of these are being experienced this may be a medical emergency and should be treated as such. Sepsis should be treated as quickly and efficiently as possible as soon as it has been identified. Treatment includes rapid administration of antibiotics and fluids (Sepsis Trust, 2023).

CONCLUSION

It is essential that clinicians can identify wound infections correctly and when appropriate, choose a topical antimicrobial dressing or antibiotic for the treatment. The goal is that of preventing and eradicating infection to promote wound healing.

REFERENCES

International Wound Infection Institute (IWII) Wound Infection in Clinical Practice. Wounds International. 2022 || Royal College of Physicians. National Early Warning Score (NEWS2). December 2017. <https://www.rcplondon.ac.uk/projects/outputs/national-early-warning-score-news-2> || Sepsis Trust. www.sepsistrust.org accessed April 2023 || Terry Swanson, David Keast, Rose Cooper, Joyce Black, Donna Angel, Greg Schultz, Keryn Carville, Jacqui Fletcher. Ten top tips: identification of wound infection in a chronic wound. Wounds International 2015 | Vol 6 Issue 2 | ©Wounds International 2015 | www.woundsinternational.com || Wounds UK (2020) Best Practice Statement: Antimicrobial stewardship strategies for wound management. Wounds UK, London.



Simplifying the
Complexities of
Wound Care



academy.activheal.com



Advanced Medical Solutions

Advanced Medical Solutions

Premier Park, Road One, Winsford Industrial Estate,
Winsford, Cheshire CW7 3RT

Copyright © Advanced Medical Solutions Limited 2023