

Wound Infection

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AWMA(SA) Seminar August 2011



Australian Wound Management Association (South Australia)

Introduction

- This presentation is based on the AWMA Position Document

Bacterial impact on wound healing:
From contamination to infection

- Available from the AWMA website
 - www.awma.com.au
- References and further resources are listed within the Position Document



Definitions

Wound infection can be defined as multiplication of bacteria that overwhelm host defences, resulting in disruption of healing and damage to the wound

Wound infection can result in local and systemic host responses

number of bacteria x virulence
patient (host) resistance



Introduction

- The consequences of wound infection can be significant
 - Delayed healing
 - Patient suffering
 - Prolonged hospitalisation/treatment
 - Increased direct costs
 - Antibiotic therapy, surgery, pathology, GP visits, community nursing,
 - Loss of productivity & possible disability
 - Depression, anxiety, social isolation
 - In very small proportion - death due to sepsis



Introduction

- The true extent of bacterial impairment of wound healing is unknown
- There is a need to collect and analyse data for infection in primary & secondary intention healing



Surgical site infection

- Well defined parameters
- Reasonable reporting mechanisms and analysis

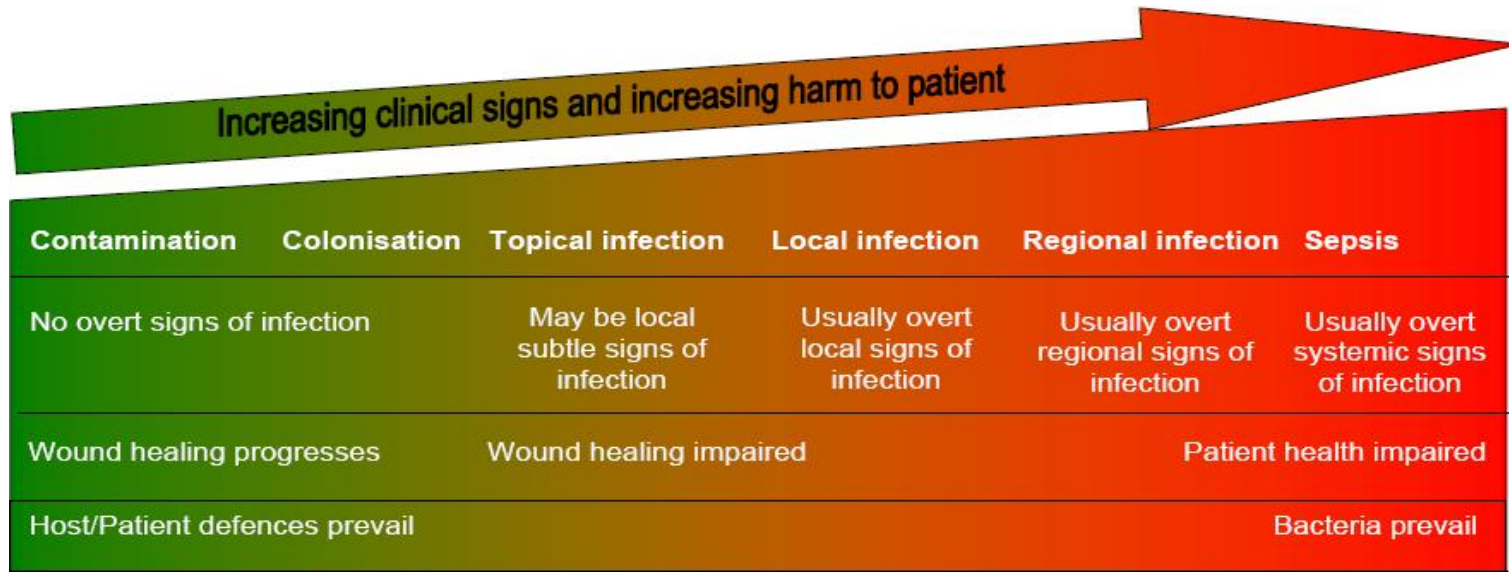
Superficial incisional SSI	Infection involves only skin or subcutaneous tissue of the incision and occurs within 30 days after the operative procedure
Deep incisional / organ space SSI	Infection involves deep soft tissues (eg fascial & muscle layers) AND/OR organs/spaces opened or manipulated during an operation and occurs within 30 days after the operative procedure if implant not present or within one year if implant insitu

Secondary intention & infection

- Over 270 000 Australians live with chronic wounds
- High risk of infection
- Infection burden is unknown
- No reporting mechanisms
- No data analysis
- Apparent lack of agreement on diagnosis, & management



The infection continuum



Topical infection



Local infection



Regional infection (cellulitis)

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Effects of bacteria

- Production of toxins & destructive enzymes
- Promotion of a chronic inflammatory state
- Increased exudate that can have toxic effects including degrading growth factors & matrix metalloproteinases
- Increase pain
- Cause malodour
- Biofilm formation & the effects of biofilm



Biofilms

- Some microorganisms form complex symbiotic communities
- Secrete an exopolymeric substance which resists penetration by antimicrobials and can withstand normally harsh external conditions
- Can resist culturing
- Glossy appearance



Reducing infection risk

- Optimise patient immune response
 - Good nutrition, optimise health conditions
- Remove non viable wound tissue
 - Unless contra-indicated
- Practice strict infection control
- Undertake adequate wound cleansing
- Control excess exudate with dressings
- Use dressings that minimise potential for bacterial entry and can lock in exudate
- Educate patient, families & colleagues



Clinical indicators of infection

Level of bacterial impairment	Clinical indicators
Topical infection / Critical colonisation <i>(Biofilm infection)</i>	<ul style="list-style-type: none"> • dull wound tissue – absence of vibrant granulation • slough • failure of wound to decrease in size • increased exudate • hypergranulation / friable tissue • demarcated and/or rolled and/or raised wound margin
Local infection	<ul style="list-style-type: none"> • wound breakdown / increase in wound size • erythema – usually localised to peri-wound tissue • oedema – usually localised to peri-wound tissue • purulent or discoloured, viscous exudate • malodour • bridging and/or pocketing within the tissue • increased temperature of peri-wound tissue
Regional/Spreading infection Cellulitis	<ul style="list-style-type: none"> • spreading erythema– more than 2cm from wound margin • induration (hardness) of regional tissues • fever • oedema of regional tissues • malaise and/or general feeling of unwellness
Sepsis	<ul style="list-style-type: none"> • high fever or hypothermia • lymphangitis and regional lymphadenopathy • delirium • organ compromise or failure • circulatory shock – hypotension, tachypnoea, tachycardia



Diagnosis

A wound should be considered infected if the clinical signs of infection are present (even if wound swab results do not indicate infection)

Wound swab results should not over-rule clinical judgement



Other factors to consider

- In some persons the traditional clinical signs of inflammation (erythema, oedema, pain, heat) may not be present due to a dampening of the immune response
 - Ischaemia, neuropathy or immunosuppression
- The traditional signs of inflammation can also be seen in conditions not associated with bacteria, including:
 - Charcot neuroarthropathy, pressure injury, acute lipodermatosclerosis



Wound swabbing

- Swab results do not diagnose infection
- A wound swab is taken to
 - Identify which pathogens are present
 - What antibiotics are appropriate for treatment
- Include as much information as possible on the request form
- Transport swab to laboratory asap
- Remember – swabs may not identify the causative bacteria
 - Swabs may not pick up bacteria deep in a wound
 - Swabs do not identify anaerobes
 - Swabs do not pick up bacteria within biofilm



Wound swabbing – Levine method

Procedure	Precautions	Rationale
Remove dressing & discard	Do not swab old dressing	May not collect causative organisms
If necessary, remove or debride non viable tissue	Avoid swabbing non viable tissue	May not collect causative organisms
Cleanse wound with saline or water	Do not cleanse wound with antiseptics Do not swab pooled, stale exudate	May kill or inhibit causative organisms May not collect causative organisms
Wait 2–5 minutes		Allows fresh exudate to rise to wound surface from deeper tissues
If wound is fairly dry moisten swab with saline If wound is moist swab can be used dry		Maximises uptake of exudate by swab to enhance a higher recovery rate of bacteria and allow more precise data for sampling
Using moderate pressure depress & rotate the swab against a 1cm ² area of viable wound tissue	Avoid wound margins	Assists in collection of fresh exudate from deeper in the wound where causative organisms are more likely



Management of infection

- Treat the bacteria
 - Dependent on severity and species
- Treat the local wound
 - Regular debridement of non viable tissue & biological coatings (unless contraindicated)
 - Appropriate dressings/therapies
- Control or correct factors impairing healing
 - eg nutritional status, smoking, diabetes
- Educate the patient
 - eg importance of completing antibiotic therapy



Treat the bacteria

Appropriate management of wound infection involves treating the right bacteria with the right agent/s, delivered in the right manner for the right length of time

Empiric, systemic antibiotics should be commenced immediately when signs of clinical infection are present



Treat the bacteria

Level of bacterial impairment	Management
Topical infection / Critical Colonisation <i>(Biofilm infection)</i>	Primary agents: topical antimicrobials +/- washes with topical antiseptic solution <i>(Wound swabs & antibiotics are not required)</i>
Local infection	Primary agent - systemic oral antibiotics Adjunct agent - topical antimicrobials
Regional/Spreading infection Cellulitis	Primary agent - systemic oral or IV antibiotics Adjunct agent - topical antimicrobials
Systemic infection Sepsis	Primary agent - systemic IV antibiotics

- Primary agent = first line treatment
- Adjunct agent = might assist but will not be adequate to treat deeper infection
 - Might or might not be used depending on service provider, patient & wound factors



Treat the bacteria

- Agents for the treatment of wound infection should be tailored to the extent of the infection and based on recommended treatment guidelines
 - eg Aus Therapeutic Guidelines, Aus Medicines Handbook
- The length of treatment with topical and/or systemic agents should be determined by the response of the wound & the patient
- For complex, recurrent, recalcitrant or unresponsive infections consultation with a microbiologist or infectious diseases specialist is recommended



Topical management

Element	Aim	Practice application
Tissue viability	Remove non viable tissue (unless contra-indicated)	<ul style="list-style-type: none"> • debride wound as necessary • regular, repeated debridements might be necessary • cleanse wound at each dressing change
Infection & Inflammation control	Treat infection & chronic inflammation & prevent recurrence	<ul style="list-style-type: none"> • use antimicrobial agents & antibiotics as indicated • use good infection control practices • use dressings that minimise risk of contamination • seek specialist advice where necessary
Moisture balance	Maintain optimal wound moisture, temperature & pH	<ul style="list-style-type: none"> • use dressings to achieve and maintain a moist wound environment • avoid changing dressings too often • minimise wound exposure • avoid using hot or cold solutions
Evaluation & Edge	Monitor wound progress to determine if management is effective	<ul style="list-style-type: none"> • assess the wound regularly & systematically • document wound size & progress • reassess management if wound fails to progress & this is the expectation

Infection & Inflammation control

- Antimicrobial is a broad term used to describe a variety of agents that kill or inhibit the growth or replication of bacteria & other microbes
- Topical antiseptic solutions should generally be used for treatment of topical contamination or minor skin infections and their use avoided on clean, healing wounds
 - Antiseptics have generally remained free from the resistance problems of antibiotics as they act against bacteria & microbes in several ways



Antiseptic solutions

Recommended

- Povidone iodine (eg Betadine)
- Chlorhexidine
 - Apply liberally and wash off after 3-5 minutes
- Polyhexanide & Undecylenamidopropyl Betaine
 - ie Prontosan
 - Apply as a soak for 10-15 minutes

Use with caution

- Acetic acid (vinegar)
- Potassium permanganate (Condy's crystals)
- Hydrogen peroxide



Topical antibiotics

Generally not recommended

- Topical antibiotics can promote development of resistant bacteria
- Carrier medium is often inappropriate for wounds
 - eg chloromycetin eye ointment, neomycin ear ointment
- May be a limited role for some preparations
 - eg mupirocin, metronidazole



Antimicrobial dressings (Moisture balance)

- To treat topical infection or prevent infection
- Most agents promoted as ‘antimicrobial’ have antiseptic effects
- Available in mild and powerful forms
- Generally use powerful no longer than four weeks
 - Silversulphadiazine cream (flamazine)
 - PVP iodine (inadine)
 - Cadexomer iodine (iodosorb)
 - Silver-containing dressings (acticoat, silvercel, biatain ag, mepilex ag, aquacel ag, atrauman ag)
 - Wound honey (apinate, medihoney, manuka honey)
 - Polyhexamethylene biguanide – PHMB (AMD dressings)
 - Polyhexanide & Undecylenamidopropyl Betaine (Prontosan gel)



Topical antimicrobials

Mild	<ul style="list-style-type: none">• the agent is only held within the dressing & not released, OR• is released in only small quantities AND/OR• does not have a sustained mechanism of action <ul style="list-style-type: none">• generally indicated where the practitioner believes that:• there is a high degree of colonisation that might lead to infection if not treated• antiseptics are required for wounds unlikely to heal
Powerful	<ul style="list-style-type: none">• the agent is released from the product into the wound AND• is released in moderate to high quantities AND• has a sustained mechanism of action <ul style="list-style-type: none">• generally indicated where the practitioner believes that:• bacteria (or other microbes) are impairing wound healing & a topical agent will be of benefit AND/OR• the wound is at significant risk of infection & if infection occurred catastrophic consequences could result• eg patients with major burns or a neuro-ischaemic foot wound

Evaluation & Edge

- If a wound has failed to improve after 4 weeks use of topical antimicrobials
 - ie reduced in size by at least 20%
 - Other factors impairing healing should be considered
 - Consider the need for a different agent (topical or systemic)



Conclusion

- Bacterial impairment of wound healing is a significant burden on patients, service providers & the health system
- A systematic approach to preventing, identifying and managing wound infection can reduce this burden & improve the lives of persons with a wound
- It is only through coordinated, consistent and persistent efforts that the impact of bacteria on wound healing can be minimised



Thank you

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