IWII Wound infection in clinical practice consensus document 2016 update

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ABSTRACT

The International Wound Infection Institute (IWII) is a volunteer group of interdisciplinary health professionals dedicated to advancing and improving practice relating to the prevention and control of wound infection. The second edition of *Wound infection in clinical practice* is an update of the first edition published in 2008 and was endorsed by the World Union of Wound Healing Societies (WUWHS). The original document was authored by leading experts who were in wound management, many of whom formed the inaugural committee of the IWII.

For the second edition, the IWII collaborative team undertook a comprehensive review of contemporary literature, including systematic reviews and meta-analyses when available. In addition, the team conducted a formal Delphi process to reach consensus on wound infection issues for which scientific research was minimal or lacking. This rigorous process provided a document with an update on the science and expert opinion regarding prevention, diagnosis and control of wound infection. The updated document outlines new definitions relevant to wound infection, presents new paradigms and advances in the management and diagnosis of a wound infection, and highlights controversial areas of discussion. The intent is to provide a practical, updated resource that is easy to use and understand.

Keywords: Wound infection continuum, biofilm, wound cleansing, debridement, wound infection management.

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INTRODUCTION

The Wound Infection Institute (WII) was formed formally in 2008 prior to the World Union Wound Healing Societies (WUWHS) conference in Toronto; however, the name was changed to the International Wound Infection Institute (IWII) in 2009 due to the launch of the WII games.

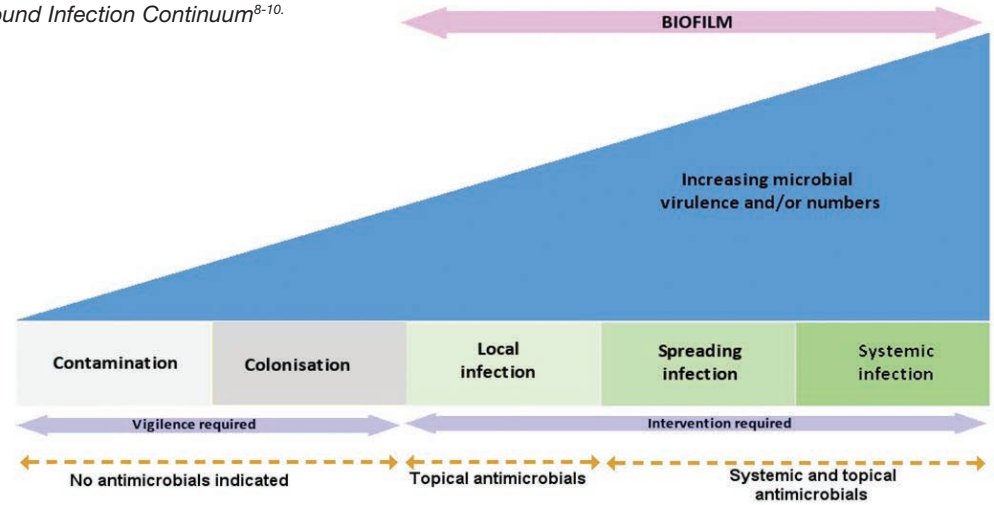
Prior to the Institute's formation, a group met in Budapest in 2006 through an unrestricted grant by Smith & Nephew, with the aim of determining best practice for wound infection of various aetiologies. The 2006 participants were from 23 countries and most were health care professionals with disciplines related to wound management or the science of wound infection.

This volunteer group of scientists and health care professionals was dedicated to advancing and improving practice relating to the prevention and control of wound infection. In 2008 an expert group, many of whom were founding members of the inaugural IWII committee, authored the first edition of *Wound infection in clinical practice* (2008). In 2014 it was acknowledged that practice and knowledge had advanced and the document required an update, leading to the publication of the second edition of *Wound infection in clinical practice* in November 2016.

Work on the second edition commenced in earnest in May 2015, when many of the team members met in London to attend a development meeting. At this meeting the strategic plan was developed and implementation was commenced shortly after.

For the second edition, the IWII collaborative team undertook a comprehensive review of contemporary literature, including systematic reviews and meta-analyses when available. In addition, the team conducted a formal Delphi process to reach consensus on wound infection issues for which scientific research was minimal or lacking. This rigorous process provided a document with an update on the science and expert opinion regarding the prevention, diagnosis and control of wound infection. This edition outlines new definitions relevant to wound infection, presents new

Figure 1: IWII Wound Infection Continuum[8-10].



paradigms and advancements in the management and diagnosis of a wound infection, and highlights controversial areas of discussion. The intent of this new consensus document is to provide a practical, updated resource that is easy to use and understand regarding the concepts of wound infection.

The complete document of IWII *Wound infection in clinical practice* is free and can be downloaded from the IWII website http://www.woundinfection-institute.com.

PROCESSES

To update the document, the group undertook a comprehensive targeted literature search to identify recent evidence related to management of wound infection. The best available evidence was reviewed and selected by the experts to inform the development of each section in the second edition document.

Because the science is not complete in this field, the expert group undertook a Delphi process to reach consensus on areas for which there is ongoing debate. A formal process was undertaken using the previously published RAND/UCLA Appropriateness Method[1], through which the experts could collectively judge the available knowledge and reach agreement on the document content. The Delphi process was conducted over three consensus voting rounds using a web-based platform, and provided opportunity for the participants to review the current state of the science, vote on their level of agreement with statements related to the science, provide rationale for their opinion that was fed back to the group in successive voting rounds and to ask and answer questions of each other. Individual responses provided in the Delphi process were anonymous and a facilitator moderated the written discussion and calculated voting outcomes using the RAND/UCLA methods.

DEFINITIONS

One of the aims of the IWII 2016 consensus document was to update definitions and to provide new ones. As discussed, a Delphi process was conducted and the following three definitions were provided after three rounds:

Acute wound:

An acute wound is a wound with an aetiology that occurs suddenly, either with an aetiology that occurs suddenly, either with or without intention, but then heals in a timely manner.

Chronic wound:

A chronic wound is a wound that has a slow progression through the healing phases or delayed, interrupted or stalled healing due to intrinsic and extrinsic factors that impact on the individual and their wound. A chronic, non-healing wound could be suggestive of a biofilm infection, provided holistic evaluation has excluded or corrected underlying pathologies such as ischaemia.

During the Delphi process, there was much discussion regarding the concept of the time frame normally associated with the definition of a chronic wound and agreement could not be achieved after three rounds. The outcome of the Delphi process was to exclude the time frame from the definition, reflecting the recent understanding that non-healing of a healable wound that is non-malignant, regardless of time frame, should be considered chronic. The new paradigm of a chronic non-healing wound equating to presence of biofilm is discussed in the biofilm section.

Biofilm:

Both current science and agreement reached during the Delphi process suggest that an accurate definition of biofilm identifies that it is a structured community of microbes with genetic diversity and variable gene expression (phenotype) that creates behaviours and defences used to produce unique infections (chronic infection). Biofilms are characterised by significant tolerance to antibiotics and biocides whilst remaining protected from host immunity.

The second edition of the document contains a comprehensive glossary that allows for the novice and generalist to gain

greater understanding of terminology that may be new or updated in recent years.

THE WOUND INFECTION CONTINUUM

It is well acknowledged that it is more than the presence of bacteria that leads to adverse events in wounds, therefore the wound infection continuum has been updated to recognise that microbes other than bacteria are associated with wound infection. The importance to the development of wound infection of microbial virulence (as well as numbers) is also acknowledged[2-7]. The stages in the wound infection continuum describe the gradual increase in the number and virulence of microorganisms, together with the response they invoke within the host. The wound infection continuum is a conceptualised framework to provide greater understanding of the impact microbes may have on a wound (Figure 1)[3].

The IWII version of the wound infection continuum may spark debate as the term *critical colonisation* has been removed from this continuum. Consensus by the expert panel was that the term critical *colonisation* has previously been poorly defined and understood, and that local infection and the covert signs and symptoms can be identified by experienced clinicians[2-3] and are provided in Table 1.

BIOFILM

Biofilm was discussed at the WII first meeting in 2006 and was acknowledged in the first edition of *Wound infection in clinical practice*; however, significant scientific and clinical understanding of biofilm and the correlation with chronic wound healing has emerged since 2008[13-16]. Although we have had advances in knowledge through the emerging science from the laboratory, we do not have a complete understanding of wound biofilm in the clinical context. The inclusion of biofilm in the wound infection continuum recognises the growing understanding and acceptance of the role of biofilm and the requirement to visit old paradigms and practices regarding biofilm identification, prevention and management[17,18].

The identification of biofilm via visual indicators is an important concept for clinicians as this may lead to early identification and treatment[19,20]. Although this concept is supported in theory, we do not have conclusive evidence. The IWII expert panel reached agreement on the following factors as potential clinical indicators suggesting biofilm presence in a wound:

- failure of appropriate antibiotic treatment;
- recalcitrance to appropriate antimicrobial treatment;
- recurrence of delayed healing on cessation of antibiotic treatment;
- delayed healing in spite of optimal wound management and health support;
- increased exudate/moisture;
- low level chronic inflammation;

Table 1: Signs and symptoms associated with stages of the wound infection continuum

Contamination[11]	Colonisation[11]	Local infection		Spreading infection[8,12]	Systemic infection[8,12]
All wounds may acquire microorganisms. If suitable nutritive and physical conditions are not available for each microbial species, or they are not able to successfully evade host defences, they will not multiply or persist; their presence is therefore only transient and wound healing is not delayed.	Microbial species successfully grow and divide, but do not cause damage to the host or initiate wound infection.	**Covert (subtle) signs of local infection:**[2,27-36] • Hypergranulation (excessive 'vascular' tissue) • Bleeding friable granulation • Epithelial bridging and pocketing in granulation tissue • Wound breakdown and enlargement • Delayed wound healing beyond expectations • New or increasing pain • Increasing malodour	**Overt (classic) signs of local infection:**[2,27,28,35,36] • Erythema • Local warmth • Swelling • Purulent discharge • Delayed wound healing beyond expectations • New or increasing pain • Increasing malodour	• Extending induration +/-erythema • Lymphangitis • Crepitus • Wound breakdown/ dehiscence with or without satellite lesions • Malaise/ lethargy or non-specific general deterioration • Loss of appetite • Inflammation, swelling of lymph glands	• Severe sepsis • Septic shock • Organ failure • Death

- low level erythema;
- poor granulation/friable hypergranulation; and
- secondary signs of infection.

DIAGNOSIS OF WOUND INFECTION

All health care professionals should be aware of the clinical signs and symptoms (s&s) of wound infection, as stated in Table 1. The expert group reached agreement that local infection includes both overt/classic signs and symptoms, as well as covert or secondary signs of symptoms that may be subtle. These s&s of wound infection are in addition to the indicators of biofilm presented above. Early detection and management of wound infection may save a limb and lives. Unfortunately, diagnostic investigations for confirmation of the type of microbes that are causative agents and their virulence are limited and in many cases are inadequate[21]. In addition, inadequate collection and interpretation of specimens and results often reduces accuracy in diagnosis. Compounding this is that biofilm cannot be identified easily without advanced microscopy.

The second edition of *Wound infection in clinical practice* provides clinicians with guidance on when to take a wound culture, which culturing technique is most effective and information regarding emerging diagnostic techniques.

HOLISTIC MANAGEMENT OF A PATIENT WITH A WOUND INFECTION

We have long understood that considerations of the individual, their wound and their environment can contribute to the development of a wound infection. A comprehensive, holistic approach is essential to accurately diagnose and treat an individual with a wound infection. Three main principles of patient-centred care for effective management of a wound infection are:

- optimising the host response;
- reducing the number and/or virulence of microorganisms in the wound; and
- optimising the wound healing environment.

Prevention of wound infection is fostered through good infection control and prevention practices by the health care professional, individuals with wounds and their carers.

Several tables are provided in the IWII *Wound infection in clinical practice* consensus document 2016, including an update on topical management for a wound infection. There is emphasis on wound cleansing and information regarding types of solutions, cytotoxicity and effects on biofilm. A section on topical management reviews the current antimicrobial treatments and their biofilm efficacy.

TOPICAL ANTIMICROBIAL THERAPY

This section reviews the terminology of antimicrobial therapy and discusses current practices in regard to managing wound infection.

Another controversy is the use of topical antibiotics, and their risks and benefits are discussed within this section. As previously noted, bacteria are not the only microbe that are commonly found in wounds; therefore topical antifungal therapy is also addressed.

WOUND BED PREPARATION

The principles of wound bed preparation, summarised in the acronym of TIME (tissue, infection/inflammation, moisture balance, edge of wound), have been the standard of care since the early 2000s for any open wound, regardless of aetiology[12,22]. In 2008, Wolcott provided us with biofilm-based wound care (BBWC)[23], which places emphasis on debridement, therapeutic wound cleansing and topical antimicrobials with the intent of preventing biofilm and, if present, in disrupting immature, mature and dispersed biofilm.

It has been demonstrated that debridement provides a window of opportunity in which biofilm is more susceptible to the topical and systemic management strategies previously discussed[24]. The updated document provides detail on the types of debridement and their efficacy in preventing and treating biofilm.

Cleansing of the wound with a wound infection is now recommended at each dressing change, to decrease the bioburden and improve the wound environment. This takes time; however, cleansing is such a key component to good wound care that it must be a priority.

The growing understanding of the efficacy of surfactants to facilitate separation of loose, non-viable tissue and disruption of biofilm has led to the recommendation that they be used for cleansing of wounds at risk of or with a wound infection[12].

ANTIBIOTIC THERAPY

Antibiotics must be used in combination with TIME or BBWC due to virulence and tolerance factors of biofilms to antibiotics and antimicrobials[12,25,26]. Inappropriate antibiotic prescribing and patterns of use is contributing to antibiotic resistance and has become a significant international concern[37]. Combining preparation of the wound for application of a carefully selected wound dressing with wound cleansing and debridement and systemic management will improve outcomes.

FUTURE DEVELOPMENTS

As the need for improved diagnostics and treatment strategies continues, revision of old and development of new concepts will emerge. Point of care diagnostics is a promising area, with ability to determine the presence of bacteria and where within the wound bed they reside. Determination of the best strategies to disrupt and prevent biofilm is imperative and early indicators are positive.

SUMMARY

Clinicians and managers must take time to provide optimal wound management. Understanding that a wound dressing

procedure is not just a routine task but is a key component of assessment, diagnosis and the development of regimens that optimise and promote wound healing is an imperative. The goal for the wound care team, including the individual with a wound, is prevention of wound infection and optimal outcomes. The second edition of the *Wound Infection in clinical practice,* endorsed by the IWII, has been developed to provide the wound care team with resources to help meet these goals.

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