

hygiene   
in practice

# REVIEW

Issue 2

**DEBRIDEMENT –**  
preventing and managing  
wound infections

**STRATEGIES**  
against multi-resistant germs

**SURGICAL SITE INFECTIONS –**  
the history of prevention



# Dear hygiene professionals,

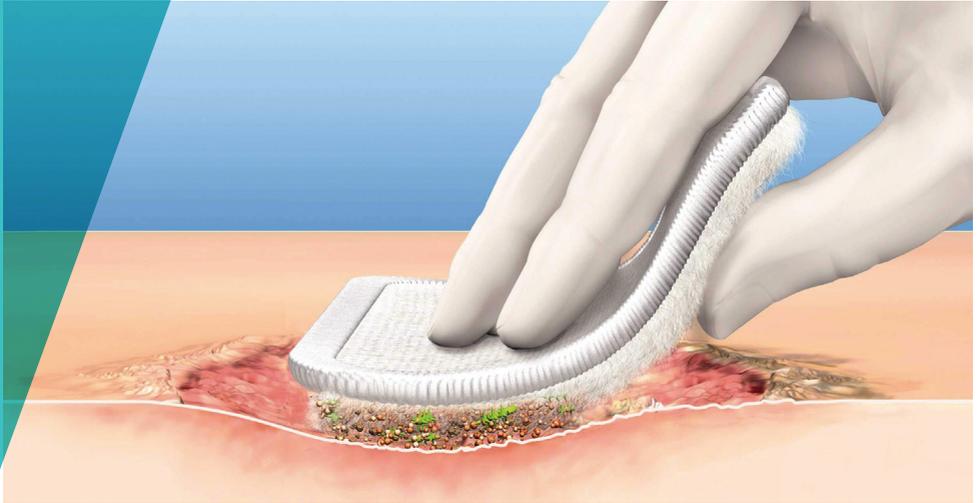
Since the beginning of time, people have been burdened by wounds. Today there is still much to discover in this field. From researching their healing processes, the effects of biofilm to evaluating treatment methods and developing new therapies, such as negative pressure wound therapy – we are always discovering new factors that make us better understand wounds and answer open questions.

One common question about wounds concerns healing time – how long should it take? Generally, if wounds have not healed after three months, or if they show no tendency to heal after four weeks of optimised treatment, we are dealing with chronic wounds. So, why are they not healing? Chronic wounds reflect an underlying disease – which surely does not make therapy any less complex. Questions and challenges like these are the reason why, in the second issue of *review*, we dedicate our feature story to the management of chronic wounds and the fight against biofilm in chronic wounds. In this story you will read about methods experts use to prevent infections and to heal chronic wounds.

The worldwide spread of multi-resistant, gram-negative bacteria poses a special risk to patients. Here, an important question arises: Are we doing enough to fight this? Are we doing things right? A research team has now looked at patient data from more than 50 years and evaluated which strategies work best against these multi-resistant germs. We show their results in our story about “Antibiotic Stewardship.” This much we can already tell: The classic, most commonly implemented strategy against germs is not always the best.

Finally, our article “Surgical Site Infections: The History of Prevention” deals with postoperative wound infections. Aiming to reduce the risk of infection as much as possible, health authorities have been adopting guidelines with recommendations for behaviour since 1983. Ask yourself: Are you up to date? You will find out in this article.

**We hope you enjoy this issue,  
Your *hygiene in practice* team**



Debridement with the pad consisting of monofilament fibres.

# Debridement of chronic wounds: A key step in preventing and managing wound infections

**Chronic wounds cause pain and misery to millions of people around the world. Removing slough and biofilm through professional debridement is crucial for managing infected wounds and promoting healing. The monofilament device offers a very effective method for debridement and brings welcome pain relief to patients.**

We all experience small injuries every now and then. Usually they heal without any problems. When they don't, and even become infected, patients suffer for weeks or possibly months. Also known as a "silent epidemic", chronic or hard-to-heal wounds represent a worldwide malady that affects one to two per cent of the population in developed countries.

Prevalence can even reach three to five per cent when considering the senior population, because ageing slows wound healing processes. With an estimated annual cost of USD 20 billion in the United States alone, the management of chronic wounds also has a massive economic impact on patients, health systems and countries. Dealing with chronic wounds often results in a reduced quality of life for the patients who experience pain, uncertainty, reduced mobility, decreased work ability, and social isolation.

More and more clinicians and researchers are focusing on better understanding and assessing chronic wounds, as well as on developing new treatment modalities. Dr Kevin Woo, an associate professor at Queen's University in Ontario, Canada is an expert in the field of chronic wound management. "It takes a lot of thinking outside the box to understand the comprehensive picture of all factors that can influence chronic wound healing," he explains. His research focus is on wound-related problems, wound care, chronic wound management and clinical management of patients with chronic wounds. Understanding and relieving pain is the central focus of his research.

### **The UPPER and LOWER score allows a better assessment of infected wounds**

The different types of chronic wounds display various characteristics, depending on the underlying pathophysiological mechanisms. The Wound Healing Society classifies chronic wounds in four categories: pressure ulcers, diabetic ulcers, venous ulcers, and arterial insufficiency ulcers. "Chronic wounds are very complex, and their management often involves many different systems and many different comorbidities," remarks Woo. "Unless we identify the factors that impair wound healing – whether poor blood circulation, infection, or diabetes-related issues, for example – treatment is not going to be effective."

One challenge for clinicians in wound care is determining whether the wound is infected, as sometimes wounds do not display the five typical signs of infection: redness, temperature, pain, swelling and impaired function. In this case, checklists can be used to assess the wound, to differentiate between superficial infections and infections on a deeper skin level, and to identify patients who need specific local wound treatment.

"I created the UPPER and LOWER system to make it easier for clinicians to remember the covert signs of wound infection, because the ways infections display themselves in chronic wounds are very different compared to soft tissue infection, for example," explains Woo.

The score helps to separate wound infections into the upper, or localised environment, versus the inner, deep, lower compartment. This differentiation supports clinicians when they want to determine the appropriate treatment for removing microorganisms from the wound environment. “The score helps clinicians identify the problem, so they have a more accurate and better data basis to use when deciding on the appropriate treatment,” Woo emphasises. “What we are proposing is using local antimicrobial dressing for upper, localised infections versus antibiotic systemic agents for lower and deeper types of wound infections.” The UPPER and LOWER score has been internationally adopted in many wound care centres, as it is easy to remember. “It is a work in progress. As we understand wound infection better, the scoring system continues to evolve, and the signs might change,” says Woo.



Wound expert Dr Kevin Woo, associate professor at Queen's University in Ontario, Canada

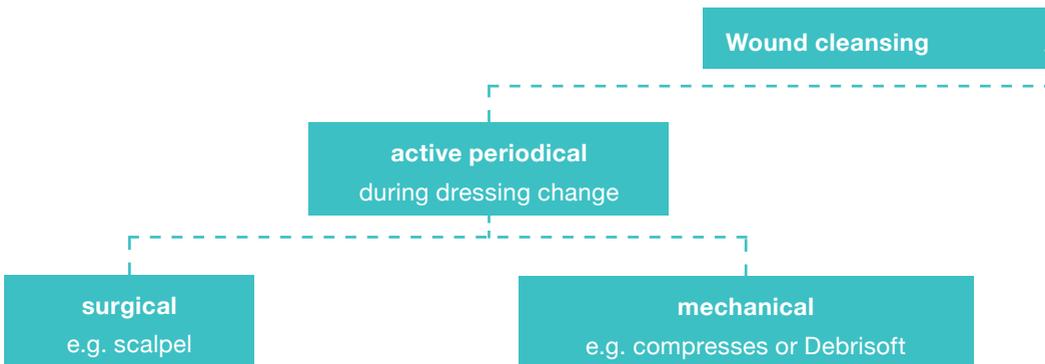
### **Biofilm plays an important role in chronic wound management**

Biofilm plays an important role in the management of chronic wounds, as it is present in up to 80 per cent of all chronic wounds. It triggers inflammatory responses and hinders wound healing. “The body’s immune system tries to attack the biofilm but fails because the microorganisms are embedded in a slimy matrix. However, prolonged inflammatory responses lead to the degradation of proteins that are necessary for wound healing. This is when chronic wounds become hard to heal. Biofilm also represents a repository for bacteria that are just waiting for the opportunity to proliferate.” The Biofilm Based Wound Care (BBWC) principles emphasise the need to remove slough, necrotic tissue and biofilm from a wound, as well as the importance of applying wound dressings with antimicrobial agents to control the bacterial growth and prevent a rapid rebuilding of the biofilm. “We need to disturb the biofilm structure and disrupt the protective shield for the bacteria, making them more vulnerable to the attack of antimicrobial substances,” says Woo.

## Mechanical debridement: An effective way of removing biofilm

Debridement refers to the removal of non-viable tissue, debris and biofilm from wounds, and was first practised in the late 18<sup>th</sup> century by French surgeons, who made incisions into the skin and deep fascia to release pressure from localised swelling after ballistic injuries. Debridement is the crucial first step of modern wound management. It is necessary to clean the wound bed and its surrounding skin and thus promote healing. “Without debridement, the necrotic tissue becomes an area where bacteria can grow. Then even antibiotics are not helpful in managing wound infection, and wounds are even less likely to heal,” explains Woo. The most common types of debridement are autolytic, enzymatic, surgical, and mechanical. Autolytic and enzymatic debridement methods use the body’s own processes or chemical agents to break down necrotic tissue and slough, respectively. Surgical debridement uses sharp instruments to remove necrotic tissue and is mostly used for very large wounds. Mechanical debridement requires the use of mechanical forces to remove wound debris.

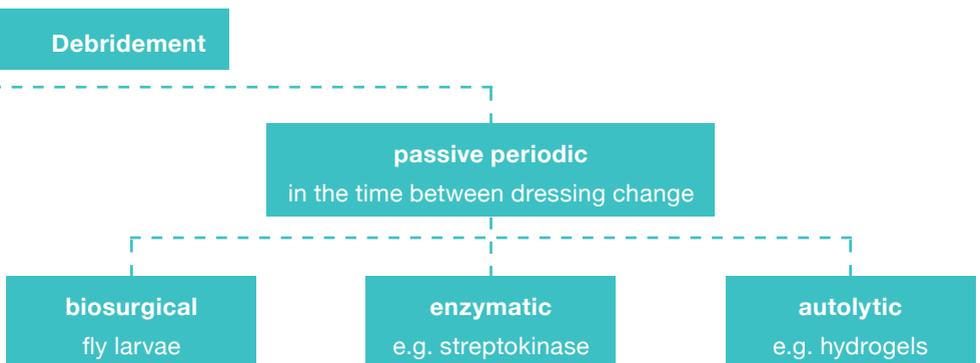
The sterile pad of monofilament fibres (*Debrisoft*<sup>®</sup>) has been developed to mechanically remove biofilm and slough. A recent study conducted by Woo and colleagues examined its effectiveness on ten patients with chronic wounds. Their findings suggest that this pad is beneficial for the removal of slough, as the average wound size decreased, exudate was reduced, and the UPPER score improved for every patient. “Using the monofilament fibre pad for debridement offers many advantages for both clinicians and patients. The pad is user friendly and can be used by professionals and – in the USA and Canada – even patients. It represents an effective solution for mechanically removing loose slough and biofilm.



It also has a positive effect on patients, as it can positively influence wound healing and lessen wound infection, which is often associated with pain and increased odour. By removing the burdens of superficial bacteria and slough, the wound healing is quicker, with less exudation and odour, and as a result, patients have a better quality of life. Moreover, the monofilament fibre pad also has a positive effect on compliance as the patients are empowered to engage and to look after the wounds,” remarks Woo.

The major role of pain during debridement is the subject of a 2015 study conducted by Dr Woo on 96 patients with chronic wounds, who were dealing with the effects of anxiety on the experience of pain. “What I found in this study is that patients experience a lot of pain during dressing change and wound cleansing, because scrubbing was often involved to remove the non-viable tissue. The anticipation of this pain would then trigger anxiety, that can lead to increased pain.” Debridement with the monofilament fibre pad comes with low pain levels for patients during the procedure. “I remember two patients I treated with the pad. I was very conscious about the pain level. However, the patients did not experience any discomfort,” concludes Woo.

**Find more about wound cleansing and debridement under:**  
<http://bit.ly/debridement>



# Antibiotic stewardship plus hand hygiene: More effective against resistant germs than traditional strategy

**The global spread of multi-resistant bacteria, particularly gram-negative bacteria, is a risk for patients. When this type of germ is detected in a hospital, the traditional strategy of “screening, isolation and eradication” usually takes effect. But does evidence prove that this method really is the most effective? A team of researchers asked themselves this question and came to astonishing conclusions.**

Professor Sebastian W Lemmen, Head of the Central Department of Hospital Hygiene and Infectiology at University Hospital of RWTH Aachen, and Dr Karl Lewalter, also from RWTH Aachen, compared the traditional strategy for fighting resistant germs with an alternative strategy. The alternative is based on “antibiotic stewardship” – in other words, a strategy for the rational use of antibiotics – in combination with hygiene measures, in particular, correct hand hygiene. The researchers based their comparison on a series of studies that they evaluated and summarised. They published their results in the trade journal “Infection”.

## **The traditional strategy has disadvantages**

According to the article, the traditional pathogen-specific screening system used by most clinics today has many limitations because the swab materials, frequency and detection methods, as well as screening groups, are not standardised. In addition, the effectiveness of isolation measures as such has not yet been proven. However, the disadvantages of single-room isolation for the successful outcome and the mental state of the patients are very well described. The eradication of multi-resistant pathogens is a major challenge and has not yet been sustainably successful in carriers of *vancomycin-resistant enterococci* (VRE) or multi-resistant gram-negative bacteria.



## **Antibiotic Stewardship Programme - known but neglected**

A current and systematic review that evaluated data of more than nine million patient days between 1960 and 2016 proves the effectiveness of a limited and targeted use of antibiotics on multi-resistant germs, the authors explain in their summary. Antibiotic stewardship has significantly reduced infections and colonisations with MRSA (*methicillin-resistant staphylococci*), multi-resistant gram-negative bacteria and *Clostridium difficile* by 37, 51 and 32 per cent, respectively. In combination with appropriate hygiene measures, the occurrence of multi-resistant germs has been reduced by up to 70 per cent. Hand hygiene proved to be the most effective measure.

## **Improving hand hygiene compliance**

In their pioneering work at the Geneva University Hospital, researchers led by the Swiss physician Professor Didier Pittet were able to prove as early as 1997 that consistent hand hygiene reduces infection rates. Despite such evidence, however, compliance in many medical areas is still not optimal. In many subsequent studies, researchers have since investigated how compliance can be improved. These clearly show that this topic must be continuously addressed with the help of courses, during medical training, through motivational activities, process optimisation and availability of appropriate devices.

**Up to 70%**

fewer multi-resistant germs through  
the use of antibiotic stewardship  
and appropriate hygiene measures

## **Isolation without additional benefits**

First of all, it is important to reduce the bacterial count: various studies have shown that washing with 2% chlorhexidine and, in certain cases, in combination with the nasal ointment Mupirocin, significantly reduces the transmission of MRSA and VRE (*vancomycin-resistant enterococci*), and also reduces the rate of blood stream infections. Additional screening and isolation measures have no further effect on the transmission rate of multi-resistant bacteria, according to a comparative study.

# The study at a glance

- authors: Prof. Sebastian W Lemmen, Dr Karl Lewalter, RWTH Aachen University
- current and systematic review
- data analysis of more than nine million patient days
- from the years between 1960 and 2016
- demonstrates the effect of a limited and targeted use of antibiotics on the occurrence of multi-resistant germs

## Conclusion and practical application

According to Lemmen and Lewalter, antibiotic stewardship in combination with antiseptic bathing and standard hygiene measures, in particular hand hygiene, significantly reduces the transmission rate of multi-resistant germs. According to the scientists, screening and isolation did not lead to any additional benefit. In practice, they say the above measures should be better implemented to reduce the problem of resistant germs.

Learn more about the traditional strategy of “screening, isolation and eradication”:  
[http://bit.ly/antibiotic\\_stewardship](http://bit.ly/antibiotic_stewardship)





# Surgical site infections: The history of prevention

**Every medical procedure is accompanied by a risk of infection. Preventive measures in particular are key to avoiding postoperative wound infections. Since 1983, health authorities have published recommendations with behavioural guidelines, for example, what steps are important and when they should be taken.**

“The very first requirement in a hospital is that it should do the sick no harm.” Florence Nightingale (1820-1910) stated this already in the century before last. The British nurse influenced medical care and health care like almost no other at the time. Today the topic is more relevant than ever. The prevention of surgical site infections (SSI) has become increasingly important, especially as the number of surgical procedures continues to rise. In Germany, for example, the number of operations increased by 39 per cent between 2005 and 2016, as annual evaluations by the German Federal Statistical Office show.

The demands on the reporting of quality indicators on the one hand, combined with patient and employee protection on the other hand, continue to grow. In addition, patients who need surgery tend to be older today, and often suffer from serious surgery-related secondary diseases.

## **SSI are among the most common hospital acquired infections**

With a share of approximately 22 per cent, SSI are the second most common nosocomial infections in Germany. Although in high-income countries the overall SSI rate is somewhat lower, it remains the second most common form of nosocomial infection in Europe and the USA. In low and middle-income countries, SSI is the most common form of nosocomial infection, according to the WHO.

But this fact shouldn't be simply accepted. Proper infection prevention can drastically reduce the risk of infection for patients. Clearly formulated and practical guidelines are the basis for implementing proven and effective infection prevention measures. That is why the health authorities have long relied on such guidelines.

### **SSI prevention recommendations since 1983**

In the USA, the Centers for Disease Control and Prevention (CDC) published the first recommendations for the prevention of SSI in 1983, when the CDC was still known as the Office of National Defense Malaria Control Activities (founded in 1946 to support the control of malaria). This first guideline covered only the prevention of intraoperative wound infections. The 1985 reissue added new information on preoperative hair removal and surgical ventilation. The 1999 version first coined the term “surgical site infections”.

At global level, WHO formulated its first guidelines for the prevention of SSI on 3 November 2016. These guidelines contained a list of 29 specific recommendations compiled by 20 of the world’s leading experts from 26 review publications. The recommendations were published in “The Lancet Infectious Diseases” journal and are intended to counteract the increasing risk of healthcare infections for both patients and healthcare systems worldwide. Since then, WHO has regularly updated the guidelines to incorporate the latest scientific findings.

SSI represents  
**the second most**  
common form of nosocomial  
infection in Europe and the USA

### **Latest KRINKO recommendation from April 2018**

This is also the goal of the Commission for Hospital Hygiene and Infection Prevention (KRINKO) at the Robert Koch Institute, whose latest recommendation on “Prevention of postoperative wound infections” dates from April 2018. KRINKO’s hygiene experts are continually developing the guidelines further, under consideration of current infection epidemiological evaluations. The guidelines are drawn up in accordance with the Infection Protection Act (IfSG) § 23 and published by the German Robert Koch Institute (RKI) in the Federal Health Gazette.

## A large part of infections could be prevented

Experts agree that it will not be possible to reduce the infection rate to zero. However, up to 40 per cent of all nosocomial infections could be prevented through proper hand hygiene alone. Participation in a national surveillance system and feedback from one's own SSI data with national reference data can also reduce the infection rate by 25 - 65 per cent. This has been shown by data from surveillance systems in various countries. These figures show that the effort is worthwhile. This helps to bring Florence Nightingale's aspiration for a hospital that does no harm to patients a good deal closer.

Interventions in detail you can find here:

[http://bit.ly/history\\_of\\_prevention](http://bit.ly/history_of_prevention)



## The bacteria most frequently associated with SSI

- *Staphylococcus aureus*
- *Enterococcus spec*
- *Escherichia coli*
- *Coagulase-negative Staphylococci*
- *Pseudomonas aeruginosa*  
(see cover picture)
- *Enterobacteriaceae*
- *Klebsiella*

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