



hygiene   
in practice

# REVIEW

May 2018

**RISK OF INFECTION –**  
lack of awareness?

**THE BIOFILM MYSTERY –**  
why do wounds fail to heal?

**DISPOSABLES IN THE OR –**  
a relationship of trust?

# Dear hygiene professionals,

Do you know how often contact occurs during the care and treatment of patients? Researchers have now found out that, on average, this takes place every four seconds! That would be two contacts in the time it takes you to read this text.

Every two minutes, a risk of infection arises from such contacts. On the following pages, in the cover story of our *review*, you can read how scientists arrived at this conclusion and how you can prevent infections with proper hand hygiene.

*review* is a print format of *hygiene in practice*, a movement we have created with the dual aims of educating people about hygiene and hygiene measures, and minimising infection rates. You are now holding an excerpt of the contents.

You can find out why hygiene is so enormously important in all aspects of medical and nursing treatment in our story, “The biofilm mystery – Why do wounds fail to heal?” Treating chronic wounds remains a major challenge for physicians and nurses – and biofilm makes their work more difficult. Experts are just beginning to understand the microbial community that makes up a biofilm. We invite you to join us in this journey of discovery.

**We hope you enjoy reading our articles.**

**Your *hygiene in practice* team**

**PS. You can also find further interesting facts on infection prophylaxis and relevant hygiene news on our website [hygiene-in-practice.com](http://hygiene-in-practice.com). Come and take a look!**



# Medical personnel may not be aware of the risk of infection

**Hand hygiene is still not sufficiently and consistently implemented. According to a recent study, one possible reason is that medical personnel do not seem to be aware of how often they touch patients, and the surfaces inside and outside of the patient's environment. Such contacts can transmit microorganisms and create potential risks of infection. The study found that on average, contact takes place every 4.2 seconds during patient care and treatment – and every 2 minutes, even contact that carries the risk of infection.**

First greet the patient. Then place medical equipment you've brought with you onto the patient's bedside table. Check the vein access site in the patient's arm. Then check the infusion bag. Make a note of the medication in the patient's file. Touch the pocket of your coat because your station pager beeps. Feel the patient's pulse. Change the wound dressing, brushing back a strand of hair that has slipped into your face. Many such contacts take place between nurses or doctors and their patients or their environments. All carry a potential risk of infection if your hands are not disinfected before any contact with so-called critical areas (e.g. wounds, mucous membranes, infusion accesses).

Nevertheless, hand hygiene is not sufficiently and consistently implemented at such moments. To clarify and quantify the topic, a team led by Lauren Clack and Hugo Sax from the Division of Infectious Diseases and Hospital Epidemiology at Zurich University Hospital investigated how many such contacts occur between the hands of staff, patients, and various surfaces in everyday intensive care. The researchers discovered that on average, a transmission of potentially harmful microorganisms to the patient and his environment occurs every four seconds, and a potentially infectious contact approximately every two minutes.

The authors published their results in the journal "Antimicrobial Resistance & Infection Control" in 2017. The team observed patient-surface contacts in three intensive care units for trauma, cardiac and visceral surgery using head-mounted cameras. The camera angle was adjusted to keep the hands of the participants – eight nurses and two doctors – permanently in the field of view. Each of the ten subjects wore the camera system for 70 minutes during their morning shift. Following the videotaping, the researchers selected approximately 30 minutes of each video sequence involving direct patient care, and evaluated the data for contamination and infection risks. The scientists evaluated all hand-to-surface contacts in the respective video sequences and coded them with regard to their number, duration and type. In addition, the

# Your 5 moments for hand hygiene

- 1** BEFORE patient contact
- 2** BEFORE an aseptic task
- 3** AFTER body fluid exposure risk
- 4** AFTER patient contact
- 5** AFTER contact with patient surroundings

researchers recorded which hand the staff member used, which surfaces they touched and whether their hands were gloved.

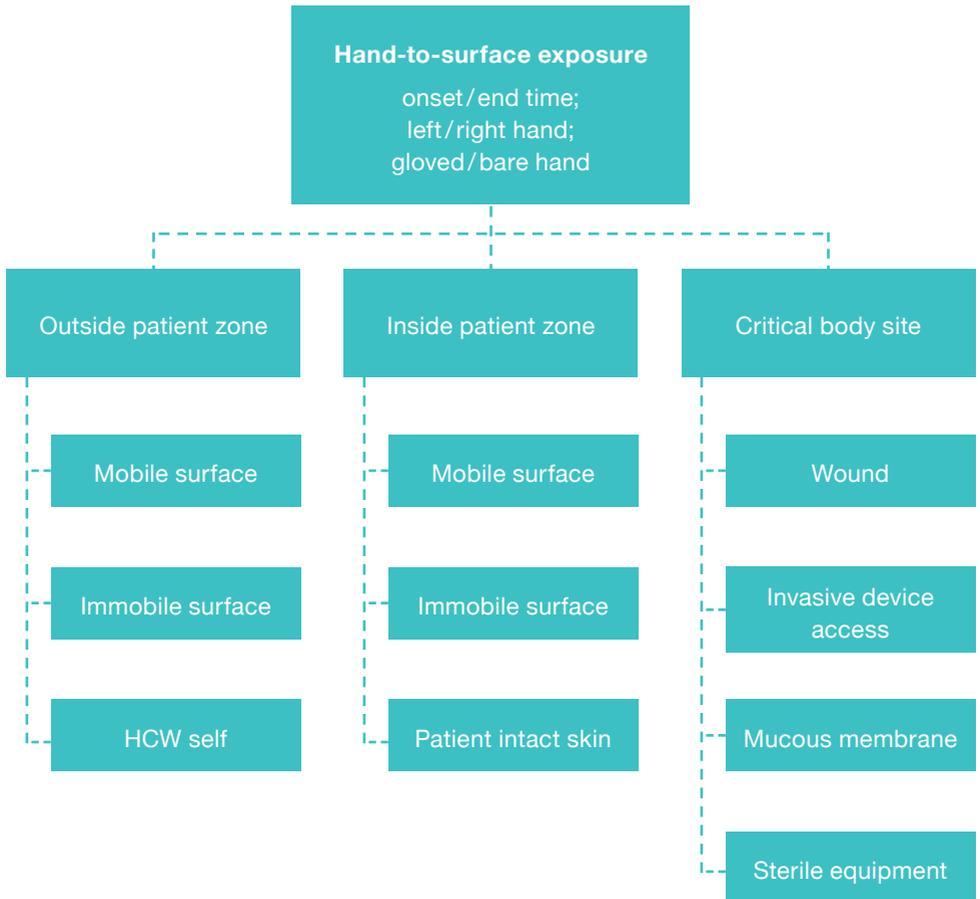
The analysis of the research team reveals a problem that is surprising in its scope: When medical staff members are concentrating primarily on care or treatment activities, they do not seem to notice how often they touch surfaces inside and outside the patient's environment, and with critical areas of the patients. Perhaps this low awareness is one of the reasons for the poor implementation of hand hygiene, the researchers suspect. In particular, the frequent and mostly unconscious contact of hospital staff with their own bodies and clothing is an unexpected result of the study.

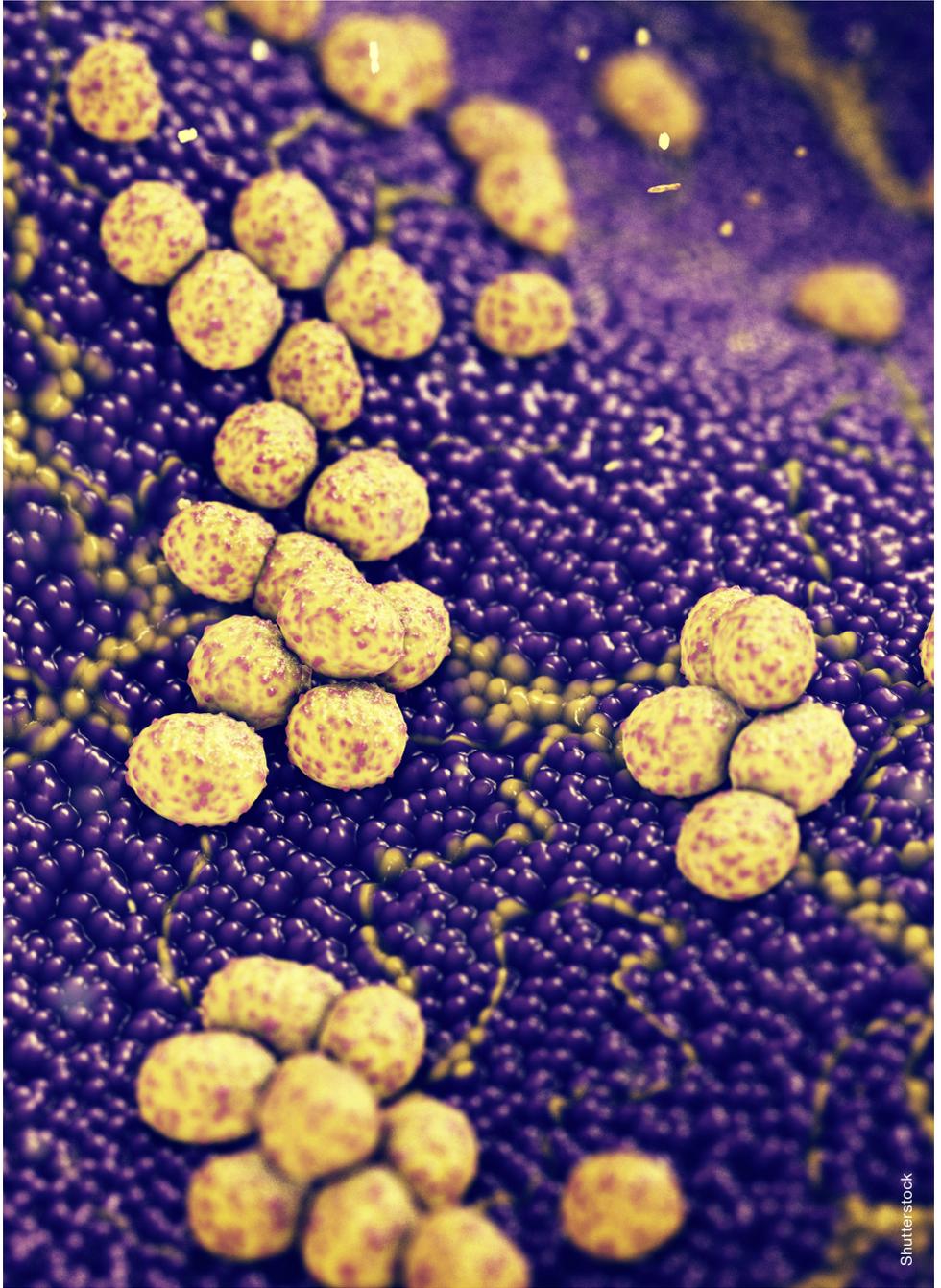
Until now, experts had assumed that the direct patient environment was mainly populated with the patient's own flora. However, the results of the Swiss study suggest that the patient's environment is also populated with foreign microorganisms. One reason is the frequent change of nurses' and doctors' hands between "inside" and "outside" the patient zone, according to the Swiss researchers. In detail, the authors of the study sorted the events as follows: Touches "outside the patient's environment" included, for example, the carer's body, clothing and equipment, other patients and all other surfaces outside the direct patient environment. "Inside the patient's environment" included the patient himself and all objects in his immediate vicinity. "Critical points" included sterile medical devices (such as catheters or other sterile equipment) that have been brought into the room, and critical parts of the patient's body that must be rigorously protected against microbial contamination to prevent infection.

The researchers defined touching a surface "outside the patient environment" followed by contact with a surface "inside the patient environment" as a "colonisation event" – i.e. an event in which microorganisms were transferred from outside to inside the patient environment. Sequences in which any surface was initially touched followed by contact with a "critical" site were defined as an "infection event" – i.e. an event in which microorganisms were transferred from a surface to a part of the patient's body that required rigorous protection against infection.

**You can read more about the study methods and other results of the examination on *hygiene in practice* under "protection":**  
[http://bit.ly/risk\\_of\\_infection](http://bit.ly/risk_of_infection)

# Hand-to-surface exposure





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*Staphylococcus aureus* on skin.

# The biofilm mystery – why do wounds fail to heal?

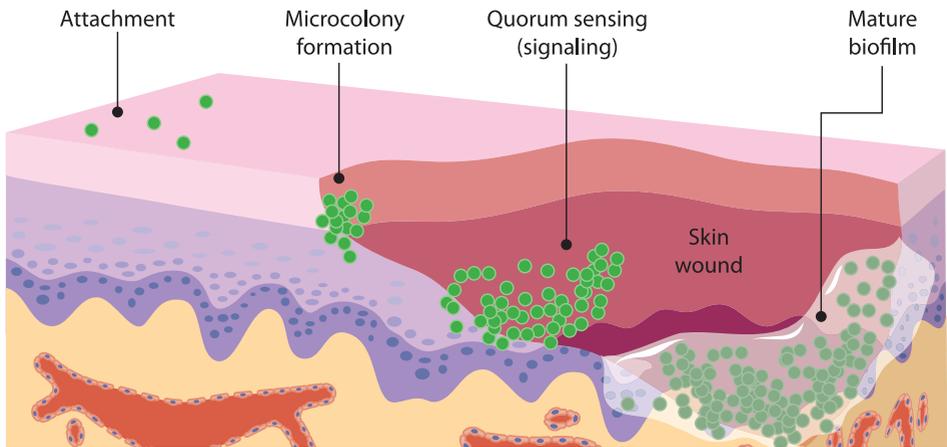
**When wounds fail to close, medical assistance is needed. Proper wound management with thorough debridement and adequate local wound care can save patients a lot of suffering. Here, measures to prevent biofilms from forming in the wound play a decisive role. Bacteria can lead to delayed wound healing – and this occurs much more frequently than previously assumed.**

A fall, an accident, an operation – in many situations, people can sustain wounds accompanied by significant tissue damage. In most cases, this is only a temporary and short-term problem. In others, however, an injury evades the normal healing process and the wound becomes chronic. Often, a microbial biofilm has formed in the wound that prevents it from closing and healing.

Roughly three per cent of the population in Germany have chronic wounds. Most of the people affected are 70 years and older. Venous leg ulcer, post-traumatic wounds, decubitus and diabetic foot syndrome are the most common conditions. A total of 2.7 million people had to seek medical help for chronic wounds in 2012, according to a study conducted in 2015. Treating such patients is a great challenge for doctors and nurses – biofilm in the wounds makes this work more difficult.

Biofilms in non-healing wounds are comprised of microorganisms embedded in a slimy matrix of various sugars and proteins. Initially, aggregates from skin bacteria or from other places form microcolonies within a few hours, and adhere firmly to the wound surface. After two to four days, the microbial community has united and produce the extracellular polymers that define a dense biofilm. Immune cells and antimicrobial therapies cannot kill the bacteria in the biofilms. The colony regulates itself with the help of various genes, using so-called “quorum sensing”. This describes the mechanism for assessing population density, used to ensure that there are a sufficient number of cells before activities are initiated that can only be carried out at a certain cell density. The genes support the bacterial growth in the biofilm, which consists of specific polysaccharides. The biofilm increases the pathogenicity of the organism and prevents the penetration of antibiotics.

## Stages of biofilm development



After the first microorganisms have adhered to the wound surface, a fusion of microcolonies occurs within a few hours. With the help of molecular communication, quorum sensing, the biofilm community is organised.

# These bacteria are most commonly found in biofilms on wounds

Studies have shown that both aerobic and anaerobic bacteria are found in wound biofilms. These are the most common germs that bind together in wounds:

- *Pseudomonas aeruginosa*
- *Staphylococcus aureus*
- *Staphylococcus epidermidis*

Dr. Thomas Bjarnsholt from Denmark is a leading researcher in the field of biofilms. He says, “Biofilms are most likely involved in all chronic wounds, even if they could be detected microscopically in only 60 to 80 per cent of cases so far. This is why wounds that are closing poorly should be intensively treated from the beginning, so that their healing does not take weeks and months – which can lead to the risk of fatal sepsis. “This is particularly important for people whose health conditions promote chronic wounds, for example, obesity and diabetes, or when they are bedridden,” explains Bjarnsholt.

In his laboratory at the University of Copenhagen, the microbiologist is working on deciphering the biofilm’s secrets to ultimately find substances that are effective against the tolerant biofilm growing bacteria. “However, we still do not know enough about biofilms in chronic wounds,” says the scientist.

**What international research has already discovered about biofilms and how scientists try to control biofilm in wounds read here: [http://bit.ly/biofilm\\_wounds](http://bit.ly/biofilm_wounds)**



# Using disposables, building trust in the OR

**Before any surgery, there must be trust: Trust in the expertise and experience of doctors and OR staff, but also in the hospital's hygiene standards. Because even in routine procedures, wound infections – which can be avoided – unfortunately continue to occur. Today, with growing competition for patients, clinics can position themselves as hygiene leaders, for example by using disposable surgical materials, and by installing effective practices. This also improves patient safety.**

Christiane Auras is in the operating room twice a week. There she assists during operations on ligaments, joints, and other orthopedic conditions. Auras is clinical practice manager for Sporthomedic, a sports orthopedic clinic in Cologne. “Our patients assume that their surgery will be performed to the highest possible standards. And here, that is true – also because we use disposable surgical textiles.” The materials protect patients, as well as the clinic staff, from infections. “Single-use ensures that potentially contaminated, infectious products are directly disposed of, without having to be touched again,” explains Auras.

Yet this is not common practice everywhere. According to the European Centre for Disease Prevention and Control (ECDC), some 3.2 million people annually contract nosocomial infections in Europe. Every year, approximately 37,000 patients die from infections acquired during or after surgery –surgical site infections (SSI) account for almost one-fifth of all infections. The ECDC estimates that 20 to 30 percent of all hospital infections could be avoided through intensive hygiene management and control programs.

The consequences of poor hygiene are often life threatening for patients. In addition – from the point of view of clinics and doctors – these are also relevant under liability law. “Public awareness is increasing, and complaints and damage claims are likely to increase,” explained Dr. Monika Ploier at an event of the “Safety in the OR” initiative, which took place in Vienna in November 2017. Ploier is a lawyer with HLMK-Attorneys in Vienna and a medical-law expert. “Until now, nosocomial infections were regarded as an unavoidable eventuality of hospitalization,” she says. “But this view is changing – not least because numerous studies have shown that such infections often can be prevented.”

For example, current studies suggest that single-use surgical gowns and single-use surgical drapes keep the infection rate lower than the corresponding reusable products, especially in operations that carry a

high risk of infection. This applies in particular to cardiac surgery, implant-based breast reconstruction, and surgical procedures with implants.

The reasons are clear: disposable medical devices have never been used before, so there can be no possible residues from previous applications. Unlike reusable materials, disposable surgical drapes and gowns do not wear out. To ensure an optimal germ barrier, the materials must be impermeable to microbes, free of microorganisms and organic residues, lint-free, liquid-impermeable, tear-, tensile- and pressure-resistant. Despite regular impregnation and sterilization, cotton used for reusable products cannot always guarantee all of this 100 percent.

A study published in the *Journal of Cardiothoracic Surgery* found that the frequency of infections in the study group with disposable surgical drapes was 68 percent lower than in the group using reusables. The authors of the study conclude “a more generous use of disposable surgical drapes can reduce post-operative infections caused by lack of hygiene“.

### **The clinic is liable for treatment errors**

“Of course, hygiene mistakes aren’t based on evil intentions,” says Ploier. Often it is simply a brief moment of thoughtlessness. The growing burden arising from facilities reducing their staff numbers certainly plays a role here. “To the hospital, however, this is not an excuse that would be relevant in a court case. In such a case, the clinic is always liable.” If it can be proven that treatment errors were caused by negligence, or by not adhering to existing hygiene regulations, Ploier explains that from a criminal-law point of view, is considered a negligent bodily injury, in the worst case, even a negligent homicide.

**A link to the study and what it means in practice, find out on hygiene in practice under “protection”: [http://bit.ly/OR\\_disposables](http://bit.ly/OR_disposables)**

## **20–30 % of all hospital infections**

can be avoided through intensive hygiene and control programmes.

## **68 % fewer infections**

with disposable surgical drapes than with reusable drapes

## **3.2 million Europeans**

become ill through hospital germs every year.

## **37,000 patients**

die all over Europe annually due to nosocomial infections caused by operative procedures.

# Are you curious?

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