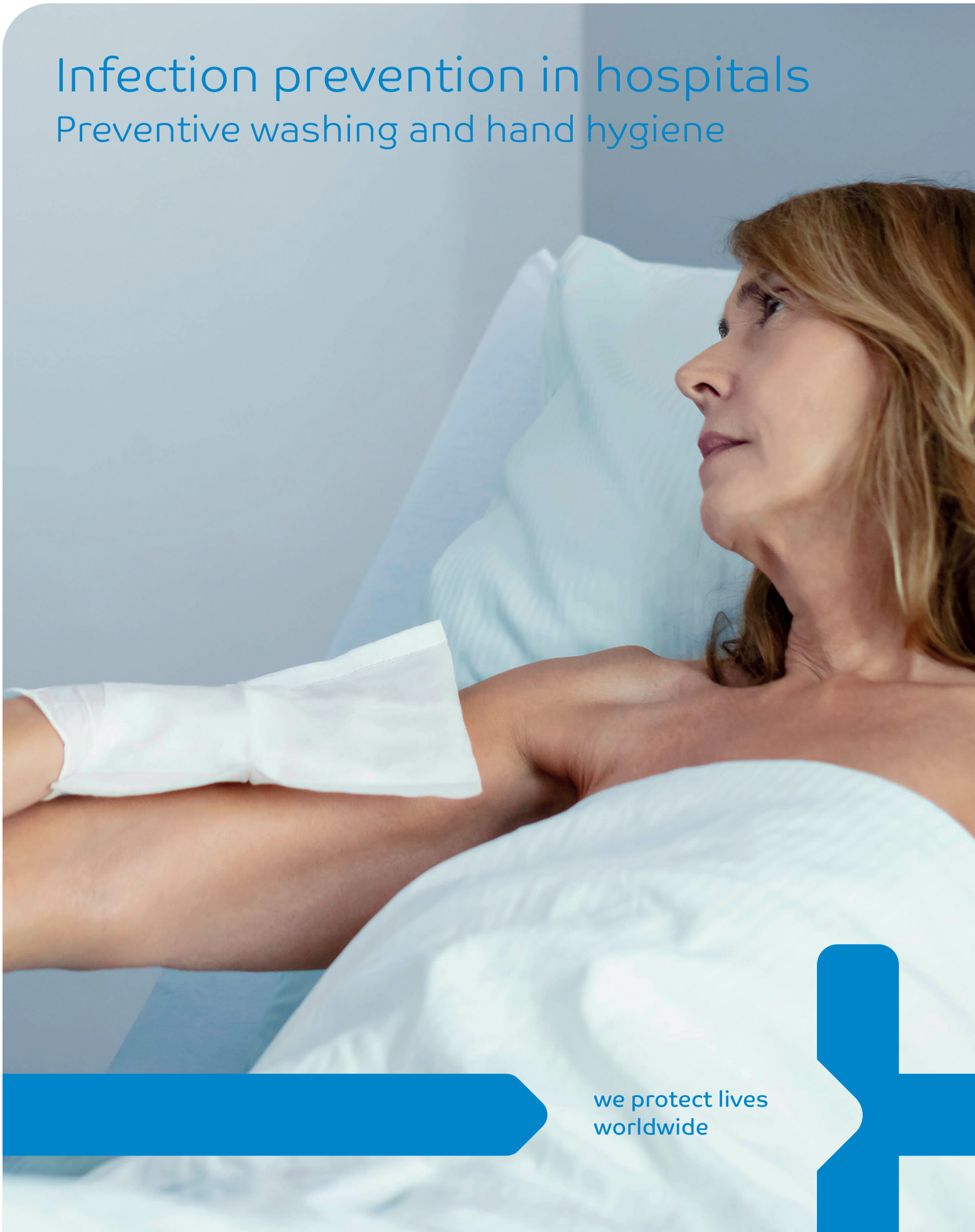
schülke

Infection prevention in hospitals

Preventive washing and hand hygiene



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INFECTION PREVENTION IN HOSPITALS - PREVENTIVE WASHING AND HAND HYGIENE

Clostridioides difficile *(C. difficile),* methicillin-resistant *Staphylococcus aureus* (MRSA), methicillin-sensitive *Staphylococcus aureus* (MSSA) and *Escherichia coli (E. coli)* are bacterial infections that may occur as a direct result of healthcare interventions or from being in contact with a healthcare setting. Healthcare-associated infections (HCAIs) pose a serious risk to both patients and staff, are costly for the NHS, and can cause significant morbidity to those infected.

The emergence of new infections also poses a risk as highlighted by the transmission of SARS-CoV-2 in health and care settings. HCAIs are caused by a wide range of microorganisms and some of these are carried by the patients themselves. There is evidence that preventive washing with an antimicrobial body wash reduces the likelihood of some HCAIs occurring. Effective hand hygiene also plays a key role in infection prevention.

HEALTHCARE-ASSOCIATED INFECTIONS

Healthcare-associated infections (HCAIs) are defined as 'infections occurring in a healthcare setting that were not present prior to a patient entering that care setting' [NICE, 2017].

The most common types of healthcare-associated infection are respiratory infections (including pneumonia and infections of the lower respiratory tract), urinary tract infections and surgical site infections. Each one of these infections means additional use of NHS resources, greater patient discomfort and a decrease in patient safety [NICE, 2014].

Recent modelling estimates that in 2016/2017 in NHS hospitals in England (including general, teaching and specialist hospitals) there could have been 834,000 HCAIs, which may have:

- Cost the NHS £2.7 billion
- Accounted for 28,500 patient deaths
- Led to an additional 7.1 million occupied hospital bed days (equivalent to 21% of the annual number of all bed days across all NHS hospitals in England) [Guest, 2020].

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SURGICAL SITE INFECTIONS

The prevalence of healthcare-associated infections in hospitals in England is estimated to be about 6.4% [NICE, 2014] and surgical site infections (SSIs) account for around 20% of all HCAIs [Badia, 2017]. SSIs have been identified as one of the most important preventable sources of morbidity and mortality associated with clinical treatment [Kim, 2010].

- SSIs are relatively common, with 5% of surgical patients developing one, but studies including post-discharge follow up suggest much higher rates [Tanner, 2012].
- It is estimated that general surgery patients who contract an SSI cost the NHS an additional £10,523 per patient, compared to patients not affected [Tanner, 2009].
- Patients developing an SSI spend an additional 7-10 days in hospital [Coello, 2005].
- Periprosthetic joint infections may cost up to £75K per patient to treat [Jeans, 2018].

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An additional **7-10 days** in hospital [Coello, 2005].

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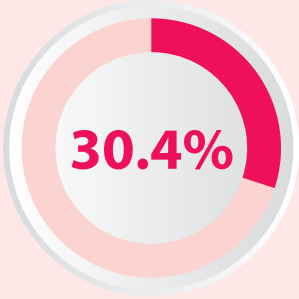
FREQUENCY OF SSI ISOLATES ACROSS ALL SURGICAL CATEGORIES [PHE, 2019]



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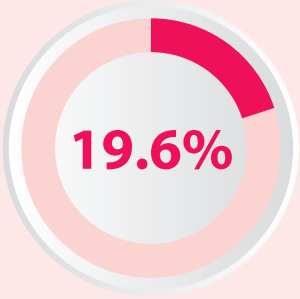
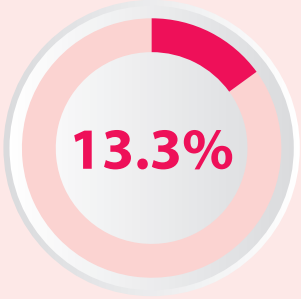
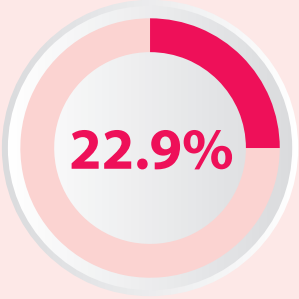


COLIFORMS



PROTEUS MIRABILIS

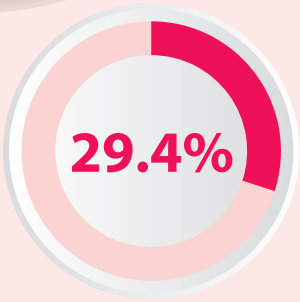


STAPHYLOCOCCUS AUREUS

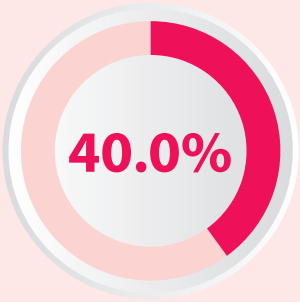
SSI INCIDENCE [PHE, 2019]

FREQUENCY OF ISOLATES IN ORTHOPAEDIC SURGERY

Methicillin-sensitive *Staphylococcus aureus* (MSSA) remains the dominant causative organism for SSI in orthopaedic surgery [PHE, 2019].



HIP REPLACEMENT



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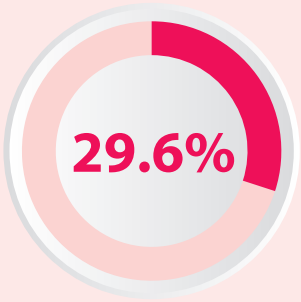

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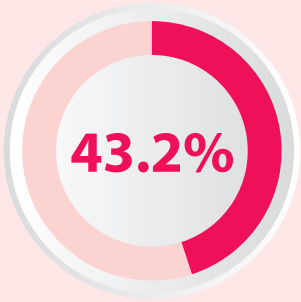


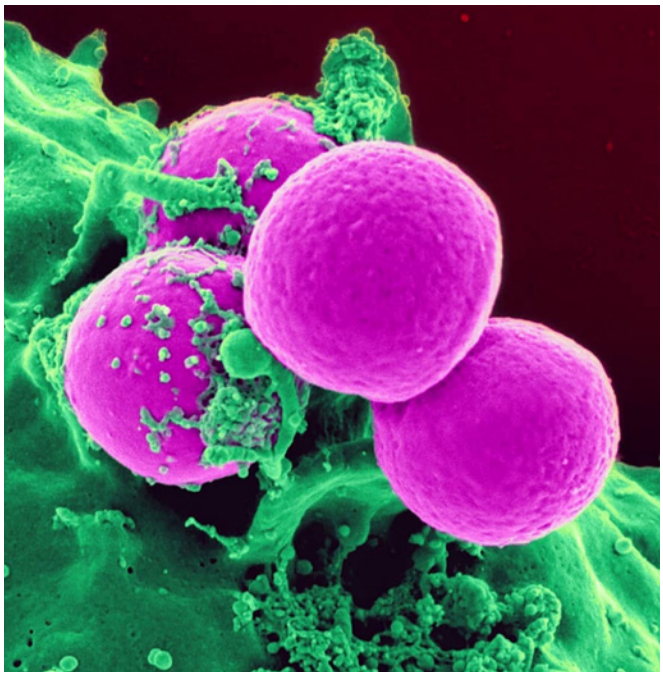
SPINAL SURGERY

EVIDENCE FOR DECONTAMINATION

STAPHYLOCOCCUS AUREUS AND HCAIS

Staphylococcus aureus accounts for more healthcare–associated infections than any other pathogen. It is the most common cause of ventilator-associated pneumonia and surgical-site infection and the second most common cause of central-catheter–associated bloodstream infection [Huang, 2013].

- Colonisation is a proven risk factor for developing surgical site infection during hospital stay with isolates matching those of nasal swabs in 85% of cases [Jeans, 2018].
- Around 30% of patients identified as MRSA positive develop a subsequent infection [Huang, 2003].
- 80% of patients developed infections at a site unrelated to the initial site from which MRSA was isolated [Huang, 2003].
- Patients colonised with *Staphylococcus aureus* have an increased risk of staphylococcal infection at the site of a total hip or knee arthroplasty [Weiser, 2015].
- 25– 30% of the United Kingdom population is positive for skin or nasal carriage of *Staphylococcus* [Jeans, 2018].



DECONTAMINATION

Decontamination helps reduce transmission and prevent disease in *Staphylococcus aureus* carriers. Using an anti-microbial body wash and nasal gel has been shown to improve health outcomes as well as reduce costs [Robotham, 2011].

A 2011 study concluded that all decontamination strategies improved health outcomes as well as cutting costs of healthcare provision. Universal decontamination was the most cost effective approach in the short term [Robotham, 2011].

A study in over 74,000 patients demonstrated that universal decontamination is more effective and efficient compared to alternative methods such as screening with selective decontamination. 'Universal decolonisation in adult Intensive Care Units led to a 37% reduction in risk of an MRSA clinical isolate and a 44% reduction in risk of bloodstream infections due to all pathogens' [Huang, 2013].

In a large, randomised multicentre trial, the risk of developing hospital associated *Staphylococcus aureus* infection in MSSA-carrier patients who 'were decolonised on admission to hospital fell by nearly 60% compared with placebo' [Johnson, 2013].

In patients undergoing cardiothoracic or orthopaedic surgery, screening for *Staphylococcus aureus* nasal carriage and decontaminating carriers resulted in a substantial reduction in hospital costs. This approach resulted in a cost saving of almost £3,000 per cardiothoracic patient compared to the non-screened and non-treated patients. [van Rijen, 2012].

DECONTAMINATION IN INTENSIVE CARE UNITS

A study looking at infections in ICU patients found that **26.4% of infections** were HCAIs [Nuvials, 2015].

Healthcare-associated infections (HCAIs) are frequent in patients admitted to Intensive Care Units (ICU) and have a significant negative impact on clinical outcomes. It has been estimated that between 9% to 37% of those admitted to intensive care units have an HCAI [Hacque, 2018]. A study looking at infections in ICU patients found that 26.4% of infections were HCAIs [Nuvials, 2015]. There is evidence that patients admitted to ICU with an HCAI have a worse clinical outcome with higher mortality and length of stay, and are more severely ill on admission than patients without [Nuvials, 2015].

There are a number of potential strategies for reducing HCAIs including screening of all admitted patients and decontamination of those colonised with *Staphylococcus aureus,* and universal decontamination of all patients admitted to ICU. A 2011 study concluded that all decontamination strategies in ICU improved health outcomes as well as cutting costs of healthcare provision, but universal decontamination was found to be the most cost effective [Robotham, 2011].

UNIVERSAL DECONTAMINATION:

Was estimated to **save $171,000** and prevent 9 additional bloodstream infections for every 1,000 ICU admissions [Huang, 2014].

- Provided both lower intervention costs and lower total ICU costs than either screening and isolation or targeted decontamination [Huang, 2014].
- Was estimated to save $171,000 and prevent 9 additional bloodstream infections for every 1,000 ICU admissions [Huang, 2014].
- Led to a 37% reduction in risk of an MRSA clinical isolate and a 44% reduction in risk of bloodstream infections due to all pathogen [Huang, 2013].

DECONTAMINATION IN ICU HAS A POSITIVE IMPACT ACROSS THE WHOLE HOSPITAL

A 2017 study investigated the impact when routine MRSA decontamination in ICU was discontinued. There was a 250% increase in bacteraemia cases across the whole hospital. Six months after reinstating routine decontamination in ICU, cases showed a significant decrease. The researchers concluded that 'routine decolonization for MRSA in a large ICU setting is an effective strategy to reduce the spread and incidence of MRSA across the whole hospital' [Bradley, 2017].

ORTHOPAEDIC SURGICAL SITE INFECTIONS

In England & Wales alone **over 1000** revision procedures are performed annually because of PJI of the hip [Lenguerrand, 2018].

Total joint replacement (TJR) is a life-enhancing procedure which is recognised as being one of the most clinically and cost effective interventions, providing predictable improvements in pain and quality of life [Vanhegan, 2012]. With an ageing population, it is unsurprising that the number of total joint replacements is increasing annually, with 2,548,896 primary joint replacements recorded by the UK National Joint Registry for 2019 [NJR, 2020].

Although uncommon, periprosthetic joint infection (PJI) is devastating and leads to severe pain, poor function, reduced quality of life, and in some cases death. Revision surgery is usually required which is complex, protracted, and associated with further complications, as well as significant costs [Lenguerrand, 2018].

Deep infection affects approximately 4% of primary and 15% of revision knee replacements [Lenguerrand, 2019]. In England & Wales alone, over 1000 revision procedures are performed annually because of PJI of the hip [Lenguerrand, 2018].

Costs due to PJI are in excess of **£30,000** per knee case, and **£22,000** per hip case. [Vanhegan, 2012].

In terms of the financial burden to the healthcare system, the costs associated with PJI are in excess of £30,00 per revision knee replacement and £22,00 per hip revision case. These costs are greater than for any other indications for revision, even before accounting for potential costs associated with litigation [Lenguerrand, 2017]. Patients undergoing revision surgery spend significantly longer in hospital than those undergoing a primary total joint replacement [Vanhegan, 2012].

Methicillin sensitive *staphylococcus aureus* (MSSA) is a common isolate in PJI and colonisation is a proven risk factor for subsequent infection [Jeans, 2018]. A significantly higher rate of surgical site infection has been observed among methicillin-resistant *Staphylococcus aureus* carriers [Kim, 2010].

An estimated total

cost benefit of £942,068

over the course of the study.

[Jeans, 2018].

REDUCTION IN MSSA INFECTIONS WITH DECOLONISATION PROTOCOL – THE QIST PROJECT

An MSSA screening and decolonisation programme, undertaken at Northumbria Healthcare Foundation Trust, was shown to be effective in reducing rates of periprosthetic joint infection (PJI) by up to 60%. This lead the researchers to conclude that: 'the decolonisation programme was a significant factor in the threefold reduction of MSSA.' [Jeans 2018].

The aim of the study, published in the Journal of Infection (2018), was to determine if MSSA screening and decolonisation reduced MSSA PJI rates in primary joint replacement. Results were analysed in almost 13,000 patients [Jeans, 2018]. All MSSA positive patients attending for elective arthroplasty were prescribed octenisan® wash lotion and a nasal gel for use five days prior to the procedure, and five days after. Infection data was collected prospectively and compared with a control group from before the study.

The programme was found to result in significant savings when compared to the cost of prevented infections. Following the introduction of the screening programme 47 PJIs were avoided, with a cost per infection prevented of £1893. This compares to the revision cost of £21,937, leading to an estimated total cost benefit of £942,068 over the course of the study [Jeans, 2018].

The screening and intervention approach tested by Northumbria Healthcare is now being adopted by 30 NHS Trusts with the aim of reducing MSSA infections in patients undergoing hip and knee replacement surgery.

This unique collaborative, called QIST (Quality Improvement for Surgical Teams) is being supported by schülke. QIST will drive forward improvements for patients by 'scaling up' interventions, such as screening and the use of bodywash and nasal gel treatments for patients to reduce infections.

EVIDENCE FOR OCTENIDINE IN PREVENTIVE WASHING

A number of studies have evaluated the efficacy of preventive washing with an octenidine based antimicrobial:

Led to a **76% reduction** in the acquisition of multi-drug resistant organisms [Spencer, 2013].

In 2013, preventive body washing with an octenidine based antimicrobial was introduced for all patients on a 32 bed ICU which had experienced an increasing number of nosocomial cases in spite of robust hand hygiene and environmental disinfection measures. The implementation of universal decontamination using an octenidine based antimicrobial in combination with a standardised washing regimen led to a significant reduction in nosocomial colonisation [Messler, 2019].

A randomised trial of 60 participants compared the effects of using soap or an octenidine based antimicrobial on colony forming units (CFUs) for up to six hours. Octenidine was found to be more effective than soap in reducing CFUs on the skin of healthy volunteers [Tanner, 2012].

Octenidine was found to be **more effective than soap** in reducing CFUs on the skin [Tanner, 2012].

A two year retrospective pilot study in a mixed medical and surgical ICU / high dependency unit examined the use of an octenidine based antimicrobial for routine patient washing. The study showed a 76% reduction in the acquisition of multi-drug resistant organisms [Spencer, 2013].

An MSSA screening and decolonisation programme undertaken at Northumbria Healthcare Foundation Trust, was shown to be effective in reducing rates of periprosthetic joint infection (PJI) by up to 60% [Jeans 2018]. It also resulted in significant savings when compared to the cost of prevented infections. Results were analysed in almost 13,000 patients. All MSSA positive patients attending for elective arthroplasty were prescribed octenisan® wash lotion and a nasal gel [Jeans, 2018].

EVIDENCE SUMMARY FOR AN OCTENIDINE BASED ANTIMICROBIAL BODY WASH IN ICU

Clinical studies examining the use of an octenidine based antimicrobial body wash in ICU found the following:

- 76% reduction in the acquisition of multi-drug resistant organisms [Spencer, 2013].
- Significant reduction in ICU-acquired blood-stream infections and MRSA in medical ICUs after implementation of octenidine based antimicrobial for decontamination [Gastmeier, 2016].
- Nosocomial incidence density of 7.55 (pre-intervention) was reduced to 2.61 (post-intervention) per 1000 patient days [Messler, 2019].
- Nosocomial infections were significantly reduced from 13 cases to 1 case after intervention [Messler, 2019].

Nosocomial infections were **significantly reduced** 13 cases to 1 case after intervention [Messler, 2019].

60 -70% alcohol

concentration effective against enveloped viruses [CDC, 2020].

HAND HYGIENE

Maintaining hand hygiene has long been recognised as essential for reducing the incidence of infectious diseases. Compliance with recommended hand cleansing procedures appears to play a significant role in decreasing the risk of gastroenteric and respiratory infections. For healthcare staff stringent hand hygiene measures are critical. Unclean hands may assist the transmission of microorganisms between patients and staff, leading to increased morbidity, mortality, and costs related to healthcare-associated infections [Gold, 2020].

Enhanced hand hygiene procedures in clinical settings are an intrinsic element of COVID-19 prevention. SARS-CoV-2 (the virus which causes COVID-19) has been found to remain on the skin for up to 9 hours, which is significantly longer than that of Influenza A Virus (IAV), which was approximately 1.8 hours [Hirose, 2020]. However, when exposed to an ethanol-based disinfectant, researchers found that both SARS-CoV-2 and IAV on human skin were completely inactivated within 15 seconds [Hirose, 2020].

In the clinical environment the NHS advises that ABHRs should be used for routine hand hygiene during care, unless the hands are visibly soiled [NHS, 2019]. The actual formulation of an ABHR is critical. The antimicrobial agents within the product need to work in conjunction with added components like moisturiser, without compromising each other. An ABHR for use in hospitals should conform to stringent testing, for example European Norms (EN): EN 1500, EN 12791 and EN 14476.

The alcohol component of the hand rub is the main active ingredient to eliminate microorganisms. Besides its rapid killing action, the fast drying time is also an advantage when it comes to hand sanitising. 60 -70% alcohol (commonly ethanol/isopropanol) is the concentration demonstrated to be effective against enveloped viruses, such as those causing COVID-19 [CDC, 2020].

desderman® pure gel meets EN1500 for hygienic hand disinfection in 30 seconds and EN12791 for surgical hand disinfection in 90 seconds as well as EN14476 for virucidal efficacy.

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