



Hand antisepsis:

A review of the guidance

The importance of hand hygiene cannot be overstated, according to Julian Guest's economic study, in England in 2016/2017 there were 834,000 Healthcare Associated Infections (HCAIs), accounting for one-fifth of bed days, 79,700 days of absenteeism among healthcare professionals and 28,500 deaths, which totals up to a significant cost to the NHS of £2.7 billion per year (Guest et al 2020).

Infections are high up on the World Health Organization's (WHO) radar. WHO has recently declared an emergency regarding antibiotic resistance, stating that it is one of the biggest threats to global health, food security and development today. In the worst scenario, it is predicted the number of deaths will increase to 10 million by 2050 if no action is taken (IACG 2019). WHO have published their multimodal improvement strategy, hand hygiene guidance and implementation toolkit, stating that up to 50% of HCAI's are preventable with hand hygiene improvement strategies and that economic savings are on average 16 times the cost of implementation (Allegranzi et al 2013).

Gloves are used in theatres to protect patients from pathogens that may be present on a healthcare professional's hands. However, in one study, up to 41% of all procedures resulted in glove perforations and 70% of those went unnoticed until the procedure was completed (Bekele et al 2017). It is for this reason that hand hygiene in theatres is imperative in preventing surgical Site Infections (SSIs) and protecting patients.

Approximately 16% of all HCAIs are SSI related (Guest et al 2020), and therefore a key focus area for improvement strategies. Outbreaks of SSI's are known to occur where hand hygiene guidance is not followed. In one scenario, SSIs occurred where surgeons who normally used an antimicrobial product for scrubbing, switched to a non-antimicrobial product (Grinbaum et al 1995). In another scenario, an outbreak of *P. aeruginosa* occurred where a cardiac surgeon with onychomycosis became the source of infections due to poor hand hygiene (Mermel et al 2003).

For a scrub or rub solution to be deemed appropriate for usage in theatres,

it must possess an immediate effect, be effective against transient and resident flora, and have a residual, persistent effect for up to three hours. This is to protect against microorganisms in the event of glove tears during a procedure (WHO 2009).

Many readers of the IPP will likely find 4% chlorhexidine gluconate (CHG) and/or 7.5% povidone iodine (PVP-I)-based products above scrub sinks in the UK. These products have become a staple in theatres having been habitually used for decades.

CHG was developed in the 1950s as an antiseptic agent (Davies et al 1954) and gained popularity in healthcare settings due to its immediate and persistent effect. It owes its persistent effect to its ability to bind to proteins in the skin and mucus membrane, CHG is effective against Gram-positive bacteria, but less effective against Gram-negative bacteria, fungi and much less against mycobacteria (WHO 2009). There is also growing concern over the frequent use of CHG-based products causing antimicrobial resistance, although more research on this is required to be conclusive (Kampf et al 2016, RKI 2016).

Iodine was introduced in 1811 and PVP-I in 1955, however studies have shown the persistent effect to be 30 to 60 minutes, which falls short of the three hours required for surgical hand antisepsis (Ayliffe et al 1988, Galle et al 1978, Wade et al 1991). Scrubbing using 4% CHG solution has also been proven to be significantly more effective for reducing microorganisms than a 7.5% PVP-I-based solution (WHO 2009).

The top layer of the skin, the stratum corneum, consists of corneocytes (bricks) and the lipid-rich matrix (mortar). The lipid rich matrix mostly contains ceramides (40 to 50%), cholesterol (25%) and free fatty acids (10-15%). Surfactants, products which have a lathering effect or 'create bubbles', break down proteins in microorganisms and cause them to detach from the skin, yielding cleaner hands. Surfactants also break down the lipid-rich matrix (mortar), therefore frequent hand washing leads to a decrease in the skin's structural integrity and result in a breakdown of skin health (Mijaljica 2022, Kownatzki 2003).

Allergic reactions have been reported among healthcare professionals with certain antiseptic agents, including chlorhexidine, iodophors, QAC and alcohols (Rosenberg et al 1976, Ophaswongse et al 1994, Cimiotti et al 2003, Denton 1991). However, among that

list, alcohol has a very low incidence of contact dermatitis and allergic reactions (Widmer 2000). Gloves may also contribute to dermatitis due to allergies to latex or shearing forces when applying, wearing or removing gloves (Kownatzki 2003).

In their guidance, WHO states '[skin reactions] can vary from quite mild to debilitating, including dryness, irritation and even cracking and bleeding', disinfecting hands with damaged skin is much more difficult and therefore can leave healthcare professionals unable to practice if conditions do not improve (WHO 2009).

In recent years there has been increasing evidence for alcohol-based hand rubs (ABHRs), demonstrating their effectiveness for hand antisepsis in theatres. WHO (2009) state '[use of ABHRs is advantageous due to the] evidence-based, intrinsic advantages of fast acting and broad-spectrum microbicidal efficacy with minimal risk of generating resistance to antimicrobial agents.' ABHRs, depending on concentration and type of alcohol, can be fully virucidal, effective against gram-positive and gram-negative microorganisms, including hard-to-kill viruses such as Noroviruses (Kampf 2018), therefore, proving more effective than 4% CHG- or 7.5% povidone iodine-based solutions.

Though, not all ABHRs are suitable for surgical use. ABHRs are required to meet the standard EN 12791, that is, demonstrating an immediate and significant reduction in transient and resident flora, while also having a minimum three-hour persistent effect limiting regrowth of microorganisms (BSI 2018).

Many studies indicate that scrubbing for five minutes is sufficient in decreasing bacterial counts using a traditional scrub solution* (WHO 2009), however, just one and a half minutes is required for a surgical rub using some ABHRs (Kampf et al 2005). This argument is especially compelling in scenarios where surgical intervention is urgent and every second counts.

The climate crisis has resulted in shortages of many resources, water is one of them (EA 2021). Consider that each scrub uses on average 20 litres of warm water and multiply that per person, per procedure, per theatre, per hospital, and it amounts to significant water usage across the UK (Jehle 2008). Therefore, the waterless surgical hand antisepsis technique using ABHR where typically 15ml of solution is >>

*Always consult manufacturer's instructions for use before using any disinfection product

required represents significant savings in water, energy, cost and time (WHO 2009). While some believe scrubbing before rubbing is required, this is not the case. WHO (2009) recommends handwashing using a non-medicated soap before the first rub of the day and after visiting the toilet as excessive hand washing can lead to exacerbated symptoms. This is due to alcohol being non-effective against spore forming bacteria such as *C. Difficile*, which basic hand washing is effective against. ABHRs have gained the reputation for having a drying effect on the skin, but this is not always the case. WHO (2009) recommends ABHRs that contain humectants or emollients such as glycerol, which offer improved tolerance and reduced incidents of contact dermatitis. Surveillance was conducted at a Swiss hospital over ten years and failed to produce any documented cases of allergy to a commercial ABHR (Widmer 2000), therefore careful selection of an ABHR is important.

The Association for Perioperative Practice (AfPP) recommends the use of ABHRs in their guidance, citing various studies supporting their use and effectiveness for surgical hand antisepsis (AfPP 2020). NHS England has very recently published the National infection prevention and control manual for England, which now also recommends the use of ABHRs as an alternative to traditional scrub solutions (CHG or PVP-I) (NHS 2022).

Based on the rationale included in this article, including improved efficacy, time and cost-saving, WHO (2009) state that use of ABHRs is gold standard for hand hygiene in healthcare settings, including theatres. In conclusion, I would recommend those reviewing their approach to hand hygiene to consult the AfPP, NHS and WHO Hand Hygiene Guidelines and consider alcohol as an alternative for surgical scrubbing. ■

Article by **Anne Barclay, Senior Educator for Perioperative Practice**

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The Association for Perioperative Practice