Continuing the fight in reducing the risk of surgical site infections in the perioperative environment


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SSIs arise when sufficient microorganisms enter the surgical site to overwhelm the host’s natural defence mechanisms (PHE 2014). In the UK, the Health and Social Care Act 2008 Code of Practice for the prevention and control of HCAIs (DH 2015) emphasises the responsibility of care providers to make suitable and sufficient assessment of the risk to patients with respect to HCAIs. The National Patient Safety Agency (2004) also highlighted the importance of risk assessment when it published “Seven Steps to Patient Safety”. These steps included the need to integrate risk-management activity and implement solutions to prevent harm. Throughout many healthcare facilities, including the perioperative area, many initiatives have been taken to reduce the harm arising as a result of HCAIs and in particular SSIs.

In Scotland significant improvements in reducing HCAIs between 2003 and 2010 have been reported (Wilson 2013b). Public Health England (2015) also reported a significant decrease in SSI incidence occurring following surgery for repair of neck of femur, between 2008 and 2014, and a decreasing trend for SSIs following gastric surgery. However the risks of SSIs are still a cause for concern (Srejic 2015). Health Protection Scotland (2013) and The Northern Ireland (NI) Public Health Agency (2014) report that while significant advances in infection control practices within operating rooms have been made, SSIs remain a substantial cause of morbidity and mortality.

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Richmond (2009) cautions against complacency with regard to infection control practice within operating departments. As part of the effort to reduce risks, staff must be able to identify and separate potential sources of infection (Pyrek 2002). Understanding the chain of infection and how to implement strategies to disrupt this chain is imperative if the incidences of SSIs are to be reduced. This involves analysing how infectious agents can be transmitted, the susceptibility of patients to infection and the implementing of infection prevention and control precautions while continuing to provide for the individual’s healthcare needs.

There are six links to the chain including the causative agent, the reservoir of infection, portal of exit, mode of transmission, portal of entry and the susceptible host. At any time if a link in this chain is broken then the infection risk will be minimised.

Tanner and Khan (2008) and Wilson (2013a) outline a number of sources of SSI risks within the perioperative area to include the patient, the environment and the staff. Particular factors determining the infection risk in an operating suite are the duration and complexity of the surgical procedure itself, the number of people in contact throughout, the patient’s state of health, such as pre-existing immune deficient conditions, and the nature of the microorganism and its route of transmission.

Not all the organisms cause HCAIs but most often responsible for SSIs are the patient’s endogenous flora and the bacteria most often associated with SSIs are Staphylococcus, Enterococcus and Escherichia coli (Owens & Stoessel 2008, Tanner & Khan 2008). According to Chen et al (2013) staphylococcus aureus is the most common organism responsible for SSIs. Staphylococcus aureus is a gram positive bacteria and can be frequently found as a commensal organism on the surface of human skin. Public Health England (2015) reports that staphylococcus aureus accounted for 13% of inpatient SSIs in 2014/15 following a decreasing trend from 2006. Methicillin-resistant S. aureus (MRSA) accounted for 25% of SSIs and had decreased markedly since 2006. However Enterobacteriaceae SSIs increased from 2008 and accounted for 25% in 2014.

There are two identified routes of transmission of such microorganisms; through direct contact, or through indirect contact. Direct contact as the name implies consists of bodily contact with the bacteria and a physical transfer from the
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infected source to the host. Indirect contact occurs when an agent is carried from a reservoir (the source of infection) to a susceptible host without direct contact with the source. In the operating environment there are many surfaces that can be contaminated with microorganisms such as dressing trolleys, door handles, keyboards, and soap dispensers (Pellowe 2007). Microorganisms can also be dispersed from contact with unsterile instruments, inadequately decontaminated endoscopes and surgical accessories.

Humphreys (2009) outlines three broad classifications of interventions in the control of SSIs to include interventions before surgery, during surgery and following surgery. In 2014 NICE reviewed the 2008 infection control guidelines based on the latest available evidence and published recommendations for clinical practice for minimising risks to patients. The key elements of these revised guidelines are summarised under the headings of preoperative, intraoperative and postoperative phases.

Although the 2008 NICE guidelines recommended topical skin decontamination of staphylococcus aureus to routinely prevent surgical site infection the 2014 revised guidelines recommend that in the preoperative phase, patients who are undergoing planned surgery should be advised to shower or bathe with soap on the day before or day of surgery.

The removal of hair from the area of the operative site has been a tradition but NICE (2014) does not recommend the routine removal of hair. This is in line with earlier recommendations by Owens and Stoessel (2008) who suggest that hair removal should be avoided unless it might interfere with the surgical procedure. Tanner et al (2011) compared hair removal (shaving, clipping, or depilatory cream) with no hair removal and found no statistically significant difference in SSI rates. In cases where hair removal is necessary the current NICE recommendation is that this should be done with single use headed electric clippers and should be performed on the day of surgery. As in previous guidance, and guidance elsewhere, the use of razors is advised against due to the risk of small incisions (Tanner & Khan 2008).

Although Kallen et al (2005) have claimed a reduction in SSI rates following nasal mupirocin application, the NICE 2014 guidance recommends against the routine use of such antimicrobial nasal decontamination preparations. Anderson (2014) also highlights that it is now recognised that mechanical bowel preparation do not reduce the risk of SSI, this is reflected in the NICE guidelines which advises against the routine use of mechanical bowel preparation. The use of prophylaxis antibiotics is also advised against in routine clean non-prosthetic uncomplicated surgery, but further detailed guidance in the use of antibiotics is given for various types of surgery.

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Hand hygiene is the cornerstone of infection control and in both the preoperative and the intraoperative phase. Widespread guidance is available for the moments when hand hygiene should be performed and these include before performing invasive procedures and between procedures on the same patient where soiling of hands is likely to cause cross-contamination of body sites.

The current NICE guidelines (2014) reiterate the importance of hand decontamination, recommending hand washing with antiseptic surgical solutions prior to the first operation and use of either alcoholic hand rub or antiseptic surgical solutions before subsequent operations. The recommendations also suggest that skin at the surgical site should be prepared using an antiseptic solution. Solutions such as chlorhexidine gluconate in a 2% solution are effective against a wide variety of skin-borne pathogens (Edmiston et al 2013).

Gloves protect against contact with infectious materials. NICE recommend the consideration of two pair of sterile gloves when there is a high risk of glove perforation. Cicconi et al (2010) argue that this practice reduces the risk of occupational exposures for healthcare workers and the risk of SSIs for patients. Al Maqbali (2014) reviewed a number of trials which compared single gloves with double gloves for numbers of perforations. There was some evidence that the use of double gloving reduces the risk of the innermost glove being perforated. However as Al Maqbali (2014) highlight the longer duration of surgery, the bacteria count on the hands of surgical teams increases, as does the number of perforations. Once contaminated, gloves can become a means for spreading micro-organisms.

The way gloves are used can influence the risk of infection transmission. Incorrect use of clinical gloves and failure to change them between procedures increases the risk of cross-transmission (Loveday et al 2014). Humphreys (2009) highlighted how compliance with preventative measures and guidance is often poor. A Regulation and Quality Improvement Authority (RQIA) 2014 report of theatre practice in Northern Ireland Healthcare Trusts, found poor practice in the use of gloves with some
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staff failing to wash hands before or after donning gloves, and excessive use of gloves when there was no identifiable clinical need (RQIA 2014). If gloves become torn or heavily soiled and additional patient care tasks must be performed, then change the gloves before starting the next task. Gloves should always be changed after use on each patient and be discarded in the appropriate receptacle. Hand decontamination should also occur immediately after removing gloves.

The use of physical barriers, including incise drapes and sterile gowns, to reduce SSI is a long-standing practice in the operating environment. The use of surgical incise drapes to protect the wound from organisms is one strategy used to prevent SSIs. They are considered to provide a sterile barrier to bacteria migrating to the wound and creating an SSI (Evans 2012). However there have been conflicting conclusions regarding their value with regard to reduction of SSIs. Webster and Alghamdi (2013) caution that there are conflicting results from non-randomised studies about the efficacy of this approach, and that no systematic review has been conducted to date to guide clinical practice. The antimicrobial efficacy of an iodine-impregnated incise drape against MRSA was evaluated in Casey et al (2015) who found that the iodine impregnated drape demonstrated high antimicrobial activity. The current NICE guidelines recommend against the use of non-iodophor impregnated incise drapes for routine surgery. However the effectiveness of the use of such drapes may be affected by drape lift or drape pull-back from the wound edge allowing skin organisms to contaminate the wound (Evans 2012).

SSIs have been seen as a key performance indicator in the delivery of high quality care and will continue to be so. Adherence to the NICE guidance and to the latest evidence will help to minimise the risks. Ongoing surveillance and review of practice will play an important role in this fight but individual practitioners must also reflect on their own practice and identify risks of infections in the perioperative environment.

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