

## The OneTogether collaborative approach to reduce the risk of surgical site infection: identifying the challenges to assuring best practice

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Keyword:	Surgical Site Infection, Competencies, Education, Clinical Governance, Behaviour, Audit, Evidence-based Practice
Abstract:	<p><b>Background:</b> Surgical site infections (SSI) account for 16% of healthcare associated infection, are associated with considerable morbidity, mortality and increased costs of care. Ensuring that evidence-based practice to prevent SSI is incorporated across the patient's surgical journey is complex. OneTogether is a quality improvement collaborative formed to promote and support the spread and adoption of best practice to prevent SSI. This paper describes the findings of an expert workshop on infection prevention in the operating department.</p> <p><b>Methods:</b> A total of 84 delegates from 75 hospitals attended the workshop, comprising 46 (55%) theatre nurses/operating department practitioners; 16 (19%) infection control practitioners and 22 (26%) other healthcare practitioners. Discussion focused on evidence, policy implementation and barriers to best practice. Responses were synthesised into a narrative review.</p> <p><b>Results:</b> Delegates reported significant problems in translating evidence-based guidance into everyday practice, lack of local policies and poor compliance. Major barriers were lack of leadership, poorly defined responsibilities, and lack of knowledge/training.</p> <p><b>Conclusions:</b> This workshop has provided important insights into major challenges in assuring compliance with best practice in relation to the prevention of SSI. The OneTogether partnership aims to support healthcare practitioners to improve the outcomes of patients undergoing surgery by reducing the risk of SSI.</p>

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**Abstract**

Background: Surgical site infections (SSI) account for 16% of healthcare associated infection, are associated with considerable morbidity, mortality and increased costs of care. Ensuring evidence-based practice to prevent SSI is incorporated across the patient's surgical journey is complex.

OneTogether is a quality improvement collaborative of infection prevention and operating department specialists, formed to support the spread and adoption of best practice to prevent SSI. This paper describes the findings of an expert workshop on infection prevention in operating departments.

Methods: A total of 84 delegates from 75 hospitals attended the workshop, comprising 46 (55%) theatre nurses/operating department practitioners; 16 (19%) infection control practitioners and 22 (26%) other healthcare practitioners. Discussion focused on evidence, policy implementation and barriers to best practice. Responses were synthesised into a narrative review.

Results: Delegates reported significant problems in translating evidence-based guidance into everyday practice, lack of local policies and poor compliance. Major barriers were lack of leadership, poorly defined responsibilities, and lack of knowledge/training.

Conclusions: This workshop has provided important insights into major challenges in assuring compliance with best practice in relation to the prevention of SSI. The OneTogether partnership aims to support healthcare practitioners to improve the outcomes of patients undergoing surgery by reducing the risk of SSI.

**Introduction**

Quality and safety in healthcare is a key priority for patients and those that deliver clinical care. In 2013 three key reports linked to patient safety provided important insights into less than optimal care in healthcare organisations. The public enquiry into care provided at the Mid Staffordshire NHS Foundation Trust (Francis 2013) and a report into fourteen failing trusts (Keogh 2013) demonstrated

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3 less than optimal care in healthcare organisations. The National Advisory Group on the Safety of  
4 Patients in England (2013) report made recommendations to learn and improve safety by the  
5 National Advisory Group on the Safety of Patients in England (2013) and stated '*Patient safety should*  
6 *be the ever-present concern of every person working in or affecting NHS-funded care. The quality of*  
7 *patient care should come before all other considerations in the leadership and conduct of the NHS,*  
8 *and patient safety is the keystone dimension of quality.'*  
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14 Healthcare associated infections (HCAIs) present a major risk to patients and mitigating this must be  
15 an integral part of the quality agenda for all healthcare providers'. Ensuring that infection  
16 prevention practice is embedded in the delivery of care to all patients in all settings is therefore an  
17 important priority. National prevalence surveys of HCAI indicate that surgical site infections (SSI) are  
18 one of the most common infections, accounting for between 15% and 20% of all HCAI (Smyth *et al*,  
19 2006; Health Protection Agency 2012; Zarb 2012). However such surveys generally underestimate  
20 the true risk of SSI because many infections do not become apparent until after the patient has been  
21 discharged from hospital. Surgical site infections are associated with considerable morbidity and  
22 mortality, they are estimated to double the length of postoperative stay, and in the most severe  
23 infections significantly increase the risk of death (Astagneau *et al* 2001; Coello *et al* 2005; Broex *et al*  
24 2009). In addition, when repeat admissions to hospital, repeat operations and other treatments are  
25 taken into account, severe SSI can quadruple the costs of care and decrease the quality of life of  
26 affected patients (Whitehouse *et al* 2002; Hollenbeak *et al* 2000).  
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37 The risk of a patient developing SSI depends on a combination of factors including: the number of  
38 micro-organisms introduced into the operative site, the number that remain when the wound is  
39 closed, the ability of micro-organisms to multiply and invade tissues, and the efficacy of the  
40 patients's immune defences against them (National Collaborating Centre for Women's and  
41 Children's Health (NCCWCH) 2008). Evidence-based guidance on practices shown to prevent or  
42 reduce the risk of SSI is available (NICE 2008; NCCWCH 2008; Bratzler *et al* 2013; Mangram *et al*  
43 1999; Hoffman *et al* 2002). However, in the multidisciplinary environment of the operating theatre  
44 ensuring that evidence is incorporated into best practice in a timely manner across the patient's  
45 surgical journey is complex (Leaper *et al* 2014). This is compounded by the patient pathway crossing  
46 physical and cultural boundaries e.g. ward, anaesthetic room, operating theatre and recovery.  
47 Infection prevention teams are not always involved in local policy development or risk assessment  
48 within the operating theatre setting, it may be difficult to implement infection prevention guidance  
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3 consistently and the impact of poor practice may not be obvious to theatre staff who may not be  
4 aware of whether a patient subsequently develops SSI.  
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8 Multi-organisational partnerships or quality improvement collaboratives (QICs) have been identified  
9 as an efficient approach to improving provider practices and patient outcomes through the  
10 dissemination of evidence-based practices (Nadeem et al 2013). OneTogether is partnership  
11 between leading professional organisations with an interest in the prevention of SSI, and has been  
12 initiated as a quality improvement collaborative with the aim of promoting and supporting the  
13 spread and adoption of best practice to prevent SSI across the surgical patient pathway. The  
14 partners in OneTogether are: The Association for Perioperative Practice (AfPP), The Infection  
15 Prevention Society (IPS), College of Operating Department Practitioners (CODP) and the Royal  
16 College of Nursing (RCN). The objectives of the partnership are to:  
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- 22 1. explore how guidance on infection prevention in relation to surgery is applied in practice
- 23 2. identify challenges and barriers that affect compliance with guidance;
- 24 3. support the implementation of best practice through the development of a readily  
25 accessible and practical set of resources that can be used to inform and educate staff  
26 working across the entire surgical pathway.  
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32 This paper describes the findings from an expert workshop that explored compliance with infection  
33 control guidance on prevention of SSI and the barriers that currently affect how guidance is  
34 implemented. The workshop focused on bridging the gap between infection prevention specialists  
35 and the surgical team in the following key areas of practice:  
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- 39 • Skin preparation
  - 40 • Instrument management
  - 41 • Management of patient temperature
  - 42 • Surgical environment
  - 43 • Prophylactic antibiotics
  - 44 • Wound management
  - 45 • Surveillance of SSI
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52 The information gathered will be used to inform the development of infection prevention resources  
53 to support implementation of best practice in these areas.  
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## 56 **Methods**

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3 OneTogether held a SSI prevention expert conference in November 2013, which brought together  
4 operating theatre staff and infection prevention specialists to discuss current practice and the  
5 barriers to good infection prevention (see figure 1). The 84 delegates comprised 46 (55%) theatre  
6 nurses and operating department practitioners (ODP), 16 (19%) infection control practitioners (ICP),  
7 and 22 (26%) healthcare professionals with other roles related to operating departments (e.g.  
8 educator, manager, infection control link practitioner, surveillance nurse). Participants represented  
9 more than 75 different hospitals in England, including both NHS and private sector healthcare  
10 facilities.  
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18 The overall aim of the workshop was to identify 'small and large actions' that could overcome  
19 barriers to implementation of infection prevention guidance across the surgical pathway. Working  
20 in groups and looking at each of the domains of infection prevention practice indicated above, the  
21 participants reviewed:  
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- 24 • The availability of evidence and policy
  - 25 • Ownership of practice
  - 26 • Barriers to implementation of best practice
  - 27 • Small and large actions that would support excellent, consistent care.
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32 The responses gathered from each of the workshops were then synthesised and are reflected in this  
33 narrative review.  
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## 37 **Results**

### 38 ***Implementation of operating department policy and practice***

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40 In some aspects of practice there was awareness of National guidelines or local policies, in particular  
41 in relation to perioperative warming and instrument management, but in other aspects of practice  
42 either clear guidelines were not considered to be available or there was wide variation in practice  
43 e.g. skin preparation (see Table 1). Compliance with recommended practice was considered to be  
44 variable, but greatest in respect of instrument management and weakest in relation to fluid  
45 warming, surveillance of SSI and management of the surgical environment.  
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### 53 ***Barriers to implementing best practice in the prevention of perioperative hypothermia***

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55 The NICE guideline on perioperative warming recommends that all patients should be assessed for  
56 risk of intraoperative hypothermia, their temperature documented before induction of anaesthesia  
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3 and then every 30 minutes until the end of surgery. For high-risk patients, active warming should be  
4 used to maintain normal body temperature prior to transfer (NICE 2008). The data captured from  
5 this group of theatre personnel suggests that compliance with the guideline is weak in operating  
6 theatres, although better in recovery areas, and in many theatres there is a lack of clear policy or  
7 ownership of practice related to patient warming. Key barriers identified are summarised in Table 2.  
8 These include the lack of equipment such as thermometers, which are essential for consistent  
9 monitoring to detect if the patients temperature drops below 36°C, and difficulties in ordering the  
10 equipment necessary to support whole body warming because of procurement procedures, e.g. not  
11 standard items, or the equipment is not given priority in the allocation of resources. Lack of  
12 knowledge and training across the multidisciplinary team on the significance of body temperature in  
13 preventing SSI and absence of defined standards for best practice it difficult to establish effective  
14 audit systems.  
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#### 24 ***Barriers to compliance with best practice in skin preparation***

25 In relation to skin preparation, guidelines on the prevention of surgical site infections advise that  
26 patients should have a shower or bath prior to surgery, and recommend hair should not be removed  
27 routinely and where necessary electric clippers should be used rather than razors in order to  
28 minimise skin damage (NCCWCH 2008; Mangram *et al* 1999; Woodhead *et al* 2002). An antiseptic  
29 solution containing povidone-iodine or chlorhexidine should be used to disinfect the skin at the  
30 surgical site immediately before the incision is made (NCCWCH 2008; Mangram *et al* 1999;  
31 Woodhead *et al* 2002). Key barriers to assuring best practice in relation to skin preparation are  
32 summarized in Table 3.  
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#### 40 ***Barriers to best practice in relation to instrument management***

41 Any item in contact with sterile tissues should be sterile to protect the wound from contamination  
42 and subsequent infection. Systems must therefore be in place to ensure that used surgical  
43 instruments are correctly handled and washed after surgery to facilitate the removal of protein and  
44 assure the efficacy of sterilisation procedures in removing micro-organisms including prions  
45 (NCCWCH 2008; National Institute for Health and Care Excellence 2013). These systems should also  
46 ensure that sterile instruments remain sterile prior to use and that any equipment in contact with  
47 the sterile surgical field is either sterile, or covered with a sterile barrier (Department of Health  
48 2013). Instruments should be laid up in a clean area, as close to the procedure time as possible, and  
49 protected from contamination prior to use as airborne particles shed from fabric or skin may  
50 transfer microorganisms onto the instruments (Barrie *et al* 1994). The key barriers to good practice  
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3 could be summarised as lack of resources, issues related to equipment flow and communication with  
4 CSSD, standardisation of practice, and training.  
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### 7 8 **Surgical environment**

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10 Micro-organisms carried on airborne particles can also enter the surgical wound either directly or by  
11 first settling onto the surgical field or instruments (Hoffman *et al* 2002; Barrie *et al* 1994). Airborne  
12 microbial particles are commonly derived from the skin or clothing fabric of the people present in  
13 the operating room, and the greater the movement the more particles are likely to be shed  
14 (Mangram *et al* 1999; Mackintosh *et al* 1978; Whyte *et al* 1979). In order to minimize the risk of  
15 contaminated particles settling into the incision an effective ventilation system that changes and  
16 filter the air should be in place, the number of personnel present in theatre should be kept to a  
17 minimum, the doors to the operating theatre kept closed and traffic in and out of theatre should be  
18 restricted (Mangram *et al* 1999; Hoffman *et al* 2002; Woodhead *et al* 2002). The participants  
19 identified knowledge of staff and aspects of theatre management and culture as key barriers to  
20 compliance with this best practice (see Table 4).  
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### 29 **Surveillance**

30 Evidence suggests that systematically capturing data on SSI and reporting rates to the surgical team  
31 is highly effective in reducing the risk of infection (Mangram *et al* 1999, Haley *et al* 1985). A  
32 standardised surveillance methodology should be used to provide robust data on rates of SSI and  
33 inform the surgical team about the quality of infection prevention in the operating theatre (Wilson  
34 2013). Monitoring of infection rates is also essential to provide patients with accurate information  
35 about the risk of SSI associated with the operation. In England, surveillance of SSI following  
36 orthopaedic surgery is mandatory for all NHS trusts; many private hospitals also participate in the  
37 PHE SSI Surveillance Service. Despite this many theatre personnel were not engaged or involved in  
38 the surveillance, did not get any feedback on the results, or see any action taken in response to  
39 them. Practical difficulties with performing surveillance were also identified, in particular: requires  
40 time and resources, is hampered by the lack of integrated IT systems, and it is difficult to follow-up  
41 patients after discharge to identify those who develop SSI.  
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### 51 **Wound management**

52 The NICE guideline recommends that surgical incisions should be covered with an appropriate  
53 interactive dressing at the end of the operation (NCCWCH 2008). The main barrier to best practice  
54 in relation to wound management was identified as education with a lack of training to support  
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3 expertise in dressing selection. There was also considered to be a lack consensus on policy, varied  
4 opinions on the evidence supporting dressing choice and lack of clarity about who owns the decision  
5 about dressing choice.  
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### 8 9 **Potential solutions**

10 Discussion about solutions to the problems identified included making guidance and policy more  
11 visible, user-friendly and widely available. A number of key 'small actions' that could be relatively  
12 easily implemented included making clear policies available in pocket format or lanyard style for  
13 easy reference and supporting it with 'decision trees'; involving the ICN in theatre audit and  
14 establishing an infection control forum. Longer-term strategies included establishing operating  
15 theatre link nurse roles; breaking down barriers between clinical teams and between theatre and  
16 ward staff; improving surveillance with feedback of rates to theatre staff; and developing defined  
17 standards of care that can be used for monitoring practice and supporting staff training to ensure  
18 policies are clearly understood.  
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### 27 **Discussion**

28 The information captured by this workshop with experts in operating theatre and infection control  
29 has provided an important insight into the difficulties of translating evidence-based guidance into  
30 everyday practice in the operating department. The experience of many of these staff was that local  
31 policies did not exist for many aspects of practice and that compliance with best practice is poor,  
32 especially for perioperative warming, skin preparation and management of the surgical  
33 environment. Others have identified poor compliance with evidence-based practice as a problem in  
34 the prevention of SSI (Leaper *et al* 2014). Evidence for poor compliance with infection prevention  
35 policy in operating theatres has been provided by Campbell *et al* 2008. They surveyed operating  
36 theatre staff about the use of evidence based processes of care such as pre-operative skin  
37 preparation, administration of prophylactic antibiotics and checking of intra-operative blood  
38 glucose, and found that these practices were in place in only 42% of the 32 hospitals surveyed. In  
39 addition, experts in surgical quality and SSI (given no information about whether the hospital was a  
40 low or high outlier) were able to correctly identify each as a high or low outlier on the basis of what  
41 they observed during a site visit. In fact, they were generally able to make this determination within  
42 the first few hours of the visits. In addition, they found evidence for an association between  
43 hospitals with the lowest risk of SSI and policies aimed at minimising operating room foot traffic and  
44 systems that increased the operative team efficiency (Campbell *et al* 2008).  
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3 The main barriers to implementation of best practice identified by the group of practitioners in our  
4 study were: a lack of leadership to drive implementation of guidance; lack of ownership of policies  
5 such that responsibilities to ensure compliance are not clearly defined; and a lack of knowledge,  
6 information and training for the multi-disciplinary team. Practical problems with the purchase,  
7 supply and storage of equipment is needed to support best practice e.g. disposable hair clippers,  
8 was also identified as an important barrier. The lack of engagement of theatre personnel in  
9 surveillance activity demonstrates a missed opportunity to involve staff in the best position to  
10 prevent SSI in monitoring rates of infection and using the information to drive quality improvement.  
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18 Although a self-selected group, the delegates were drawn from a broad range of NHS and  
19 independent sector providers across the UK. Their analysis suggests a widespread picture of poor  
20 compliance with best practice in relation to infection prevention practice in the surgical environment  
21 driven by lack of knowledge, leadership and ownership of good practice across the multidisciplinary  
22 team. It demonstrates the need for closer working between infection control practitioners and  
23 operating department staff to develop local policy based on evidence based guidance and effective  
24 translation of policy into systems of work that define clear responsibilities for the multi-disciplinary  
25 team.  
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32 Initiatives such as the World Health Organisation (WHO) Safer Surgery Checklist are focused on  
33 improving patient safety in operating department practice but have not broadly encompassed  
34 infection prevention, except with regard to the administration of prophylactic antimicrobial therapy  
35 (WHO 2008). However, evidence is emerging that this collaborative approach to improving patient  
36 safety in the theatre environment may have a demonstrable positive effect on patient outcomes  
37 (Norton *et al* 2014; Haugen *et al* 2013, Berg *et al* 2014). The Surgical Care Improvement Project  
38 (SCIP) in the USA has developed a set of 10 evidence-based quality improvement performance  
39 measures aimed specifically at the prevention of SSI (Rosenberger *et al* 2011). Combining SCIP and  
40 WHO safer surgery checklist has been shown to have a positive impact on compliance with best  
41 practice in relation to the prevention of SSI (Tillman *et al* 2013). In addition, there is emerging  
42 evidence for a reduction in rates of SSI associated with improved compliance with infection  
43 prevention indicators (Berenguer *et al* 2009; Schwann *et al* 2011).  
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### 53 **Conclusion and future plans for OneTogether**

54 This workshop has provided important insights into some of the major challenges in assuring  
55 compliance with best practice in relation to the prevention of SSI. Lack of guidance is not the main  
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3 problem. Key to quality improvement is education and training on what is required to prevent SSI,  
4 communication of clear standards of practice to all members of the multidisciplinary team, and  
5 systems that support monitoring and feedback of data on both compliance with standards and rates  
6 of SSI. The OneTogether partnership is developing a programme of work over the next three years  
7 that is aimed at supporting these requirements. Activity will focus on:  
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- 9 • developing an infection prevention self-assessment tool for operating theatres
- 10 • creating a set of resources for each element of infection prevention practice that provides  
11 micro-training on the evidence-base and recommended practice, model policy and  
12 standards of practice and audit tools.
- 13 • a second expert conference to shape the way forward.

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21 Work has commenced with the production of a wall chart illustrating the key practice required to  
22 prevent SSI and highlighted in this workshop (OneTogether 2014). This represents the beginning of a  
23 journey to support healthcare practitioners in improving the outcomes of patients undergoing  
24 surgery by reducing the risk of SSI.  
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31 Conflicts of interest: None declared  
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For Peer Review

**Table 1: Availability of policy and compliance with best practice**

Policy area	Practice in operating departments	Compliance with policy
Skin preparation	Variation in approach to skin disinfection and no standard approach to washing/showering prior to surgery	Variable
Perioperative hypothermia	Although there is NICE guidance, implementation depends of surgeon and/or anaesthetist	Weak, although good in recovery
Instrument management	Although policy exists it is not universally known about	Good
Surgical environment	Focused on the 'Saving Lives' care bundles which are not specific to the operating theatre	Variable and influenced by leadership, enforcement and surgeons
Prophylactic antibiotics	Focus on WHO safer surgery checklist	Good; although hard to measure timing
Wound management	No consensus on use of wound dressings; no specific policy;	Variable; capacity an issue
Surveillance	Limited knowledge or involvement in surveillance activity	Poor, especially follow-up in community; no feedback on data

**Table 2: Barriers to implementing NICE guideline on preventing perioperative hypothermia**

Barrier	Specific issues
Finance	The procurement process Lack of resources for necessary equipment
Culture	Lack of leadership, ownership and defined responsibilities for the policy & procedures Difficult to standardise practice
Equipment	Theatre environment is cold Lack of thermometers Faulty/inaccurate equipment
Knowledge	Staff do not perceive importance Other colleagues not supportive Lack of knowledge, information and training for the MDT (Drs, nurses, ODPs) No time allocated to training Lack of standards to support best practice No patient survey to capture feedback
Time	Lack of time



**Table 3: Barriers to implementing best practice in relation to skin preparation**

Barrier	Specific issues
Policy/standard	Lack of clarity about the evidence for most effective approach to pre-operative showering/skin preparation Variation in surgeon opinion on hair removal and skin prep solutions
Communication with the patient	Difficult to check patient hygiene pre-operatively Patients may remove hair when it is not necessary
Equipment	Clippers with disposable heads not always available
Time	Insufficient time allowed for skin preparation to dry
Education	Lack of staff education/training on best practice

**Table 4: Barriers to implement best practice in relation to the surgical environment**

Barrier	Specific issues
Culture	Custom and practice 'What goes on in theatre stays in theatre' Conflict of ideas Leadership Management support Lack of open discussion Apathy; low staff morale
Policy	Lack of specific clear policies Policies not implemented
Knowledge	Varied knowledge Lack of evidence, not in NICE guideline

Figure 1: Guiding principles of OneTogether

For Peer Review

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**Through the power of small actions we can ALL make a difference.**

**Raise** the profile of infection prevention and the scientific data supporting the practice.  
**Engage** healthcare professionals and institutions to make a difference at every level to reduce SSI and improve patient outcomes  
**Share** best practice across all specialties  
**Leverage** the strength and reach of professional associations, industry partners and online platforms to educate and engage.

**BY**

- Connecting UK infection prevention associations and key industry partners
- Facilitating collaboration between the infection prevention community by connecting existing resources and education
- Addressing the issue of inconsistent care by improving compliance to national guidance

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