Implementation of the surgical site infections prevention guidelines

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Outline

- People-centered, throughout the surgical patient journey

- Strength of recommendations

- WHO implementation approach:
  - Scientific evidence
  - SUSP
  - Implementation models
SSI prevention throughout the patient journey

WHAT'S THE SOLUTION?
A range of precautions - before, during and after surgery - reduces the risk of infection

BEFORE SURGERY
- Ensure patients bathe or shower
- Do not shave patients
- Only use antibiotics when recommended
- Use chlorhexidine alcohol-based antiseptic solutions to prepare skin
- Surgical scrub technique: hand wash or alcohol-based handrub

DURING SURGERY
- Limit the number of people and doors being opened
- Ensure all surgical equipment is sterile and maintain asepsis throughout surgery

AFTER SURGERY
- Do not continue antibiotics to prevent infection - this is unnecessary and contributes to the spread of antibiotic resistance
- Check wounds for infection and use standard dressings on primary wounds

https://www.youtube.com/watch?v=H1CQk9QA3JY&feature=youtu.be
WHO Recommendations for SSI Prevention for the Preoperative Period

- Carriers' decolonisation with mupirocin
- MBP with use of oral antibiotics
- Hair removal
- SAP optimal timing
- Surgical hand preparation
- Surgical site skin preparation

- Perioperative immunosuppressive agents
- Enhanced nutritional support
- Preoperative bathing
- Antimicrobial skin sealants

SAP: surgical antibiotic prophylaxis
WHO Recommendations for SSI Prevention for the Intraoperative Period

- Perioperative oxygenation
- Normothermia
- Normovolemia
- Glucose control
- (the right) drapes and gowns
- Wound protection devices
- Incisional wound irrigation
- Prophylactic negative pressure wound therapy
- Antimicrobial-coated sutures
- Laminar flow
WHO Recommendations for SSI Prevention for the Postoperative Period

Surgical antibiotic prophylaxis prolongation

Advanced dressing

Antimicrobial prophylaxis in presence of a drain

Launched on 3 November 2016
Multidisciplinary team

- Surgical team: OR, ward, and outpatient services
- Infection prevention & control
- Anaesthetists
- Sterilization services
- Pharmacists
- Senior managers
- Trainers
Integration of IPC actions in the flow of patient care
Surgical Handrubbing Technique

- Handwash with soap and water on arrival to OR, after having donned theatre clothing (cap/hat, thyroid and mask).
- Use an alcohol-based handrub (ABHR) product for surgical hand preparation, by carefully following the technique illustrated in images 1 to 17, before every surgical procedure.
- If any residual talc or biological fluids are present when gloves are removed following the operation, handwash with soap and water.

Images 3-7: Spread the handrub on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds).

Images 8-10: Now repeat steps 1-7 for the left hand and forearm.

Images 11-12: Pat approximately 3ml (3 doses) of ABHR in the palm of your left hand, using the elbow of your other arm to operate the dispenser.

Images 13-17: Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice versa.

Images 14-15: Rub palm against palm back and forth with fingers smearing.

Images 16-17: Rub the back of the fingers by holding them in the palm of the other hand with a sideways back and forth movement.

Images 18-19: Rub the thumb of the left hand by rotating it in the clasped palm of the right hand and vice versa.

Images 20-21: Spread the whole surface of the hands up to the wrist with ABHR, rubbing palm against palm with a rotating movement.

When the hands are dry, sterile surgical clothing and gloves can be donned.

Repeat this sequence (average 60 sec) the number of times that adds up to the total duration recommended by the ABHR manufacturer’s instructions. This could be two or even three times.
My 5 moments for HAND HYGIENE

1. BEFORE TOUCHING A PATIENT
2. BEFORE CLEAN/ASEPTIC PROCEDURE
3. AFTER BODY FLUID EXPOSURE RISK
4. AFTER TOUCHING A PATIENT
5. AFTER TOUCHING PATIENT SURROUNDINGS

Your 5 Moments for Hand Hygiene

1. BEFORE TOUCHING A PATIENT
2. BEFORE CLEAN/ASEPTIC PROCEDURE
3. AFTER BODY FLUID EXPOSURE RISK
4. AFTER TOUCHING A PATIENT
5. AFTER TOUCHING PATIENT SURROUNDINGS
“Strong” : Expert panel was confident that benefits outweighed risks – considered to be adaptable for implementation in most (if not all) situations and patients should receive intervention as course of action.

“Conditional” : Expert panel considered that benefits of intervention probably outweighed the risks – a more structured decision-making process should be undertaken, based on stakeholder consultation and involvement of patients and health care professionals.
Priority – 4 recommendations specifically focus on improving antibiotic use in surgery

1. Optimal timing for surgical antibiotic prophylaxis (SAP)
   - EV SAP should be administered prior to the surgical incision when indicated (depending on the type of operation)
   - The administration of SAP should be within 120 minutes of the incision, while considering the half-life of the antibiotic (microbiology and pharmacy advice will support this decision)

Recommendations against:

2. antibiotic wound irrigation
3. antibiotic prophylaxis in presence of a drain
4. SAP prolongation in the post-operative period
Important considerations for implementation in low-resource settings

- Some recommendations will NOT be resource demanding or they will even allow avoidance of unnecessary costs (e.g. no antibiotic prophylaxis prolongation; no laminar flow)
- Some recommendations will contribute to reducing AMR
- For others, careful evaluation should be made about:
  - Additional costs involved and/or limited product availability (e.g. alcohol-based hand rubs, chlorhexidine gluconate alcohol-based antiseptic solutions, antimicrobial sutures)
  - Need for staff training (e.g. increased oxygenation)
  - Need for specific expertise (e.g. glucose control; normovolemia)
  - Need for technical laboratory capacity (e.g. S. aureus carrier identification)
  - Involving organisational resources for appropriate administration (e.g. antibiotic timing)
  - Reuse and contamination risks (e.g. clippers)
  - Infrastructure constraints (e.g. limited access to clean water)
- Local production and solutions should be encouraged
<table>
<thead>
<tr>
<th>Section</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immunosuppressive medication</td>
<td>Immunosuppressive medication should <strong>not</strong> be discontinued prior to surgery for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Nutritional formulas</td>
<td>Consider the administration of oral or enteral multiple nutrient-enhanced nutritional formulas for the purpose of preventing SSI in underweight patients who undergo major surgical operations.</td>
</tr>
<tr>
<td>Bathing before surgery</td>
<td>It is good clinical practice for patients to bathe or shower before surgery. Either a plain soap or an antiseptic soap could be used for this purpose.</td>
</tr>
<tr>
<td>Intranasal mupirocin</td>
<td>Consider treating patients with known nasal carriage of <em>S. aureus</em> undergoing other types of surgery with perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash.</td>
</tr>
<tr>
<td>Antibiotics &amp; MBP</td>
<td>Preoperative oral antibiotics combined with MBP should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery.</td>
</tr>
<tr>
<td>Antimicrobial sealants</td>
<td>Antimicrobial sealants should <strong>not</strong> be used after surgical site skin preparation for the purpose of reducing SSI.</td>
</tr>
<tr>
<td>Warming devices</td>
<td>Warming devices should be used in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.</td>
</tr>
<tr>
<td>Blood glucose control</td>
<td>Protocols for intensive perioperative blood glucose control should be used for both diabetic and non-diabetic adult patients undergoing surgical procedures.</td>
</tr>
<tr>
<td>Fluid therapy</td>
<td>Goal-directed fluid therapy should be used intraoperatively for the purpose of reducing SSI.</td>
</tr>
<tr>
<td>Drapes and gowns</td>
<td>Either sterile disposable non-woven or sterile reusable woven drapes and surgical gowns can be used during surgical operations for the purpose of preventing SSI.</td>
</tr>
</tbody>
</table>
## Conditional recommendations

<table>
<thead>
<tr>
<th>Topic</th>
<th>Recommendation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adhesive drapes</td>
<td>Plastic adhesive incise drapes with or without antimicrobial properties should <strong>not</strong> be used for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Wound protectors</td>
<td>Consider the use of wound protector devices in clean-contaminated, contaminated and dirty abdominal surgical procedures for the purpose of reducing the rate of SSI.</td>
</tr>
<tr>
<td>Saline wound irrigation</td>
<td>There is insufficient evidence to recommend for or against saline irrigation of incisional wounds for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Povidone iodine irrigation</td>
<td>Consider the use of irrigation of the incisional wound with an aqueous povidone iodine solution before closure for the purpose of preventing SSI, particularly in clean and clean-contaminated wounds.</td>
</tr>
<tr>
<td>Antibiotic irrigation</td>
<td>Antibiotic incisional wound irrigation before closure should <strong>not</strong> be used for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Neg pressure wound therapy</td>
<td>Prophylactic negative pressure wound therapy <strong>may</strong> be used on primarily closed surgical incisions in high-risk wounds and, taking resources into account, for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Coated sutures</td>
<td>Triclosan-coated sutures <strong>may</strong> be used for the purpose of reducing the risk of SSI, independent of the type of surgery.</td>
</tr>
<tr>
<td>Laminar flow ventilation</td>
<td>Laminar airflow ventilation systems should <strong>not</strong> be used to reduce the risk of SSI for patients undergoing total arthroplasty surgery.</td>
</tr>
<tr>
<td>Peri-op antibiotics</td>
<td>Perioperative surgical antibiotic prophylaxis should <strong>not</strong> be continued due to the presence of a wound drain for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Wound drains</td>
<td>The wound drain should be removed when clinically indicated. No evidence was found to allow making a recommendation on the optimal timing of wound drain removal for the purpose of preventing SSI.</td>
</tr>
<tr>
<td>Advanced dressings</td>
<td>Advanced dressing of any type should <strong>not</strong> be used over a standard dressing on primarily closed surgical wounds for the purpose of preventing SSI.</td>
</tr>
</tbody>
</table>
What is an effective implementation strategy?

1. **Systematic Review** on Implementation for SSI Prevention & analysis of existing guides/toolkits

2. **Lessons learned** from many regions/countries (patient safety, safe surgery, SUSP approach)

3. **WHO** proven **multimodal improvement strategy**
1. Strategies to improve SSI prevention and reduce SSI – a systematic review

- Quality improvement initiatives designed to improve adherence with evidence based processes for SSI prevention
- 1990-2015; English, French or Spanish
- Pubmed, Embase, CINAHL, Cochrane library, WHO regional database, Afro-Lib and Africa-Wide

- 118 studies included
- 99 from high-income countries, 19 from low-/middle-income countries
- 97 (84%) used multi-faceted interventions
- Most studies showed reduction in SSI rates: 86 (74%)

Ariyo P et al. ICPIC 2017
Common IPC measures

- SAP: 76
- Skin prep techniques: 23
- Normothermia: 23
- Glucose control: 21
- Hair removal: 20
- Wound care/sterile dressing: 20
- Preoperative bathing: 18
- Equipment sterilization: 16
- Hand hygiene: 14
- OR Discipline/traffic: 12
- OR ventilation: 3
- Double Gloves/Glove change: 9
- Bowel prep: 8
- S. aureus screening/ decolonization: 6
- Surgical drain management: 3
- Isolation precautions: 2
- Oxygen: 2
- Hemostasis: 1

Ariyo P et al. ICPIC 2017
<table>
<thead>
<tr>
<th>4 Es</th>
<th>Executive Leaders</th>
<th>Team Leaders</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engage</td>
<td>How does this make the world a better place?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educate</td>
<td></td>
<td>What do we need to do better?</td>
<td></td>
</tr>
<tr>
<td>Execute</td>
<td></td>
<td>How can we do it with our resources and culture?</td>
<td></td>
</tr>
<tr>
<td>Evaluate</td>
<td></td>
<td>How do we know we made a difference?</td>
<td></td>
</tr>
</tbody>
</table>

*Health Services Research 2006*
Engage

- **65 (54%) studies utilized an engagement strategy**
- **Frontline staff** understanding implications of SSI and their roles in prevention
- Commitment of hospital **leadership** and senior executives
  - Sends a clear message and aligns QI efforts with organization priorities
  - Navigates challenges with changing organization practice
  - Fosters accountability
- **Multidisciplinary teams**
  - Surgeons, anesthesiologists, perioperative nursing, etc…involved in different aspects of perioperative care and infection control
  - Identify barriers to change and customize care processes to local environment
- **Motivated local champions** taking ownership of QI projects
59 (49%) describes an education component to their implementation strategies

Educating frontline staff using summaries of evidence regarding SSI prevention
- Traditional lectures, education materials, refresher courses, online videos, posters, brochures.

Educating patients and families about SSI prevention practices and emphasizing their roles in infection prevention practices (12 studies)
- Standardized patient educational sessions during pre-op visit
- Posters in clinic and hospital waiting areas
- Pamphlets distributed about perioperative care
Execute

- 97 (81%) utilized an execution tool to improve SSI
- Involves redesigning of care processes with timely review of execution process to identify barriers to implementation
- Toolkits that standardize care processes and create independent checks
- Checklists, bundles, protocols, pathways, policies, algorithms
  - Improve adoption of evidence-based interventions
  - Allow multiple interventions that are potentially additive in decreasing SSI
  - Dose response in some studies with compliance with increased interventions and decrease in SSI.
- Reminders, electronic flagging, automatic STOPs to antibiotics, physician order-sets
  - Create “double checks” and prompts consistent care among all level of providers.

Ariyo P et al. ICPIC 2017
Evaluate

- 73 studies (61%) used an evaluation strategy
- 58 studies (49%) reported on compliance with the intervention
- Giving timely feedback to frontline staff
  - Individual feedback to surgeons and their associated SSI rates
  - Feedback to clinical units and entire hospital, including leadership
  - Electronic dashboards
  - Score cards in patient care areas
- 5 studies used surveillance as the only intervention with associated decreases in SSI
  - Allows comparisons between SSI rates and national benchmarks

Ariyo P et al. ICPIC 2017
2. The Surgical Unit-based Safety Program (SUSP)

Patient safety culture improvement (CUSP):
- Science of safety education
- Staff safety assessment
- Leadership
- Learning from defects
- Team work & communications

Infection prevention best practices
Evidence based and identified according to local staff assessment

Improvement of the patient safety climate

Reduction of:
- Surgical site infections
- Surgical complications
SUSP cohorts in USA and Africa

**IPC MEASURES FOR IMPROVEMENT - USA**
- Pre-op bathing
- Mechanical bowel preparation & oral antibiotics
- Glucose control
- Surgical site skin preparation
- Antibiotic prophylaxis

**IPC MEASURES FOR IMPROVEMENT - AFRICA**
- Pre-op bathing
- Hair removal
- Surgical hand preparation
- Alcohol-based skin prep
- OR Discipline
- Antibiotic prophylaxis

195 Hospitals

Kenya

Uganda

Zimbabwe

Zambia

World Health Organization
An approach for improving SSI outcomes

- Technical Work
  - Evidence-based interventions
- Adaptive Work
  - Safety culture
### Patient safety culture approach

#### Comprehensive Unit-based Safety Program (CUSP)

1. Educate staff on science of safety
2. Identify defects
3. Assign executive to adopt unit
4. Learn from one defect per quarter
5. Implement teamwork tools

#### Translating Evidence Into Practice (TRiP)

1. Summarize the evidence in a checklist.
   - Clean your hands, clean skin with alcohol-based chlorhexidine, avoid femoral site, use barrier precautions, ask daily if you need the catheter
2. Identify local barriers to implementation
3. Measure performance
4. Ensure all patients get the evidence
   - Engage
   - Educate
   - Execute
   - Evaluate

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Berenholtz SM et al, CCM 2004
Pronovost P et al, NEJM 2006
Pronovost P et al, BMJ 2010
Pronovost P et al, AJMQ 2015

[www.hopkinsmedicine.org/armstronginstitute](http://www.hopkinsmedicine.org/armstronginstitute)
### Explaining technical and adaptive work

<table>
<thead>
<tr>
<th>TECHNICAL WORK</th>
<th>ADAPTIVE WORK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work that we know we should do: implementation of evidence-based recommendations (e.g. appropriate antibiotic dosing and skin preparation)</td>
<td>The intangible components of work, like ensuring team members speak up with concerns and hold each other accountable</td>
</tr>
<tr>
<td>Work that lends itself to standardization (e.g., checklists and protocols)</td>
<td>Work that shapes the <strong>attitudes, beliefs, and values</strong> of clinicians, so they consistently perform tasks the way they know they should</td>
</tr>
<tr>
<td>Evidence-based interventions</td>
<td>Safety culture, including improved communications and teamwork</td>
</tr>
</tbody>
</table>
Organizational culture change → Antibiotic prophylaxis

→ OR discipline

→ Surgical site skin preparation

→ Surgical hand preparation

→ No Hair removal

→ Pre-op Bath

→ Modified WHO checklist
Multidisciplinary local teams

LAUNCHING THE SUSP PROJECT

The SUSP Team with the infection control committee held a launch ceremony of WHO Surgical Unit Safety Program (SUSP) Project on Tuesday, April 8th in the KH chapel. The ceremony was officiated by Dr. Benedetta ALLEGRAZNI, WHO Technical Lead. She made some presentations on patient safety and importance of the study.

World Health Organization
Hospital Survey on Patient Safety

Instructions
This survey asks for your opinions about patient safety issues, medical error, and event reporting in your hospital and will take about 10 to 15 minutes to complete.

If you do not wish to answer a question, or if a question does not apply to you, you may leave your answer blank.

- An "event" is defined as any type of error, mistake, incident, accident, or deviation, regardless of whether or not it results in patient harm.
- "Patient safety" is defined as the avoidance and prevention of patient injuries or adverse events resulting from the processes of healthcare delivery.

SECTION A: Your Work Area/Unit
In this survey, think of your "unit" as the work area, department, or clinical area of the hospital where you spend most of your work time or provide most of your clinical services.

What is your primary work area or unit in this hospital? Select ONE answer.

a. Many different hospital units/No specific unit
b. Medicine (non-surgical)
   i. Psychiatry/mental health
   n. Other, please specify.
c. Surgery
   j. Rehabilitation
d. Obstetrics
   k. Laboratory
e. Pediatrics
   l. Pharmacy
f. Emergency department
   m. Anesthesiology
g. Intensive care unit (any type)

Please indicate your agreement or disagreement with the following statements about your work area/unit.

Think about your hospital work area/unit:

1. People support one another in this unit: Strongly Disagree Disagree Neither Agree Strongly Agree
2. We have enough staff to handle the workload: Strongly Disagree Disagree Neither Agree Strongly Agree
3. When a lot of work needs to be done quickly, we work together as a team: Strongly Disagree Disagree Neither Agree Strongly Agree
4. In this unit, people treat each other with respect: Strongly Disagree Disagree Neither Agree Strongly Agree
Tools to address the culture

CUSP for Safe Surgery
Perioperative Staff Safety Assessment

Purpose of this form: The purpose of this form is to tap into your experiences at the frontlines of patient care to find out what risks jeopardize patient safety in your clinical area.

Who should complete this form: All staff members.

How to complete this form: Provide as much detail as possible when answering the 4 questions. Drop off your completed safety assessment form in the location designated by the SUSP team.

When to complete this form: Any staff member can complete this form at any time.

CUSP for Safe Surgery (SUSP)
Safety Issues Worksheet for Senior Executive Partnership

Date of Safety Rounds:

Unit:

Attendees:

1. 
2. 
3. 
4. 

(Please use back of form for additional attendees.)

CUSP for Safe Surgery (SUSP)
Executive Safety Rounds Kickoff Template

The Learning From Defects Tool

World Health Organization

JOHNS HOPKINS MEDICINE

World Health Organization

Armstrong Institute for Patient Safety and Quality

World Health Organization
Tools for technical work: adapted SSI surveillance protocol

Surgical Unit-based Safety Program
Protocol for SSI Surveillance in African sites

Purpose of this document
Conducting high-quality Surgical Site Infection (SSI) surveillance is challenging in any setting, but it is especially difficult to perform in routine practice in settings where resources are limited and hence, is rarely undertaken. Methods described for SSI surveillance in high-income countries (such as those of the Centers for Disease Control (CDC)) are not entirely appropriate in low-income countries (LICs) due to financial and other constraints, and hence there is a need for a practical, reproducible, and low-cost SSI surveillance methodology for health professionals in these settings.

This protocol describes the intended format for SSI surveillance in the SUSP project being undertaken across five African hospitals in 2013/14 under the coordination of the WHO Patient Safety Programme and in collaboration with Johns Hopkins University. This protocol is strongly based on the CDC method and definitions for SSI surveillance and is accompanied by data collection forms, training materials, information sheets and Epi Info database that are meant to practically facilitate surveillance in the context of a LIC. These methods may need further adaptation according to local circumstances.

Principles of SSI surveillance
Surveillance can be described as “the systematic collection, analysis and interpretation of health data, closely integrated with the timely dissemination of these data to those who need to know.” In surgical care, the collection of SSI surveillance information can serve to motivate and guide surgical teams on how to improve their services to minimize the risk of SSI in their patients. Most surgeons are very interested to know the results of SSI surveillance on their own patients, as long as they have confidence in the methods being used — so it is important that surgeons understand the key principles of the surveillance process.

Instructions for data-entry and data-analysis using Epi Info™
After collecting data using the forms in the SUSP AFRICA Toolkit data can be entered and analysed using Epi Info™ database files developed specifically for these forms. These database files can be downloaded from your dropbox folders on the computer you have chosen from the shared link. To use these files, the main Epi Info™ software also needs to be downloaded.

Using Epi Info™ in 5 steps

1. Access Epi Info
2. Open database file
3. Enter data
4. Analyze data
5. Close and save

World Health Organization
Patient Safety
A World Alliance for Safer Care

SAVE LIVES
Clean Your Hands

Peri-operative form

Post-operative form
Tools for technical work: Fact Sheets explaining the key SSI prevention measures

SSI PREVENTION – PATIENT PREPARATION: BATHING AND HAIR REMOVAL

Things you should know!

- A preoperative antimicrobial shower or bath decreases skin microorganisms and reduces the risk of wound infections associated with skin bacteria.
- Most studies investigated the use of products based on chlorhexidine/alcohol or iodophor because of small abrasions to skin.
- Removal of hair by shaving compared to no shaving has no effect on postoperative infection.
- Although the use of depilatories (e.g. creams) has been associated with lower rates of skin colonization, shaving or depilatories sometimes produce hyperesthesia.
- Most studies support that hair removal, if any, should be done immediately before the operation.
- Several studies and reviews of the literature have now shown that the incidence of SSI is higher when hair removal is performed with depilatories because of small abrasions to skin.
- If hair removal is necessary, it should be done immediately before the operation.
- American and European guidelines recommend removing hair with depilatories.

Things you should do right!

1. All patients must receive instructions to use a antimicrobial shower or bath for at least 6 hours before the operation.
2. Ideally, hair should not be removed at all.
3. With the help of a nurse, the surgeon should carefully evaluate the patient to determine whether or not hair removal is necessary.
4. When it is deemed by the surgeon that hair should be removed, it should be done immediately before the operation.
5. Clipping should be performed with care to avoid skin damage and postoperative bleeding.
6. After use, clippers should be cleaned and disinfected according to the manufacturer’s instructions before being used on another patient.

Sources:

DJ Anderson et al. Strategies to Prevent Surgical Site Infections in Acute Care Hospital Settings. Infect Control Hosp Epidemiol 2008, 29:551-561

SSI PREVENTION – SURGICAL SITE SKIN PREPARATION AND SURGICAL HAND PREPARATION

Things you should know!

- Most guidelines prohibit wearing any jewellery, watches, or artificial fingernails by the surgical team because they can be associated with change of the normal flora and impaired hand hygiene.
- Adequate time (washing with soap and water for 2 to 5 minutes; rubbing with a handrub for 1.5-3 min according to manufacturer’s instructions) is essential for hand preparation.
- Almost all studies discourage the use of brushes. These may be beneficial only in the preoperative room.
- Combinations of alcohol and chlorhexidine or alcohol and an iodophor for the entire surgical site preparation and surgical hand preparation have been shown to lead to a longer lasting antimicrobial barrier.
- Patients should have provided preoperative data about their hand hygiene and the use of soap and water.

Things you should do right!

1. Surgical hand preparation
   - 1. All patients must receive instructions to use a antimicrobial shower or bath for at least 6 hours before the operation.
   - 2. Ideally, hair should not be removed at all.
   - 3. With the help of a nurse, the surgeon should carefully evaluate the patient to determine whether or not hair removal is necessary.
   - 4. When it is deemed by the surgeon that hair should be removed, it should be done immediately before the operation.
   - 5. Clipping should be performed with care to avoid skin damage and postoperative bleeding.
   - 6. After use, clippers should be cleaned and disinfected according to the manufacturer’s instructions before being used on another patient.

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DJ Anderson et al. Strategies to Prevent Surgical Site Infections in Acute Care Hospital Settings. Infect Control Hosp Epidemiol 2008, 29:551-561

SSI PREVENTION - CORRECT AND SAFE SURGICAL ANTIBiotic PROPHYLAXIS

Things you should know!

- There is wide consensus on specific procedures that warrant antibiotic prophylaxis as well as in which procedures it is not required.
- Correct use of surgical antibiotic prophylaxis is very important not only to prevent surgical site infection but also to avoid emergence of antimicrobial resistant pathogens that can cause more serious disease to the patient.
- Key elements of a correct and safe surgical antibiotic prophylaxis are:
  1. Correct pre-operative administration timing, to achieve high concentration of drug at the site of incision at the beginning of the operation (highest risk of surgical site contamination).
  2. Correct antibiotic type according to the procedure and patient history, to kill the bacteria most frequently found at the operation site and to keep the patient safe.
  3. Correct dose and intra-operative re-doing, only if needed, to have the right antibiotic concentration at the operation site throughout the entire operation.
  4. Appropriate discontinuation after surgery, to avoid unnecessary extra costs, potential side effects, and emergence of antimicrobial resistant pathogens which can hamper subsequent infection treatment.

Things you should do right!

1. Surgical antibiotic prophylaxis should be administered only when needed.
2. Correct pre-operative administration timing: The optimal time for administration of antibiotic prophylaxis is within the 60 minutes before surgical incision.
3. Correct antibiotic type according to the procedure and patient history (of allergy or severe adverse events): see table.
4. Correct dose and intra-operative re-doing: standardized doses (see table) should be used.
5. Appropriate discontinuation after surgery: therapeutic antibiotic levels should be maintained a few hours after the incision is closed in the operating room. In general, the duration of antimicrobial prophylaxis should be less than 24 hours.

* 2 hours for fluoroquinolones (e.g. ciprofloxacin) and vancomycin because they require administration over one to two hours.
* More specifically, if the procedure time exceeds two half-lives of the antimicrobial agent. Some antibiotics (e.g. etepenem, gentamicin[nug/kg], metronidazole) do not require intraoperative re-doing due to their pharmacokinetic properties.
Locally developed tools

Take 3 steps to make your surgical patient safe by preventing wound infections!

1. Pre-operative
   - Patient bathing
     - Make sure the patient takes a shower or bath and washes with soap on the day of the operation or the evening before. This helps remove bacteria from the skin and reduces the risk of wound infection.
   - Avoid hair removal
     - Avoid hair removal or use clippers and change or disinfect gowns after each patient. Razors damage the skin, which can lead to infection.

2. Peri-operative
   - Good surgical hand preparation
     - Follow all the steps of a good hand preparation technique before operating. Scrub with soap and water for 3-5 min or rub with an alcohol-based solution for 2-3 min.
   - Appropriate antibiotic prophylaxis needs to be:
     - Right antibiotic for the operation
     - Right dose
     - Right time = a single dose within 60 min
     - Appropriate discontinuation = stop after surgery.

3. Intra-operative
   - Appropriate skin preparation
     - Clean incision site with soap and water and then use antiseptic preparation (chlorhexidine/alcohol or isopropyl alcohol). Leave to dry before incision.
   - Discipline in the OR*
     - 1. Make sure that all the equipment needed is in the OR before starting.
     - 2. Only essential staff should be in the OR*
     - 3. Keep doors and windows closed during the operation.

*Operating Room

World Health Organization
Antimicrobial resistance in hospitalized surgical patients: a silently emerging public health concern in Uganda

Table 1  Antimicrobial resistance pattern among isolates from surgical site infections

<table>
<thead>
<tr>
<th>Antibiotics</th>
<th><em>E. coli</em> (n = 72)</th>
<th><em>Klebsiella</em> spp (n = 39)</th>
<th><em>Acinetobacter</em> spp (n = 52)</th>
<th><em>P. aeruginosa</em> (n = 12)</th>
<th>Enterococcus spp (n = 23)</th>
<th>Other g+ (n = 08)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ampicillin</td>
<td>100.0%</td>
<td>100.0%</td>
<td>NA</td>
<td>NA</td>
<td>100.0%</td>
<td>30.0%</td>
</tr>
<tr>
<td>Piperacillin</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>100.0%</td>
<td>NA</td>
<td>50.0%</td>
</tr>
<tr>
<td>TZP</td>
<td>30.6%</td>
<td>38.5%</td>
<td>53.8%</td>
<td>32.4%</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>AMC</td>
<td>90.3%</td>
<td>100.0%</td>
<td>NA</td>
<td>94.1%</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>TMP-SMX</td>
<td>86.1%</td>
<td>92.3%</td>
<td>100.0%</td>
<td>100.0%</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tetracycline</td>
<td>72.2%</td>
<td>-</td>
<td>100.0%</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Ciprofloxacin</td>
<td>72.7%</td>
<td>-</td>
<td>77.0%</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Chloramphenicol</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Gentamicin</td>
<td>76.9%</td>
<td>87.5%</td>
<td>90.5%</td>
<td>91.3%</td>
<td>95.8%</td>
<td>89.5%</td>
</tr>
<tr>
<td>Aminoglycoside</td>
<td>77.8%</td>
<td>92.3%</td>
<td>2.6%</td>
<td>NA</td>
<td>16.3%</td>
<td>8.9%</td>
</tr>
<tr>
<td>Ceftazime</td>
<td>77.8%</td>
<td>87.2%</td>
<td>90.4%</td>
<td>25.0%</td>
<td>95.6%</td>
<td>82.0%</td>
</tr>
<tr>
<td>Cefepime</td>
<td>69.4%</td>
<td>87.2%</td>
<td>61.5%</td>
<td>16.3%</td>
<td>95.6%</td>
<td>82.0%</td>
</tr>
<tr>
<td>Imipenem</td>
<td>0.0%</td>
<td>0.0%</td>
<td>3.9%</td>
<td>0.0%</td>
<td>95.6%</td>
<td>82.0%</td>
</tr>
<tr>
<td>Erythromycin</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Clindamycin</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Vancomycin</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>


Gram-positive bacteria [*Streptococcus pyogenes* (3), *Streptococcus agalactiae* (1), and *Staphylococcus aureus* (10), *Proteus mirabilis* (7), *Morganella morganii* (6), *Providence spp* (5), *Citrobacter freundii* (2), *Escherichia coli* (5), *Enterococcus* (12), and *Klebsiella* (4)]

New SAP protocol tailored to local AMR patterns
Improving surgical hand preparation

1. **Local production of modified WHO formulation for ABHR**

2. **Surgical hand preparation**
   - **Antimicrobial soap+water** = 2 – 5 mins
   - **Alcohol-based** = 1.5 – 3 mins
   - Good technique is crucial!
   - Nail-brushes not recommended
Surgical skin preparation

Local preparation of 2% chlorhexidine isopropanol solution

1. Isopropanol: 62.7 % g/g
2. Chlorhexidin digluconate 18.8% g/g solution: 12.1 % g/g
3. Top up with distilled water up to 100%

Appropriate technique for skin preparation

- Wash+clean incision site
- Chlorhexidine-alcohol or iodophor-alcohol
- Apply with sterile instruments
- Allow to dry!
Lessons learned

• Use multimodal strategies (this does not mean checklists & bundles)
• Have a step-wise action plan
• Map recommendations according to surgical patient journey
• Empower teams and involve front-line staff
• Engage leadership
• Let teams take the lead on adaptation
• Catalyze collective and individual ownership
• Use data to create awareness and show success
• Reward teams and work within a safety culture spirit
3. Multimodal implementation approaches

**The Five Components of the WHO multimodal hand hygiene improvement strategy**

1a. System change – alcohol-based handrub at point of care

1b. System change – access to safe, continuous water supply, soap and towel

2. Train

3. Evaluate

4. Reminders in the workplace

5. Institutional safety climate

**4 Es**

<table>
<thead>
<tr>
<th>4 Es</th>
<th>Executive Leaders</th>
<th>Team Leaders</th>
<th>Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engage</td>
<td>How do we make our hospital a better place?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Educate</td>
<td>How do we need to do better?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Evaluate</td>
<td>How can we do it with our current resources?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Implement</td>
<td>How can we make a difference?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Intensive Unit-based Safety Program (CUSP)**

1. Educate staff on science of safety
2. Identify defects
3. Assign an executive to the unit
4. Learn from one defect per quarter
5. Implement teamwork tools

**Same concepts, different terms**
Critical point: implementation, whatever way you look at it, means that there are key elements for success, whatever these elements are called – these two strategies are similar and have demonstrated success.
A WHO implementation framework

The approach includes five steps to be undertaken sequentially:

Step 1: facility preparedness – readiness for action
Step 2: baseline evaluation – establishing knowledge of the current situation
Step 3: implementation – introducing the improvement activities
Step 4: follow-up evaluation – evaluating the implementation impact
Step 5: ongoing planning and review cycle – developing a plan for the next 5 years (minimum)

The overall aim is to embed hand hygiene as an integral part of the culture in the health-care facility.

The overall aim is to embed SSI evidence based recommendations as an integral part of the culture in the health care facility on the continuum of the surgical patient’s journey.

Based on the WHO Guide to Implementation [Link]
Multimodal strategy for IPC interventions

In other words, the WHO multimodal improvement strategy addresses these five areas:

1. Build it (system change)
   - What infrastructures, equipment, supplies and other resources (including human) are required to implement the intervention?
   - Does the physical environment influence health worker behaviour? How can ergonomics and human factors approaches facilitate adoption of the intervention?
   - Are there certain types of health workers needed to implement the intervention?
   - Practical example: when implementing hand hygiene interventions, ease of access to handwashes at the point of care and the availability of WASH infrastructures (including water and soap) are important considerations. Are these available, affordable and easily accessible in the workplace? If not, action is needed.

2. Teach it (training & education)
   - Who needs to be trained? What type of training should be used to ensure that the intervention will be implemented in line with evidence-based policies and how frequently?
   - Does the facility have trainers, training aids, and the necessary equipment?
   - Practical example: when implementing injection safety interventions, train all those responsible for administering injections, including nurses and community workers, on important considerations, as well as adequate disposal methods.

3. Check it (monitoring & feedback)
   - How can you identify the gaps in IPC practices or other indicators in your setting to allow you to prioritize your intervention?
   - How can you be sure that the intervention is being implemented correctly and safely, including at the bedside? For example, are there methods in place to observe or track practices?
   - How and when will feedback be given to the target audience and managers? How can patients also be informed?
   - Practical example: when implementing surgical site infection interventions, the use of key tools is important considerations, such as surveillance data collection forms and the WHO checklist (adapted to local conditions).

4. Sell it (reminders & communications)
   - How are you promoting an intervention to ensure that there are cues to action at the point of care and messages are reinforced to health workers and patients?
   - Do you have capacity/funding to develop promotional messages and materials?
   - Practical example: when implementing interventions to reduce catheter-associated bloodstream infection, the use of visual cues to action, promotional/reinforcing messages, and planning for periodic campaigns are important considerations.

5. Live it (culture change)
   - Is there demonstrable support for the intervention at every level of the health system? For example, do senior managers provide funding for equipment and other resources? Are they willing to be champions and role models for IPC improvements?
   - Are teams involved in co-developing or adapting the intervention? Are they empowered and do they feel ownership and the need for accountability?
   - Practical example: when implementing hand hygiene interventions, the way a health facility approaches this as part of safety and quality improvement and the value placed on hand hygiene as part of the clinical workflow are important considerations.

Interim Practical Manual supporting national implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes

World Health Organization
Understanding the multimodal strategy for SSI prevention (1)

- System change
  ‘Build It’

Ensuring that the health care facility has the **necessary infrastructure and resources in place** to allow for steps to be taken to prevent SSI based on the known modifiable risk factors.

- The right infrastructure and available resources can **streamline interventions for consistent delivery of care** and make execution easier and safer

- Supplies for surgical hand preparation*
- Right and easily accessible antibiotics
- Clippers
- Chlorhexidine-, alcohol-based solution*
- Soap
- Mupirocin 2% ointment
- Oxygen
- Antimicrobial-coated sutures
- Negative Pressure Wound Therapy devices
- Sterile drapes and gowns
- IT system for monitoring

*Procurement vs local production*
Understanding the multimodal strategy for SSI prevention (2)

- Training and education
  - 'Teach It'
  
  Practical training and education methods aligned with the recommendations for SSI prevention

  - Insufficient knowledge, particularly of evidence based SSI recommendations and the reasons why they are important, is a key barrier to change

- On site courses
- Simulations
- Videos
- Focus groups
- Bed-side training
- Training support materials (handouts, e-learning, etc)
Understanding the multimodal strategy for SSI prevention (3)

- **Evaluation and feedback - ‘Check It’**

  Regular monitoring and timely feedback of:
  - risk factors for SSI
  - compliance with recommended procedures and practices
  - infrastructures and available resources & supplies
  - knowledge and perception of the problem
  - SSI rates

- It should not be seen as a component separated from implementation or only to be used for scientific purposes

- Essential step in:
  - identifying areas deserving major efforts and in feeding crucial information into the local action plan
  - measuring the changes induced by improvement efforts and to ascertain whether interventions have been effective
Reminders and communications - 'Sell it'

Point of care means of reminding and prompting health care workers about the importance of practices to prevent SSI. Also means of informing patients and their visitors of the standard of care that they should expect to receive. Communications to inform senior leaders and decision makers regarding the standards that they should assure.

- Posters
- Leaflets
- Flowcharts
- Infographics
- Letter templates
- Advocacy messages
Understanding the multimodal strategy for SSI prevention (5)

- Institutional safety climate and culture - ‘Live It’

Creating an environment and the perceptions that facilitate awareness-raising about SSI prevention at all levels. Climate that understands and prioritizes surgical safety issues. Team spirit and cohesion. Awareness of self capacity to make a change, ownership of the intervention.

- Motivated, multidisciplinary teams
- Champions
- Role models
- Leadership rounds
- Morbidity & mortality meetings – learning from defects
- Advocacy messages
WHO global guidelines for the prevention of surgical site infection

The 2016 World Health Organization (WHO) Global guidelines for the prevention of surgical site infection (SSI) are evidence-based and unique in that they are the first global guidelines of this sort, are based on systematic reviews and present additional information in support of actions to improve practice. They were developed by international experts adhering to WHO's Guideline Development Process and overall aim to achieve standardisation.

Summary
The objectives of the new Guidelines are:
1. To provide comprehensive evidence-based and expert consensus-based recommendations to be applied during the pre-, intra- and postoperative periods for prevention of SSI and to help combat antimicrobial resistance (AMR).
2. To support health (and related) settings and practitioners to develop or strengthen infection prevention and control (IPC) programmes, with a focus on surgical safety, as well as AMR action plans.
3. To highlight that working as teams, both practices and patient outcomes can be improved, taking account of resource availability.

Why these guidelines?
1. To increase awareness of the global burden of SSI in all settings, and including in maternal and child health.
2. To increase knowledge of the need for appropriate antibiotic prophylaxis for surgical patients.
3. To increase knowledge of the high burden of preventable SSI and to mobilise surgeons, nurses, technical support staff, anaesthetists and any professionals directly providing surgical care.
4. Because every infection prevented is an antibiotic treatment avoided.

Strong guideline recommendations

- Patients with known nasal carriage of *S. aureus* should receive intranasal applications of mupirocin 2% ointment with or without a combination of chlorhexidine gluconate body wash.
- Mechanical bowel preparation alone (without the administration of oral antibiotics) should NOT be used in adult patients undergoing elective colorectal surgery.
- In patients undergoing any surgical procedure, hair should either NOT be removed or, if absolutely necessary, should only be removed with a clipper. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room.
- Surgical antibiotic prophylaxis (SAP) should be administered before surgical incision, when indicated.
- SAP should be administered within 120 min before incision, while considering the half-life of the antibiotic.
- Surgical hand preparation should be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable alcohol-based handrub before donning sterile gloves.
- Alcohol-based antiseptic solutions based on CHG for surgical site skin preparation should be used in patients undergoing surgical procedures.
- Adult patients undergoing general anaesthesia with endotracheal intubation for surgical procedures should receive 80% fraction of inspired oxygen intraoperatively and, if feasible, in the immediate postoperative period for 2–6 h.
- Surgical antibiotic prophylaxis administration should not be prolonged after completion of the operation.

Conditional guideline recommendations

- Immunosuppressive medication
  - Immunosuppressive medication should not be discontinued prior to surgery for the purpose of preventing SSI.

- Nutritional formulas
  - Consider the administration of oral or enteral multiple nutrient-enhanced nutritional formulas for the purpose of preventing SSI in underweight patients who undergo major surgical operations.

- Bathing before surgery
  - It is good clinical practice for patients to bathe or shower before surgery.
  - Either a plain soap or an antiseptic soap could be used for this purpose.

- Intranasal mupirocin
  - Consider treating patients with known nasal carriage of *S. aureus* undergoing other types of surgery with perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash.

- Antibiotics & MRSA
  - Preoperative oral antibiotics combined with MRSA should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery.

- Antimicrobial sealants
  - Antimicrobial sealants should not be used after surgical site skin preparation for the purpose of reducing SSI.

- Warming devices
  - Warming devices should be used in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.

- Blood glucose control
  - Protocols for intensive perioperative blood glucose control should be used for both diabetic and non-diabetic adult patients undergoing surgical procedures.

- Fluid therapy
  - Goal-directed fluid therapy should be used intraoperatively for the purpose of reducing SSI.

- Drapes and gowns
  - Either sterile disposable non-woven or sterile reusable woven drapes and surgical gowns can be used during surgical operations for the purpose of preventing SSI.

- Adhesive drapes
  - Plastic adhesive incise drapes with or without antimicrobial properties should not be used for the purpose of preventing SSI.

- Wound protectors
  - Consider the use of wound protector devices in clean-contaminated, contaminated and dirty abdominal surgical procedures for the purpose of reducing the rate of SSI.

- Saline wound irrigation
  - There is insufficient evidence to recommend for or against saline irrigation of incisional wounds for the purpose of preventing SSI, particularly in clean and clean-contaminated wounds.

- Povidone iodine irrigation
  - Consider the use of irrigation of the incisional wound with an aqueous povidone iodine solution before closure for the purpose of preventing SSI, particularly in clean and clean-contaminated wounds.

- Antibiotic irrigation
  - Antibiotic incisional wound irrigation before closure should not be used for the purpose of preventing SSI.

- Neg pressure wound therapy
  - Prophylactic negative pressure wound therapy may be used on primarily closed surgical incisions in high-risk wounds and, in the operating room, for the purpose of preventing SSI.

- Coated sutures
  - Triclosan-coated sutures may be used for the purpose of reducing the risk of SSI, independent of the type of surgery.

- Laminar flow ventilation
  - Laminar airflow ventilation systems should not be used to reduce the risk of SSI for patients undergoing total orthopaedic surgery.

- Peri-op antibiotics
  - Perioperative surgical antibiotic prophylaxis should not be continued due to the presence of a wound drain for the purpose of preventing SSI.

- Wound drains
  - The wound drain should be removed when clinically indicated.
  - No evidence was found to allow making a recommendation on the optimal timing of wound drain removal for the purpose of preventing SSI.

- Advanced dressings
  - Advanced dressing of any type should not be used over a standard dressing on primarily closed surgical wounds for the purpose of preventing SSI.

http://www.who.int/infection-prevention/tools/surgical/en/
Decontamination recommendations as part of SSI prevention

- Aspects of sterilization
- Risk management
- The sterile services department
- Cleaning of medical devices
- Preparation and packaging for reprocessing
- Chemical disinfectants
- Decontamination of endoscopes
- Sterilization of reusable medical devices
- Reuse of single use medical devices
- Transporting of medical devices
- Dental practice

THANK YOU!!!

WHO Infection Prevention and Control Global Unit

Learn more at: http://www.who.int/infection-prevention/en/