

Advanced Infection Prevention and Control Training

Prevention of surgical site infection: trainer's guide

Outline of the module

The “Prevention of surgical site infection” advanced training module is part of a broader infection prevention and control (IPC) training package targeting individuals and teams in IPC who work or intend to work as IPC focal points. In particular, this module is designed to support implementation of the WHO global guidelines for the prevention of surgical site infection (SSI).¹ It introduces recommended best practices and a multimodal approach for successful implementation and improvement.

Trainees are expected to possess at least basic experience and competence in IPC. They could include IPC professionals, IPC hospital teams, facility administrators, hospital epidemiologists, microbiologists and other relevant health care professionals, among others.

Learning objectives of the module

The module aims to equip the IPC focal point to:

- describe the interconnection between SSI prevention and overall IPC efforts and how preventing SSI should be a critical part of a strong and effective IPC programme;
- describe and explain the burden and epidemiological factors that influence SSI, understand the importance of reviewing existing and emerging data to aid SSI reduction within the local context;
- explain the content of the WHO SSI prevention recommendations and understand the evidence supporting them;
- describe adaptive and technical improvement approaches and the role of process and outcome indicators, which form part of an improvement project applied to SSI prevention;
- explain how evidence-based recommendations on SSI can be implemented effectively in the local context and in real life situations;

¹ Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016 (<http://www.who.int/infection-prevention/publications/ssi-prevention-guidelines/en/>, accessed 10 June 2018).

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- describe and explain the WHO multimodal improvement strategy designed to implement SSI prevention recommendations.

Overview

This module is to be delivered as a one-day training session. It comprises a blend of PowerPoint slides, audiovisual material and a student handbook. The training is divided into an introduction and five sessions:

Introduction (45 minutes);

Session 1: SSI prevention in the context of IPC (15 minutes);

Session 2: the importance of SSI: epidemiology and burden on a global scale (100 minutes);

Session 3: SSI prevention measures: the 2016 WHO global guidelines for the prevention of SSI and other associated recommendations (3 hours 15 minutes);

Session 4: Understanding the application of implementation strategies to ensure SSI prevention including real life examples (3 hours 40 minutes);

Session 5: applying a multimodal improvement strategy for SSI prevention (90 minutes).

Materials needed

All materials should be collected and reviewed prior to starting the training:

- PowerPoint slide deck;
- trainer's guide;
- student handbooks (these include handouts and group work instructions);
- WHO guidelines on core components of IPC programmes at the national and acute health care facility level (including two-page summary) (available to download from: <http://www.who.int/infection-prevention/tools/core-components/en/>);
- WHO core components and leadership videos (links provided in trainer notes below);
- WHO practical manuals to support implementation of the core components, particularly focusing on the surveillance and monitoring, audit and feedback components (available to download from: <http://www.who.int/infection-prevention/tools/core-components/en/>);
- WHO multimodal improvement strategy visual (available to download from: <http://www.who.int/infection-prevention/publications/ipc-cc-mis.pdf?ua=1>);

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- WHO tools to assess the level of progress in core component implementation at the national and facility level, particularly focusing on the surveillance and monitoring, audit and feedback sections (available to download from: <http://www.who.int/infection-prevention/tools/core-components/en/>);
- WHO global guidelines for the prevention of SSI (available to download from: http://www.who.int/infection-prevention/tools/surgical/training_education/en/);
- WHO skin preparation, wound dressing and hand hygiene videos (links provided in trainer notes below);
- WHO SSI prevention implementation tools (available to download from: <http://www.who.int/infection-prevention/tools/surgical/en/>);
- WHO protocol and data collection forms for SSI surveillance in settings with limited resources (available to download from: http://www.who.int/infection-prevention/tools/surgical/evaluation_feedback/en/);
- WHO Guidelines on hand hygiene in health care (available to download from: <http://www.who.int/infection-prevention/publications/hand-hygiene-2009/en/>);
- WHO manual on decontamination and reprocessing of medical devices for health care facilities (available to download from: http://www.who.int/infection-prevention/tools/surgical/system_change/en/);
- laptop and data projector capable of playing video and audio;
- flipcharts and pens;
- paper and pens for students to use during group work.

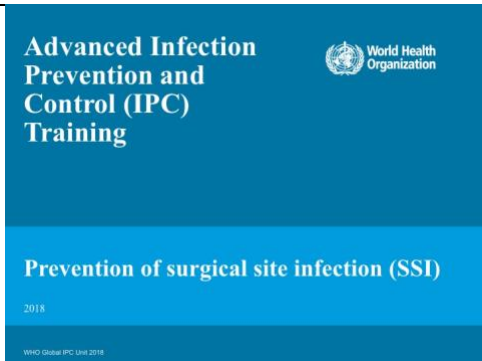
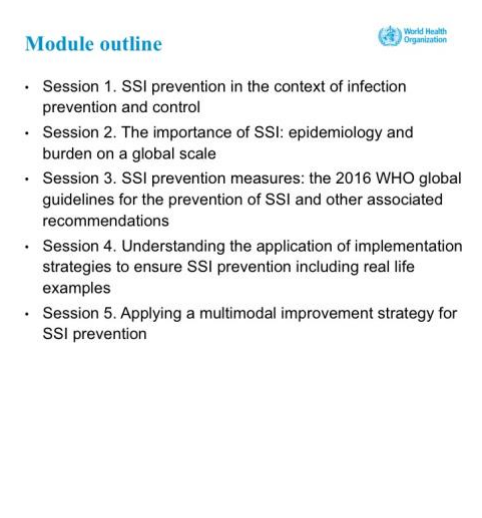
Evaluation

The same pre- and post-training test (Annex 1) will be distributed to participants at the beginning and end of this module to help gauge their knowledge of SSI prevention. The pre-training test will develop a baseline, measuring existing knowledge, and identify knowledge gaps. The post-training test will assess the knowledge gained through the module.

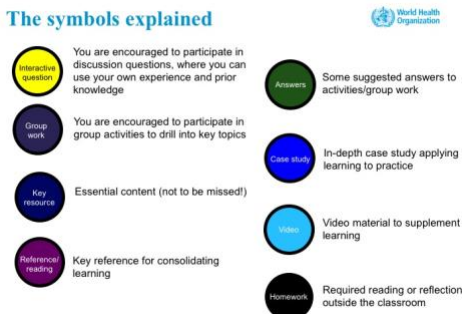
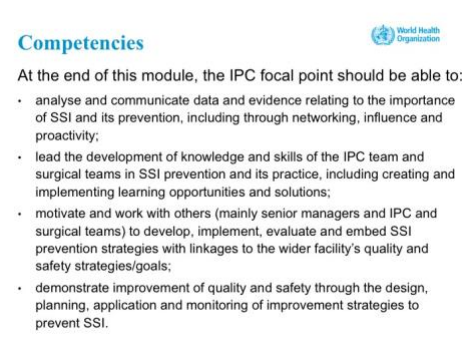
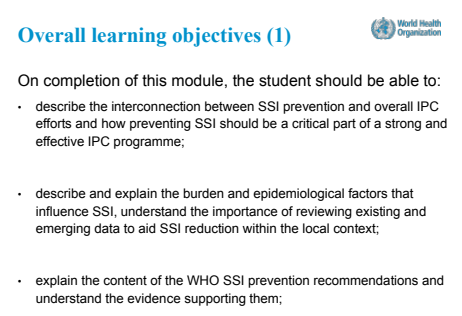
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Details of presentation slides, with resources for the trainer






The table below sets out the module's sessions and lists the associated resources for the trainer. The last column in the table provides the trainer with preparatory pre-reading resources, information for further reading if needed at any point and/or key references to direct the students to do further reading offline.

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
1		<p>Welcome participants and introduce yourself and the topic for this module.</p> <p>Ask if there are any questions before advancing to the next slide.</p>	–
2		<p>Give a 1–2-minute overview of the whole module</p> <p>State that this module will cover different aspects of surgical site infection (SSI) and its prevention, including the importance of a multimodal improvement strategy with practical examples – the module is divided into an introduction and five sessions to make different aspects of SSI prevention clear.</p> <p>Read the slide.</p> <p>Emphasize that each session builds on the previous one.</p>	–

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
3	<p>The symbols explained</p>  <p>You are encouraged to participate in discussion questions, where you can use your own experience and prior knowledge.</p> <p>You are encouraged to participate in group activities to drill into key topics.</p> <p>Essential content (not to be missed!).</p> <p>Key reference for consolidating learning.</p> <p>Some suggested answers to activities/group work.</p> <p>In-depth case study applying learning to practice.</p> <p>Video material to supplement learning.</p> <p>Required reading or reflection outside the classroom.</p>	<p>Read the explanations of the symbols from the screen.</p>	–
4	<p>Competencies</p>  <p>At the end of this module, the IPC focal point should be able to:</p> <ul style="list-style-type: none"> analyse and communicate data and evidence relating to the importance of SSI and its prevention, including through networking, influence and proactivity; lead the development of knowledge and skills of the IPC team and surgical teams in SSI prevention and its practice, including creating and implementing learning opportunities and solutions; motivate and work with others (mainly senior managers and IPC and surgical teams) to develop, implement, evaluate and embed SSI prevention strategies with linkages to the wider facility's quality and safety strategies/goals; demonstrate improvement of quality and safety through the design, planning, application and monitoring of improvement strategies to prevent SSI. 	<p>Read the slide or ask a participant to read it.</p> <p>Emphasize that these are the learning outcomes the attendees will attain through completion of the module.</p>	–
5	<p>Overall learning objectives (1)</p>  <p>On completion of this module, the student should be able to:</p> <ul style="list-style-type: none"> describe the interconnection between SSI prevention and overall IPC efforts and how preventing SSI should be a critical part of a strong and effective IPC programme; describe and explain the burden and epidemiological factors that influence SSI, understand the importance of reviewing existing and emerging data to aid SSI reduction within the local context; explain the content of the WHO SSI prevention recommendations and understand the evidence supporting them; 	<p>Read the slide or ask a participant to read it (note: the list continues on the next slide).</p> <p>Emphasize that these objectives are the knowledge and skills the attendees should be able to demonstrate on completion of this module.</p>	–


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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
6	<p>Overall learning objectives (2)</p>  <ul style="list-style-type: none"> describe adaptive and technical improvement approaches and the role of process and outcome indicators, which form part of an improvement project applied to SSI prevention; explain how evidence-based recommendations on SSI can be implemented effectively in the local context and in real life situations; describe and explain the WHO multimodal improvement strategy designed to implement SSI prevention recommendations. 	<p>Ice breaker</p> <ul style="list-style-type: none"> After all the objectives have been read out, ask the participants to introduce themselves to the person next to them and share with them one fact about why they are interested in IPC and SSI. Allow a couple of minutes to exchange the information. Then allow 10 minutes for participants to tell the class what they have learned from each other: the name and fact about their partner. 	—
7	<p>Common abbreviations</p>  <p><i>FourEs</i> – engage, educate, execute, evaluate</p> <p>ABHR – alcohol-based handrub</p> <p>AMR – antimicrobial resistance</p> <p>CDC – [United States] Centers for Disease Control and Prevention</p> <p>CHG – chlorhexidine gluconate</p> <p>CUSP – comprehensive unit-based safety programme</p> <p>HAI – health care-associated infection</p> <p>IPC – infection prevention and control</p> <p>LMICs – low- and middle-income countries</p> <p>MBP – mechanical bowel preparation</p> <p>MRSA – methicillin-resistant <i>Staphylococcus aureus</i></p> <p>NNIS – national nosocomial infection surveillance</p> <p>PPE – personal protective equipment</p> <p>SAP – surgical antibiotic prophylaxis</p> <p>SSI – surgical site infection</p> <p>SUSP – surgical unit-based safety programme</p> <p>VAP – ventilator-associated pneumonia</p> <p>WHO – World Health Organization</p> 	<p>Say:</p> <p>“To begin the topic, we want to make it easy for you to become more familiar with common terms used in SSI prevention work, so we have listed some abbreviations here.</p> <p>You will hear and see these frequently throughout this module. It will be useful to recognize these and be able to recall them as we go through the next session.”</p>	Refer to handout 1 in the student handbook, p. 5.
8	<p>Group work 1. Acknowledging the current status of your SSI prevention</p>  <ul style="list-style-type: none"> Take a few minutes to talk to the person next to you. Take it in turns to describe your top three challenges with SSI prevention. Then take it in turns to tell each other one thing that is currently working really well in your SSI prevention work – it can be anything, small or big – concerning a technical piece of work or building relationships. 	<p>Group work 1 instructions</p> <p>Invite participants to discuss with one another (in turn) their top three challenges with SSI prevention.</p> <p>Here are some example points to help stimulate discussion.</p> <ul style="list-style-type: none"> I am unaware of the problem in my institution. I can't get the surgical team to listen my recommendations for better practices I don't know how best to start a journey of SSI prevention improvement 	Refer students to group work 1 - student handbook, p. 6.

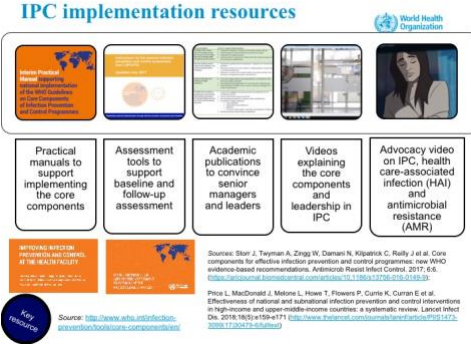
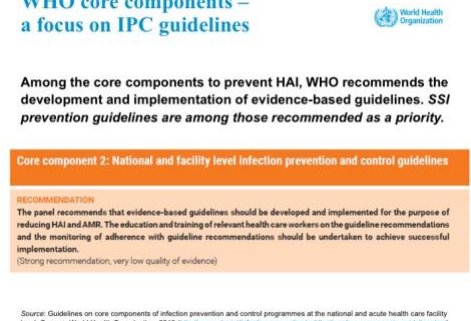
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>Then ask each participant to relate one thing that is currently working really well in their infection prevention work – it can be anything, small or big – concerning a technical piece of work or building relationships. Allow 5 minutes per exchange.</p> <p>Allow 20 minutes for collective feedback and ask that they keep their notes to reflect on how their thoughts change during the module.</p>	
9	<p>Session 1</p>  <p>SSI prevention in the context of IPC</p>	<p>Say:</p> <p>“The first session of this module addresses SSI prevention in the context of IPC.”</p>	–
10	<p>Learning objective – session 1</p>  <p>Describe the interconnection between SSI prevention and overall IPC efforts and how preventing SSI should be a critical part of a strong and effective IPC programme</p>	<p>State that it is important to recognize the interconnection with overall IPC efforts and how, for example, preventing SSI should be a critical part of a strong and effective IPC programme.</p>	–
11	<p>Effective IPC programmes – the core components and SSI prevention</p>    <p>Key resource</p> <p>Source: Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016. (https://www.who.int/infection-prevention/publications/ipc-core-components/en/)</p>	<p>State that the WHO guidelines on core components of IPC programmes at the national and acute health care facility level are a key resource for IPC leaders and a roadmap for effective implementation and improvement of IPC. As with any map they require some interpretation, and the IPC focal point is the key player on the ground to develop, coordinate and oversee action. The guidelines set out</p>	<p>Refer to handout 2 in the student handbook, p. 7.</p> <p>http://www.who.int/infection-prevention/campaigns/clean-hands/ipc-cc_visual.pdf?ua=1</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>evidence-based recommendations for action at the national and acute health care facility level.</p> <p>Use the image to show the core components and their interconnections concisely.</p>	<p>WHO guidelines on core components of IPC programmes: http://www.who.int/infection-prevention/publications/core-components/en/</p>
12	<p>Use of the core component resources to promote and support SSI and IPC work</p>  <p>Source: http://www.who.int/ppsc/HAI-infographic.pdf?ua=1</p>	<p>State that it is important to be able to see SSI prevention activities within the overarching purpose of IPC and antimicrobial resistance (AMR), and hence what an IPC leader aims to do.</p> <p>An IPC programme with effective leadership is the solution to the problem of all health care-associated infections (HAIs), including SSI prevention.</p> <p>IPC programmes affect patient outcomes, reduce harm and improve the quality of care and help to stop the spread of antibiotic resistance.</p> <p>The video explains the core components guidelines in the words of international leaders in IPC. It is less than 10 minutes long and could be used to explain to senior leaders and managers the importance of IPC – it is therefore a potentially powerful advocacy tool for use at the start of an improvement journey.</p> <p>Play the video from the link provided.</p> <p>Refer students to the “Leadership and programme management” training module for further information on this topic.</p>	<p>Refer to handout 3 in the student handbook, p. 9. http://www.who.int/ppsc/HAI-Infographic.pdf?ua=1</p> <p>Video on the core components of IPC programmes: https://www.youtube.com/watch?v=LZapz2L6J1Q&feature=youtu.be</p> <p>Leadership module: http://www.who.int/infection-prevention/tools/core-components/en/</p>



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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
13	 <p>IPC implementation resources</p> <p>World Health Organization</p> <p>Practical manuals to support implementing the core components</p> <p>Assessment tools to support baseline and follow-up assessment</p> <p>Academic publications to convince senior managers and leaders</p> <p>Videos explaining the core components and leadership in IPC</p> <p>Advocacy video on IPC, health care-associated infection (HAI) and antimicrobial resistance (AMR)</p> <p>Source: http://www.who.int/infection-prevention/publications/core-components/en/</p>	<p>Read out the available key WHO IPC generic implementation resources:</p> <ul style="list-style-type: none"> • practical manuals for implementation, nationally and at the facility; • baseline assessment tools to guide where to prioritize action, nationally and at the facility; • academic publications on the guidelines – helpful for convincing senior managers and leaders; • the advocacy video mentioned earlier; • an advocacy video on IPC, HAI and AMR. <p>Say:</p> <p>“All are useful in progressing the IPC journey in support of SSI prevention.”</p>	<p>WHO core components for IPC webpage:</p> <p>http://www.who.int/infection-prevention/publications/core-components/en/</p>
14	 <p>WHO core components – a focus on IPC guidelines</p> <p>World Health Organization</p> <p>Among the core components to prevent HAI, WHO recommends the development and implementation of evidence-based guidelines. SSI prevention guidelines are among those recommended as a priority.</p> <p>Core component 2: National and facility level infection prevention and control guidelines</p> <p>RECOMMENDATION</p> <p>The panel recommends that evidence-based guidelines should be developed and implemented for the purpose of reducing HAI and AMR. The education and training of relevant health care workers on the guideline recommendations and the monitoring of adherence with guideline recommendations should be undertaken to achieve successful implementation.</p> <p>(Strong recommendation, very low quality of evidence)</p> <p>Source: Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization, 2016. http://www.who.int/infection-prevention/publications/who-core-components-guidelines/en/</p>	<p>Say:</p> <p>“Let’s take a moment to understand the core component recommendations for effective IPC that refer to the importance of SSI prevention.”</p> <p>Read the slide.</p> <p>Say:</p> <p>“This recommendation highlights the overall importance of IPC guidelines, education and monitoring; these are aspects that apply fully to SSI prevention, as we will discuss throughout this module.</p> <p>This WHO statement can be used to support progress: it is a mandate that can help you sell the importance of SSI prevention. The recommendation also highlights the importance of conducting training for health care workers when introducing new or updated guidelines. The evidence on implementing IPC training and education, including for</p>	<p>WHO guidelines on core components of IPC programmes:</p> <p>http://www.who.int/infection-prevention/publications/who-core-components-guidelines/en/</p>


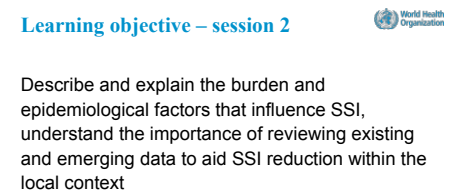
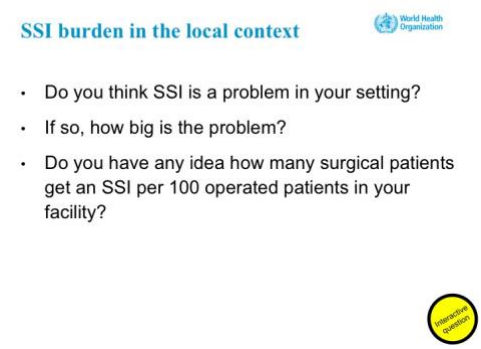
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		target audiences, is further detailed in core component 3.”	
15	<p>WHO core components – a focus on surveillance</p>  <p>The WHO recommendations on HAI surveillance were supported by studies into SSI surveillance and reduction.</p> <p>Core component 4: Health care-associated infection surveillance ■ 4a. Health care facility level</p> <p>RECOMMENDATION The panel recommends that facility-based HAI surveillance should be performed to guide IPC interventions and detect outbreaks, including AMR surveillance with timely feedback of results to health care workers and stakeholders and through national networks. (Strong recommendation, very low quality of evidence)</p> <p>Core component 4: Health care-associated infection surveillance ■ 4b. National level</p> <p>RECOMMENDATION The panel recommends that national HAI surveillance programmes and networks that include mechanisms for timely data feedback and with the potential to be used for benchmarking purposes should be established to reduce HAI and AMR. (Strong recommendation, very low quality of evidence)</p> <p><small>Source: Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization, 2016 (http://www.who.int/infection-prevention/tools/surgical-evaluation-feedback/en/).</small></p>	<p>Say:</p> <p>“Surveillance is critical to inform and guide IPC strategies: this is true for SSI and we will shortly look at some results from regional and global surveillance studies that help us understand the global burden.</p> <p>Early detection of infections can help control clusters and outbreaks. Surveillance systems at health facility and national levels need support from senior staff and resources; this is acknowledged by the core components guidance, so use this evidence in your journey.</p> <p>Furthermore, conducting SSI surveillance has been shown to contribute to substantial reductions in SSI rates. Read the chapters dedicated to HAI surveillance in the WHO guidelines on core components of IPC programmes and find out more about the background to SSI surveillance in the WHO global guidelines for the prevention of SSI.”</p>	<p>Link to these resources online if helpful and time permits:</p> <ul style="list-style-type: none"> • http://www.who.int/infection-prevention/publications/ipc-components-guidelines/en/ • http://www.who.int/infection-prevention/publications/ssi-prevention-guidelines/en/
16	<p>WHO protocol for SSI surveillance in settings with limited resources</p>   <ul style="list-style-type: none"> • Surveillance: “the ongoing, systematic collection, analysis, interpretation and evaluation of health data closely integrated with the timely dissemination of these data to those who need it” • Conducting high-quality SSI surveillance is crucial to detect the magnitude of the problem and to assess the impact of any prevention/improvement intervention. <p><small>Source: Protocol for surgical site infection surveillance with a focus on settings with limited resources. Geneva: World Health Organization, 2016 (http://www.who.int/infection-prevention/tools/surgical-evaluation-feedback/en/).</small></p>	<p>Read the slide.</p> <p>Say:</p> <p>“This is why it’s important to conduct surveillance. You might want to learn further details in the WHO training module ‘Surveillance of HAIs’. WHO has developed and tested a protocol for SSI surveillance in settings with limited resources. Support is therefore available for you to collect data and to aid SSI reduction within your local context. While this protocol has a focus on settings with limited resources, some approaches – such as post-</p>	<p>WHO protocol for SSI surveillance with a focus on settings with limited resources:</p> <p>http://www.who.int/infection-prevention/tools/surgical-evaluation-feedback/en/</p>

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		discharge patient follow-up by phone – may be helpful in any country.”	
17	<p>The WHO approach to SSI surveillance in settings with limited resources</p>  <ul style="list-style-type: none"> • WHO has created an adapted approach that has been used in settings with limited resources to conduct surveillance in the context of interventions to reduce SSI. • The protocol is based on the widely accepted Centers for Disease Control and Prevention – National Healthcare Safety Network (CDC-NHSN) definitions for SSI, but definitions based on clinical signs and symptoms should be prioritized, given the lack of high-quality microbiology laboratory support. • For feasibility reasons, this protocol is based on post-discharge surveillance up to 30 days only. • Patient follow-up after discharge includes phone calls and involvement of the patient in recognizing signs and symptoms of SSI. 	<p>Say:</p> <p>“How is the WHO approach different? Recognizing that surveillance is challenging and demanding, especially when human resources and time are limited, WHO developed an adapted and slightly simplified approach and tested it in African hospitals, while continuing to base it on international definitions and a solid methodology.”</p> <p>Read the slide.</p> <p>Note: for more information on how to conduct and interpret HAI surveillance properly, tell participants that a “Surveillance” training module will be/is available.</p>	–
18	<p>WHO core components – a focus on prevention and implementation</p>  <p>The WHO recommendations on best IPC implementation strategies were supported by studies into approaches for SSI reduction.</p> <p>Core component 5: Multimodal strategies for implementing infection prevention and control activities ■ 5a: Health care facility level</p> <p>RECOMMENDATION The panel recommends that IPC activities using multimodal strategies should be implemented to improve practices and reduce HAI and AMR. (Strong recommendation, low quality of evidence)</p> <p>Core component 5: Multimodal strategies for implementing infection prevention and control activities ■ 5b: National level</p> <p>RECOMMENDATION The panel recommends that national IPC programmes should coordinate and facilitate the implementation of IPC activities through multimodal strategies on a nationwide or sub-national level. (Strong recommendation, low quality of evidence)</p> <p><small>Source: Guidelines on core components of infection prevention and control programmes at the national and acute health care facility level. Geneva: World Health Organization; 2016 (http://www.who.int/infection-prevention/publications/ipc-core-components/)</small></p>	<p>Say:</p> <p>“Further, multimodal improvement strategies are recommended as the most effective way to implement IPC guidelines and best practices; they are therefore a core component of IPC.</p> <p>SSI prevention studies contributed to informing the development of these evidence-based recommendations.</p> <p>We will go into much more detail about multimodal improvement strategies for SSI prevention in sessions 4 and 5 of this module.</p> <p>For a further summary of the IPC core components and how important they are, as well as how they will support your SSI prevention work, see handouts 2 and 4 in your student handbook (pp. 7 and 11).</p> <p>The student handbook also contains a list of key SSI-related references for</p>	<p>Refer to handout 2 in the student handbook, p. 7: http://www.who.int/infection-prevention/campaigns/clean-hands/ipc-cc_visual.pdf?ua=1</p> <p>Refer to handout 4 in the student handbook, p. 11: http://www.who.int/gpsc/cc_summary.pdf?ua=1</p> <p>Refer to handout 23 in the student handbook, p. 76.</p>

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		further reading – see handout 23 on p. 76.”	
19	 <p>Session 2</p> <p>The importance of SSI: epidemiology and burden on a global scale</p>	<p>Say:</p> <p>“The second session of this module addresses the importance of SSI epidemiology and burden globally.”</p>	–
20	 <p>Learning objective – session 2</p> <p>Describe and explain the burden and epidemiological factors that influence SSI, understand the importance of reviewing existing and emerging data to aid SSI reduction within the local context</p>	<p>Read the slide.</p>	–
21	 <p>SSI burden in the local context</p> <ul style="list-style-type: none"> • Do you think SSI is a problem in your setting? • If so, how big is the problem? • Do you have any idea how many surgical patients get an SSI per 100 operated patients in your facility? 	<p>Ask the questions on the slide, giving participants a moment to reflect, and take feedback as a classroom discussion.</p> <p>Say:</p> <p>“I am sure you have already learned something about SSI in the context of IPC, that you have been recalling the problems you face or been stimulated to think about this from comments made by others, but as some people are not aware of the extent of the problem we have to think about this in our own local context - this is important if we are to convince others to understand and support SSI prevention.</p> <p>The following slides identify how to detect the problem of SSI and review</p>	–

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>key data from various countries about the magnitude and burden of the problem and how it affects patients.”</p> <p>Allow 2–3 minutes for self-reflection and 10 minutes for feedback.</p>	
22	<p>CDC classification of SSI – the problem for the patient</p> <p>Source: Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention of surgical site infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Am J Infect Control. 1999; 27(2):97–134.</p>	<p>Say:</p> <p>“The Centers for Disease Control and Prevention (CDC) published classifications of SSI. This visual in particular helps us to see the impact of these infections on the patient – the patient’s skin, tissue and at times organs.”</p>	<p>Refer to handout 5 in the student handbook, p. 14.</p>
23	<p>CDC definitions (1)</p> <p>Superficial incisional SSI: case definition</p>	<p>Say:</p> <p>“Let’s read the case definition for more detail on what constitutes a superficial SSI.”</p> <p>Read the slide.</p> <p>You may wish to pause to take questions and repeat the definition if necessary.</p>	<p>Refer to handout 6 in the student handbook, p. 15.</p> <p>http://www.who.int/infection-prevention/tools/surgical/evaluation-feedback/en/</p>
24	<p>CDC definitions (2)</p> <p>Deep incisional SSI: case definition</p>	<p>Say:</p> <p>“This slide shows the difference when aiming to diagnose a deep SSI.”</p> <p>Read the slide.</p> <p>You may wish to pause to take questions and repeat the definition if necessary.</p>	–


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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
25	<p>CDC definitions (3)</p> <p>Organ/space SSI: case definition (e.g. osteomyelitis, myocarditis, meningitis, breast abscess, mediastinitis)</p> <p>Infection within 30 or 90+ days post surgery AND Any part of anatomy (e.g. organs or spaces) deeper than the fascial/muscle layers, opened or manipulated during surgery</p> <p>And one of the following:</p> <ul style="list-style-type: none"> Persistent drainage from drain placed in organ/space Abscess involving organ/space found during debridement or direct examination or re-operation Organisms isolated from surgically obtained cultures of tissue or fluid from organ/space <p>Source: CDC/NHSN Surgical Site Infection (SSI) Definitions, 2011. Copyright by American College of Surgeons, 2011.</p>	<p>Say:</p> <p>“Now we can see the different definitions for organ or space SSI.”</p> <p>Read the slide.</p> <p>You may wish to pause to take questions and repeat the definition if necessary. Refer students to the CDC reference for further reading on this topic.</p> <p>State that the three definitions not only support diagnosis and treatment but also help us understand the extent of the problem of infections arising from surgery. The descriptions give an indication of the burden of infection on patients and is important for you to be aware of in the wider context of SSI prevention activities.</p>	—
26-27	<p>Wound classification (1)</p> <p>1. Clean: an uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tracts are not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. Operative incisional wounds that follow nonpenetrating (blunt) trauma should be included in this category if they meet the criteria.</p> <p>2. Clean-contaminated: operative wounds in which the respiratory, alimentary, genital, or urinary tracts are entered under controlled conditions and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.</p> <p>Source: Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guidelines for prevention of surgical site infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Am J Infect Control. 1999; 27(2):365-384.</p> <p>Wound classification (2)</p> <p>3. Contaminated: open, fresh, accidental wounds. In addition, operations with major breaks in sterile technique (e.g. open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered including necrotic tissue without evidence of purulent drainage (e.g. dry gangrene) are included in this category.</p> <p>4. Dirty or infected: includes old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.</p>	<p>State that additional information on diagnosis of infection includes the surgical wound classification outlined by CDC and used widely. It is meant to help clinicians describe the degree of bacterial contamination of various surgical wounds. It helps gauge the risk of potential complications such as SSI among surgical procedures.</p> <p>Read the slide.</p> <p>Ask:</p> <p>“Are all health workers involved in surgery aware of the classifications presented in these slides so that accurate infection diagnosis can be made?”</p> <p>If time permits, allow 2–3 minutes for discussion. If not, just leave participants to consider the question in their own time for engaging with surgeons.</p>	—



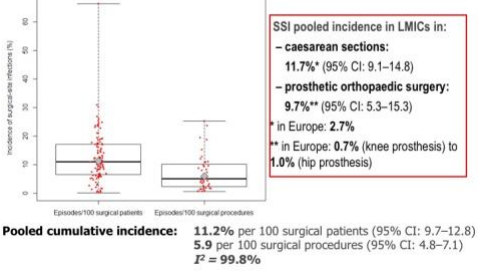

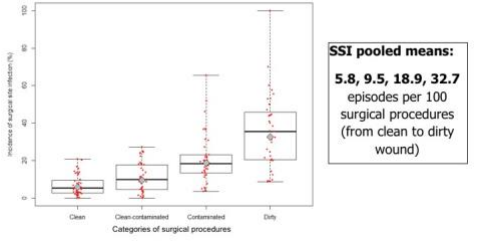
Advanced Infection Prevention and Control Training

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
28	<p>Source: http://www.who.int/infographic/infographic.pdf?ua=1</p>	<p>Say:</p> <p>“Let’s now move to understand the magnitude of the SSI problem worldwide. This clear visual resource helps us all to describe the problem of SSI in a concise way, for both low- and middle-income countries (LMICs) and high-income countries.”</p>	<p>Refer to handout 7 in the student handbook, p. 17: http://www.who.int/qpsc/ssi-infographic.pdf?ua=1</p>
29	<p>“Surgical site infection (SSI) is the most surveyed and most frequent type of infection in low- and middle-income countries with incidence rates ranging from 1.2 to 23.6 per 100 surgical procedures and a pooled incidence of 11.8%. By contrast, SSI rates vary between 1.2% and 5.2% in developed countries.”</p>	<p>Say:</p> <p>“To recap for a moment on the global burden of infection, you may or may not be aware of these important reports and studies published by WHO since 2011:</p> <ul style="list-style-type: none"> • the WHO report on the burden of endemic HAI worldwide; • the Allegranzi et al. systematic review and meta-analysis of the burden of endemic HAI in developing countries in <i>The Lancet</i>; • the Bagheri et al. systematic review of HAI in Africa in the <i>Bulletin of the World Health Organization</i>. <p>An update about the epidemiology and burden of SSI is also available in the WHO global guidelines for the prevention of SSI.</p> <p>SSI is the most surveyed and most frequent HAI of in LMICs, as the highlighted quotation from the WHO burden document states.”</p> <p>Click twice then read the quotation.</p> <p>Say:</p> <p>“It is clear that SSI prevention is a critical part of overall infection prevention and avoidance of preventable harm in health care.”</p>	<p>Report on the Burden of endemic health care-associated infection worldwide: http://www.who.int/infection-prevention/publications/burden_hcai/en/</p> <p>Refer to handout 23 in the student handbook, p. 76.</p>


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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>These references will be important for you when presenting the overall context of the global burden of avoidable infection in health care, including for SSI.</p> <p>The student handbook also contains a list of key SSI-related references for further reading – see handout 23 on p. 76.”</p>	
30	<p>SSI burden – an overview (1)</p>  <ul style="list-style-type: none"> • Second most frequent type of HAI in Europe and the USA • Most frequent type of HAI on admission (67% in the USA, 33% in Europe) <ul style="list-style-type: none"> ○ SSI incidence (per 100 procedures) <ul style="list-style-type: none"> – USA 2014: 1.9% – Europe 2013–14: 0.6–9.5% ○ Incidence varies according to type of procedure (very low in clean procedures, such as arthroplasty; higher in contaminated/dirty procedures, such as colon surgery) ○ Most frequent pathogens: Gram-positive cocci (such as <i>Staphylococcus aureus</i> (<i>S. aureus</i>) at 17–30%), followed by Gram-negative bacilli ○ AMR: 39–51% of SSI pathogens are resistant to standard prophylactic antibiotics in the USA <p><small>Sources: - No. 1, Edwards JR, Rouse MC, Borchert T, et al. Probing the adjusted measures of surgical site infection for the national healthcare safety network. Infect Control Hosp Epidemiol. 2011;136(10):1260. - National and state healthcare-associated infection program report: National Safety Network Center for Emerging and Zoonotic Infectious Diseases, Centers for Disease Control and Prevention. 2014. https://www.cdc.gov/nhsn/getmedia/1a1a1a1a-1a1a-1a1a-1a1a-1a1a1a1a1a1a/ssi-report.pdf, accessed 10 August 2016. - ESCC. Annual epidemiology report 2014. Europe and Western. European Centre for Disease Prevention and Control. https://ecdc.europa.eu/en/en/files/document/2015/04/2014-annual-epidemiology-report, accessed 10 August 2016. - Seward DK, Wilson P, Edwards JR, Schneider A, Patel J, Struelens A, et al. Antimicrobial-resistant pathogens associated with healthcare-associated infections: summary of data reported to the National Healthcare Safety Network at the Centers for Disease Control and Prevention, 2005–2010. Infect Control Hosp Epidemiol. 2013;138:1–14.</small></p>	<p>Say:</p> <p>“These slides highlight how you can describe the SSI problem from an epidemiological perspective. They are not designed to help you or others fully understand or undertake epidemiological studies; rather, they describe the information available. Explaining to others that SSI is a major problem, especially in LMICs, can help engage them in improvement activities.</p> <p>This slide highlights the frequency of SSI in some high-income countries (USA and Europe). It is important to note these rates to compare with those in LMICs in the next slide.</p> <p>Read the slide.</p> <p>Say:</p> <p>“It is important to note that this information reminds us of the additional links to other health care topics, such as AMR issues and sepsis following surgery.”</p>	—




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
31	<p>SSI burden – an overview (2)</p>  <ul style="list-style-type: none"> • Most frequent type of HAI in LMICs • Infection is the most frequent complication of surgery in Africa • Pooled SSI incidence in LMICs (WHO unpublished data, 2017) <ul style="list-style-type: none"> – 5.9 per 100 procedures – 11.2 per 100 surgical patients • A few studies from LMICs report SSI rates by surgical procedure and data on microbiological causes of SSI • Most frequent pathogens are <i>S. aureus</i> (20.3%) and <i>Escherichia coli</i> (<i>E. coli</i>) (20.3%) • Average methicillin resistance among <i>S. aureus</i> isolates (MRSA): 54.5% • SSI pooled incidence in South-east Asia: 7.7% • Surgical sepsis = 30% of all patients with sepsis <p><small>Sources: 1. Wegering B, Beighan N, et al. Complications C. Deydier W, Alar H, Davidson L, et al. Burden of antibiotic health-care-associated infection in low-income countries: systematic review and meta-analysis. <i>Lancet</i>. 2015; 377:20-41. 2. Loo B, Appandawati A, Bhatnagar S. The burden of health-care-associated infections in South-east Asia: a systematic literature review and meta-analysis. <i>Clin Infect Dis</i>. 2016;55(11):1986-9. 3. Borek M, Borek T, Thandrasekaran R, et al. Multiple antibiotic resistance in <i>Staphylococcus aureus</i> isolates from surgical sites in South-east Asia. <i>Antonie van Leeuwenhoek</i>. 2015;107(1):1-10. 4. Borek M, Borek T, Thandrasekaran R, et al. Multiple antibiotic resistance in <i>Staphylococcus aureus</i> isolates from surgical sites in South-east Asia. <i>Antonie van Leeuwenhoek</i>. 2015;107(1):1-10.</small></p>	<p>Say:</p> <p>“SSI is the most frequent type of HAI in LMICs, according to WHO analyses published in 2011 and recently updated with a systematic review up to 2015.”</p> <p>Read the slide.</p>	—
32	<p>SSI incidence in LMICs (1995–2015, 107 studies)</p>   <p>Pooled cumulative incidence: 11.2% per 100 surgical patients (95% CI: 9.7–12.8) 5.9 per 100 surgical procedures (95% CI: 4.8–7.1) I² = 99.8%</p> <p><small>Source: updated systematic review – WHO unpublished data, 2017.</small></p>	<p>State that in the updated WHO pooled analysis of studies available between 1995 and 2015, SSI rates were 11.2 per 100 surgical patients and 5.9 per 100 surgical procedures in LMICs.</p> <p>In comparison, the average incidence of SSI in the USA was 1.9 per 100 surgical procedures in 2014, and in Europe it varied between 0.6 and 9.5 per 100 surgical procedures in 2013–14.</p> <p>SSI rates in specific procedures that are meant to be clean, such as caesarean sections and prosthetic orthopaedic surgery, are very high in LMICs compared to rates in high-income countries; for instance, the SSI rate in caesarean sections in Europe is 2.7%, while in LMICs it is 11.7%.</p>	—
33	<p>SSI risk in LMICs according to wound classification (1995–2015, 231 studies)</p>   <p>SSI pooled means: 5.8, 9.5, 18.9, 32.7 episodes per 100 surgical procedures (from clean to dirty wound)</p> <p><small>Source: updated systematic review – WHO unpublished data, 2017.</small></p>	<p>State that further, according to wound classification, mean cumulative incidence rates of SSI in clean, clean-contaminated, contaminated and dirty wounds, respectively, were:</p> <ul style="list-style-type: none"> • 5.8 (4.6 to 7.2) • 9.5 (7.5 to 11.8) • 18.9 (15.1 to 22.9) • 32.7 (26.2 to 39.6) episodes per 100 surgical procedures. 	—

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer																																			
		<p>These rates are extremely high in all categories.</p> <p>Similar pooled rates according to wound classification are not available for high-income countries, but data from ECDC show that:</p> <ul style="list-style-type: none">• for colorectal surgery (which is a contaminated/dirty type of surgery), incidence was 9.7 per 100 procedures;• for clean procedures such as hip or knee prosthesis, incidence rates were 0.7–1 per 100 procedures. <p>Proportions of SSI differed significantly between wound classes (dirty versus clean; dirty versus clean-contaminated; dirty versus contaminated) (p<0.0001).</p>																																				
34	<p>Examples of studies reporting SSI burden* in LMICs</p>  <table><tr><th>Author, year, country</th><th>Population</th><th>LOS^a, days</th><th>Mortality</th><th>Costs</th></tr><tr><td>Ameh, 2009, Nigeria</td><td>Paediatrics</td><td>26.1 (8–127) with SSI vs 18.0 (1–99) without</td><td>10.5% vs 4.1%</td><td>NA</td></tr><tr><td>Bhatia, 2003, India</td><td>Coronary artery bypass graft (CABG)</td><td>LOS significantly higher (mild 15, moderate 20, severe 25)</td><td>No SSI related deaths</td><td>Increase by 3.8%, 14.7% and 29.4% in mild, moderate, severe infections</td></tr><tr><td>Raka, 2007, Kosovo (in accordance with Security Council resolution 1244 (1999))</td><td>Abdominal surgery</td><td>9 with SSI vs 4 without</td><td>NA</td><td>NA</td></tr><tr><td>Kasatipibul, 2005, Thailand</td><td>Mixed surgery</td><td>Mean excess LOS: 21.3</td><td></td><td>Mean excess cost: US\$1355</td></tr><tr><td>Kaya, 2006, Turkey</td><td>General surgery</td><td>Mean excess LOS: 8</td><td>NA</td><td>Mean excess cost: US\$600</td></tr><tr><td>Le, 2006, Vietnam</td><td>Orthopaedics and neurosurgery</td><td>Median excess LOS: 18</td><td>No mortality difference</td><td>NA</td></tr></table> <p><small>*Mortality, length of stay (LOS), costs. Source: Report on the Burden of endemic health care-associated infection worldwide, Geneva: World Health Organization; 2011 http://www.who.int/infection-prevention/publications/burden_infection/</small></p>	Author, year, country	Population	LOS ^a , days	Mortality	Costs	Ameh, 2009, Nigeria	Paediatrics	26.1 (8–127) with SSI vs 18.0 (1–99) without	10.5% vs 4.1%	NA	Bhatia, 2003, India	Coronary artery bypass graft (CABG)	LOS significantly higher (mild 15, moderate 20, severe 25)	No SSI related deaths	Increase by 3.8%, 14.7% and 29.4% in mild, moderate, severe infections	Raka, 2007, Kosovo (in accordance with Security Council resolution 1244 (1999))	Abdominal surgery	9 with SSI vs 4 without	NA	NA	Kasatipibul, 2005, Thailand	Mixed surgery	Mean excess LOS: 21.3		Mean excess cost: US\$1355	Kaya, 2006, Turkey	General surgery	Mean excess LOS: 8	NA	Mean excess cost: US\$600	Le, 2006, Vietnam	Orthopaedics and neurosurgery	Median excess LOS: 18	No mortality difference	NA	<p>Say:</p> <p>“Limited data are available about the burden of SSI in LMICs. Here are some examples of studies that have reported on mortality, length of stay and costs in a range of surgeries.</p> <p>You can see here the impact of SSI on these aspects of patient lives, as well as the burden on health systems and countries.</p> <p>Some of the studies specifically note the difference between length of stay with and without an SSI, and while mortality was not always an issue, the impact on costs has been demonstrated in some studies – all representing a burden that could be avoided.”</p>	—
Author, year, country	Population	LOS ^a , days	Mortality	Costs																																		
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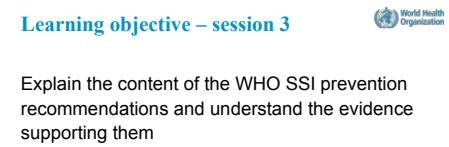

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
35	<p>SSI burden data in the local context – summary</p>  <ul style="list-style-type: none"> • Surveillance is important in understanding and explaining your own incidence and prevalence. • It is important to use country and regional data to explain what the common problems are likely to be and to persuade others to commit to improvement. • Based on your/available data, you are then able to consider prioritizing an improvement likely to have the greatest impact. • Choose improvement actions that are measurable and where progress can be clearly reported over time, against prevalence or incidence studies. <p><small>Use the WHO Protocol for surgical site infection surveillance with focus on settings with limited resources Geneva: World Health Organization, 2018 https://www.who.int/infection-prevention/surgical-SSI-surveillance-protocol.pdf?ua=1 to understand more about conducting surveillance.</small></p>	<p>Say:</p> <p>“We’ve talked in this session we talked about the importance of data – here is a summary of the key points related to surveillance.”</p> <p>Read the slide or ask a participant to read it.</p> <p>Say:</p> <p>“It is vitally important that any data collection and presentation is used for improvement and that you consider the problems in the context of what can be improved – for example, which area of surgery could you address as a starting-point to demonstrate that improvement activities can have an impact on prevention, patient safety and quality of care?”</p> <p>We will return to this when we talk about improvement actions for the evidence-based recommendations for SSI prevention later in this session.”</p> <p>Read the footnote at bottom of slide.</p>	–
36	<p>What leads to SSI?</p>  <ul style="list-style-type: none"> • Lack of understanding of the problem (frequency and burden) • Lack of adherence to safe processes • Lack of a safety culture • Lack of awareness of what the safe processes are (effective SSI preventive measures) 	<p>Use this slide with animation, showing only the title first.</p> <p>Say:</p> <p>“It has been recognized that all these statements reflect the problems with SSI around the globe.</p> <p>Now take a few minutes to note down your own thoughts on what leads to SSI by finding concrete examples in the context of these four main points.”</p> <p>Allow 10 minutes for discussion in small groups. Then show the key points in the slide and read them. Ask what different aspects were identified in the groups. Allow 5 minutes for this feedback.</p>	–




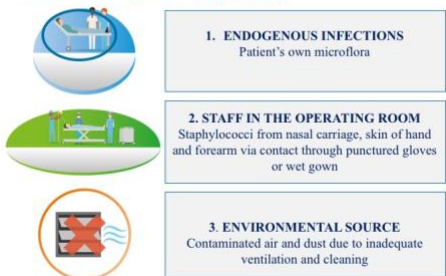


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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>Say:</p> <p>“We have talked about the importance of understanding the burden, and later we will talk about how a safety culture plays a role in improvement. The next slides outline the evidence regarding safe processes so that we can all aim for consistent practices known to prevent SSI.”</p>	
37	<p>World Health Organization logo</p> <p>WHAT ARE THE KNOWN RISK FACTORS FOR SSI?</p> <p>Interactive question icon</p>	<p>Ask the question on the slide</p> <p>Say:</p> <p>“Shout out what you think the risk factors are: let’s see how many we can list together. They can be patient-related or factors related to what happens during the surgical journey.”</p> <p>Allow 10 minutes in total.</p>	—
38	<p>World Health Organization logo</p> <p>Overall risk factors for SSI</p> <p>Patient-related</p> <ul style="list-style-type: none"> • increasing age • diabetes • obesity • smoking • immunosuppressive drugs (corticosteroids) • <i>Staphylococcus aureus</i> carriage (nasal or other) • distant infection focus • malnutrition <p>Preoperative</p> <ul style="list-style-type: none"> • preoperative length of stay • antibiotic prophylaxis • hair removal technique <p>Operative</p> <ul style="list-style-type: none"> • wound classification • operative technique, degree of tissue trauma • prolonged duration of surgery • traffic intensity in the operating room • presence of foreign body • need for blood transfusion <p>Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016. http://www.who.int/infection_prevention/publications/sis_prevention_publication/en</p> <p>Assess icon</p>	<p>Say:</p> <p>“Here are the main patient-related and health care-related factors from the literature.”</p> <p>Read (or ask someone to read) the slide. Be sure to indicate those answers that were and were not given by participants.</p> <p>Ask whether any risk factors are surprising or unclear.</p> <p>Allow 10 minutes in total for this slide.</p>	—
39	<p>World Health Organization logo</p> <p>Assessment of SSI risk</p> <p>Infection risk lower</p> <p>Intact skin</p> <p>Intact mucous membrane</p> <p>BROKEN</p> <p>RISK</p> <p>Broken skin or mucous membrane</p> <p>Foreign body implant (fully enclosed)</p> <p>Foreign body from outside to inside body</p> <p>Infection risk increases</p> <p>Assess icon</p>	<p>Say:</p> <p>“This pyramid makes sense when we note that we are breaching the skin for a surgical procedure and consider the varying degrees of risk this presents.</p> <p>Infection risk is lower when skin is intact; risk increases when skin is broken, when a foreign body is implanted (but fully enclosed) and</p>	—



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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		when a foreign body goes from outside to inside the patient's body."	
40		Say: "The third session of this module addresses SSI prevention measures. Having considered the risk factors, this will help us move on to focus on the WHO global guidelines for the prevention of SSI."	–
41		Read the slide.	–
42		Read the slide. Pose the question to all participants and discuss briefly. Allow 5 minutes in total and then move to the next slide with answers.	–






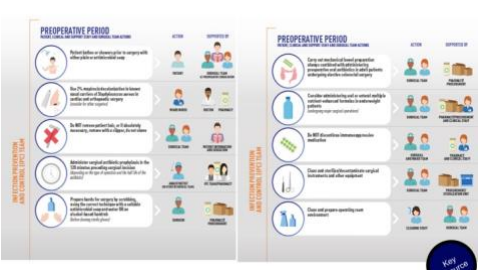
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
43	<p>Summary: how an SSI can occur</p>  <ul style="list-style-type: none"> Source of pathogens: <ul style="list-style-type: none"> endogenous flora on the patient's skin, mucous membranes and hollow viscera exogenous organisms (air in the operating room, surgical equipment, implants, gloves/hands, medications administered during operative procedure) – including various pathogens Routes of entry: <ul style="list-style-type: none"> hands, equipment, intravenous, air, ways of controlling the whole surgical patient environment/experience (skin preparation, including hair removal, intraoperative temperature) We can protect surgical patients from endogenous and exogenous organisms. <p><small>Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016 (http://www.who.int/infection-prevention/publications/sip-prevention-guidelines)</small></p> 	<p>State that the sources of pathogens come from patients themselves and from external sources.</p> <p>Read the slide.</p> <p>Say:</p> <p>“It is clear, therefore, that how we manage the patient and the whole surgical environment is critical to preventing entry of potential pathogens to the surgical site.</p> <p>By taking certain actions we can protect our patients, as described in the next part of this session.”</p> <p>Note: prompt attendees to read more on routes of entry/microbiology, as it is not covered in detail in this session.</p>	<p>Refer to handout 8 in the student handbook, p. 19.</p>
44	<p>Sources of SSI in the operating room environment specifically</p>  	<p>Say:</p> <p>“When thinking about the operating room in particular, we can visualize where endogenous and exogenous flora will arise.”</p> <p>Read the slide.</p>	<p>–</p>
45	 <p>What are the most important measures to prevent SSI?</p> 	<p>Read the slide.</p> <p>Pose the question to all participants.</p> <p>Ask one participant to come to the flipchart and record what the others shout out.</p> <p>Take a few minutes to hear and note answers from the group, making sure everyone has a chance to speak.</p> <p>Allow 15 minutes in total.</p> <p>Say:</p>	<p>Flipchart and pens</p>


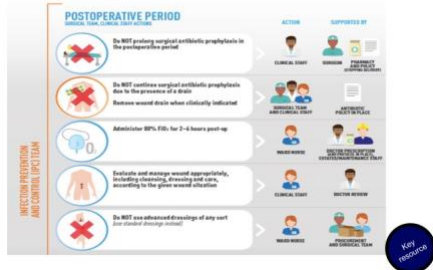

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		“The following slides explain all the WHO recommendations that are important to prevent SSI.”	
46	<p>One visual poster highlighting the most important measures for SSI prevention throughout the patient journey</p>  <p>Source: http://www.who.int/gpsc/ssi-infographic.pdf?ua=1</p>	<p>Say:</p> <p>“Let’s think about everything that happens on the surgical journey that requires safe processes, in detail.</p> <p>This can be a good summary visual representation for staff and patients alike to outline the most important SSI prevention measures that need to be applied at different crucial times during the surgical patient journey, although it does not include them all. Later slides will go through details of some of the measures included in the WHO recommendations.”</p>	<p>Refer to handout 7 in the student handbook, p. 17: http://www.who.int/gpsc/ssi-infographic.pdf?ua=1</p>
47	<p>WHO guidelines, 2016</p>  <p>Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016. (http://www.who.int/gpsc/ssi-prevention-publications/ssi-prevention-guidelines/en/)</p>	<p>Say:</p> <p>“This is the cover of the WHO global guidelines for the prevention of SSI, launched in 2016. Many of you may have reviewed these already. You can also see the two main publications taken from the systematic reviews behind the guidelines; these are also useful to present to your medical colleagues to engage them in the SSI prevention recommendations.</p> <p>The WHO guidelines provide the evidence for you to present to others confidently the key actions required to prevent SSI. There is enough evidence that you do not have to think about the required processes but just set them out, explain why they are important and then work on improvement. This is the information presented in the next sections.”</p>	<p>Refer to handout 9 in the student handbook, p. 20: http://www.who.int/gpsc/SSI-outline.pdf?ua=1</p> <p>Useful reading for the trainer in preparation for this session, in addition to the guidelines and papers indicated in the slide:</p> <p>Summaries of systematic reviews of the evidence supporting the recommendations: http://www.who.int/infection-prevention/publications/ssi-web-appendices/en/</p>





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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
48-49	<p>Methods for recommendation development (1)</p>  <p>Development of recommendations</p> <ul style="list-style-type: none"> Recommendations were developed according to the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach, based on scientific evidence and expert consensus/country experience. The decision-making process involved expert discussion about the evidence of effectiveness of the preventive measure, any harms it may cause, resource implications of implementation and views of patients and professionals. <p><small>Source: Global guidelines for the prevention of surgical site infection, Geneva: World Health Organization, 2016 (http://www.who.int/infection-prevention/publications/sis-prevention-guidelines/en/)</small></p> <p>Methods for recommendation development (2)</p>  <p>Strength of recommendations – two types</p> <ul style="list-style-type: none"> “Strong” – the expert panel was confident that benefits outweighed risks, that the measure was considered to be adaptable for implementation in most (if not all) situations and that patients should receive the intervention as standard. “Conditional” – the expert panel considered that the benefits of intervention probably outweighed the risks or that a more structured decision-making process should be undertaken, based on stakeholder consultation and involvement of patients and health care professionals. 	<p>Say:</p> <p>“This slide explains how the recommendations within the guidelines were developed. It is important to note that the topics were identified as key to the focus of expert consensus according to the available evidence.</p> <p>Recommendations can be in support of or against a specific measure. When there is sufficient evidence, experts agree to formulate a recommendation that can be strong or conditional. You can read more about this in the guidelines.”</p> <p>Read the slide.</p>	–
50	<p>WHO recommendations for SSI prevention (1)</p>  <p>DO THE RIGHT THING AT THE RIGHT TIME TO STOP SURGICAL SITE INFECTION</p>  <p><small>Source: http://www.who.int/infection-prevention/tools/surgical/infection-prevention</small></p>	<p>State that, thinking of the patient journey, the SSI prevention recommendations apply to three key periods: preoperative, intraoperative and postoperative. This visual poster includes all WHO recommendations for each period as well as what is NOT recommended.</p> <p>Note: if questions arise they may be deferred to the next slides as each will be explained in more detail.</p>	<p>Refer to handout 10 in the student handbook, p. 23: http://www.who.int/infection-prevention/tools/surgical/key-recommendations.jpg?ua=1</p>
51	<p>WHO recommendations for SSI prevention (2)</p>  <p>PREOPERATIVE PERIOD</p>  <p><small>Key resources</small></p>	<p>State that these are the preoperative recommendations summarized from the WHO guidelines.</p>	–




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
52	<p>WHO recommendations for SSI prevention (3)</p> 	<p>State that these are the intraoperative recommendations summarized from the WHO guidelines.</p> <p>Read the slide.</p>	—
53	<p>WHO recommendations for SSI prevention (4)</p> 	<p>State that these are the postoperative recommendations summarized from the WHO guidelines.</p> <p>Read the slide.</p> <p>Say:</p> <p>“The following slides give more detail on the recommendations for each period, outlining which are strong and which conditional.”</p>	—
54	<p>Strong recommendation – preoperative measures: treatment of <i>S. aureus</i> nasal carriers (1)</p>  <p>Patients undergoing cardiothoracic and orthopaedic surgery with known nasal carriage of <i>S. aureus</i> should receive perioperative intranasal applications of mupirocin 2% ointment with or without a combination of chlorhexidine gluconate (CHG) body wash.</p> <p>Consider treating patients with known nasal carriage of <i>S. aureus</i> undergoing other types of surgery with perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash (associated conditional recommendation).</p>	<p>Say:</p> <p>“Let us start by clearly describing the nine strong recommendations and why they are important, the problems caused if they are not adhered to and therefore what can be achieved by implementing them.</p> <p>The first is around treatment of <i>S. aureus</i> nasal carriers but is also linked to a conditional recommendation that is further described here.”</p> <p>Read the slide.</p>	<p>Refer to handout 9 in the student handbook, p. 20.</p> <p>http://www.who.int/infection-prevention/publications/ssi-guidelines/en/</p> <p>Refer to the WHO global guidelines for the prevention of SSI for further information, if required:</p> <p>http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
55	<p>Strong recommendation – preoperative measures: treatment of <i>S. aureus</i> nasal carriers (2)</p>  <p>Why</p> <ul style="list-style-type: none"> • <i>S. aureus</i> is a leading HAI pathogen worldwide. • <i>S. aureus</i> infections impose a high burden on the patient and the health system and are a known cause of postoperative wound infections. • Nasal carriage of <i>S. aureus</i> is a risk factor for subsequent infection in a patient. It has been shown repeatedly that a large proportion of HAIs due to <i>S. aureus</i> originate from patients' own flora. 	<p>Ask a student to read the slide.</p>	–
56	<p>Strong recommendation – preoperative measures: treatment of <i>S. aureus</i> nasal carriers (3)</p>  <p>Notes</p> <ul style="list-style-type: none"> • Screening of patients for <i>S. aureus</i> varies between and within countries and is dependent on several factors including cost–effectiveness and local epidemiology. • This recommendation only applies to facilities where screening (nasal swabs sent to a laboratory) for <i>S. aureus</i> is feasible, and may not apply to settings with high prevalence of mupirocin resistance. 	<p>Ask a student to read the slide.</p> <p>You may need to take time for questions, considering the challenges of screening for <i>S. aureus</i> within the local context. State that it is clear that it will be challenging if not impossible to implement this particular recommendation in some countries, but this should not detract from those recommendations that can and should be implemented.</p>	–
57	<p>Practical points</p> <ul style="list-style-type: none"> • This recommendation can be applicable to pre- and perioperative periods (depending on local conditions for treatment). • The application of mupirocin is usually twice a day for 5–7 days before surgery or from the day of hospital admission to the day of surgery. • Ensure that potential allergic reactions to mupirocin are investigated and recorded and patient communications and record keeping regarding this treatment occur.  <p>Source: https://www.who.int/publications/m/item/surgical-site-infection-prevention-and-control</p>	<p>Read the slide.</p> <p>Say:</p> <p>“This is additional information found while undertaking the reviews to inform the guidelines, but as noted, there are practical considerations and much will depend on the local context.”</p>	<p>Refer to handout 11 in the student handbook, p. 29:</p> <p>http://www.who.int/infection-prevention/tools/surgical/training_education/en/</p>
58	<p>Strong recommendation – preoperative measures: mechanical bowel preparation (MBP) and preoperative oral antibiotics</p>  <p>1. MBP alone (without administration of oral antibiotics) should not be used in adult patients undergoing elective colorectal surgery (strong recommendation).</p> <p>2. Preoperative oral antibiotics combined with MBP should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery (conditional recommendation).</p> <p>Why?</p> <ul style="list-style-type: none"> • Evidence (moderate quality) showed that preoperative MBP alone has neither benefit nor harm in reducing SSI rate when compared to performing no MBP. • Further evidence (moderate quality) showed that preoperative MBP combined with oral antibiotics reduced SSI when compared to MBP alone. 	<p>Say:</p> <p>“Let’s move on to the second strong recommendation.”</p> <p>Ask a student to read the slide.</p> <p>State that mechanical bowel preparation (MBP) refers to the preoperative administration of substances to induce voiding of the intestinal and colonic contents. Polyethylene glycol and/or sodium</p>	–



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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		phosphate were the agents of choice for MBP in most studies.	
59	<p>Practical points</p>  <ul style="list-style-type: none"> This recommendation applies only to the preoperative period and should not be referred to as "selective digestive decontamination". Local considerations may determine variations in decisions about the type of MBP regimen and oral antibiotics, and the drug of choice for intravenous antibiotic prophylaxis (availability, resistance data and volume of surgical activity). The combination of drugs used should guarantee activity against both facultative gram-negative and anaerobic bacteria. In most studies, oral aminoglycosides were combined with metronidazole or erythromycin. 	<p>Read the slide.</p> <p>If necessary, say:</p> <p>"You may or may not know about such treatments, including selective digestive decontamination, but it is important to focus this recommendation on MBP related to colorectal surgery."</p>	–
60	<p>Strong recommendations – preoperative measures: hair removal</p>  <p>In patients undergoing any surgical procedure, hair should either <i>not</i> be removed or, if <i>absolutely necessary</i>, should only be removed with clippers. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room.</p> <p>Why?</p> <ul style="list-style-type: none"> Removal of hair by any method has no benefit on the incidence of postoperative infection compared to no hair removal. The incidence of SSI is higher when hair removal is performed by razor than by clippers because shaving causes small abrasions to the skin. Most studies support that hair removal, if any, should be done immediately before operation. Note: the evidence showed that use of depilatory creams has no benefit (no lower SSI risk) compared with shaving; in addition, these sometimes produce hypersensitivity reactions. WHO does not recommend their use. 	<p>Ask a student to read the slide.</p>	–
61	<p>Practical points</p>  <ul style="list-style-type: none"> It has been noted that, when hair absolutely must be removed (when presence of hair will interfere with the operation), a single-use head should be used for electric clippers. Women may prefer shaving the genital area before surgery and may even come to the hospital already shaved because of cultural norms – this is something that should be avoided and should be addressed in training and education targeted at patients. 	<p>Ask another student to read this slide.</p> <p>If time permits, invite open discussion about practical aspects (10 minutes maximum) – do not aim to answer discussion points but state that implementation challenges will be covered in upcoming sessions.</p>	<p>Refer to handout 12 in the student handbook, p. 32:</p> <p>http://www.who.int/infection-prevention/tools/surgical/training_education/en/</p>





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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
62	<p>Strong recommendations – preoperative measures: Surgical antibiotic prophylaxis (SAP) timing (1)</p>  <p>SAP should be administered before the surgical incision, when indicated.</p> <p>SAP should be administered within 120 minutes before incision, while considering the half-life of the antibiotic.</p> <p>Why?</p> <ul style="list-style-type: none"> Correct preoperative administration timing to achieve adequate concentration of drug at the site of incision at the beginning of the operation (highest risk of surgical site contamination) is critical. Incorrect (before 120 minutes or after incision) timing can lead to an increased risk of SSI. Correct antibiotic type according to the procedure and patient history aims to destroy the bacteria most frequently found at the operation site and to be safe for the patient. 	<p>Read the slide.</p> <p>Say:</p> <p>“We will return to the role of the SSI recommendations in the AMR agenda in later slides.”</p>	–
63	<p>Strong recommendations – preoperative measures: SAP timing (2)</p>  <p>Notes</p> <ul style="list-style-type: none"> Correct dosage is important to have the right antibiotic concentration at the operation site throughout the entire operation. Correct use of SAP is important not only to prevent SSI but also to avoid emergence of antimicrobial-resistant pathogens that can cause more serious disease to the patient. 	<p>Ask a student to read the slide.</p>	–
64	<p>Practical points</p>  <ul style="list-style-type: none"> Half-life of antibiotics may affect serum and tissue concentrations – half-life of administered antibiotics should be taken into account in order to establish the exact time of administration within the 120-minute recommendation. Antibiotics with a short half-life (e.g. cefazolin, cefoxitin and penicillins in general) should be administered closer to the incision time (<60 minutes). Underlying factors in patients may also affect drug disposition (e.g. malnourishment, obesity, cachexia or renal disease with protein loss may result in suboptimal antibiotic exposure through increased antibiotic clearance in the presence of normal or augmented renal function). An example of surgery not requiring SAP is clean orthopaedic surgery not involving implantation of foreign materials. There are recommendations about redosing if a procedure exceeds two half-lives of the drug or if there is excessive blood loss, but not enough evidence is available to make this confirmed protocols. 	<p>Say:</p> <p>“It is important for you to be aware of these practical points.”</p> <p>(Read slide if time allows.)</p> <p>Say:</p> <p>“This information from the guidelines is important for local policies and prescribing. You may not be directly involved in this, but as an IPC leader, you should ensure that microbiology and pharmacy expertise – where available – is engaged in surgical antibiotic prophylaxis (SAP) decision-making and prescribing.”</p>	–




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
65	<p>Strong recommendations – preoperative measures: surgical hand preparation</p>  <p>Surgical hand preparation should be performed by either scrubbing with a suitable antimicrobial soap and water or using a suitable alcohol-based handrub (ABHR) before donning sterile gloves.</p> <p>Why?</p> <ul style="list-style-type: none"> • It is vitally important to maintain the lowest possible contamination of the surgical field (even when sterile gloves are worn – glove punctures can occur). Hand preparation should reduce the release of skin bacteria from the hands to the open wound. • Surgical hand preparation should eliminate transient flora and reduce resident flora. • Moderate-quality evidence shows the equivalence of ABHR and use of antimicrobial soap and water. • Note: the hands of the surgical team should be clean upon entering the operating room. 	<p>Ask a student to read the slide.</p>	–
66	<p>Practical points</p>  <ul style="list-style-type: none"> • Once in the operating area, repeating handrubbing or scrubbing without an additional prior handwash is recommended before switching to the next procedure. • Surgical handscrub and surgical handrub with an alcohol-based product should not be combined sequentially. • Alcohol-based handrubs can be produced locally (more on this later). • The use of alcohol on patients or health workers who for religious reasons may object has been addressed in the WHO guidelines on hand hygiene in health care, with cultural and religious leaders providing supporting statements to overcome barriers. • Skin irritation can happen and health facilities should be alert to deal with such situations. • There is more on practical support for implementation of this recommendation later in this module. <p><small>Source: WHO guidelines on hand hygiene in health care, Geneva: World Health Organization, 2009 (http://www.who.int/infection_prevention_control/collections)</small></p>	<p>Ask another student to read this slide.</p> <p>Be sure to clarify that:</p> <ul style="list-style-type: none"> • surgical hand preparation refers to an antiseptic handwash or antiseptic handrub performed preoperatively by the surgical team to eliminate transient flora and reduce resident skin flora – such antiseptics often have persistent antimicrobial activity; • surgical handrub(bing) refers to surgical hand preparation with a waterless alcohol-based handrub; • surgical handscrub(bing)/presurgical scrub refers to surgical hand preparation with antimicrobial soap and water. <p>More information is available in the WHO guidelines on hand hygiene in health care: refer to your student handbook for a number of tools that support the hand hygiene guidelines and we will return to some when discussing how to improve SSI prevention practices.</p>	<p>WHO guidelines on hand hygiene in health care:</p> <p>http://apps.who.int/iris/bitstream/10665/70126/1/WHO_IER_PSP_2009.07_eng.pdf?ua=1</p>

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
67	<p>Strong recommendations – preoperative measures: surgical site skin preparation</p>  <p>Alcohol-based antiseptic solutions based on CHG for surgical site skin preparation should be used in patients undergoing surgical procedures.</p> <p>Why?</p> <ul style="list-style-type: none"> • This measure reduces the microbial load on the patient's skin as much as possible before incision. • Alcohol-based CHG is more effective in reducing SSI rates compared to alcohol-based povidone-iodine. • Notes: intact skin prep should be done prior to incision in the operating room. This recommendation is not proven for paediatric patients. 	Read the slide.	–
68	<p>Practical points</p>  <ul style="list-style-type: none"> • Alcohol-based solutions should not be in contact with mucosa or eyes and should not be used on newborns. • Ensure operating and ward staff are aware that CHG can cause skin irritation. • The use of alcohol on patients or health workers who for religious reasons may object has been addressed in the WHO guidelines on hand hygiene in health care, with cultural and religious leaders providing supporting statements to overcome barriers. • Alcohol/CHG-based skin preparation solutions can be produced locally if needed (more on this later). <p>In the operating room:</p> <ul style="list-style-type: none"> • ensure correct placement of patient (to avoid movement after skin prep but considering areas of skin that might be prone to breaking down due to the pressure of being in one position for too long) and skin examine; • protect health workers against splashing – gloves should be worn but changed once the skin prep is complete; • ensure skin preparation is not removed/washed off before draping. 	<p>Read the slide.</p> <p>You may need to take time for discussion, considering any practical challenges with the use of alcohol-based chlorhexidine gluconate (CHG) for skin preparation.</p> <p>State that in some countries this recommendation might be challenging at this stage but this should not detract from those recommendations that can and should be implemented.</p>	–
69	<p>Surgical skin preparation in practice: key resources</p>  <p>How to perform</p> <p>PREOPERATIVE SURGICAL SITE SKIN PREPARATION</p> <p>An educational video produced by the World Health Organization</p>  <p>Source: http://www.who.int/infection-prevention/tools/surgical-training-education/en/</p>	<p>Say:</p> <p>“Now we can watch the steps that lead to successful skin preparation.”</p> <p>Play the video from the link provided (6 minutes).</p>	<p>Refer to handout 13 in student handbook, p. 35:</p> <p>http://apps.who.int/iris/bitstream/10665/70126/1/WHO_IER_P_SP_2009.07_eng.pdf?ua=1</p> <p>Video:</p> <p>https://www.youtube.com/watch?v=9E1t7AHW3i8&feature=youtu.be</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
70	<p>Strong recommendations – intra- and postoperative measures: SAP prolongation</p>  <p>SAP administration should <i>not</i> be prolonged after completion of the operation. Why?</p> <ul style="list-style-type: none"> Moderate-quality evidence shows that prolonged SAP postoperatively has no benefit in reducing SSI after surgery compared to a single (preoperative) dose. Discontinuation of SAP after surgery avoids unnecessary extra costs, potential side-effects and <u>emergence of AMR</u>. 	<p>Say:</p> <p>“Here is a strong recommendation that tells people how NOT to act.”</p> <p>Read the slide.</p>	–
71	<p>Practical points</p>  <ul style="list-style-type: none"> This recommendation is applicable to the peri- and postoperative periods. A relevant harm linked to SAP prolongation is the intestinal spread of <i>Clostridium difficile</i>, with higher risk of clinical manifestation of infection. It can be challenging to ensure SAP is not continued or confused with the need for antibiotics due to an infection. 	<p>Read the slide.</p> <p>Say:</p> <p>“Let’s take a few moments to reflect on these nine strong recommendations.</p> <p>Considering this last one, do you think it is more challenging to get someone to add a task to their routine practice or to remove one?</p> <p>Does SAP prolongation occur in your facility?</p> <p>By now, many points will have occurred to you about how difficult it might be to implement these strong recommendations in your setting. So far we have described them, and you have the summary in your handout, but we will move on to discuss how they can be implemented and who needs to be involved.”</p>	<p>Refer to handout 10 in the student handbook, p. 23. http://www.who.int/infection-prevention/tools/surgical/reminders-advocacy/en/</p>
72	<p>WHO conditional recommendations for SSI prevention</p>  <p>Conditional recommendations are also important recommendations for which the expert panel considered that the benefits of intervention probably outweighs the risks; however, when considering them for adoption, a more structured decision-making process should be undertaken, based on stakeholder consultation and involvement of patients and health care professionals.</p> <p>This involves considering local priorities for improvement, feasibility, resource (both human and financial) implications and local culture.</p>	<p>Say:</p> <p>“Let’s now take a new more minutes to consider the conditional recommendations within the WHO global guidelines for the prevention of SSI. These are important too, and you should consider them in your improvement plans. Some cover best practice principles, such as patient bathing before the intervention; they are conditional only because not many</p>	<p>Refer to handouts 9, 11-13 in the student handbook, p. 20, 29, 32 and 35.</p>





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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>studies have proved their effectiveness.</p> <p>Others might be challenging within your local context, but let's think for a minute about these. Some say that an action is NOT recommended. These are important and can save resources, but it is still a challenge to get people to change what might be embedded practices.”</p> <p>If time allows, read the recommendations in the next slides, highlighting some that might be particularly important in your local setting.</p>	








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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer																																								
73-75	<p>WHO conditional recommendations for SSI prevention – preoperative period (1)</p>  <table border="1"> <thead> <tr> <th>Topic</th><th>Research question</th><th>Recommendation</th><th>Strength Quality</th></tr> </thead> <tbody> <tr> <td>Perioperative discontinuation of immunosuppressive agents</td><td>Should immunosuppressive agents be discontinued perioperatively and does this affect the incidence of SSI?</td><td>Immunosuppressive medication should not be discontinued prior to surgery for the purpose of preventing SSI.</td><td>Conditional recommendation Very low quality of evidence</td></tr> <tr> <td>Enhanced nutritional support</td><td>In surgical patients, should enhanced nutritional support be used for the prevention of SSI?</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><td>Conditional recommendation Very low quality of evidence</td></tr> <tr> <td>Preoperative bathing</td><td>1. Is preoperative bathing using an antiseptic soap more effective in reducing the incidence of SSI in surgical patients when compared to bathing with plain soap? 2. Is preoperative bathing with CHG-impregnated cloths more effective in reducing the incidence of SSI in surgical patients when compared to bathing with antiseptic soap?</td><td>It is a 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. Due to very low quality evidence, the panel decided not to formulate a recommendation the use of CHG-impregnated cloths for the purpose of reducing SSI.</td><td>Conditional recommendation Moderate quality of evidence</td></tr> </tbody> </table> <p>Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016 https://www.who.int/publications-detail/global-guidelines-for-the-prevention-of-surgical-site-infection</p> <p>WHO conditional recommendations for SSI prevention – preoperative period (2)</p>  <table border="1"> <thead> <tr> <th>Topic</th><th>Research question</th><th>Recommendation</th><th>Strength Quality</th></tr> </thead> <tbody> <tr> <td>Decolonisation with mupirocin ointment with or without CHG body wash for the prevention of S. aureus infection in nasal carriers undergoing surgery</td><td>Is mupirocin nasal ointment in combination with or without a CHG body wash effective in reducing the number of S. aureus infections in nasal carriers undergoing surgery?</td><td>Patients undergoing cardiothoracic and orthopaedic surgery with known nasal carriage of S. aureus should receive perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash. Consider also 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.</td><td>Strong recommendation Moderate quality of evidence</td></tr> <tr> <td>MBP and the use of oral antibiotics</td><td>Is MBP combined with or without oral antibiotics effective for the prevention of SSI in colorectal surgery?</td><td>Preoperative oral antibiotics combined with MBP should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery. MBP alone (without the administration of oral antibiotics) should not be used for the purpose of reducing SSI in adult patients undergoing elective colorectal surgery.</td><td>Conditional recommendation Moderate quality of evidence Strong recommendation Moderate quality of evidence</td></tr> </tbody> </table> <p>WHO conditional recommendations for SSI prevention – preoperative period (3)</p>  <table border="1"> <thead> <tr> <th>Topic</th><th>Research question</th><th>Recommendation</th><th>Strength Quality</th></tr> </thead> <tbody> <tr> <td>Antimicrobial skin sealants</td><td>In surgical patients, should antimicrobial sealants (in addition to standard surgical site skin preparation) versus standard surgical site skin preparation be used for the prevention of SSI?</td><td>Antimicrobial sealants should not be used after surgical site skin preparation for the purpose of reducing SSI.</td><td>Conditional recommendation Very low quality of evidence</td></tr> <tr> <td>Perioperative oxygenation</td><td>How safe and effective is the perioperative use of an increased fraction of inspired oxygen in reducing the risk of SSI?</td><td>The panel recommends that adult patients undergoing general anaesthesia with endotracheal intubation for surgical procedures should receive an 80% fraction of inspired oxygen intraoperatively and, if feasible, in the immediate postoperative period for 2-6 hours to reduce the risk of SSI.</td><td>Conditional recommendation Moderate quality of evidence</td></tr> </tbody> </table>	Topic	Research question	Recommendation	Strength Quality	Perioperative discontinuation of immunosuppressive agents	Should immunosuppressive agents be discontinued perioperatively and does this affect the incidence of SSI?	Immunosuppressive medication should not be discontinued prior to surgery for the purpose of preventing SSI.	Conditional recommendation Very low quality of evidence	Enhanced nutritional support	In surgical patients, should enhanced nutritional support be used for the prevention of SSI?	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.	Conditional recommendation Very low quality of evidence	Preoperative bathing	1. Is preoperative bathing using an antiseptic soap more effective in reducing the incidence of SSI in surgical patients when compared to bathing with plain soap? 2. Is preoperative bathing with CHG-impregnated cloths more effective in reducing the incidence of SSI in surgical patients when compared to bathing with antiseptic soap?	It is a 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. Due to very low quality evidence, the panel decided not to formulate a recommendation the use of CHG-impregnated cloths for the purpose of reducing SSI.	Conditional recommendation Moderate quality of evidence	Topic	Research question	Recommendation	Strength Quality	Decolonisation with mupirocin ointment with or without CHG body wash for the prevention of S. aureus infection in nasal carriers undergoing surgery	Is mupirocin nasal ointment in combination with or without a CHG body wash effective in reducing the number of S. aureus infections in nasal carriers undergoing surgery?	Patients undergoing cardiothoracic and orthopaedic surgery with known nasal carriage of S. aureus should receive perioperative intranasal applications of mupirocin 2% ointment with or without a combination of CHG body wash. Consider also 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.	Strong recommendation Moderate quality of evidence	MBP and the use of oral antibiotics	Is MBP combined with or without oral antibiotics effective for the prevention of SSI in colorectal surgery?	Preoperative oral antibiotics combined with MBP should be used to reduce the risk of SSI in adult patients undergoing elective colorectal surgery. MBP alone (without the administration of oral antibiotics) should not be used for the purpose of reducing SSI in adult patients undergoing elective colorectal surgery.	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Conditional recommendation Moderate quality of evidence	<p>Read the slides, focusing on the topic in question (first column) and the recommendation that resulted (third column).</p> <p>Do not re-read the strong recommendations.</p> <p>Say:</p> <p>“It is important to highlight the bathing before surgery recommendation in particular, although recorded in the guidelines as ‘conditional’ owing to limited available evidence, we can all agree that it is an important action.”</p>	–
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Perioperative discontinuation of immunosuppressive agents	Should immunosuppressive agents be discontinued perioperatively and does this affect the incidence of SSI?	Immunosuppressive medication should not be discontinued prior to surgery for the purpose of preventing SSI.	Conditional recommendation Very low quality of evidence																																								
Enhanced nutritional support	In surgical patients, should enhanced nutritional support be used for the prevention of SSI?	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.	Conditional recommendation Very low quality of evidence																																								
Preoperative bathing	1. Is preoperative bathing using an antiseptic soap more effective in reducing the incidence of SSI in surgical patients when compared to bathing with plain soap? 2. Is preoperative bathing with CHG-impregnated cloths more effective in reducing the incidence of SSI in surgical patients when compared to bathing with antiseptic soap?	It is a 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. Due to very low quality evidence, the panel decided not to formulate a recommendation the use of CHG-impregnated cloths for the purpose of reducing SSI.	Conditional recommendation Moderate quality of evidence																																								
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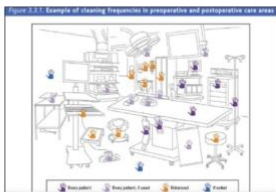

Advanced Infection Prevention and Control Training

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Is natural ventilation an acceptable alternative to mechanical ventilation?</td><td>Laminar airflow ventilation systems should not be used to reduce the risk of SSI for patients undergoing total arthroplasty surgery.</td><td>Conditional recommendation Low to very low quality of evidence</td></tr> </tbody> </table>	Topic	Research question	Recommendation	Strength Quality	Maintaining normal body temperature (normothermia)	In surgical patients, should systemic body warming versus no warming be used for the prevention of SSI?	Warming devices should be used in the operating room and during the surgical procedure for patient body warming with the purpose of reducing SSI.	Conditional recommendation Moderate quality of evidence	Use of protocols for intensive perioperative blood glucose control	1. Do protocols aiming to maintain optimal perioperative blood glucose levels reduce the risk of SSI? 2. What are the optimal perioperative glucose target levels in diabetic and non-diabetic patients?	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81	<p>Four recommendations specifically focus on improving antibiotic use in surgery and contribute to reducing AMR</p>  <p>1. Optimal timing for SAP</p> <ul style="list-style-type: none"> • Intravenous 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). <p>Recommendations are against:</p> <ol style="list-style-type: none"> 2. Antibiotic wound irrigation 3. Antibiotic prophylaxis in presence of a drain 4. SAP prolongation in the postoperative period  <p>This is important in relation to the WHO global action plan on AMR.</p> <p>Source: Global action plan on antimicrobial resistance. Geneva: World Health Organization; 2015 (http://www.who.int/antimicrobial-resistance/global-action-plan/)</p>	<p>This slide aims to highlight how adopting and successfully implementing SSI recommendations in part address the AMR agenda.</p> <p>Say:</p> <p>“Given that AMR is a global problem that needs input from everyone at all levels both to save antibiotics and to stop their misuse, it is important that you explain to colleagues how four of the SSI recommendations specifically aim to improve antibiotic use and reduce antibiotic resistance in surgical services.”</p> <p>Read the slide or ask a participant to read it.</p>	–												
82	<p>Sterilization and decontamination recommendations as part of SSI prevention</p>  <ul style="list-style-type: none"> • 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  <p>Source: Decontamination and reprocessing of medical devices in health-care facilities. Geneva: World Health Organization; 2016 (http://www.who.int/infection-prevention/publications/decontamination/en/)</p> 	<p>Say:</p> <p>“This complementary document was issued by WHO in 2016 and was written by experts in the field. It was specifically supported by colleagues with experience in LMICs so that it would explain decontamination in a way that could apply to many different settings. A chapter on this topic is also included in the WHO global guidelines for the prevention of SSI.”</p> <p>State that the slide lists the document’s main topics.</p> <p>Read the slide.</p>	<p>Decontamination and reprocessing of medical devices in health-care facilities:</p> <p>http://www.who.int/infection-prevention/publications/decontamination/en/</p> <p>Flipchart and pens</p>												





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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>Say:</p> <p>“As part of your SSI prevention plans, ensure that you read the content and address any decontamination needs that might affect a safe surgical patient journey.”</p> <p>If there are any questions, use flipchart and pen to note items for discussion or follow-up later to ensure this discussion does not distract from the main discussion in this module.</p>	
83	<p>Environmental cleaning in operating rooms</p> <p>General principles for environmental cleaning and cleaning requirements for various surface types in operating rooms</p>  <p>Source: Global guidelines for the prevention of surgical site infection, Geneva: World Health Organization, 2016 (http://apps.who.int/ris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1)</p>	<p>State that some key points on a clean operating room environment and decontamination of medical devices and surgical instruments are also included in the WHO SSI guidelines.</p>	<p>WHO global guidelines for the prevention of SSI: http://apps.who.int/ris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1</p>
84	<p>Basic principles of environmental cleaning</p> <ul style="list-style-type: none"> • Provide training to cleaning staff. • Appropriate personal protective equipment (PPE) must be worn. • Special emphasis should be placed on hand touch surfaces. • Always start with: <ul style="list-style-type: none"> – the cleanest areas first → the dirtiest last; – the top first → the bottom last. • Discard items that cannot be decontaminated effectively. <p>Note: if an item is torn, it will not be possible to decontaminate it effectively, so discard it or find a way to resolve the problem (e.g. cover the bed with a plastic sheet until a replacement is found).</p> 	<p>Say:</p> <p>“The key principles to ensure the right environmental cleaning are as follows: think about whether you know if this is achieved in your facility and consider the principles when back in your own workplace.”</p> <p>Read the slide.</p> <p>Note: do not take questions at this time: just pose this point for reflection.</p>	–









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85	<p>Cleaning, decontamination and disinfection requirements for surfaces in clinical (including surgical) areas</p>  <table border="1"><thead><tr><th>SURFACE TYPE</th><th>DEFINITION</th><th>CLEANING REQUIREMENT</th></tr></thead><tbody><tr><td>High hand touch surface</td><td>Any surface with frequent contact with hands</td><td>Requires special attention and more frequent cleaning. After thorough cleaning with detergent, use of appropriate disinfectants to decontaminate these surfaces</td></tr><tr><td>Minimal touch surface (floors, walls, ceilings, window sills, etc.)</td><td>Any surface with minimal contact with hands. Not in close contact with the patient or his/her immediate surroundings</td><td>Requires cleaning on a regular basis with detergent only, or when soiling or spills occur</td></tr></tbody></table>	SURFACE TYPE	DEFINITION	CLEANING REQUIREMENT	High hand touch surface	Any surface with frequent contact with hands	Requires special attention and more frequent cleaning. After thorough cleaning with detergent, use of appropriate disinfectants to decontaminate these surfaces	Minimal touch surface (floors, walls, ceilings, window sills, etc.)	Any surface with minimal contact with hands. Not in close contact with the patient or his/her immediate surroundings	Requires cleaning on a regular basis with detergent only, or when soiling or spills occur	<p>Say:</p> <p>“Here are some examples of the requirements for cleaning, decontamination and disinfection for surfaces of areas where surgical patients are cared for”</p> <p>Read the slide.</p>	—
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86	<p>Surfaces contaminated with blood and body fluids</p>  <ul style="list-style-type: none">Wear appropriate personal protective equipment.Contain spills using absorbent material (cloth, paper etc.) and remove as soon as possible.Clean with detergent and then disinfect the surface.Dispose of materials into dedicated medical waste containers.  	<p>Say:</p> <p>“This information is also relevant and useful to be aware to ensure the environment is safe in surgical areas.</p> <p>This module does not cover use of personal protective equipment (PPE) for cleaning, but it is obviously important and more information can be found in the decontamination document mentioned earlier.”</p> <p>Read the slide.</p> <p>If there are any questions, use flipchart and pen to note items for later discussion or follow-up after the module to ensure the discussion does not distract from the main discussion in this module.</p>	Flipchart and pens									
87	<p>Decontamination and sterilization of operating room equipment principles</p>  <ul style="list-style-type: none">The decontamination facility should have standard operating procedures including on decontamination of surgical instruments<ul style="list-style-type: none">The role of the surgical team in decontamination and sterilization should also be outlined <div><p>Box 3.3.2. Recommendations related to the soaking of instruments in disinfectant prior to cleaning</p><p>Do not soak instruments in disinfectant prior to cleaning. Soaking instruments in 0.5% hypochlorite solution or any other disinfectant before cleaning is not recommended for the following reasons:</p><ul style="list-style-type: none">It may damage/corrode the instruments.The disinfectant may be inactivated by blood and body fluids, which could become a source of microbial contamination and formation of biofilm.Transportation of contaminated items soaked in chemical disinfectant to the decontamination area may pose a risk to health care workers and result in inappropriate handling and accidental damage.Soaking may contribute to the development of antimicrobial resistance to disinfectants.</div> <p>For more information on this topic, please refer to the “Decontamination and sterilization” training module.</p> <p><small>Source: Decontamination and reprocessing of medical devices in health-care facilities, Geneva: World Health Organization; 2016. http://www.who.int/infection-prevention/publications/decontamination/en/</small></p> 	<p>State that as well as information on decontamination and the important role that the whole surgical team plays in ensuring safe practices when working within the environment and with instruments, this is further useful information to present to clinical colleagues about the safe handling of instruments (CAN READ SLIDE)</p>	<p>Refer to handout 9 in the student handbook, p. 20.</p> <p>http://www.who.int/infection-prevention/publications/ssi-guidelines/en/</p>									


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88	<p>Group work 2. Resource considerations</p>  <ul style="list-style-type: none"> Lack of availability or cost of, for example, mupirocin, antimicrobial soap, ABHR, CHG, SAP and oxygen may create procurement issues and a financial burden, including on patients. Technical laboratory capacity and other facility infrastructure (such as water or sterilization services) may not be available. Workload and organizational commitment are required – for example, related to MBP and oxygenation and the required written procedures/instructions. Staff training and specific expertise (e.g. on increased oxygenation, glucose control) are needed. Importantly, some recommendations have no added cost or burden – for example, avoiding hair removal. Local production of many resources is possible and often a low-cost option. Note: some costs of SSI prevention will still be lower than not undertaking the recommended interventions and dealing with the subsequent consequences, including SSI. <p><small>Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016. http://apps.who.int/iris/bitstream/handle/10665/250680/1/9789241549882-eng.pdf?ua=1</small></p> 	<p>Say:</p> <p>“Take a few moments to discuss with those next to you the resource implications these recommendations present to you. The slide contains some examples for you to talk about, but try to think of others as well.</p> <p>Also, think how you might balance cost-setting across different areas to help those that need further resources. Be ready to shout out your thoughts to be recorded – this is intended to prepare you for a similar activity in your own settings.”</p> <p>Ask someone to come to the front and record answers on the flipchart. Try to make sure everyone gets a chance to speak.</p> <p>Allow 15 minutes in total.</p> <p>After feedback, say:</p> <p>“The WHO guidelines highlight resource considerations, including those for LMICs; however, to emphasize again...”</p> <p>Read the last two bullet points.</p> <p>Say:</p> <p>“We will discuss how to address resource availability as part of the overall improvement process later on.”</p>	<p>Flipchart and pens</p> <p>Refer students to group work 2 - student handbook, p. 38.</p> <p>WHO global guidelines for the prevention of SSI http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1</p>
89	<p>WHO advice for wound management</p>  <p>Recommendation The panel suggests not using any type of advanced dressing over a standard dressing on primarily closed surgical wounds for the purpose of preventing SSI. (Conditional recommendation/low quality of evidence)</p> <p>Rationale for the recommendation Advanced dressings used in the included studies were of the following types: hydrocolloid, hydroactive, silver-containing (metallic or ionic), and polyhexamethylene biguanide (PHMB) dressings. Standard dressings were dry absorbent dressings.</p> <p>Key additional considerations for post-operative wounds</p> <p><small>Avoid unnecessary handling of the post-operative wound site, including by the patient. Wear gloves if contact with body fluids is anticipated, the need for hand hygiene does not change even if gloves are worn, as per the WHO's 5 Moments. Follow local procedures regarding use of aseptic non-touch technique for any required dressing changes/wound procedures. Don't touch dressings for at least 48 hours after surgery, unless leakage or other complication occur. Routine post-operative wound dressings should be basic dressing types (e.g. absorbent or low-adherence dressings). When approaching a patient for the examination of a wound, the health worker may also perform other tasks (e.g. assessing a venous catheter, drawing blood samples, checking urinary catheter). Hand hygiene may be needed before and after these specific tasks, to once again fulfil Moments 2 and 5, for example (refer to WHO's dedicated 5 Moments posters for time or cabinet management). When indicated, pre-operative surgical antibiotic prophylaxis (SAP) should be administered as a single preoperative dose 2 hours or less before the surgical incision, while considering the half-life of the antibiotic. Do not prolong administration of SAP after completion of the operation. Antibiotic therapy for any proven surgical site infection should ideally be administered based on wound sample culture and sensitivity results. Common signs and symptoms of wound infection are pain or tenderness, localized swelling, erythema, heat, or purulent drainage from the wound site. This guideline does not include information on complicated post-operative wound care, when specific treatments or therapies may be required.</small></p> <p><small>Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016. http://apps.who.int/iris/bitstream/handle/10665/250680/1/9789241549882-eng.pdf?ua=1</small></p>  <p>SAVE LIVES CLEAN YOUR HANDS</p>	<p>State that the SSI guidelines cover what type of dressings are recommended – in particular, advanced wound dressings that should not be used over standard dressings</p> <p>Read the slide.</p>	<p>WHO global guidelines for the prevention of SSI: http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1</p>





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90	<p>Why do we need to understand postoperative wound care?</p>   <ul style="list-style-type: none"> Wounds should heal by primary intention, but may not always heal “normally” (owing to many risk factors, as described earlier in this module). If a wound does not heal normally: <ul style="list-style-type: none"> it must be managed to ensure the best outcome; the process of wound assessment, cleansing and care must suit the patient’s needs and must limit additional infection risk; there is a risk of introducing infection to a postoperative wound. There are different phases of wound healing: an understanding may be required if a wound is not healing. Communication with community health workers may be critical if wound healing is problematic after discharge. 	<p>Read the slide.</p> <p>Say:</p> <p>“This module, however, does not go into detail on wound healing and management but just covers some key considerations about postoperative wounds as part of the surgical patient’s journey.”</p>	–
91-93	<p>Wound evaluation/dressing (1)</p>   <p>Following closure of the surgical incision site, the following actions should be taken.</p> <ul style="list-style-type: none"> A standard wound dressing should be applied. The wound should be checked after about 48 hours. Dressing removal should be assessed; if the wound is dry and healing with no signs of infection, no additional dressing is required (the patient can shower as normal). If any signs of discharge/infection are seen, a doctor/wound specialist should be consulted (to undertake further wound assessment and decisions, such as specimen sample, further dressings). <p>Wound evaluation/dressing (2)</p>   <ul style="list-style-type: none"> Before removing the dressing, patient preparation should take place (comfort, pain relief) – the patient should be actively involved in wound healing goals (considering that nutrition and similar are part of maintaining healthy skin and tissue). Check the patient’s care notes for an update on any changes in the patient’s condition and to make sure the dressing is due to be removed. A decision should be made if the dressing will be changed using a nontouch or a full aseptic technique (which will determine what type of gloves to be used). For closed surgical wounds with no signs of complication, a nontouch technique using nonsterile gloves to remove the surgical wound dressing should be acceptable. <p>Wound evaluation/dressing (3)</p>   <ul style="list-style-type: none"> Premade packs are available in some countries, containing all items needed for wound dressing removal/wound cleaning if required – otherwise, all clean/sterile items should be gathered before starting the wound evaluation/dressing procedure. A wound assessment should be completed – some health facilities have wound assessment forms containing prompts, e.g. on a visual check, comparing and evaluating any smell, amount of blood or ooze (excretions), their colour and the size of the wound if it is not healing. 	<p>Ask a student to read the slide.</p> <p>Ask another student to read the next slide.</p> <p>Again, ask another student to read the next slide.</p> <p>Say:</p> <p>“Remember the WHO recommendation is not to use any type of advanced dressing over a standard dressing on primary closed surgical wounds for the purpose of preventing a SSI.</p> <p>As a reminder – topical antimicrobial agents or prolonged SAP are NOT recommended owing to concerns over postoperative wound infection.”</p> <p>If there is time, ask if there are any questions.</p>	–


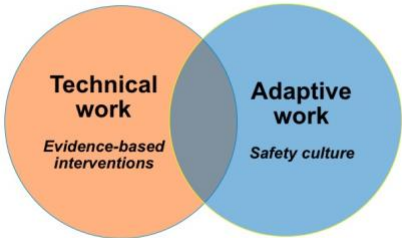

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
94	<p>Wound dressing video</p>  <p>Source: https://www.who.int/infection-prevention/ebc/surgicaltraining_education/</p>	<p>Say:</p> <p>“The video portrays two scenarios related to wound management (primary and secondary) and the appropriate steps to take when performing wound dressings and sample collection. They will be useful for you when training others to improve wound evaluation and dressings.”</p> <p>Play the (8 minute) video using the link provided.</p>	<p>Video:</p> <p>https://www.youtube.com/watch?v=Y1gZZvY9ft4&feature=youtu.be</p>
95	<p>Group work 3. Hand hygiene workflow</p>  <p>Source: Hand hygiene technical reference manual, Geneva: World Health Organization, 2009 (http://www.who.int/emc/5may/5moment_s-EducationalPoster.pdf?ua=1)</p>	<p>State that it is important to help people focus on the most critical hand hygiene actions when caring for surgical wounds, a number of which have been covered in this module.</p> <p>Say:</p> <p>Everyone needs to understand when hand hygiene is necessary to keep the patient and surgical wound safe and to consider the application of the five moments for hand hygiene in the context of how flow of care occurs locally – for example, if an item needed for dressing removal is forgotten or a nurse is called to do something else while removing a wound dressing.”</p> <p>“This slide gives an example of critical times for hand hygiene.</p> <p>We have provided you with an exercise that can be done at your facility, post-training.</p> <p>The exercise asks you to list the steps involved in the flow of care when dealing with a surgical wound in your own health setting.</p> <p>Once you have done this,</p> <p>Refer to the WHO hand hygiene technical reference manual to be sure</p>	<p>Refer to handout 14 in the student handbook, p. 39:</p> <p>http://www.who.int/gpsc/5may/5moment_s-EducationalPoster.pdf?ua=1</p> <p>Refer students to group work 3 - student handbook, p. 41.</p> <p>WHO hand hygiene technical reference manual:</p> <p>http://apps.who.int/iris/bitstream/10665/44196/1/9789241598606_eng.pdf</p>

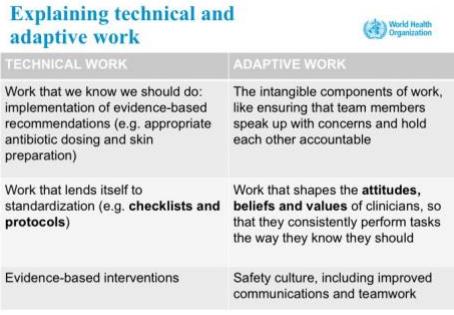

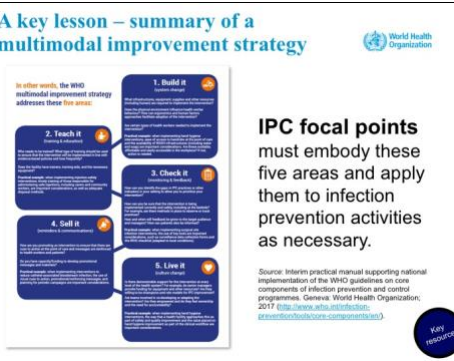
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		people are applying the five moments accurately.”	
96	<p>Group work 4. Using SSI guidelines in your setting</p>  <ul style="list-style-type: none"> • Do you have SSI prevention guidelines in your institution? If not, can you explain why not? • If you have your own guidelines, how do they compare to the WHO recommendations? If you do not have your own guidelines, how would you present the WHO recommendations in your institution? • Have you identified from the WHO recommendations which are the most challenging to include in your guidelines or to implement? 	<p>Ask that participants discuss these questions in groups of 3–4, identifying one person as the note taker/rapporteur who will provide feedback to the larger group.</p> <p>Note: keep the discussion tight – you cannot answer all points raised if students think it will be hard to implement all the WHO guidelines in their facilities, but this activity is designed to challenge their thinking.</p> <p>Allow 20 minutes for group discussion and 20 minutes for feedback (40 minutes in total).</p>	<p>Refer students to group work 4 - student handbook, p. 44.</p>
97	<p>Session 4</p>  <p>Understanding the application of implementation strategies to ensure SSI prevention including real life examples</p>	<p>Say:</p> <p>“The fourth session of this module covers understanding the application of improvement strategies to ensure SSI prevention in real life, including the potential barriers.”</p>	–
98	<p>Learning objectives – session 4</p>  <ul style="list-style-type: none"> • Describe adaptive and technical improvement approaches and the role of process and outcome indicators, which form part of an improvement project applied to SSI prevention • Explain how evidence-based recommendations on SSI can be implemented effectively in the local context and in real-life situations 	<p>Read the slide or ask a participant to read it.</p>	–

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
99	 <p>HOW DO WE START TO IMPROVE ADHERENCE TO SSI RECOMMENDATIONS?</p>	Read the slide.	–
100	<p>An approach for improving SSI outcomes</p>  	<p>Say:</p> <p>“Evidence-based IPC technical interventions to improve IPC practices are most successful when implemented within an enabling environment, supportive of a patient safety culture and people-centred service delivery, including patient participation. Thus, combining technical work with ‘adaptive’ work (that is, the intangible work that shapes the attitudes, beliefs and values of clinicians towards a safety culture) is essential in implementation strategies.</p> <p>It is very important to discuss aspects of both technical and adaptive approaches to an improvement project. This session will outline examples of both.</p> <p>It is vital that staff are supported to perform tasks the right way consistently and that safe practices become the norm.”</p>	–






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101	 <p>Principles of safe design: CUSP integrates adaptive and technical work. Baltimore, MD: Johns Hopkins Medicine; 2014. https://www.johnshopkinsmedicine.org/armstrong_institute/learning_services/workshop/cusp_implementation_training/eip_evidence.html</p>	<p>Say:</p> <p>“Let’s read a little more on this concept, which is primarily promoted by the Armstrong Institute at Johns Hopkins Medicine in the USA. We will hear about the application in a range of countries later in the session.”</p> <p>Ask a student to read the slide.</p>	—
102	 <p>Armstrong Institute for Patient Safety and Quality [website]. Baltimore, MD: Johns Hopkins Medicine; 2014. https://www.johnshopkinsmedicine.org/armstrong_institute/learning_services/workshop/cusp_implementation_training/eip_evidence.html</p>	<p>Say:</p> <p>“The ‘adaptive’ side of the improvement journey is outlined here. This is generally needed to address a patient safety culture within an organization, together with technical evidence and tools, so that you have the greatest chance of achieving success with your planned interventions.</p> <p>To reiterate, this is part of the adaptive side of the work in the whole improvement process. It is challenging in a different way from implementing technical recommendations and takes time, but is critical. Again, we will hear more about the practical application of this in a number of countries later in the session.”</p>	—
103	 <p>Source: Interim practical manual supporting national implementation of the WHO guidelines on core components of infection prevention and control programmes. Geneva: World Health Organization; 2017 (http://www.who.int/infection-prevention/tools/core-components/en/)</p>	<p>Say:</p> <p>“I want to introduce you to the concept of the WHO multimodal improvement strategy. This is explained in detail in the ‘Leadership and programme management’ module of the WHO training package.</p> <p>The WHO multimodal improvement strategy is an evidence-based approach initially developed to achieve improvement in hand hygiene. WHO has now adapted this concept to any IPC intervention and included it as a</p>	<p>Refer to handout 15 in the student handbook, p. 45: http://www.who.int/infection-prevention/tools/core-components/en/</p>

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		<p>recommended core component of IPC programmes. It is considered ‘the’ way to achieve change in systems, climate and behaviour that supports IPC progress and, ultimately, the measurable impact that benefits patients and health care workers, based on evidence about best approaches for IPC implementation.</p> <p>This is the definition included in the WHO guidelines on core components of IPC programmes: ‘the multimodal strategy consists of several of elements or components (three or more; usually five) implemented in an integrated way with the aim of improving an outcome and changing behaviour. It includes tools, such as bundles and checklists, developed by multidisciplinary teams that take into account local conditions. The five most common components include: (i) system change (that is, availability of the appropriate infrastructure and supplies to enable IPC good practices); (ii) education and training of health care workers and key players (for example, managers); (iii) monitoring infrastructures, practices, processes, outcomes and providing data feedback; (iv) reminders in the workplace/communications; and (v) culture change with the establishment or strengthening of a safety climate.’</p> <p>When considering the adaptive and technical approach we must use to achieve greatest success, keep in mind the multimodal improvement strategy we will be using to consider your actual practical improvement work later on – the steps that will allow you to implement adaptive and technical plans and tools. It links nicely to the adaptive and technical approach, providing a way to do this. While</p>	





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		<p>different language is used, this approach achieves the same as the CUSP approach to technical and adaptive work that has been described. Therefore, this is what we will discuss from here on regarding your actions to improve SSI prevention practices. We will also return to this in session 5.”</p> <p>Ask five attendees to read each of the five elements of the strategy.</p> <p>Take brief feedback from attendees verbally (just a few moments).</p>	
104	<p>The surgical unit-based safety programme (SUSP) – combining technical and adaptive work</p>  <ul style="list-style-type: none"> • This is one example of a proven approach to reducing SSI by improving (perioperative) safety including through documenting the culture of safety within a health care facility. • It provides tools and resources to improve safety culture and reduce SSIs. • It aids tracking of valid performance measures. • It engages front-line clinicians and hospital leaders to implement evidence-based interventions and improve patient care. • It supports infrastructure development to improve teamwork and learn from mistakes. • It is an approach that has now been tested in the USA and four African countries. <p><small>Source: The surgical unit-based safety programme in African hospitals. In: World Health Organization [website]. Geneva: World Health Organization, 2018. http://www.who.int/infection-prevention/country-surgical/en/</small></p> 	<p>Say:</p> <p>“We will come on to discuss the implementation of a surgical unit-based safety programme (SUSP) in African countries. First, we would like to use this as a case study to help you understand how to use the WHO multimodal improvement strategy and apply it to SSI prevention. This will also be the focus of session 5.”</p> <p>Read the slide.</p>	<p>Additional information on SUSP can be found here:</p> <p>http://www.who.int/infection-prevention/country-surgical/en/</p>
105	<p>Group work 5. Case study</p>   <p><small>Source: Allegranzi B, Aiken AM, Zeynep Kublay N, Nthunba P, Barasa J, Okumu G et al. A multimodal infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before-after, cohort study. Lancet Infect Dis. 2018; 18(5):507–515.</small></p> 	<p>Divide participants into five groups, give them copies of the paper by Allegranzi et al. and refer them to handout 15.</p> <p>Assign to each group one of the five elements of the WHO multimodal improvement strategy.</p> <p>If possible, assign to each group a facilitator from the training team.</p> <p>Say:</p> <p>“Take 20 minutes to read the paper, focusing more on the methods and the results and the appendix, which focuses on the table of activities undertaken in the hospitals, than other sections of the paper.</p>	<p>Flipchart and pens per group</p> <p>Refer students to group work 5 - student handbook (p. 47) and handout 15 (p. 45).</p> <p>For group work answers: see Annex 2 - group work 5, in the trainer guide, p. 72.</p>





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		<p>The exercise consists of discussing what activities implemented in the study reflect the element of the strategy multimodal strategy you have been assigned – take 15 minutes to discuss.”</p> <p>Gather the groups together again to discuss their conclusions (5 minutes per group).</p> <p>Allow 20 minutes for personal reading, 15 minutes for group discussion and 25 minutes for group feedback (1 hour in total).</p>	
106	<p>The SUSP approach</p> <p>Patient safety culture improvement (CUSP approach):</p> <ul style="list-style-type: none"> • science of safety education • staff safety assessment • leadership • learning from defects • team work and communication <p>+</p> <p>Infection prevention best practices</p> <ul style="list-style-type: none"> • evidence-based and identified according to local staff assessment <p>↓ ↓</p> <p>Improvement of the patient safety climate</p> <p>Reduction of:</p> <ul style="list-style-type: none"> • SSIs • surgical complications 	<p>Say:</p> <p>“Let’s talk more about how this fits with surgical safety and SSI prevention. We heard about the CUSP approach, which aims to create/improve safety culture using methods such as those listed in the blue box. This was adapted for use specifically in surgical units, combined with and supporting IPC best practices identified as priorities by local staff (see the orange box) in order to achieve three goals of improving safety climate, reducing SSI and reducing surgical complications.”</p> <p>Say:</p> <p>“Local ownership is key to SUSP. Front-line staff identify local defects, and together staff develop an SSI prevention ‘bundle’ to address local defects and issues.</p> <p>A bundle is an implementation tool aiming to improve the care process and patient outcomes in a structured manner. It comprises a small, straightforward set of evidence-based practices (generally 3–5) that have been proven to improve patient outcomes when performed collectively and reliably.”</p>	–

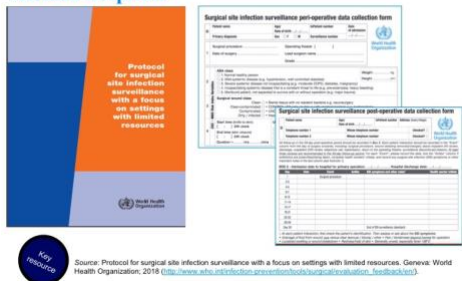
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
107	<p>Group work 6. Understand your current situation</p>  <ul style="list-style-type: none"> • How did you or will you start your SSI prevention journey – what approach are you using? • What tools did you or will you use to understand the local priorities for improvement? • Discuss the following questions from the <i>SUSP Perioperative Staff Safety Assessment Tool</i>: <ul style="list-style-type: none"> ➢ Briefly describe the most frequent ways (list a maximum of three) in which patients may get an SSI in your surgical services/facilities. ➢ Describe what you think can be done to prevent this SSI. <p><small>Source: Supplemental Tools (webtool). Rockville, MD: Agency for Healthcare Research and Quality; 2018 https://www.ahrq.gov/ondp/online/qualify_patient_safety_tools/susp/guide-appcusp.html</small></p> 	<p>This is a reserve exercise, if time permits.</p> <p>Ask participants to divide into small groups of 3–4 and identify one note taker or rapporteur.</p> <p>Say:</p> <p>“Take a few moments to discuss in small groups the major factors determining SSI in your surgical services/facilities and how you would start your improvement journey. What tools are available to you? Do you have a tried and tested approach to improvement within your facility, reflecting the existing culture?”</p> <p>Ask each group to provide brief feedback or a summary of their discussion.</p> <p>Allow 15 minutes for group discussion and 15–20 minutes for feedback (30 minutes in total).</p> <p>Emphasize that in SUSP, the Perioperative Staff Safety Assessment Tool is proposed to identify major factors determining SSI in the local context and therefore to help choose/prioritize what preventive measures should be improved. The tool and the questions in it can be used to reflect on the situation in participants’ surgical services/facilities.</p>	<p>Familiarise yourself with the perioperative staff safety assessment tool:</p> <p>https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/surgery/guide-appcusp.html</p> <p>Flipchart and pens per group</p> <p>Refer students to group work 6 - student handbook, p. 57.</p>
108	<p>Gap areas leading to SSI identified in African SUSP hospitals</p>   <ul style="list-style-type: none"> • Lack of infection prevention and control = inadequate/inappropriate: <ul style="list-style-type: none"> • SAP • patient bathing • hair removal • surgical hand preparation • surgical skin site preparation • discipline in the operating room • equipment: sterile gloves, sterilization, clippers, drapes, gowns • Lack of staff training & education, patient education <p><small>Source: Alagrawani B, Aiken AM, Zeynep Kublay N, Nthunbe P, Barasa J, Okumu G et al. A multimodal infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before–after, cohort study. <i>Lancet Infect Dis</i>. 2018; 18(5):507–515.</small></p>	<p>Say:</p> <p>“An important part of SUSP is encouraging local facilities/teams to decide what needs to be improved, based on their knowledge of known or perceived gaps. They should be steered to consider those based on the evidence for preventing SSI, like those in the WHO guidelines.</p>	–



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		<p>This is more specific information on what was gathered from the African hospital teams taking part in SUSP to show why the improvement measures were as described in the last slide.”</p> <p>Read the slide or ask a participant to read it.</p>	
109	<p>The best approach for starting a SUSP project – adaptive and technical focus</p>  <ul style="list-style-type: none"> • Assemble a multidisciplinary team to include pre-anaesthesia, surgery and post-anaesthesia units. • Engage a senior-level executive as part of your team. • Implement the project with the intention of improving perioperative teamwork, communication and safety culture. • Meet regularly as a team to implement interventions and monitor performance. • Collect a minimal set of standardized surgical outcome data monthly. 	<p>Say:</p> <p>“Given the experiences and lessons learned from using the SUSP approach, these are the recommendations for starting SUSP.”</p> <p>Read the slide or ask a participant to read.</p> <p>State that these are important points that led to success and also reflect aspects of the multimodal improvement strategy discussed briefly earlier – safety culture and monitoring and feedback.</p>	–
110	<p>Tools to address the culture</p>  <p>Core CUSP toolkit Created for clinicians by clinicians, the CUSP toolkit is modular and modifiable to meet individual unit needs. Each module includes teaching tools and resources to support change at the unit level, presented through facilitator notes that take you step-by-step through the module, presentation slides, tools, videos.</p> <p>CUSP for Safe Surgery (SUSP) Perioperative Staff Safety Assessment</p>  <p>Source: Core CUSP Toolkit [website]. Rockville, MD: Agency for Healthcare Research and Quality; 2018 (https://www.ahrq.gov/professionals/education/surgicaltools/cuspworkbooks/index.html). Supplemental Tools [website]. Rockville, MD: Agency for Healthcare Research and Quality; 2018 (https://www.ahrq.gov/professionals/quality-safety/cusp/).</p>	<p>Say:</p> <p>“Useful tools are available from CUSP and SUSP to improve the safety culture, although some of them may require adaptations based on your local situation and culture.”</p>	–
111	<p>Understanding and influencing the local culture: tools created by SUSP teams in African hospitals</p>   <p>Source: The surgical unit-based safety programme in African hospitals. In: World Health Organization [website]. Geneva: World Health Organization; 2018 (http://www.who.int/infection-prevention/surgical-safety/).</p>	<p>Say:</p> <p>“Let’s now look at some real SUSP hospital experiences that outline both adaptive and technical approaches.</p> <p>Here you can see some of the tools created by the SUSP teams in African hospitals.</p> <p>One important element was that the surgeons from these hospitals acted as SUSP leaders, recording a video</p>	–



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		similar to one made to promote CUSP in the USA. This was important to create a sense of ownership of the project and improvement journey and to show that it was applicable to African hospitals. This type of action can ensure the right culture is achieved to support local change."	
112	<p>WHO protocol and forms for SSI surveillance based on SUSP testing in African hospitals</p>  <p>Source: Protocol for surgical site infection surveillance with a focus on settings with limited resources. Geneva: World Health Organization; 2019 (http://www.who.int/infection-prevention/tools/surgical/evaluation-feedback/en/)</p>	<p>Say:</p> <p>"For SSI surveillance and monitoring of the preventive measures SUSP aimed to improve (such as surgical hand preparation and SAP administration information), WHO created a protocol and data collection forms. One important element of this approach was the option of patient follow-up by phone to ensure post-discharge surveillance.</p> <p>This allowed hospitals to understand what was working and what was not. This was critical for reporting (the monitoring and feedback element of a multimodal strategy); the experiences of using these forms and an associated protocol and database were a very important part of the improvement journey.</p> <p>Based on the SUSP surveillance and monitoring experiences, WHO reviewed and improved the protocol and forms. These are now available on WHO's website and can be used for monitoring.</p>	<p>Data collection tools:</p> <p>http://www.who.int/infection-prevention/tools/surgical/evaluation-feedback/en/</p> <p>Refer to handouts 16 and 17 in the student handbook, p. 58-61.</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
113	<p>Antimicrobial resistance in hospitalized surgical patients: a silently emerging public health concern in Uganda</p> <p>Serhi et al. BMC Research Notes 2017 http://www.biomedcentral.com/</p> <p>Table 1 Antimicrobial resistance pattern among isolates from surgical site infections</p>  <p>New SAP protocol tailored to local AMR patterns</p>	<p>Say:</p> <p>“An example from a SUSP hospital included a new SAP protocol, based on local data on pathogens responsible for SSI and their antibiotic resistance patterns. This was visibly promoted in the operating room as part of the improvement project.</p> <p>To be able to change behaviours and improve processes and SSI outcomes, information about local problems and targeted information and instruction is very important.”</p>	—
114	<p>Improving surgical hand preparation</p> <p>1. Local production of modified WHO formulation for ABHR</p> <p>2. Surgical hand preparation</p> <ul style="list-style-type: none"> Antimicrobial soap + water = 2–5 minutes Alcohol-based = 1.5–3 minutes The right technique is crucial Nailbrushes are <u>not</u> recommended. 	<p>Say:</p> <p>“Another example of local action to ensure improvements to prevent SSI was local production of alcohol-based handrub (ABHR). Information is provided on the WHO website. Availability of handrub can be challenging but is achievable, as demonstrated in African hospitals. It supports situations where reliable clean running water, along with soap and clean towels, cannot be assured.</p> <p>Further, key information was provided on use of ABHR for surgical scrub in posters and messages – staff knowledge had to be updated and commitment to changing practices achieved. This slide shows the points promoted locally in the SUSP project, and more detailed information on surgical hand preparation is provided by WHO.”</p>	—

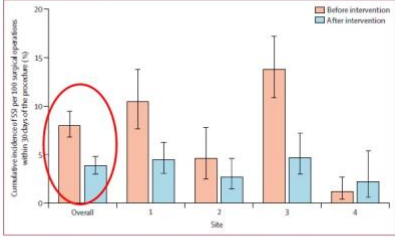
Advanced Infection Prevention and Control Training

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
115	<p>Modified WHO formulations for surgical hand preparation</p>  <p>Formulation I Final concentrations: ethanol 80% wt/wt, glycerol 0.725% vol/vol, hydrogen peroxide 0.125% vol/vol.</p> <p>Ingredients:</p> <ol style="list-style-type: none"> 1. ethanol (absolute), 800 g 2. H₂O₂ (3%), 4.17 ml 3. glycerol (98%), 7.25 ml (or 7.25 x 1.26 = 9.135 g) 4. top up to 1000 g with distilled or boiled water <p><small>Source: ¹ Suchomel M KM, Kundt M, Pittet D, Rotter ML. Modified World Health Organization hand rub formulations comply with European efficacy requirements for preoperative surgical hand preparations. Infect Control Hosp Epidemiol. 2013; 34(3):245–250.</small></p> <p>Formulation II Final concentrations: isopropanol 75% wt/wt, glycerol 0.725% vol/vol, hydrogen peroxide 0.125% vol/vol.</p> <p>Ingredients:</p> <ol style="list-style-type: none"> 1. isopropanol (absolute), 750 g 2. H₂O₂ (3%), 4.17 ml 3. glycerol (98%), 7.25 ml (or 7.25 x 1.26 = 9.135 g) 4. top up to 1000 g with distilled water <p><small>Quality assurance and efficacy must be assured</small></p> 	<p>Say:</p> <p>“These are the formulations used by the hospitals in SUSP, modified from the WHO formulations to increase efficacy, according to some recent publications. Remember, ABHR is recommended for surgical scrub in the WHO SSI guidelines.</p> <p>Let’s think together of this in the context of system change (of the multimodal improvement strategy), as this might mean introducing a new product.</p> <p>One of the challenges in your setting might be reliable availability of solutions to perform surgical hand preparation (scrubbing).</p> <p>The “journey” to ensure that ABHR is available would include all five steps in the multimodal improvement strategy. It might entail a business plan and senior management signing up to the plan; securing products to make the solution; enlisting expertise (from pharmacy colleagues); securing a high-quality testing mechanism for the product; communications and documents to promote a change to the use of ABHR for surgical hand preparation; and education and training on its use. Lastly, it is helpful and positive to provide feedback on use of ABHR for surgical hand preparation to encourage its use.</p> <p>All this is possible, but you have to plan to make it happen.</p> <p>As a reminder, the locally produced formula led to availability in the African hospitals and adherence by surgeons, and was one aspect of the observed SSI reduction rates. It should be noted, however, that the whole team was involved in this process – not just IPC</p>	<p>Refer to handout 18 in the student handbook, p. 64.</p> <p>WHO guidelines on hand hygiene in health care: http://apps.who.int/iris/bitstream/10665/70126/1/WHO_IER_PSP_2009.07_eng.pdf?ua=1</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer																																																		
		<p>leads. This is important for implementation of any change.”</p> <p>Note: depending on the audience, this issue might not be relevant, or it might need a lengthy discussion on aspects of local production. More information should be taken from the WHO guidelines on hand hygiene in health care, or you can refer people to that resource if time is limited.</p>																																																			
116	<div><div><h3>System change – surgical skin preparation</h3><p>Local preparation of 2% chlorhexidine isopropanol solution</p><ol style="list-style-type: none">1. Isopropanol: 62.7 % g/g2. chlorhexidine 12.1% g/g taken from a 18.8% g/g chlorhexidine digluconate water solution3. Top up with distilled water up to 100%</div><div></div><div><p><small>Source: Alegretti B, Aiken AM, Zeynep Kublay N, Nthunya P, Barasa J, Okumu G et al. A multimodal infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before–after, cohort study. Lancet Infect Dis. 2018; 18(5):507–515.</small></p></div></div>	<p>State that another example of local action is local preparation of skin preparation solution.</p> <p>This slide shows the example formula used during the SUSP project. At one site it was coloured pink to ensure it was visible during the process. As a reminder, here is the link to the video we viewed earlier on the appropriate process for performing skin preparation before surgery.”</p>	–																																																		
117	<div><div><h3>Impact on preventive measures</h3><table><thead><tr><th></th><th>Baseline (n=1604)</th><th>Follow-up (n=1827)</th><th>p value</th><th>Sustainability period (n=591)</th></tr></thead><tbody><tr><td>Preoperative patient bathing (n=4321, 0.02%)</td><td>1238 (77.2)</td><td>1544 (84.5)</td><td><0.0001</td><td>799 (89.7)</td></tr><tr><td>Appropriate hair removal (n=4310, 0.3%)</td><td>1169 (27.1)</td><td>1702 (93.5)</td><td><0.0001</td><td>880 (98.8)</td></tr><tr><td>Appropriate skin preparation (n=4307, 0.3%)</td><td>330 (20.7)</td><td>1544 (90.2)</td><td><0.0001</td><td>845 (94.8)</td></tr><tr><td>Quality of surgical hand preparation (n=4223, 2.3%)</td><td>1213 (78.7)</td><td>1554 (94.4)</td><td><0.0001</td><td>865 (97.4)</td></tr><tr><td>Appropriate use of antibiotic prophylaxis (n=4322, 0%)</td><td>205 (12.8)</td><td>734 (39.1)</td><td><0.0001</td><td>635 (71.3)</td></tr><tr><td>Theatre discipline</td><td></td><td></td><td></td><td></td></tr><tr><td>Theatre door openings per hour of operation time (n=4921, 6.7%)</td><td>14.8 (12.8)</td><td>14.2 (16.1)</td><td>0.3771</td><td>19.0 (21.6)</td></tr><tr><td>Number of individuals present at the start of the operation (n=4313, 0.2%)</td><td>8.3 (3.4)</td><td>7.7 (2.5)</td><td><0.0001</td><td>7.4 (2.5)</td></tr><tr><td>Number of entries during the operation (n=4236, 2.0%)</td><td>5.0 (4.1)</td><td>4.8 (4.9)</td><td>0.1758</td><td>4.2 (2.7)</td></tr></tbody></table><p><small>Data are mean (SD). Data per variable and percentage missing data are also given. SSI=surgical site infection.</small></p><p>Table 2: Process indicators for SSI prevention intervention measures across study periods in four (baseline and follow-up) and three (sustainability period) hospitals</p><p><small>Source: Alegretti B, Aiken AM, Zeynep Kublay N, Nthunya P, Barasa J, Okumu G et al. A multimodal infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before–after, cohort study. Lancet Infect Dis. 2018; 18(5):507–515.</small></p></div><div></div></div>		Baseline (n=1604)	Follow-up (n=1827)	p value	Sustainability period (n=591)	Preoperative patient bathing (n=4321, 0.02%)	1238 (77.2)	1544 (84.5)	<0.0001	799 (89.7)	Appropriate hair removal (n=4310, 0.3%)	1169 (27.1)	1702 (93.5)	<0.0001	880 (98.8)	Appropriate skin preparation (n=4307, 0.3%)	330 (20.7)	1544 (90.2)	<0.0001	845 (94.8)	Quality of surgical hand preparation (n=4223, 2.3%)	1213 (78.7)	1554 (94.4)	<0.0001	865 (97.4)	Appropriate use of antibiotic prophylaxis (n=4322, 0%)	205 (12.8)	734 (39.1)	<0.0001	635 (71.3)	Theatre discipline					Theatre door openings per hour of operation time (n=4921, 6.7%)	14.8 (12.8)	14.2 (16.1)	0.3771	19.0 (21.6)	Number of individuals present at the start of the operation (n=4313, 0.2%)	8.3 (3.4)	7.7 (2.5)	<0.0001	7.4 (2.5)	Number of entries during the operation (n=4236, 2.0%)	5.0 (4.1)	4.8 (4.9)	0.1758	4.2 (2.7)	<p>Say:</p> <p>“Let’s reflect on what was achieved overall in the SUSP Africa study, including significant changes in practices. As you can see in this table, the first five indicators reflecting the key preventive measures targeted by the intervention significantly improved in the follow-up period and were consolidated in the sustainability period. Among those related to the theatre discipline, the number of individuals present at the start of the operation decreased, but the door openings and the number of entries during the operation did not.”</p> <p>Take a few moments to pose the following questions and address discussion points with participants. Allow 5 minutes for discussion.</p> <p>Say:</p>	<p>For full article: see Annex 2 in the trainer guide, p. 76.</p>
	Baseline (n=1604)	Follow-up (n=1827)	p value	Sustainability period (n=591)																																																	
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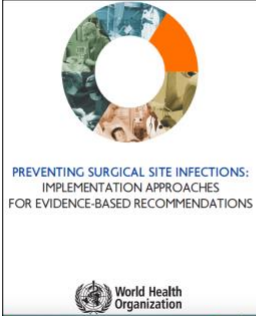

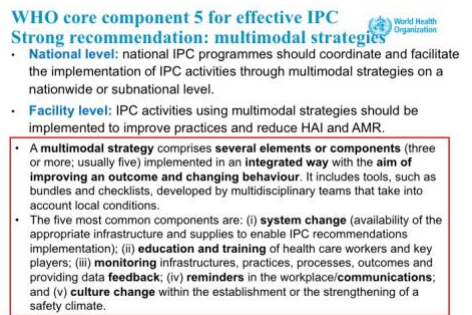

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>“Do you think the implementation of these measures would be achievable in your settings?</p> <p>Do you think you could significantly improve adherence to these WHO recommendations?</p> <p>We will return to discussing the multimodal improvement strategy shortly to consider how you could do this (taking account of technical and adaptive tools).”</p>	
118	<p>Impact on SSI</p>  <p>Figure 2: Unadjusted SSI cumulative incidence overall and by site at baseline and follow-up in four sites Error bars show 95% CI. SSI=surgical site infection.</p> <p>Source: Alegria B, Ahan AM, Zeynep Kublay N, Ntumba P, Barasa J, Othman G et al. A multimodal infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before–after, cohort study. <i>Lancet Infect Dis</i>. 2018; 18(5):507–515.</p>	<p>Say:</p> <p>“This is the cumulative SSI incidence for the SUSP project – total and for each site. It explains how all the measures had an impact on SSI incidence.</p> <p>The slide shows that the project worked overall, and a significant reduction of SSI was observed across all sites. According to a statistical model correcting for confounding factors, the SSI risk was reduced by 60%. It is not possible to measure the effect from a statistical point of view because the study was set up to assess not the changes at each site but the cumulative effect.</p> <p>This gives you ammunition and a strong reason to tell others that taking (technical and adaptive) measures to reduce SSI works.”</p>	–

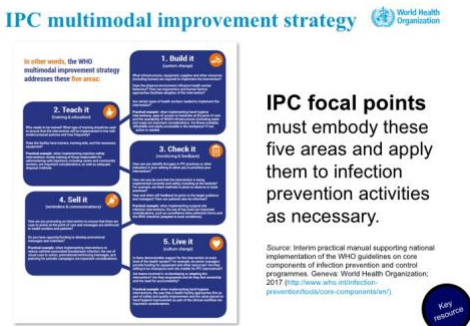
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
119	<p>Summary of success factors</p>  <ul style="list-style-type: none"> • Use of multimodal strategies (this does not mean checklists and bundles) • Having a step-wise action plan • Mapping recommendations according to the surgical patient journey • Empowering teams and involving front-line staff • Engaging leadership • Letting teams take the lead on adaptation • Catalysing collective and individual ownership • Using data to create awareness • Awarding teams and work demonstrating a safety culture spirit 	<p>Say:</p> <p>“In summary, to conclude this session, here is a list of factors from a range of settings that made success in SSI improvement achievable.</p> <p>Importantly, as stated earlier, multimodal improvement strategies were the most commonly used and successful. We will talk more about this in the final session as it is critical to how to approach improvement of SSI recommendations and reduction of infections.”</p>	<p>Refer to handout 19 in the student handbook, p. 65.</p>
120	<p>Session 5</p>  <div> <p>Applying a multimodal improvement strategy for SSI prevention</p> </div>	<p>Say:</p> <p>“The fifth and final session of this module addresses applying a multimodal improvement strategy for SSI prevention.”</p>	<p>–</p>
121	<p>Learning objectives – session 5</p>  <p>To describe and explain the WHO multimodal improvement strategy designed to implement SSI prevention recommendations</p>	<p>Say:</p> <p>“Let’s recap on the objectives for this final session. We want to consolidate what we have covered so far, the lessons learned from many studies and country and hospital experiences, and take the WHO multimodal improvement strategy, using it to plan how to undertake SSI recommendation improvements, which are critical to SSI prevention.”</p> <p>Be sure to remind students of handout 9 in their handbook (two-page summary of SSI recommendations) and to use this as a guide when going through this session.</p>	<p>Refer to handout 9 in the student handbook, p. 20.</p> <p>http://www.who.int/infection-prevention/publications/ssi-guidelines/en/</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
122	 <p>Use this document is to learn about a range of tested approaches to achieve successful SSI prevention implementation at the facility level, including in the context of a broader surgical safety climate.</p>	Read the slide.	—
123	 <p>A WHO implementation framework</p>	<p>Say:</p> <p>“This slide briefly highlights the process of implementation described by WHO in key publications, including the manual for implementation of the WHO core components of IPC programmes and a publication summarizing implementation approaches for SSI prevention. It applies to SSI improvement projects.”</p>	—
124	 <p>WHO core component 5 for effective IPC Strong recommendation: multimodal strategies</p> <ul style="list-style-type: none"> National level: national IPC programmes should coordinate and facilitate the implementation of IPC activities through multimodal strategies on a nationwide or subnational level. Facility level: IPC activities using multimodal strategies should be implemented to improve practices and reduce HAI and AMR. A multimodal strategy comprises several elements or components (three or more; usually five) implemented in an integrated way with the aim of improving an outcome and changing behaviour. It includes tools, such as bundles and checklists, developed by multidisciplinary teams that take into account local conditions. The five most common components are: (i) system change (availability of the appropriate infrastructure and supplies to enable IPC recommendations implementation); (ii) education and training of health care workers and key players; (iii) monitoring infrastructures, practices, processes, outcomes and providing data feedback; (iv) reminders in the workplace/communications; and (v) culture change within the establishment or the strengthening of a safety climate. 	<p>Say:</p> <p>“First I want to outline the specific evidence behind the multimodal improvement strategy again. This information is in the WHO guidelines on core components of IPC programmes.”</p> <p>Ask a student to read the slide.</p>	—
125	 <p>Operational manual for the WHO SSI prevention recommendations.</p> <p>This implementation manual is designed to help you understand the WHO multimodal improvement strategy applied to SSI prevention</p>	Read the slide.	—






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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
126	 <p>IPC multimodal improvement strategy</p> <p>In other words, the WHO multimodal improvement strategy addresses these five areas:</p> <ol style="list-style-type: none"> 1. Build it (Leadership) 2. Teach it (Education and training) 3. Check it (Monitoring and evaluation) 4. Sell it (Communication and engagement) 5. Live it (Sustainability) <p>IPC focal points must embody these five areas and apply them to infection prevention activities as necessary.</p> <p>Source: Interim practical manual supporting national implementation of the WHO guidelines on core components of infection prevention and control programmes, Geneva: World Health Organization, 2017 (http://www.who.int/infection-prevention/outreach-components/).</p> <p>Key message</p>	<p>Say:</p> <p>“Scientific evidence and global experience show that each component of the WHO strategy is crucial, and in general no component can be considered optional if the objective is to achieve an effective and sustainable impact.</p> <p>However, the implementation strategy itself is designed to be adaptable without jeopardizing its fidelity and intended outcome. Therefore, depending on the local situation and available resources, some components might be given more emphasis than others or might be implemented practically in different ways.</p> <p>Regular assessment allows health facilities to direct efforts to all, some or one of the components at any given time.</p> <p>In summary, what is required for success? Focus on all five components as appropriate in the local context. Focus on a local context, recipients/key multidisciplinary team identified, some innovation, an understanding of the social, cultural and organizational factors, and a clearly understood process of implementation at that local level.”</p> <p>Remind students of handout 12 in their handbook (WHO multimodal improvement strategy) to follow for the next five slides.</p>	<p>Refer to handout 12 in the student handbook, p. 32.</p> <p>http://www.who.int/infection-prevention/tools/surgical/training_education/en/</p>

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
127	<p>Understanding the multimodal strategy for SSI prevention (1)</p>  <p>System change "Build it"</p> <ul style="list-style-type: none"> 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. <p><small>Source: Preventing surgical site infections: implementation approaches for evidence-based recommendations. Geneva: World Health Organization; 2018 (http://www.who.int/infection-prevention/tools/implementation)</small></p>	<p>Say:</p> <p>"Now let's take each component of that multimodal improvement strategy and outline the definition as it applies to SSI prevention."</p> <p>Ask a student to read the slide.</p> <p>Ask:</p> <p>"Does this make sense? Each safe process (recommendation) you are trying to achieve needs to have the right infrastructure and resources in place to achieve success."</p> <p>Note: if discussion ensues with examples, say that this will be covered shortly once we have heard a definition for each component.</p>	—
128	<p>System change - "Build it" (cont') Necessary infrastructure and resources</p>  <ul style="list-style-type: none"> Allocated budget Standard operating procedures, protocols, local policies and tools/mechanisms for training An IT system (or paper) for monitoring and feedback on infrastructure and resources and other improvement steps Laboratory services Surgical services/human resources including a dedicated, competent team for ensuring SSI prevention activities working to an action plan Supplies for surgical hand preparation* <ul style="list-style-type: none"> ABHR, antimicrobial soap <p><small>* Procurement vs local production</small></p> <ul style="list-style-type: none"> Sterile drapes and gowns The correct antibiotics for SAP (and if need to be given with MBP) - easily accessible Clippers (if hair removal essential) Chlorhexidine- alcohol-based (skin prep) solution* Mupirocin 2% ointment Oxygen Standard postoperative wound dressings <p>To consider:</p> <ul style="list-style-type: none"> Antimicrobial-coated sutures Negative pressure wound therapy devices Nutritional formulas Warming devices Fluid therapy Aqueous povidone iodine solution (irrigation) 	<p>Read the slide, highlighting various examples listed on the slide.</p>	—
129	<p>Understanding the multimodal strategy for SSI prevention (2)</p>  <p>Training and education – "Teach it"</p> <ul style="list-style-type: none"> Practical training and education methods aligned with the recommendations for SSI prevention Onsite hospital courses Bolus (single relatively large) sessions Simulation sessions for skills training Use of locally made or online videos Online e-learning courses and webinars Focus groups and workshops Bedside training In-person sessions, e.g. during ward or grand rounds, town hall meetings, coaching visits Pre and post knowledge and perception tests Training support materials (handouts, e-learning, etc.) 	<p>Ask a student to read the slide.</p> <p>Say:</p> <p>"Does this make sense? Would you agree that the right education and training is a critical component of successful improvement?"</p> <p>Note: you can allow some open discussion but move on, as group work 8 will help students understand using all components of the strategy.</p>	—


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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
130	<p>Understanding the multimodal strategy for SSI prevention (3)</p>  <p>Evaluation and feedback "Check it" <i>Regular monitoring and timely feedback of:</i></p> <ul style="list-style-type: none"> • risk factors for SSI; • compliance with recommended procedures and practices; • infrastructures and available resources and supplies; • knowledge and perception of the problem; • SSI rates. <p>It should not be seen as a component separate from implementation or only to be used for scientific purposes. Targeted tools and use of observations are inherent.</p> <p>This is an essential step in:</p> <ul style="list-style-type: none"> • identifying areas deserving major efforts and feeding crucial information into development of local action plan; • measuring the changes induced by improvement efforts and ascertaining whether interventions have been effective; • engaging staff in deciding upon different formats for providing feedback (real time and personalised feedback have proven beneficial). 	<p>Ask a student to read the slide.</p> <p>Say:</p> <p>"Would you agree that monitoring and feedback is important for implementation of the SSI recommendations to be successful? Remember, this can be undertaken in many different ways, focused on outcome and/or processes. We will go into more detail on this next."</p>	—
131	<p>Understanding the multimodal strategy for SSI prevention (4)</p>  <p>Reminders and communications "Sell it"</p> <ul style="list-style-type: none"> • <i>Reminding and prompting health care workers about the importance of practices to prevent SSI when they are working at the point of care</i> • <i>Informing patients and their visitors of the standard of care that they should expect to receive</i> • <i>Communications to inform senior leaders and decision-makers regarding the standards that they should assure</i> <ul style="list-style-type: none"> • Posters • Leaflets • Banners • Stickers • Flowcharts • Infographics • Letter templates • Advocacy messages suitable to the local setting, e.g. memos • Manuals • Electronic reminders (built in to hospital IT system) • Telephone call (including for patient reminders) 	<p>Ask a student to read the slide.</p> <p>Say:</p> <p>"We have all seen many posters in our settings, but effective communications to remind busy health workers of the actions they have to take play a major part in achieving success, so this should be part of your strategy."</p>	—
132	<p>Understanding the multimodal strategy for SSI prevention (5)</p>  <p>Institutional safety climate and culture "Live it" <i>Creating an environment and the perceptions that facilitate awareness-raising about SSI prevention at all levels:</i></p> <ul style="list-style-type: none"> • a climate that understands and prioritizes surgical safety issues; • team spirit and cohesion; • awareness of self-capacity to make a change, ownership of the intervention. <ul style="list-style-type: none"> • Motivated, multidisciplinary well functioning teams • Champions • Role models • Visible leadership including on ward/grand rounds, through photographs and signatures • Morbidity and mortality meetings including senior hospital staff – to learn from defects and facilitate sharing for improvement • Advocacy messages from leaders (delivered in a timely manner) 	<p>Ask a student to read the slide.</p> <p>Say:</p> <p>"I am sure you would all agree that the culture in an organization can affect how change or improvement happens. So however hard it is to address, this must be considered in your strategy."</p>	—
133	<p>Group work 8. Preparing a multimodal strategy for SSI - example</p>  	<p>Say:</p> <p>"We will now work in groups to use the multimodal improvement strategy as a set of prompts to plan your journey to implement the SSI recommendations.</p> <p>Take the blank table in your handbook and work in your groups – first, use surgical hand preparation as your example of a needed improvement. The scenario is: it has been noticed that not all surgeons undertake the</p>	<p>Refer students to group work 7 - student handbook, p. 66.</p> <p>Refer to handout 9 in the student handbook, p. 20. http://www.who.int/infection-prevention/publications</p>




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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>recommended surgical hand preparation, and postoperative infections are frequent in patients.</p> <p>Try to list under each component of the multimodal strategy in the blank table you have been given, the requirements to ensure that all surgeons follow this recommendation.</p> <p>Next, take another SSI recommendation that you think needs to be improved and do the same exercise.</p> <p>Remember that earlier in this module we talked about the resources that might be needed when thinking about, for example, system change as part of a multimodal strategy to prevent SSI.</p> <p>Key questions for each group</p> <ul style="list-style-type: none"> • Does the facility need to procure, produce, identify, allocate or prepare anything for the improvement to take place and for the system change to be sustainable in order to help staff to prevent SSI? Where should resources be deployed within the facility, including when improvement is slower than expected? • Does the facility have staff competent in delivering targeted training and the right materials to deliver the training? Which staff need to be trained and how can the facility ensure staff can attend training sessions? It is also important to ask whether any system change has been made or is needed so that the training delivered is realistic to the setting – for example, if training takes place on use of a negative pressure device, the device needs to be available for use. • Does the facility have staff competent in undertaking monitoring and 	ons/ssi-guidelines/en/


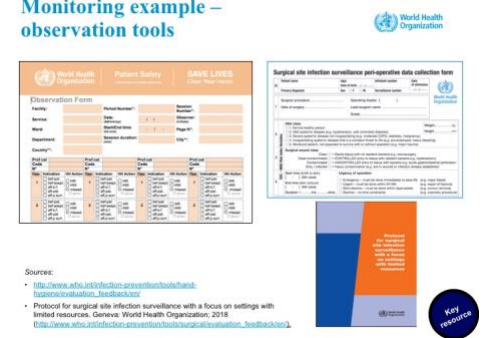
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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		<p>feedback and the right resources to conduct monitoring? Which staff need to be trained to ensure effective monitoring and feedback? Are there forums in which feedback can be delivered, and is the organization prepared to receive feedback and act on it?</p> <ul style="list-style-type: none"> Does the facility know which recommendations need communications to support reliable implementation, as well as which staff would benefit from reminders and where best to position these for impact? Are the right expertise and resources available to develop impactful communications? <p>Allow 1 hour total for this activity (30 minutes for group work, 30 minutes for feedback).</p>	
134	<p>Integration of hand hygiene in the flow of patient care</p>  <p>Source: http://www.who.int/infection-prevention/tools/surgical/reminders-advocacy/en/</p>	<p>Say:</p> <p>“Let’s now apply the strategy to improving hand hygiene in surgical care and let’s see what resources are available from WHO to facilitate its application.</p> <p>Has anyone used this infographic to highlight hand hygiene in the surgical patient journey? Why not consider using this tool and blanking out some of the steps to ask clinical staff where they think the moments for hand hygiene occur and other facts about surgery?”</p> <p>If time allows, read through the infographic.</p>	<p>Refer to handout 20 in the student handbook, p. 69:</p> <p>http://www.who.int/infection-prevention/tools/surgical/reminders-advocacy/en/</p>

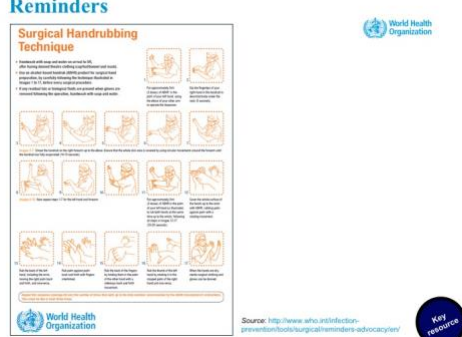


Advanced Infection Prevention and Control Training

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
135	<p>System change: modified WHO formulations for surgical hand preparation</p>  <p>Formulation I Final concentrations: ethanol 80% wt/wt, glycerol 0.725% vol/vol, hydrogen peroxide 0.125% vol/vol. Ingredients: 1. ethanol (absolute), 800 g 2. H₂O₂ (3%), 4.17 ml 3. glycerol (98%), 7.25 ml (or 7.25 x 1.26 = 9.135 g) 4. top up to 1000 g with distilled or boiled water</p> <p>Formulation II Final concentrations: isopropanol 75% wt/wt, glycerol 0.725% vol/vol, hydrogen peroxide 0.125% vol/vol. Ingredients: 1. isopropanol (absolute), 750 g 2. H₂O₂ (3%), 4.17 ml 3. glycerol (98%), 7.25 ml (or 7.25 x 1.26 = 9.135 g) 4. top up to 1000 g with distilled water</p> <p><small>Source: 1. Buckton M, Kozel M, Patel D, Fisher M. Modified WHO hand rub formulations comply with European efficacy requirements for preparation surgical hand preparation. Infect Control Hosp Epidemiol. 2013; 134(3):245-250. 2. Angermund M, Alotaibi M, Zeynal-Khazry R, Huchard P, Senechal J, Ouellet J et al. A multistep infection control and patient safety intervention to reduce surgical site infections in Africa: a multicentre, before-after, cohort study. Lancet Infect Dis. 2016; 16(5):507-515.</small></p> 	<p>Say:</p> <p>First, for system change you might need to consider reliable placement of filled bottles of antimicrobial soap or ABHR, but depending on your situation you might also need to consider availability of the product. This slide sets out two formulations for local production of ABHR, as approved by WHO and implemented in the SUSP Africa project. This led to successful availability in those hospitals and adherence by surgeons, and was part of the observed SSI reduction rates. It should be noted, however, that the whole team was involved in this process – not just IPC leads. This is important for implementation of any change.”</p> <p>Note: depending on the audience, this issue might not be relevant, or it might need a lengthy discussion on aspects of local production. More information should be taken from the WHO guidelines on hand hygiene in health care, or you can refer people to that resource if time is limited.</p>	—
136	<p>Education and training example: improving surgical hand preparation</p>  <p>1. Local production of modified WHO formulation for ABHR</p> <p>2. Surgical hand preparation</p> <ul style="list-style-type: none"> • Antimicrobial soap + water = 2–5 minutes • Alcohol-based = 1.5–3 minutes • The right technique is crucial • Nailbrushes are <u>not</u> recommended. 	<p>Read the slide.</p>	—



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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
137		<p>Say:</p> <p>“A video is also available, which is another way of engaging the surgical team in improving techniques for surgical hand preparation through training. It might be a resource you want to use. This is part of education.”</p> <p>Play the video via the link provided to demonstrate the proper technique for performing surgical scrub.</p>	<p>Refer to handout 21 and 22 in the student handbook, p. 71-73</p> <p>Surgical handscrubbing technique: http://www.who.int/gpsc/5may/hh-surgicalA3.pdf?ua=1</p> <p>Hand hygiene observation form: http://www.who.int/infection-prevention/tools/hand-hygiene/evaluation/feedback/en/</p>
138		<p>Say:</p> <p>“When you want to record whether surgical hand preparation is happening reliably, use an observational tool to monitor and provide feedback to surgeons. You can instruct staff to observe just moment 2 – before a clean/aseptic procedure (the surgery). Instructions are on the back of the form too. Monitoring the appropriateness of the technique used for surgical hand preparation is also included in the perioperative form of the WHO SSI surveillance protocol mentioned earlier.”</p>	<p>Refer to handout 22 in the student handbook, p. 73: http://www.who.int/infection-prevention/tools/hand-hygiene/evaluation/feedback/en/</p>



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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
139		<p>Say:</p> <p>“Next, when considering surgical hand preparation, placement of reminders about the steps involved will be another factor – this provides education and a reminder in the workplace. Do any of you already use this resource?”</p>	<p>Refer to handout 21 in the student handbook, p. 71: http://www.who.int/gpsc/5may/A4_hh-poster-visual-EN.pdf?ua=1</p>
140		<p>Say:</p> <p>“You saw from the SUSP work that local ownership was critical, and many local awareness tools were developed to support the improvement strategies. Posters are just one way to remind and communicate a message, but remember that WHO has produced a number of campaign materials on surgical infections that you may find useful.”</p>	<p>Additional campaign materials: http://www.who.int/gpsc/5may/A4_hh-poster-visual-EN.pdf?ua=1</p>
141		<p>Say:</p> <p>“Surgical patients are most likely to have a postoperative wound dressing. Remember that the WHO recommendation is not to use any type of advanced dressing over a standard dressing on primary closed surgical wounds for the purpose of preventing SSI. It's important to help people focus on the most critical actions when caring for surgical patients. This is the poster we saw earlier indicating critical times for hand hygiene in the context of wound care”</p>	<p>Refer to handout 14 in the student handbook, p. 39.</p>

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
142	<p>Tools to address the culture</p>  <p>Core CUSP toolkit Created for clinicians by clinicians, the CUSP toolkit is modular and modifiable to meet individual unit needs. Each module includes teaching tools and resources to support change at the unit level, presented through facilitator notes that take you step-by-step through the module, presentation slides, tools, videos.</p> <p>CUSP for Safe Surgery Perioperative Staff Safety Assessment</p> <p>Purpose of this form: The purpose of this form is to tap into your experience at the bedside of patient care to help you understand patient safety in your clinical area. Who should complete this form: All staff members. How to complete this form: Please complete this form as soon as possible after attending the 4 sessions. Drop off your completed safety assessment form in the location designated by the staff team. When to complete this form: Any staff member can complete this form at any time.</p> <p>CUSP for Safe Surgery (SUSP) Safety Issues Worksheet for Senior Executive Partnership</p> <p>Date of Safety Review:</p> <p>Unit:</p> <p>Attendees:</p> <p>1. 3. 2. 6. 4. 7. (Please use back of form for additional attendees.)</p> <p>Source: Core CUSP Toolkit [website]. Rockville, MD: Agency for Healthcare Research and Quality; 2018 (https://www.ahrq.gov/professionals/quality-patient-safety/surgery/index.html). Supplemental Tools [website]. Rockville, MD: Agency for Healthcare Research and Quality; 2018 (https://www.ahrq.gov/professionals/quality-patient-safety/surgery/index.html).</p>	<p>Say:</p> <p>“And now to describe some additional adaptive specific tools. You might not have used these before, but they have been tried and tested, including in hospitals in Africa as part of SUSP. They provide a useful start to addressing institutional safety climate and culture, along with the hospital safety culture survey mentioned earlier, in understanding organizational and individual barriers that exist and therefore enhancing teamwork over time. They are part of this improvement journey: using the technical tools alone will not help you address key barriers that arise.</p> <p>You will be able to think of other tools now that we have discussed improvement in terms of the WHO SSI recommendations and in the context of a multimodal improvement strategy. Not just for surgical hand preparation but for all the areas that require improvement, we have a critical point to remember here, the patient at the centre of the care.”</p>	<p>Comprehensive unit-based safety program for safe surgery tools:</p> <ul style="list-style-type: none"> • https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/surgery/index.html • http://www.who.int/infection-prevention/tools/surgical/en/
143	<p>SSI prevention throughout the patient journey – IPC in action</p>  <p>WHAT'S THE SOLUTION? A range of precautions - before, during and after surgery - reduces the risk of infection.</p> <p>BEFORE SURGERY</p> <p>1. Patient assessment and optimization 2. Preoperative antibiotics 3. Skin antisepsis 4. Shave or clip hair 5. Preoperative patient education 6. Preoperative patient positioning</p> <p>DURING SURGERY</p> <p>7. Aseptic technique 8. Antimicrobial prophylaxis 9. Temperature management 10. Fluid management 11. Blood conservation 12. Wound management</p> <p>AFTER SURGERY</p> <p>13. Wound care 14. Pain management 15. Patient education 16. Discharge planning</p> <p>Source: http://www.who.int/gpsc/ssi-infographic.pdf</p> <p>WHO resource</p>	<p>Say:</p> <p>“Putting the patient at the centre of the care means thinking about all the things that happen on the surgical journey that require safe IPC processes to implement them. This can be a good visual representation for staff and patients alike, as discussed previously.”</p>	<p>Refer to handout 7 in the student handbook, p. 17:</p> <p>http://www.who.int/infection-prevention/publications/ssi-guidelines/en/</p>

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
144	<p>WHO SSI Prevention Implementation Package</p>  <p>Fact sheets on SSI recommendations http://www.who.int/infection-prevention/tools/surgical/en/</p>	<p>Say:</p> <p>“The use of an overall implementation package is important in the sustainability of efforts. Check WHO web pages for all resources now and in the future.”</p>	
144	<p>Acknowledgements</p> <ul style="list-style-type: none"> • Benedetta Allegranzi (Department of Service Delivery and Safety, WHO) coordinated the development of this module and contributed to its writing. • Claire Kilpatrick (Department of Service Delivery and Safety, WHO) led the writing of the module. • Anthony Twyman and Nizam Dimani (Department of Service Delivery and Safety, WHO) contributed to the writing of the module. 	<p>Read the slide.</p>	–
145	<p>WHO Infection Prevention and Control Global Unit</p> 	<p>Thank the participants for their time and attention.</p>	–

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Annex 1

The same pre- and post-training test (p. 67 below) should be distributed to participants at the beginning and end of this module to gauge their knowledge of SSI. The pre-training test will develop a baseline, measuring existing knowledge, and identify knowledge gaps. The post-training test will assess the knowledge gained through the module.

This page contains the answers to the test; please ensure two copies of the master form on p. 67 are printed for each student. Hand one out at the start of the session to collect initial data from participants and the other at the end to assess progress.

FORM WITH ANSWERS – for trainer

Advanced IPC knowledge exam: SSI prevention

All questions are multiple choice. Please circle one answer or all that apply as per each question's instructions.

SSI prevention

1. Which of the following best describes the burden of SSI in the United States of America and Europe? (Please circle one answer.)
 - a. The most frequent type of health care-associated infection (HAI)
 - b. Not frequent
 - c. The second most frequent type of HAI**
 - d. Equal to bloodstream infections as a common type of HAI

2. Which of the following best describes the burden of SSI in low- and middle-income countries? (Please circle one answer.)
 - a. The most frequent type of HAI**
 - b. Not frequent
 - c. The second most frequent type of HAI
 - d. Equal to bloodstream infections as a common type of HAI

3. Which of these situations makes SSI risk most likely? (Please circle one answer.)
 - a. Intact skin
 - b. Intact mucous membrane
 - c. Broken skin or mucous membrane
 - d. Foreign body going from outside to inside the patient's body**

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4. Which of these pre/intraoperative factors can lead to SSI? (Please circle all that apply.)
- a. **Hair removal technique**
 - b. **Operative technique**
 - c. **Prolonged duration of surgery**
 - d. **Traffic intensity**
5. How many strong recommendations are in the WHO global guidelines for the prevention of SSI? (Please circle one answer.)
- a. One
 - b. Three
 - c. **Nine**
 - d. Fifteen
6. The wording of which of these WHO recommendations is not correct? (Please circle one answer.)
- a. Patients with known nasal carriage of *Staphylococcus aureus* (*S. aureus*) should receive perioperative intranasal applications of mupirocin 2% ointment, with or without a combination of chlorhexidine gluconate (CHG) body wash.
 - b. In patients undergoing any surgical procedure, hair should either NOT be removed or, if absolutely necessary, should only be removed with clippers. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room.
 - c. **Surgical antibiotic prophylaxis (SAP) should first be administered after the surgical incision.**
 - d. Alcohol-based antiseptic solutions based on CHG for surgical site skin preparation should be used in patients undergoing surgical procedures.
7. How might you start your journey to SSI improvement in the operating room? (Please circle one answer.)
- a. Looking at global HAI data
 - b. **Using a safety assessment tool**
 - c. Asking the surgeons if they always wear gloves
 - d. Presenting an action plan that tells the operating room staff what to do

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8. What actions would you then take to start an SSI improvement project? (Please circle all that apply.)
- a. Run the project for two months
 - b. Assemble a multidisciplinary team**
 - c. Engage senior management in part of the team**
 - d. Arrange to meet once a year to discuss improvement interventions
9. Which of these are components of the WHO multimodal improvement strategy? (Please circle all that apply.)
- a. System change**
 - b. Organizational culture**
 - c. Facility preparedness
 - d. Monitoring and feedback**
10. When in the patient journey should hair removal with clippers happen if hair removal is absolutely necessary? (Please circle one answer. Note: this question deliberately focuses on the patient journey rather than the recommendation itself.)
- a. Three days before the operation
 - b. On patient admission
 - c. Immediately before the operation**
 - d. In the patient's own home
11. When should hand hygiene occur when caring for a postoperative wound? (Please circle all that apply.)
- a. Upon entering the ward
 - b. Immediately before the clean/aseptic procedure**
 - c. Immediately after exposure to the wound's blood/body fluid**
 - d. After making the patient's bed
12. Who needs to be involved in an SSI improvement project? (Please circle all that apply.)
- a. Surgical team**
 - b. Pharmacists**
 - c. Sterilization services**
 - d. IPC team**

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Master form – for use in session

Advanced IPC knowledge exam: SSI prevention

All questions are multiple choice. Please circle one answer or all that apply as per each question's instructions.

SSI prevention

1. Which of the following best describes the burden of SSI in the United States of America and Europe? (Please circle one answer.)
 - a. The most frequent type of health care-associated infection (HAI)
 - b. Not frequent
 - c. The second most frequent type of HAI
 - d. Equal to bloodstream infections as a common type of HAI
2. Which of the following best describes the burden of SSI in low- and middle-income countries? (Please circle one answer.)
 - a. The most frequent type of HAI
 - b. Not frequent
 - c. The second most frequent type of HAI
 - d. Equal to bloodstream infections as a common type of HAI
3. Which of these situations makes SSI risk most likely? (Please circle one answer.)
 - a. Intact skin
 - b. Intact mucous membrane
 - c. Broken skin or mucous membrane
 - d. Foreign body going from outside to inside the patient's body
4. Which of these pre/intraoperative factors can lead to SSI? (Please circle all that apply.)
 - a. Hair removal technique
 - b. Operative technique
 - c. Prolonged duration of surgery
 - d. Traffic intensity

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5. How many strong recommendations are in the WHO global guidelines for the prevention of SSI? (Please circle one answer.)
 - a. One
 - b. Three
 - c. Nine
 - d. Fifteen

6. The wording of which of these WHO recommendations is not correct? (Please circle one answer.)
 - a. Patients with known nasal carriage of *Staphylococcus aureus* (*S. aureus*) should receive perioperative intranasal applications of mupirocin 2% ointment, with or without a combination of chlorhexidine gluconate (CHG) body wash.
 - b. In patients undergoing any surgical procedure, hair should either NOT be removed or, if absolutely necessary, should only be removed with clippers. Shaving is strongly discouraged at all times, whether preoperatively or in the operating room.
 - c. Surgical antibiotic prophylaxis (SAP) should first be administered after the surgical incision.
 - d. Alcohol-based antiseptic solutions based on CHG for surgical site skin preparation should be used in patients undergoing surgical procedures.

7. How might you start your journey to SSI improvement in the operating room? (Please circle one answer.)
 - a. Looking at global HAI data
 - b. Using a safety assessment tool
 - c. Asking the surgeons if they always wear gloves
 - d. Presenting an action plan that tells the operating room staff what to do

8. What actions would you then take to start an SSI improvement project? (Please circle all that apply.)
 - a. Run the project for two months
 - b. Assemble a multidisciplinary team
 - c. Engage senior management in part of the team
 - d. Arrange to meet once a year to discuss improvement interventions

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9. Which of these are components of the WHO multimodal improvement strategy? (Please circle all that apply.)
- a. System change
 - b. Organizational culture
 - c. Facility preparedness
 - d. Monitoring and feedback
10. When in the patient journey should hair removal with clippers happen if hair removal is absolutely necessary? (Please circle one answer.)
- a. Three days before the operation
 - b. On patient admission
 - c. Immediately before the operation
 - d. In the patient's own home
11. When should hand hygiene occur when caring for a postoperative wound? (Please circle all that apply.)
- a. Upon entering the ward
 - b. Immediately before the clean/aseptic procedure
 - c. Immediately after exposure to the wound's blood/body fluid
 - d. After making the patient's bed
12. Who needs to be involved in an SSI improvement project? (Please circle all that apply.)
- a. Surgical team
 - b. Pharmacists
 - c. Sterilization services
 - d. IPC team

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Annex 2

Group work 5. Case study

Instructions:

- Divide participants into five groups and give them copies of the paper by Allegranzi et al. (p. 77) and of the WHO multimodal improvement strategy (handout 15 in the student handbook).
- Assign one of the five elements of the WHO multimodal improvement strategy to each group.
- If possible, assign a facilitator from the training team to each group.
- Advise participants to take 20 minutes to read the paper, focusing more on the methods and the results and the appendix, which focuses on the table of activities undertaken in the hospitals, than other sections of the paper. Be ready to use this information to discuss what activities implemented in the study reflect the element of the multimodal improvement strategy you have been assigned (15 minutes for discussion).
- Gather the groups together and discuss their conclusions (5 minutes per group: total of 25 minutes).
- Sample answers are provided and begin on p. 73. These example answers explain steps needed for some key SSI recommendation actions across all WHO multimodal improvement strategy components. Students may not provide the same wording or examples for each component as per a recommendation, however, they can be prompted to consider their future actions in the way presented here once all feedback has been received, as this promotes actions for each step which is known to achieve the greatest success as already explained. The aim is to see innovative ideas but also reference to the tools that have been highlighted in this session. Consider providing this as a supplemental handout upon completion of the group work.

Suggestions for making improvements at local level – how do I change the situation to meet the evidence-based recommendation?

SUMMARY OF THE RECOMMENDATION: WHAT, WHY, WHEN AND WHO

WHAT HAS TO BE ADDRESSED

- Good clinical practice recommends that patients should bathe or shower with either plain or medicated soap prior to surgery.
- Effective local strategies and standard operating procedures (SOP) should be implemented and monitored, including a focus on patient engagement/training.
- Provision of soap by health care facilities, preferably supported by procurement plans, may be required or desirable. The aspect of water availability (and quality) may also be a consideration in some countries.

WHY

- A preoperative shower or bath ensures that the skin is as clean as possible and reduces the skin bacterial load, especially bacterial colony counts at the site of surgical incision.
- Scientific evidence shows that preoperative bathing with antimicrobial soap containing chlorhexidine gluconate (CHG) has no additional benefit in reducing the SSI rate compared to plain soap (24).

WHEN

- It is useful to perform patient bathing or showering on the day of the operation or the day or night before so that patients are prepared before entering the intraoperative area/period.

WHO SHOULD BE INVOLVED






- Directly: surgical teams including outpatient clinic staff involved in preoperative patient information and preparation, and surgical and nursing ward staff.
- Patients, patient representatives/care givers, primary care health workers.
- To support: procurement services, senior management and IPC and patient safety teams.



Most frequent challenges encountered in implementing this recommendation

- No instructions available to patients and families.
- Lack of consideration of the importance of bathing by surgical teams.
- Incorrect timing for bathing (for example, done too early before admission).
- Lack of soap and/or out-of-pocket cost for patients.
- Low quality and/or lack of water.
- Waste of resources if CHG impregnated cloths and antimicrobial soap are used, especially in settings with limited resources.

The table below should be read in conjunction with the explanations and details on the WHO multimodal improvement strategy provided in Part 2.1. It provides a summary of actions to consider when implementing the strategy to improve the situation regarding this recommendation in a practical way. These are suggestions that proved to be effective to help achieve sustainable improvement, but they require local decision-making according to the facility needs and goals.

ELEMENTS OF THE MULTIMODAL STRATEGY - THE "HOW OF IMPROVEMENT"	
SYSTEM CHANGE ('built it') 	<ul style="list-style-type: none"> Put in place/improve a sustainable system to reliably procure and deliver soap for the preoperative bathing of patients, including a dedicated budget. In settings where water access/quality and baths/showers are not readily available, develop a plan for improving water access and quality and increasing the number of showers and basins.
TRAINING AND EDUCATION ('teach it') 	<ul style="list-style-type: none"> Put in place a reliable mechanism for producing/using updated education resources and information for staff and patients to support preoperative bathing. Train key staff on the need for preoperative patient bathing and how to advise patients on this measure. Provide patients and families with leaflets/ educational materials in a timely manner to educate on preoperative bathing.
MONITORING AND FEEDBACK ('check it') 	<ul style="list-style-type: none"> Put in place/improve a monitoring, reporting and feedback mechanism (including roles and responsibilities) regarding: <ul style="list-style-type: none"> reliable availability of soap for preoperative patient bathing and appropriate placement in a location suitable for the timing of bathing (this might be in clinical areas supporting the preoperative patient assessment in the hospital or primary care setting); staff knowledge and perception on preoperative bathing to help assess training needs and identify lack of awareness and/or implementation barriers; adherence to preoperative patient bathing SOPs; patient feedback on the approach/tools used to educate them on preoperative bathing; SSI rates. Integrate patient bathing into the preoperative checklist or patient preparation form.
COMMUNICATIONS AND REMINDERS ('sell it') 	<ul style="list-style-type: none"> In collaboration with staff, develop/adapt: <ul style="list-style-type: none"> prompts to be used to champion the need for preoperative patient bathing (including in conjunction with patient representatives/clinics/primary care health workers) and to be placed/replenished in suitable areas; other communications to highlight a plan of changes that will happen (standardized approach to preoperative bathing) where this is necessary and the reasons why adherence to preoperative bathing will be monitored and fed back to all staff; videos on bathing as part of patient preoperative preparation to be used in outpatient areas. Integrate preoperative bathing into the preoperative checklist.
SAFETY CLIMATE AND CULTURE CHANGE ('live it') 	<ul style="list-style-type: none"> Engage surgeons, nurses (including from the wards and outpatient clinics/primary care), patients and their families to ensure maximum awareness and compliance. Organize meetings and focus group discussions with all the right people to discuss the problem (for example, lack of knowledge and awareness). Promote the importance of a facility culture that supports staff to be given the time to be updated/trained on preoperative bathing. Gather support from community leaders known to be influential and who could issue messages on preoperative bathing, for example, in the form of a billboard or radio message, as well as social media messages (particularly in settings where resources are limited). Obtain senior management budget allocation, as necessary.

Suggestions for making improvements at local level – how do I change the situation to meet the evidence-based recommendation?

SUMMARY OF THE RECOMMENDATION: WHAT, WHY, WHEN AND WHO

WHAT HAS TO BE ADDRESSED

- Hair removal in patients undergoing any surgical procedure should be avoided or, if absolutely necessary, hair should only be removed with a clipper.
- Shaving is strongly discouraged at all times, both preoperatively and in the operating room. A protocol/SOP regarding the avoidance of hair removal should be developed, implemented and monitored to standardize practices and with the aim to undertake a thorough assessment of hair removal practices if deemed necessary, including the use of clippers.

WHY

- Scientific evidence shows that either no hair removal or clipping is associated with a significantly lower risk of SSI when compared to shaving (26).
- The risk of SSI is higher when hair removal is performed by a razor than by a clipper as shaving causes small abrasions to the skin.
- Evidence shows that the use of a depilatory cream has neither benefit nor harm when compared to shaving for the prevention of SSI. Additional drawbacks are the necessity to leave them in place for approximately 15-20 minutes for the hair to be dissolved and the potential for allergic reactions.

WHEN

- Hair should not be removed. Hair removal, if absolutely necessary, should be done shortly before the operation.

WHO SHOULD BE INVOLVED






- Directly: surgical teams, including outpatient clinic staff involved in preoperative patient information and preparation, surgical ward staff, patients, patient representatives and primary care health workers.
- To support: procurement services, senior management and IPC and quality improvement teams.



Most frequent challenges encountered in implementing this recommendation

- No instructions available to patients and families prior to admission about avoiding hair removal.
- No protocol/SOPs about hair removal available to surgical teams.
- Cultural issues (especially in women) about avoiding hair removal.
- Surgeons' reluctance to avoid hair removal.
- Habits and cultural resistance to dismiss shaving.
- Incorrect timing for hair removal, when deemed necessary (for example, done the day before surgery instead shortly before skin preparation).
- Financial and procurement constraints to make single-use clippers continuously available.
- Lack of/or defective process for the decontamination of clippers if they are reused.

The table below should be read in conjunction with the explanations and details on the WHO multimodal improvement strategy provided in Part 2.1. It provides a summary of actions to consider when implementing the strategy to improve the situation regarding this recommendation in a practical way. These are suggestions that proved to be effective to help achieve sustainable improvement, but they require local decision-making according to the facility needs and goals.

ELEMENTS OF THE MULTIMODAL STRATEGY - THE "HOW OF IMPROVEMENT"	
SYSTEM CHANGE ('built it') 	<ul style="list-style-type: none"> Put in place/improve: <ul style="list-style-type: none"> a sustainable procurement system to reliably procure single-use clippers, including a dedicated budget; a system which can ensure the safe and correct disposal of clippers; a safe and reliable system for the cleaning and decontamination of clipper heads* and handle if single-use clippers are not affordable; a system for the appropriate location of clippers for essential hair removal; a system for the identification of razors for regular facial hair removal only in order to ensure that surgical site skin hair is not removed preoperatively (or only if absolutely necessary with clippers). Review and update as necessary all hospital policies and procedures on appropriate preoperative hair removal.
TRAINING AND EDUCATION ('teach it') 	<ul style="list-style-type: none"> Put in place/improve a reliable mechanism for producing/using updated training resources and information for staff and patients about avoiding hair removal or performing it with clippers when necessary, including scientific evidence. Conduct training for key staff and educational sessions for patients.
MONITORING AND FEEDBACK ('check it') 	<ul style="list-style-type: none"> Put in place a monitoring, reporting and feedback system (including roles and responsibilities) regarding: <ul style="list-style-type: none"> reliable availability of single-use clippers; staff knowledge and perception on avoiding hair removal to help assess training needs and identify lack of awareness and/or implementation barriers; adherence to hair removal SOPs; patient feedback regarding the approach/tools used to educate them; SSI rates. Integrate avoiding hair removal or using clippers into the preoperative checklist or patient preparation form.
COMMUNICATIONS AND REMINDERS ('sell it') 	<ul style="list-style-type: none"> Develop/adapt: <ul style="list-style-type: none"> awareness-raising messages (for example, posters) and place them appropriately to remind staff not to remove hair at the surgical skin site (unless absolutely necessary and never with a razor); patient information leaflets, including for specific target audiences (for example, pregnant mothers undergoing a caesarean section).
SAFETY CLIMATE AND CULTURE CHANGE ('live it') 	<ul style="list-style-type: none"> Convince management to provide a budget for the purchase of clippers. Engage surgeons, nurses, patients and their families to ensure maximum awareness and compliance. Organize meetings and focus group discussions with all the right people to discuss the problem (for example, lack of knowledge and awareness). Consider one- to-one meetings with senior management to address opinions by surgeons who continue to want to remove hair preoperatively. Use messages from leading surgeons telling all surgical staff not to remove hair at the surgical skin site (unless absolutely necessary and never with a razor), for example, video messages, on grand rounds, at surgical meetings. Engage community leaders when messages to the public are needed to prevent hair removal at home or in the hospital.

* Proposed expert consensus-based decontamination process: cleaning and decontamination after use before use on another patient. This is performed by carefully disassembling the blades using protective equipment, cleaning with soap and water, drying and then wiping them with alcohol or another suitable disinfectant according to manufacturer's instructions.

Suggestions for making improvements at local level – how do I change the situation to meet the evidence-based recommendation?

SUMMARY OF THE RECOMMENDATION: WHAT, WHY, WHEN AND WHO

WHAT HAS TO BE ADDRESSED

- SAP should be administered intravenously when indicated (depending on the type of operation) within 120 minutes before the surgical incision.
- For exact timing, the half-life of the antibiotic should be considered. Thus, antibiotics with a short half-life should be administered closer to incision time.
- A standardized protocol for SAP should be developed (ideally adapted from national/international ones), implemented and monitored, including instructions on timing, indications, antibiotic regimens of first and alternative choice, doses, need for re-dosing in specific situations, etc., while taking into consideration antibiotic pharmacokinetics and pharmacodynamics and local AMR patterns, if available.

WHY

- Correct preoperative SAP administration timing, dose and intraoperative re-dosing (when necessary) achieve adequate concentrations of the drug at the site of incision at the beginning of the operation (highest risk of surgical site contamination) and throughout the operation duration.
- Incorrect (before 120 minutes or after incision) timing can lead to an increased risk of SSI (27, 28);
- Use of the correct antibiotic type according to the procedure and patient history aims to eliminate the risk of bacterial contamination most frequently found at the operation site and maintain patient safety.
- Correct use of SAP is important not only to prevent SSI, but also to avoid the emergence of antimicrobial-resistant pathogens that can cause more serious disease to the patient.

WHEN

- Within 120 minutes before surgical incision (and intraoperative re-dosing, when necessary),

WHO SHOULD BE INVOLVED






- Directly: anaesthetists or others tasked to administer SAP in the surgical team.
- To support: procurement services, pharmacy senior management and antimicrobial stewardship and IPC teams, especially experts in antimicrobial therapy and infectious diseases.



Most frequent challenges encountered in implementing this recommendation

- Absence of protocols for appropriate SAP, including correct time of administration.
- Unclear roles and responsibilities about who is in charge of ensuring correct SAP.
- Lack of knowledge of the evidence supporting the need for administering SAP intravenously within 120 minutes before incision.
- Incorrect location of antibiotic stockage, thus preventing prompt availability when SAP needs to be administered.
- Lack of resources to ensure appropriate SAP.

The table below should be read in conjunction with the explanations and details on the WHO multimodal improvement strategy provided in Part 2.1. It provides a summary of actions to consider when implementing the strategy to improve the situation regarding this recommendation in a practical way. These are suggestions that proved to be effective to help achieve sustainable improvement, but they require local decision-making according to the facility needs and goals.

ELEMENTS OF THE MULTIMODAL STRATEGY - THE “HOW OF IMPROVEMENT”	
SYSTEM CHANGE ('built it') 	<ul style="list-style-type: none"> • Develop a locally- adapted detailed SAP protocol. Up-to-date SAP protocol should be readily available to all concerned staff. • Put in place/improve: <ul style="list-style-type: none"> – a reliable system for the continuous supply of adequate antibiotics for SAP, including a dedicated budget; – a reliable delivery system of SAP, including electronic orders and/or an appropriate location in the operating room area with provision of new lockers with locks to ensure appropriate timing.
TRAINING AND EDUCATION ('teach it') 	<ul style="list-style-type: none"> • Put in place/improve a reliable mechanism for producing/ using updated training resources and information for staff on the SAP protocol (including timing), including scientific evidence and information on how antibiotics can be promptly accessed in the flow of care (including the hospital system/ policy on the placement of SAP). • Plan formal training sessions as well as one-to-one training/coaching sessions during clinical practice, also involving pharmacy staff when appropriate.
MONITORING AND FEEDBACK ('check it') 	<ul style="list-style-type: none"> • Put in place/improve a monitoring, reporting and feedback system (including roles and responsibilities) regarding: <ul style="list-style-type: none"> – staff knowledge and perception on SAP; – continuous procurement of SAP antibiotics; – appropriate administration of SAP (including timing); – antibiotic consumption for SAP; – SSI rates.
COMMUNICATIONS AND REMINDERS ('sell it') 	<ul style="list-style-type: none"> • Develop and make clear communications to key players about the local SAP protocol in a range of formats, as well as highlighting the changes to happen where necessary. • Make the local SAP protocol easily available in electronic and/or printed copy to all involved staff and display the protocol at the point of use. • Develop pocket booklets or leaflets for staff. • Develop posters, in conjunction with staff, highlighting the location of antibiotics for SAP and the key principles of the SAP protocol. • Put in place electronic reminders/alerts about the need for SAP connected to electronic patient records, if existing.
SAFETY CLIMATE AND CULTURE CHANGE ('live it') 	<ul style="list-style-type: none"> • Involve procurement, pharmacy and surgical and antimicrobial stewardship teams for the SAP protocol development. • Convince management to provide budget for purchasing the right antibiotics for SAP. • Engage leaders and champions among surgical and anaesthesiology staff to drive change and ensure maximum compliance with the protocol. • Organize meetings and focus group discussions with all the right people to discuss the new SAP protocol. • Issue leadership messages on a regular basis in a range of formats to remind staff of the SAP location and protocol. • Introduce/support a culture that supports reliable SAP delivery, including visible messages from senior management.

Suggestions for making improvements at local level – how do I change the situation to meet the evidence-based recommendation?

SUMMARY OF THE RECOMMENDATION: WHAT, WHY, WHEN AND WHO

WHAT HAS TO BE ADDRESSED

- Surgical hand preparation, including the use of the right products and technique, should be performed following the WHO hand hygiene recommendations (Appendix 2).
- Either a suitable antimicrobial soap, water and sterile single-use towels or a suitable ABHR can be used for surgical scrubbing. Products are suitable when they comply with the European Norm EN 12791 or the ASTM E-1115 standard.
- Appropriate product availability, placement and quality of supplies (including water) are critical for optimal compliance and adequate efficacy.
- Adequate supplies should be supported by procurement plans and budget. Market options as well as local production should be evaluated.

WHY

- To maintain the lowest possible contamination of the surgical field (gloves punctures can occur even when sterile gloves are worn). Hand preparation should reduce the release of skin bacteria from the hands to the open wound, particularly in the case of an unnoticed puncture of the surgical glove.
- Surgical hand preparation should eliminate transient flora and reduce resident flora.
- Some evidence shows no difference between the use of ABHR and antimicrobial soap and water for surgical hand preparation in reducing SSI (29).
- Some evidence indicates a primary surgeon preference for ABHRs, due mainly to the reduced time required for surgical hand preparation and fewer skin reactions.

WHEN

- The hands of the surgical team should be clean upon entering the operating room by washing with a non-medicated soap.
- Once in the operating area, handrubbing or scrubbing should be done immediately prior to donning sterile gloves and gowns; repeating this action before switching to the next procedure is required without an additional prior handwash.

WHO SHOULD BE INVOLVED

- Directly: surgical teams.
- To support: procurement staff, senior health facility leaders/managers, IPC, quality improvement and patient safety teams. In some areas, it might also be useful to include water and sanitation teams when necessary.



Most frequent challenges encountered in implementing this recommendation

- Lack of resources to prioritize procurement of ABHR and/or antimicrobial soap.
- Difficulties to procure ABHR.
- Absence of SOPs for the appropriate performance of surgical hand preparation.
- Lack of knowledge about the efficacy of ABHRs for surgical hand preparation causing surgeons' reluctance to use them.
- Concerns about possible harm associated with the use of ABHR (skin tolerance, other occupational health concerns, religious concerns, fire risks).

The table below should be read in conjunction with the explanations and details on the WHO multimodal improvement strategy provided in Part 2.1. It provides a summary of actions to consider when implementing the strategy to improve the situation regarding this recommendation in a practical way. These are suggestions that proved to be effective to help achieve sustainable improvement, but they require local decision-making according to the facility needs and goals.

ELEMENTS OF THE MULTIMODAL STRATEGY - THE “HOW OF IMPROVEMENT”	
SYSTEM CHANGE ('built it') 	<ul style="list-style-type: none"> Put in place/improve: <ul style="list-style-type: none"> a sustainable procurement system to reliably procure and deliver adequate surgical hand preparation supplies (including antimicrobial soap, single-use sterile towels, good quality water, and ABHR), including a dedicated budget; a service/unit to produce ABHR locally according to the WHO formulation (see WHO tools below) if unavailable or unaffordable from the market. Define and agree on roles and responsibilities for those who will ensure continuous availability and placement of supplies in a position suitable to clinical workflow and agreed with surgeons.
TRAINING AND EDUCATION ('teach it') 	<ul style="list-style-type: none"> Put in place/improve a reliable mechanism for producing/ using updated training resources and information for staff on appropriate surgical hand preparation technique, including evidence to support the use of ABHR and all related issues covered by the WHO recommendation (for example, avoiding nail brushes). Engage staff in interactive sessions, simulation and practical training using standardized tools such as the WHO poster and training video.
MONITORING AND FEEDBACK ('check it') 	<ul style="list-style-type: none"> Put in place a monitoring and feedback system (including roles and responsibilities) regarding: <ul style="list-style-type: none"> staff knowledge about surgical hand preparation; continuous procurement of ABHR and antimicrobial soap; ABHR and antimicrobial soap consumption; tolerance and acceptability of surgical hand preparation solutions; appropriate surgical hand preparation; SSI rates.
COMMUNICATIONS AND REMINDERS ('sell it') 	<ul style="list-style-type: none"> Use/adapt the WHO surgical hand preparation technique posters (available from WHO) and place them in the most suitable areas after consultation with surgical staff. Develop prompts to be used to champion the need for and the use of surgical hand preparation products at the right time.
SAFETY CLIMATE AND CULTURE CHANGE ('live it') 	<ul style="list-style-type: none"> Put in place visible signage showing surgeon and other key leader commitment to reliable surgical hand preparation, for example, a memo issued to all relevant hospital staff, a photo with a statement and signature placed around the surgical units, a video message to be played on computers/TVs. Discuss about appropriate surgical hand preparation and SSI risk during staff meetings, etc.

Suggestions for making improvements at local level – how do I change the situation to meet the best practices recommendations?

SUMMARY OF THE RECOMMENDATION: WHAT, WHY, WHEN AND WHO

WHAT HAS TO BE ADDRESSED

- Clear protocols/SOPs should be developed or improved as needed on appropriate environmental cleaning in the operating room, including maintaining asepsis and the decontamination of medical devices and surgical instruments, and effective multimodal implementation strategies should be put in place and monitored accordingly.






Cleaning

- The environment should be thoroughly cleaned and general principles of good practice should be taken into consideration (see Figure 5) (12).
- Cleaning is an essential first step prior to any disinfection process to remove dirt, debris and other materials.
- Appropriate detergent/disinfection solutions should be used and must be discarded after each use.
- **At the beginning of each day**, all flat surfaces should be wiped with a clean, lint-free moist cloth to remove dust and lint.
- **Between surgical procedures**, hand-touch surfaces and surfaces that may have come in contact with patients' blood or body fluids (see Figure 6) should be wiped clean first by using a detergent solution and then disinfected according to hospital policy and allowed to dry. The operating table should be cleaned and wiped with a detergent solution, including the mattress and the surface. All surfaces that have come in contact with a patient or a patient's body fluids must be cleaned and disinfected using an appropriate disinfectant solution according to local SOPs.
- **At the end of every day**, a total cleaning procedure must be performed. All areas of the surgical suite, including scrub sinks, scrub or utility areas, hallways and equipment should be thoroughly cleaned, regardless of whether they were used or not during the last 24 hours.
- Soiled linen should be removed in closed leak-proof containers. All contaminated waste containers should be removed and replaced with clean containers. Sharps' containers should be closed and removed when they are three-quarters full. All surfaces should be cleaned from top to bottom using a detergent, followed by a disinfectant if necessary, and then allowed to dry.
- To reduce the microbial contamination of environmental surfaces, such as walls, ceilings and floors, they should be thoroughly cleaned from top to bottom with a detergent and allowed to dry. The routine use of a disinfectant or fumigation of the operating room is *not* necessary, even after contaminated surgery.

Decontamination of medical devices and surgical instruments

- Decontamination is a complex and highly specialized subject.
- The availability of a separate demarcated department or a designated decontamination area with clear demarcated areas for workflow is critical.
- According to the Spaulding classification, which is based on the degree of risk of infection transmission, surgical instruments are categorized as 'critical' (at high risk) and require sterilization.
- All medical devices that are reprocessed, such as surgical instruments, must undergo **rigorous cleaning prior to decontamination and sterilization** procedures. Soaking contaminated medical devices prior to cleaning in disinfectants of any kind is not sufficient or recommended.
- At the end of every surgical procedure, all instruments should be returned to the sterile services department (after rinsing as per the SOP and securely contained in a leak-proof container before transportation).
- The cycle of decontamination is an important part of this (see Figure 7). More details can be found in the WHO guidelines for SSI prevention in the section on 'Importance of a clean environment in the operating room and decontamination of medical devices and surgical instruments'.

The table below should be read in conjunction with the explanations and details on the WHO multimodal improvement strategy provided in Part 1.2. It provides a summary of actions to consider when implementing the strategy to improve the situation regarding this recommendation in a practical way. These are suggestions that proved to be effective to help achieve sustainable improvement, but they require local decision-making according to the facility needs and goals.

ELEMENTS OF THE MULTIMODAL STRATEGY - THE “HOW OF IMPROVEMENT”	
SYSTEM CHANGE (‘built it’) 	<ul style="list-style-type: none"> Put in place/improve a sustainable system to reliably procure the necessary cleaning and decontamination/sterilisation products, including a dedicated budget. Develop/adapt a protocol/SOP to include instructions on: <ul style="list-style-type: none"> formal staff qualifications, education and training and competency assessment; cleaning; high-level disinfection; preparation and packaging of medical devices; sterilizer operating procedures; monitoring and documenting of chemical or cycle parameters; workplace health and safety information, specific to the chemical sterilant; handling, storage and disposal of sterilizing solutions according to the manufacturer’s instructions/local regulations; use of physical, chemical and/or biological indicators; quality systems; validation of cleaning, disinfection and sterilization.
TRAINING AND EDUCATION (‘teach it’) 	<ul style="list-style-type: none"> Put in place/improve a reliable mechanism for producing/using updated training resources and information for cleaning staff, sterile services staff, as well as the surgical team. Train staff on all aspects of cleaning in the operating room according to a regular schedule, with the corresponding details provided in a SOP.
MONITORING AND FEEDBACK (‘check it’) 	<ul style="list-style-type: none"> Put in place/improve a monitoring, reporting and feedback mechanism (including roles and responsibilities), regarding the: <ul style="list-style-type: none"> cleaning process applied in the operating room; standards of the sterile surgical instruments/trays (including the presence of a chemical indicator); placement of pack indicators within patients’ records; availability of an adequate number of fit-for-purpose devices for a surgical procedure; process for returning surgical instruments to the sterile services department after a procedure.
COMMUNICATIONS AND REMINDERS (‘sell it’) 	<ul style="list-style-type: none"> In collaboration with staff, develop/adapt prompts, posters, pictorials, algorithms on: <ul style="list-style-type: none"> operating room cleaning processes; cleaning and sterilization of surgical instruments/devices; correct use of sterile surgical instruments/trays; placement of pack indicators within the patients’ records.
SAFETY CLIMATE AND CULTURE CHANGE (‘live it’) 	<ul style="list-style-type: none"> Develop tailored strategies to address, engage and value environmental cleaning and sterilization teams. Engage surgical teams and sterile service department staff, to liaise and communicate on both good and inadequate practices. Introduce/reinforce a culture that supports appropriate cleaning and sterilization services, including visible messages and commitment from senior management.

Suggestions for making improvements at local level – how do I change the situation to meet the evidence-based recommendation?

SUMMARY OF THE RECOMMENDATION: WHAT, WHY, WHEN AND WHO

WHAT HAS TO BE ADDRESSED

- Alcohol-based antiseptic solutions containing CHG should be preferred for surgical site skin preparation over aqueous iodine-based solutions (PVP-I).
- A process should be developed, implemented and monitored at the facility level in order to align with this recommendation.
- Clear SOPs should be developed or adapted to guide appropriate surgical skin preparation using a standardized technique.
- Adequate supplies should be supported by procurement plans and budget. Market options and local production should be evaluated, including addressing product quality and the need for being visible on skin. A dye (e.g., E122 = azorubine) can be added to colourless solutions to make the product visible on the patient's skin.
- Alcohol-based solutions should not be used on neonates or be in contact with mucosa or eyes. CHG solutions must not be allowed to come into contact with the brain, meninges, eye or middle ear. Thus, alternative disinfectants should be available for the indications.
- Potential allergic reactions to CHG and other adverse events linked to alcohol- and CHG-based antiseptic solutions should be investigated and recorded.
- Alcohol-based antiseptic preparations represent a potential fire risk in the operating room because they may ignite if used in the presence of diathermy and they must be allowed to dry by evaporation. Therefore, ensure that the drapes are not saturated with alcohol or that the alcohol-based solution has not formed a pool underneath the patient before operating.

WHY

- Appropriate surgical site preparation is critical to reduce the microbial load on the patient's skin as much as possible before incision of the skin barrier.
- Alcohol-based antiseptic solutions for surgical site skin preparation are more effective compared to aqueous solutions in reducing SSI.
- Alcohol-based solutions containing CHG are more effective in reducing SSI rates compared to alcohol-based solutions containing PVP-I (35).






WHEN

- Perioperatively, with time built in to allow for drying before draping.

WHO SHOULD BE INVOLVED

- Directly: surgical teams.
- To support: procurement and pharmacy services, senior management and IPC and quality improvement teams.

The table below should be read in conjunction with the explanations and details on the WHO multimodal improvement strategy provided in Part 2.1. It provides a summary of actions to consider when implementing the strategy to improve the situation regarding this recommendation in a practical way. These are suggestions that proved to be effective to help achieve sustainable improvement, but they require local decision-making according to the facility needs and goals.

ELEMENTS OF THE MULTIMODAL STRATEGY - THE “HOW OF IMPROVEMENT”	
SYSTEM CHANGE ('built it') 	<ul style="list-style-type: none"> Put in place/improve: <ul style="list-style-type: none"> a sustainable system to reliably procure and deliver adequate supplies of skin preparation solution, including a dedicated budget; a service/unit to produce alcohol-based antiseptic solution locally,* including a process for adding dye as necessary, if unavailable or unaffordable from the market. Define and agree on roles and responsibilities for those who will ensure continuous availability and placement of supplies in a position suitable to clinical workflow and agreed upon with surgeons. Develop/adapt an SOP for appropriate surgical skin preparation using a standardized technique (including roles and responsibilities).
TRAINING AND EDUCATION ('teach it') 	<ul style="list-style-type: none"> Put in place/improve a reliable mechanism for producing/ using updated training resources and information for staff (based on a needs assessment) on appropriate skin preparation, including the appropriate technique, as well as providing evidence to support the use of alcohol-based solutions and CHG. Engage staff in interactive sessions, simulation and practical training using standardized tools, such as the WHO poster and training video, using a range of training modes deemed appropriate for the local situation (short sessions at grand rounds, existing meetings, topic embedded in formal, planned training sessions). Also consider providing as necessary the evidence on how the risk of burns, etc. from alcohol-based solutions can be managed.
MONITORING AND FEEDBACK ('check it') 	<ul style="list-style-type: none"> Put in place a monitoring, reporting and feedback system (including roles and responsibilities) regarding: <ul style="list-style-type: none"> staff knowledge about surgical skin preparation; continuous procurement of appropriate products; consumption of surgical skin preparation solutions; tolerance and acceptability of surgical skin preparation solutions; adherence with appropriate surgical skin preparation techniques; SSI rates.
COMMUNICATIONS AND REMINDERS ('sell it') 	<ul style="list-style-type: none"> In collaboration with staff, develop/adapt reminders and agree upon their most relevant placement to be used to champion the need for appropriate skin preparation solution (with added dye as necessary), including in collaboration with patient representatives as deemed appropriate.
SAFETY CLIMATE AND CULTURE CHANGE ('live it') 	<ul style="list-style-type: none"> Put in place visible signage showing surgeon and other key leader commitment to reliable surgical skin preparation, for example, a memo issued to all relevant hospital staff, a photo with a statement and signature placed in the surgical operating room, a video message to be played on computers/TVs. Discuss appropriate surgical hand preparation and the SSI risk during staff meetings, etc. Encourage senior management to use relevant opportunities to explain that the facility is supportive of the right surgical safety steps to prevent SSI.

* Use the following formula: isopropanol: 62.7% g/g + chlorhexidine digluconate (18.8% g/g solution); 12.1% g/g + distilled water up to 100%.