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;

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[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).

- 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);

- 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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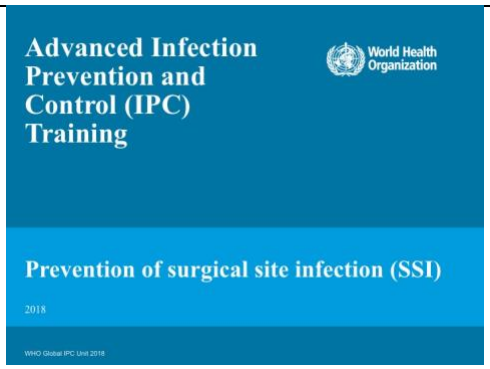
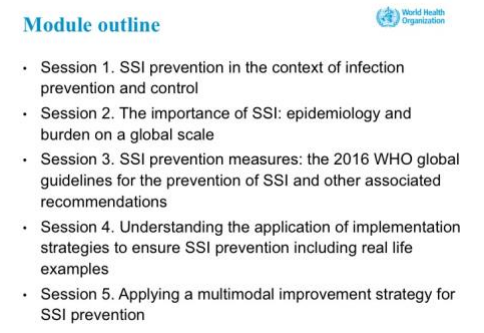
Details of presentation slides, with resources for the trainer

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		**Welcome** participants and **introduce** yourself and the topic for this module. **Ask** if there are any questions before advancing to the next slide.	–
2		**Give** a 1–2-minute overview of the whole module **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. **Read** the slide. **Emphasize** that each session builds on the previous one.	–

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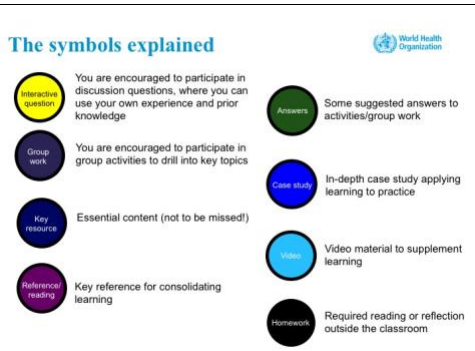
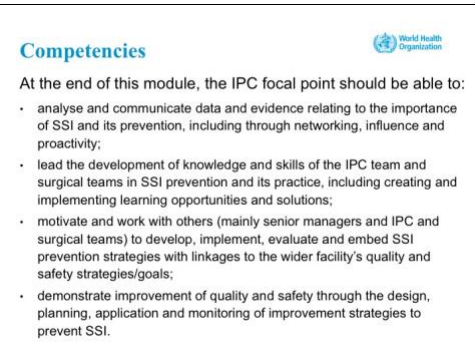
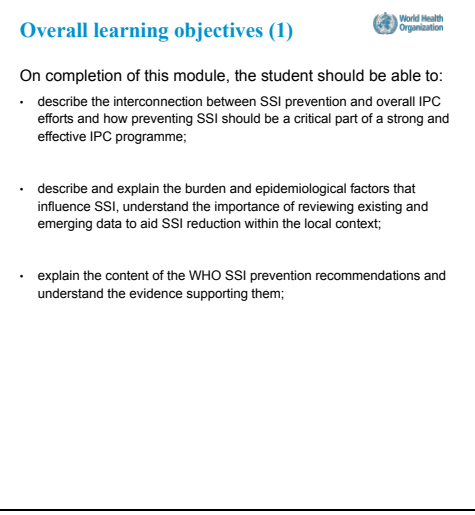
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
3		**Read** the explanations of the symbols from the screen.	–
4		**Read** the slide or ask a participant to read it. **Emphasize** that these are the learning outcomes the attendees will attain through completion of the module.	–
5		**Read** the slide or ask a participant to read it (note: the list continues on the next slide). **Emphasize** that these objectives are the knowledge and skills the attendees should be able to demonstrate on completion of this module.	–

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
6	**Overall learning objectives (2)** World Health Organization • 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.	**Ice breaker** • 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	**Common abbreviations** World Health Organization *FourEs* – engage, educate, execute, evaluate ABHR – alcohol-based handrub AMR – antimicrobial resistance CDC – [United States] Centers for Disease Control and Prevention CHG – chlorhexidine gluconate CUSP – comprehensive unit-based safety programme HAI – health care-associated infection IPC – infection prevention and control LMICs – low- and middle-income countries MBP – mechanical bowel preparation MRSA – methicillin-resistant *Staphylococcus aureus* NNIS – national nosocomial infection surveillance PPE – personal protective equipment SAP – surgical antibiotic prophylaxis SSI – surgical site infection SUSP– surgical unit-based safety programme VAP – ventilator-associated pneumonia WHO – World Health Organization Key resource	**Say:** "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. 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."	**Refer to handout 1 in the student handbook, p. 5.**
8	**Group work 1. Acknowledging the current status of your SSI prevention** World Health Organization • 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. Group work	**Group work 1 instructions** **Invite** participants to discuss with one another (in turn) their top three challenges with SSI prevention. Here are some example points to help stimulate discussion. • 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
		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. **Allow** 20 minutes for collective feedback and ask that they keep their notes to reflect on how their thoughts change during the module.	
9	Session 1 SSI prevention in the context of IPC	**Say:** "The first session of this module addresses SSI prevention in the context of IPC."	–
10	Learning objective – session 1 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	**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.	–
11	Effective IPC programmes – the core components and SSI prevention   Key resource 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	**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	**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

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		evidence-based recommendations for action at the national and acute health care facility level. **Use** the image to show the core components and their interconnections concisely.	**WHO guidelines on core components of IPC programmes:** http://www.who.int/infection-prevention/publications/core-components/en/
12		**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. An IPC programme with effective leadership is the solution to the problem of all health care-associated infections (HAIs), including SSI prevention. IPC programmes affect patient outcomes, reduce harm and improve the quality of care and help to stop the spread of antibiotic resistance. 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. **Play** the video from the link provided. **Refer** students to the "Leadership and programme management" training module for further information on this topic.	**Refer to handout 3 in the student handbook, p. 9.** http://www.who.int/gpsc/HAI-Infographic.pdf?ua=1 **Video on the core components of IPC programmes:** https://www.youtube.com/watch?v=LZapz2L6J1Q&feature=youtu.be **Leadership module:** http://www.who.int/infection-prevention/tools/core-components/en/

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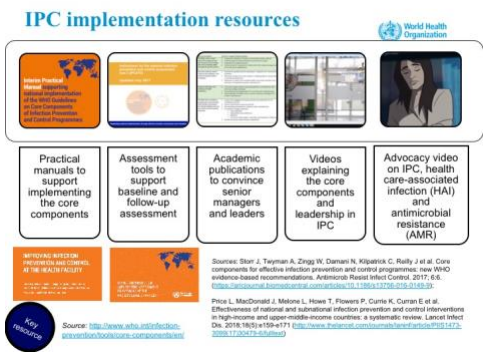
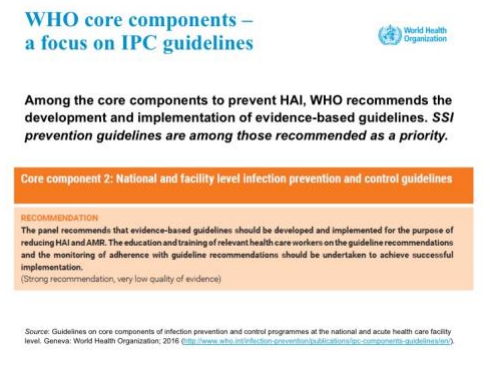
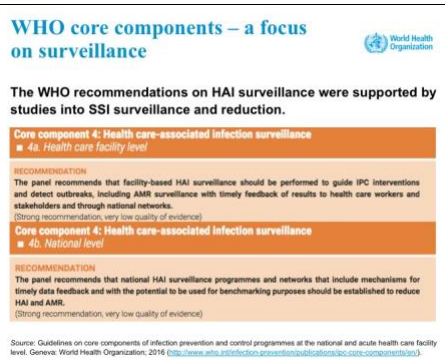
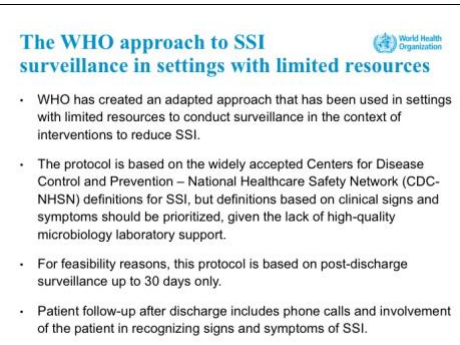
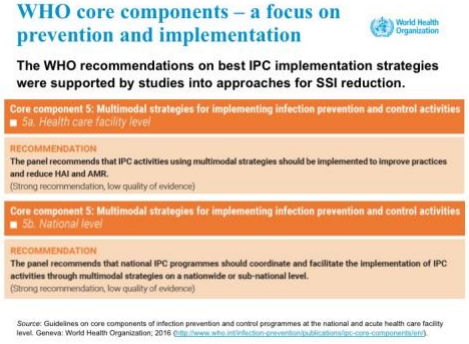
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
13		**Read out** the available key WHO IPC generic implementation resources: • practical manuals for implementation, nationally and at the facility; • baseline assessment tools to guide where to prioritize action, nationally 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. **Say:** "All are useful in progressing the IPC journey in support of SSI prevention."	**WHO core components for IPC webpage:** http://www.who.int/infection-prevention/publications/core-components/en/
14		**Say:** "Let's take a moment to understand the core component recommendations for effective IPC that refer to the importance of SSI prevention." **Read** the slide. **Say:** "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. 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	**WHO guidelines on core components of IPC programmes:** http://www.who.int/infection-prevention/publications/ipc-components-guidelines/en/

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		target audiences, is further detailed in core component 3."	
15		**Say:** "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. 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. 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."	**Link to these resources online if helpful and time permits:** • http://www.who.int/infection-prevention/publications/ipc-components-guidelines/en/ • http://www.who.int/infection-prevention/publications/ssi-prevention-guidelines/en/
16		**Read** the slide. **Say:** "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-	**WHO protocol for SSI surveillance with a focus on settings with limited resources:** http://www.who.int/infection-prevention/tools/surgical/evaluation_feedback/en/

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		**Say:** "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." **Read** the slide. Note: for more information on how to conduct and interpret HAI surveillance properly, **tell** participants that a "Surveillance" training module will be/is available.	–
18		**Say:** "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. SSI prevention studies contributed to informing the development of these evidence-based recommendations. We will go into much more detail about multimodal improvement strategies for SSI prevention in sessions 4 and 5 of this module. 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). The student handbook also contains a list of key SSI-related references for	**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 **Refer to handout 4 in the student handbook, p. 11:** http://www.who.int/gpsc/cc_summary.pdf?ua=1 **Refer to handout 23 in the student handbook, p. 76.**

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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	Session 2 The importance of SSI: epidemiology and burden on a global scale	**Say:** "The second session of this module addresses the importance of SSI epidemiology and burden globally."	–
20	Learning objective – session 2 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	**Read** the slide.	–
21	SSI burden in the local context • 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? Interactive Question	Ask the questions on the slide, giving participants a moment to reflect, and take feedback as a classroom discussion. **Say:** "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. The following slides identify how to detect the problem of SSI and review	–

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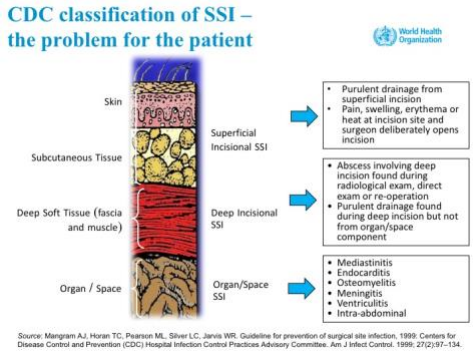
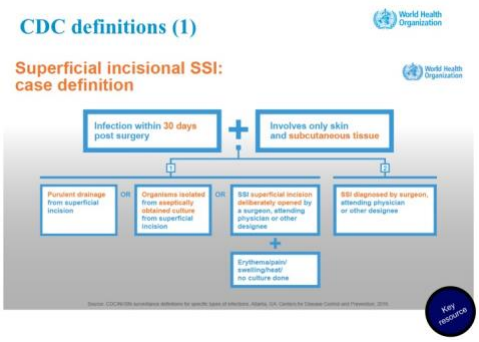
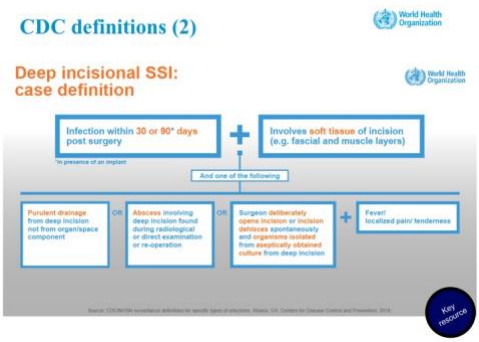
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		key data from various countries about the magnitude and burden of the problem and how it affects patients." **Allow** 2–3 minutes for self-reflection and 10 minutes for feedback.	
22		**Say:** "The Centers for Disease 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."	**Refer to handout 5 in the student handbook, p. 14.**
23		**Say:** "Let's read the case definition for more detail on what constitutes a superficial SSI." **Read** the slide. You may wish to pause to take questions and repeat the definition if necessary.	**Refer to handout 6 in the student handbook, p. 15.** **http://www.who.int/infection-prevention/tools/surgical/evaluation_feedback/en/**
24		**Say:** "This slide shows the difference when aiming to diagnose a deep SSI." **Read** the slide. You may wish to pause to take questions and repeat the definition if necessary.	–

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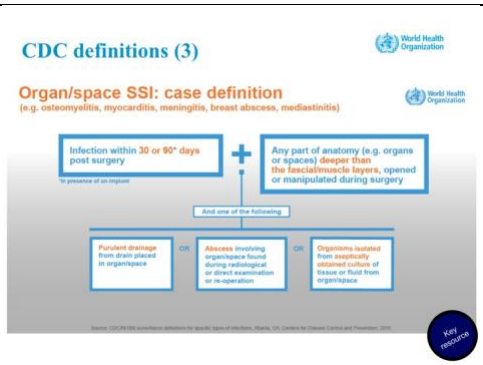
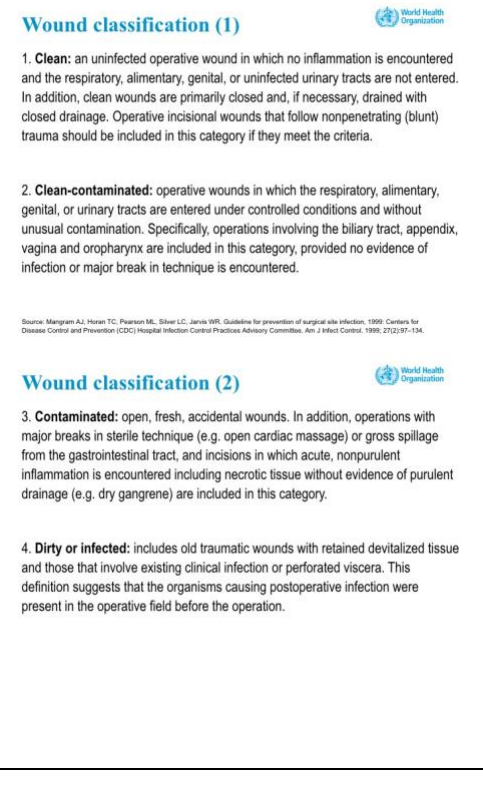
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
25		**Say:** "Now we can see the different definitions for organ or space SSI." **Read** the slide. You may wish to pause to take questions and repeat the definition if necessary. Refer students to the CDC reference for further reading on this topic. **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.	–
26-27		**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. **Read** the slide. **Ask:** "Are all health workers involved in surgery aware of the classifications presented in these slides so that accurate infection diagnosis can be made?" 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.	–

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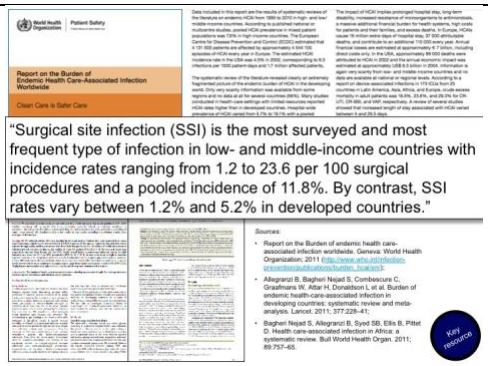
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
28		**Say:** "Let's now move to understand the magnitude of the SSI problem worldwide. This clear visual resource helps us all to describe the problem of SSI in a concise way, for both low- and middle-income countries (LMICs) and high-income countries."	**Refer to handout 7 in the student handbook, p. 17:** http://www.who.int/gpsc/ssi-infographic.pdf?ua=1
29		**Say:** "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: • 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 *The Lancet*; • the Bagheri et al. systematic review of HAI in Africa in the *Bulletin of the World Health Organization*. An update about the epidemiology and burden of SSI is also available in the WHO global guidelines for the prevention of SSI. SSI is the most surveyed and most frequent HAI of in LMICs, as the highlighted quotation from the WHO burden document states." **Click twice then read** the quotation. **Say:** "It is clear that SSI prevention is a critical part of overall infection prevention and avoidance of preventable harm in health care.	**Report on the Burden of endemic health care-associated infection worldwide:** http://www.who.int/infection-prevention/publications/burden_hcai/en/ **Refer to handout 23 in the student handbook, p. 76.**

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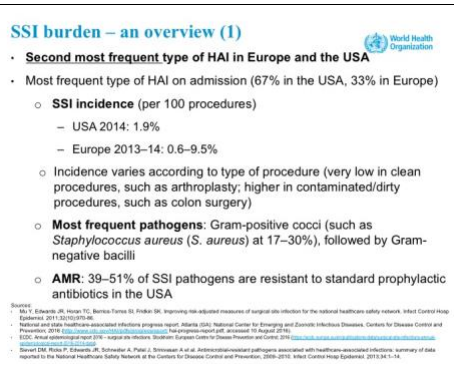
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		These references will be important for you when presenting the overall context of the global burden of avoidable infection in health care, including for SSI. The student handbook also contains a list of key SSI-related references for further reading – see handout 23 on p. 76."	
30		**Say:** "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. 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. **Read** the slide. **Say:** "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."	–

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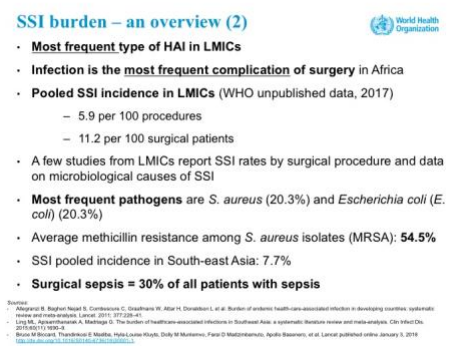
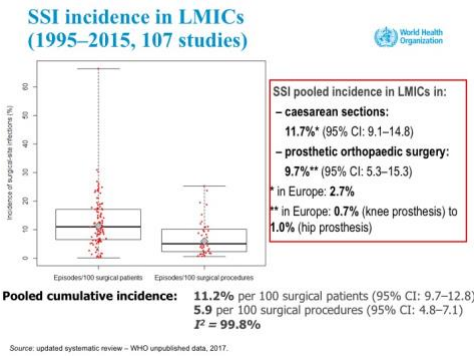
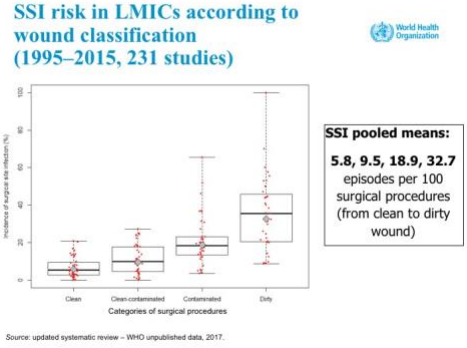
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
31		**Say:** "SSI is the most frequent type of HAI in LMICs, according to WHO analyses published in 2011 and recently updated with a systematic review up to 2015." **Read** the slide.	–
32		**State** that in the updated 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. 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. 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%.	–
33		**State** that further, according to wound classification, mean cumulative incidence rates of SSI in clean, clean-contaminated, contaminated and dirty wounds, respectively, were: • 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
		These rates are extremely high in all categories. Similar pooled rates according to wound classification are not available for high-income countries, but data from ECDC show that: • 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. Proportions of SSI differed significantly between wound classes (dirty versus clean; dirty versus clean-contaminated; dirty versus contaminated) ($p<0.0001$).	
34	**Examples of studies reporting SSI burden* in LMICs** World Health Organization Author, year, country / Population / LOS*, 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 Kasatpibal, 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 *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_hcaiem/).	**Say:** "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. You can see here the impact of SSI on these aspects of patient lives, as well as the burden on health systems and countries. 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."	–

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
35	**SSI burden data in the local context – summary** World Health Organization • 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. Use the WHO Protocol for surgical site infection surveillance with focus on settings with limited resources Geneva: World Health Organization; 2018 (http://www.who.int/infection-prevention/tools/surgical/SSI-surveillance-protocol.pdf?ua=1) to understand more about conducting surveillance.	**Say:** "We've talked in this session we talked about the importance of data – here is a summary of the key points related to surveillance." **Read** the slide or ask a participant to read it. **Say:** "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? We will return to this when we talk about improvement actions for the evidence-based recommendations for SSI prevention later in this session." **Read** the footnote at bottom of slide.	–
36	**What leads to SSI?** World Health Organization • 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) Interactive session Answers	**Use this slide with animation, showing only the title first.** **Say:** "It has been recognized that all these statements reflect the problems with SSI around the globe. 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." **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.	–

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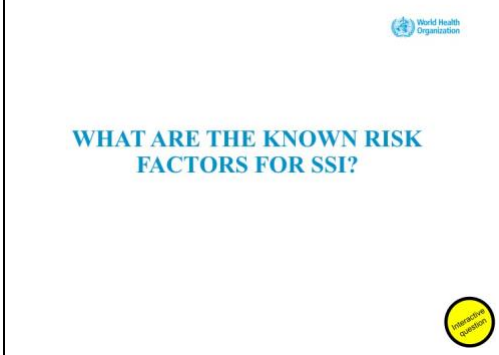
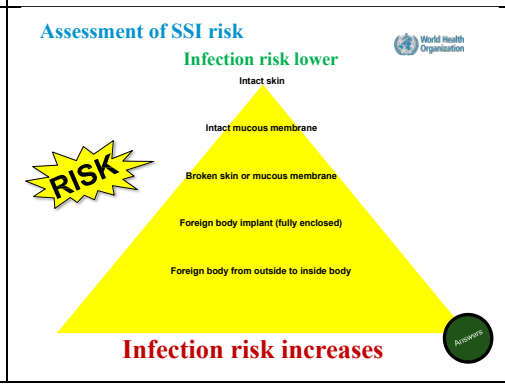
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		Say: "We have talked about the importance of understanding the burden, and later we will talk about how a safety culture plays a role in improvement. The next slides outline the evidence regarding safe processes so that we can all aim for consistent practices known to prevent SSI."	
37		**Ask** the question on the slide **Say:** "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." **Allow** 10 minutes in total.	–
38		**Say:** "Here are the main patient-related and health care-related factors from the literature." **Read** (or ask someone to read) the slide. Be sure to indicate those answers that were and were not given by participants. **Ask** whether any risk factors are surprising or unclear. **Allow** 10 minutes in total for this slide.	–
39		**Say:** "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. Infection risk is lower when skin is intact; risk increases when skin is broken, when a foreign body is implanted (but fully enclosed) and	–

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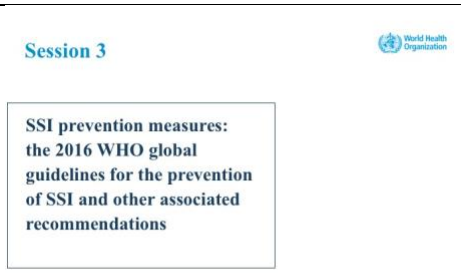
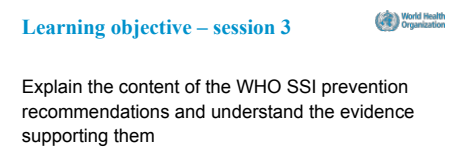
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		when a foreign body goes from outside to inside the patient's body."	
40		**Say:** "The third session of this module addresses SSI prevention measures. Having considered the risk factors, this will help us move on to 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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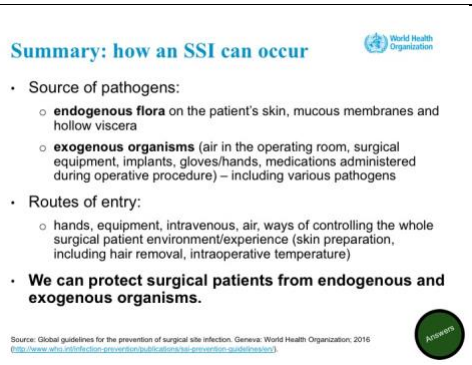
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
43		**State** that the sources of pathogens come from patients themselves and from external sources. **Read** the slide. **Say:** "It is clear, therefore, that how we manage the patient and the whole surgical environment is critical to preventing entry of potential pathogens to the surgical site. By taking certain actions we can protect our patients, as described in the next part of this session." **Note:** prompt attendees to read more on routes of entry/microbiology, as it is not covered in detail in this session.	**Refer to handout 8 in the student handbook, p. 19.**
44		**Say:** "When thinking about the operating room in particular, we can visualize where endogenous and exogenous flora will arise." **Read** the slide.	–
45		**Read** the slide. **Pose** the question to all participants. **Ask** one participant to come to the flipchart and record what the others shout out. Take a few minutes to hear and note answers from the group, making sure everyone has a chance to speak. **Allow** 15 minutes in total. **Say:**	**Flipchart and pens**

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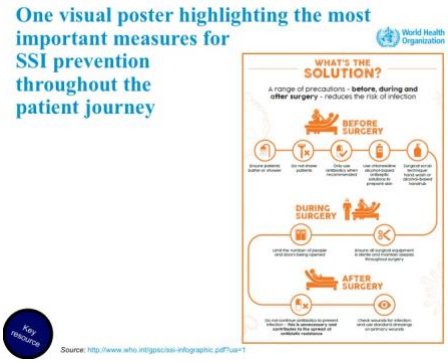
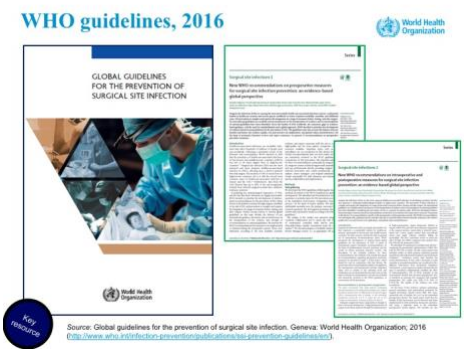
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		"The following slides explain all the WHO recommendations that are important to prevent SSI."	
46		**Say:** "Let's think about everything that happens on the surgical journey that requires safe processes, in detail. This 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."	**Refer to handout 7 in the student handbook, p. 17:** http://www.who.int/gpsc/ssi-infographic.pdf?ua=1
47		**Say:** "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. 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."	**Refer to handout 9 in the student handbook, p. 20:** http://www.who.int/gpsc/SSI-outline.pdf?ua=1 **Useful reading for the trainer in preparation for this session, in addition to the guidelines and papers indicated in the slide:** **Summaries of systematic reviews of the evidence supporting the recommendations:** http://www.who.int/infection-prevention/publications/ssi-web-appendices/en/

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
48-49	**Methods for recommendation development (1)** Development of recommendations • 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. Source: Global guidelines for the prevention of surgical site infection. Geneva: World Health Organization; 2016 **Methods for recommendation development (2)** Strength of recommendations – two types • "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.	**Say:** "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. 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." **Read** the slide.	–
50	**WHO recommendations for SSI prevention (1)** DO THE RIGHT THING AT THE RIGHT TIME TO STOP SURGICAL SITE INFECTION PREOPERATIVE INTRAOPERATIVE POSTOPERATIVE Key resource	**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. **Note:** if questions arise they may be deferred to the next slides as each will be explained in more detail.	**Refer to handout 10 in the student handbook, p. 23:** http://www.who.int/infection-prevention/tools/surgical/key-reccomendations.jpg?ua=1
51	**WHO recommendations for SSI prevention (2)** PREOPERATIVE PERIOD PREOPERATIVE PERIOD Key resource	**State** that these are the preoperative recommendations summarized from the WHO guidelines.	–

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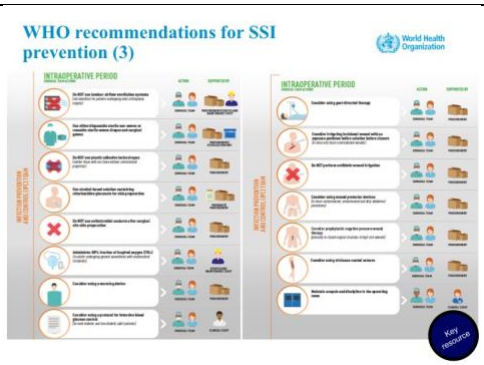
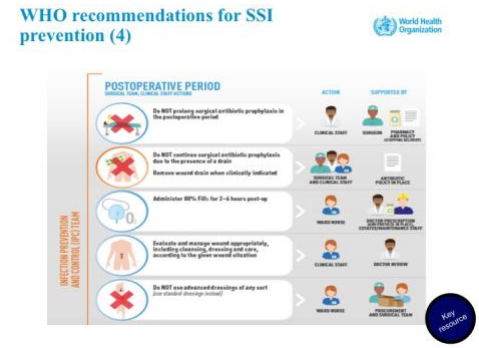
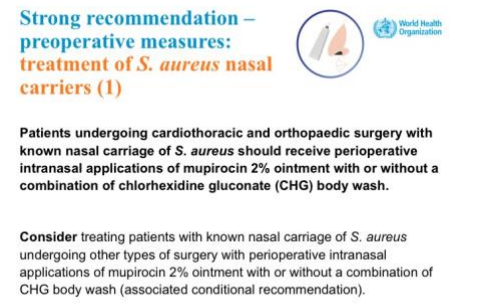
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
52		**State** that these are the intraoperative recommendations summarized from the WHO guidelines. **Read** the slide.	–
53		**State** that these are the postoperative recommendations summarized from the WHO guidelines. **Read** the slide. **Say:** "The following slides give more detail on the recommendations for each period, outlining which are strong and which conditional."	–
54		**Say:** "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. The first is around treatment of *S. aureus* nasal carriers but is also linked to a conditional recommendation that is further described here." **Read** the slide.	**Refer to handout 9 in the student handbook, p. 20.** **http://www.who.int/infection-prevention/publications/ssi-guidelines/en/** **Refer to the WHO global guidelines for the prevention of SSI for further information, if required:** **http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1**

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
55	**Strong recommendation – preoperative measures: treatment of *S. aureus* nasal carriers (2)** **Why** • *S. aureus* is a leading HAI pathogen worldwide. • *S. aureus* infections impose a high burden on the patient and the health system and are a known cause of postoperative wound infections. • Nasal carriage of *S. aureus* is a risk factor for subsequent infection in a patient. It has been shown repeatedly that a large proportion of HAIs due to *S. aureus* originate from patients' own flora.	**Ask** a student to read the slide.	–
56	**Strong recommendation – preoperative measures: treatment of *S. aureus* nasal carriers (3)** ***Notes*** • Screening of patients for *S. aureus* 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 *S. aureus* is feasible, and may not apply to settings with high prevalence of mupirocin resistance.	**Ask** a student to read the slide. You may need to take time for questions, considering the challenges of screening for *S. aureus* 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.	–
57	**Practical points** • 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. Key resource 	**Read** the slide. **Say:** "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."	**Refer to handout 11 in the student handbook, p. 29:** http://www.who.int/infection-prevention/tools/surgical/training_education/en/
58	**Strong recommendation – preoperative measures: mechanical bowel preparation (MBP) and preoperative oral antibiotics** **1. MBP alone (*without* administration of oral antibiotics) should *not* be used in adult patients undergoing elective colorectal surgery** (strong recommendation). **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). **Why?** • 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.**	**Say**: "Let's move on to the second strong recommendation." **Ask** a student to read the slide. **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	–

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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	**Practical points** • 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.	**Read** the slide. If necessary, **say:** "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."	–
60	**Strong recommendations – preoperative measures: hair removal** **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.** **Why?** • 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.	**Ask** a student to read the slide.	–
61	**Practical points** • 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.  Key resource Source: http://www.who.int/infection-prevention/tools/surgical/training_education/en/	**Ask** another student to read this slide. 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.	**Refer to handout 12 in the student handbook, p. 32:** http://www.who.int/infection-prevention/tools/surgical/training_education/en/

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
62	**Strong recommendations – preoperative measures: Surgical antibiotic prophylaxis (SAP) timing (1)** **SAP should be administered before the surgical incision, when indicated.** **SAP should be administered within 120 minutes before incision, while considering the half-life of the antibiotic.** **Why?** • 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.	**Read** the slide. **Say**: "We will return to the role of the SSI recommendations in the AMR agenda in later slides."	–
63	**Strong recommendations – preoperative measures: SAP timing (2)** ***Notes*** • 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.	**Ask** a student to read the slide.	–
64	**Practical points** • 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.	**Say:** "It is important for you to be aware of these practical points." (**Read** slide if time allows.) **Say:** "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."	–

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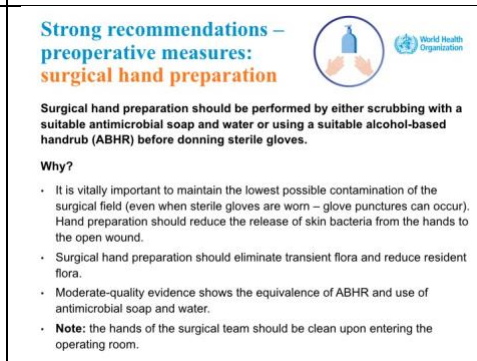
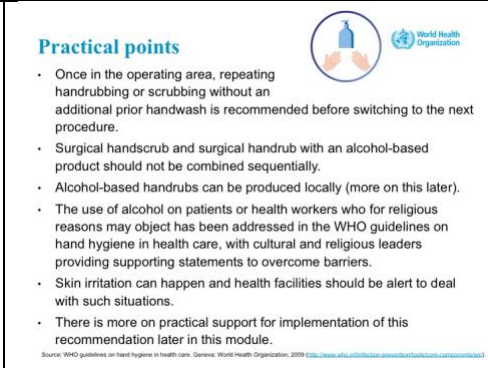
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
65		**Ask** a student to read the slide.	–
66		**Ask** another student to read this slide. Be sure to **clarify** that: • surgical hand preparation refers to an antiseptic handwash or antiseptic handrub performed preoperatively 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. 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.	**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

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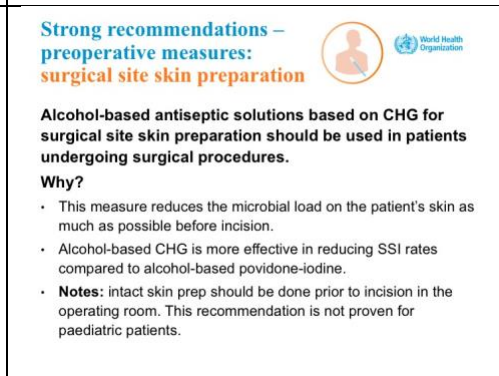
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
67		**Read** the slide.	–
68		**Read** the slide. You may need to take time for discussion, considering any practical challenges with the use of alcohol-based chlorhexidine gluconate (CHG) for skin preparation. **State** 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.	–
69		**Say:** "Now we can watch the steps that lead to successful skin preparation." **Play** the video from the link provided (6 minutes).	**Refer to handout 13 in student handbook, p. 35:** http://apps.who.int/iris/bitstream/10665/70126/1/WHO_IER_PSP_2009.07_eng.pdf?ua=1 **Video:** https://www.youtube.com/watch?v=9E1t7AHW3i8&feature=youtu.be

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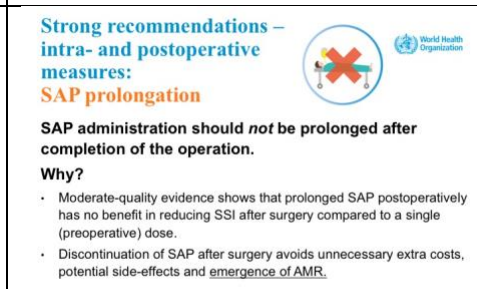
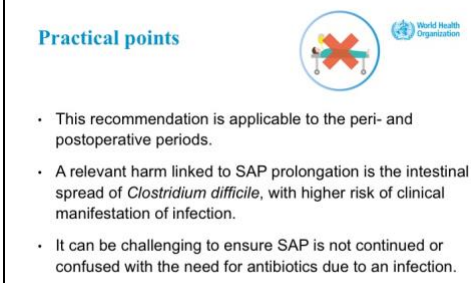
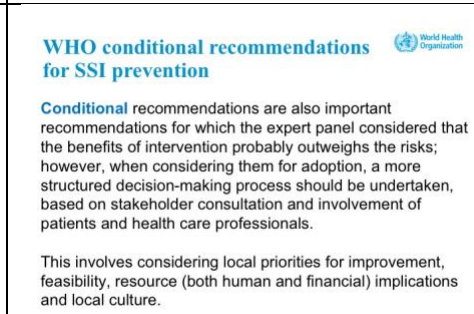
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
70		**Say:** "Here is a strong recommendation that tells people how NOT to act." **Read** the slide.	–
71		**Read** the slide. **Say:** "Let's take a few moments to reflect on these nine strong recommendations. Considering 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? Does SAP prolongation occur in your facility? 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."	**Refer to handout 10 in the student handbook, p. 23.** http://www.who.int/infection-prevention/tools/surgical/reminders-advocacy/en/
72		**Say:** "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	**Refer to handouts 9, 11-13 in the student handbook, p. 20, 29, 32 and 35.**

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		studies have proved their effectiveness. 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." If time allows, **read** the recommendations in the next slides, highlighting some that might be particularly important in your local setting.	

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
73-75		**Read** the slides, **focusing** on the topic in question (first column) and the recommendation that resulted (third column). **Do not re-read** the strong recommendations. **Say:** "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."	–

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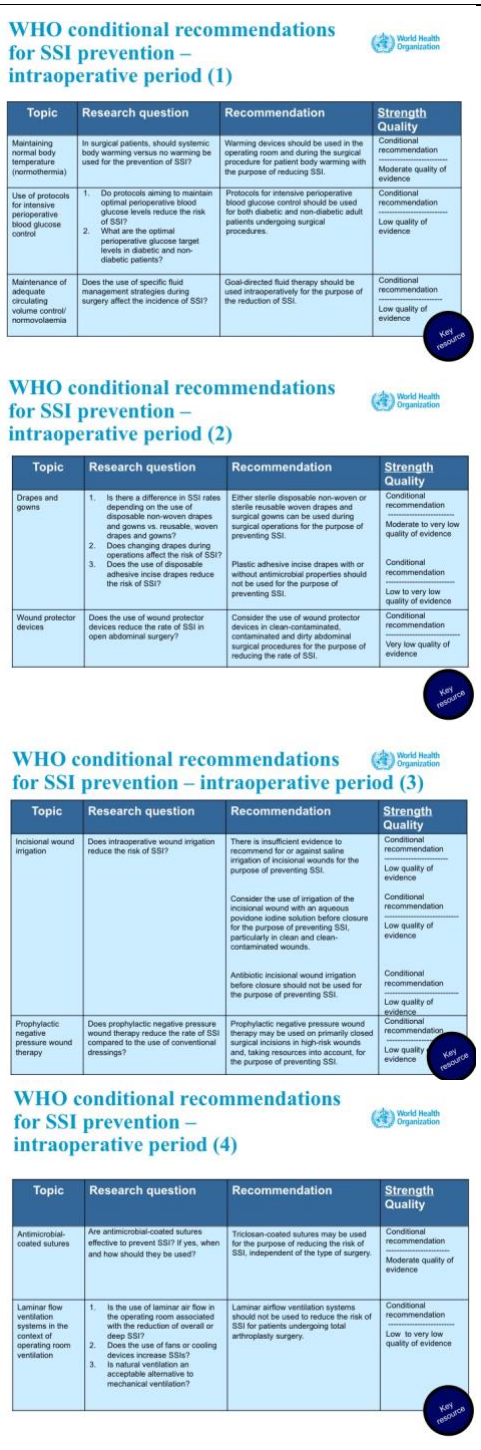
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
76-79		**Read** the slides, **focusing** on the topic in question (first column) and the recommendation that resulted (third column).	–

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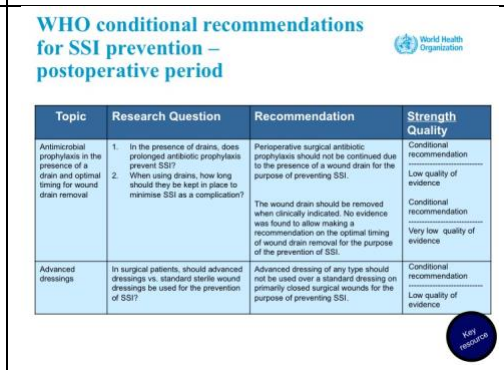
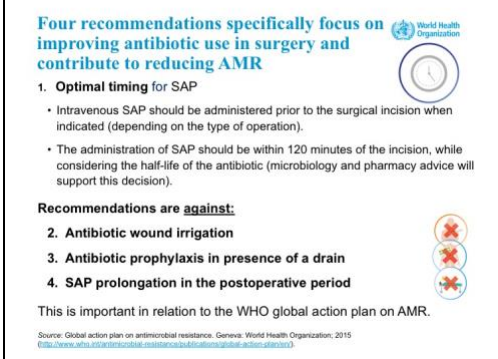
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
80		**Read** the slides, **focusing** on the topic in question (first column) and the recommendation that resulted (third column).	–
81		This slide aims to highlight how adopting and successfully implementing SSI recommendations in part address the AMR agenda. **Say:** "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." **Read** the slide or ask a participant to read it.	–
82		**Say:** "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." **State** that the slide lists the document's main topics. **Read** the slide.	**Decontamination and reprocessing of medical devices in health-care facilities:** http://www.who.int/infection-prevention/publications/decontamination/en/ **Flipchart and pens**

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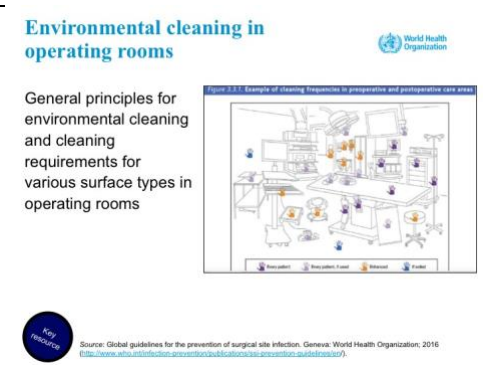
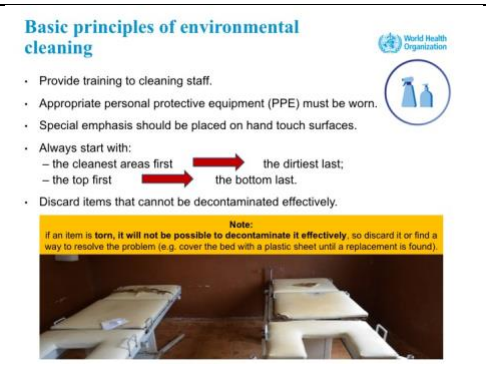
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		Say: "As part of your SSI prevention plans, ensure that you read the content and address any decontamination needs that might affect a safe surgical patient journey." If there are any questions, use flipchart and pen to note items for discussion or follow-up later to ensure this discussion does not distract from the main discussion in this module.	
83		**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.	**WHO global guidelines for the prevention of SSI:** http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1
84		**Say:** "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." **Read** the slide. **Note:** do not take questions at this time: just pose this point for reflection.	–

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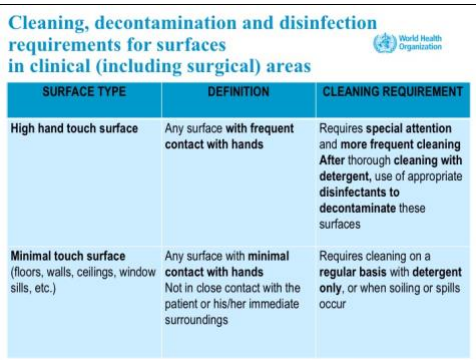
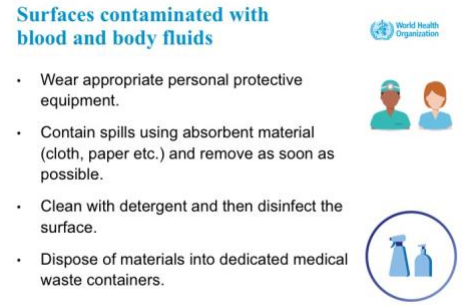
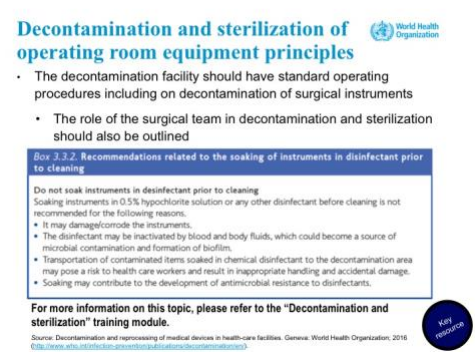
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
85		**Say:** "Here are some examples of the requirements for cleaning, decontamination and disinfection for surfaces of areas where surgical patients are cared for" **Read** the slide.	–
86		**Say:** "This information is also relevant and useful to be aware to ensure the environment is safe in surgical areas. 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." **Read** the slide. 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.	**Flipchart and pens**
87		**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)	**Refer to handout 9 in the student handbook, p. 20.** http://www.who.int/infection-prevention/publications/ssi-guidelines/en/

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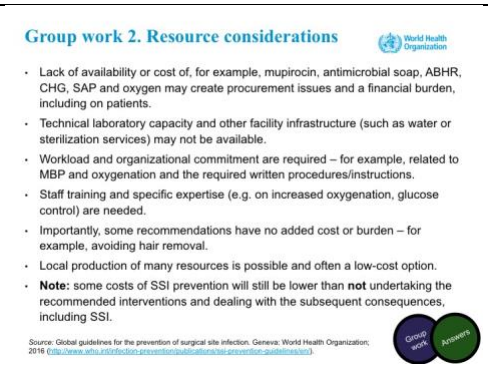
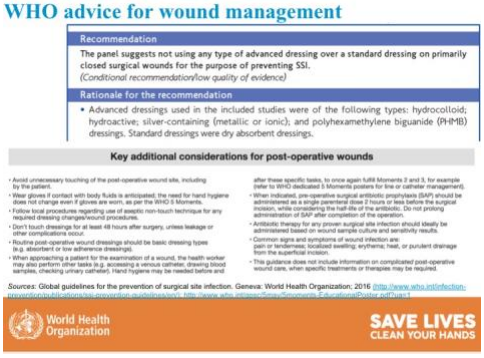
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
88		**Say:** "Take a few moments to discuss with those next to you the resource implications these recommendations present to you. The slide contains some examples for you to talk about, but try to think of others as well. 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." **Ask** someone to come to the front and record answers on the flipchart. Try to make sure everyone gets a chance to speak. **Allow** 15 minutes in total. After feedback, **say:** "The WHO guidelines highlight resource considerations, including those for LMICs; however, to emphasize again…" **Read** the last two bullet points. **Say:** "We will discuss how to address resource availability as part of the overall improvement process later on."	**Flipchart and pens** **Refer students to group work 2 - student handbook, p. 38.** **WHO global guidelines for the prevention of SSI** http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1
89		**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 **Read** the slide.	**WHO global guidelines for the prevention of SSI:** http://apps.who.int/iris/bitstream/10665/250680/1/9789241549882-eng.pdf?ua=1

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
90	**Why do we need to understand postoperative wound care?**  • 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: o it must be managed to ensure the best outcome; o the process of wound assessment, cleansing and care must suit the patient's needs and must limit additional infection risk; o 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.	**Read** the slide. **Say:** "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."	–
91-93	**Wound evaluation/dressing (1)**  Following closure of the surgical incision site, the following actions should be taken. • 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). **Wound evaluation/dressing (2)**  • 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. **Wound evaluation/dressing (3)**  • 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.	**Ask** a student to read the slide. **Ask** another student to read the next slide. Again, **ask** another student to read the next slide. **Say:** "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. As a reminder – topical antimicrobial agents or prolonged SAP are NOT recommended owing to concerns over postoperative wound infection." If there is time, ask if there are any questions.	–

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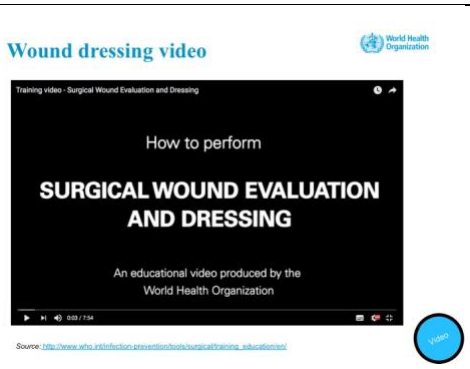
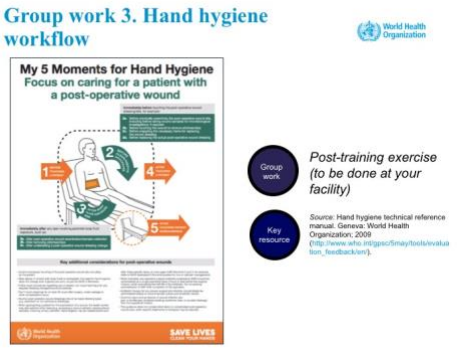
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
94		**Say:** "The video portrays two scenarios related to wound management (primary and secondary) and the appropriate steps to take when performing wound dressings and sample collection. They will be useful for you when training others to improve wound evaluation and dressings." **Play** the (8 minute) video using the link provided.	**Video:** https://www.youtube.com/watch?v=Y1gZZvY9ft4&feature=youtu.be
95		**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. **Say:** 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." "This slide gives an example of critical times for hand hygiene. We have provided you with an exercise that can be done at your facility, post-training. 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. Once you have done this, Refer to the WHO hand hygiene technical reference manual to be sure	**Refer to handout 14 in the student handbook, p. 39:** http://www.who.int/gpsc/5may/5moments-EducationalPoster.pdf?ua=1 **Refer students to group work 3 - student handbook, p. 41.** **WHO hand hygiene technical reference manual:** http://apps.who.int/iris/bitstream/10665/44196/1/9789241598606_eng.pdf

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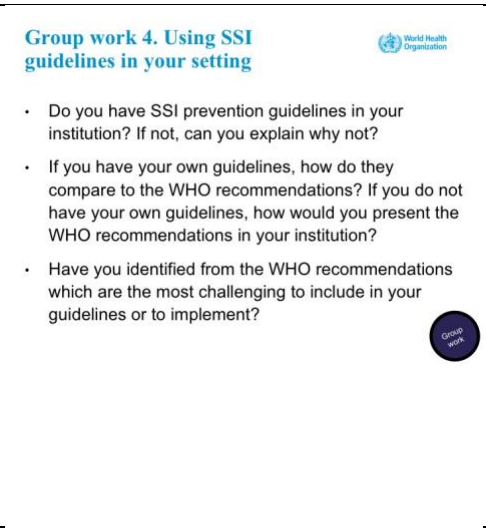
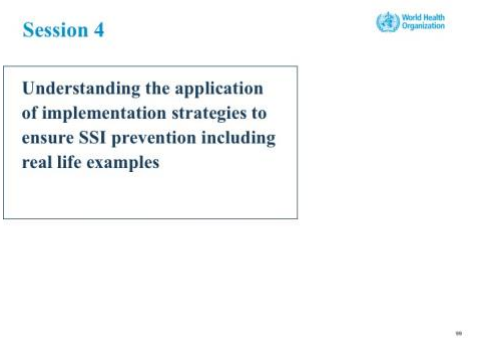
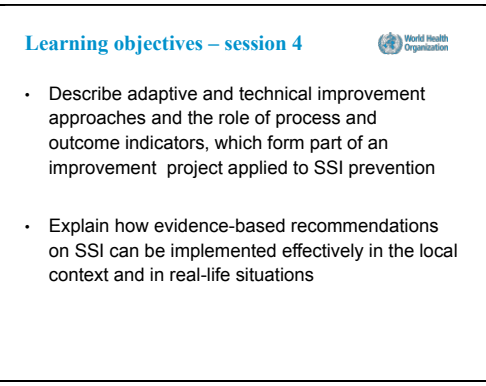
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		people are applying the five moments accurately."	
96		**Ask** that participants discuss these questions in groups of 3–4, identifying one person as the note taker/rapporteur who will provide feedback to the larger group. **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. **Allow** 20 minutes for group discussion and 20 minutes for feedback (40 minutes in total).	**Refer students to group work 4 - student handbook, p. 44.**
97		**Say:** "The fourth session of this module covers understanding the application of improvement strategies to ensure SSI prevention in real life, including the potential barriers."	–
98		**Read** the slide or ask a participant to read it.	–

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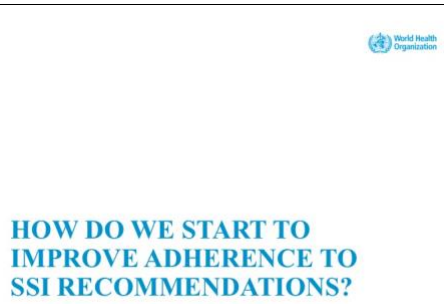
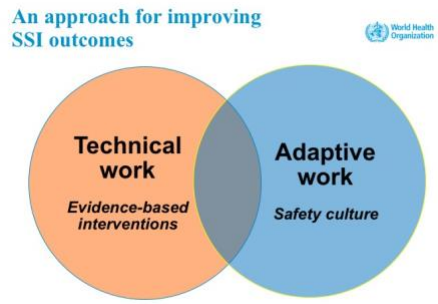
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
99		**Read** the slide.	–
100		**Say:** "Evidence-based IPC technical interventions to improve IPC practices are most successful when implemented within an enabling environment, supportive of a patient safety culture and 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. It is very important to discuss aspects of both technical and adaptive approaches to an improvement project. This session will outline examples of both. It is vital that staff are supported to perform tasks the right way consistently and that safe practices become the norm."	–

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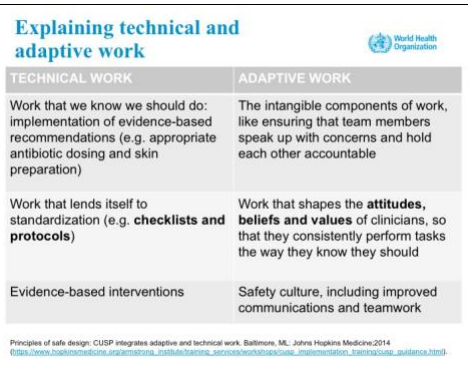
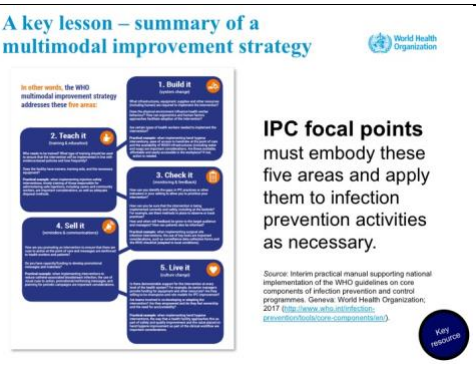
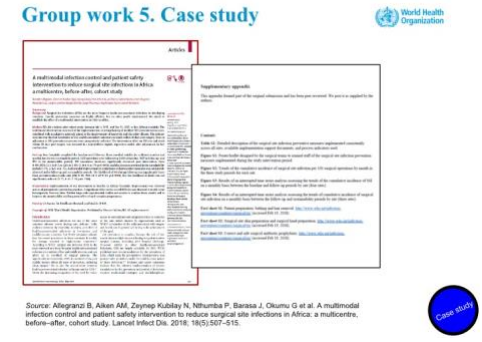
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
101		**Say:** "Let's read a little more on this concept, which is primarily promoted by the Armstrong Institute at Johns Hopkins Medicine in the USA. We will hear about the application in a range of countries later in the session." **Ask** a student to read the slide.	–
102		**Say:** "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. 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."	–
103		**Say**: "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. 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	**Refer to handout 15 in the student handbook, p. 45:** http://www.who.int/infection-prevention/tools/core-components/en/

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		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. 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.' 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	

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		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." **Ask** five attendees to read each of the five elements of the strategy. Take brief feedback from attendees verbally (just a few moments).	
104		**Say**: "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." **Read** the slide.	**Additional information on SUSP can be found here: http://www.who.int/infection-prevention/countries/surgical/en/**
105		**Divide** participants into five groups, give them copies of the paper by Allegranzi et al. and refer them to handout 15. **Assign** to each group one of the five elements of the WHO multimodal improvement strategy. If possible, **assign** to each group a facilitator from the training team. **Say:** "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.	**Flipchart and pens per group** **Refer students to group work 5 - student handbook (p. 47) and handout 15 (p. 45).** **For group work answers: see Annex 2 - group work 5, in the trainer guide, p. 72.**

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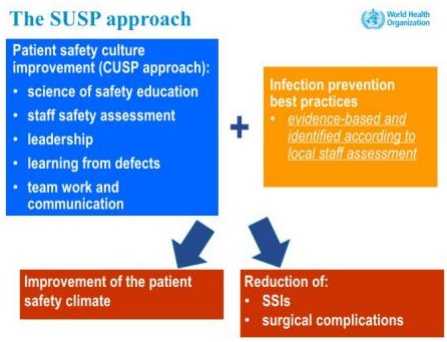
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		The exercise consists of discussing what activities implemented in the study reflect the element of the strategy multimodal strategy you have been assigned – take 15 minutes to discuss." **Gather** the groups together again to discuss their conclusions (5 minutes per group). **Allow** 20 minutes for personal reading, 15 minutes for group discussion and 25 minutes for group feedback (1 hour in total).	
106		**Say:** "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." **Say:** "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. 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."	–

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Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
107	**Group work 6. Understand your current situation** World Health Organization • 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 *SUSP Perioperative Staff Safety Assessment Tool:* ➢ 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. *Source: Supplemental Tools [website]. Rockville, MD: Agency for Healthcare Research and Quality; 2018 (https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/surgery/guide-appcusp.html).* Group work	This is a **reserve exercise**, if time permits. **Ask** participants to divide into small groups of 3–4 and identify one note taker or rapporteur. **Say:** "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?" **Ask** each group to provide brief feedback or a summary of their discussion. **Allow** 15 minutes for group discussion and 15–20 minutes for feedback (30 minutes in total). **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.	**Familiarise yourself with the perioperative staff safety assessment tool: https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/surgery/guide-appcusp.html** **Flipchart and pens per group** **Refer students to group work 6 - student handbook, p. 57.**
108	**Gap areas leading to SSI identified in African SUSP hospitals** World Health Organization SUSP • Lack of infection prevention and control = inadequate/inappropriate: • 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 *Source: Allegranzi B, Aiken AM, Zeynep Kubilay N, Nthumba 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.*	**Say:** "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.	–

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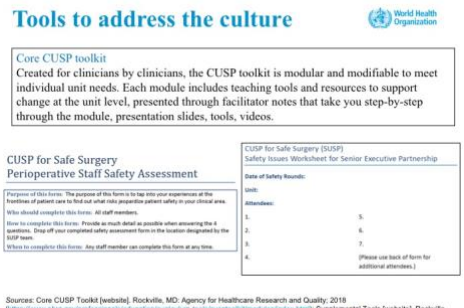
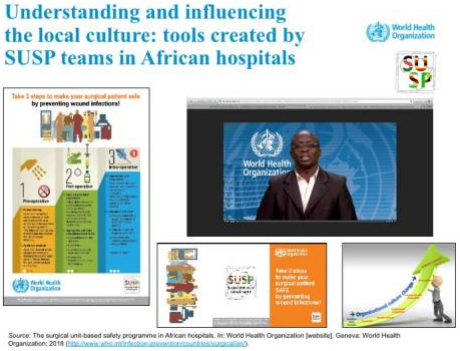
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		This is more specific information on what was gathered from the African hospital teams taking part in SUSP to show why the improvement measures were as described in the last slide." **Read** the slide or ask a participant to read it.	
109		**Say:** "Given the experiences and lessons learned from using the SUSP approach, these are the recommendations for starting SUSP." **Read** the slide or ask a participant to read. **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.	–
110		**Say:** "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."	–
111		**Say:** "Let's now look at some real SUSP hospital experiences that outline both adaptive and technical approaches. Here you can see some of the tools created by the SUSP teams in African hospitals. One important element was that the surgeons from these hospitals acted as SUSP leaders, recording a video	–

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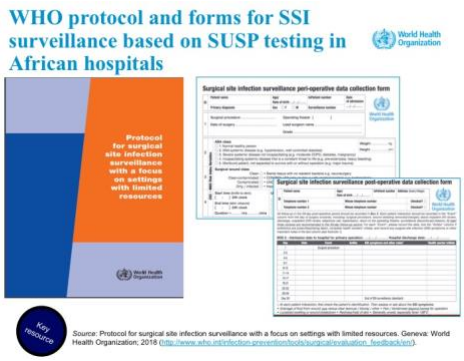
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		similar to one made to promote CUSP in the USA. This was important to create a sense of ownership of the project and improvement journey and to show that it was applicable to African hospitals. This type of action can ensure the right culture is achieved to support local change."	
112		**Say:** "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. 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. 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.	**Data collection tools:** http://www.who.int/infection-prevention/tools/surgical/evaluation_feedback/en/ **Refer to handouts 16 and 17 in the student handbook, p. 58-61.**

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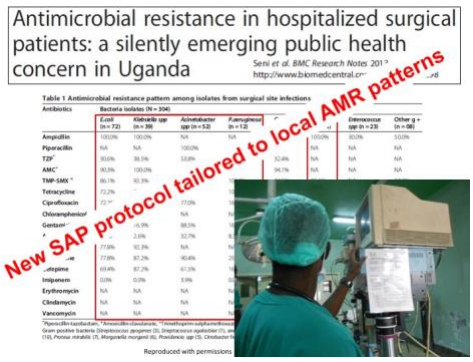
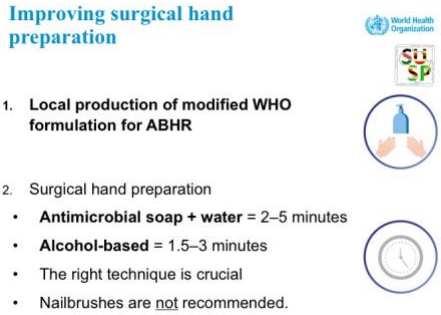
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
113		**Say:** "An example from a SUSP hospital included a new SAP protocol, based on local data on pathogens responsible for SSI and their antibiotic resistance patterns. This was visibly promoted in the operating room as part of the improvement project. To be able to change behaviours and improve processes and SSI outcomes, information about local problems and targeted information and instruction is very important."	–
114		**Say:** "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. 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."	–

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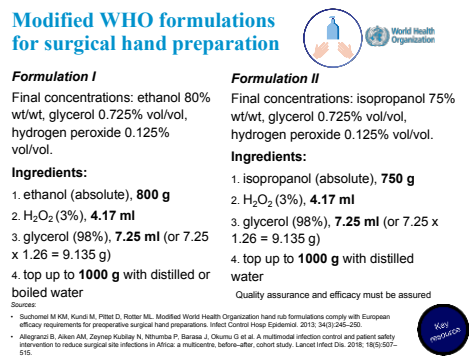
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
115		**Say:** "These are the formulations used by the hospitals in SUSP, modified from the WHO formulations to increase efficacy, according to some recent publications. Remember, ABHR is recommended for surgical scrub in the WHO SSI guidelines. 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. One of the challenges in your setting might be reliable availability of solutions to perform surgical hand preparation (scrubbing). 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. All this is possible, but you have to plan to make it happen. 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	**Refer to handout 18 in the student handbook, p. 64.** **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

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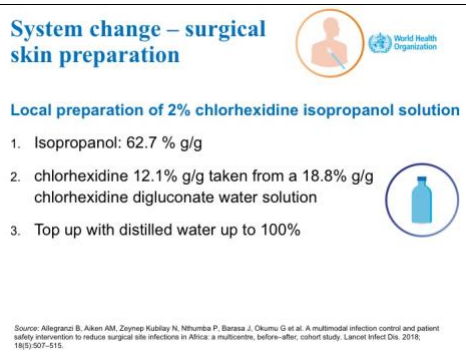
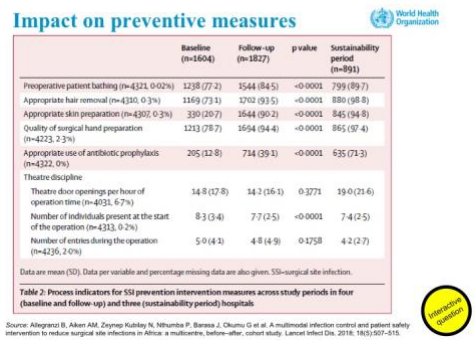
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		leads. This is important for implementation of any change." **Note:** depending on the audience, this issue might not be relevant, or it might need a lengthy discussion on aspects of local production. More information 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.	
116		**State** that another example of local action is local preparation of skin preparation solution. 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."	–
117		**Say:** "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." **Take a few moments** to pose the following questions and address discussion points with participants. **Allow** 5 minutes for discussion. **Say:**	**For full article: see Annex 2 in the trainer guide, p. 76.**

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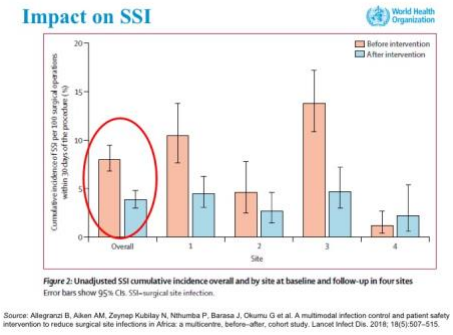
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		"Do you think the implementation of these measures would be achievable in your settings? Do you think you could significantly improve adherence to these WHO recommendations? We will return to discussing the multimodal improvement strategy shortly to consider how you could do this (taking account of technical and adaptive tools)."	
118	 *Figure 2:* Unadjusted SSI cumulative incidence overall and by site at baseline and follow-up in four sites Error bars show 95% CIs. SSI=surgical site infection. Source: Allegranzi B, Aiken AM, Zeynep Kubilay N, Nthumba 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.	**Say:** "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. 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. This gives you ammunition and a strong reason to tell others that taking (technical and adaptive) measures to reduce SSI works."	–

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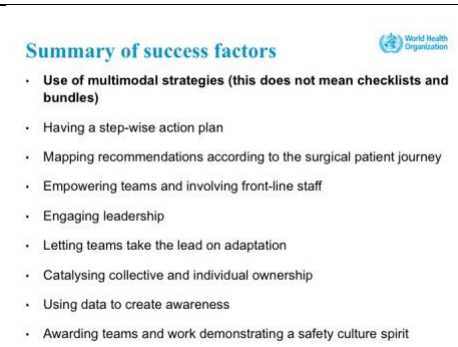
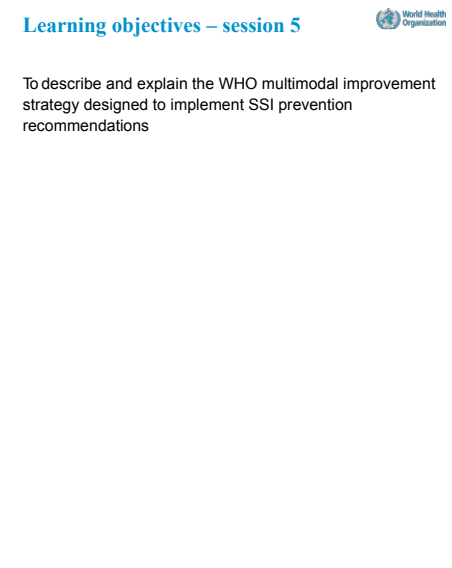
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
119		**Say:** "In summary, to conclude this session, here is a list of factors from a range of settings that made success in SSI improvement achievable. Importantly, as stated earlier, multimodal improvement strategies 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."	**Refer to handout 19 in the student handbook, p. 65.**
120		**Say**: "The fifth and final session of this module addresses applying a multimodal improvement strategy for SSI prevention."	–
121		**Say:** "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." 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.	**Refer to handout 9 in the student handbook, p. 20.** http://www.who.int/infection-prevention/publications/ssi-guidelines/en/

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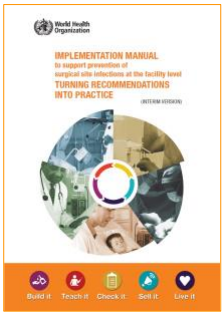
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
122	 World Health Organization **Use this document is to learn about a range of tested *approaches to achieve successful SSI prevention implementation* at the facility level, including in the context of a broader surgical safety climate.** Key resource	**Read** the slide.	–
123		**Say:** "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."	–
124	**WHO core component 5 for effective IPC** **Strong recommendation: multimodal strategies** World Health Organization • **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. 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	**Say:** "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." **Ask** a student to read the slide.	–
125	 World Health Organization ***Operational manual*** for the WHO SSI prevention recommendations. This implementation manual is designed to help you understand the WHO multimodal improvement strategy applied to SSI prevention http://www.who.int/infection-prevention/tools/surgical/en/ Key resource	**Read** the slide.	–

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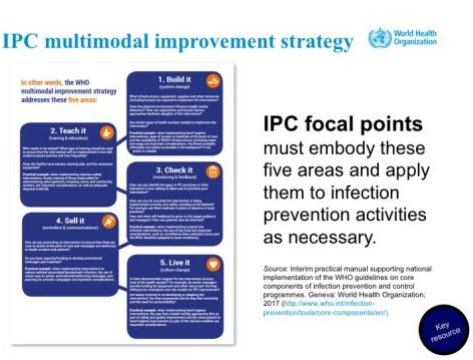
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
126		**Say:** "Scientific evidence and global experience show that each component of the WHO strategy is crucial, and in general no component can be considered optional if the objective is to achieve an effective and sustainable impact. 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. Regular assessment allows health facilities to direct efforts to all, some or one of the components at any given time. 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." **Remind** students of handout 12 in their handbook (WHO multimodal improvement strategy) to follow for the next five slides.	**Refer to handout 12 in the student handbook, p. 32.** http://www.who.int/infection-prevention/tools/surgical/training_education/en/

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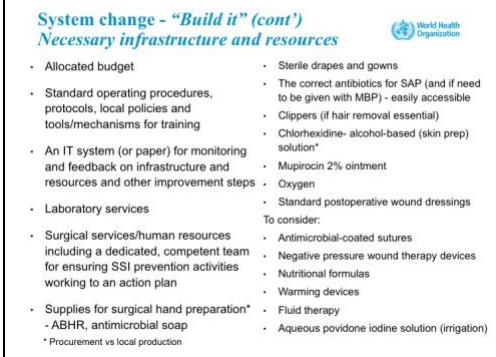
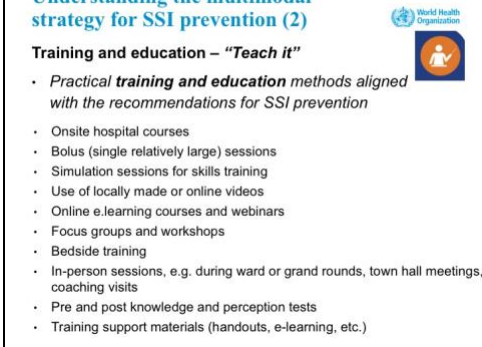
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
127		**Say:** "Now let's take each component of that multimodal improvement strategy and outline the definition as it applies to SSI prevention." **Ask** a student to read the slide. **Ask:** "Does this make sense? Each safe process (recommendation) you are trying to achieve needs to have the right infrastructure and resources in place to achieve success." **Note:** if discussion ensues with examples, say that this will be covered shortly once we have heard a definition for each component.	–
128		**Read** the slide, highlighting various examples listed on the slide.	–
129		**Ask** a student to read the slide. **Say:** "Does this make sense? Would you agree that the right education and training is a critical component of successful improvement?" **Note:** you can allow some open discussion but move on, as group work 8 will help students understand using all components of the strategy.	–

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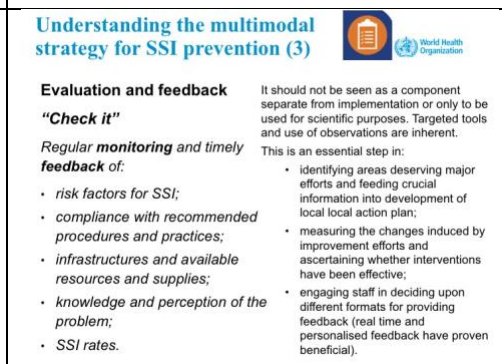
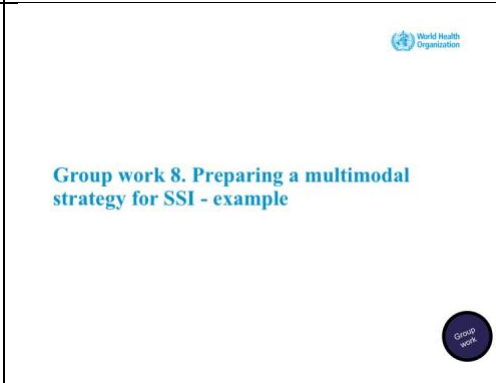
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
130		**Ask** a student to read the slide. **Say:** "Would you agree that monitoring and feedback is important for implementation of the SSI recommendations to be successful? Remember, this can be undertaken in many different ways, focused on outcome and/or processes. We will go into more detail on this next."	–
131		**Ask** a student to read the slide. **Say:** "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."	–
132		**Ask** a student to read the slide. **Say:** "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."	–
133		**Say:** "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. 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	**Refer students to group work 7 - student handbook, p. 66.** **Refer to handout 9 in the student handbook, p. 20.** **http://www.who.int/infection-prevention/publicati**

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
		recommended surgical hand preparation, and postoperative infections are frequent in patients. 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. Next, take another SSI recommendation that you think needs to be improved and do the same exercise. 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. **Key questions for each group** • 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
		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? • 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? **Allow** 1 hour total for this activity (30 minutes for group work, 30 minutes for feedback).	
134		**Say:** "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. 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?" If time allows, **read** through the infographic.	**Refer to handout 20 in the student handbook, p. 69:** http://www.who.int/infection-prevention/tools/surgical/reminders-advocacy/en/

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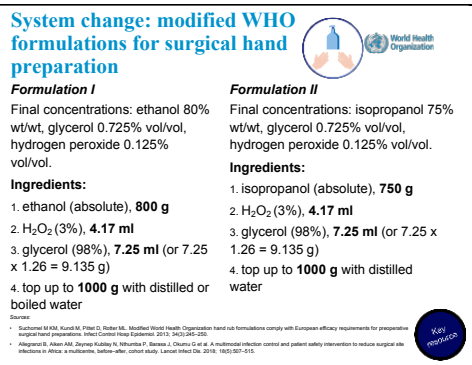
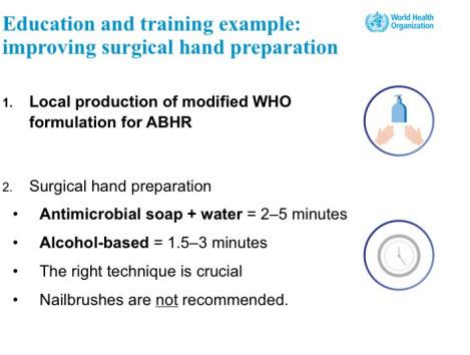
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
135		**Say:** First, for **system change** you might need to consider reliable placement of filled bottles of antimicrobial soap or ABHR, but depending on your situation you might also need to consider availability of the 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." **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.	–
136		**Read** the slide.	–

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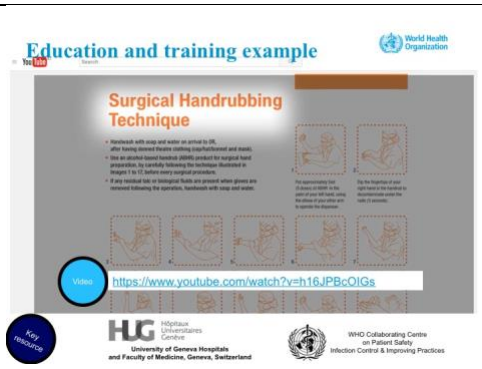
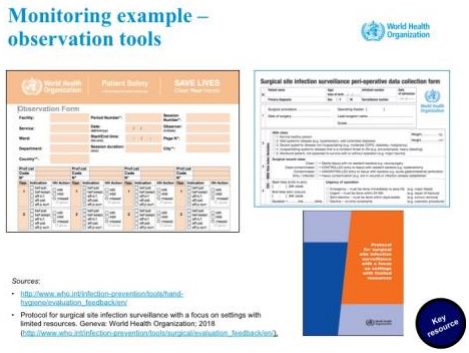
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
137		**Say:** "A video is also available, which is another way of engaging the surgical team in improving techniques for surgical hand preparation through training. It might be a resource you want to use. This is part of **education**." **Play** the video via the link provided to demonstrate the proper technique for performing surgical scrub.	**Refer to handout 21 and 22 in the student handbook, p. 71-73** **Surgical handscrubbing technique:** http://www.who.int/gpsc/5may/hh-surgicalA3.pdf?ua=1 **Hand hygiene observation form:** http://www.who.int/infection-prevention/tools/hand-hygiene/evaluation_feedback/en/
138		**Say:** "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."	**Refer to handout 22 in the student handbook, p. 73:** http://www.who.int/infection-prevention/tools/hand-hygiene/evaluation_feedback/en/

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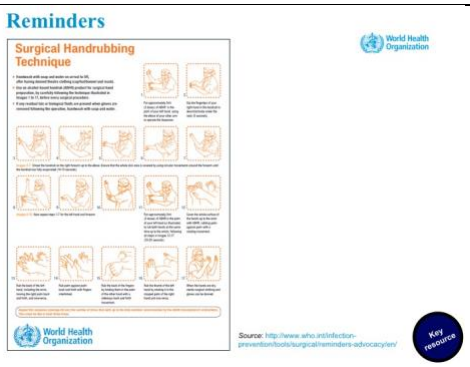
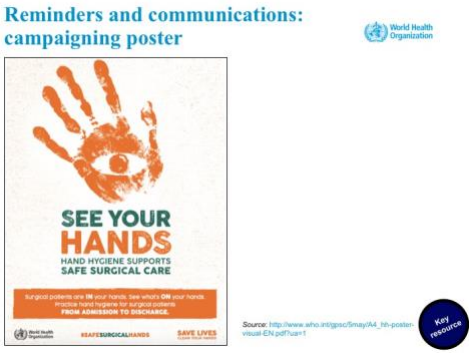
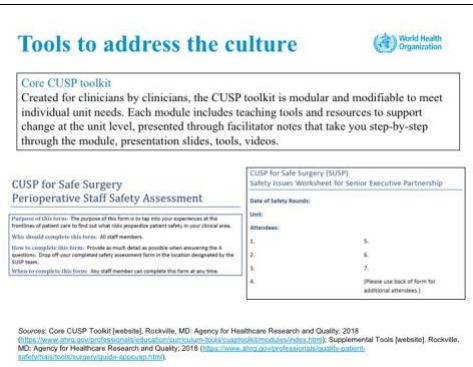
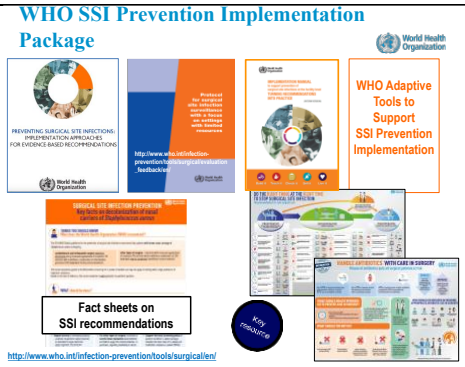
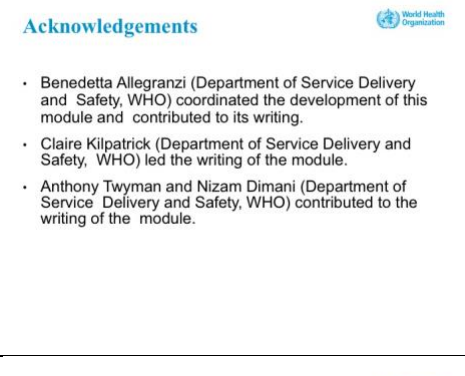
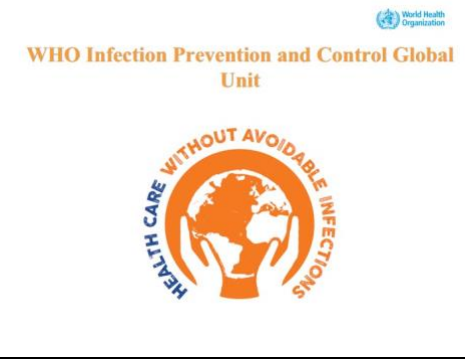
Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
139		**Say:** "Next, when considering surgical hand preparation, placement of **reminders** about the steps involved will be another factor – this provides education and a reminder in the workplace. Do any of you already use this resource?"	**Refer to handout 21 in the student handbook, p. 71:** http://www.who.int/gpsc/5may/A4_hh-poster-visual-EN.pdf?ua=1
140		**Say:** "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."	**Additional campaign materials:** http://www.who.int/gpsc/5may/A4_hh-poster-visual-EN.pdf?ua=1
141		**Say:** "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"	**Refer to handout 14 in the student handbook, p. 39.**

Advanced Infection Prevention and Control Training

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
142		**Say:** "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 with not help you address key barriers that arise. 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."	**Comprehensive unit-based safety program for safe surgery tools:** • https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/surgery/index.html • http://www.who.int/infection-prevention/tools/surgical/en/
143		**Say:** "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."	**Refer to handout 7 in the student handbook, p. 17:** http://www.who.int/infection-prevention/publications/ssi-guidelines/en/

Advanced Infection Prevention and Control Training

Slide no.	Slide image	Notes and suggestions for trainer	Resources for the trainer
144		**Say:** "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."	
144		**Read** the slide.	–
145		**Thank** the participants for their time and attention.	–

Advanced Infection Prevention and Control Training

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

Advanced Infection Prevention and Control Training

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

Advanced Infection Prevention and Control Training

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

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   a. Hair removal technique
   b. Operative technique
   c. Prolonged duration of surgery
   d. Traffic intensity

Advanced Infection Prevention and Control Training

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**.**

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    a. Looking at global HAI data
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    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') 	• 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') 	• 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') 	• Put in place/improve a monitoring, reporting and feedback mechanism (including roles and responsibilities) regarding: – 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') 	• In collaboration with staff, develop/adapt: – 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') 	• 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') 	• Put in place/improve: – 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') 	• 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') 	• Put in place a monitoring, reporting and feedback system (including roles and responsibilities) regarding: – 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') 	• Develop/adapt: – 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') 	• 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') 	• Develop a locally- adapted detailed SAP protocol. Up-to-date SAP protocol should be readily available to all concerned staff. • Put in place/improve: – 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') 	• 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') 	• Put in place/improve a monitoring, reporting and feedback system (including roles and responsibilities) regarding: – 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') 	• 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') 	• 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') 	• Put in place/improve: – 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') 	• 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') 	• Put in place a monitoring and feedback system (including roles and responsibilities) regarding: – 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') 	• 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') 	• 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') 	• 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: – 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') 	• 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') 	• Put in place/improve a monitoring, reporting and feedback mechanism (including roles and responsibilities), regarding the: – 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') 	• In collaboration with staff, develop/adapt prompts, posters, pictorials, algorithms on: – 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') 	• 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. CHGsolutions 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') 	• Put in place/improve: – 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 standardzsed technique (including roles and responsibilities).
TRAINING AND EDUCATION ('teach it') 	• 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') 	• Put in place a monitoring, reporting and feedback system (including roles and responsibilities) regarding: – 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') 	• 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') 	• 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%.