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ORIGINAL ARTICLE

Stakeholders' perceptions about a surgical site infection master training plan for a low-middle income country

Muhammad Nasir Ayub Khan[1,2*], Walther Nicolaas Anton van Mook[2,3], Abu Baker Hafeez Bhatti[4], Diana H.J.M. Dolmans[2,5] and Daniëlle M.L. Verstegen[2,5]

[1]Department of Health Professions Education, Shifa International Hospital, Shifa Tameer-e-Millat University, Islamabad, Pakistan; [2]School of Health Professions Education, Maastricht University, The Netherlands; [3]Department of Intensive Care Medicine, Maastricht University Medical Center, The Netherlands; [4]Department of Liver Transplantation, Shifa International Hospital, Shifa Tameer-e-Millat University, Islamabad, Pakistan; [5]Department of Educational Development & Research, Faculty of Health, Medicine and Life Sciences, Maastricht University, The Netherlands

Abstract

***Background*:** Training is a critical component for improving the practice of surgical site infections (SSI). We have designed a master training plan characterized by a task-based, interprofessional and reflective approach consisting of initial training of employees and subsequent refresher training. It aims to improve the practice of SSI in hospitals. The research question was: How do policymakers, teachers and managers/leaders of health care institutions perceive the outline of a master training plan for SSI?

***Methods*:** Semi-structured interviews were conducted with a purposive sample of 28 stakeholders from three categories.

***Results*:** Four key themes emerged from the interviews: 1) Discussion of authentic tasks fosters the transfer of knowledge to the workplace; 2) interprofessional reflective learning comes with challenges; 3) the master training plan help to change behavior, and 4) it is feasible with limited resources. However, the stakeholders pointed that interprofessional training creates friction among health care professionals (HCPs) who work together and participate in the interprofessional training sessions. To disseminate the training across healthcare facilities, stakeholders suggested developing a train-the-trainer plan. Furthermore, stakeholders suggested making HCPs accountable for actual behavior changes in the workplace.

***Conclusion*:** The stakeholders agreed with the approach that the master plan is based on. Implementing this master training plan was expected to encourage knowledge and skills to practice. Participants indicated that arranging training might be feasible in different institutions and it should be part of undergraduate, postgraduate, and continuing medical education. The stakeholders perceived the outline of the master training plan to be well-suited for implementation in low- and middle-income countries (LMICs).

Keywords: *training programs; task-based learning; interprofessional training; surgical site infection; prevention; low- and middle-income countries; Pakistan*

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The most frequent complication in postoperative health care settings is surgical site infection (SSI). SSI has a substantial effect on morbidity and death rates. SSI negatively impacts the quality of life and increases patients' suffering and distress. In addition, SSI has an economic impact, particularly when patients have to pay for medical costs themselves. It may contribute to personal hardship and increased health care costs (1–4). Preventing SSI in the hospital is critical to achieve high-quality care, patient safety, and health security.

Eight core components were proposed by the World Health Organization (WHO) to enhance patient protection and promote quality in delivering health care services (Table 1) (5–7). Implementing these eight components will prevent a large portion of SSI, especially in countries where infection control is limited or non-existent. The WHO recommends that relevant health care professionals (HCPs) be educated and trained on guideline recommendations.

In a previous study, we have created and evaluated an initial training based on three principles: task-based learning (8), interprofessional learning (9, 10), and reflective learning (11) (Table 2). We designed training for HCPs working in operating rooms (ORs), provided in their hospital. In this training, they learned about SSI by discussing a set of authentic tasks encountered in their

Table 1. World Health Organization Core components to prevent a surgical site infection (5–7)

Core component 1: infection prevention and control program
Core component 2: infection prevention and control guidelines
Core component 3: infection prevention and control education and training
Core component 4: surveillance of health-associated infection
Core component 5: multimodal strategies
Core component 6: monitoring and audit
Core component 7: workload, staffing, and bed occupancy
Core component 8: built environment, materials, and equipment for infection prevention at the facility

Table 2. The principles of tasked-based interprofessional reflective learning

In **tasked-based** training a set of tasks addressed by health care professionals in clinical practice serves as the learning focus. Participants learn about a variety of tasks that instructors assign to them. The learning is organized around the tasks, and the learner attempts to comprehend not only the tasks themselves but also the concepts and mechanisms underlying the tasks.
Interprofessional learning is defined as learning that occurs as a result of interactions between members of two or more professions. This could be the result of interprofessional education or it could happen on its own in the workplace.
Reflection is a metacognitive process that occurs before, during, and after situations to gain a better understanding of both the self and the situation so that future encounters with the situation are informed by previous encounters.

clinical practice to gain a better understanding of its challenges and possible solutions. The training was provided to an interprofessional group or participants to stimulate interactions and to encourage professionals to reflect both on themselves and the problems they face in their practice. The training was judged favorably by the participants and they reported that they learned new competencies. Involving all the (multi-disciplinary) stakeholders early in the process increased its success (12, 13). However; a single training will not be enough to cause sustainable awareness and behavioral change regarding infection prevention and successfully prevent SSI in the long run. Moreover, a systematic plan will be required to roll out training to all HCPs, taking into account the available resources in low- and middle-income countries (LMICs). We developed a master training plan that proposes initial training of all involved HCPs, regular follow-up meetings, and training based on task-based, interprofessional, and reflective learning (Appendix A). To implement the master training plan, the support of stakeholders – policymakers, teachers in health care education, and managers/leaders of health care institutions – is essential (14). This study explored whether and how the master training plan for education and training can be implemented in a LMIC and whether it is likely to lead to sustainable behavior change. We investigated the perceptions of stakeholders to gain their insights.

Research question

How do policymakers, teachers in health care education, and managers and leaders of health care institutions perceive the outline of a SSI master training to enhance sustainable awareness and induce behavioral change about SSI prevention in a LMIC?

Materials and methods

Study design

A qualitative individual interview study was conducted to explore how various stakeholders perceived the outline of the SSI master training plan to enhance sustainable awareness and induce behavioral change about SSI prevention in Pakistan.

Context

Pakistan is a LMIC where SSI is a severe problem. Most undergraduate and postgraduate medical teaching in Pakistan uses traditional teaching methods, such as lectures and studying books, with little interaction between students and teachers. In private and public sector health institutions, 75% of the curriculum content is taught by traditional lectures (15). Despite some progress, most colleges continue to implement teacher-centred, traditional subject-based curricula and are managed by teachers with little formal training in teaching and learning. Currently, there is no evidence-based training on the prevention of SSI for HCPs, neither in initial (undergraduate) education nor in continuing (postgraduate) education. For this study, we focus on post-graduate education and training in private and public hospitals in Pakistan.

Participants

This study included three categories of participants: eight policymakers at the local, regional, and national levels, 10 hospital leaders/managers of health care institutions, and 10 teachers/educators (see Table 3). Sampling was purposely done to include participants from Pakistan's public, private, and military health systems and with different professional and training backgrounds, for example surgeons, gynecologists, and anesthesiologists in Pakistan and abroad. Purposive sampling was employed to have maximal diversity and gain deeper insight. In total, 28 individual interviews were conducted. Three stakeholders were unable to participate due to professional obligations. The participants were personally contacted via cell phone. Interviews were held at a time and location that was convenient for them.

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Interviews

Semi-structured interviews were conducted between January and February 2021 and lasted approximately an average of 22–24 min. Interview questions related to the components of the outline of the master training plan and its approach, that is, the principles of interprofessional, tasked-based, and reflective learning. Furthermore, interview questions focused on the expected impact, the cost-effectiveness of the plan, and the suitability for a LMIC. The semi-structured interview guide can be found in Appendix B. MNA composed a draft of the semi-structured interview guide based on a review of the literature, which was subsequently discussed, and improved by all authors. The improved draft was piloted with four anesthesia consultants not involved in the study and no major changes were made afterwards. Participants received a copy of the information sheet detailing the process and aims 2–3 days before the interview. MNA conducted all interviews in English. The interviews were transcribed and pseudonymized.

Data analysis

Data were analyzed through a thematic approach. Data saturation was reached after 23 interviews. No new information appeared in the last five interviews. We combined inductive and deductive coding. Initially, the first and third authors (MNA and ABH) independently read the verbatim transcripts and identified general issues. Although we analyzed the stakeholders' perspective, we also used several sensitizing concepts, including the three principles, being authentic, interprofessional, and reflective learning, to better understand the participants' voices on a more theoretical level. All five authors participated in the discussion and refinement of themes. The generated themes were discussed and cross-checked with all authors (DV, DD, WvM). The team discussed differences in perspective among authors until consensus was reached.

Table 3. The participants of the study

Policymakers: an individual who makes policies and is involved in education in health care institutions, that is, members of governing bodies.
Teachers in health care education: individuals with the power to influence the opinions and behavior of others, that is, medical and nursing teachers. Health care professionals registered as a faculty with Pakistan medical and dental, College of Physicians & Surgeons of Pakistan and Pakistan Nursing Council
Managers and leaders: individuals who have an interest in the decision to implement guidelines and who actively support an innovation, that is, managers, anesthesiologists, surgeons, infection control nurses, supervising residents, and team leaders

Reflexivity

The researchers' different backgrounds widened and enhanced the data analysis. MNA and ABH are well-versed in surgery and the safety of ORs in Pakistan. The same can be said for WvM in the Netherlands. DV and DD are educational scientists with a background in instructional design.

Ethical approval

The study was granted ethical approval from the Shifa Tameer-e-Millat University Ethical Committee (reference number IRB # 435-1255-2020). The participants could withdraw from the study at any point for any reason. The data were safely stored and available only to the researchers.

Results

The analysis of the interviews' data resulted in the identification of four key themes (Table 4): 1) discussion of authentic tasks fosters the transfer of knowledge in the workplace; 2) interprofessional reflective learning comes with challenges; 3) the master training plan will help to change and sustain behavior; 4) the master-training plan is feasible with limited resources. We will consecutively discuss these themes in the following sections. Illustrative quotes are presented.

Table 4. Themes and subthemes related to stakeholders' perception of the master training plan

No.	Themes	Sub-themes
1	Discussion of authentic tasks fosters the transfer of knowledge in the workplace.	• Enhances decision-making and critical thinking skills • Participants see the potential impact of the training immediately
2	Interprofessional reflective learning comes with challenges.	• Good to include all personnel involved. • The potential risk of friction was between colleagues.
3	The training master plan will help to change and sustain behavior.	• Training can have a ripple effect: knowledge and skills transfer from one HCP to another. • HCPs should be held accountable for SSI prevention after the training. • The support of heads of the departments is a significant stimulus to reduce SSI.
4	The master plan for training is feasible with limited resources.	• The plan is feasible and easily implemented in the context of own work and the local language. • Training makes use of available resources which are conducive to a LMIC. • A train the trainers' plan is recommended.

Discussion of authentic tasks fosters the transfer of knowledge in the workplace

Firstly, stakeholders agreed with the task-based approach proposed in the master plan. They thought that discussion of authentic tasks in small groups with colleagues would foster understanding. Trying to solve actual problems was perceived to stimulate critical thinking and transfer knowledge and skills to the workplace. During the training, HCPs learned to work together to prevent infection and deliver safe, high-quality surgical care to the patients.

> *'Task-based training enhances decision-making and critical thinking skills as you learn a particular situation. That's when you figure it out and find a solution'.* (Participant 4)

Secondly, stakeholders believed that this master training plan would bring together HCPs. Because the training is interactive, participants can learn what works and what does not in their specific situation.

> *'Since the training is practical, professionals can see the results immediately and determine what works and what doesn't work for them'.* (Participant 10)

Interprofessional reflective learning comes with challenges

In general, stakeholders were positive about learning with colleagues from different professions. Some even suggested expanding the training to the housekeeping staff working in the ORs. However, others were concerned that this kind of interprofessional training with colleagues could trigger friction since some participants may have more knowledge and experience than others. Some participants may have a higher position in the health care system than others and this might hamper interactions between participants: juniors might not feel safe to speak freely and openly.

> *'Reflective learning can be challenging to implement because it involves bringing together different people, from cleaners to top surgeons, and sharing ideas on where the fault might be or improve. However, reflective learning becomes challenging to implement due to the difference in education and experience between health care workers'.* (Participant 15)

The training master plan will help to change and sustain behavior

The stakeholders thought that the master training plan would lead to sustainable behavior change in different ways.

Firstly, they expect that training will have a ripple effect. Once HCPs are aware and equipped with skills to prevent SSI, they are expected to become ambassadors of infection prevention. The master training plan will help develop a culture of infection prevention throughout the hospital.

> *'A nurse is employed in the OR and transferred to another integral unit after being taught these modules. Eventually, training and knowledge would be passed on to other healthcare staff, causing a ripple effect'.* (Participant 8)

Secondly, stakeholders agreed that the longitudinal, repetitive approach in the master training plan will cause a sustainable change in the behavior of HCPs. They recommend that training should also be incorporated in the medical and nursing schools to start teaching on this topic early. This might help to gain awareness of prevention measures once nurses and doctors start their clinical careers. Moreover, they agreed that there should be regular follow-up training as proposed in the master plan.

> *'Training is often held, but people think it's a one-time experience and often forget it. As a result, follow-up sessions will help them recall the information and integrate it into their everyday life, which is the module's most critical element'.* (Participant 21)

Thirdly, stakeholders believed that HCPs should be held accountable for following SSI prevention guidelines. They mentioned different ways to do so: incorporating rewards, financial rewards, and incentives, or penalties or warnings when guidelines are not applied.

> *'Cultural or individual behaviour sometimes dictates the personality of the individual. However, teaching people the right way can change that. Nevertheless, if a person still chooses not to observe what they are taught, there should be some kind of penalty or warning. It also shows that they are accountable to the organization'.* (Participant 18)

The interviewees initiated a lot of discussion about the organization's role in preventing SSI. The stakeholders expressed that it would be vital to include the leadership of organizations in implementing the master training plan; more specifically, to ensure the support of the heads of the departments for implementing the master training plan and to create a sustainable culture of infection prevention.

> *'If the head of the department understands and wants to reduce the percentage of infection, then it will be a*

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major stimulus for the institution. After that, the practices will change, and the outcome will eventually change'. (Participant 22)

The master training plan is feasible with limited resources

Stakeholders thought that the master training plan was feasible, acceptable, and easily implementable for different reasons. Firstly, the plan is attractive because training is proposed to take place locally and interprofessionally, with colleagues that also work together in practice. During training sessions, they discuss problems they face in their daily practice and find solutions for them. In addition, they discuss with their colleagues and in their local languages, and this will stimulate dialogue and interaction among participants.

'It is feasible and easily implemented, as we usually use the same language as local audiences when presenting videos, role plays, case scenarios, or task-based learning. So it's not only easier to understand, but it's, even more, interactive'. (Participant 22)

Secondly, stakeholders noticed that the master training plan is cost-effective because it relies on resources such as role-plays, case descriptions, and video fragments that are already available with limited costs.

'It doesn't require a substantial budget. It includes activities such as role-playing, video clips, and task-based learning. These instruction methods don't require many gizmos or complex setups'. (Participant 3)

Finally, stakeholders identified that up scaling is necessary to implement the master training plan at a national level systematically. This implies that a national program manager responsible for organization and content is indispensable. In their views, teach-the-teacher programs should be put in place to recruit and train more trainers to become certified teachers.

'You can't train everyone; you'll need more facilitators. You'll need to teach them how to conduct the interprofessional task-based training'. (Participant 11)

Discussion

All the stakeholders agreed that a master plan for training is useful and essential to improve the prevention of SSI: repetitive training interventions were perceived necessary to induce sustainable behavioral changes. The stakeholders were positive about the educational approach proposed in the master training plan, which is based on interprofessional, task-based, and reflective learning. This approach is perceived to enhance comprehension and transfer of skills to the workplace. In addition, they judged the outline of the master training plan to be well adapted to the LMIC, given that it requires limited implementation costs. Despite the advantages of the interprofessional nature of the training program, the stakeholders pointed out that it may create friction between HCPs who work together and participate in the same interprofessional training sessions (see below).

Furthermore, stake- holders suggested making HCPs accountable for behavior change in the workplace, for instance by rewarding their efforts. Finally, to further disseminate the training across other health care facilities and HCPs, they suggest developing a train-the-trainer plan.

Stakeholders confirmed the feasibility and cost-effectiveness of the outline of the master training plan. They observed that the role-plays, case studies, and video films herein used are inexpensive and readily available resources. Thus, implementation was considered feasible and this master training plan was seen as a helpful alternative to the more expensive simulation-based training to prevent SSI (5, 6).

The master training plan relies on interprofessional training at the workplace. The stakeholders saw this as an advantage but pointed out that difference in educational level, seniority, and hierarchal positions might hamper interactions between participants. Seniors may be seen as having more knowledge, abilities, and experience in preventing SSI than others, (4). We did, however, not observe this in our earlier study on interprofessional SSI training in Pakistan (12, 13). Hence, we would propose that training should continue to be interprofessional (8, 9) because this will result in a better understanding of roles and responsibilities, as well as other professionals' strengths and weaknesses (9, 10).

To improve HCPs' behavior regarding infection control, stakeholders suggested incorporating rewards, financial incentives, and penalties for non-compliance to the newly acquired knowledge and skills. This implies that accountability for infection control must be linked to clear expectations and reasonable goals, such as, for example providing evidence of increased compliance with infection prevention bundles and decreased infection rates. There has been some debate about whether punishment is more effective than reward (16), but a recent study suggests that rewards may be preferred to boost good behavior (17).

For the systematic spread of the master training plan on a national level, the stakeholders suggested developing an interprofessional train-the-trainer program with the involvement of the different stakeholders: hospital management, policymakers, and medical educators (18, 19). Train-the-trainer programs effectively expand the training from a single institution to a local and regional health

institution. To properly expand the master training plan regionally and nationally, a surplus number of trainers is paramount, preferably both with the understanding of interprofessional task-based reflective learning and clinical practice. The outline of the master training plan used in this study could set the first stage for harmonizing infection prevention activities.

This study shows that all stakeholders, that is policymakers, teachers in health care education, and managers/leaders of health care institutions, support the master training plan. From the study results, we can deduce the following suggestions to have a sustained change in behavior and to expand the training at the national level:

1. Incorporate an auditing system and rewards, financial incentives, and penalties for non-compliance with the guidelines to prevent SSI.

2. Develop an interprofessional train-the-trainer program with initial and refresher training to expand the training from a single institution to a local and regional health institution.

Strengths and limitations of the study

The first strength of this study is that it was executed in a LMIC and included a wide range of stakeholders with extensive working experience, teaching, and policymaking in the public sector and private hospitals. The second strength is that the master plan is based on learning theory, more specifically, the principles of tasked based, interprofessional and reflective learning.

The study was limited to the participant's perception of the outline of a master training plan. We did not evaluate its actual impact in practice because the master plan is not yet fully developed and implemented. A second limitation is that we only explored perceptions of stakeholders in Pakistan. Results in other resource-constrained contexts might be different.

Implications for practice

A consistent and systematic effort is required to prevent SSI in the LIMC. It needs a well-coordinated master training plan supported by the hospital, regional, and national stakeholders, that is managers and leaders, teachers in health care institutions at the regional level, and policymakers at the national level. The construction of the outline of such a master training plan will necessitate a collaborative effort. Workplace-based interventions must accompany SSI prevention training, and HCPs should be held accountable to ensure long-term behavioral change. We strongly recommend that training be set up locally and interprofessionally, that is doctors, nurses, and technologists working in ORs together, if possible with colleagues from the participants' workplace, and based on authentic learning tasks from their practice. We recommend beginning with a pilot initiative in one hospital, focusing on locally educating HCPs and building a thorough master training plan. This pilot can then be expanded to the regional and national levels.

Implications for future research

After initial education and training, several longitudinal studies, and clinical audits could be introduced. Pre- and post-training measurements of SSI would be needed to observe the effect of this master training plan on the incidence of SSI. Furthermore, the number of refresher courses required to establish and maintain a SSI culture in LMIC ORs must be ascertained.

Conclusion

The task-based, reflective, and interprofessional learning components of the SSI prevention master training plan were perceived to foster understanding, transfer of knowledge, and skills to the workplace. The training plan was well adapted to the context with minimal costs to implement in a LMIC setting. Train-the-trainer programs to systematically promote long-term change to implement the master plan at the national level were considered critical to induce sustainable behavioral changes.

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Authors' contributions

MNA, DV, AB, DD, and WvM participated and approved the study design. MNA has written the main manuscript text. It was multiple times read corrected and reviewed by MNA, DV, DD and WvM. AB helped in collecting and analyzing data. All authors read and approved the final manuscript.

Data availability

The datasets generated and analyzed during this study are not publicly available due to risks of confidentiality, privacy breaches and legitimate private interests but are available from the corresponding author on reasonable request.

Ethical approval

This study was performed in line with the principles of the Declaration of Helsinki. Approval was granted by the

Institutional review Board & Ethics Committee of Shifa Tameer e Millat University Islamabad (Date. December 5/2020/) IRB # 435-1255-2020).

Consent to participate

Informed consent was obtained from all individual participants included in the study. Written informed consent was obtained from the parents.

References

1. Rojas-Gutierrez E, Vilar-Compte D. An overview of surgical site infection in low-and middle-income countries: the role of recent guidelines, limitations, and possible solutions. Curr Treat Options Infect Dis 2019; 11(3): 300–16. doi: 10.1007/s40506-019-00198-1
2. World Health Organization. Protocol for surgical site infection surveillance with a focus on settings with limited resources. License: CC BY-NC-SA 3.0 IGO. Geneva: World Health Organization; 2018.
3. Bhangu A, Ademuyiwa AO, Aguilera ML, Alexander P, Al-Saqqa SW, Borda-Luque G, et al. Surgical site infection after gastrointestinal surgery in high-income, middle-income, and low-income countries: a prospective, international, multicentre cohort study. Lancet Infect Dis 2018; 18(5): 516–25. doi: 10.1016/S1473-3099(18)30101-4
4. Troughton R, Mariano V, Campbell A, Hettiaratchy S, Holmes A, Birgand G. Understanding determinants of infection control practices in surgery: the role of shared ownership and team hierarchy. Antimicrob Resist Infect Control 2019; 8(1): 116. doi: 10.1186/s13756-019-0565-8
5. World Health Organization. Improving infection prevention and control at the health facility: interim practical manual supporting implementation of the WHO Guidelines on Core Components of Infection Prevention and Control Programmes (No. WHO/HIS/SDS/2018.10). Geneva: World Health Organization; 2018.
6. World Health Organization. Minimum requirements for infection prevention and control programs. Geneva: World Health Organization; 2019. Available from: https://www.who.int/publications/i/item/9789241516945 [cited 1 January 2021].
7. Storr J, Twyman A, Zingg W, Damani N, Kilpatrick C, Reilly J, et al. Core components for effective infection prevention and control programmes: new WHO evidence-based recommendations. Antimicrob Resist Infect Control 2017; 6(1): 1–8. doi: 10.1186/s13756-016-0149-9
8. Vandewaetere M, Manhaeve D, Aertgeerts B, Clarebout G, Van Merriënboer JJ, Roex A. 4C/ID in medical education: how to design an educational program based on whole-task learning: AMEE Guide No. 93. Med Teach 2015; 37(1): 4–20. doi: 10.3109/0142159X.2014.928407
9. van Diggele C, Roberts C, Burgess A, Mellis C. Interprofessional education: tips for design and implementation. BMC Med Educ 2020; 20(2): 1–6. doi: 10.1186/s12909-020-02286-z
10. Coleman AJ, Finn GM, Nattress BR. Interprofessional education in dentistry. Br Dent J 2018; 225(3): 257–62. doi: 10.1038/sj.bdj.2018.547
11. Fragkos KC. Reflective practice in healthcare education: an umbrella review. Educ Sci 2016; 6(3): 27. doi: 10.3390/educsci6030027
12. Khan MN, Verstegen DM, Islam S, Dolmans DH, van Mook WN. Task-based training to prevent surgical site infection: A formative evaluation. Infection Prevention in Practice. 2022; 4(4): 100235.
13. Khan MNA, Verstegen DML, Shahid A, Dolmans DHJM, van Mook WN. The impact of interprofessional task-based training on the prevention of surgical site infection in a low-income country. BMC Med Educ 2021; 21: 607. doi: 10.1186/s12909-021-03046-3
14. Hegarty J, Murphy S, Creedon S, et al. Leadership perspective on the implementation of guidelines on healthcare-associated infections. BMJ Leader 2019; 3(2): 43–51. doi: 10.1136/leader-2018-000111
15. Javad A. The crisis of health professions education in Pakistan. MedEdPublish 2019; 8: 27. doi: 10.15694/mep.2019.000027.1
16. Steel A, Silson EH, Stagg CJ, Baker CI. The impact of reward and punishment on skill learning depends on task demands. Sci Rep 2016; 6(1): 1–9. doi: 10.1038/srep36056
17. Gaughan AA, Walker DM, DePuccio MJ, MacEwan SR, McAlearney AS. Rewarding and recognizing frontline staff for success in infection prevention. Am J Infect Control 2021; 49(1): 123–5. doi: 10.1016/j.ajic.2020.06.208
18. Birgand G, Johansson A, Szilagyi E, Lucet JC. Overcoming the obstacles of implementing infection prevention and control guidelines. Clin Microbiol Infect 2015; 21(12): 1067–71. doi: 10.1016/j.cmi.2015.09.005
19. Tartari E, Fankhauser C, Masson-Roy S, et al. Train-the-trainers in hand hygiene: a standardized approach to guide education in infection prevention and control. Antimicrob Resist Infect Control 2019; 8(1): 206. doi: 10.1186/s13756-019-0666-4

***Muhammad Nasir Ayub Khan**
Email: drmnasirayubk@gmail.com

Appendix A: draft master plan for education and training to prevent surgical site infection in operating rooms

Introduction

Education and training are recommended as a core component to bridge the gaps between knowledge and practice of surgical site infection (SSI) by the World Health Organization (WHO). In the past, simulation-based training has proved to increase hand hygiene compliance and decrease health-associated infections. Fortunately, education and training can be cheap and available (15). Especially in a low-income country, there is a need to bridge the gaps between knowledge and practice. This does require effort and organization, for the training of all personnel involved.

This study aims to explore how a realistic master plan can support hospitals to ensure effective implementation of their SSI interventions, implementation of an infection control system, and subsequently improve the delivery of health care services to patients. The study thus focuses on a master plan for the core component 'Education'. A draft master plan is presented that is developed for countries with low incomes, but components that also apply to high income countries. This study aims to get insight into the perceptions of the various stakeholders about the master plan for training in SSI prevention that we developed to enhance sustainable awareness and behavioral change in alow-income country.

Education as one of the eight core components

The WHO advises each hospital to set up an SSI prevention program consisting of eight components:

Core component 1: infection prevention and control program-having a committed, qualified infection prevention team in each hospital and a national infection plan with precisely specified goals, roles, and practices to avoid infection in the operating rooms (ORs).

Core component 2: infection prevention and control guidelines-the development and implementation of SSI evidence-based guidelines.

Core component 3: education and training-the establishment of the participatory training strategies. Education and training of health care professionals (HCPs) on the guidelines should be monitored by implementing an infection control program.

Core component 4: surveillance of infection-onsite facility-based surveillance to guide HCPs for prevention and control of infection, interventions, quality assurance, and feedback to all stakeholders.

Core component 5: multiple strategies-hospitals should establish multimodal strategies to health care workers in each hospital to prevent infection in the ORs

Core component 6: monitoring and audits-health care institutions should have regular audits, and timely feedback should be provided to HCPs by infection control standards to all relevant stakeholders.

Core component 7: workload, staffing, and bed occupancy-HCPs should be assigned the following workload, with turnover time between two surgeries. In addition, the movement of HCPs to and from the ORs should be clearly defined and monitored.

Core component 8: built environment, materials, and equipment for infection prevention control at the facility level-a physical environment with adequate facilities and equipment to prevent SSI to ensure that patient care activities are carried out in a clean environment.

Draft master plan for core component 3: education and training

Education and training of HCPs in the theory and practice are essential to prevent SSI. Infection control education and training provide the knowledge base, skills, and insight into why SSI is so important.

The guidelines to prevent SSIs are prepared in high-income countries; hence, many guidelines are challenging to implement in low-income countries. Similarly, the high-tech simulation-based training that is done in high-income countries is challenging to implement in low-income countries. In low-income countries, it is a challenge to develop education and training based on sound principles that are cost-effective, realistic, and fit in the context.

Task-based training is the most suitable strategy to help HCPs to develop competencies essential to prevent SSI. Task-based learning using, for example videos and role-plays can also be done with limited resources. In task-based training, participants discuss their tasks (authentic tasks) with their colleagues (inter-professional learning) and reflect on promoting factors and barriers and ways to overcome these barriers (reflective learning). Regular training and repetitions/follow-up meetings should eventually lead to a community of practice where attention for preventing SSI becomes part of daily practice.

Initial training of all personnel

Aim and the objective of the training

To create awareness, knowledge, and skills relating to preventive measures to avoid SSI in the ORs of hospitals.

Use of interprofessional training programs to bridge the gap between knowledge and practice to prevent SSI.

Content

The content of the training program addresses recommendations of the 2016 WHO global guidelines for the prevention of SSI.

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Facilitators

The training program will be conducted by two trained facilitators with experience in conducting problem-based learning.

Participants

The HCPs working in ORs are divided randomly into small mixed (interprofessional) groups with around five members in each group

All HCPs involved in the prevention of SSIs follow an initial training, organized in their hospital. We have already developed training for this purpose, which involves five meetings of 2 h each. The training has an interprofessional nature: participants are a mix of different kinds of professionals working in the OR, namely doctors (i.e. surgeons, anesthesiologists), nurses (i.e. preoperative nurses, perioperative scrub nurses, and technologists). They first come together to watch videos regarding the standard practice of preventing SSIs. They reflect and compare good practices with the current practices of SSI in the hospital they work in. This session is followed by an interactive lecture to consolidate the knowledge about SSI prevention. It is followed by small group sessions in groups similar to the teams they work in ORs. In these sessions, trainees are presented with authentic learning tasks: video showing good practice to prevent SSI, role-plays, case scenarios, and task analysis. The participants solve tasks by collaborative learning and discussion. When they have concluded, participants present their solutions to the rest of the participants. Eight weeks after these sessions, participants get together and discuss their experiences in the workplace and the barriers they perceive for the ideal practice of preventing SSI in their hospital. They discuss what they learned in training and give suggestions on how to overcome the barriers. Along with that, they discuss tips to increase compliance with good practice in preventing SSI.

Short training to maintain awareness, knowledge, and skills

The initial training will not be sufficient to achieve long-term behavior change. Regular repeated discussion and training are necessary to maintain awareness, knowledge, and skills regarding preventing SSI and foster a culture change in the workplace. It is also necessary to observe procedural skills because if these are not practiced regularly, they can deteriorate over time. They require mandatory repetitive training and collaborative practice. Moreover, there might be changes in the hospital that require different ways to prevent SSI and overcome new barriers. There may be a need for intervention after incidents or near incidents and a need for training the team leaders to organize their intervention sessions. Based on what we know from our clinical experience, we can say that there is a need for follow-up training and meetings because a single short training is not enough to cause long-lasting changes in behavior.

Learning outcomes of task-based learning: the students are expected to achieve the following learning outcomes at the end of the course

1. Acquire in-depth knowledge of the principles of SSI prevention.
2. Identify the links between suboptimal SSI prevention practices and increased rates of SSI affecting patient safety.
3. Understand types of hand hygiene, hand washing, and use of alcohol hand rub to promote best practice of hand hygiene in ORs.
4. Achieve an understanding of the importance of preoperative antibiotics in the prevention of SSI. Illustrate the appropriate antibiotic timing and dosing for general, gynecologic, orthopedic, and colorectal surgeries.
5. Achieve an understanding of hair removal before surgery. Understand current recommendations for preoperative hair removal. Understand advancement in device technology that improves the safety of hair removal before surgery.
6. Understand intraoperative thermoregulation and its impact on SSI.
7. Achieve an understanding of surveillance of SSI, audit, and quality assurance to establish validity and utilization of SSI prevention guidelines. Learn from feedback and audit results appropriately and effectively.
8. Understand the importance of glycemic control and its importance in preventing SSI.
9. Be able to speak up when SSI guidelines are not being followed.
10. Collaborate with other HCPs within their clinical team to achieve their goals of preventing SSI. Acquired skills of communication, teamwork, and interprofessional collaboration were enhanced.
11. Learn the application of knowledge into practice to prevent SSI in their settings by developing checklists and tailoring SSI prevention guidelines according to the need of their settings.

Appendix B: interview guide

What are your designation and organizational affiliation?

Did you read the master plan? What is your general first impression?

The master plan proposes initial training of all involved HCPs plus regular follow-up meetings and short training based on task-based, interprofessional, and reflective learning.

Which elements did you like most?

Which element did you dislike or perhaps have some doubts about? Please explain.

How do you think this master plan can help to improve SSI prevention? Why will it help, and why not?

Will it enhance awareness of SSI? Why? Why not?

Will participants reach the objectives and goals? Why yes? Why not?

Will it lead to behavioral change in the short term and the long term?

Will it lead to a change in SSI culture?

What else could be offered to stimulate long-term and sustainable behavioral change?

Is the master plan suitable for the context? Explain why yes, or why not.

Is the master plan doable/realistic/can it be implemented? Explain why yes or why not? Give examples.

Does it fit with the context of a low-income country? Why? Give an example?

Is it cost-effective? Explain why yes or why not?

What changes should we make in this training to make it more feasible to use?

Which aspects of the master plan are most positive and why?

Which adaptations are needed and why?

Or there any other issues you would like to discuss?

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