PROTECTING PATIENTS WITH HIV FROM ANTIMICROBIAL-RESISTANT ORGANISMS

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The increasing prevalence of antimicrobial resistance, while likely to affect everyone, will be especially harmful for people who are at higher risk of contracting infectious diseases. People living with HIV are one such group. Antimicrobial resistance can affect the 37 million people living with HIV *(1)* in a number of ways. First, they can be infected with a virus which is resistant to treatment or develop resistance while on treatment. For example, rates of transmission of resistant viruses have almost doubled in the past decade *(2)*. Second, HIV infection makes people susceptible to opportunistic infections with organisms, such as tuberculosis, that can be resistant to antimicrobials. Third, their exposure to health facilities makes them more likely to come into contact with other organisms which may be resistant to antimicrobials.

Various approaches to address antimicrobial resistance are discussed elsewhere in this book. This article will focus on describing how healthcare providers can protect their patients with HIV from antimicrobial-resistant organisms. Specifically, I will discuss approaches to reduce HIV-infected patients' exposure to resistant microorganisms by putting in place strategies to ensure that there are fewer resistant organisms in the environment (in the air and on fomites) and on the hands of health workers, and reduced exposure to organisms during medical procedures.

A recent article listed seven strategies that healthcare managers can use to improve service delivery. These include: 1) education and training, 2) standards and guidelines, 3) organizational design, 4) leadership and management interventions, 5) organizational culture, 6) incentives, and 7) process improvement *(3)*. These approaches are applicable to preventing infection in health facilities. Table 1 provides some examples of how healthcare managers could use these approaches to improve health workers' hand hygiene.

Each of these approaches can be effective in different settings and for solving different types of problems. However, not all directly improve care. Improvements in care happen only when change occurs at the patient level (Fig. 1). Only two of the seven approaches can directly reduce exposure to resistant organisms: improved skills and improved processes. The other approaches can potentially prevent infection with resistant organisms but only if they lead to better skills or to better processes.

For example, if a hospital manager wants to improve hand hygiene, he or she could set up an infection control committee to develop guidelines for when and how to wash hands; to measure hand hygiene and rates of preventable nosocomial infections; and link incentives to good and bad performers (an organizational design, guideline, and incentive initiative). The committee could organize meetings to emphasize the importance of hand hygiene and clarify that this is an institutional priority (an education, leadership and culture change initiative).

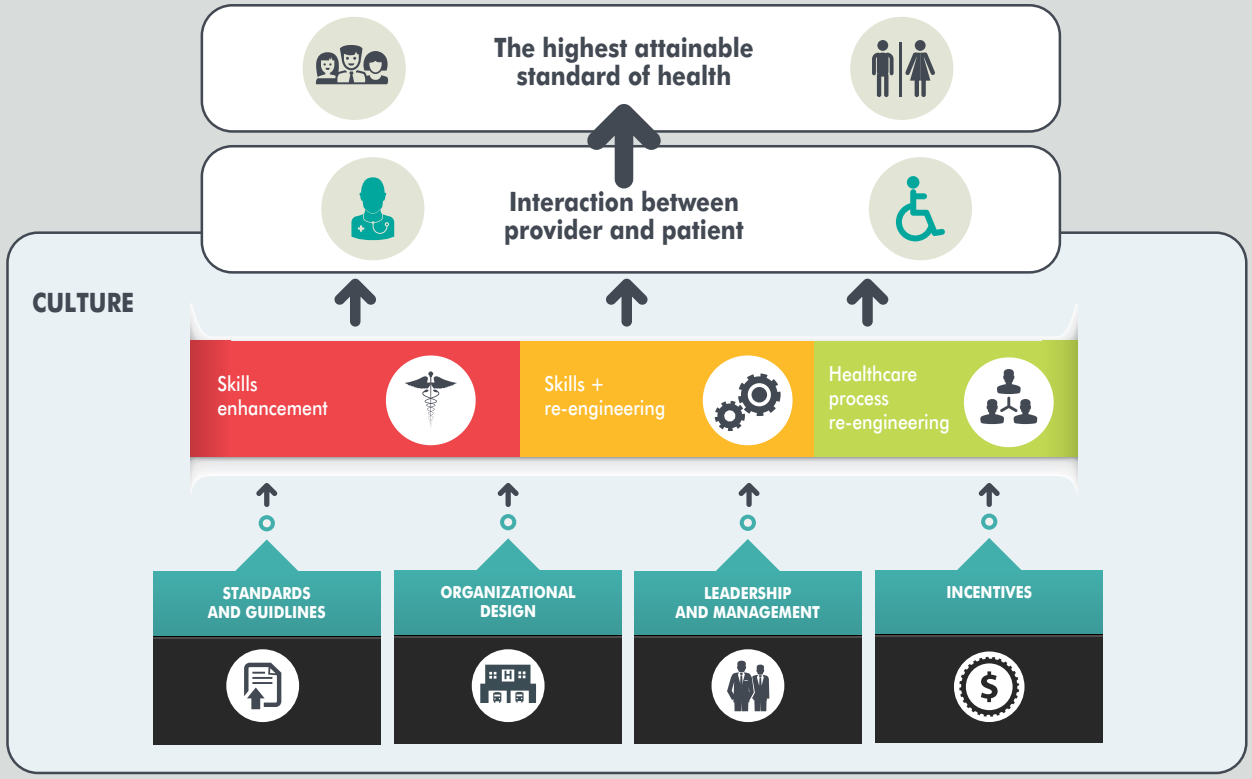
While knowledge about the benefit of hand washing is one determinant of whether someone will wash his or her hands it is not the only factor. Other determinants of hand washing include workload, inconvenience of handwashing and whether the person was involved in making decisions about the organization's handwashing strategy *(4)*. If the problem is that the ward is disorganized and staff have to walk far to wash their hands, get the equipment that they need, get the records that they need and then see the patient, then training and standards are not going to fix those problems. Instead, health workers could use process redesign to re-organize the ward to decrease the amount of time that staff spend walking to find what they need. This frees up more time for doing the important parts of clinical care including practising good hand hygiene.

Health systems around the world put a lot of resources into trying to improve service delivery through education and training, standards and guidelines, organizational design, leadership and management interventions, organizational culture and incentives (typically non-monetary). Conversely, very few health systems have mechanisms to support process redesign. For example, the World Health Organization

Table 1: **Examples of infectious diseases in patients presenting to various healthcare settings and RDTs available**

Approach	Application to protect patients with HIV from antimicrobial-resistant organisms
Education and training	• Training health workers on importance of handwashing • Practical training on how effective handwashing
Standards and guidelines	• Standards on when to wash hands
Organizational design	• Formation of an infection control committee to promote and monitor hand hygiene
Leadership and management	• Clear communication on importance of handwashing
Organizational culture	• Efforts to make hand washing part of the culture of the facility
Incentives	• Rewards or recognition to staff who actively promote hand hygiene
Process redesign	• Elimination of non-value-added work so that staff have more time for hand hygiene and other crucial tasks

Figure 1: **Pathways for improvement in patient care**



website provides many materials to support hand hygiene including: training materials *(5)*, standards and guidelines, recommendations for infection control committees, approaches for measuring compliance, guidance for leaders and managers, how to set up incentive systems *(6)*, and how to change culture *(7)*. But they do not provide guidance on how process redesign methods can be used to make it easier for health workers to wash their hands or to free up more time for health workers to wash their hands better. This is not unusual, health systems typically focus on telling health workers what to do (through training and standards) and setting up measurement systems to see if they are doing what they are told. They rarely put resources into supporting health workers to change their processes of work to apply the knowledge and skills that they have.

Despite being under-used in the health sector, other sectors have spent decades developing approaches to support workers to improve their processes of work. These approaches are often called quality improvement or improvement science *(8, 9)*. Improvement science was first developed to improve manufacturing. More recently, healthcare providers are using improvement science to address the types of problems that the traditional approaches of standards, training and incentives are not effective at solving.

Improvement science is based on a number of propositions including:

- the results you achieve are a function of the overall system, not just the individuals in the system;
- systems are too complex to be understood by a single person, working in teams to understand the system and identify opportunities for improvement is crucial;
- local context is a major determinant of the success or failure of interventions and therefore most interventions need to be tailored to that context;
- predicting how a new intervention will work is challenging and therefore there is a need to use structured tests of change (such as plan-do-study-act cycles) to adapt new interventions to that context.

In the context of infection control, improvement science is an approach that can allow a health manager to remove the barriers to infection prevention in their unit so that health workers will have more time for prevention activities and, in conjunction with training, be more skilled at prevention tasks. There are many improvement science approaches that managers could use but they all boil down to seven steps:

- pick an improvement aim;
- form a team to work towards the aim;
- identify the barriers in your context that are keeping you from reaching your aim;
- develop some solutions that you think may work;
- develop a simple measurement system to track your performance;
- use iterative testing to identify what does not work and adapt successful solutions to your setting;
- develop strategies to sustain the use of these solutions.

For example, hospital staff could decide to improve the hygiene in the labour room where HIV-infected and non-infected pregnant women and their babies are delivered. The managerial team asks for a team of volunteers to work on achieving this goal. They look for staff who are enthusiastic and who are actively involved in delivering babies and in cleaning the labour room. It is critical to include staff who are involved in delivery and cleaning because they understand the barriers making infection prevention difficult. In addition, these staff will have to make changes to improve infection prevention. Involving them in deciding how to fix the problem makes it more likely that the team will develop better solutions and increases buy-in for making these changes. The team then analyses how the room is cleaned and how babies receive care to identify the risks that contribute to neonatal infection. They then develop some possible solutions based on what they learned.

For example, the team identifies that the labour room and table are not cleaned after every delivery because the cleaners do not have time to clean after every delivery. They know that they are not going to be able to get new staff to help with the workload so they decide to look for activities that take up the cleaner's time but do not add value. If they can find such activities, they can stop them and make more time for critical activities such as cleaning. The cleaners volunteer to pay attention as they work the next day and identify some activities which are time-consuming but do not add any value to patient care. The next day the team meets again. The cleaners tell the team that they have to spend a lot of time looking for the cleaning solution and equipment because it gets left in the last place it was used. They also have to spend a lot of time cleaning the outpatient department (OPD) waiting area even though no patient care occurs there and it is usually pretty clean. The team decides that both of those activities (looking for the equipment and keeping the OPD waiting area clean) do not add value in protecting patients. The team decides that a few solutions may work: 1) coming up with a dedicated space to keep the cleaning solutions and equipment and making sure it is always kept there and 2) reducing the amount of time that the cleaners spend on the waiting space so they can spend time in the labour room.

Before making any changes the team decides to measure each day how many times the labour room is cleaned and how many deliveries are happening with clean sheets and in a clean room. At this point, one of the cleaners on the team volunteers to meet with the other cleaners, identify the best place to keep the equipment and come up with a way to make sure that everyone keeps it there. Because the best place is not obvious, they decide to try keeping it in three different places over the next three days and see which is easiest for all of the cleaners. After three days, the cleaners pick the place that works best and develops signs on each ward stating where the equipment is. This iterative testing approach helps reduce the time to find the cleaning equipment. The cleaners also discuss what to do about reducing the amount of time cleaning the OPD waiting area. Right now they are supposed to clean it three times a day but they think that once a day would be enough. When they tell their supervisor, the supervisor says that the facility in-charge will not allow it because a dirty waiting room had been one of the main patient complaints until the three times a day cleaning. The cleaners organize a meeting with other staff in the OPD waiting area – the receptionist and guard. They also ask a nurse from the labour room to attend. The nurse explains the situation: that babies are dying because there is not enough time to clean the labour room properly and they want to see if the cleaners can spend less time cleaning the waiting area while still making sure that the area stays clean and patients are comfortable. They come up with two ideas: 1) they will take

some old cloths and make a foot mat for people to wipe their shoes when they come in, and 2) they will place rubbish bins in the room and the guard will ask people to use them.

Because they are not sure that these changes will actually work, they decide to test the first idea the next day and to try to find extra rubbish bins. When the team meets at the end of the next day they found out that most people were not cleaning their shoes and they also thought that most of the dust was coming in because the door was open most of the time. The guard volunteered to remind people to clean their feet and to make sure the door was closed. The team had also found a bin and decided to place it in the waiting room. After making these changes they notice a difference. The room gets less dusty and people use the rubbish bins.

The team decides to show the in-charge what they have done and talk about cleaning the room once a day and spending the extra time cleaning the labour room. The in-charge thanks them for their initiative but is worried that the waiting room will be dirty. They agree that the cleaners will clean it tomorrow morning and the in-charge will come and see it later in the day. The next day, the in-charge comes in the afternoon and the waiting area looks good. She agrees that they can keep going with this new plan but if she starts getting complaints they will need to reassess. The cleaners now have more time to spend on keeping the labour room clean. Over the next week there is an increase in the number of times the labour room is cleaned and an increase in the number of deliveries taking place with clean sheets and in a clean room.

Improvement science has been used to improve infection prevention in a variety of settings *(10)*, including hand hygiene in Pakistan *(11)*, bio-waste management in Namibia *(12)*, and reducing hospital acquired-infections in the United States *(13)*. Scaling up its use will give hospital managers another tool to protect patients with HIV from antimicrobial resistance.

Conclusion

Antimicrobial resistance is a global public health threat of especial concern to people living with HIV. Addressing the threat and providing the best possible care to people will require the use of all the available tools for solving healthcare problems. Most health systems do not use all the available tools and are therefore making their jobs harder and delivering worse care than they should. This puts people with HIV at additional and unnecessary risk of infections with AMR. Improvement science methods are a well-established set of tools for addressing problems related to processes of care and allowing health workers to ensure that they can provide better care. Governments interested in infection prevention and control should invest in learning more about these approaches and how to apply them in their health systems. ■

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