

Better AMR control: Learning from experiences with HIV and Ebola about how to improve infection prevention in health settings

Dr David Gisselquist (top) and Simon Collery (bottom), independent consultants on HIV, whose joint website, Don't Get Stuck with HIV, offers advice about how to avoid blood-borne risks



Infection prevention and control in health facilities is crucial in the fight against antimicrobial resistance. Experiences with HIV epidemics and Ebola virus disease (EVD) outbreaks provide a lesson for how to improve infection control: recognize and admit nosocomial (patient-to-patient) infections and warn the public about risks. HIV prevalence is lower in countries where governments have investigated nosocomial outbreaks and thereby openly acknowledged nosocomial infections than in countries where governments have denied and ignored nosocomial infections. Similarly, differences in EVD outbreaks over time show better results in earlier outbreaks when the public health response acknowledged nosocomial infections and warned the public about injections, compared to what happened in the West African outbreak in 2013–16, when experts said little about blood borne risks and patient-to-patient transmission. People aware of risks can ask healthcare providers to show that equipment is sterile and safe; these procedures have been proposed as Patient Observed Sterile Treatment (POST).

Infection prevention is one of five objectives in the World Health Organization's (WHO) plan to combat antimicrobial resistance. Both HIV and Ebola virus disease (EVD) transmit through a mix of nosocomial and other risks, e.g., sex and injection drug use (IDU) for HIV and touching patients and corpses for EVD. People with HIV and damaged immune systems are at risk to get other infections during healthcare, and for those infections to develop antimicrobial resistance. And HIV resistance to antiretrovirals is a mounting threat; for example, a 2017 national survey in South Africa found that more than 50% of people on antiretroviral treatment had drug-resistant mutations as did more than 20% of HIV-positive people not on treatment (1). This article does not address all that must be done to limit infections and antimicrobial resistance, but rather focuses on one lesson: what to tell the public about nosocomial risks.

The first section will look at differences across countries in governments' response to nosocomial risks in HIV epidemics: some governments investigated nosocomial outbreaks, thereby warning the public about risks to get HIV from healthcare, whereas other governments have not investigated or warned. The second section will discuss similar differences over time in the management of nosocomial risks in EVD outbreaks: in early outbreaks, public health experts acknowledged hospitals

as amplifiers and public health messages warned the public about injections and other blood exposures, whereas in West Africa in 2013–16, public health managers all but ignored patient-to-patient transmission and messages aimed at the public said little or nothing about bloodborne risks.

HIV: Two responses to nosocomial infections

Beginning in the mid-1980s, governments of many developed, middle- and low-income countries investigated suspected nosocomial HIV infections to find and stop outbreaks. An alternate response, common among governments in sub-Saharan Africa, has been to ignore, avoid, or deny evidence of nosocomial HIV infections while at the same time assuring people they have little or no risk of getting HIV from healthcare. This section discusses these two responses in turn, with attention to consequences for HIV epidemics.

Response 1: Acknowledging and investigating nosocomial HIV infections: Beginning in the mid-1980s, 10 governments investigated nosocomial HIV outbreaks with more than 100 to an estimated 100,000 infections (Table 1). Widespread lapses in standard precautions allowed these outbreaks; investigations brought changes. As of 2017, the median adult HIV prevalence in these 10 countries was 0.2% (ranging from less than 1% to 1.2%). At least 10 other governments investigated what turned

Table 1: Investigated HIV outbreaks from healthcare with at least 100 infections

Country	Investigated nosocomial outbreak			2017 adult HIV prevalence
	Year of outbreak	Who was infected	Number of cases	
Mexico	1986	Blood and plasma sellers	281	0.3%
Russia	1988–89	Inpatient children	>260	1.2%
Romania	1987–92	Children	~10,000	0.1%
India	1988	Blood and plasma sellers	~172	0.2%
China	1990–95	Blood and plasma sellers	~100,000	<0.1%
Libya	1997–99	Inpatient and outpatient children	>400	<0.1%
Kazakhstan	2006	Inpatient children	>140	0.2%
Kyrgyzstan	2007	Inpatient children	~270	0.2%
Uzbekistan	2008	Inpatient children	>140	0.3%
Cambodia	2012–14	Patients of a private clinic	~292	0.5%

Source: Dates of outbreaks, who was infected, and number of infections are summarized and referenced in *Points to Consider* (2) and *dontgetstuck.org* (3). HIV prevalence percentages in 2017 are from UNAIDS except authors' estimates for China and Libya.

out be smaller nosocomial outbreaks (2,3).

Source: Dates of outbreaks, who was infected, and number of infections are summarized and referenced in *Points to Consider* (2) and *dontgetstuck.org* (3). HIV prevalence percentages in 2017 are from UNAIDS except authors' estimates for China and Libya.

Although all investigated nosocomial outbreaks infected adults and/or children in the general population, as of 2017 all but one of these 20 countries has a concentrated epidemic with many if not most infections in men who have sex with men (MSM) and IDUs, and with more men than women infected. Cambodia was the only country to have a (low level) generalized epidemic, infecting as many women as men; however, Cambodia's investigation in 2014–15 was too recent to expect any impact on nosocomial transmission to impact 2017 adult HIV prevalence.

Investigations in these countries show that at least some government officials were alert to evidence of unexpected HIV infections, had a low tolerance for nosocomial infections, and were willing to let the public learn about HIV infections from healthcare. These countries illustrate various paths from unexpected infections to investigations. In some countries, the path went through official channels. For example, in Elista, Russia (former USSR), in early 1988, doctors who found unexpected infections in a hospitalized baby and a blood donor reported these infections to the Ministry of Health. Officials in the Ministry almost immediately began an investigation. By late summer 1989, the investigation had traced transmission from one child through 13 hospitals to more than 260 children (2,3).

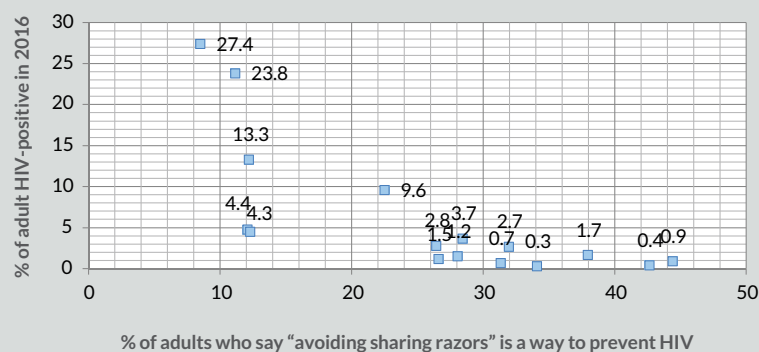
In Libya, the government's initial response to a magazine's August 1998 report of children with HIV traced to El Fatah

Hospital, Benghazi, was to close the magazine. But parents did not accept a non-responsive government. In November 1998, a group of desperate fathers interrupted a medical conference Ghaddafi was attending in Benghazi and appealed to him for help (4). Gaddafi ordered treatment for HIV-infected children and an investigation offering tests to children treated at El Fatah Hospital in the previous year. The investigation found 402 children with HIV from healthcare and 20 HIV-positive mothers, most with no risk other than breastfeeding their HIV-positive babies. Although Gaddafi did the right thing to protect children, he misleadingly blamed the infections exclusively on foreigners working in Libya.

In Roka, Cambodia, in November 2014, a 74-year-old man tested HIV-positive. Surprised, he sent his son-in-law and granddaughter for tests; both were infected. More villagers, alerted and worried, went for tests. In December 2014, local health authorities reported 30 unexpected HIV infections. Acting on this information, government ordered an investigation (3). Eventually, government and foreign partners reported results from the investigation: 242 HIV infections, almost all attributed to skin-piercing procedures from a local private healthcare provider (5).

Investigations led through multiple channels to reductions in nosocomial infections and improved infection control in healthcare. In China, India, and Mexico, where outbreak investigations had reported HIV transmission during plasma donation, tighter rules about blood and plasma collection had a direct effect. Elsewhere, there is little information about changes in healthcare budgets or management, yet there is a clear drop-off in nosocomial transmission. Some investigations resulted in criminal prosecutions, so that fear may have encouraged stricter implementation of standard precautions.

Figure 1: Percentage of adults with HIV vs percentage who mentioned sharing razors as a risk



Sources: The percentages of adults who say "avoiding sharing razors/blades" average percentages for men and women extracted from survey data by Devon Brewer (8).

On the other hand, many healthcare workers outside the purview of the investigations were no doubt mortified to learn that what they had been doing all along could have infected patients; investigations educated healthcare staff about unexpected risks (e.g., re-entering multi-dose vials with a used syringe, changing needles but reusing syringes, reusing plastic tubes to deliver intravenous solutions, etc.). Patient education was another channel for investigations to reduce infections from healthcare. After investigations, at least some patients were more aware to see and avoid blood exposures in healthcare and cosmetic services.

Response 2: Ignoring and/or denying nosocomial HIV infections: Although unexpected HIV infections (i.e., not from sex, IDU, or mother-to-child) have been common in sub-Saharan Africa, no government has investigated any such infection to look for linked infections and to find and stop the source. Beginning with some of the earliest HIV testing in Africa, local and international health experts recognized nosocomial infections. For example, in 1985, researchers in Kinshasa, Democratic Republic of the Congo (DRC, formerly Zaire), found 16 of 32 HIV-positive inpatient children aged 2–24 months to have HIV-negative mothers (2,3). There was no subsequent investigation to find the extent of the problem or to find and stop the sources. One year later, three researchers who had reported nosocomial HIV in DRC's children accepted continuing infection control lapses: "one cannot hope to prevent reuse of disposable injection equipment when many hospital budgets are insufficient for the purchase of antibiotics," they said (6,p962).

Evidence of a large contribution from nosocomial transmission to Africa's generalized HIV epidemics has mounted over the years. For example, in a 2012 survey of high school students aged 12 years and older in KwaZulu-Natal, South Africa, 21 (55%) of 38 HIV-positive boys reported being virgins as did 56 (54%) of 104 HIV-positive girls (7).

Even without outbreak investigations, government and

private initiatives can warn people about bloodborne risks. Random sample national surveys in 16 countries in Africa during 2003–7, asked people if there was anything they could do to avoid getting HIV or AIDS. If they answered "Yes," the next question was: "What can a person do?" The interviewers coded answers to that open question to include three codes for blood risks: avoid blood transfusions, avoid injections, and avoid sharing razors/blades. Mentioning risks from razors or blades showed awareness of bloodborne risks for HIV in all potentially contaminated skin-piercing procedures, including but not limited to injections (8).

Intriguingly, more awareness of bloodborne risks correlates with lower HIV prevalence. In six of 16 countries where only 9%–23% of adults mentioned sharing razors as a risk for HIV, adult HIV prevalence ranged from 4.5%–27.4%. In the 10 countries where 26%–44% of adults mentioned sharing razors as a risk, HIV prevalence was much less, ranging from 0.3%–3.7%.

EVD: Two responses to nosocomial infections

Although the Ebola virus has been in Africa in one or more host species for millenia and has no doubt infected humans from time to time, the virus was not recognized until two outbreaks in 1976 in Sudan and Zaire (Democratic Republic of the Congo (DRC)). Between 1976 and 2013, 21 outbreaks were recognized in Africa; all ended within months and the average death toll was 75 (ranging from 1 to 280) (9). Subsequently, four outbreaks during 2013–2019 include two similarly limited outbreaks in DRC in 2014 and 2018, and two much larger outbreaks:

- ➔ an outbreak in Guinea, Liberia and Sierra Leone that lasted more than two years from December 2013 to January 2016 with more than 11,000 deaths, more than seven times as many as recorded in all previous outbreaks combined, and
- ➔ an outbreak in eastern DRC recognized in July 2018 and continuing with more than 600 confirmed and probable deaths as of end-March 2019.

Thus, there is an inflection point after 2013 in the size and duration of EVD outbreaks. The two much larger outbreaks after 2013 are not easily explained by funerals, weak formal healthcare systems, or home-based care; these conditions have been common in all previous outbreaks and even before EVD was recognized. One thing that has been different is the

Figure 2: Poster used in Kikwit, DRC, in 1995 to warn people about risks to get EVD (12)



response to nosocomial infections.

Response 1: Acknowledging nosocomial EVD and warning people about blood-borne risks: The International Commission that investigated Zaire's 1976 outbreak reported (p 271 in (18)) "almost all...cases had either received injections at the [Yambuku Mission] hospital or had had close contact with another case." Infection control was weak (p 273 in (10): "Five syringes and needles were issued to the nursing staff each morning for use at the outpatient department [with an average of 200-400 outpatients each day], the prenatal clinic, and the inpatient wards [with 120 beds]. These syringes and needles were apparently not sterilized between their use on different patients but rinsed in a pan of warm water." The hospital closed in early October 1976 after 11 of 17 staff died. Transmission quickly stopped: when surveillance teams began to visit villages to look for new cases in early November, they found none.

In a 2005 review of haemorrhagic fever outbreaks, Dr Susan Fisher-Hoch describes hospitals as the main site for EVD transmission. She credits local understanding and action for containing outbreaks; in Zaire in 1976, for example (11 p129): "Most of the cases became infected in the hospital, and the local community, despite their poverty and lack of education, quickly figured this out and abandoned the hospital, effectively terminating the outbreak." Moreover, the official response to at least some early outbreaks included explicit warnings to the public about EVD from injections and other blood exposures, as in posters (Figure 3) used in the 1995 outbreak in Kikwit, DRC.

Response 2: Not acknowledging nosocomial EVD and not warning people about bloodborne risks: In the 2013–16 EVD

Figure 3: Poster from Liberia about various EVD risks but not blood or injections (14)



outbreak in West Africa, governments of Guinea, Liberia, and Sierra Leone, together with foreign partners including WHO, Doctors Without Borders (MSF) and others, focused on getting cases into hospitals and taking over burials. In 2014, WHO described goals to get 70% of cases into isolation wards and safe funerals for 70% of EVD deaths. The turning point in Liberia's outbreak occurred around August-September 2014, about the time Doctors Without Borders (MSF), overwhelmed by the rising numbers of cases, began to support home-based care (13). As observed in earlier outbreaks, transmission during home-based care was not enough to sustain the outbreak.

Both during and after the West African outbreak, public discussions seldom noted patient-to-patient (nosocomial) transmission. Similarly, posters to educate the public about risks seldom if ever said anything about injections or other bloodborne risks (Figure 3).

The initial public health response to the EVD outbreak that began in eastern DRC in the summer of 2018 similarly focused on getting cases into isolation centres, sometimes with force, and there was similarly little attention to patient-to-patient transmission in healthcare facilities. This changed in early 2019. At WHO's Executive Board meeting in January, Mike Ryan, WHO's Assistant Director General, reported (47-50 minutes into the online video of the late morning session on 28 January (15)): "In Beni...we estimate that 80-85% of the transmission...was occurring inside the health system," including children who came with malaria and left with Ebola. Dr Ryan's comments acknowledged a general but often ignored issue which is at the heart of the development of antimicrobial resistance: healthcare centres worldwide spread hard to treat or outright untreatable and often deadly diseases.

In 2019, WHO and partners have been tracing EVD cases to health facilities and sending teams to source facilities to

strengthen infection prevention and control. However, it is not yet clear whether and how much WHO and partners are warning the public about injections and other bloodborne risks.

Moving from response 1 to response 2

Not warning people about risks to get HIV and EVD from healthcare has serious faults:

- ➔ It is unethical. According to the Declaration of Lisbon on the Rights of the Patient, insofar as public health staff and researchers participate “in the provision of health care,” they have a “joint responsibility” with other providers to give patients “health education that will assist him/her in making informed choices about personal health and about the available health services” (16).
- ➔ It does not educate, enlist, empower and respect patients to participate in the management of safe healthcare systems, but rather considers patients to be passive recipients of whatever experts want to do.
- ➔ It poses an unnecessary choice between unsafe healthcare and no healthcare, without considering safe care as a third option. Any such choice should, in any case, be left to patients.

Africa’s generalized HIV epidemics and EVD outbreaks illustrate these faults: Not telling people about nosocomial infections while at the same time not investigating unexpected HIV infections and trying to get all EVD cases into healthcare centres has been dangerous for Africans.

The ethical and practical obligation to acknowledge nosocomial infections and risks creates a challenge for public health programmes: After warning patients about risks, how can patients be confident healthcare is safe, so they attend when they need it? One strategy for people to assure themselves they will not get HIV from skin-piercing healthcare and cosmetic services has been proposed as: Patient Observed Sterile Treatment (POST). The POST strategy proposes four options: avoid; use new disposable instruments; sterilize instruments yourself; and/or ask providers how they sterilize instruments. POST procedures have been proposed for injections, infusions, blood tests, dental care, and other

Table 2: POST for injections

1. Avoid skin-piercing procedures	(a) When your doctor prescribes an injection, ask if you can get along without any medicine, or if an oral alternative is available. Many conditions, such as colds, flu, dry cough, and diarrhoea are often better treated without injected medicines. (b) The following drugs and other substances can be taken orally, and should be injected only in rare situations (especially if someone is unconscious or vomits so much that oral medication will not stay down): vitamins, glucose, paracetamol and other drugs to reduce temperature, most pain-killers, treatments to stop diarrhoea or vomiting, medicines to treat asthma, antibiotics (with a few exceptions, such as penicillin) (c) Most sexually transmitted diseases (STDs) can be treated with oral drugs. The most common exception is syphilis, which is often treated with injected penicillin. If your provider wants to inject penicillin for syphilis, ask for one injection of long-acting penicillin, which is safer than 7-10 daily injections of short-acting penicillin. (Old syphilis infections are harder to treat and may require repeated injections of long-acting penicillin.)
2. Use new disposable instruments	(a) Use a new disposable syringe and needle taken from a sealed package. (b) Ask your provider to take medication to inject from a single-dose vial (a small bottle with medicine for one injection only). Many providers stock only multi-dose vials. You can ask your provider to write a prescription for a single-dose vial, which you can buy at a pharmacy. If no single-dose vial is available, ask your provider to take medicine from a new multi-dose vial opened in front of you. (Exception: If your provider uses a new syringe and needle every time he or she takes medicine from a multi-dose vial, there is no chance for blood or HIV to get into the vial. Can you be sure?) (c) Another option is to take injections from pre-filled disposable syringes.
3. You sterilize the instruments	It’s safer not to do this for injection equipment. If you keep reused syringes and needles at home, even if you boil them after use, they can pick up germs from hands, cloth, and air. This can lead to infections and abscesses. So: use new disposables.
4. Ask providers how they sterilize instruments	Your provider will have to use special reusable syringes and needles in some situations, such as to inject rabies vaccine. If the syringe or needle are reused, ask if they have been autoclaved or boiled.

healthcare and cosmetic services (3). To illustrate, Table 2 summarizes POST proposals for injections. Patient Observed Sterile Treatment could become a powerful tool to prevent the transmission of AMR infections in healthcare systems.

When government monitoring does not assure safe healthcare procedures, and governments do not warn patients, non-government organizations such as churches, labour unions and others could promote the POST approach to educate and protect people. In this way, even where government monitoring and oversight are limited, as in cosmetic services and informal health settings, public awareness of risk promotes standard precautions.

Conclusion

Generalized AIDS epidemics and Ebola outbreaks in Africa challenge governments to improve infection control in healthcare settings. In a 2005 review of haemorrhagic fever viruses, Fisher-Hoch urged governments to tell the public about risks in healthcare so as to generate their support for better infection control (11 p135):

“What is needed now is to concentrate on disseminating and implementing the understanding of the risks of bloodborne viruses and the discipline of good training and good clinical practice. Indeed, training of medical staff is the critical component... Education of the public, the consumer, can be a powerful tool... [T]he AIDS epidemic gives us a powerful educational tool, which should be used to try to get the message to as many of the public as possible, even in the poorest regions, so that pressure from the public for higher standards acts in concert with better training of medical staff.”

Lessons from HIV epidemics and Ebola outbreaks confirm her advice. Governments that warn people about bloodborne risks help them to protect themselves and enlist their support to improve infection control in healthcare facilities. These lessons apply not only to bloodborne pathogens, such as HIV and Ebola, but also to other hard to treat pathogens, notably AMR pathogens, with any mode of transmission. With hospital-associated infections accounting for a majority of antibiotic-resistant infections, stopping nosocomial transmission is crucial in the fight against antibiotic resistance. ■

Dr David Gisselquist has written extensively on nosocomial risks for HIV, including more than 20 articles in medical journals and

several books. With Simon Collery, he maintains a website, Don't Get Stuck with HIV, offering advice about how to avoid blood-borne risks. His history of HIV and unsafe healthcare in Africa, Points to Consider, is available online. With Mariette Correa, he co-wrote HIV from blood exposures in India – an exploratory study, which is also available on-line. With co-authors Correa and Deodatta Hari Gore, he published Blood-borne HIV: risks and prevention, for a South Asian audience. With Yvan Hutin he co-edited a collection of country studies on injection practices, Pilot-Testing the WHO Tools to Assess and Evaluate Injection Practices, published by WHO in 2003. He has spoken at WHO and at international AIDS conferences. He is an independent consultant with a PhD in economics and experience in anthropology and development.

Simon Collery has spent the last 11 years working in developing countries, running NGOs, researching and writing about development issues. He has focused on the history of HIV epidemics, non-sexually transmitted HIV, unsafe healthcare, media coverage of issues such as attacks on albinos in Tanzania and various other topics. Before working in developing countries, he was an information consultant and researcher in the UK. He has a BA in Philosophy and an MA in Education and International Development.

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