

IN THE ERA OF ANTIMICROBIAL RESISTANCE, SAFETY-ENGINEERED INJECTION DEVICES CAN DECREASE THE BURDEN ON COUNTRIES' HEALTHCARE SYSTEMS

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In this commentary we highlight the problem of unsafe therapeutic injections and its harmful effects on patients' lives. Many countries around the world are seriously struggling with injection safety, including unnecessary injections which are often prescribed because of economic incentive on the part of the healthcare provider (both trained and untrained). Sometimes the patients also demand injections, believing that they will provide quick relief and cure the ailment. Disposable syringes meant for single use are used more than once on multiple patients, increasing the risk of transmission of bloodborne pathogens, including hepatitis B virus, hepatitis C virus and HIV, as well as bacterial and haemorrhagic infections. Often, antibiotics are provided through injections by healthcare providers to improve their efficacy (a mistaken assumption), further ignoring the fact that they may lead to antimicrobial resistance spread.

In 2015, the World Health Organization (WHO) developed a detailed guideline policy document for injection safety which recommends that by 2020 all member states should switch to the exclusive use of safety-engineered devices to improve injection safety. The guidelines also recommend sharps injury prevention devices to protect healthcare workers from needlestick injuries. The current issue of *AMR Control 2016* will help in highlighting this important global health problem.

Introduction

Therapeutic injection is one of the most common medical procedures in the world. Almost everybody at some point in their lives will have received an injection. Therapeutic injections help in saving lives and provide relief in acute conditions. The World Health Organization (WHO) describes a safe injection as one that does not harm the recipient and the provider and does not result in waste that is unsafe for others. Unfortunately, therapeutic or medical injections in many parts of the world are not so safe and have resulted in the transmission of bloodborne and life-threatening infections, including hepatitis B virus (HBV) infection, hepatitis C virus (HCV) and human immunodeficiency virus (HIV). There is

also evidence of transmission of bacterial and haemorrhagic infections because of unsafe injections.

It is estimated that 16 billion injections are provided worldwide and 90–95% are for therapeutic purposes in healthcare settings. Unsafe injections include unnecessary injections and injections given with already used injection equipment leading to the transmission of infections. Reuse of injection equipment is almost always intentional on the part of the healthcare provider and is often associated either with lack of injection equipment, affordability or lack of knowledge on the part of the patient and, sometimes, the providers as well. The risk of acquiring HBV from an infected source or patient due to a contaminated syringe or needle is as high as 30%, while for HCV it is 3% and for HIV it is 0.3% (1–7). While the risk of transmission of HIV is lower, its severity is much higher both in terms of threat to life if left untreated and the overall social impact on the affected person's life.

The WHO global burden of disease study in the year 2000 revealed that contaminated injections caused annually an estimated 21 million HBV infections, two million HCV infections and 260,000 HIV infections, accounting for 32%, 40% and 5%, respectively (8). The nature of healthcare is such

The problem of hepatitis B and C transmission due to unsafe injections is widespread. For example, the prevalence of HCV among 15- to 29-year-olds in Egypt has been documented to be as high as 10% (10). The transmission was associated primarily with inadequate infection control during medical and dental care procedures (11, 12)

that healthcare workers are often exposed to injuries and when the burden of bloodborne infection is high in the world, the risk of transmission also increases. The incidence and fraction of HBV, HCV and HIV infections that were attributable to a workplace percutaneous injury with a needle or sharp contaminated with bloodborne pathogens were modelled and the annual proportions of healthcare workers exposed to bloodborne pathogens was 2.6% for HCV, 5.9% for HBV and 0.5% for HIV, corresponding to about 16,000 HCV infections and 66,000 HBV infections in healthcare workers worldwide. According to the model, 200–5,000 HIV infections would have also been transmitted (9).

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Figure 1: Safe syringes



hepatitis survey in Pakistan reported the prevalence of hepatitis C in the country as high as 4.8% and hepatitis B 2.5%. A strong association between hepatitis C infection and exposure to unsafe therapeutic injections was found in data analysis (16). With a population of almost 180 million people in Pakistan, the total number of people affected with hepatitis is phenomenally high, obviously burdening the fragmented healthcare system.

Inappropriate prescription of antibiotics, the main theme of *AMR Control 2016*, also has a strong relationship with therapeutic injections as injections are one of the methods of providing antibiotics to patients in conditions when antibiotics are not necessary, or they can be taken orally, but the prescribers make it part of the treatment to increase its effectiveness, not realizing the harmful effects it can have in terms, for example, of the possibility of developing antimicrobial resistance. Combating antimicrobial resistance requires a three-fold approach: first, by improving infection prevention and control; second, by conserving the effectiveness of existing and future antimicrobials; and third, by engaging in research to optimise such approaches and to develop new antimicrobials, vaccines, treatment alternatives and rapid diagnostic tools (17).

Treatment costs of hepatitis and HIV

The countries mentioned above are just an example of a few countries where unsafe therapeutic injections are wreaking havoc with people's lives, affecting many in the prime of their lives and resulting in a devastating social and economic impact, not only on the lives of the patients and their immediate families, but on the entire health system. Advances in treatment for hepatitis have been achieved but, even after reduction, the cost for a newly introduced hepatitis C drug ranges between US\$ 50,000–83,000 for 12 weeks of treatment (18). In Egypt and Pakistan, the cost has been subsidised between US\$ 100–300 per month and US\$ 900 per month for India. It has been significantly lowered but is still out of reach for many patients if they have to pay from their own pockets. The cost of generic antiretroviral (ARVs) drugs for HIV positive persons (WHO recommended Tenofovir, Lamivudine and Efavirenz as first-line therapy) is approximately US\$ 2,560 per month (19). Although in many countries ARVs are provided free of charge to patients, someone is bearing that cost, usually the already over-stretched budget of the ministry of health. The only cost-effective protection available is for HBV infection, in the form

Figure 2: Unreusable syringe



of a vaccine. Fortunately, since the end of 2014, the vaccine is available to 184 countries and the global coverage with three doses is estimated at 82% (20).

WHO injection safety guidelines

In 2015, WHO took a holistic approach and after a rigorous evidence-based process produced new injection safety guidelines (21) which were launched in February 2015. The guidelines recommend that by 2020 all member states should switch to the exclusive use of reuse prevention devices (RUPs) for most medical injections and it also recommends sharps injury prevention (SIP) devices to protect healthcare workers from needlestick injuries. These syringes are designed in such a way that, if properly used, they cannot be reused once the safety mechanism is activated. A conventional disposable syringe can be used multiple times, putting patients at risk of contamination where an RUP can only be used once, thus preventing the risks of reuse and also reducing the heightened risk of hepatitis and HIV transmission in many settings around the world. The key recommendations from the WHO injection safety guidelines are:

- ➔ Recommendation for transition to the exclusive use of WHO prequalified AD/RUP/SIP devices for therapeutic injections in all countries and development of related national policies;
- ➔ Recommendation to develop standards for rational use and supply of standard disposable syringes for specific procedures and settings where they remain necessary;
- ➔ Request to donor agencies and development partners to fund procurement of safety-engineered injection devices in all projects, including injectable medications, and to finance appropriate quantities of safety-engineered injection devices, single dose diluents, safety boxes and the

Figure 3: Single use syringe



cost of sharps waste management and healthcare workers' training;

- ➔ Requests to international and local manufacturers to switch to safety-engineered injection device production as soon as possible and to seek PQS prequalification for their products; and
- ➔ Recommendation for countries to develop and put in place a strategy for implementing their national policies, based on WHO-recommended key components.

Occupational Safety and Health Administration (OSHA) of United States also recommends SIPs to prevent healthcare workers from needlestick injuries (22).

Ultimately, saving resources

There is a marginal cost difference between a conventional disposable and a safety-engineered injection device. For example, the conventional syringe costs US\$ 0.03–0.04 and the RUP costs US\$ 0.04–0.05. However, a syringe with both RUP and SIP features costs a few cents more (21). Initially, it may seem like a burden to countries to procure the safety-engineered syringes, but in the longer-term, countries will make immense savings. Preliminary results of a very important cost-effectiveness analysis study, commissioned by WHO, suggest that it is highly cost-effective to switch to safety-engineered devices in the long-run as it will ultimately save resources which would have gone on expensive treatments of viral hepatitis, in particular, but also HIV and other bloodborne pathogens. During the latest devastating ebola outbreak in Western Africa, it was demonstrated that reused syringes could contribute to the transmission of the disease. Very recently, there has been a major HIV outbreak related to unsafe injections in a village of Cambodia, investigated by the US Centers for Disease Control (23).

Conclusion

The global problems of unsafe injections and antimicrobial

resistance need urgent attention by governments, academic institutions and all other stakeholders. Injection safety requires a multi-pronged approach and the introduction of new technology, such as the safety-engineered devices, can play a key role in preventing disease transmission and, ultimately, saving lives of patients and communities. Millions of patients are affected because of antimicrobial resistance and thousands die due to resistance. The global plan of action warns that health systems will be “amplifiers” unless infection control is really strengthened. ■

Dr Arshad Altaf is a physician and public health specialist trained and educated in Pakistan and United States. Dr Altaf has been an injection safety advocate, researcher and a master trainer since 2000. He is currently working as a Consultant in World Health Organization Headquarters in Geneva as the focal person for injection safety in the Infection Prevention and Control Unit. Dr Altaf has been closely associated with the Safe Injection Global Network Alliance since its inception. He has multiple publications on injection safety to his credit in peer-reviewed journals. He has designed and developed three successful injection safety intervention projects in Pakistan.

He completed his MBBS in 1994 from Liaquat Medical College in Pakistan and did his Master of Public Health from the University of Alabama at Birmingham, USA, in 1998.

Dr Selma Khamassi retired from the World Health Organization

in 2015 after remaining at the helm of the injection safety programme and coordinator of the Safe Injection Global Network (SIGN) for over a decade. She was instrumental in supporting injection safety programmes and policies in many high burden countries. She is currently working as a Consultant for WHO and is the focal person for the injection safety project in Egypt. Dr Khamassi has 32 years of professional experience of which, 13 years at international level. She speaks English, French and Arabic fluently.

She received her doctorate in Medicine from University of Tunis in 1982 and her Masters in Public Health from René Descartes University in Paris in 1995.

Dr Assad Hafeez is a leading public health specialist and researcher with extensive clinical and management experience spanning over 25 years in various capacities. He is currently the Director-General of Health in the Federal Ministry of Health Services Regulations and Coordination in Islamabad, Pakistan. He is also working as Executive Director and Dean of the Health Services Academy, a public health institution in Pakistan. Dr Hafeez represents Pakistan on the WHO Executive Board (2015–18) and was elected as Vice President of the Board in May 2015. He is also member of WHO EMRO Regional Committee for Research and Development in Health and a member of the IHR emergency committee of poliomyelitis.

Dr Hafeez is an accomplished paediatrician trained in Pakistan and the United Kingdom. He has supervised a number of PhDs, FCPS and M Phil students.

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