

Technologies for injection safety

Historical overview and current status



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Health need

In the 1980s and 1990s, there was growing recognition of widespread unsafe injection and waste disposal practices, and focus on solutions to reduce their impacts on bloodborne pathogen transmission. In 1999, the World Health Organization (WHO) estimated that 50% of injections globally were administered with reused, unsterilized injection equipment.¹ These unsafe injection practices, coupled with high rates of needlestick injuries among health workers, contributed to an estimated 21 million hepatitis B, 2 million hepatitis C, and 260,000 HIV infections annually—causing 1.3 million early deaths, a loss of 26 million years of life, and \$535 million in direct medical costs per annum.²

Fortunately, due to coordinated global efforts, there has been significant improvement in injection safety in all regions of the world. The development and introduction of safety syringes and sharps disposal technologies and initiatives to promote safe injection practices resulted in an estimated 86% reduction in the rate of unsafe injections between 2000 and 2010, and 81% of countries continued to make progress by 2015.³

Immunization programs have broadly adopted safe injection devices, but the majority of injections are for therapeutic medications. Reuse of syringes still occurs in health care settings across the globe due to inadequate education and financial constraints, with high rates persisting in some countries.^{3,4} Continued efforts are needed to sustain the gains that have been made and to eliminate disease transmission from needlestick injuries and misuse of syringes.

PATH's role

Designing and developing innovative injection technologies for improved safety and ease of use

In the 1980s, PATH advanced a design for an AD syringe that became the first commercialized AD syringe product when launched by BD as the SoloShot™ syringe in 1992. PATH also developed the first CPAD device, the Uniject™ injection system, and advanced the development and availability

Technology solutions

Syringes that support safe injections:



Autodisable (AD) syringes have features that after a single use, automatically and permanently disable both the syringe and the needle, which cannot be removed. AD syringes provide fixed doses (0.05, 0.1, 0.25, 0.3, 0.5, or 1.0 mL versions are available) and are primarily used for immunization and injectable contraceptives.



Reuse prevention (RUP) syringes have either an automatic or an elective (user-initiated) disabling feature and either removable or nonremovable needles. They are available in a variety of sizes, can deliver variable doses, and are suitable for vaccine reconstitution and most therapeutic injections.



Sharps injury prevention (SIP) syringes have a mechanism for safely covering the sharp after use, such as a needle shield or retractable needle. SIP syringes may or may not also qualify as AD or RUP, depending on their design.

of RUP syringes, additional AD syringes and CPAD devices, disposable-syringe jet injectors, and needle removers. With partners, PATH developed category specifications for technologies that formed the basis for International Organization for Standardization and WHO Performance, Quality and Safety standards for injection safety products and was one of the founding members of WHO's Delivery Technologies Working Group, as well as the Safe Injection Global Network.

Generating evidence to inform policy changes leading to broad adoption of injection safety devices

Over the past four decades, PATH has conducted validation testing, user assessments, in-country pilots, and health economic evaluations of numerous injection safety technologies, and has supported countries with training materials and procurement planning. In 1999, WHO, United Nations Children's Fund (UNICEF), and the United Nations Population Fund issued a joint statement on injection safety requiring exclusive use of AD syringes for immunization, which was reaffirmed in 2019.^{5,6}

Convening public- and private-sector stakeholders to improve equitable access to safe injection devices

Beginning in 2020, PATH worked with UNICEF and global vaccine manufacturers to ensure adequate supply of AD syringes and other safe injection technologies for COVID-19 vaccine delivery without compromising routine immunization efforts.⁷ To address the logistical challenges of manufacturers being geographically concentrated in the Americas, Europe, and Asia, PATH supported local manufacturers in Africa with technical assistance to achieve WHO prequalification and supported procurement agencies in diversifying procurement to shape a more resilient and sustainable market.

Current status and the next generation of syringe technology

Today, injection safety technologies from a broad array of manufacturers are WHO prequalified and have been widely introduced—including multiple local manufacturers in Africa. Beginning in 2026, more than 50% of UNICEF syringes will be procured from Africa, better reflecting the amount distributed in the region.

Immunization and family planning programs in most low- and middle-income countries use AD syringes, and UNICEF supplies AD and RUP syringes for vaccine delivery and reconstitution for the countries for which it provides procurement services.

Technology solutions, continued

Compact prefilled autodisable (CPAD) devices are prefilled with the vaccine or pharmaceutical, have an attached needle and an AD feature to prevent reuse, and a low storage volume.



Disposable-syringe jet injectors provide injections with a liquid stream, rather than a needle, and consist of a reusable handpiece, a needle-free disposable syringe, and a filling adapter.



Safety boxes are puncture-resistant containers suitable for collection and disposal of used syringes and needles.

Needle removers separate used needles and disable syringes, reducing the volume of sharps waste.



Use of RUP syringes for therapeutic injections has become more established across low- and middle-income country health systems, though more progress is needed. SIP syringes are the norm for injections in many high-income countries, and WHO recommends their broader use.⁸

New generations of vaccine and pharmaceutical packaging and delivery technologies continue to be developed, including polymer containers, prefilled injection devices, reconstitution technologies, mini- and microneedles, solid dose technologies, and respiratory devices. These have potential added benefits such as ease of use, increased safety for the administrator, increased efficacy, rapid production capacity, and/or compact storage. PATH continues to work to support product developers and policymakers to ensure that new technologies are compatible with injection safety practices and that safety features are incorporated into product designs, as well as work toward a future in which more vaccines and essential medicines can be delivered needle free.

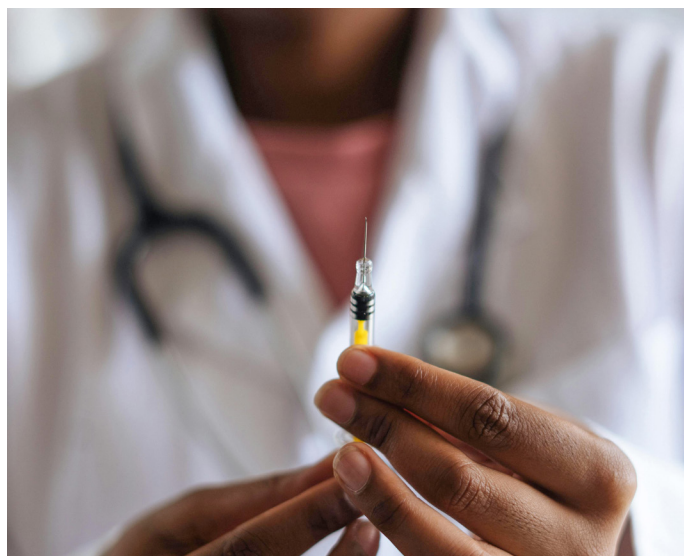


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