Immunization safety in developing country vaccination programs

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With thanks to WHO colleagues and particularly to Selma Khamassi, Denis Maire, and Sophie Boisson
Issues covered

1. Range of immunization safety issues
2. Real problems and challenges
3. Differences between developing and industrialized countries
4. What should be done to ensure immunization safety and related WHO's contribution
"ensuring and monitoring the safety of all aspects of immunization, including:

- vaccine quality,
- transport, storage and handling,
- vaccine administration,
- and the disposal of sharps."
Examples of issues

- Egypt, 1999: 3 deaths labelled post DPT encephalopathy due to methanol impregnated compresses.
- Algeria, 2001: 7 infants died following measles vaccination. Use of selenium vials instead of proper diluent.
- Guinea, 2002: 2 adults died after yellow-fever vaccination. Investigation points vial contamination.
- Sri Lanka, 2008 Liquid pentavalent (DTwP-HepB-Hib) vaccine. Suspension 3 months after introduction following deaths: concern about a "new" reaction (hypotonic-hyporesponsive episodes).
Examples of issues

- Allegations of hormone contamination of vaccines in Nigeria, India and the Philippines (polio, TT)
- Rotavirus vaccine: intussusception and porcine circovirus type 1
- France: hepatitis B vaccination and multiple sclerosis
- Brazil and Italy: MMR vaccine, increased risk of allergic reactions
- England and India: coincidental deaths following vaccination with HPV (series of more recent allegations in Israel and Japan)
- Increased risk of narcolepsy following use of Pandemrix in children

One death in 18 year old 13 hours after MR vaccination in context of mass vaccination campaign in Ukraine
Between 2000 and 2010 global proportion of reuse of injection devices dropped from 39.8% to 5.5% and the average number of injections per person per year from 3.4 to 2.9.
Unsafe injections and global disease burden: situation and progress

In 2010, between 0.7% and 1.3% of the estimated 2.55 million new HIV infections (i.e. between 16,734 and 33,468) attributed to unsafe injections. For hepatitis C viral infections (HCV), the corresponding estimate is between 157,592 and 315,120 cases, and for hepatitis B viral infections (HBV) 1.68 million cases.

Compared with 2000, in 2010:
- unsafe injections decreased by 88%
- reductions in unsafe therapeutic injection resulted respectively in 87%, 83%, and 91% decrease in HIV, HCV, and HBV infections acquired through unsafe injections

In 2010 between 5.5 and 8.2 million DALYs saved due to reduction in incidence of injection related HIV, HBV, and HCV infections.

In 2008, use of auto-disable syringes for immunization injections prevented and estimated:
- 5,457 HIV infections
- 217,900 HBV infections
- 50,234 HCV infections
- 86,103 infections with nosocomial bacteraemia
- 34,440 injection site abscesses

In 2008, hepatitis B vaccination prevented 1,548,678 infections from unsafe injections.
What makes a vaccination safe?

Development of new vaccine and technologies

Proper storage, handling, administration, and waste management

Postmarketing surveillance of adverse events

Licensing/Market authorization

Manufacture and supply
World Health Organization’s Goals

Ensure that “100%” of vaccines used in all national immunization programmes are of assured quality.

Definition of “Assured quality vaccines”

- National Regulatory Authority (NRA) independent from vaccine manufacturer
- NRA fully functional (system + 6 regulatory functions)
- No unresolved reported problem with vaccine

Guided by Expert Committee on Standardization of Biologicals (ECBS) recommendations on safety, efficacy and quality issued in WHO Technical Report Series (TRS)

www.who.int/biologicals/expert_committee/en/
National Regulatory Functions depend on vaccine source

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WHO prequalification

Objectives
- Provide UN purchasing agencies with an independent opinion/advice on the quality, safety and efficacy of vaccines
- Ensure that candidate vaccines are suitable for target population and meet programme needs
- Ensure continuing compliance with specifications and established standards of quality

Principles
- Reliance on a "functional" NRA
- Production consistency ensured through good manufacturing practices
- Random testing for compliance with specifications
- Monitoring of complaints from field

Procedure recently revised
- Programmatic suitability

http://www.who.int/immunization_standards/vaccine_quality/PQ_vaccine_list_en/en/
Injection and other immunization related equipment: regulations and prequalification

2 major challenges

- Significant increase of vaccine volume to be stored and transported
- Transport and storage of vaccines at correct temperature from manufacture down to end user, especially avoid freezing freeze-sensitive vaccines

Regulation of equipment and devices for immunization
WHO prequalification
Performance Quality and Safety project (PQS)

http://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue/
A Safe Injection

- No harm to the recipient
- No harm to the health-care worker
- No harm to the community

Reuse of equipment

Unsafe collection

Unsafe disposal
Best infection control practices for skin piercing, intradermal, subcutaneous, and intramuscular needle injections

1. Using sterile injection equipment
2. Preventing contamination of equipment and medication
3. Preventing needle-sticks
4. Preventing access to used needles

Safe Injection Global Network (SIGN) Mission: Ensuring universal access to safe injection devices and practices in all Member States
WHO/UNICEF/UNFPA joint statement on the use of AD syringes for immunization services

Policy on Injection Safety

All countries should use only Auto-Disable (AD) syringes for immunization injections (ISO 7886-3) (WHO & UNICEF in favor of AD mechanisms triggered at the start of injection)

Bundling Policy

Ensure sufficient numbers of AD syringes, reuse prevention reconstitution syringes and Safety boxes for each vaccine dose

Reconstitution syringes

UNICEF supplies only syringes with re-use prevention features (ISO 7886-4)
Over 30 WHO approved AD syringes (.05ml, .1ml, .25ml, .5ml) including some with retractable features (Bangladesh, Belgium, China, Denmark, Hungary, India, Indonesia, Korea, Malaysia, Pakistan, Singapore, Spain, UAE, USA, Vietnam) and >50 WHO prequalified reuse prevention injection devices for therapeutic use including a large number with retractable features

Disposable syringes: ± 3 cents
AD & reuse prevention syringes: 4.5 to 6 cents per unit
Manual retractable syringes: 6 to 9 cents per unit; Automatic retractable syringes: 15 cents up
Retractable syringes:
not all with AD features
Are ADs & reuse prevention injection devices an answer to all injections safety issues?

**NO,**

AD does not stand for

Auto Destructible or Auto Disposable syringe
Are ADs & reuse prevention injection devices an answer to all injections safety issues?

**NO,**

AD does not stand for Auto-Destructible or Auto-Disposable syringe

it is only Auto-Disable syringe for fixed dose immunization

- ADs & reuse prevention injection devices prevent reuse problems and do not protect the vaccinator nor the community
- WHO is in favour of syringes with safety-engineered protection mechanisms
Some good and some bad practices

Two-handed recapping is dangerous

Checking packages for breaks in integrity

The sharps box needs to be next to the patient care area

Needle left in the septum of a multi-dose diluent vial, Northern Asia
Proper reconstitution?
Reading labels?
Following the open vial policy?

If Vaccine Vial Monitor (VVM) on cap: discard after 6 hours.

If VVM on vial: you can keep vaccine for 28 days as per Multi Dose Vial Policy.

DANGER

BCG
Measles

freeze-dried Hib Vaccine

Yellow Fever

Must be discarded 6 hours after reconstitution

Adapted from poster CCPS/21, (4031) Freeze-dried Vaccine, World Health Organization (WHO)
Using the proper technique?
Waste Management

- No one-size-fits-all solution
- **Solutions do exist for many situations “non-availability” of technologies = “wrong problem” or not a technical one**
- Environmental concerns, pressure groups, Kyoto, bans on burning in some countries
- **Support Stockholm and Basel conventions**
- Strategies
  - Assessment and proper management
  - Identification and development of recycling options
  - All components same plastic, PVC free
  - Research and promotion of alternatives to small scale incineration
  - Small scale incineration acceptable if used appropriately
Non-Incineration Treatment Technologies: Examples

- **Autoclave technologies**
  - Small autoclave – health post
  - Medium-size autoclaves + shredders - hospitals
  - Large autoclave (5 tons/day) + compactor – central treatment facility

- **Advanced hybrid autoclave systems** – central treatment facilities
  - Rotating autoclave
  - Hybrid autoclave with internal shredding
  - Hybrid autoclave with fragmenting arm

- **Microwave technologies** - hospitals

- **Alkaline hydrolysis** for anatomical waste - hospitals
Low-cost Technology for Africa
(University of Dar es Salaam, College of Engineering & Technology, Tanzania)

- Low-cost autoclave (200 liters)
  - Horizontal, ergonomically designed
  - Compact, self-contained, modular
  - On-site or mobile (fits on pick-up truck)
  - Multiple energy options (electricity, bottled gas+solar, other fuels)
  - Gasket mold provided

- Autoclavable metal waste containers:
  - Leak-proof, color-coded, allows rapid steam penetration, durable to last for many years, stackable (35 & 20 liters)

- Autoclavable mechanical needle cutter & autoclavable sharps container

- Compactor +baler or shredder
Injection safety is NOT only about devices and national plans alone do not provide the answer but are important steps forward.

Training, advocacy and information, education and communication are essential and require continued attention and resources (money and people) at all levels!
Mass vaccination campaigns - special issues

- Apparent increase in adverse events
  - many doses over short period of time
  - more vigilance/awareness

- Real rise from programmatic errors
  - pressure and fatigue result in normal safe injection practices not observed
  - new staff lack specific training and expertise

- Increased risk of negative impact of rumours

- Adverse events generate criticism of campaign

- Different age groups
Global capacity building and harmonized tools

WHO and partners
Global Vaccine Safety Initiative

Brighton Collaboration

CIOMS/WHO working group

National AEFI surveillance, investigation and response

Immunization programme

Regulatory authority

AEFI review committee

Other support groups

Product monitoring

Vaccine manufacturers

Licensing authorities in countries of manufacture

Procurement agencies

Global analysis and response

GACVS

Other global or regional advisory bodies

Global signal detection and evaluation

Uppsala Monitoring Centre

Global vaccine safety data link

Global Network for Postmarketing Surveillance of Prequalified Vaccines *

Other partners

* Senegal, Uganda, Brazil, Mexico, Iran, Tunisia, Albania, Kazakhstan, India (1 State), Sri Lanka, Vietnam
Global Advisory Committee on Vaccine Safety (GACVS)

Advisory body to WHO

Response to vaccine safety issues of potential global importance

Broad expertise & Independence

Decisions and recommendations based on best available evidence

Issues discussed include: reviews of safety profile/issues, allegations of global dimension, safety of new vaccines/vaccines under development, proactive review of safety of non active ingredients


http://www.who.int/vaccine_safety/committee/en/
Vaccine Safety Net

GACVS endorsed criteria for evaluating websites
- Credibility (essential criteria)
- Content (important criteria)
- Accessibility (practical criteria)
- Design (desired criteria)

Web sites evaluations

Sites meeting credibility and content criteria listed with brief description (over 38 sites as of 9 May 2014 – Dutch, English, French, German, Hungarian, Italian, Polish, Spanish, Swedish)

Networking
Immunization safety: What is needed?

- Exclusive use of vaccine of ensured quality
- Prevent reuse of needles/syringes (AD syringes)
- Proper disposal of immunization waste
- Appropriate waste management
- Training of staff and monitoring
- Effective AEFI monitoring and management (background rates)
- Appropriate handling of safety issues and rumours
- GACVS = independent process to review safety issues
- Global collaboration
Additional web resources resources

- WHO Protecting health workers – preventing needle stick injuries tool kit
- [www.who.int/patientsafety/en/](http://www.who.int/patientsafety/en/)
- [www.who-umc.org/](http://www.who-umc.org/)
- [www.cioms.ch/](http://www.cioms.ch/)

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