HUMANITARIAN ACADEMY · HUMANITAIRES JOBS

Mini MBA Humanitarian Logistics and Supply Chain: supplying fast, well and fairly

Course handout · Week 10 : Health logistics: medicines, cold chain and quality assurance

A programme of exactly 3 months (12 weeks, 144 hours) to lead a humanitarian supply chain: mapping and landed cost, demand forecasting and safety stocks, procurement and competitive bidding, Incoterms and contracts, transport, warehouses and inventories, fleet and fuel, customs and exemptions, prepositioning and distributions, health products and the cold chain, performance, costs and the environment, constrained contexts and data protection. Corrected numerical exercises, three monthly exams with case studies, and a verifiable diploma from the Humanitarian Academy.

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Week 10 : Health logistics: medicines, cold chain and quality assurance

Objectives

- Apply the supply rules for health products: essential lists, qualified suppliers, expiry, batch traceability.
- Size and monitor a cold chain for vaccines and temperature-sensitive products.
- Manage the risks specific to health products: falsified products, batch recalls, waste and controlled substances.

The basic rules for health products

Health products (medicines, medical devices, laboratory reagents, vaccines) are subject to stricter rules than other items, because a mistake can kill:

- **Reference lists**: the national essential medicines list, the WHO model list, national treatment protocols. A medicine not authorised in the country is not imported without a waiver.
- **Qualified suppliers**: WHO prequalification for certain products, recognised humanitarian procurement centres, manufacturers that comply with good manufacturing practices. Purchases on the uncontrolled local market are the exception, with reinforced controls.
- **Standard kits**: for example the Interagency Emergency Health Kits (IEHK), designed for 10,000 people for 3 months, useful at the start of a crisis but to be replaced afterwards by orders adapted to actual consumption.
- **Batch traceability**: every receipt and issue records the batch number and the expiry date, so that a batch can be withdrawn in the event of a recall.

Quantifying health needs

Two main methods:

- **Consumption method**: based on the AMC corrected for stock-outs (see week 2). Reliable if the data are good and prescribing is rational.
- **Morbidity method**: number of expected cases × standard treatment. Useful at start-up or when consumption data are distorted.

Morbidity example. Population 50,000; malaria incidence during the season: 8% per month; 60% of cases seek care; 70% of cases are adults. Adult treatment: 24 tablets; child (according to weight, average used): 12 tablets. Cases treated per month: 50,000 × 8% × 60% = 2,400. Tablets: 2,400 × (0.7 × 24 + 0.3 × 12) = 2,400 × (16.8 + 3.6) = 2,400 × 20.4 = 48,960 tablets per month. Over a 4-month season, plus a 2-month safety stock: 6 × 48,960 = 293,760 tablets.

The two methods cross-check each other: a large difference signals a problem (irrational prescribing, leakage, under-use of services).

The cold chain

Vaccines and many biological products must be kept between **+2 °C and +8 °C**; some must be frozen. A break can render them ineffective with no visible sign.

Equipment: cold rooms, prequalified refrigerators and freezers (WHO PQS catalogue), solar direct-drive refrigerators, cold boxes and vaccine carriers with conditioned ice packs, temperature loggers.

Sizing. Net storage volume = number of doses × volume per dose (cm^3) × period factor (maximum stock). **Example:** measles campaign, 60,000 children, expected wastage rate 15%, 10-dose vials. Doses required = 60,000 / 0.85 ≈ 70,590, rounded to 70,600, i.e. 7,060 vials. Volume per packed dose: 2.6 cm^3 (to be checked on the product sheet). Volume: 70,600 × 2.6 ≈ 183,600 cm^3 ≈ 184 litres net, to which the diluent is added (often stored at room temperature but refrigerated before use).

Monitoring. Temperature reading twice a day, electronic loggers with alarms, vaccine vial monitors (indicators that change colour after cumulative exposure to heat). Any temperature excursion is documented and assessed according to the manufacturer's instructions before the product is used.

Wastage rate and vaccine efficiency

The vaccine **wastage rate** combines opened vials not fully used, expired products and cold chain breaks.

Wastage factor = 1 / (1 − wastage rate). With a wastage rate of 20%, the factor is 1.25: to vaccinate 1,000 children, 1,250 doses are needed.

Example. 1,000 vials of 10 doses distributed; 6,400 children vaccinated. Doses used: 10,000; wastage rate = (10,000 − 6,400) / 10,000 = 36%. For a 10-dose multi-dose vial in sessions with few children, part of this wastage is unavoidable; the multi-dose vial policy (keeping certain opened vials for up to 28 days under conditions) and the organisation of sessions reduce it. The rate must be compared with the national programme's target.

Falsified products, recalls and waste

Falsified or substandard products. They circulate widely in countries with weak regulatory capacity. Signs: different packaging, spelling mistakes, abnormally low prices, inconsistent batch numbers. Course of action: quarantine, report to the national authority and to the WHO Global Surveillance and Monitoring System, no distribution.

Batch recalls. Thanks to traceability, it is possible to identify within a few hours where the units of the batch concerned are: warehouses, health centres, patients if necessary.

Controlled substances. Narcotics and psychotropics (morphine, for example) require specific import authorisations, double-lock storage and a special register.

Waste. Expired medicines, sharps waste, infectious waste: segregation at source, safety boxes, appropriate incineration or an approved disposal channel, destruction report. Burning medicines in the open air is dangerous and often illegal.

Quality assurance and good distribution practices

Good distribution practices cover the entire journey of a health product:

- a clean, dry, ventilated warehouse, with temperature and humidity readings (often below 25 °C for ordinary medicines, according to the labelling);
- strict FEFO, quarantine and rejected product zones;
- transport that protects against heat, humidity and theft;
- trained staff, with a pharmacist or qualified person who validates receipts;
- written procedures and self-inspections.

Performance indicators of a health supply chain: availability of tracer products (for example 15 essential medicines monitored in each centre), stock-out days, expiry rate, inventory discrepancies, replenishment time for health centres.

> Tracer product availability = number of tracer products in stock on the day of the visit / number of tracer products monitored. A centre at 9 out of 15 (60%) cannot provide proper care.

Exercise: preparing a vaccination campaign

Situation. Measles vaccination campaign: 45,000 children targeted, expected wastage rate 10%, 10-dose vials, 2.6 cm³ per dose. Refrigerators available at the district store: 3 units of 60 litres net each. During the campaign, a logger shows that one refrigerator rose to 12 °C for 5 hours during a power cut. After the campaign: 5,000 vials distributed, 41,800 children vaccinated.

Tasks. 1) Doses and vials required. 2) Net volume and adequacy of capacity. 3) Course of action after the temperature excursion. 4) Actual wastage rate.

Answer. 1) Wastage factor 1 / 0.9 ≈ 1.11; doses 45,000 / 0.9 = 50,000; 5,000 vials. 2) 50,000 × 2.6 = 130,000 cm³ = 130 litres; capacity 180 litres: sufficient if the vaccines arrive in one go and the space for ice packs and other products is taken into account. 3) Place the vials concerned in quarantine in the cold, read the vaccine vial monitors, apply the excursion assessment procedure according to the manufacturer's and national programme's instructions, document, and use only the vials declared usable; correct the cause (backup power supply). 4) Doses distributed: 50,000; wastage rate = (50,000 − 41,800) / 50,000 = 16.4%, above the 10% expected: analyse session size and the management of opened vials.

Key takeaways

- Health products: essential lists, qualified suppliers, batch traceability, strict FEFO.
- Quantify by consumption and by morbidity, and compare the two.
- Cold chain: +2 to +8 °C, continuous monitoring, every excursion assessed before use.
- Wastage factor = 1 / (1 − wastage rate); doses = target × wastage factor.
- Falsified products, recalls, controlled substances and waste: written, documented procedures.

Quiz

1. With a wastage rate of 20%, the wastage factor is:
   A. 1.2
   B. 0.8
   C. 1.25
   D. 1.5

2. 12,000 children, wastage rate 25%. Doses required:
   A. 15,000
   B. 16,000
   C. 12,000
   D. 9,000

3. Storage range for most vaccines:
   A. +2 to +8 °C
   B. −20 to −10 °C
   C. +15 to +25 °C
   D. 0 to +2 °C

4. Population 20,000, incidence 5% per month, 50% seek care. Cases treated per month:
   A. 1,000
   B. 10,000
   C. 200
   D. 500

5. A centre has 12 tracer products in stock out of 15 monitored. Availability is:
   A. 12%
   B. 80%
   C. 75%
   D. 120%

Quiz answers : 1. C · 2. B · 3. A · 4. D · 5. B