

Perception of health workers on the use of 30-day temperature recorders

The ability to monitor vaccines for optimal temperatures throughout the supply chain is a cornerstone of successful immunization programmes. As stated in the WHO Vaccine Management Handbook, in "How to monitor temperatures in the vaccine supply chain" [1], it is considered best practice to use 30 day temperature recorders (30 DTRs) as temperature monitoring devices for vaccine refrigerators. 30 DTR devices not only provide spot temperature readings at the time of inspection, they can also store the excursions and provide evidence of what occurred between the manual readings.

This evidence brief provides supply chain managers in low- and middle-income countries with a summary of how health workers throughout Africa perceive the use of 30 DTR devices.



Credit: UNICEF/UNI77071/HOLMES

The need for 30 DTRs in vaccine refrigerators

Vaccines stored outside the recommended temperature ranges can lead to loss of potency of the vaccines, monetary loss, and children receiving vaccines that are ineffective.

Effective, well-managed temperature monitoring is essential for ensuring vaccine quality throughout the supply chain and for preventing wastage of vaccines due to excessive heat or freezing.

Traditionally, a stem or a bimetallic dial thermometer was generally used in each vaccine refrigerator to monitor the temperature twice every day, in the morning and evening, with readings recorded in a temperature monitoring chart affixed to each refrigerator. Manual readings from the stem or the bimetallic dial thermometer provide spot temperature readings at the time of inspection only, and

give no temperature information between inspections. Experiences from the field show evidence of situations where, for example, if the clinic was closed for the weekend, or for other "days-off", temperature readings were either not performed, or health workers anticipated the readings of minimum and maximum temperatures for those days and prefilled the temperature chart.

To correct these weaknesses in temperature monitoring using manual reading, the Effective Vaccine Management (EVM) standards [2] recommend the use of continuous temperature monitoring and recording devices. The *WHO Vaccine Management Handbook* [1] considers it best practice to use 30 DTRs as temperature monitoring devices in vaccine refrigerators as a minimum standard, and a stem thermometer as a backup.

Implementation and use

The 'Temperature monitoring - technical resources' area of the TechNet-21 website [3] provides valuable information on the implementation and use of 30 DTRs. 30 DTRs are small devices that can continuously measure temperature and log the history of the measurement for 30 (or 60 for the Fridge-tag 2) consecutive days on a rolling basis. The primary use of 30 DTRs is in the vaccine refrigerators at intermediate stores and health facilities.

The device records a 30-day (or 60-day) history of the temperature in the equipment containing the vaccine and displays any heat or freeze violations. As long as the temperature has remained within the recommended range, the device displays "OK" or a tick symbol. Heat and freeze alarms violations show when a temperature excursion has occurred that may reduce the quality or potency of the vaccine. The following predefined and factory-programmed criteria are used to set the alarms violations: freeze or low alarm is set to -0,5 °C or lower for 60 consecutive minutes; heat or high alarm is set to +8 °C or higher for 10 consecutive hours.

Health workers must check the Vaccine Vial Monitor (VVM) of the vaccines in cases of high alarm, and perform a shake test in cases of low alarm, and take action accordingly.

30 DTR devices are powered with non-replaceable lithium batteries with a maximum operating life of two years. The data can be read or downloaded for analysis, but after 30 days (or 60 days for the Fridge tag 2), they are overwritten and cannot be retrieved.

The WHO Performance, Quality and Safety (PQS) catalogue [4], and the UNICEF Supply Division Cold Chain Support Package [5] provide a detailed overview of prequalified 30 DTR devices.

Survey results of health workers' perceptions

An online survey conducted in September 2016 sought feedback on the use of 30 DTRs from health workers throughout Africa. A total of 158 responses were received from respondents in 24 countries. The average time the respondents worked at vaccine cold stores was five years. The results compiled from the responses are summarized in this section.

Reasons for using 30 DTRs

Respondents monitored and recorded temperatures in the cold chain for a variety of reasons: 93% thought the process of monitoring and recording was to rapidly detect exposure to heat or freezing temperatures in the cold chain and take corrective actions; 84% thought it was to ensure the cold chain equipment was performing according to the recommended temperature standards; 23% thought it was to provide a lot of data to their supervisor during regular visits; and 26% thought it was to show that the new temperature monitoring technologies worked well. A further 15% of respondents said that it was for all the above reasons.

Experience using 30 DTRs and types of devices used

Almost all (95%) respondents said they worked with 30 DTRs in their refrigerators at the time of the survey; 80% had experienced vaccines that had to be discarded due to freezing; and 94% of those who discarded vaccines due to freezing reported completing a shake test and reported use of a 30 DTR to detect the freezing event.

Most (83%) respondents used the Fridge-tag devices (Fridge-tag 1 or Fridge-tag 2) from Berlinger & Co. AG; 7% used LogTag devices from LogTag Recorders Limited; and 5% said they still used only a stem thermometer in their vaccine refrigerators. It appears that two major 30 DTR devices (illustrated in Figure 1) are used in countries in Africa, with an overwhelming majority using the Fridge-tag devices.

The physical features (e.g. the large screen), the longer 60-day measurement period, and the capability of downloading, are listed among the advantages of the Fridge-tag 2 device; notable, also, is the clear marketing presence of Fridge-tag in the field.



FRIDGE-TAG 2 BY BERLINGER & CO. AG.



VAXTAG BY LOGTAG RECORDERS LIMITED

Training and ease of use

Nearly 90% of respondents reported being trained to use 30 DTR devices. The majority (82%) attended a training workshop, and 18% participated in onsite training.

There was clear consensus (90%) among respondents that the 30 DTR device was not difficult to use. However, a few difficulties were reported; these included (i) batteries expiring before their due date; (ii) problems switching on the device; and (iii) occasional fuzzy screens when reading logged temperatures.

Storing data history

Less than half (~47%) of all respondents using 30 DTRs reported downloading or saving temperature recordings in electronic format. Of those who reported that temperature recordings were saved, the persons who downloaded or archived the information were the respondents themselves (68%), their supervisors (23%) or others (9%).

All (100%) of respondents who downloaded or archived recordings believed that saving this information was useful; however, only 72% actually reviewed readings with their supervisors.

Acceptability

Overall acceptability of implementing a 30 DTR device in refrigerators was positive: 95% of respondents thought that 30 DTRs helped identify refrigerators in need of maintenance, and 98% believed that 30 DTR devices should be used in all refrigerators. Almost all (99%) respondents would recommend 30 DTR devices to other cold-chain managers.

Limitations

- + Despite its apparent strengths, health workers mentioned, in their comments, some limitations in the use of 30 DTRs:
- + There is a lack of sustainable financing to enable timely procurement to make 30 DTRs available regularly in all refrigerators at all levels.
- + The battery lifespan is short and needs to be increased to at least five years, or the device needs to allow new batteries to be loaded.
- + The functionality of 30 DTR devices is not intuitive for all users, although they are not considered difficult to use. Distributing 30 DTR devices without proper training is therefore a major impediment and may explain why many 30 DTRs were not activated, used, or placed correctly in refrigerators, and why some health workers did not know how to read data from previous days, or the alarms.
- + Proper training for the successful implementation of 30 DTRs is lacking. It requires time and resources to continuously train users at all levels and to provide clear roles, accountability, and supportive management.
- + Implementation of effective data review is inadequate due to lack of accountability, tools, sufficient training and supportive supervision.

Ideas from health workers to improve the technology included:

- + Increasing the lifespan of the batteries to at least five years, or allowing new batteries to be loaded.
- + Incorporating 30 DTRs into refrigerators, or having hooks inside the refrigerators on which to hang the device.
- + Providing an audible alarm in addition to the visual alarm sign on the display.
- + Allowing messages to be sent to stock managers in cases of emergency.
- + Equipping health workers with microcomputers to facilitate the downloading and analysis of data.

Lessons learned

To address some of the concerns and limitations raised by health workers, the following are recommended:

- + Making the 30 DTR devices available on a more regular basis: sustained coverage of functioning temperature monitoring devices is critical, but many countries still struggle to ensure the timely replacement or renewal of 30 DTR before the battery expires. Documentation on the total cost (TCO) of the use of 30 DTRs should include procurement, deployment, operational and future costs, and should be made available to countries for planning and funding.
The procurement of 30 DTRs should be staggered, with the procurement of refrigerators and information included in strategic planning and funding applications.
- + Use of 30 DTR devices need appropriate training approaches and supportive management: devices must be paired with proper training, so that users know how to activate, interpret, record and act upon the data presented. Ensuring consistent knowledge of these practices has been a challenge, affected by limited training resources, or poor approaches, as well as high turnover in staff.
- + Effective review of data for action. An effective review of data is required to trigger action to address problems or issues in the cold-chain equipment in a timely fashion and lead to the improvement of cold-chain performance.

Conclusion

This evidence brief highlights the importance of continuous temperature monitoring in refrigerators and the perceptions of health workers on the use of 30 DTR devices. Although the devices seem to be appreciated,

there remain many points of concern, such as regular availability, training for adequate use, and supportive monitoring to take timely corrective measures.

References

1. World Health Organization (WHO). WHO Vaccine Management Handbook. Module VMH-E2-0.11. How to monitor temperatures in the vaccine supply chain. Geneva: WHO; 2015. (http://apps.who.int/iris/bitstream/10665/183583/1/WHO_IVB_15.04_eng.pdf)
2. World Health Organization (WHO). EVM Model SOP. User guide for the Effective Vaccine Management Model Standard Operating Procedures. Version 1. Geneva: WHO; 2011. (www.who.int/immunization/programmes_systems/supply_chain/evm/en/index2.html)
3. Temperature monitoring - technical resources. (<https://www.technet-21.org/topics/temperature-monitoring>)
4. World Health Organization (WHO). WHO Performance, Quality and Safety (PQS) catalogue. (http://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue)
5. UNICEF Supply Division. Cold Chain Support Package. Procurement Guidelines. Temperature monitoring devices. 2016. (www.unicef.org/supply/files/Temperature_Monitoring_Devices_Oct_06_2016.pdf)

Finding more information

The following resources may be useful when investigating 30 DTRs.

RESOURCE 1

Performance, Quality and Safety Catalogue, WHO

A list of WHO-prequalified equipment, including temperature monitoring devices, is available in the PQS Devices Catalogue, available on the WHO website.

- + http://apps.who.int/immunization_standards/vaccine_quality/pqs_catalogue

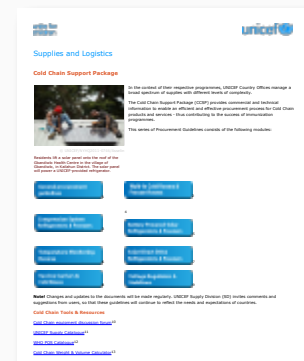


RESOURCE 2

Cold Chain Country Support Package, UNICEF Supply Division

A website to support UNICEF country offices and procurement service partners in strengthening immunization supply chains through the procurement of cold chain equipment and services. The website provides information on important technical and commercial considerations in the planning and procurement phases of cold-chain implementation projects.

- + www.unicef.org/supply/index_68367.html



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https://www.yunbaogao.cn/report/index/report?reportId=5_25729

