

Effect of mobile-based supportive supervision on cold chain point management and routine immunization service delivery

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ABSTRACT


Background: Supportive supervision (SS) as a public health strategy has gathered much consideration in cold chain management and effective service delivery of routine immunization (RI). **Objectives:** In this study, an attempt was made to assess the effect of mobile-based SS strategy on cold chain point's (CCPs) management and RI service delivery. **Materials and Methods:** UNICEF supported mobile-based software was used to carry out the SS in Golaghat district of Assam. A total of 15 CCPs and 18 session sites were visited 2 times each in the year 2017. Data collected in the first visit were compared with the second visit to find out whether there was any improvement in cold chain management in CCPs and at routine immunization session sites following SS. **Results:** We observed a significant improvement in vaccine management and infrastructure handling at CCPs from initial to the second visit. Knowledge and skills of cold chain handlers regarding cold chain management at session site were improved adequately. This substantiates successful transfer of knowledge and skills during SS. **Conclusion:** The observed improvements in the CCP management practices and service delivery indicate positive influence of mobile-based SS. The improvement in the skills and knowledge of health workers on different components related to CCP management could be due to successful real-time hand holding of cold chain handlers and workers through SS.

KEY WORDS: Cold Chain; Routine Immunization; Supportive Supervision

INTRODUCTION

Immunization is one of the safest and most effective interventions in protecting children from vaccine-preventable diseases.^[1] India has one of the largest immunization programs in the world.^[2] In 1974, the World Health Organization (WHO) launched a global immunization program, known as Expanded Programme on Immunization (EPI) to protect all children against six vaccine-preventable diseases.^[3] The government of India launched EPI in the year 1978.^[2]

One of the important elements for improving the immunization is cold chain and vaccine logistics management which is the backbone of immunization program.^[4] Success of immunization program is highly dependent on supply chain system for delivery of vaccines and cold chain equipment's, with a functional system that meets six rights of supply chain, i.e., the right vaccine in the right quantity at the right place at the right time in the right condition and at the right cost.^[3] The cold chain is a system of storing and transporting vaccines at recommended temperatures from the point of manufacture to the point of use. The cold chain system is necessary because vaccine may be ineffective due to failure of cold chain system.^[5] If vaccine is exposed to too much heat, light, or cold, it can be damaged and lost its potency or effectiveness. Once vaccine potency is lost, it cannot be restored and it becomes wastes. Hence, care must be taken to see that the vaccines do not lose their potency, before the date of expiry by maintaining "cold chain."^[6] All

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vaccines retain their potency at temperature between +2°C and + 8°C.^[7]

Supportive supervision (SS) as a strategy in the delivery of public health services promotes quality at all levels of the health system through the development of professional competence among the health workforce.^[8] The Ministry of Health and Family Welfare guidelines, 2005, describe SS as a “process which promotes quality outcomes by strengthening communication, identifying and solving problem, facilitating teamwork, and providing leadership and support to empower health providers to monitor and improve their own performance.”^[9] A mobile-based RMNCH+ A and routine immunization (RI) SS field activity were started in Assam in November 2014 across all districts.^[10]

Issues related to quality of service delivery pose operational challenges in delivering effective immunization services. SS as a public health tool in improving quality of cold chain management and effective service delivery of RI has saw much attention. This study aimed to assess the effect mobile-based SS on cold chain points (CCPs) management and effective service delivery of RI in Golaghat district of Assam.

MATERIALS AND METHODS

A descriptive longitudinal study was conducted in Golaghat district of Assam. The data were collected using UNICEF sponsored mobile-based data collection software during 11 months period of RI SS. The SS was supported by UNICEF, Assam, in collaboration with National Health Mission and Director of Medical Education, Assam. The field visit plan was developed in the beginning of the study. Field visit was done monthly as per the plan and each of the CCPs and RI session sites was visited twice during the period, maintaining an interval of 4 months between the first and second visit.

Mobile-based standard SS checklist was used during our field visit for data collection. During the field visit, we assessed the quality of service delivery in the catering areas of the CCPs. We also provided real-time hands-on training to the field workers for necessary correction. At the end of each visit, feedback was provided to the district and all concerned implementing authorities for further necessary improvements.

Ethical Approval

The study was a part of the National Health Programme of Government of India where the sole purpose of the exercise is refinement and improvement of National Immunization Programme. There are no direct identifiers in the study and therefore exempted from the ethical review by the Institutional Ethics Committee of Jorhat Medical College, Jorhat.

RESULTS

During the entire period of study, we visited a total of 15 CCPs and 18 RI session sites 2 times in the study district Golaghat.

CCP

During our initial visit, among the 15 CCPs of Golaghat district, only 10 (66.7%) had dedicated room for cold chain equipment's and dry storage provision. Dedicated table/space and clean cloth for conditioning of ice pack were available at 9 (60%) CCPs. The power backup facility was available in 12 (80%) CCPs. Separate stabilizer connection for ice lined refrigerator (ILR) and deep fridge (DF) was observed in all CCPs, functional thermometer for ILR and DF was available in 12 (80%) CCPs. Separate temperature log book with the records of power failure and defrosting was found to be maintained in all CCPs. We also observed that temperature log book was monitored regularly by medical officer i/c in only 2 (13.3%) of the CCPs. The cabinet temperature of ILR and DFs had correct reading in 12 (80%) CCPs. The correct placements of the vaccine within expiry dates and with readable labels were found in 14 (92.3%) CCPs. Ice packs in DF were placed correctly in 11 (73.3%) CCPs. In 12 (80%) CCPs, the functional cold boxes were found clean and they were not kept one above another. As far as, knowledge of cold chain handlers is concerned, 8 (53.3%) had correct knowledge about all freeze-sensitive vaccines and only 6 (40%) had complete knowledge about “Shake Test.” In 11 (73.3%) CCPs, open vials were correctly (i.e., separate box/zipper bag) placed inside ILR and had date and time mentioned in it for 8 (53.3%) CCPs. The stock and distribution register for records of vaccine and logistics were maintained as per standard only in 7 (46.6%) CCPs. None of the Primary Health Centres had updated RI coverage monitoring chart [Table 1].

Improved results were recorded in our second visit, 13 (86.6%) CCPs had dedicated cold chain room and dry storage facility. Dedicated table and clean cloth for wiping of ice packs after conditioning were present in all CCPs. Record of power failures was maintained in all CCPs and 13 (86.6%) CCPs maintained records of defrosting. All functional cold boxes were observed to be dirt free and dry from inside and were not kept one above another. In all CCPs, the vaccine vials were correctly arranged inside ILR and all vials were found to be within expiry dates, with readable labels and vaccine vial monitor (VVM) in usable stage. As for open vials are concerned, in all CCPs open vials were stored in separate box/zipper bag. On the contrary, date and time were found written in open vials in 12 (92.3%) CCPs. Among the auxiliary nurse midwife (ANM) interviewed 11 (84.6%) had adequate knowledge on shake test and for freeze-sensitive vaccine. The stock and distribution register used for vaccine and logistics were maintained as per standard norm in

Table 1: SS findings at CCP (n=15)

Parameter	1 st visit observation (%)	2 nd visit observation (%)
Cold chain infrastructure		
Dedicated room/space available for cold chain at facility	10 (66.7)	13 (86.6)
Dedicated room/space available for dry storage	10 (66.7)	13 (86.6)
Dedicated table/space available for conditioning of ice packs?	9 (60)	15 (100)
Clean cloth available for wiping of ice packs after conditioning?	9 (60)	15 (100)
Power backup facility available	12 (80)	12 (80)
ILRs and DFs connected through separate stabilizers	15 (100)	15 (100)
Functional thermometer in ILR and DF	12 (80)	13 (86.6)
Vaccine management and infrastructure handling		
Separate temperature log books for all ILRs and DFs	15 (100)	15 (100)
Twice daily monitoring of temperature	15 (100)	15 (100)
Record of power failures/cuts	11 (73.3)	15 (100)
Record of defrosting ILRs and DFs	12 (80)	13 (86.6)
Temperature log book reviewed by facility I/C	2 (13.3)	13 (86.6)
All functional cold boxes are clean and dry from inside	13 (86.6)	15 (100)
Cold box not kept one over another	11 (73.3)	15 (100)
Correct temperature recordings in ILR and DF	11 (73.3)	13 (86.6)
No frost OR frost <5 mm in ILR/DF	13 (100)	15 (100)
Vaccine vials correctly arranged	12 (80)	15 (100)
Vaccines in ILR within expiry dates and with labels, OPV VVM in usable stage	14 (92.3)	15 (100)
Diluents placed in ILR 24 h before distribution	15 (100)	15 (100)
Open vial stored in separate box/zipper bag	14 (92.3)	15 (100)
Correct placement of the ice pack in DF	11 (73.3)	14 (92.3)
Date and time written in open vial	11 (73.3)	13 (86.6)
Knowledge of ANM on shake test	6 (40)	11 (84.6)
Knowledge of ANM on freeze-sensitive vaccine	8 (53.3)	11 (84.6)
Immunization supplies and sessions management		
Stock register used for vaccine and logistics as per norm	7 (46.6)	13 (86.6)
Distribution register used for vaccine and logistics as per norm	7 (46.6)	13 (86.6)
Updated RI coverage monitoring chart	0	4 (26.7)

CCP: Cold chain point, OPV: Oral polio vaccine, VVM: Vaccine vial monitor, ILR: Ice lined refrigerator, DF: Deep fridge, ANM: Auxiliary nurse midwife, RI: Routine immunization, SS: Supportive supervision

12 (92.3%) CCPs. Updated RI coverage monitoring chart was maintained in only 4 (26.7%) CCPs [Table 1].

Session Site

From our initial visit to 18 session sites, we observed that in all session sites vaccine carriers with four ice packs were available. Vaccine vials and diluents were placed in plastic bag inside the vaccine carrier. Use of conditioned ice pack and correct arrangement of vaccine at session site was observed in 16 (88.9%) sessions. In all the session sites, vaccine vials were found to be within expiry dates with readable labels, and in 16 (88.9%) sessions, VVM was found to be in usable state. However, we noticed only in 2 (11.1%) session sites date and time of reconstitution was written on reconstituted vaccines vial. The reconstituted vaccine used within 4 h in all session sites [Table 2].

During our second visit to the session sites changes, we observed were that all sessions had correct arrangement of vaccines. In all sessions, the VVM was found to be in usable state and the date and time of reconstitution for reconstituted vaccines were observed to be written in 15 (83.3%) sessions sites [Table 2].

DISCUSSION

The purpose of this study was to assess the impact of mobile-based RI SS and monitoring in cold chain management. SS is a process that uses dialogue and constructive feedback to help the staff, volunteers, or entire organizations to improve the performance in pursuit of the organization's mission, while also setting goals for growth and development.^[11] Here, efforts were made to address all the issues related to CCP management and timely feedback notification of

Table 2: Cold chain management at session site (*n*=18)

Vaccine and logistics variable	1 st visit observation (%)	2 nd visit observation (%)
Vaccine carriers with four ice packs available	18 (100)	18 (100)
Vaccine vials, ampoules, and diluents placed in plastic bag in vaccine carrier	15 (83.3)	18 (100)
Use of conditioned ice pack	16 (88.9)	18 (100)
Correct arrangement of vaccine at session site	16 (88.9)	18 (100)
VVM stage usable	16 (88.9)	18 (100)
Date and time of reconstitution written for reconstituted vaccines/open vials	2 (11.1)	15 (83.3)
Reconstituted vaccine used within 4 h	16 (88.9)	18 (100)

VVM: Vaccine vial monitor

the issues to district and state level stakeholders for public health actions.

As per as cold chain infrastructure is concerned, our initial visit revealed that many of the CCPs 5 (38.4%) lack dedicated cold chain room for cold chain equipment's and dry storage for logistics. Government of India recommends that at the district level vaccines are to be stored in dedicated cold storage facilities in CCPs.^[12] This should ideally be a separate room with restricted entry to keep the vaccines and cold chain equipment safe and secure.^[13] In our second visits for SS, we noticed better results with majority 11 (84.6%) CCPs had dedicated cold chain room for cold chain equipment's and dry storage so with SS the importance of separate dedicated cold chain room could be highlighted.

Temperature monitoring is very much essential for cold chain maintenance and temperature record book is key tool for monitoring the temperature regulation. ILR/DF should have separate temperature record book and they must be recorded twice daily along with the record of power failure and defrosting. After recording the temperature, cold chain handlers should sign on the temperature record book. Every week Medical Officer (MO) in-charge should oversee the temperature record book and sign on it.^[6] In our study, we observed during our first visit that separate temperature log book with twice recording was maintained in almost all CCPs. However, the records of defrosting and power failure were not uniformly maintained in some of the CCPs. The temperature log book was found to be reviewed by MO i/c in only few CCPs. However, in our second visit in majority of the CCPs temperature log book was maintained adequately as per standard and there was also timely checking by MO i/c every week. This improvement in maintaining temperature log books brings out the positive effect of regular SS.

The success of cold chain management depends very much on the knowledge of cold chain handlers and awareness regarding cold chain practices, management, and handling. On the part of knowledge of cold chain handlers is concerned, from our initial observation many did not have adequate knowledge of freeze sensitivity vaccines and shake test. It was also observed through open vials were correctly (i.e., separate box/zipper bag) placed inside ILR in many of the CCPs, most did not

have date and time mentioned in it. However, noticeable improvement was observed in the second visit with majority of cold chain handlers acquired adequate knowledge on freeze sensitivity vaccines and shake test. A cornerstone of SS is working with health staff to establish goals, monitor performance, identify and correct problems, and proactively improve the quality of service.^[13] Through SS, we were able to assess the knowledge of cold chain handler and make necessary correction wherever required.

Standard stock book and distribution registers authorized by the Government of India at every CCP for efficient vaccine record-keeping is recommended. Efficient vaccine record-keeping improves efficiency of vaccination.^[12] In our present study, the stock and distribution register used for vaccine and logistics were not efficiently maintained as per standard norm in many of the CCPs. However, better results were observed for immunization supplies and sessions management in our second visit. Maintenance of the stock book and distribution register significantly improved in many CCPs. This improvement in register record keeping was a notable behavioral change attributed to SS.

As per open vial policy 2015, multidose vials from which one or more doses of vaccine have been used during an immunization session may be used in subsequent immunization sessions for up to a maximum of 4 weeks from the date of opening, and all open vials should have recorded date and time of opening.^[14] Reconstituted BCG, measles/MR, and JE vaccines are the most heat and light sensitive. Since these live vaccines do not contain preservatives, there is risk of contamination. They should be used within 4 h of reconstitution. In our present study, during the first visit, the date and time of reconstitution was written on reconstituted vaccines in only 2 (11.1%) sessions' sites. However, this practice of writing date and time of reconstitution on reconstituted vaccines vials has gone up significantly in majority 15 (83.3%) session sites during our second visit. The improvement of the knowledge and practices of ANM related to maintaining cold chain during immunization sessions is highly appreciable.

Various similar studies done worldwide also reveal that SS improves CCP management and serves an efficient tool to

strengthen the immunization program indicators. In a study conducted by Som *et al.*, the observed improvements in the ILR management practices indicate positive influence of SS.^[1] Similarly, a study done by Menteny *et al.* observed qualitative improvement in key indicators of immunization and overall ranking of health facilities between two rounds of SS.^[15] A study carried out by Bankole *et al.* in 1000 privately owned facilities also observed SS improves the practice of cold chain management.^[16]

According to Djibuti *et al.*, provider-based interventions such as SS can have independent positive effects on immunization program indicators.^[17] Babu *et al.* demonstrated that SS has an independent role and might be a significant contributor for overall immunization program strengthening.^[18] Similarly, a study done by Panda *et al.*^[19] observed SS as a strategy may be conditionally envisaged for quality improvement within the overall framework of a National Immunization Programme.

CONCLUSION

The present study highlight's issues related to CCP management through SS. The results clearly showed that the effect of SS is not limited to only logistics and record maintenance. The skills and attitudinal behavior of the peripheral staff has also improved. Although we could not reach all of the vaccination sites, through the sample visits, key issues were brought to the notice of the district and PHC level officers for appropriate follow-up public health actions to be taken to improve the quality of cold chain management and RI service throughout the district.

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