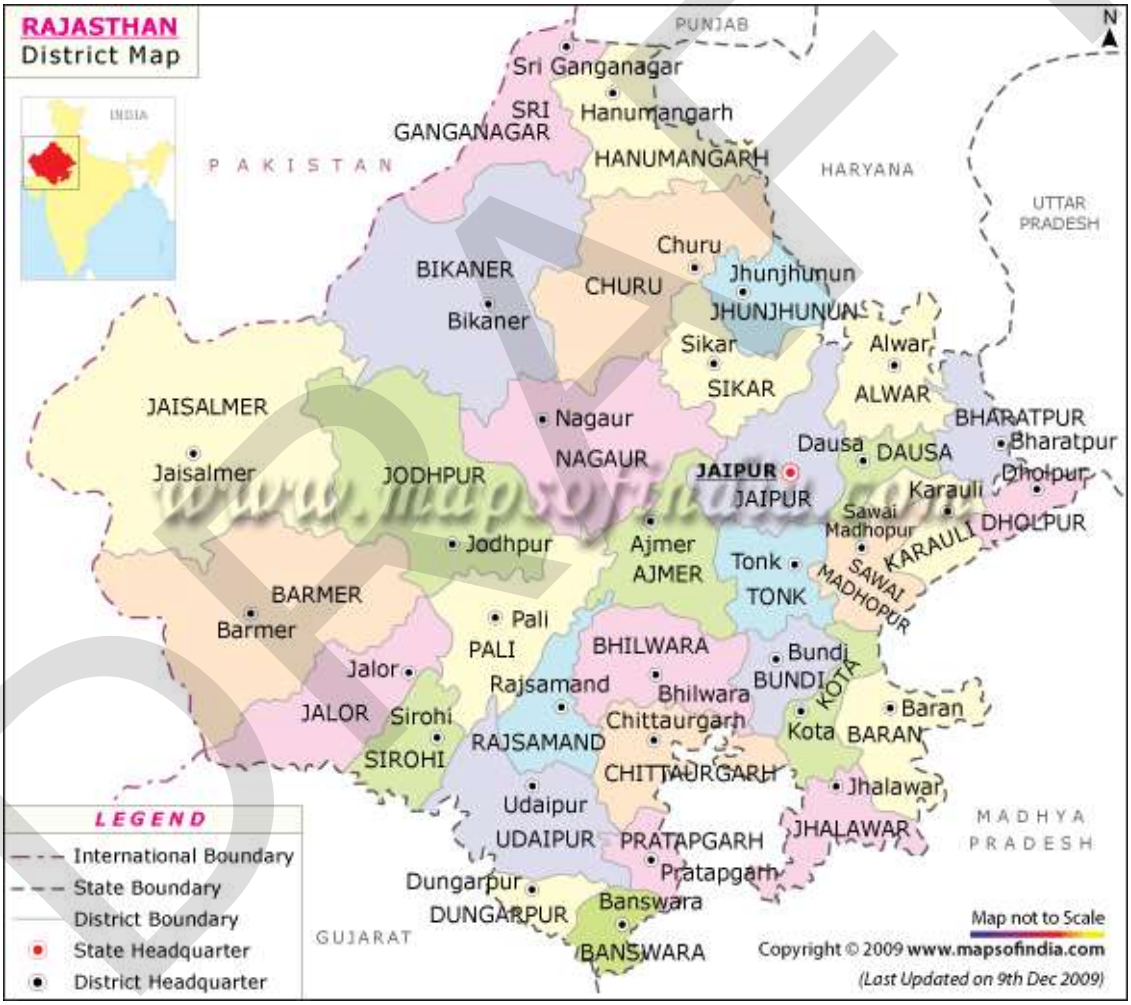
Assessment of

Cold Chain & Vaccine Management

in RAJASTHAN



MAY 2010

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Abbreviations and Glossary

°C	degree Celsius
CCO	Cold Chain Officer
CM& HO	Chief Medical & Health Officer
CFC	Chlorofluorocarbon (ozone depleting substance)
CHC	Community Health Centre
CI	Critical Indicator (in EVSM and VMAT)
DIO	District Immunization Officer
EEFO	Earliest Expiry First Out
EPI	Expanded Programme on Immunization
EVSM	(WHO-UNICEF) Effective Vaccine Store Management initiative
GTN	Global Training Network (Now known as Global Learning Opportunities)
HP	Health Post
MDVP	Multi Dose vial Policy
MO	Medical Officer
MOH	Ministry of Health
MQP	Model Quality Plan (module 2 of EVSM)
PHC	Primary Health Centre
OPV	Oral Polio Vaccine
RCHO	Reproductive & Child Health Officer
RVS	Regional vaccine store
SEPIO	State EPI Officer
SOP	Standard Operating Procedure
SVS	State Vaccine Store
UNICEF	United Nations Children's Fund
VAR	vaccine Arrival Report
VM	Vaccine Management
VMAT	(WHO-UNICEF) Vaccine Management Assessment Tool
VVM	Vaccine Vial Monitor

Executive Summary

Rajasthan is a State with a total population of 69,164,700 in 33 districts. In terms of immunization programme, its target group of less than 1 year children is 1,902,029. To cover them, the state has one State Vaccine Store (SVS) at Jaipur, and the Store at Udaipur is supposed to take 20% of the load off the SVS. The Expanded Programme on Immunization is managed by the State EPI Officer (SEPIO) [Deputy Director (Immunization)] and strengthened by one Cold Chain Officer (CCO). In the past years the immunization coverage has improved from 27% (NFHS-3, 2005-06) to 48.8% (DLHS-3, 2007-08).

The GoI has recently supplied 6 Walk-in Coolers and 2 Walk-in Freezers to enhance the storage capacity of the vaccines in the State. In view of the important phase of strengthening of the immunization infrastructure, it is of importance to evaluate the quality of the cold chain, as well as the immunization programme, and identify the additional needs to strengthen the programme further. The current mission was initiated by the Ministry of Health & Family Welfare (MoH&FW) of Govt. of Rajasthan and supported by UNICEF – Rajasthan.

The assessment is conducted using the WHO-UNICEF Vaccine Management Assessment Tool (VMAT). This tool is based upon **eleven global criteria listed below.**

1. Vaccine arrival procedures
2. Vaccine storage temperatures
3. Cold storage capacity
4. Buildings, cold chain equipment and transport
5. Maintenance of cold chain equipment and transport
6. Stock management
7. Effective vaccine delivery
8. Correct diluents use for freeze dried vaccines
9. Effective VVM use
10. Multi-Dose Vial Policy (MDVP)
11. Vaccine wastage control

The objective of such an assessment is to identify the following aspects:

- Strengths & good practices
- Major knowledge gaps
- Major performance gaps
- Resource & Training needs

In addition the methodology adopted aims to:

- **Develop internal capacity of the system to conduct similar self-assessment periodically in order to strengthen it and make it self-sustainable.**

The methodology adopted for the mission, while achieving the goal of conducting an assessment of the vaccine management system, assures the following beneficial deliverables:

- **Training of health staff in use of VMAT.**
- **Developing their skill in conducting self assessment of the system in future**
- **Developing their capacity to identify weaknesses and define recommendations to address them**
- **Develop skills in supportive supervision and provide on spot hand-holding in correct practices**
- **Learn to summarise the observations and make its presentation**

Thus, it is a multi-capacity building activity, which is targeted at strengthening the vaccine management system to become self-sustainable.

The results are depicted in the form of spider graphs and bar charts. Sections 3 and 4 describe the tool and the methodology.

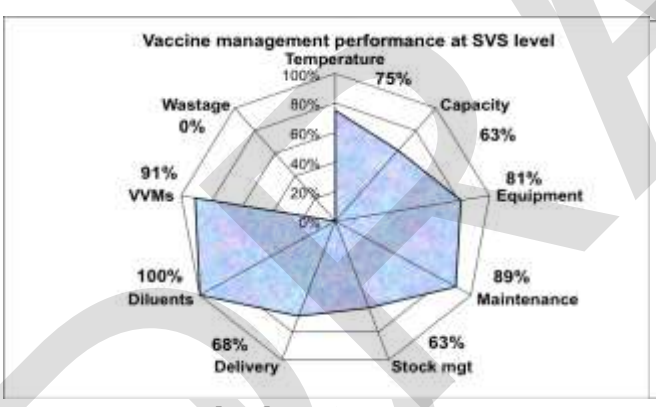
The assessment has been carried out by first training 36 selected health staff in the use of the tool, and then assessing 1 State vaccine store (SVS), 7 Zone store, 15 DVS and a total of38 CHC / PHCs / UCs. The results were collected and verified and analysed by the consultant in collaboration with selected team members. Section 5 describe in detail the way the mission was implemented and the consolidation of the results.

The summary of the consolidated results is given in the table below. Note that scores ***less than or equal to 70% are marked in red with italics*** to highlight that these indicators at the respective level need attention. The scores between 70% and 90% are left in the normal black font to indicate that they are in the acceptable range. Those **above 90% are marked in green** to indicate that these are in a very comfortable range.

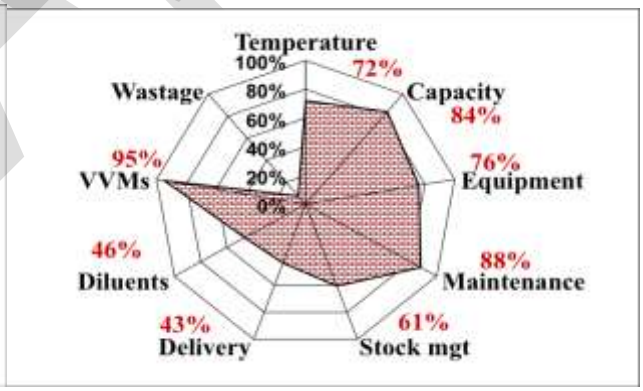
Table 1: Summary of Consolidated VMAT score for RAJASTHAN

Ind.	Indicator	Consolidated scores			
		SVS	Zone	15 DVS	38 CHC/ PHC/UC
2	Vaccine storage temperature	75%	72%	72%	72%
3	Cold store capacity	*63%*	84%	*54%*	91%
4	Building, cold chain equipment and transport	81%	76%	*65%*	76%
5	Maintenance of cold chain equipment and transport	89%	88%	88%	79%
6	Stock management	*63%*	*61%*	*58%*	*42%*
7	Effective vaccine delivery	*68%*	*43%*	*42%*	*55%*
8	Correct diluents use for freeze dried vaccines	100%	*46%*	*34%*	*41%*
9	Effective VVM use	91%	95%	92%	86%
11	Vaccine wastage control	*0%*	*7%*	*11%*	*10%*

Spider Graph Results of Performance of VMAT

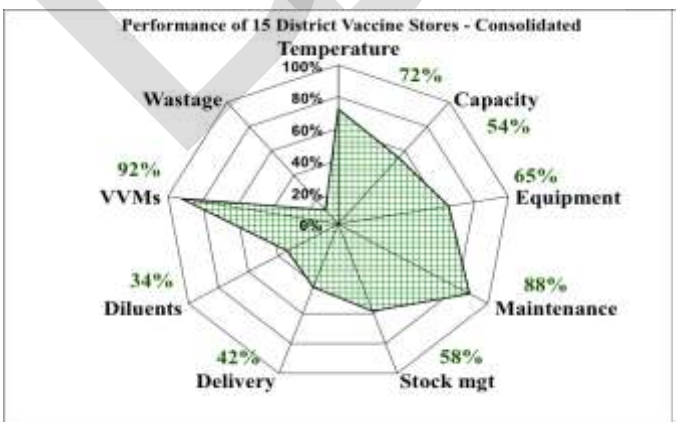


State level vaccine store

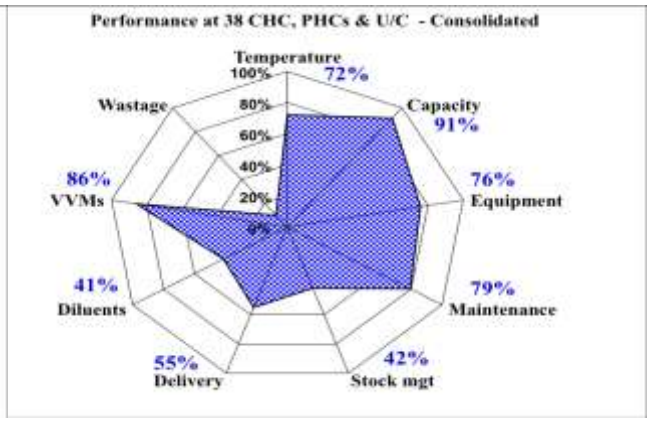


Consolidated for 7 ZONE LEVEL

Consolidated for 15 DVS level



Consolidated for 38 CHC / PHC / UC level



The findings are discussed in detail, in the section 6 of this report. Each of the indicators are discussed on the basis of the assessment results, the spider graphs and the bar graphs obtained for each of the global criteria at the different vaccine store levels. Both strengths and weaknesses identified at each level are discussed in detail. Finally, recommendations have been developed for each of the indicators to improve the performance and listed under the respective indicators.

In section 9, all these recommendations have been again sorted out terms of priority and the following 7 areas of implementation.

A. Human Recourse
B. Infrastructure
C. Technical
D. Logistics
E. Capacity building
F. Practices to be implemented and
G. Supervision

The reader is invited to go over to this section to appreciate the level of task ahead. There are quite a number of areas that need attention. Ministry of Health is invited to define an action plan in collaboration with the different stake holders to implement the recommendations in the most practical and speedy manner in order to improve the whole immunization programme.

The mission was aimed at training health staff in the use of VMAT and conducting the assessment in selected locations. During the mission as an add-on to this Terms of reference, and in order to contribute to the mission in the best possible manner, the consultant took the initiative to provide several additional reports:

1. A1-Suggestions for improving the Temperature monitoring booklet
2. A2-Suggestions for Technical strengthening of cold chain
3. A3-Report on Special observations and supportive supervision by the Consultant team during assessment visit
4. A4-All Special observations and supportive supervision in Rajasthan

In addition, the consultant had proposed each team to make a brief presentation of their findings during the debriefing, based a pre-defined structure of the presentation. The **seven power point presentations** prepared by the RCHOs and MCHO coordinators are provided along with the consultants presentation file.

Let us care for the vaccines for the sake of our children

1. Introduction

Rajasthan is a State with a total population of 69,164,700 in 33 districts. In terms of immunization programme, its target group of less than 1 year children is 1,902,029. To cover them, the state has one State Vaccine Store (SVS) at Jaipur, and the Store at Udaipur is supposed to take 20% of the load off the SVS.

It has 7 Zonal (or Regional) Vaccine Stores (RVSs), supplying vaccines to 33 district vaccine stores (DVSs). These cover the 368 Community Health Centres (CHCs), 1,503 Primary Health Centres (PHCs) and 11,488 sub-centres.

The Expanded Programme on Immunization is managed by the State EPI Officer (SEPIO) [Deputy Director (Immunization)] and strengthened by one Cold Chain Officer (CCO).

In the past years the immunization coverage has improved from 27% (NFHS-3, 2005-06) to 48.8% (DLHS-3, 2007-08).

The GoI has recently supplied 6 Walk-in Coolers and 2 Walk-in Freezers to enhance the storage capacity of the vaccines in the State.

In view of the important phase of strengthening of the immunization infrastructure, it is of importance to evaluate the quality of the cold chain, as well as the immunization programme, and identify the additional needs to strengthen the programme further.

The current mission was initiated by the Ministry of Health & Family Welfare (MoH&FW) of Govt. of Rajasthan and supported by UNICEF – Rajasthan.

2. Objectives of Vaccine Management Assessment

The objective of such an assessment is to identify the following aspects:

- **Strengths & good practices**
- **Major knowledge gaps**
- **Major performance gaps**
- **Resource & Training needs**

In addition the methodology adopted aims to :

- **Develop internal capacity of the system to conduct similar self-assessment periodically in order to strengthen it and make it self-sustainable.**

3. The Tool

The Vaccine Management Assessment Tool (VMAT) is developed by the Vaccine Management Training Network (VMTN) team to help countries to improve the quality of their vaccine management down to the service delivery level. The modules complement the package of guidance, assessment and training materials developed for the initiative for Effective Vaccine Store Management (EVSM), which focus on vaccine management at national primary stores.

The purpose of VMAT is to investigate vaccine management knowledge and practices amongst health staff operating at national or state level, sub-national (RVS & DVS) or intermediate and service delivery levels (CHC and PHCs). It bases itself on the data and practices over the last 6 months. The tool helps assessors to achieve the objectives mentioned in the previous section. Namely, identify and document the areas of strengths and good practices, identify major knowledge and performance gaps in a consistent format. Targeted support and training can then be provided to overcome these deficiencies.

The tool is based upon **eleven global criteria listed below.** Of these the first seven have been derived directly from Effective Vaccine Store Management (EVSM) initiative. Criteria 8, 9 & 11 are implicitly part of EVSM but have been identified as separate indicators for assessment at periphery levels.

A criterion 10 on Multi-Dose Vial Policy (MDVP) has been added. **Note that criterion 10 is not applicable in India.**

1. Vaccine arrival procedures
2. Vaccine storage temperatures
3. Cold storage capacity
4. Buildings, cold chain equipment and transport
5. Maintenance of cold chain equipment and transport
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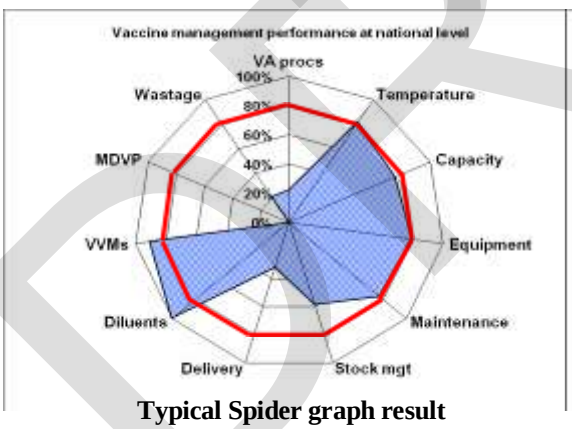
Grouped under each criterion there are a set of specific questions which are applied to the different levels of vaccine supply chain within the health system (SVS or RVS, DVS and PHC) and to which one attributes a mark corresponding to the answer: 1 (yes), 0 (no) or n/a (not applicable- when such an option is possible). The sum of these marks is then normalized to give an overall score for each criterion on a scale of 0 to 100%.

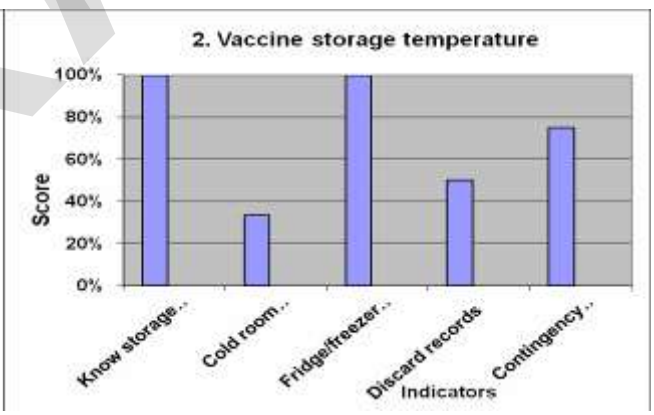
These scores are then used to depict graphically on a spider web the strengths and weaknesses of a country's vaccine management systems. The graph below shows the result of the assessment at SVS. A minimum of 80% score is recommended for each criterion as shown by the red polygon in the graph. In summary one can see that the performance of some criteria are above 80% while those that are below 80% are a cause for concern and need to be addressed.

The individual criteria are also plotted in bar graphs in terms of status of specific indicators. An example of one bar graph for the indicators of criterion 2 corresponding to the spider chart is shown alongside the spider graph. This graph depicts the status of performance for the 5 core indicators verified under this criterion.

It can be seen that the score is good only for the knowledge of the storekeeper and the temperature monitoring of ILR and DF. The score for the other 3 indicators is poor. Note that the weightage of the different indicator being different, the total score corresponds to about 80% as shown on the spider chart on the left.



Typical Spider graph result (state vaccine store at Orissa)



Corresponding Bar chart result for criteria no. 2

NB. Criteria 1 – Vaccine arrival procedures applies more to a national store receiving vaccines from overseas or directly from the manufacturer. Govt. of India has not adopted MDVP (criteria 10). Hence criteria 1 and 10 are not assessed while conducting a state assessment.

4. The Methodology

This methodology, while achieving the goal of conducting an assessment of the vaccine management system, assures the following beneficial deliverables:

- **Training of health staff in use of VMAT.**
- **Developing their skill in conducting self assessment of the system in future**
- **Developing their capacity to identify weaknesses and define recommendations to address them**
- **Develop skills in supportive supervision and provide on spot hand-holding in correct practices**
- **Learn to summarise the observations and make its presentation**

Thus, it is a multi-capacity building activity, which is targeted at strengthening the vaccine management system to become self-sustainable.

To achieve this, the **first step is to train a certain number of health department staff** (DIOs / vaccine handlers / cold chain technicians) in the use of the Vaccine Management Assessment Tool (VMAT).

The training will be 50% theoretical, exposing the participants to the questionnaires of the VMAT, the real life situations and discussion. The other 50% is through assessment of vaccine stores and evaluation of data collected. This approach helps the participants to develop a certain level of competence in the use of the tool, such that they can also apply it periodically to their system in future in form of self-assessment.

This should be **followed with a partial assessment of the current system**, by involving all the participants, to get a feel of the actual status. Teams will be formed to assess parts of the system where, other than their duty stations for a more objective collection of data.

Then **the data needs to be validated and analysed**. This again is done together with the team members who will then be guided to identify the strengths and weaknesses in the system and how to best address the weaknesses. Thus the participants get more engaged into the issues. As a result, the conclusions reached and the recommendation formulated to address the weaknesses, are largely through their contribution, leading to a more serious ownership

Additional benefits

Such an approach provides a potential to contribute towards improvement of wrong practices, during the week of the assessment itself, through hands-on and supportive supervision. The participants learn through the exercise to become better observers and to provide the necessary support where required. Above all, the exercise opens their eyes to the issues present in their own system, which stimulates them to take ownership to address them. It is worth comparing this against an expert conducting a 2 week assessment, and submitting a wonderful report which mostly gathers dust in a shelf.

As an additional outcome of such an approach, depending on the calibre of the participants, it is possible to have the team leaders and members to make a short write up of observations made in the areas they visited and the nature of support provided. Such reports can then be used to a) define specific action in that region and b) define common issues of priority across the state.

A further benefit that can be attempted is to involve the participants during the formal debriefing, where each team can present their findings, recommendations and supportive actions provided by them to all the others. This is a stimulating exercise, which gives recognition to their efforts and it benefits all the others as well.

5. Implementation

A total of 36 participants attended the training, though only 30 were present at the start. Annexure A gives list of the participants. Both the SEPIO and the CCO participated in the 4 day training programme, providing a vital boost to the serious involvement by all the participants.

5.1 Training on VMAT

The programme of the first four days was a combination of debriefing through presentations, group works and presentations by participants. Annexure B provides sample of the agenda for the first 2 days.

The field training was carried out by dividing the entire group into 5 teams and each team conducting visits to one of the 4 vaccine stores (the State Vaccine Store, District Vaccine Store, and 3 CHC/PHCs) and responds to the questions of the tool and bring back the answers. Annexure C gives the details of the practical exercise plan, with the teams.

On each day only 2 to 3 out of 10 global criteria and their detailed questions were presented, discussed and used for the assessment. After the field visit the data was consolidated. The experience of the participants and the results were discussed in the same evening or the following day along with the observations of the consultant.

Different objectives were targeted through this induction phase:

1. Familiarising the participant with the tool,
2. Training the health staff to use the tool to assess specific facilities,
   (central, sub-national or periphery),
3. Collect data from the different facilities visited,
4. Consolidate the data and analyse the same,
5. Guide the participants in better data collection,

6. Draw major conclusions on the preliminary data.

The induction programme began with a pre-course questionnaire to evaluate the knowledge level of the group. Annexure D gives the performance matrix. The performance of most indicators is relatively good and reflects a good level of knowledge. **The average comes up to be 67.4%.**

The induction programme lasted 4 days and covered all the indicators, except indicator 1 on vaccine arrival and indicator 11 on Wastage Control. All the participants worked very enthusiastically all 4 days and participated actively in the field exercises. This contributed immensely to enhance their level of confidence in the use of the tool.

On receiving and analysing the data collected each day, the consultant guided the participants on improving the quality of data collection and safeguarding against reporting incomplete or incorrect data. Some of the important aspects stressed were:

1. To take the store managers into confidence,
2. To try and verify all information as much as possible based on documented records,

3. To report factual information based on what is seen. This is important to avoid misinterpretation of results.
4. To provide sufficient comments to support the score given to a question – especially if it is zero,
5. Not to disturb or correct any existing practice unless one is sure of it and it is drastically incorrect (eg. conditioning of ice packs)
6. Not to tamper with any equipment (thermostats) unless one is the authorised technician,

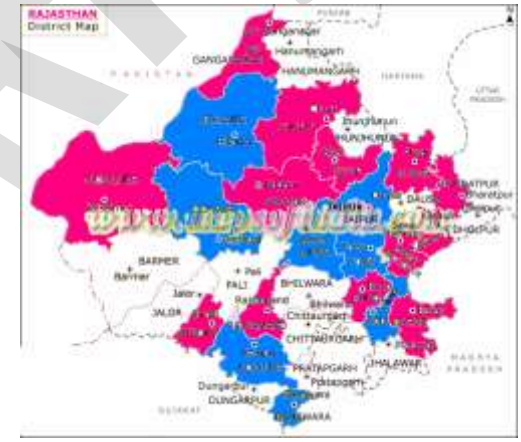
During the training of the assessment indicators, the consultant identified important gaps in the knowledge of the participants. He included more details with regard to these aspects in order to assist them to improve their knowledge and understanding. These are :

1. Proper knowledge of storage temperature with possible use of minus temperature for Measles and BCG
2. Proper ice pack conditioning
3. Proper packing of cold box
4. Estimating the vaccine needs using target population
5. Defining the total requirement taking into account working and buffer (safety) stock.
6. Determining the gross and net storage capacity of an equipment

At the end of the first phase, the consultant circulated an evaluation form for the participants to assess the training programme. It included three aspects delivery of the trainer, the relevance of the programme and last but not least the confidence of the participants in using the tool. Annexure E gives the results.

5.2 Field Assessment using VMAT

In the second phase, 7 teams were formed. Each team comprised of 1 RCHO, 1 DMCH coordinator, 1 Refrigeration technician and 1 or 2 store keepers. The assessment exercise covered, a total of 7 RVS (marked in blue), 14 DVS (marked in red), 1 urban centre (UC) under the RVS, and to the extent possible 1 CHC and 1 PHC under each DVSs (a total of 38 CHC/PHCs/UCs). Details of the teams and locations they visited are given in Annexure F.



The RCHO's were designated as the team leaders and they were supported by Divisional MCH coordinators who also had the role of preparing the soft copy of the assessment data suing the VMAT excel tool.

5.3 Data Validation and consolidation

Following the assessment, the consultant collected the field assessment data and conducted a three day workshop on data validation with the DMCH coordinators. The exercise was directed to ensure reliability and consistency of data between the teams for similar observations, and clarification of the comments accompanying the scores. This is critical to ensure a balanced analysis, since the consultant himself could not visit all the locations.

The findings are given in the next section. The resulting graphic representation for each of the District and its respective CHC and PHC is given in Annexure G1 to G7 for respective zones.

Thereafter, the consultant consolidated the data from all the zones to prepare the state perspective at the different levels. The assessment data collected during the first week of training (from the state vaccine store, Jaipur-DVS and three CHC/PHCs) and the data collected by the seven teams during the assessment week were consolidated into a single file.

The consolidated table with detailed scores is given in Annexure H along with the averages resulting at each level. The summary of the consolidation is given in the table 1 below. Note that scores ***less than or equal to 70% are marked in red in italics***to highlight that these indicators at the respective level need attention. The scores between 70% and 90% are left in the normal black font to indicate that they are in the acceptable range. Those **above 90% are marked in green** to indicate that these are in a very comfortable range.

Looking at the score table, one can identify areas of **green** and ***red*** to appreciate the strengths and weaknesses in the system at a glance. The consolidated spider graphs for the SVS, 7 Zonal, 15 district level and 38 service level centres (CHCs. PHCs & UCs) are given after the table.

Table 1: Summary of Consolidated VMAT score for RAJASTHAN

Ind.	Indicator	Consolidated scores			
		SVS	Zone	15 DVS	38 CHC/ PHC/UC
2	Vaccine storage temperature	75%	72%	72%	72%
3	Cold store capacity	*63%*	84%	*54%*	91%
4	Building, cold chain equipment and transport	81%	76%	*65%*	76%
5	Maintenance of cold chain equipment and transport	89%	88%	88%	79%
6	Stock management	*63%*	*61%*	*58%*	*42%*
7	Effective vaccine delivery	*68%*	*43%*	*42%*	*55%*
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9	Effective VVM use	91%	95%	92%	86%
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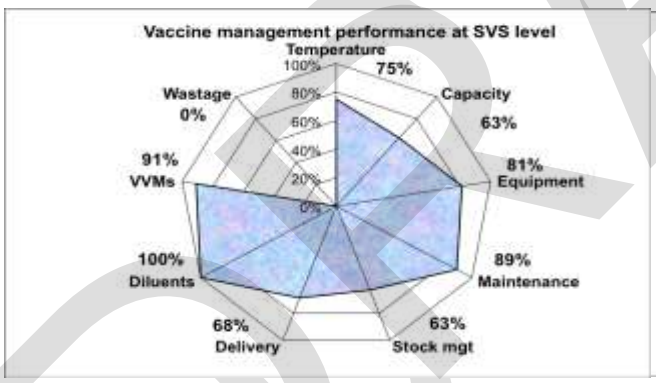
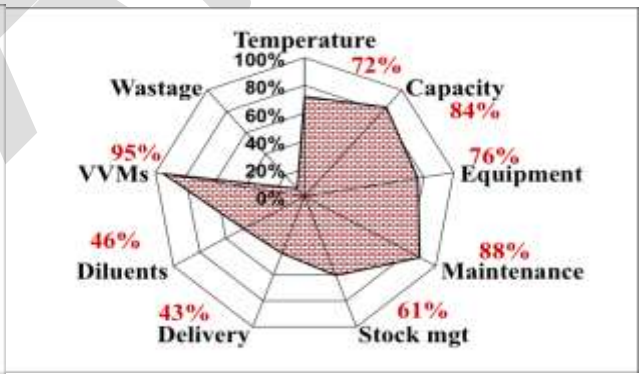
Spider Graph Results of Performance of VMAT

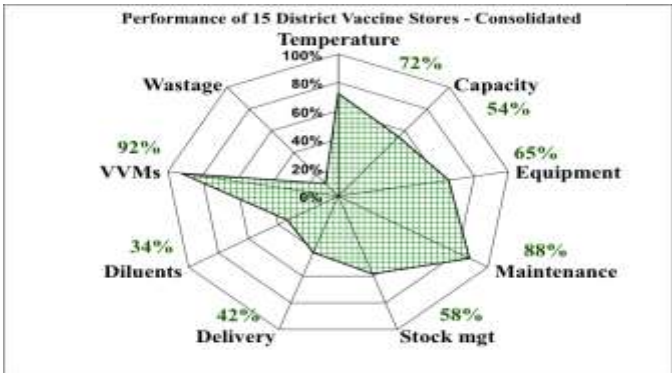
State level vaccine store



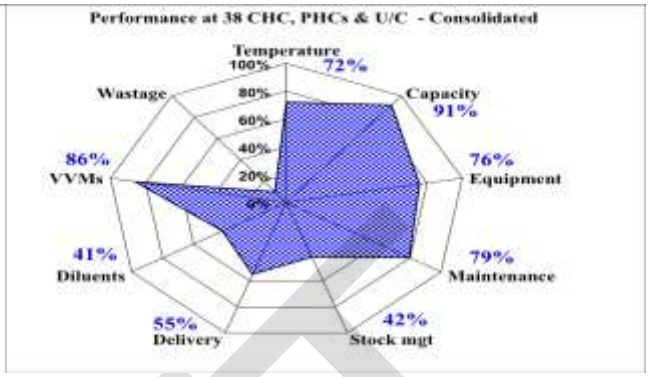
Consolidated for 7 ZONE level



Consolidated for 15 DVS level



Consolidated for 38 CHC / PHC / UC level



Thereafter, the workshop was continued with partial analysis of the data. First the team members were asked to shortlist no more than a total of 6 strengths or weaknesses observed during their assessment visits, and present them to the group. Their inputs are listed in Annexure I.

Thereafter, details discussions were conducted to analyse the result and walking through the essential conclusions and thereafter derive the essential practicable recommendations through consensus. Unfortunately, due to other obligations the selected team members could not stay longer and hence the remaining task of the analysis and development of recommendations was completed by the consultant himself.

6. Findings

In this section, the findings for each global criteria is presented. First a general introduction on what that criteria is about is given in a light blue coloured box. Then the performance score obtained from VMAT for different level is given, Wherever it is helpful a bar graph of the results at SVS, 7 Zone RVSs, 15 DVS and 38 U/Cs / CHCs / PHCs for the key questions is given alongside. The score and the bar graph are discussed in terms of strengths and weaknesses. This is followed by specific recommendations, marked in bulleted bold fonts, for improving the performance. The same recommendations are then consolidated in the conclusion according to the category of implementation.

This mission was carried out soon after completing a similar mission in Chhattisgarh for the Nation Rural Health Mission (NRHM). There are several weaknesses that have been found to be common to both the states and hence the recommendations provided to address these weaknesses are also similar.

6.1 Pre-shipment and arrival procedures

This indicator assesses the process of vaccine arrival from the manufacturer to the primary store. It verifies the proper receipt and recording of all pre-advice and arrival documents through the Vaccine Arrival Reports; the smooth clearing at the customs and adequate functioning by a clearing agent if engaged in the process.

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	**22%**	*NA*	*NA*	*NA*

This criterion is applicable actually to national primary stores. In the case of Rajasthan it is used to assess the state vaccine store (SVS) at Jaipur.

It should be noted that the SVS does not need to clear the vaccines through the customs, and hence it also does not use any service of a clearing agent. In order to avoid loss of score due to these two aspects that are not applicable, the total score have been given for the customs clearance and "not applicable" (n/a) option has been exercised for the clearing agent. All the shipments were complete and received in order. There have not been any need for any follow ups.

The most critical weakness has been the lack of practice of using a VAR or any similar document with complete information of vaccine arrivals. There have been 12 arrivals of vaccines for routine immunization, but for none of them there is any proper documentation. The predefined form has been used only for the 3 supplies of OPV through UNICEF for campaigns. The resulting total score is ***22%.***

As this criterion is not applicable at DVS, CHCs and PHCs it is not discussed at these levels.

Recommendations:

- **In order to ensure proper traceability of each lot of vaccine arriving in the state, it is recommended to fill up the VAR for every type and lot of vaccine.**
- **A supervisor should verify the VAR and a copy should be sent to GoI or UNICEF as required for further record and follow ups.**

6.2 Temperature Monitoring

All vaccines are sensitive biological substances. The higher the temperature to which the vaccine is exposed, the quicker is the loss of potency. Some vaccines are also sensitive to freezing, and this can cause irreversible damage.

The only way that it is possible to ensure that vaccines have been stored at the correct temperature at all times is by having adequate temperature recording at all stores having vaccines. In case of any danger, the vaccines can be saved using an adequate and ready contingency plan.

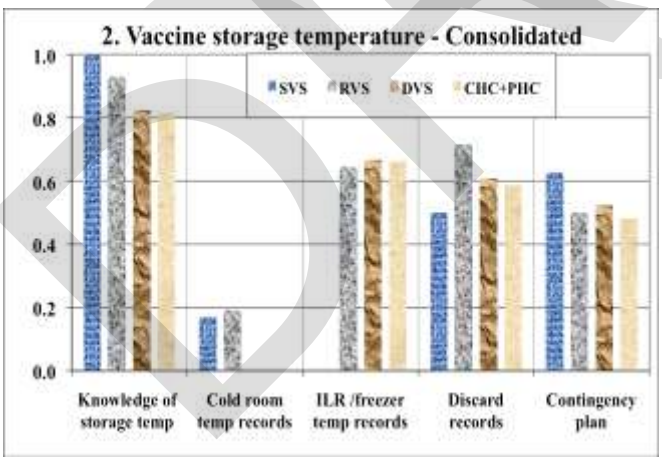
The following aspects are assessed here:

- **Knowledge of the store keeper with regard to the storing temperature for the different vaccines and their sensitivity to freezing**
- **Continuous temperature records of the cold rooms and freezers rooms**
- **Twice daily manual temperature recording for all equipment storing vaccines**
- **Are these temperature records inspected regularly and retained for auditing purposes**
- **Whether the quantum of damaged vaccines due to improper storage is no more than 1%.**
- **Status of existence and implementation of contingency plan in case of any emergency.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	75%	72%	72%	72%

The score is within the acceptable range at all levels. However, the strengths and weaknesses vary from one level to another. The bar graph on the right gives more details. At SVS and Zone level the staff have good knowledge about the correct storage temperature of all vaccines, and which antigens are vulnerable to freezing. However, at RVS Jodhpur, despite following the training, the staff had left Measles in the DF while the WIC was practically empty. At 3 of the visited DVSs the knowledge of correct storage temperature was poor – particularly amongst those who have been deputed without any training. DVS-Baran has frequent change of staff. At DVS-Rajsamand the Refr. Mechanic is doing the task and DVS-Karauli had a new staff. In some places, despite basic knowledge, staff tends to keep Measles in DFs (eg. Jaiselmer, Jodhpur).



At service level too, the newly deputed staff do not know the correct temperature of storage – examples being Hindon, Pushkar, Dangawas. Atru and Ramgarh, where the staff is untrained or newly appointed. This has led to damage of vaccine at Hindon and Karauli due to keeping of frozen ice packs along with DTP and TT in ILRs.

At SVS, the WIF has complete chart graph. But the graph recorder at WIC (located at 4 km from WIF) is non-functional due to lack of pen since long. The continuous chart recorders at 5 RVSs are non-functional, Jodhpur was an exception. Jaipur RVS does not have a WIC.

There is no manual recording of temperature at WIF or WIC in SVS. At 2 RVS (eg. Bikaner, Jodhpur), most DVS and service level (eg. Sirsi, Bassi) the manual temperatures are incomplete on Sundays and public holidays. The temperature monitoring of DF at Bharatpur and Jodhpur RVS/ DVS was incorrect. The staff has apparently not examined the thermometer before marking the temperature. The thermometer in the DF having OPV at Bharatpur was defective, yet the temperature was marked as -20^{o}C.

There is no system of noting the quantities of damaged vaccines. Based on this one would conclude that there is damage due to storage, which is a strength. However, it should be noted that, in general, the staff are very apprehensive to note any vaccine loss resulting from damage, due to fear of disciplinary action.

At SVS the staff is knowledgeable on how to handle contingency. He has familiarised himself with local cold room The Store keepers at RVS and DVS have limited knowledge. They propose to keep vaccine in cold boxes. The solution of pushing vaccine down is not opted spontaneously.

There seems to be some instructions and guidelines regarding contingency in the temperature monitoring booklet designed for service level. However, in spite of having the booklet, many field staff is not very familiar with the details. These instruction need to be implemented at each level.

The emergency numbers are posted at WIF but not at WIC. At DVS Jaipur the numbers were posted in several places.

Recommendations:

- **Procure good quality chart recorders from local market for both the WICs and the WIF with sufficient supply of accessories (paper, pens and ink). This would also reduce the administrative load of ordering and importing such items in future.**
- **It would be better to avoid changing the vaccine handling staff too often. Ideally, the MoH&FW MUST ensure that properly trained and serious vaccine handlers are only appointed at each vaccine point.**
    - **Staff at zonal or district store handling large volumes of vaccines must be tested for his competence.**
    - **All newly appointed staff in the field must be provided with a proper training in the knowledge, as otherwise large volumes of vaccines will be at stake. handling and storage of all the vaccine in ILRs at CHCs and PHCs.**
    - **It is preferable to train at least two staff at every vaccine store so that in the absence of one the other can handle the task without making mistakes.**
- **In order to ensure safe storage of vaccines, WHO recommends manual recording of temperature twice daily - 7 days on 7 of all equipment containing vaccines. A system to instil this practice needs to be developed with the help of staff who is on site, or through some form of additional incentive.**
    - **Staff should always ensure that the thermometers are in proper working condition.**
    - **Temperature records should be periodically signed**
- **Instil the practice through proper training to ensure that CHC and PHC staff monitor and record the temperature correctly and reliably.**
- **At CHCs and PHCs the Deep Freezer must be used exclusively to prepare ice packs.**
    - **Vaccines must never be stored in the same unit as this causes the internal temperature to keep varying. All vaccines should be kept in ILRs at the CHC and PHC.**
- **The staff needs to be encouraged to note all damaged vaccines at all levels with adequate documented proof.**
    - **A system for recording damage in the stock book should be developed so that stock records match with actual physical stock.**
- **Written contingency plans are needed at every level. This should include the safe hold over time of the equipment beyond which the action should be considered.**
    - **Staff at service level MUST be familiar with the contingency plans provided in the temperature monitoring booklet.**
    - **Contingency plans at SVS, RVS and DVS MUST also include periodic check of generator and fuel status.**
    - **Contingency plans MUST include how to handle excess stick of vaccines, since equipment failure results in excess stock that needs to be taken care of.**
    - **The staff should be trained in implementation of contingency through mock exercise.**
    - **Emergency numbers must be posted using the template provided in the temperature recording booklet.**

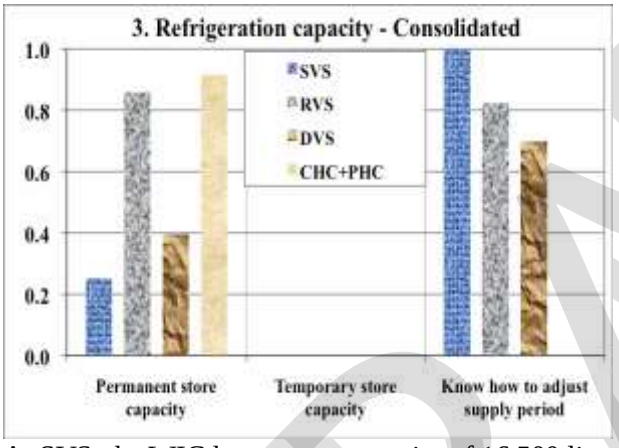
6.3 Cold storage capacity

Storage capacity should be adequate for routine as well as campaign vaccines. Hence the following issues are assessed:

- **Sufficient storage capacity to accommodate peak level stock requirements including safety stocks, for the routine immunization schedule.**
- **Satisfactory arrangements need to be made to ensure that vaccine supplied for NIDs and campaigns can be temporarily accommodated if necessary in other storage facilities that meet WHO standards.**
- **The store keeper is knowledgeable how to adapt vaccine supply schedule to accommodate space requirements.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	***63%***	84%	***54%***	**91%**



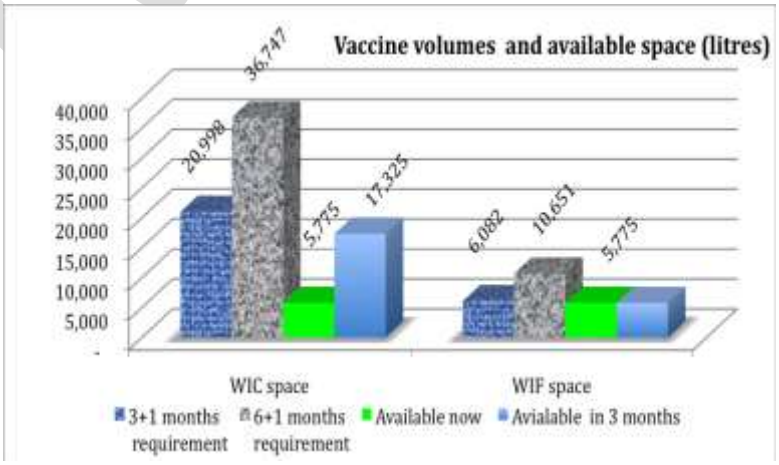
The scores indicate that the performances best at service level (CHC, PHC & UC, as there is more than sufficient space for storage of the required stock of vaccines. This as also indicated in the bar graph on the left.

Current practice is to keep a maximum of 1 month of working stock only. Even if one would add to this a buffer (safety) stock of 0.5 month, there would be no shortage of storage space at the service level.

The bar graph on the left indicates that there is a severe limitation of storage space at SVS and DVSs.

At SVS, the WIC has a gross capacity of 16,500 litres and a net capacity of 5,775 litres (approximately 35% of gross capacity).

Taking into considering that the state store should have at least 3 months of working stock and 1 month of buffer (safety) stock, the required quantities of vaccine and their volume has been computed. Annexure J gives the details. Of the total quantity of vaccine, it is assumed that, as per the current plan 20% will be sent directly by the supplier to Udaipur and 20% to Jodhpur, by air. The respective Zone stores are to function partially as state store to reduce the load on the SVS. The issue of Jodhpur will be discussed separately below.



Considering the above mentioned distribution, the storage volume required for 60% of the required 3+1 month and 6+1 months vaccine stocks is plotted in the adjacent graph. The total space available at present and what will be available shortly is also depicted alongside

Clearly, there is a serious shortage (15,223 litres net) of storage capacity in the WIC to keep even 4 months of stock at the state level. Upon the addition of 2 new WICs, which is due in the next 3 months, the net storage capacity of WIC will be enhanced to 17,325 litres. This will reduce the short fall to 3,673 litres. This is still too large as shortfall to be managed easily. The state will have to limit its stocks to lower peak volumes at Jaipur and send more than 20% to other zone vaccine stores. Storing more than 4 months of stock at the State level would seem quite unrealistic, as it would require almost twice the storage volumes.

The capacity for storage of OPV in the WIF, at the SVS, is falling short by 307 litres. This can be managed with 2 additional DFs.

At zone / RVS level GoI recommends to keep 3 months of working stock and 1 month of buffer (safety) stock. Calculation similar to the one mentioned above were carried out for the 7 zonal stores using their respective target group. The table 1 below gives the total storage volume required at each zone for +2 to +8°C and for storage of OPV at -20°C.

The table also gives along with the space required in WIC, the total net volume available and the excess or shortfall. Except at Jaipur, which does not have any WIC, there is sufficient capacity in every zonal store to keep 4 months of vaccines. However, the current practice is to collect vaccines once every month from the State store.

One can note that at Udaipur and Jodhpur, the excess space is marginal in comparison to 20% of the state stock (Approx. 7,000 litre of storage capacity) which it is planned to hold. Hence, it is not possible for these 2 stores to function as state store to offload it by 20% of its load. On the other hand there is 7,459 litres available at the new WIC of Bikaner.

The table also gives the total deep freezing capacity required to store OPV. Every RVS has ample equipment that is either awaiting repair, or is not currently put into operation, or is even brand new. These can be connected to fulfil the requirement, provided physical space to place the equipment is made available.

Table 1 – Total vaccine storage space required at the Zone / RVS

			+2 to +8°C in litres			-15 to -25°C in litres
Zone Store	**Child 0-1yr**	**Pregnant Women**	**Required**	**Available**	**(+) Excess (-) shortfall**	**Required**
Ajmer	275,162	302,678	**4,448.5**	5,775.0	1,326.5	**611.5**
Bharatpur	181,456	199,602	**2,935.6**	5,775.0	2,839.4	**403.2**
Bikaner	231,226	254,348	**3,740.7**	11,200.0	7,459.3	**513.8**
Jaipur	467,748	514,522	**10,061.8**	**No WIC**	**Sever shortage of space**	**1,039.4**
Jodhpur	318,128	349,941	**5,146.6**	5,775.0	628.4	**707.0**
Kota	158,606	174,467	**2,565.9**	5,775.0	3,209.1	**352.5**
Udaipur	269,704	296,674	**4,363.2**	5,775.0	1,411.8	**599.3**
Total	1,902,029	2,092,232				

Similar calculations are also carried out for the 33 districts stores. The result is given in the table 2 below. AT the DVSs too, the current practice is to keep only one month of stock, and accordingly limited number of equipment are connected. In most DVS, there are extra equipments that can be put into operation if needed. Hence, currently, there is shortage of capacity in most DVS, based on the equipment in operation. This has led to the lowering of the performance score.

Note that at all the DVSs attached to the RVS (which were not really assessed), the same equipment are shared by both in a rather ambiguous manner for storage of their stocks. If one makes a rigorous division in terms of physical storage capacity, the DVS will have a serious shortage of storage capacity. This capacity can be enhanced provided physical space is made available to accommodate the required additional equipment.

The staffs at all levels have some idea of how to adjust the excess stocks, though all options are not clear to them. Usual tendency is to push the vaccines down.

Table 2 – Total vaccine storage space required at the DVSs

		+2 to +8 C in litres	-15 to -25 C in litres				+2 to +8 C in litres	-15 to -25 C in litres
	DVS	**Required**	**Required**			**DVS**	**Required**	**Required**
1	Ajmer	1,184.4	162.8		17	Jaipur	3,883.0	1,363.9
2	Alwar	1,639.3	225.3		18	Jaisalmer	274.2	37.7
3	Banswara	776.2	106.6		19	Jalore	786.9	108.1
4	Baran	554.0	76.1		20	Jhalawar	638.7	87.7
5	Barmer	1,069.7	146.9		21	Jhunjhunu	1,042.6	143.2
6	Bharatpur	1,144.6	157.2		22	Jodhpur	1,568.2	215.4
7	Bhilwara	1,090.7	149.9		23	Karauli	653.8	89.8
8	Bikaner	1,033.3	141.9		24	Kota	852.7	117.1
9	Bundi	520.6	71.5		25	Nagaur	1,519.4	208.7
10	Chittorgarh	725.1	99.6		26	Pali	987.3	135.6
11	Churu	916.2	125.8		27	Pratapgarh	377.4	51.8
12	Dausa	714.5	98.2		28	Rajsamand	533.2	73.2
13	Dholpur	532.2	73.1		29	S.madhopur	604.9	83.1
14	Dungarpur	598.7	82.2		30	Sikar	1,249.3	171.6
15	Ganganagar	969.5	133.2		31	Sirohi	460.3	63.2
16	Hanumangarh	821.8	112.9		32	Tonk	655.5	90.0
					33	Udaipur	1,352.7	185.8

Three districts bordering with Haryana and UP, conduct at least 8 IPPI campaigns in the year (Alwar, Bharatpur, Dholpur). These DVS require additional DF for the storage of OPV (eg. Alwar needs space for 8 lac doses of OPV = 800 ltrs.) This requirement is fulfilled by 4 largeDFs which are dedicated for this purpose. However, these 4 units occupy valuable space in the DVS, whereas there is a shortfall of about 1,000 Lts of ILR space. Repaired or new equipment from Bharatpur RVS can fill this equipment shortfall.

At Bharatpur RVS, in the main hall, there are several DF kept for use for the polio campaign. 2 DF are used for freezing IPs and one small one along with the WIC to store OPV. Dholpur DVS was not assessed.

Rajasthan does not make use of any external facilities for storing routine or campaign vaccines.

Recommendations

- **There is an urgent need to increase the capacity of the SVS further for +2 to + 8^{o}C to ensure storage of at least 4 months of stock of all antigens except OPV. The new building should be completed in urgency and cold rooms put into operation rapidly.**
  - **The new building is currently planned for only 2 WICs. On the long run, the WIF should be installed adjacent to the WICs.**
- **At RVS level, the storage capacity of DFs and at DVS level, the storage capacity of ILRs and DFs must be adapted to be able to store a total of 4 months of stock.**
  - **One large ILR and one large DF must be also kept in reserve at every DVS.**
  - **Cold chain technician should check periodically that all additional equipment are operated for some hours once a month to keep them in running condition.**
- **Optimise use of the storage space at all RVS to offload the SVS.**
- **All DVS attached to their respective DVS need to be segregated – there should be physical differentiation of the RVS from DVS in terms of equipment and staff, even if both can be accommodated in the same room.**
- **Designate Bikaner RVS instead of Jodhpur RVS to keep 20% of the state stock, as I has sufficient free space. Jodhpur Airport can be used to ship the vaccines and a refrigeration van should be arranged for the safe transport of vaccines from Jodhpur airport to Bikaner RVS.**
- **Define Plans for handling excess stocks based on the different options available.**
  - **This should be part of the contingency plans.**

    Train staff at respective levels to implement this.

6.4 Status of Building, Equipment and Transport

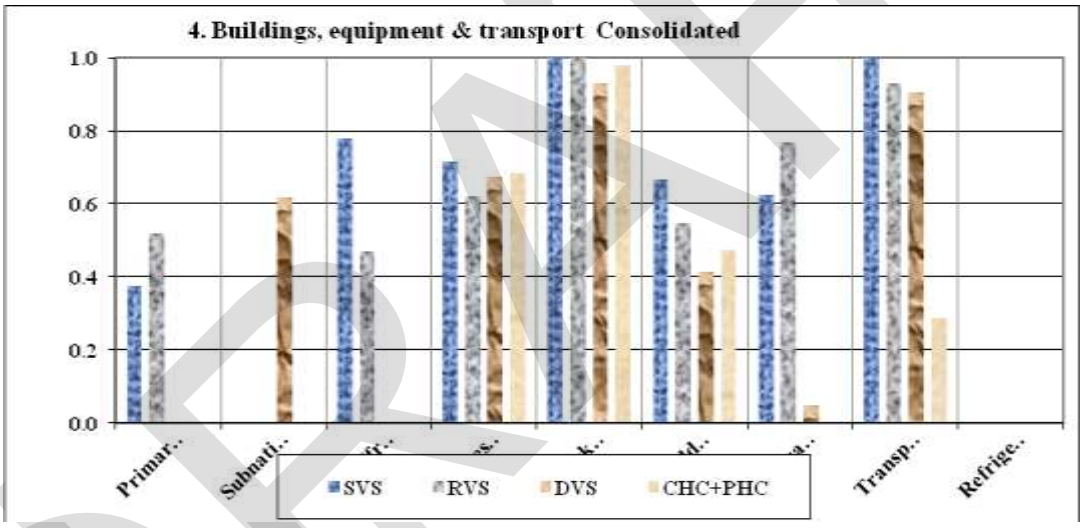
The good operating conditions of the building housing the vaccine store, the equipment storing the vaccines and the vehicles are important aspects to ensure safety of the vaccines.

The elements that are assessed here are :

- **The quality of building keeping the appliances and equipment,**
- **The space available for working,**
- **Correct operation of all equipment (WIF, WIC, DF and ILRs) for maintaining correct temperature**
- **Working acoustic alarm and 7 day graphic chart recorder**
- **Proper working condition of the stand-by generator and sufficiency of fuel,**
- **Good operation of all transport vehicles.**
- **Sufficient number of cold boxes, vaccine carriers and Ice packs.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	81%	76%	***69%***	76%



The scores and the bar graph above reflect the status of the equipment, building and transport at different levels. It presents minor limitations at all levels except at DVS level where it is weakest. At the same time the assessment identified several complementary limitations that are not directly scored in the tool which are important to be addressed as well. These are also discussed as part of the findings in this section.

SVS & RVS

Rajasthan has received two new WICs and a new building is which is earmarked for the new SVS is expected to be ready for use in about 3 months and the new WICs put into operation.

At Jodhpur the refrigeration units were never cleaned. Upon carrying out simple cleaning of the condenser resulted in a reduction of the load current by 20%. The auto start of WIC generator was also not working since some time. This was made operational the day following the assessment visit.

The WIC in Bharatpur was not cooling well. The evaporating temperature of 1st refrigeration unit was 14°C. Upon examination it was found that there was a leak in its condenser. The second unit was found to be having a lower charge. There is problem with one of the refrigeration units also at Bikaner (old WIC) and Udaipur.

The general status at the 7 zone vaccine stores is summarised in the table below. The strengths are marked in black and weaknesses are marked **in bold red fonts**.

Summary of Status at Zone Vaccine stores

Parameters	Ajmer	Bharatpur	Bikaner	Jaipur	Jodhpur	Kota	Udaipur	Remarks
Vaccine Handler	Y	Y	Y	Y	Y	Y	Y	
Duty(in %)	**50**	**50**	**50**	**50**	**50**	**50**	**50**	All VH are also handling adjoining DVS
Refrigerator Mechanic	1	1	1	2	2	1	1	At Jaipur there is also addl. 1 Mechanic who is part of mobile team
Helper	**X**	**X**	**X**	1	**X**	**X**	**X**	Only Jaipur has one helper.
Vaccine Store status	OK	Good	OK	OK	**X**	Good	**X**	All RVS are also housing DVS
Sufficient dry space	OK	OK	OK	OK	**X**	OK	**X**	Jodhpur has been improved following the visit
Repairing space	**X**	OK	Good	OK	**X**	**X**	**X**	
Continuous electricity	**X**	**X**	**X**	**X**	OK	**X**	**X**	No generator at Jaipur. Breakdown about2 hours.
Generator Status	OK	OK	OK	**X**	OK	OK	OK	Critical situation at Jaipur
No, ofILR awaiting repair	**4**				**8**		**3**	Details from all RVS missing
No. of DF awaiting repair	**2**				**3**		**3**	Details from all RVS missing
Condemned equipment	**11**	**101**						More equipment are lying at DVS
Stabilizers awaiting repair	**3**				**23**			Details from all RVS missing
Vehicle condition	OK	OK	OK	OK	OK	OK	OK	
Fuel sufficiency	OK	OK	OK	OK	OK	OK	OK	
Availability of drivers	OK	OK	OK	OK	OK	OK	OK	

The salient aspects that are worth noting are :

1. All the RVS vaccine handlers are working at 50% as they also manage the DVS located at the same venue as the RVS.
2. Except Jaipur none of the RVS have any helper to support the store keeper. The only second person available for support is the refrigeration mechanic, who also has other duties.
3. Three of the RVS have limited space for keeping equipment and ancillary materials. 4 of them do not have any space for repairing equipment – including Bikaner, which has a new building.
4. Except Jodhpur, all zone stores have some load shedding. Jaipur does not have any back up generator; it also does not have any WIC as it currently collects the stocks directly from the SVS as per needs.
5. Several equipment are awaiting repair or to get auctioned. Typically at Bharatpur 101 units, including 7 new ones from Haier were among these kept aside for auctioning. Only 88 of these were listed on the approved list for auctioning. The refrigeration mechanic could not explain the exact defects of these equipment.
6. Servo stabilizer at Udaipur RVS and Jaipur SVS is not working.

7. The acoustic alarm is fitted but do not seem to be function on the operating WIC & WIF at SVS, and several RVS (Jodhpur, Bharatpur).
8. All the vehicles are in order and there are sufficient number of drivers to ensure timely transport of vaccines.

DVS

The table below gives the summary of status at the 33 district vaccine stores as collected from the district staffs who have attended the training and analysis sessions. The strengths are marked in black and weaknesses are marked **in bold red fonts**.

Summary of status at the 33 DVS

Parameter	Positive	Negative	RemarksDistricts
DIO	29+4		Jodhpur, and Pali DIOs have been transferred and they are waiting that situation gets finalised. At Karauli and Bhlwara BCMO has been given the charge.
Vaccine Handler	33		these are MPW and clerical staff, SI, Refrig. Mechanics etc.
% Duty	100%		2 are Refrigeration Mechanics at 50%
Refrigerator Mechanic	32	**4**	10 are on contract , Pratapgarh does not have one & Dausa, Dhaulpur and Dungarpur do not have RM.
% Duty	100%		Jalore RM has 50% charge of Sirohi
Helper		**33**	No helper in any DVS
Vaccine Store status		**33**	most are small with insufficient space.
sufficient dry space		**33**	
Manual temp record	ok		Gaps on weekends and holidays.
Continuous electricity		**33**	Most have some load shedding (1-2 hrs daily), Tonk has 4 hrs per day,
Generator Status		**10**	Some don't have Generator,(eg.Chittorgarh, Bhilwara, Pratapgarh, Jaipur, Bara, Bundi, Barmar, Dausa, Rajsamnd, Banswara, Udaipur) Jaiselmer, Tonk, Nagaur have generator - but not connected.
No. of ILR awaiting repair		**n/a**	to note in individual districts
No. of DF awaiting repair		**n/a**	to note in individual districts
Condemned			Several equipment listed as condemned awaiting disposal
Stabilizers awaiting repair			Several non-functioning old models which will need to be condemned due to lack of spares.
Vehicle condition	31	2	Pratapgarh and Dausa do not have. Pratapgarh is likely to get soon.
Fuel sufficiency	33		
Driver	ok		

In summary the strengths are :

1. Almost all districts have a RCHO / DIO.
2. All the stores have someone appointed as a store keeper – though at times these are not of the right profile.
3. There are in all 32 mechanics.
4. Manual temperature records are being maintained except on weekend and pubic holidays.

The important limitations that are also present are:

- The appointment of 4 Districts RCHOs is pending confirmation,
- The supervision of the immunization programme by the RCHOs/DIOs is rather weak.
- Some of the refrigeration mechanics are not very well knowledgeable about repairing and 2 of them are working as vaccine handlers.
- None of the DVS have any helper for assisting the store manager.
- None of the DVS have adequate vaccine store.
- There is limitation of storage space for ancillary materials at most DVSs.
- There will be limitation of floor space to add more equipment which will be required to comply with GoI guidelines in terms of total storage capacity needed at the DVS.
- There is limitation of proper space for conducting repairs.
- 10 districts don't have generators and at 4 others they are not connected. There is load shedding at all districts.
- Condemned equipments are occupying usable space in many districts.
- The generator at Jodhpur was installed just beside the WIC, in the same room. The one at S. Madhopur has been installed but has never been used though there is power breakdown.

Staffing :

4 DVSs have been without refrigeration mechanic since several years.

In general whenever new staff is recruited, they must be provided proper orientation in their day to day operation and procedures. The newly appointed RM at Bharatpur has not undergone any training.

None of the DVS have any semi-skilled helper to assist the store keeper.

CHC & PHC

The space at most of the CHC and PHCs is insufficient to conduct any repair on spot.

In many CHC and PHCs the stabilizers are shared. Several stabilizers are no-functional. These are more than 10 years old, manufactured by AVR, Blue Star and Blueline, who even if in business, would no longer be producing similar models and electronic spares.

In most places the staff do not know how to pack the cold boxes and condition ice packs correctly.

Recommendations:

- **Ensure that both refrigeration units of a WIC are always in proper working condition. In case the second one fails while the first one is still not made operational, a situation of emergency will get created.**
  - **All WICs should also have functioning stabilizers**
- **The state store needs two semi-skilled helpers to support the store manager. They should be involved in regular manual recording of temperatures.**
- **At all RVS or DVS, appoint one adequate trained vaccine handler where the refrigeration mechanic or other category of staff is currently handling the task.**
  - **Appoint one semi-skilled helper at every RVS and DVS.**
- **All future Zonal Store should have adequate space for WIC, DF, dry space, workshop & packaging.**
  - **There should be adequate space to carry out equipment repairs at DVS and RVSs.**
- **Most DVS require revamping of basic infrastructure.** The plans and improvements already implemented in Orissa may be used as a starting point. **This should include:**
  - **Proper plastering of walls and improved electrical fitting**
  - **Fixing of wall shelves at head height to keep stationary and light dry material and wall supports to keep stabilizers and thus free floor space**

- **All DVS need to ensure sufficient space to accommodate the required number of ILRs and DFs based on the estimation of 3 months of working and 1 month of buffer stocks. It is also recommended to keep one extra ILR and DF in reserve.**
- **Ensure that gensets are procured and connected at every RVS and DVS.**
  - **All generators, currently installed inside the vaccine store should be relocated in an adjacent closed environment outside the main room (eg. Jodhpur).**
- **Install hooters at every WICs and WIFs to alert responsible staff in case the vaccine safety is jeopardises.**
- **Jaipur RVS needs new WIC & Genset. Replacement for the old WIC which may be allotted to RVS when the 2 new WIC are installed for SVS, should be planned.**
- **All defective old stabilizers, whose spares are no longer available, should be condemned and replaced with new ones.**
- **Each ILR and DF should have its own stabilizer to ensure that it is protected properly against any voltage instability**
- **There is an urgent need to implement the directives on how to dispose of all condemned items in order to optimise use of all usable space.**

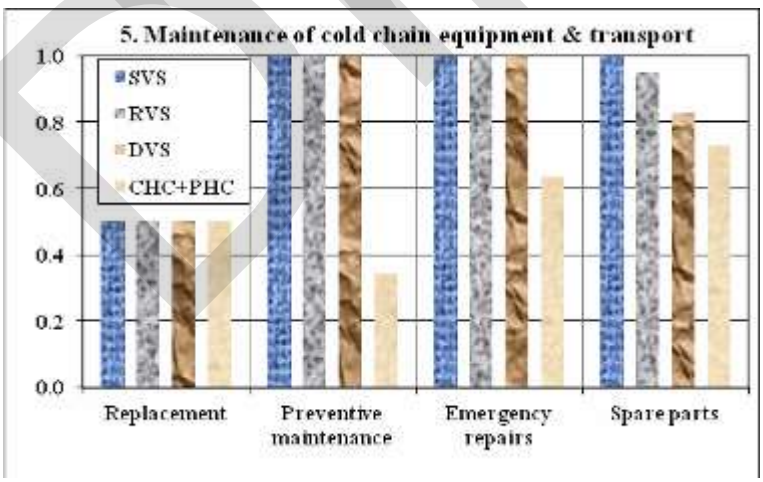
6.5 Maintenance of Building, Equipment and Transport

For ensuring a sustainable safety of the vaccines, the building, equipment and transport vehicles need to be maintained and upgraded periodically. Hence it is important to ensure that:

- **A replacement plan is in place for all outdated equipment and vehicles, and the same is being implemented,**
- **A periodic preventive maintenance plan for equipment and vehicles is also in place and being implemented,**
- **All equipment or vehicle failure is attended rapidly and that such failures have not caused damage to any vaccine,**
- **None of the equipment or vehicles have been out of service for more than 7 days due to lack of spares.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	89%	88%	88%	79%



The score indicates good performance at all levels. One of the reasons is that an error was found in the weightage factors which causes that if the score for all the questions were perfect (maximum), then the total score would be more than 100%. The consultant was not able to rectify this error. This is particularly seen on the bar graph on the left. Though there are gaps in preventive maintenance, and the score inserted is 2 or 3 out of 4, the bar graphs shows 100%.

In reality, there are no real plans for preventive maintenance. Service is basically on demand. Refrigeration technicians visit the CHC and PHCs during the vaccine deliveries and have a quick look at the equipment. It is a minimum form of preventive maintenance. Maintenance of vehicles is carried out according to its mileage.

Vaccines have never been damaged due to failure of equipment. In such cases, the non-functional equipment is promptly replaced with a new one is usually returned to the RVS or DVS and awaits action by the refrigeration technician. The response time of the technicians, though not monitored, does not seem to be very good from the number of equipment that are accumulated for repairs. This is not a very sustainable manner of ensuring a functioning cold chain.

The replacement plans for equipment have been submitted to GoI. For vehicles replacement is carried out when the vehicles are out of service.

There have been several instances of breakage of the hinge attached to the doors of ILRS and DFs. This is caused due to 2 reasons: a) absence of regular maintenance of the hinge by putting some lubricant for the articulation and b) the axis of the hinge is resting on the sharp edge of the spring holder. The solution lies in adding a small cup to the hinge that will bear the load of the door when it is opened

Many technicians are not fully trained and competent. The Refrigeration Mechanic at Bharatpur was appointed recently. Such lacuna lead to high number of equipment awaiting repair and unclear status of condemned equipment, as is the case at most RVS and DVS. The technicians are also not fully familiar with the process of auctioning which needs to be handled at another level. Spare part do not seem to be a problem at the upper vaccine stores.

Hence in order to redress these issues the following recommendations need to be implemented:

- **In order to ensure sustainable operation, there is an imperative need to prepare work plans for the refrigeration technicians and have the CCO to monitor their operations. The plans should include preventive maintenance and on demand repairs.**

  The supervision / verification of repair works should look into the total holding time (duration between the reporting of a breakdown to the day when the equipment is back into operating condition). This reflects the efficacy of the refrigeration technician and repair operation
- **State level experienced technician should be sent to work with the RVS / DVS technicians, to**
  - **Examine all non-functional units, and conduct repairs along with the local technician (in form of hands on training).**
  - **Condemn all non- repairable units- and issue define the reason for condemnation.**
  - **Technicians should maintain a repair log for each equipment. This can be included in the temperature recording booklet**
- **Special action needs to be pursued urgently for all defective Haier equipment as these may be still replaceable/ repairable under warrantee.**
- **Add metal plate bush to all hinges in the old equipment. As illustrated above.**
- **It is important to define the total quantity of excess equipment after adequate allotment for required capacity at RVS and DVS. Future indent should consider the new equipment in stock to ensure that excess stock of new equipment is avoided.**
  - **It is preferable to use repaired equipment to replace defective ones.**
- **To motivate the refrigeration mechanics, by reviewing their salary structure:**
  - **For contract workers, the current salary is Rs. 4,500 as compared to approximately Rs. 12,000 for regular refrigeration mechanics, based on Rs.5,200 scale.**

- **The regular Refrigeration Mechanics have a salary which is lower than the drivers.**

6.6 Stock Management

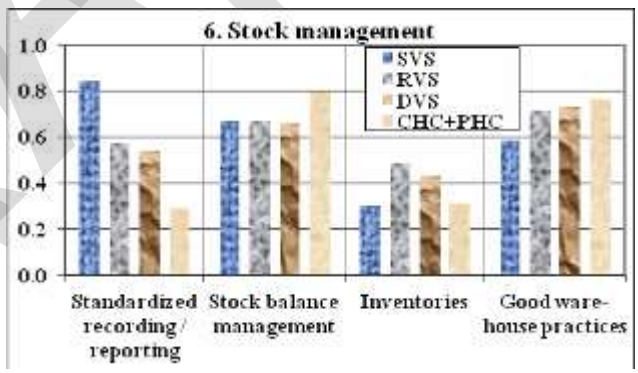
In order to maintain the quality of vaccines throughout the cold chain, it is essential to keep complete and accurate records of all stock transactions. A stock control system comprises of three steps, each of which must be performed regularly, accurately and completely. The three steps are checking and recording details of vaccine consignments or stocks when: 1. they arrive, 2. during their storage and 3. they leave the storage point. Here the following issues are assessed:

- **All lots of vaccines and diluents have been recorded along with all their salient parameters,**
- **Proper requisition and receipt forms are in place,**
- **Stocks are maintained between safety and maximum stock levels,**
- **Stocks are well laid out with contents list**
- **Deliveries are made following Early Expiry First Out (EEFO),**
- **Store keepers know when to over ride EEFO based on VVM status,**
- **Periodic physical verification are carried out and**
- **Stocks and records are safe.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	*63%*	*61%*	*58%*	*42%*

The scores above and the bar graph indicate that this indicator is one of the weak one in performance.



The strengths observed are as follows:

1. All vaccine arrivals and supply are well recorded at SVS,
2. The EEFO principle and use of VVM as a management tool is being practiced in several places – except where untrained staff is deputed.
3. The vaccine stock and records are securely stored.

At present, the system does not have any adequate stock register specifically designed for this purpose. Registers available from local stationary shop or even a diary is used (eg. Bilaspur) to record the stocks. In rare instances, some old printed registers are available (eg. Takatpur CHC) and only in such exceptional cases, most of the details of vaccines (except VVM status) are recorded properly. This leads to the following important gaps :

- VVM status is never recorded on the receipt and delivery of vaccines.
- Diluents are never recorded in the stock register at any level except SVS.
- Physical verification is not carried out at and recorded at any level.
- Stocks do not match with stock records at all levels. Particularly there is no record of diluents - and mismatch were found between vaccine stock and its corresponding diluent.

  Bharatpur: BCG:(stock and stock book) 25220 diluent = 19203 Jodhpur: BCG: 76,000 in stock book and actual 78,650 and diluent = 80,000. TT stock in register =3,500 and actual 10,210.

Despite the small quantities of vaccine kept at CHC & PHC, the quantities of vaccines and diluents do not match always with what is recorded.

While the supply is recorded in a predefined printed voucher, there is no specific form for vaccine indent from one level to another. A blank sheet is used to indent vaccine requirement. This introduces scope of missing out on one of the vaccines, or providing basic information such as stock in hand.

Most staff know EEFO & use of VVM at RVS/ DVS/ CHC/ PHC, however, at field level there seems to be limited implementation of EEFO and VVM as management tool.

In many stores, due to the unwanted clutter of non-usable material and stationary, there is poor warehouse practice. The physical condition and cleanliness need improvement. At Bharatpur 30% of the store was occupied with non-immunization material. Jodhpur RVS was also another case, which was corrected in the next days upon request by the assessment team.

With these serious shortcomings it is necessary to redress the concerns and enhance the performance with the help of the following recommendations:

Recommendations:

- **The state needs a Vaccine Logistic Manager at the state level who can ensure proper management of vaccine logistics right from the SVS level downwards. He will also provide necessary support to all Zone / RVSvaccine logistic managers to ensure adequate stocks and proper use of storage capacity at the RVS level.**
  - **There is a need for one vaccine logistic manager at every zone /RVSs that these can ensure proper vaccine management at their respective DVS and below them.**
  - **Govt. of Rajasthan plans to appoint one pharmacist to handle the DVSs. They should be trained adequately before deputation.**
- **Define, print and supply, standardize stock registers at all vaccine stores to ensure proper recording of all salient parameters of vaccines and diluents.** Formats introduced in Orissa may be considered for developing new registers.
  - **Impart training on proper use of stock register at all levels with all salient parameters,**
  - **All salient parameter of vaccine & diluent to be noted, particularly the VVM stage and manufacturers of each vaccine. batch no, expiry date.**
- **Diluents must be recorded with as much importance as the vaccines in the stock book.**
- **Retrain staff to understand use of EEFO and VVM as management tools.**
- **Implement practice of monthly physical verification of all antigen at DVS, CHC and PHC level. And quarterly verification at SVS and RVS level. Result of physical verification must be marked in the stock register along with correct or difference.**
  - **The same should be countersigned by the supervisor.**
- **Policy & training on proper management of Vaccine or diluent when either is broken needs to be imparted.**
  - **The correct practice needs to be supervised.**

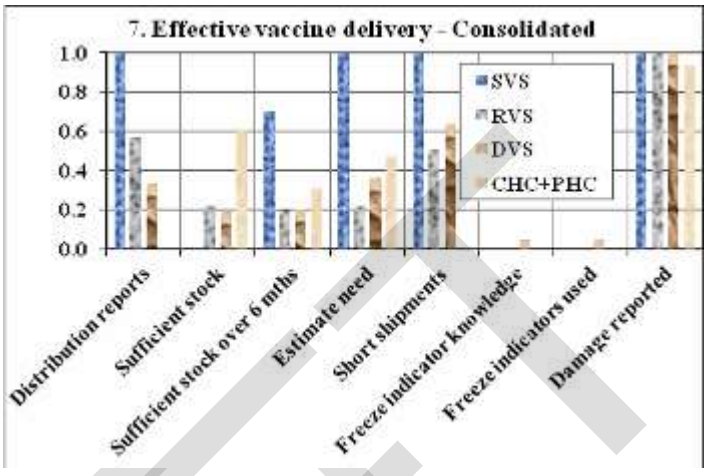
6.7 Effective Vaccine delivery

For an effective immunization programme timely deliveries and sufficiency of stocks are necessary. The parameters assessed to ensure the effectiveness of delivery are:

- **The vaccine distribution system is planned and implemented in timely fashion,**
- **Sufficient stocks of vaccines and diluents are available for supplies to the lower level stores,**
- **There is sufficient stock until next delivery,**
- **Staff is knowledgeable on how to estimate the vaccine requirements,**
- **A system is in place for managing the short supplies if it occurs, and**
- **Freeze indicators are correctly used in all deliveries.**
- **In case of vaccine damage during transport the same is reported ad the quantities replaced.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	*68%*	*43%*	*43%*	*55%*



This is another weak area of performance. At state level, it is better than elsewhere

There is no proper plan for the vaccine indenting and supplies. The indenting is done, in most cases, using a blank form or even by phone. As a result, there are chances of missing out on some antigen or information.

The current practice is to make deliveries to the lower levels once every month. Thus, once every month, the RVS send vaccines to DVS, DVS deliver vaccines to CHCs and they in turn to the PHCs.

Most staff at all levels do not know the correct method of estimating vaccine needs. During the VMAT training the consultant spent more than half day to review the basics and helped the participants to calculate for themselves their vaccine requirements based on their own target groups for one of the antigen. He further provided them with a simple excel table detailing the calculations for their vaccine store with computation of the working stock and buffer (safety) stocks based on the GoI guidelines.

Due to incorrect method of calculation and lack of keeping any buffer stocks, there have been several instances of stock outs or low stock levels. Some of the instances of stock outs, in the past 6 months at the RVS and their attached DVS are listed below.

Vaccine store	Antigen	Stock out form	Till
RVS-Bharatpur	DTP	6 Nov. 09	16 Nov. 09
RVS Ajmer	OPV Measles	22 March 10 4 Nov. 09	….? 11 Nov. 09
RVS Bikaner	Measles	8 Feb. 10	12 Feb. 10
RVS Jodhpur	Measles	30 Sept. 09	4 Nov. 09

No damage to vaccine is reported at any level due to problems at delivery.

Staff in the field do not know how to condition ice packs. The current practice puts serious threat of freezing of the liquid vaccines. Staff at DVS also not fully knowledgeable about correct way of packing cold boxes.

The state has not yet to implemented use of freeze indicators, as the same is still awaited from GoI.

The following suggestions are provided for redressing the weaknesses:

Recommendations:

- **Train DVS and Service level staff in proper vaccine estimation methods to determine the working and buffer (safety) stock based on GoI guidelines.**
- **Ensure that indent and storage are based on correct practices based on the respective peak and minimum stocks based on the working and buffer (safety) stocks:**
  - **RVS & DVS : 3 months working stock and 1 month buffer (safety)** Error! Reference source not found.
  - **CHC& PHC : 1 month working stock and 0.5 month buffer (safety) stock.**
  - **RCHOs or other responsible persons should verify that the correct practice of stock management is maintained.**

- **Define a comprehensive indent and distribution plan – at all levels starting from SVS down to PHC based on safety stocks requirements, working stocks and available storing space**
- **Define a comprehensive indent form which also includes the details of quantities used and balance in stock.**
- **Training on proper icepack conditioning & vaccine packing in the cold box needs to be imparted at all levels.**
- **Provide and implement use of freeze indicators at all levels for use during transport of freeze sensitive vaccine.**
- **RCHOs and MOs should randomly monitor preparation, packing and dispatches of vaccines.**

6.8 Correct diluents use for freeze dried vaccine

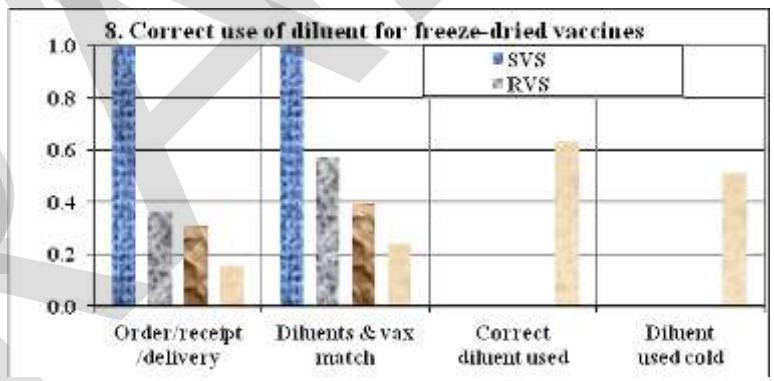
For the freeze dried vaccines the following parameters are assessed:

- **The freeze dried vaccines and their corresponding diluents are correctly ordered, received, stored and distributed,**
- **The vaccines are always used with their corresponding diluents,**
- **Diluents are maintained at +2 to +8 C, same as the vaccine before reconstitution.**

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	**100%**	~~**46%**~~	~~**35%**~~	~~**41%**~~

The management of diluents along with their respective vaccine is good and reliable at the state level, which results in 100% performance. Particularly the quantities are recorded and match with each other when checked physically. The supplies of vaccine and diluent are also conducted in matching numbers. This is reflected by 100% score on the bar graph on the left.



The practice is poor below the state level. There are practically no records of diluent information. Physical check has also revealed several serious mismatches at all levels. The table given alongside illustrates the situation at one RVS. There variance in the quantities of vaccine and diluents have been large from one make to another.

Vaccine type	Vaccine	Diluent	Vac. – Dil.	Variance
Measles (Abhay)	16,800	29,500	-12,700	-76%
Measles(SII)	19,000	11,000	8,000	42%
Total	**35,800**	**40,500**	**-4,700**	-13%

Similar differences were spotted in several cases and different levels. In another hospital, the entire stock of measles vaccine was from one manufacturer while the diluent was from another one, which is a wrong practice.

At service level, there is problem regarding proper cooling and systematic use of cooled diluent (eg. Sardar Sahar, Sajjangarh). Such practices also result from lack of proper training to the vaccine handlers before deputation. On the other hand it was indeed surprising to find the diluents of BCG in the WIC at RVS-Bharatpur.

Several staff at the field level have the understanding that Measles is reconstituted with diluent which is a form of distilled water and BCG with saline water (eg. J.S. Hospital – Jaiselmer).

Some staff have the good habit of marking the date and time of reconstitution of the Measles and BCG on the vial (eg. S. J. Hospital – Jaiselmer).

Hence the recommendations are:

Recommendation:

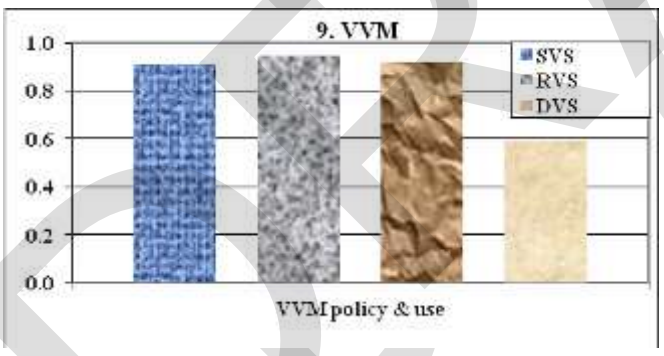
- **During every training related to diluents, the language used MUST avoid the words water, distilled water or saline water and emphasise that the specific diluent manufactured by the same company MUST be used exclusively.**
- **To minimise problem of mixing manufacturers during supply and use of freeze dried vaccines, the vaccine handler should make an identical identification mark on both the cartons of vaccines and diluents supplied together.**
  - **In case due to breakage or improper storage there develops a mismatch on the quantity of vaccine and diluent then the VH will realise that he needs to take extra care to supply the right alternative from the correct manufacturer.**
- **There is an urgent need for training staff in correct indenting and supply of diluent particularly at DVS and CHC levels.**
- **Ensure that at service level, all diluents are kept in the cold chain all the time as there is enough cold chain capacity. This will endure that the diluent is always kept in the cold chain for minimum of 24 hours before use.**

6.9 Effective VVM use

VVM are correctly interpreted and used in vaccine management of the EPI programme.

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	**91%**	**95%**	**92%**	86%



This is an area of overall strength. Most staff at all levels know how to read VVMs and also to use them as a management tool. The only exception is the newly deputed staff r some very old staff who are in service since more than 20years.

There are no posters or stickers for reference about VVM, particularly at the service points.

Recommendations

- **On the next opportunity of a state level polio campaign or NID, print and distribute posters on VVM at all CHC and PHCs for quick and easy reference.**
  - **Such posters and other IEC materials should be sent directly to the RCHOs because otherwise they tend to remain unused in the CM&HO's stores.**
- **In all trainings of vaccine handlers and immunization staff should devote 10 minutes for a quick revision and clarifications related to VVM.**

6.10 Multi Dose Vial Policy

The MDVP is implemented correctly.

As the govt. of India has not adopted this policy, this criterion is not assessed.

At Jaipur DVS, 11 bottles used / open vials of OPV were lying in DF since the last campaign in March. The staff was not able to give convincing reply for this.

During Polio campaign, the unused polio doses are permitted to be returned to the cold chain to be reused the next day provided the VVM is in good condition. In 2004, there was some training on reuse of liquid vaccines over 24 hours, by returning the vial to the cold chain in the evening.

Open vials of OPV from the last campaign held in February 2010,TT and DTP were found in several paces at the PHC and CHC level. There seems to be some miscommunication regarding the open vial policy. The instruction to stop the 24 hours reuse policy does not seem to have been clearly reached all (Sanghaner, J.S. Hospital- Jaiselmer. Such practice may lead to AEFIs and it is important to keep a watch.

Recommendations:

- **There should be proper monitoring of proper follow up of directives given during campaigns regarding reuse of open vials over several days.**
- **Monitoring is needed of proper follow up of instruction related tohow to discard all open vials after the campaigns and what to do with the unopened vials.**
- **The BMO or the MO should periodically monitor the contents of the cold chain to ensure that the correct vaccines are stored properly.**
    - **All used, opened and damaged vaccines should be disposed off according to the state guidelines.**

6.11 Vaccine wastage control

A vaccine wastage monitoring system should be in place so that the store manager can use it to assess wastage and also make necessary corrections when re-ordering vaccines. The information should be used to incorporate improvements in the system to reduce wastage in future.

Findings

Vaccine Store	State	Zone	District	CHC / PHC / UC
Performance Score	~~0%~~	~~7%~~	~~11%~~	~~10%~~

This criteria was not assessed systematically, as it was felt that it was more important to focus on the other aspects. One of the major source of wastage is through unopened vials with VVM intact which are not returned systematically, at the end of the day, by the health workers who take them for out-post sessions. Besides, currently there is no system to monitor the wastage of any unopened vials.

Hence the score above cannot be taken as any indicator of wastage control.

The current level of knowledge of wastage control is poor, and there is no formal system to monitor wastage. There is no systematic practice of monitoring. Hence adequate use of any kind of information on wastage is not possible.

Recommendations:

- **Establish system and encourage staff to record all kinds of wastages without apprehension of disciplinary action on them.**
- **Efforts to reduce wastages should not result in missing out any child. GoI clearly states that every child should be vaccinated – staff should be encouraged to open a vial even if it is just for a single child.**

7. General Findings & recommendations

1. Staff seem to have good practice of using Hub cutters immediately after immunization.
2. Records of immunization are well kept and some staff are able to relate that the BCG immunization quantum reflects the target group for OPV and DTP in the coming months.
3. The instructor of a nursing institute at Sawai Madhopur was not very knowledgeable in vaccine handling.

Recommendation :

- **There are totally 32 Nursing institutions across Rajasthan that are forming the future nurses. Staff conducting training of ANMs at the District nursing institutes should be oriented with some extent of practical experience in the key areas of vaccine handling, so that proper updated information is imparted to the nurses by the faculty.**
- **All RCHOs / DIOs, & MOs should be oriented on the periodic supportive supervision activity. It should include a check list.**

8. Additional tasks done

The mission was aimed at training health staff in the use of VMAT and conducting the assessment in selected locations. During the mission as an add on to this Terms of reference, in order to contribute to the mission in the best possible manner, the consultant has also involved two of his colleagues, Mr. Anshu Kumar (refrigeration expert) and Ms. Meghna Udgire (Vaccine specialist) in parts of the mission.

They both contributed to strengthen the different activities of the mission and provide necessary support to the participants.

The consultant also took the initiative to provide the following additional reports (numbered as A..) which in his opinion will contribute to improving the immunization programme of Rajasthan:

1. A1-Suggestions for the Temperature monitoring booklet
   - The temperature monitoring booklet distributed at each service level has some very good and useful information in it. This report provides some suggestions to improve some of its salient aspects.
2. A2-Suggestions for Technical strengthening of cold chain
   - During the assessment, several different technical weaknesses have been identified. This report provides tips to take care of some of the common issues in a manner that will contribute to avoiding them without much cost.
3. A3-Report on Special observations and supportive supervision by the Consultant team during assessment visit
   - As the name suggests, this report lists the observations specific to the locations visited by the consultant team during the assessment.
4. A4-All Special observations and supportive supervision in Rajasthan
   - This report provides the consolidated list of the observations and supportive actions carried out by each of the team in the specific zones they visited during the assessment.

In addition, the consultant had proposed each team to make a brief presentation of their findings during the debriefing, based a pre-defined structure of the presentation. The **seven power point presentations** prepared by the RCHOs and MCHO coordinators are provided along with the consultants presentation file.

The above-mentioned exercise was an added exercise with the aim of stimulating ownership of the participants through due credit to them for their genuine efforts.

9. Conclusion

The VMAT exercise has helped to identify the strengths and weaknesses of the current vaccine and cold chain management system. The performance on the whole is particularly poor in most of the areas. Specific recommendations are given in detail in section 6 under respective indicators to address these weaknesses.

There is a significant level of work to be done. In view of this, most of the key recommendations have been consolidated for implementation according to the following category:

A. Human Recourse
B. Infrastructure
C. Technical
D. Planning & Documentation
E. Capacity building
F. Practices to be implemented and
G. Supervision

The action to be implemented is divided into three categories in terms of priority:

1. To be implemented immediately or within the next 3 months
2. To be implemented within the next 6 months and
3. To be implemented within the next 12 months.

A. Human Resource		
Ser. #	**Priority**	**Action to be implemented**
1	1	It woud be better to avoid changing the vaccine handling staff too often. Ideally, the MoH&FW MUST ensure that properly trained and serious vaccine handlers are only appointed at each vaccine point. Staff at zonal or district store handling large volumes of vaccines must be tested for his competence. Govt. of Rajasthan plans to appoint one pharmacist to handle the DVSs. They should be trained adequately before deputation, otherwise large volumes of vaccines will be at stake. All newly appointed staff in the field must be provided with a proper training in the handling and storage of all the vaccine in ILRs at CHCs and PHCs, otherwise there is risk of vaccines lossing their potency. It is preferable to train at least two staff at every vaccine store so that in the absence of one the other can handle the task without making mistakes**.**
2	1	At all RVS or DVS, appoint one adequate trained vaccine handler where the refrigeration mechanic or other category of staff is currently handling the task.
3	2	The state needs a Vaccine Logistic Manager at the state level who can ensure proper management of vaccine logistics right from the SVS level downwards. ➢ He will also provide necessary support to all Zone / RVS vaccine logistic managers to ensure adequate stocks and proper use of storage capacity at the RVS level. There is a need for one vaccine logistic manager at every zone /RVS s that these can ensure proper vaccine management at their respective DVS and below them.
4	2	The state store needs two semi-skilled helpers to support the store manager. They should be involved in regular manual recording of temperatures. ➢ Appoint one semi-skilled helper at every RVS and DVS.
5	3	To motivate the refrigeration mechanics, by reviewing their salary structure: ➢ For contract workers, the current salary is Rs. 4500 as compared to approx. Rs. 12,000 for regular refrigeration mechanics, based on Rs. 5,200 scale. ➢ The regular RM have a salary which is lower than the drivers.

B. Infrastructure		
Ser. #	**Priority**	**Action to be implemented**
1	1 3	There is an urgent need to increase the capacity of the SVS further for +2 to + 8°C to ensure storage of at least 4 months of stock of all antigens except OPV. The new building should be completed in urgency and cold rooms put into operation rapidly. ➢ The new building is currently planned for only 2 WICs. On the long run, the WIF should be installed adjacent to the WICS.
2	1	At RVS level, the storage capacity of DFs and at DVS level, the storage capacity of ILRs and DFs must be adapted to be able to store a total of 4 months of stock. ➢ One large ILR and one large DF must be also kept in reserve at every DVS. ➢ Cold chain technician should check periodically that all additional equipment are operated for some hours once a month to keep them in running condition.
3	2	All DVS attached to their respective DVS need to be segregated ➢ There should be physical differentiation of the RVS from DVS in terms of equipment and staff, even if both can be accommodated in the same room.
4	2	All future Zonal Store should have adequate space for WIC, DF, dry space, workshop & packaging. There should be adequate space to carry out equipment repairs at DVS and RVSs.
5	3	Most DVS require revamping of basic infrastructure. The plans and improvements already implemented in Orissa may be used as a starting point. This should include: ➢ Proper plastering of walls and improved electrical fitting ➢ Fixing of wall shelves at head height to keep stationary and light dry material and wall supports to keep stabilizers and thus free floor space

C. Technical Aspects		
Ser. #	**Priority**	**Action to be implemented**
1	1	Procure good quality chart recorders from local market for both the WICs and the WIF with sufficient supply of accessories (paper, pens and ink). This would also reduce the administrative load of ordering and importing such items in future.
2	1	Ensure that both refrigeration units are always in proper working condition. In case the second one fails while the first one is still not made operational, a situation of emergency will get created.
3	1	There is an urgent need to implement the directives on how to dispose of all condemned items order to optimise use of all usable space.
4	1	All WICs should have functioning stabilizers
5	1	Install hooters at every WICs and WIFs to alert responsible staff in case the vaccine safety is jeopardizes.

C. Technical Aspects		
Ser. #	**Priority**	**Action to be implemented**
7	1	State level experienced technician should be sent to work with the RVS / DVS technicians, to : ➢ Examine all non-functional units, and conduct repairs along with the local technician (in form of hands on training). ➢ Condemn all non- repairable units - and define the reason for condemnation.
8	1	Special action needs to be pursued urgently for all defective Haier equipment, as these may be still replaceable/ repairable under warrantee.
9	2	All DVS needs to ensure sufficient space to accommodate the required number of ILRs and DFs based on the estimation of 3 months of working and 1 month of buffer stocks. It is also recommended to keep one extra ILR and DF in reserve.
10	2	All defective old stabilizers, whose spares are no longer available, should be condemned and replaced with new ones. Each ILR and DF should have its own stabilizer to ensure that it is protected properly against any voltage instability
11	2	Ensure that gensets are procured and connected at every RVS and DVS. ➢ All generators, currently installed inside the vaccine store should be relocated in an adjacent closed environment outside the main room (eg. Jodhpur).
12	2	Add metal plate bush to all hinges in the old equipment.
13	3	Provide and implement use of freeze indicators at all levels for use during transport of freeze sensitive vaccine
14	3	Jaipur RVS needs new WIC & Genset. Replacement for the old WIC which may be allotted to RVS when the 2 new WIC are installed for SVS, should be planned.

D. Planning & Documentation Aspects		
Ser. #	**Priority**	**Action to be implemented**
1	2	A system for recording damage in the stock book should be developed so that stock records match with actual physical stock. ➢ Encourage staff to record all kinds of wastages without apprehension of disciplinary action on them.
2	2	Written contingency plans are needed at every level. This should include the safe hold over time of the equipment beyond which the action should be considered. Contingency plans at SVS, RVS and DVS MUST also include periodic check of generator and fuel status. Staff at service level MUST be familiar with the contingency plans provided in the temperature monitoring booklet. Contingency plans MUST include how to handle excess stick of vaccines, since equipment failure results in excess stock that needs to be taken care of. The staff should be trained in implementation of contingency through mock exercise.

3	2	Designate Bikaner RVS instead of Jodhpur RVS to keep 20% of the state stock, as it has sufficient free space. A refrigeration van should be arranged for the safe transport of vaccines from Jodhpur airport to Bikaner RVS.
4	2	In order to ensure sustainable operation, there is an imperative need to prepare work plans for the refrigeration technicians and have the CCO to monitor their operations. The plans should include preventive maintenance and on demand repairs.
5	2	It is important to define the total quantity of excess equipment after adequate allotment for required capacity at RVS and DVS. Future indent should consider the new equipment in stock to ensure that excess stock of new equipment is avoided. It is preferable to use repaired equipment to replace defective ones.
6	2	Define, print and supply, standardize stock registers at all vaccine stores to ensure proper recording of all salient parameters of vaccines and diluents. Formats introduced in Orissa may be considered for developing new registers.
7	3	On the next opportunity of a state level polio campaign or NID, print and distribute posters on VVM at all CHC and PHCs for quick and easy reference. Such posters and other IEC materials should be sent directly to the RCHOs because otherwise they tend to remain unused in the CM&HO's stores.

E. Capacity Building		
Ser. #	**Priority**	**Action to be implemented**
1	1	Train DVS and Service level staff in Ice-pack conditioning & vaccine packing.
2	1	There is an urgent need for training staff in correct handling, indenting & management and use of diluents particularly at DVS and PHC levels. This should include the practice of putting the diluent at 2-8^{o}C at least 24 hours prior to immunization.
3	1	All RCHOs / DIOs, & MOs should be oriented on the periodic supportive supervision activity. It should include a check list.
4	2	In all trainings of vaccine handlers and immunization staff should devote 10 minutes for a quick revision and clarifications related to VVM.
5	2	Conduct some form of motivational workshops needed for field staff, with public representative, with the help of dedicated performing workers
6	2	Retrain staff to understand use of EEFO and VVM as management tools
7	2	Training to related health staff needs to be imparted on the following aspects a. Handling of excess stocks based on available space in the local private facilities and that at lower levels. b. Use of stock register at all levels with all salient parameters including VVM status, c. Proper vaccine estimation methods to determine the working and buffer (safety) stock based on GoI guidelines. d. Proper management of Vaccine or diluent when either is broken. e. How to note wastage at all levels with adequate documentation of proof.

E. Capacity Building		
Ser. #	**Priority**	**Action to be implemented**
8	2	Ensure that at service level, all diluents are kept in the cold chain all the time as there is enough cold chain capacity. This will endure that the diluent is always kept in the cold chain for minimum of 24 hours before use.
9	2	Train DVS and Service level staff in proper vaccine estimation methods to determine the working and buffer (safety) stock based on GoI guidelines.
10	3	There are totally 32 Nursing institutions across Rajasthan that are forming the future nurses. Staff conducting training of ANMs at the District nursing institutes should be oriented with some extent of practical experience in the key areas of vaccine handling, so that proper updated information is imparted to the nurses by the faculty.
11	1	Refresher course for all refrigerator mechanics with hands on practical in Good Servicing Practices

F. Practices to be Reinforced		
Ser. #	**Priority**	**Action to be implemented**
1	1	In order to ensure safe storage of vaccines, WHO recommends manual recording of temperature twice daily - 7 days on 7 of all equipment containing vaccines. A system to instill this practice needs to be developed with the help of staff who is on site, or through some form of additional incentive. ➢ Staff should always ensure that the thermometers are in proper working condition. ➢ Instill the practice through proper training to ensure that CHC and PHC staff monitor and record the temperature correctly and reliably. ➢ Temperature records should be periodically signed
1	1	In order to ensure proper traceability of each lot of vaccine arriving in the state, it is recommended to fill up the VAR for every type and lot of vaccine.
3	1	Emergency numbers must be posted using the template provided in the temperature recording
4	1	Ensure that indent and storage are based on correct practices based on the respective peak and minimum stocks based on the working and buffer (safety) stocks: ➢ RVS & DVS : 3 months working stock and 1 month buffer (safety) Stock. ➢ CHC & PHC : 1 month working stock and 0.5 month buffer (safety) stock.
5	1	To minimise problem of mixing manufacturers during supply and use of freeze dried vaccines, the vaccine handler should make an identical identification mark on both the cartons of vaccines and diluents supplied together. In case due to breakage or improper storage there develops a mismatch on the quantity of vaccine and diluent then the VH will realise that he needs to take extra care to supply the right alternative from the correct manufacturer.
6	1	Diluent should be recorded just like the vaccines

F. Practices to be Reinforced		
Ser. #	**Priority**	**Action to be implemented**
7	2	During every training related to diluents, the language used MUST avoid the words water, distilled water or saline water and emphasize that the specific diluent manufactured by the same company MUST be used exclusively.
7	1	Implement practice of physical verification of all antigen : ➢ Once every month at DVS, CHC and PHC level ➢ Once every quarter at SVS and RVS level. ➢ Result of physical verification must be marked in the stock register along with correct or difference. ➢ The same should be countersigned by the supervisor
8	2	The staff need to be encouraged to note all damaged vaccines at all levels with adequate documented proof.
9	2	Optimize use of the storage space at all RVS to offload the SVS.

G. Supervision		
Ser. #	**Priority**	**Action to be implemented**
1	2	Supervision by RCHOs / DIO (DVS) / BMO (CHC) /MO (PHC) in the following areas: a. Ensure proper IP conditioning b. Proper packing and dispatches of vaccines, including with use of freeze indicators when implemented c. Verify temperature records & sign them after ensuring proper temperature management of cold chain d. Verify stock records and stocks and sign them after ensuring sufficiency of working and safety stocks e. Open ILRS and ensure that : i. All vaccines are stored in ILRs ii. No open vials are found in the cold chain f. During immunization session, staff always use hub cutter g. The monthly maintenance plans and its implementation of the technician h. The repair records of the technician to ensure quick response time to put the equipment into operation i. All used, opened and damaged vaccines should be disposed off according to the state guidelines.
	2	The supervision / verification of equipment repair works should look into the total holding time (duration between the reporting of a breakdown to the day when the equipment is back into operating condition). This reflects the efficacy of the refrigeration technician and repair operation
	3	There should be monitoring of proper follow up of directives given during campaigns regarding reuse of open vials over several days.
	3	Monitoring is needed of proper follow up of instruction related to how to discard all open vials after the campaigns and what to do with the unopened vials.

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