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Reaching Impact, Saturation, and Epidemic Control (RISE)

Trainer's Handbook

BASICS OF MEDICAL OXYGEN MANAGEMENT SYSTEMS

Acknowledgments

This trainers' handbook on the "Basics of Medical Oxygen Management Systems" by PATH, which is the implementation partner for USAID RISE Project, which is primed by Jhpiego. PATH supports the USAID RISE project in building and upgrading capacities of critical workforce and decision makers for maintenance, operationalization of oxygen infrastructure, hygienic use of oxygen and respiratory care equipment for successful administration of medical oxygen therapy.

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Acronyms

BiPAP	Bilevel Positive Airway Pressure
CPAP	Continuous positive airway pressure
HFNC	High flow nasal cannula
LMO	Liquid medical oxygen
LPM	litres per minute
MGPS	Medical gas pipeline systems
MT	metric ton
NIV	Non-Invasive Ventilation mask
OCMIS	Oxygen Concentrators Management Information System
ODAS	Oxygen Demand Aggregation system
ODTS	Oxygen Digital Tracking System
PSA	Pressure swing adsorption
SOP	Standard Operating Procedure
UNICEF	United Nations Children's Fund
WHO	World Health Organisation

Context

India experienced the worst of the COVID-19 pandemic. Reported daily new infections in India had crossed the 400,000 mark with daily reported deaths are more than 2,700. The demand for hospital beds, personnel, drugs, testing kits, and life-saving oxygen spiked to unprecedented levels. The demand for medical oxygen peaked to around 11,000 MT per day by the beginning of May from around 3,800 MT per day in the mid-May 2021, over four times the pre-second wave levels. Pushed to the limits of what it could achieve, given its current state, the healthcare supply chain snapped at many places.

Although medical oxygen is an essential medicine that is used in care for patients across the healthcare systems, the pandemic has accelerated its demand and made the delivery of oxygen supplies more urgent than ever. As part of its preparations for the third wave for COVID-19, the Government of India and its state counterparts are rapidly scaling up its oxygen systems – liquid medical oxygen (LMO), pressure swing adsorption (PSA) plants and oxygen concentrators – across government health facilities, in addition to improving availability of oxygen supply systems through medical gas pipeline systems (MGPS), manifold systems and oxygen cylinders.

One of the many critical actions the government has prioritized to improve health outcomes and save lives is augmentation of the public health system's capacity to reliably deliver oxygen. The public health systems in the country, with exception to the large teaching hospitals and tertiary healthcare facilities, had historically relied on oxygen cylinders to meet its medical oxygen demands. As a result, there were very few trained personnel who understood the complexity of integration and maintenance of these newly deployed oxygen systems and know how to manage them. This course provides training relevant to oxygen program managers at national, state, district and health facility understand the components of medical oxygen management and use this information for informed decision making.

Purpose of the training

At the end of this course, participants are expected to effectively oversee the oxygen ecosystem at their respective levels.

Training objectives

By end of this training, the participants will be able to:

- Understand medical oxygen and oxygen therapy, its purpose and devices for oxygen therapy
- Correctly communicate on oxygen generation equipment, oxygen storage and delivery devices, and devices for oxygen monitoring
- Undertake facility and site requirements for installing oxygen equipment
- Ensure safe handling of medical gas
- Demonstrate the ability to use oxygen monitoring platforms, like ODAS, OCMIS and ODTs
- Understand the rationale for oxygen audit and rational use of oxygen
- Show their understanding of the respiratory care market and supplier landscape

The training module includes a package of standardized printed material, standardized PowerPoint slides, case studies, exercises, and pre-test questions.

Training methodologies

Training techniques that use participatory learning approaches have been used in this module. The training would be imparted through interactive presentations, case studies, group discussions by the trainers and the participants. This course is structured in such a way that each participant performs exercises and is encouraged to discuss with the facilitator, their problems or questions, if any.

Notes for the trainer

1. Please read up about medical oxygen (the product, its production, delivery and oxygen therapy), the Government of India guidelines, WHO and UNICEF specifications, the **Guidebook on Medical Oxygen Management Systems** and SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh.
2. The training should be done as a full day, classroom training.
3. Ensure that you have prepared the PowerPoint slides, the notes on the flipcharts and Index Cards prepared well in advance.
4. As far as possible consider doing training with a co-facilitator. The trainers must discuss their individual roles for each session when preparing for the training and share the responsibility of facilitating and co-facilitating sessions.
5. Both the trainers need to participate in all sessions with equal enthusiasm, irrespective of who is leading the session. This will help the participants stay focused during the training.
6. Explain the difficult or less familiar words. Keep asking questions to participants to the session topic to whether or not they understand the contents of the session.
7. When you give group work to participants, keep moving among the groups and guide them in their group work. Try identifying shy participants, encourage them to participate in the discussions and provide input.
8. Keep an eye on the time all the time to ensure that you are aware of the time being consumed for each session and in each activity. Ensure that all activities are done in time.
9. Neither be very loud, nor be very low in your voice. Do not give participants more information than they need.

10. Do not interject when any of the participants is speaking but do encourage participants to speak to-the-point.
11. Ensure that all the background materials are available prior to trainings.
12. Standardize training slides.
13. Ensure that a communication of the trainings has gone well in advance to all trainees.
14. Always repeat the key points of the session at the end of each session, as a reminder and to conclude the session.

Training Schedule

No.	Sessions	Methods	Duration
	Tea and registration of participants		
1	Session I: Introduction and pre-test	Group activity	30 mins
2	Session II: Oxygen therapy	Presentation discussion	60 mins
3	Session III: Oxygen delivery solutions	Presentation discussion	60 mins
4	Session IV: Oxygen inventory management and oxygen audit	Presentation discussion	90 mins
5	Session V: Medical gas handling and safety	Presentation discussion	45 mins
6	Session VI: Respiratory care market and supplier landscape	Presentation discussion	60 mins
7	Session VII: Post-training assessment and transfer out	Group activity	45 mins
	End of training		

Session I Introduction

Context

This is the first session of the training. Although most of the participants might be familiar with each other, the trademark “good start” to any training is when the trainer and the participants not only are familiar with each other, but also are able to connect their expectations with the objectives of the training. This will help the participants stay focused during the sessions.

Activity 1.1

15 mins

Introduction/ ice-breaking

Learning Objectives	Materials	Methodology
➤ Get familiar with each other	-	Group work

- Welcome all participants to the training, introduce yourself and briefly introduce the project and PATH’s technical assistance for strengthening oxygen ecosystem.

NOTE: Please collect information about the project and PATH’s technical assistance role from the project manager or the state lead.

- Ask all participants to stand in a circle.

NOTE: If the training is being done with fixed seating and limited space, the participants can stand on their spot.

- Inform the group that we will begin the training by getting introduced to one another.
- Ask the participants to pair up with one of the two people standing to either of their sides.
- Ask the participants to introduce themselves to their paired-up partner. During the introduction, ask the participants to share the following – (1) their name, (2) their designation and department, (3) the numbers of years in service and (3) one thing about medical oxygen systems that they (the partner) are concerned about.
- Start with the person standing first to your left-hand side so that you are the last person to complete the introduction.
- Ask the person to introduce his or her partner.
- Thank all participants for introducing themselves.

Activity 1.2

10 mins

Know the training flow and align expectations

Learning Objectives	Materials	Methodology
➤ Get ready to work each other to enhance learning	Presentation slides	Presentation

<ul style="list-style-type: none"> ➤ Be aware of objectives and flow of the training ➤ Express expectations from the training and apprehensions with the training 	Flipcharts (at least 2) Marker pens of different colors Flipchart stands (2) Scotch tapes/ magic tapes	Discussion
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- Using a PowerPoint presentation, introduce the participants to the purpose, objectives and schedule of the training.
- Inform the participants that the training is designed to help them familiarize them with the medical oxygen management systems, in general, and that the training will provide information on various aspects of medical oxygen management.
- Use two flipcharts. Put title as “Expectations” on one flipchart and title the other flipchart as “Apprehensions” and put them on separate flipchart stands.
- Inform the participants that all of us have expectations as well as apprehensions when we come for training. By sharing their expectations and apprehensions before start of the training, they will be able to help the trainers customise the training to meet their expectations.
- Ask them to express their expectations and apprehensions related to this training.
- Record their expectations and apprehensions on respective flipcharts.
- Put the flipcharts of “Expectations” and “Apprehensions” on the walls in the training with the help of scotch tape.
- Assure the participants that you will try to meet their expectations and address their apprehensions during the training.

Activity 1.3

05 mins

Pre-training knowledge assessment

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Understand the existing level of knowledge on medical oxygen systems 	Pre-test questionnaires	Self-assessment

- Distribute pre-test questionnaire (Participant’s Handout 1.3.1) for Medical Oxygen Systems
- Give 05 minutes for them to write the answers
- Collect the response sheet.

NOTE: Do not discuss the correct response. The co-facilitator reviews the responses while the lead facilitator initiates the next session.

Context

This is the first technical session of the training. The trainer, through this session, will provide foundational information to the participants. As participants to this training are oxygen program managers, who have been involved in various stages of sourcing, acquiring, site preparation, installing and providing oversight to operation and maintenance of oxygen devices, among others, the session will focus on providing them fundamental, relevant, and actionable information on oxygen therapy.

Activity 2.1

60 mins

Introduction to oxygen therapy

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Know medical oxygen and its importance in respiratory care management ➤ Become familiar with oxygen therapy and indications for initiating oxygen therapy ➤ State various devices used for oxygen therapy ➤ Understand judicious and rational use of oxygen 	<p>Presentation slide deck</p> <p>Oxygen devices (based on availability)</p> <ul style="list-style-type: none"> ➤ Nasal cannula ➤ Nasal catheter ➤ Rebreathing mask ➤ Non-rebreathing mask ➤ Venturi mask and valves ➤ Jet Venturi mask ➤ High Flow Nasal Cannula ➤ Non-Invasive Ventilation (NIV) mask <p>SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh (as many copies as the participants)</p>	<p>Presentation and discussion</p>

- Distribute the Participant handout 2.1.1. SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh before starting the presentation.
- Ask the participants to refer to the Guidebook on Medical Oxygen Management System’s section on Oxygen Therapy (pages 53 to 67) for detailed information. Familiarize yourself with the section on Oxygen Therapy in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to introduce Oxygen Therapy.
- Show the oxygen devices when discussing them during the presentation.

Notes for the facilitator

- You may allow participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that particular section.
- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

Context

This is a session on oxygen delivery. The trainer, through this session, will provide foundational information to the participants on equipment and process of medical oxygen production, equipment for storing and supply oxygen, equipment, and devices for delivering oxygen to the patients, and devices for monitoring oxygen levels in patients. The session will also briefly discuss oxygen supply chain. As participants to this training are oxygen program managers, the session will provide them information necessary for them for taking management decision on oxygen systems.

Activity 3.1

60 mins

Oxygen delivery solutions

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Become familiar with oxygen production sources, storage devices, devices for oxygen delivery to patients and for monitoring oxygen levels in patients ➤ Understand the functionality and pros and cons of each type of equipment ➤ Get to know oxygen supply chain, some special considerations with oxygen logistics 	<p>Presentation slide deck</p> <p>Oxygen equipment (based on availability)</p> <ul style="list-style-type: none"> ➤ Oxygen concentrator ➤ Flow splitter ➤ Humidifiers – non heated and heated ➤ Pulse oximeters – benchtop, handheld, and fingertip ➤ Oxygen analysers ➤ Portable ventilators ➤ CPAP machine ➤ BiPAP machine 	<p>Presentation and discussion</p>

- Distribute the Guidebook for Medical Oxygen Management System for oxygen delivery solutions before starting the presentation.
- Ask the participants to refer to Chapters 1 to 7 for detailed information. Familiarise yourself with the content of Chapters 1 to 7 in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to introduce oxygen delivery solutions.

Notes for the facilitator

- You may allow participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that section.
- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

Context

The fourth session of this module is on management of oxygen inventory and conducting oxygen audit. The trainer, through this session, will provide information on purpose of oxygen inventory management, units and measurement when converting oxygen from liquid to gas, or from one unit to another of measurement, how to calculate oxygen demand, why and how to conduct oxygen audit and the tool for it, and introduce various platforms available to monitor oxygen demand and supply.

Activity 4.1

40 mins

Oxygen inventory management

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Understand the importance and process of oxygen inventory management ➤ Learn to calculate oxygen quantity when measuring it and converting it from one form to another ➤ Learn to assess oxygen demand and supply for a facility 	Presentation slide deck Case study sheet (As many copies as the participants)	Presentation and discussion Case study work

Part 1: Presentation and discussion (20 minutes)

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management System.
- Ask the participants to refer to Chapter 8 of the guidebook for detailed information. Familiarise yourself with the content of the chapter in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to discuss the oxygen calculation – its purpose, supply process and delivery conversion, calculation of oxygen consumption/ requirement on basis of (a) bed strength and (b) active cases and identifying and addressing gaps between demand and supply.

Notes for the facilitator

- You should explain the conversions of gaseous oxygen from cubic metres (m³/Cu M) to metric ton (MT), from litres per minute (LPM) to MT per day and converting liquid oxygen from kilo litres (KL) to MT, with examples. Use simple numerical calculation to familiarise the learners with the conversion.

Part 2: Case study discussion (20 minutes)

- Distribute the case study provided in this handbook as Participants Handout 4.1.1, and ask them to read the case study and its questions
- Allow the participants a few minutes to read the case study.
- Invite clarifying questions about the case study and respond to questions from the participants.
- Once all the questions are addressed, ask them to form groups of three people. Adjust extra people/ ungrouped in one or more groups.
- Ask the groups to discuss the case study and work together to come up with responses to questions in the case study. Give them five (05) minutes to draft their responses to the questions in the case study.
- Randomly ask the groups to share their responses.
 - Ensure that one group answers only one of the questions in the case study.
 - In case the group’s answer is incorrect, ask another group to answer till you get correct response.
 - When you get the correct response, ask the responding group to explain how they arrived at the correct response.
 - Continue this process for each question in the case study till all questions are addressed.

Notes for the facilitator

- Check with the participants if they have any doubts on how to estimate the oxygen demand based on bed strength or on active cases.
- Allow the participants to ask their questions and clear their doubts. Repeat the case study, if required.

Activity 4.2

25 mins

Oxygen audit

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Understand the purpose, the advantages and the process of oxygen audit ➤ Become familiar with the oxygen audit tool 	Presentation slide deck Oxygen audit tool (As many copies as the participants)	Presentation and discussion

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management Systems.
- Ask the participants to refer to Chapter 10 for detailed information. Familiarise yourself with the content of the chapter in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to discuss oxygen audit – the goal, purpose, and benefits of oxygen audit and the process of oxygen audit.

- Distribute the oxygen audit form provided in this handbook as Participants Handout 4.2.1 This form is also available as Annexure 9 in the Guidebook for Medical Oxygen Management Systems.
- Take them through each section of the oxygen audit form in detail, explaining the information that needs to be filled in every field. The sections are also available in the presentation deck.
- Check with the participants if they have any doubts on how the oxygen audit form should be filled. Allow the participants to ask their questions and clear their doubts.

Activity 4.3

10 mins

Oxygen management platforms

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Become familiar with the platforms used by the Government of India for monitoring oxygen demand and supply 	Presentation slide deck	Presentation and discussion

- Orient the learners on the rational use of oxygen and the two platforms – Oxygen Demand Aggregation System (ODAS) and OxyCare Management Information System (OCMIS) using the PowerPoint slides from the trainers’ handouts.

Notes for the facilitator:

- As the purpose of this session is only to ensure that the learners become aware of the two digital platforms oxygen platforms, its purpose and its functionality, detailed discussions on them are not included in this module.

Context

The fifth session of this 7-part module is on medical gas handling and safety. The trainer, during this session, shall orient the learners on why oxygen needs to be handled safely and the precautions one needs take when handling oxygen in cylinders, when it is generated through the PSA plants, stored in LMO storage tanks and delivered through the medical gas pipeline system (MGPS). This session will also provide people handling oxygen with knowledge of different safety signs that one must put up to guide people on safe handling of oxygen.

Activity 5.1

45 mins

Medical gas handling and safety

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Know the key dos and don'ts when working with oxygen production, storage and delivery equipment ➤ Become aware of the safety signs that needs to be put in hospital premises where oxygen devices are placed 	<p>Presentation slide deck</p>	<p>Presentation and discussion</p>

- Ask the participants to refer to Chapter 9 of the guidebook for detailed information. Familiarise yourself with the content of the chapter in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to discuss medical oxygen handling and safety guidelines.

Notes for the facilitator

- You may allow participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that particular section.
- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

Context

This is the penultimate session of the training module. During this session, the trainer shall provide a preliminary guide to available suppliers with capacity to provide equipment for respiratory care. This session will focus on generic considerations for product selection and product deployment of oxygen concentrators, oxygen cylinders, PSA plants, pulse oximeters and delivery interface devices, like HFNC and cannula, among others.

Activity 6.1

60 mins

Respiratory care market and supplier landscape

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> ➤ Understand the considerations for product deployment and product selection for various oxygen equipment ➤ Become familiar with the questionnaire for documenting the supplier landscape 	Presentation slide deck Participants' handout on Respiratory Care Equipment market – key considerations for product deployment and selection (as many copies as participants) Questionnaire for supplier landscape mapping (as many copies as participants)	Presentation and discussion

- Make copies of the Participants Handout 6.1.1 from this handbook and distribute it among the participants.
- Use PowerPoint slides from Trainer's Handout to discuss key considerations for product deployment and product selection.
- After discussing the key considerations for each equipment, distribute the copies of the Participants Handout 6.1.2 from this handbook among the participants. This handout is the questionnaire that the participants can use to map their supplier landscape.
- Take the participants through each section of the questionnaire in detail, explaining the information that needs to be filled in every field.

Notes for the facilitator

- You may allow participants to ask questions in-between the presentation or you may also ask them to park their questions till you complete one section of the presentation before they ask you their questions related to that particular section.

- Repeat, in your own words, the question the participant has asked to ensure that you have correctly understood the query. This will also give you time to think through the response to the question.

Session VII Post-Training Assessment and Transfer Out

Context

This is the final session of the training. During this session, the trainer shall facilitate a recall of key takeaways of various sessions and conduct a post-training assessment.

Activity 7.1

30 mins

Key takeaways

Learning Objectives	Materials	Methodology
➤ Recall and refresh the key lessons from the previous sessions	Flipcharts (at least 2) Marker pens of different colors Flipchart stands (2) Scotch tapes/ magic tapes	Group work

- Divide the participants into five groups.
 - You can either make the participants count from 1 to 5, and group all participants counting '1' into one group, those counting '2' into another group and so on, or
 - Allow participants to self-select into one of the five groups
- Announce the five technical sessions of the training and allocate one session name to each group, ensuring that each group gets only one session –
 - Oxygen therapy
 - Oxygen delivery solutions
 - Oxygen inventory management and oxygen audit
 - Medical gas handling and safety
 - Respiratory care market and supplier landscape
- Ask the groups to record "What did we learn in this session?" on the flipchart.
- Instruct the groups to –
 - Put each lesson or take-away in bullets, with one bullet for each lesson
 - Identify a presenter from the group to present it back to the larger group
 - Complete the task in 05 (five) minutes
- Invite each group to present the key take-aways of their session. Give each group 2-3 minutes to present their take-aways.

Notes for the facilitator

- Time permitting, you may allow other groups to add more take-aways for the sessions.
- Encourage participants to contribute and be positive to input from other groups and avoid confrontations.

Activity 7.2**15 mins****Post-training assessment**

Learning Objectives	Materials	Methodology
➤ Assess the change in knowledge from the pre-training levels	Post-training questionnaire	Self-assessment

- Distribute the post-training questionnaire (Participant’s Handout 7.2.1) to all participants
- Ask participants to respond to the questions, and hand-over their responses to the co-facilitator.
- Discuss each question and its correct answer.

Participant's Handouts

Please refer to the Participants handouts folder