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Reaching Impact, Saturation, and Epidemic Control (RISE)

Trainer's Handbook

Rational and Hygienic Use of Medical Oxygen

Personnel Handling Oxygen Devices

Acknowledgments

This trainers' handbook on the "Rational and Hygienic Use of Oxygen for the Personnel Handling Oxygen Devices" 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 personnel handling oxygen devices 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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Contents

1.	CONTENTS	3
2.	ACRONYMS	4
3.	INTRODUCTION TO THE TRAINERS' HANDBOOK	6
4.	TRAINING SCHEDULE	9
5.	SESSION I INTRODUCTION	10
6.	SESSION II INTRODUCTION TO MEDICAL OXYGEN AND OXYGEN THERAPY	12
7.	SESSION III OXYGEN STORAGE AND DELIVERY DEVICES	14
8.	SESSION IV OXYGEN THERAPY DEVICES	16
9.	SESSION V DECONTAMINATION AND DISINFECTION OF OXYGEN SUPPLY DEVICES	18
10.	SESSION VI OXYGEN WASTAGE	20
11.	SESSION VII POST-TRAINING ASSESSMENT AND TRANSFER OUT	21
12.	PARTICIPANT'S HANDOUTS	23

Acronyms

ARDS	Acute Respiratory Distress Syndrome
ASU	Air Separation Unit
BIS	Bureau of Indian Standards
BPAP	Bilevel Positive Airway Pressure
CCOE	Chief Controller of Explosive
COVID- 19	Corona Virus Disease-19
CO₂	Carbon Dioxide
CPAP	Continuous Positive Airway Pressure
Cu M	Cubic Metre
FiO₂	Fraction of Inspired Oxygen
HAFOE	High Air Flow with Oxygen Enrichment
HDU	High Dependency Units
HFNC	High Flow Nasal Cannula
ICU	Intensive Care Unit
ISO	International Organization for Standardization
LMO	Liquid Medical Oxygen
LPM	Litre Per Minute
MGPS	Medical Gas Pipeline System
MT	Metric Ton
NIV	Non-invasive Ventilation
NRBM	Non-Rebreather Mask
O₂	Oxygen
OC	Oxygen Concentrator
PESO	Petroleum and Explosives Safety Organization

PISS	Pin Index Safety System
PPE	Personal Protective Equipment
PRV	Pressure Relief Valve
PSA	Pressure Swing Adsorption
SpO2	Saturation of Peripheral Oxygen
UN	United Nations
VPSA	Vacuum Pressure Swing Adsorption

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 to the personnel handling oxygen devices or oxygen device operators to understand the components of medical oxygen management, oxygen devices, oxygen storage sources, oxygen delivery equipment, operation and maintenance and their rational and hygienic use in order to meet the future demand for medical oxygen.

Purpose of the training

At the end of this course, participants are expected to effectively oversee the devices for oxygen therapy and the process of optimally delivering oxygen to patients, including rational and hygienic use of medical oxygen.

Training objectives

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

- Understand medical oxygen and its importance in respiratory care
- Understand the importance of oxygen therapy in COVID-19 case management
- Correctly communicate on various oxygen storage and delivery devices used for oxygen therapy
- Understand the rationale and the procedure for the use of different oxygen therapy devices- high flow and low flow- for optimally administering medical oxygen
- Demonstrate the procedure for decontamination and disinfection of oxygen therapy devices

- Recognize the importance to address the ways to avoid or reduce the oxygen wastage

The training module includes a package of standardized printed material, standardized PowerPoint slides, demonstrations, and pre-test and post-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, on-site and video demonstrations, group discussions by the trainers and the participants. This course is structured in such a way that each participant is encouraged to discuss with the facilitator, their problems, or questions, if any.

Notes for the trainer

1. Please read up about oxygen ecosystem (sources, delivery and oxygen therapy devices), the Guidebook on Medical Oxygen Management Systems, SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh and SOP for Rational Use of Oxygen by MoHFW.
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 know whether they understand the contents of the session.
7. When you initiate group discussion with participants, keep moving among the participants and 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: Introduction to medical oxygen and oxygen therapy	Presentation, discussion	30 mins
3	Session III: Oxygen storage and delivery devices	Presentation, discussion, and demonstration	90 mins
4	Session IV: Oxygen therapy devices	Presentation, and demonstration	60 mins
5	Session V: Infection prevention and decontaminating practices for oxygen devices	Presentation, and demonstration	45 mins
6	Session VI: Ways to reduce oxygen wastage	Presentation discussion	30 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 rational and hygienic use of oxygen, in general, and that the training will provide information on various aspects of rational and hygienic use of oxygen.
- 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 for Rational and Hygienic Use of Oxygen
- 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.

Session II Introduction to Medical Oxygen and Oxygen Therapy

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 personnel handling oxygen devices, who have been involved in various stages of operation and maintenance of oxygen devices, their troubleshooting and rational and hygienic use, the session will focus on providing them fundamental, relevant, and actionable information on rational and hygienic use of oxygen.

Activity 2.1

30 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 where it is needed➤ Understand the oxygen ecosystem➤ Learn about the different sources of medical oxygen	<p>Presentation slide deck</p> <p>Participant's Handout- Guidebook on Medical Oxygen Management Systems, SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh and SOP for Rational Use of Oxygen by MoHFW (as many copies as the participants)</p>	<p>Presentation and discussion</p>

- Distribute the guidebook on Medical Oxygen Management Systems, SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh and SOP for Rational Use of Oxygen by MoHFW before starting the presentation in as many copies as the participants.
- Use PowerPoint slides from Trainer's Handout to introduce them to medical oxygen and oxygen therapy. Make them understand the oxygen ecosystem and familiarize them with different sources of medical oxygen.
- Ask the participants to refer to the section on Oxygen Ecosystem (pages 10 to 11) of the guidebook for detailed information. Familiarise yourself with the section on Oxygen Ecosystem in the guidebook.

Notes for the facilitator

- Make sure you have as many copies of the handouts as the participants available.
- 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 III Oxygen Storage and Delivery Devices

Context

This is a session on oxygen storage and delivery devices. The trainer, through this session, will provide foundational information to the participants on devices and process of medical oxygen production, devices for storing and supply oxygen, equipment, and devices for delivering oxygen to the patients. As participants to this training are oxygen device operators or the personnel handling oxygen devices, the session will provide the information necessary for them to perform operations and maintenance of oxygen devices.

Activity 3.1

90 mins

Oxygen storage and delivery devices

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none">➤ Become familiar with oxygen storage sources➤ Understand the functionality and pros and cons of each type of equipment/ devices➤ Get to know about the devices/ equipments used for delivering oxygen to patients	<p>Presentation slide deck</p> <p>Demonstration of oxygen storage sources</p> <p>Oxygen equipment (based on availability)</p> <ul style="list-style-type: none">➤ Oxygen concentrator➤ Flow splitter➤ Humidifiers – non heated and heated	<p>Presentation, discussion and demonstration</p>

Part 1: Presentation and discussion (40 minutes)

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management System.
- Ask the participants to refer to Chapters 1,2,4 and 7 for detailed information. Familiarise yourself with the content of Chapters 1,2,4 and 7 in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to introduce oxygen storage sources and delivery devices.

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.

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

Part 2: Demonstration (50 minutes)

- This section will involve the on-site demonstration of oxygen storage and delivery devices in the facility.
- You can correlate the demonstration with the content taken during the presentation.

Notes for the facilitator

- For on-site demonstration in the facility, choose the facility having at least two sources of oxygen supply between LMO and PSA, oxygen concentrators and oxygen cylinders.
- You may allow participants to ask questions in-between the demonstration or you may also ask them to park their questions till you the demonstration.
- 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 IV Oxygen Therapy Devices

Context

The fourth session of this module is on oxygen therapy devices. The trainer, through this session, will introduce various devices used for oxygen therapy, their structure and mechanism, indications, contraindication (if any), advantages and disadvantages of each device.

Activity 4.1

60 mins

Oxygen therapy devices

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none">➤ State the various devices used for oxygen therapy➤ Learn about various low flow/ variable performance devices➤ Learn about various high flow/ fixed performance devices	<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>Presentation, discussion, and demonstration</p>

Part 1: Presentation and discussion (40 minutes)

- Before starting the presentation, ensure that every participant has the SOP for Medical Oxygen Use and Fire Safety for Public and Private Hospitals of Madhya Pradesh.
- Ask the participants to refer to Section 5.8, 5.9 and 5.10 of Chapter 5 of the SOP for detailed information. Familiarise yourself with the content in the SOP.
- Use PowerPoint slides from Trainer's Handout to discuss about the various devices used for oxygen therapy.

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.

Part 2: Demonstration (Video and Hands-on) (20 minutes)

- You should have all the devices present with you so it could be physically shown in the classroom while you explain the structure and mechanism.
- Take assistance from the co-trainer while showing the oxygen therapy devices to the participants.
- As you explain each of the oxygen device and show them in the classroom, also pay attention to the devices that have supplementary video demonstrations. Once you finish explaining, tell the participants that you would be playing a video demonstrating the use of this device.
- Most of them are short videos, and it is recommended to go through them once before the session. This would make it easier to explain them to the participants
- The following devices have video demonstrations:
 - Non-rebreathing mask
 - Venturi mask
 - High flow nasal cannula
- After playing the videos, you must also explain to the participants what they just saw in the video

Notes for the facilitator

- Check whether all the materials required during the session are available with you beforehand.
- For video demonstration, make sure you have MP4 versions of all these videos prior to the session.
- You may allow participants to ask questions in-between the demonstration or you may also ask them to park their questions till you the demonstration.
- 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 V Decontamination And Disinfection of Oxygen Supply Devices

Context

The fifth session of this 7-part module is on decontamination and disinfection of oxygen supply devices. The session will provide the insight on the importance of disinfection practices for respiratory equipments, methods used for disinfection, disinfection of disposable and non-disposable equipment.

Activity 5.1

45 mins

Decontamination and disinfection of oxygen supply devices

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none">➤ Understand the importance of disinfection and cleaning of respiratory equipments➤ Learn the process followed for cleaning and disinfection of plastic pieces of respiratory equipment➤ Understand the disinfection process of disposable and non-disposable equipment	<p>Presentation slide deck</p> <p>Demonstration using oxygen devices- Nasal catheter and humidifier bottles etc.</p> <p>Clean water, non-foaming soap, Syringe, Cleaning brush, Tubs (or buckets), Bleach (or boiling water), PPE (glasses, mask, gown, gloves)</p>	<p>Presentation, discussion, and demonstration</p>

Part 1: Presentation and discussion (30 minutes)

- Use PowerPoint slides from Trainer's Handout to discuss the disinfection procedures for respiratory equipments.

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.

Part 2: Demonstration (15 minutes)

- This section will involve demonstration of the decontamination procedure.
- You will now demonstrate disinfection of a nasal catheter with the help of the co-trainer.
- The demonstration should involve all the steps from wearing PPE to drying the disinfected device. Preparation of 0.5% sodium hypochlorite should also be demonstrated.

Notes for the facilitator

- Check whether all the materials required for demonstrating decontamination procedure are available with you beforehand.
- You may ask participants to park their questions till you complete the demonstration.
- 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 orient participants to the concept of oxygen wastage, what to check and ways to reduce oxygen wastage. This session will focus on factors contributing to misuse and wastage of oxygen and their prevention mechanism.

Activity 6.1

30 mins

Oxygen wastage

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none">➤ Understand the concept of oxygen wastage➤ Learn about the factors contributing to misuse of oxygen➤ Learn about the factors leading to wastage of oxygen➤ Understand the consequences of irrational use of oxygen➤ Learn about the ways to prevent misuse of oxygen	Presentation slide deck	Presentation and discussion

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management System.
- Ask the participants to refer to Section 5.1 and 5.2 of Chapter 10 and Annexure 8 of the guidebook for detailed information. Familiarise yourself with the content in the guidebook.
- Use PowerPoint slides from Trainer's Handout to discuss about the factors leading to misuse and wastage of oxygen, and how to prevent the misuse.

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.

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 –
 - Introduction to medical oxygen and oxygen therapy
 - Oxygen storage sources and delivery devices
 - Oxygen therapy devices
 - Decontamination and disinfection of oxygen supply devices
 - Oxygen wastage
- 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