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Reaching Impact, Saturation, and Epidemic Control (RISE)

## Trainer's Handbook

# OPERATIONS AND MANAGEMENT OF OXYGEN EQUIPMENT



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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	Liters 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 Organization

### 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 ITI trainers, Biomedical Engineers working at national, state, district and health facility to understand the operations and maintenance of oxygen or respiratory equipment.

### Entry Behavior

Entry behavior means assumed and actual entry behavior. Though the assumed entry behavior is the basis of the program design, there could be variations in actual entry behavior which will be assessed at the beginning of each training program. This training program basically aims at training the ITI Trainers, Biomedical Engineers working with the health department who are in charge of various operations of oxygen equipment's. The TOT module has been designed in view of the envisaged role of resource persons which may not be reflected in their entry behavior at the outset of the training.

### Purpose of the training

At the end of this course, participants are expected to effectively operate and manage oxygen equipment's like oxygen cylinders, liquid medical oxygen, medical gas pipeline systems, PSA plants, oxygen concentrators and other oxygen equipment like ventilators at their respective levels.

## Training objectives

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

- Assist in diagnose and provide on-call and on-site service for equipment malfunctions along with preparation of action plan for the service of equipment and timely delivery to hospitals.
- Understanding of operation of oxygen equipment and assist in calibration settings and help in respiratory equipment maintenance.
- Analyze, and solve open-ended problems with medical relevance such as those encountered during installation, inspection, repair, and calibration, as well as verify performance with minimal technical supervision.
- Demonstrate professional behavior, personal qualities, good communication and written skills and work in team appropriately for working role in operation and maintenance of respiratory equipment.
- Awareness of Do and Don'ts during handling of Equipment and appraisal of proper reports as and When the Situation demands.

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 oxygen cylinders (the product, its pros and cons, its oxygen requirement, usage, storage, precautions and Medical Gas Rule, 2016), 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 work Presentation discussion Self-assessment	60 mins
2	Session II: Basics of oxygen management system	Presentation Discussion Device demonstration	120 mins
3	Session III: Oxygen cylinders	Presentation and discussion Device demonstration Group activity	180 mins
4	Session IV: Liquid medical oxygen	Presentation and discussion Group activity	180 mins
5	Session V: PSA	Presentation and discussion Group activity	180 mins
6	Session VI: Medical gas pipeline system	Presentation and discussion Group activity	120 mins
7	Session VII: Oxygen concentrator	Presentation and discussion	120 mins
8	Session VIII: Other oxygen equipment (Ventilators and Pulse Oximetry)	Presentation, discussion, and device demonstration	120 mins
9	Session IX: Medical oxygen handling and safety	Presentation and discussion	120 mins
10	Session X: Post- training assessment	Group work Self-assessment	45 mins
	<b>End of training</b>		

**\*Note:** Facilitators might also like to consider adding in some time to the schedule for participants to read suggested resources or for free discussion.

## Session I Introduction

### Context

As opening session is going to set the tone of the workshop to follow and has to be, therefore, planned and conducted carefully.

This session must be used to share the purpose and objectives of the workshop, lay out the agenda, and set ground rules. It is also an opportunity for the participants to introduce themselves and their experience, explain their motivation for joining the workshop, and state their expectations from the event. You may want to use an 'ice-breaker' exercise like the one below to help participants to get to know each other, and to put them at ease and get them talking.

#### Activity 1.1

25 mins

##### Introduction/ ice-breaking

Learning Objectives	Materials	Methodology
➤ Meeting and knowing each other	Modular sheet and safety pins	Group work

- Welcome all participants to the training, introduce yourself and briefly introduce the project and PATH's technical assistance for strengthening oxygen ecosystem. Ask the participants to write their name on the given modular sheet and pin it to their apparel.
- Ask all participants to stand in a circle.
- Inform the group that we will begin the training by getting introduced to one another.
- Ask the participants to arrange themselves in two equal lines and facing each other. They will have a couple of minutes to introduce themselves to the person facing them and then provide their partner with some introductory information about themselves. Basic introduction may include 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
- Top Tip: Monitor how many participants have managed to meet each other. Don't forget that in larger groups it may not be plausible for every person to meet, as this will take too much time. The other factor to consider when running this session with a large group is the noise level and making yourself heard above the chatter. Ask the person to introduce his or her partner.
- Thank all participants for introducing themselves.

##### Notes for the facilitator

- Please collect information about the project and PATH's technical assistance role from the project manager or the state lead.
- If the training is being done with fixed seating and limited space, the participants can stand at their spot.

**Activity 1.2****20 mins****Know the training flow and align expectations**

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Get ready to work each other to enhance learning</li> <li>➤ Be aware of objectives and flow of the training</li> <li>➤ Express expectations from the training and apprehensions with the training</li> </ul>	Presentation slides Flipcharts (at least 2) Marker pens of different colors Flipchart stands (2) Scotch tapes/ magic tapes	Presentation Discussion

- 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 operations and management of oxygen equipment, in general, and that the training will provide information on various aspects of various oxygen equipment.
- 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 customize 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****15 mins****Pre-training knowledge assessment**

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Understand the existing level of knowledge on operations and management of oxygen equipment</li> </ul>	Pre-test questionnaires	Self-assessment

- Distribute the participant handout 1.3.1 (pre-test questionnaire) for Operations and Management of Oxygen Equipment.
- Give 10 minutes for them to write the answers.
- Collect the response sheet from every participant.

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

## Session II Basics of Oxygen Management Systems

### Objectives

The participants will be able to:

- Describe the key concepts in medical oxygen, particularly its importance in respiratory care
- Describe various devices of oxygen therapy
- Understand the rationale of judicious use of oxygen

### Session 2.1 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 ITI technicians, bio-medical engineers who have been involved in various stages of handling operations and maintenance of oxygen devices, among others, the session will focus on providing them fundamental, relevant, and actionable information on oxygen therapy.

#### Activity 2.1.1

35 mins

##### Introduction to oxygen therapy

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Know medical oxygen and its importance in respiratory care management</li><li>➤ Become familiar with oxygen therapy and indications for initiating oxygen therapy</li><li>➤ State various devices used for oxygen therapy</li><li>➤ Understand judicious and rational use of oxygen</li></ul>	<p>Presentation slide deck</p> <p>Oxygen devices (based on availability)</p> <ul style="list-style-type: none"><li>➤ Nasal cannula</li><li>➤ Nasal catheter</li><li>➤ Rebreathing mask</li><li>➤ Non-rebreathing mask</li><li>➤ Venturi mask and valves</li><li>➤ Jet Venturi mask</li><li>➤ High Flow Nasal Cannula</li><li>➤ Non-Invasive Ventilation (NIV) mask</li><li>➤ Ventilators</li></ul> <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 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. Familiarise yourself with the section on Oxygen Therapy in the guidebook.
- Use PowerPoint slides from Trainer's Handout to introduce Oxygen Therapy and explain each slide in detail.
- Show and demonstrate the oxygen devices one by one 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 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.
- In **COVID-19 patients** demand of oxygen varies, starting about 5th day onwards. Right amount of oxygen at golden hour is lifesaving.
- The need for oxygen has **increased to 1.1 million** cylinders in low to middle-income countries alone.
- While most people with COVID-19 develop only mild or uncomplicated illness, approximately 14% develop severe disease that requires hospitalization and oxygen support, and 5% require admission to an intensive care unit.
- In severe cases, COVID-19 can be complicated by the acute respiratory distress syndrome (ARDS), sepsis and septic shock, multiorgan failure, including acute kidney injury and cardiac injury.

## Session 2.2 Oxygen Delivery Solutions

### 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.

### Activity 2.2.1

90 mins

#### Oxygen delivery solutions

Learning Objectives	Materials	Methodology
➤ Become familiar with oxygen production sources, storage	Presentation slide deck	Presentation, and discussion

<p>devices, devices for oxygen delivery to patients and for monitoring oxygen levels in patients</p> <ul style="list-style-type: none"> <li>➤ Understand the functionality and pros and cons of each type of equipment</li> <li>➤ Get to know oxygen supply chain, some special considerations with oxygen logistics</li> </ul>	<p>Demonstration of oxygen storage sources</p> <p>Oxygen equipment (based on availability)</p> <ul style="list-style-type: none"> <li>➤ Oxygen concentrator</li> <li>➤ Flow splitter</li> <li>➤ Humidifiers – non heated and heated</li> <li>➤ Pulse oximeters – benchtop, handheld, and fingertip</li> <li>➤ Oxygen analysers</li> <li>➤ Portable ventilators</li> <li>➤ CPAP machine</li> <li>➤ BiPAP machine</li> </ul>	
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- 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.
- Use oxygen equipment based on the availability to demonstrate functionalities, pros and cons, installation and maintenance of each equipment.
- Show and demonstrate the oxygen devices one by one 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 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.
- A single concentrator can service several beds with the use of a flowmeter stand to split output flow.

### Objectives

The participants will be able to:

- Describe the key components of oxygen cylinders
- Understand the user setup
- Know the maintenance and troubleshooting

### Session 3.1 Components of Oxygen Cylinder

#### Context

This is on oxygen cylinders. The trainer, through this session, will provide information on types of oxygen storage devices, types of oxygen cylinders, components, and technical specifications of oxygen cylinder. The trainer will also provide insights on color coding of gases, labelling of oxygen cylinders, pros and cons of using cylinders, when and how to use and change the oxygen cylinder and precautions while handling oxygen cylinder.

#### Activity 3.1.1

90 mins

##### Introduction to oxygen cylinders

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Introduction to types of oxygen storage devices</li><li>➤ Learn about the components, technical specifications, names, and types of oxygen cylinders,</li><li>➤ State the pros and cons, when and how to use and change oxygen cylinders</li><li>➤ Learn about the precautions while handling oxygen cylinders</li><li>➤ Get familiar with the colour coding of gases and labelling of cylinders</li><li>➤ Familiarize with the MOHW SOP on handling oxygen cylinders</li></ul>	<p>Presentation slide deck</p> <p>Demonstration: Oxygen cylinders (as per availability)</p> <p>Marker pen (various colors)</p> <p>Chart papers</p> <ul style="list-style-type: none"><li>➤ Glue</li></ul>	<p>Presentation and discussion</p> <p>Device demonstration</p> <p>Group activity</p>

### **Part 1: Presentation, discussion and demonstration (60 minutes)**

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management System.
- Ask the participants to refer to Chapter 2 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 types of oxygen storage and then focus on oxygen cylinder – its components, specifications, names and types, pros and cons, what precautions to be taken while handling oxygen cylinders.

#### **Notes for the facilitator**

- You should carry an oxygen cylinder during the session for participants to understand its various parts, specifications, accessories, and precautions to be taken while handling it.
- Explain - Gas cylinders have to be stored in a dry and well-ventilated room that should be locked at all times. The room must not contain flammable materials like fuel or paints. Smoking and open flames are prohibited in and around this room. Warning signs in all local languages and with images should indicate this.
- Explain to learners that cylinders are low maintenance, there are issues that can arise especially with the accessories required for functionality. The following items are relatively inexpensive and should be present in every workshop

### **Part 2: Group activity discussion – mix match (30 minutes)**

- Take a printout of list of gases and a jumbled ISO color code (participant handout 3.1.1) in one page and distribute as many as number of participants.
- Divide the participants into group of 3-5 participants.
- Ask every group to match the gases to the right color code as per their knowledge. Give 10 minutes to each group.
- After this activity is completed, ask to show the right color coding and whichever group has got the highest number of color-coding right will receive a prize.
- This activity has to be performed before describing the color-coding session in detail.

#### **Notes for the facilitator**

- Check with the participants if they have any doubts on color coding of different gases as per ISO 32:1977.
- Allow the participants to ask their questions and clear their doubts.
- Explain to learners' tank colors. That many gases are stored/ transported in cylinders, it is critical to be able to distinguish one from the next to avoid a potentially lethal situation by administering the wrong gas. Distinguishing between gas cylinders is primarily achieved by understanding the difference in tank colors, connection systems and cylinder nomenclature.
- Ask learners for the different color for oxygen and risks.

- With ISO-standards, the oxygen cylinder itself is either black (for industrial purposes), green (in the food industry) or white (for medical purposes) but the shoulders have different colors depending on the gases they contain. These colors can be seen on the ISO legend, where medical oxygen cylinders will always have a white top or white “shoulders”.
- In the USA, oxygen cylinders are completely green.
- Emphasize: In either case, it is important to know which is being used by your facility/ distributor so that oxygen can be differentiated from other substances that are stored in similar containers.

## **Session 3.2 Oxygen Inventory Management**

### **Activity 3.2.1**

**45 mins**

#### **Oxygen inventory management**

<b>Learning Objectives</b>	<b>Materials</b>	<b>Methodology</b>
<ul style="list-style-type: none"> <li>➤ Learn to calculate oxygen quantity when measuring it and converting it from one form to another</li> <li>➤ Learn to assess oxygen demand and supply for a facility depending both on bed strength and active cases</li> <li>➤ Learn about scope and key features of Medical Gas Rule, 2016</li> </ul>	Presentation slide deck Participant Handout: Medical Gas Rule, 2016 and Problem solving exercise (distribute as many as number of participants) Participant Handout: Medical Gas Rule, 2016	Presentation and discussion Group activity

#### **Part 1: Presentation and discussion (30 minutes)**

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management Systems and Medical Gas Rule, 2016.
- 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 as well as of the Medical Gas Rule.
- 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 (m<sup>3</sup>/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 familiarize the learners with the conversion.

- You should explain the manifold layout and its components in detail to the participants.

## Part 2: Problem solving discussion (15 minutes)

- Distribute the printout of the problem in this handbook as Participants Handout 3.2.1 and ask them to read the problem.
- Allow the participants a few minutes to read the questions.
- 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 findings.
  - 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.

## Session 3.3 Manifold and Its Working

### Activity 3.3.1

45 mins

### Oxygen inventory

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Understand manifold, and its working</li> <li>➤ Know the components, technical specifications, and layout of manifold</li> </ul>	Presentation slide deck	Presentation and discussion

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management Systems and Medical Gas Rule, 2016.
- Ask the participants to refer to Chapter 2 of the Guidebook for detailed information. Familiarise yourself with the content of the chapter in the guidebook as well as of the Medical Gas Rule.
- Use PowerPoint slides from Trainer's Handout to discuss the manifold.

**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.

### Objectives

The participants will be able to:

- Describe the physical characteristics and essential aspects of LMO
- Learn the conversion of LMO to medical oxygen
- Know various LMO storage tanks and MOHFW guidelines for safe storage
- Know the maintenance and troubleshooting

### Training Simulation

#### Context

In this session three participants will prepare themselves and do demonstration of training session that has happened on the Day 2 of the ToT and subsequently orient other participants. The selected participants will act as trainer and conduct the training.

#### Activity

40 mins

#### Training Simulation

Learning Objectives	Materials	Methodology
➤ The selected participants will act as trainer to conduct the training and orient other participants	Presentation slide Participants are free to use any training delivery method Flipcharts Marker pens	Presentation, and discussion

- Identify any two people voluntarily among the participants before simulation.
- This activity requires two people, one trainer and another as co-trainer. Rest of the group will act as observer to give feedback.
- Give the identified participants the training material including the presentation deck for the particular session (e.g., Oxygen cylinder) and ask them to prepare 40 mins of presentation. Rest 20 mins will be used for providing feedback. The participants can conduct group activities as well.
- For the feedback session please use two flipcharts. One of the flipcharts will be used to capture points around 'what happened well' and on the other points related to 'what could have been better' will be captured.

#### Instruction for participants

- We are going to conduct simulation training based on the session conducted on day 1 of the workshop.

- Visualize the selected/identified participants as trainers, rest of the group will act both as participants and observer.

### Feedback

40 mins

- Participants to give their feedback on:
  - What happened well
  - What could have been better
- The trainer and co-trainer to reflect on:
  - What happened well
  - What could have been better
- Facilitator to give their feedback on (at the end):
  - What happened well
  - What could have been better

### 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 one section of the presentation is complete.
- You may give them inputs on the delivery method and their connect with other participants, but you should not be the first one to give feedback.

## Session 4.1 Essential Aspects of Liquid Medical Oxygen

### Context

This is on liquid medical oxygen. The trainer, during this session, shall orient the learners on liquid medical oxygen, its physical characteristics, conversion of LMO to gaseous medical oxygen, LMO containers, cryogenic cylinders and storage tanks, PESO certification, transportation, and handling of LMO, its maintenance and troubleshooting, why LMO tanks needs to be handled safely and the precautions one needs take when handling it. 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 4.1.1

75 mins

#### Liquid medical oxygen

Learning Objectives	Materials	Methodology
➤ Learn about the source of oxygen	Presentation slide deck Flipcharts Marker pen	Presentation and discussion Group activity

<ul style="list-style-type: none"> <li>➤ Become aware of LMO and its characteristics</li> <li>➤ Understand the conversion of LMO to gaseous medical oxygen</li> <li>➤ Learn about various liquid oxygen containers</li> <li>➤ Understand the installation and maintenance of LMO tanks– guidelines, construction, routine checks</li> <li>➤ Learn about the common maintenance problem ad solutions</li> <li>➤ Become aware of pros and cons of LMO</li> </ul>		
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#### **Part 1: Presentation and discussion (55 minutes)**

- Ask the participants to refer to Chapter 1 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 liquid medical oxygen.

#### **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.

#### **Part 2: Case Study discussion (20 minutes)**

- Distribute the Participants Handout 4.1.1 LMO case study and ask them to read the problem.
- Allow the participants a few minutes to read the questions.
- 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. Each group can use two chart papers. On one they have to write points on:
  - What went wrong?

- What could be possible solution(s)?
- Give them five (10) minutes to draft their responses to the questions in the case study.
- Randomly ask the groups to share their findings.

#### Notes for the facilitator

- Check with the participants if they have any doubts.
- Allow the participants to ask their questions and clear their doubts. Repeat the case study, if required.

## Session 4.2 Maintenance and Troubleshooting

### Context

This is a session on maintenance of LMO. During this session, the trainer shall provide a preliminary guide to prerequisite for liquid oxygen tank installation, PESO regulations to be followed, pros and cons of LMO and its troubleshooting.

#### Activity 4.2.1

45 mins

#### Maintenance and troubleshooting

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Understand the characteristics of LMO</li> <li>➤ State the pros and cons of LMO</li> <li>➤ Become familiar with maintenance requirement and troubleshooting</li> <li>➤ Discuss MOHFW guidelines handling of LMO</li> </ul>	Presentation slide deck  Participant Handout- MOHFW Guidelines for Safe Handling and Transportation of LMO and LMO poster (as many as number of participants)	Presentation and discussion

#### Part 1: Presentation and discussion (45 minutes)

- Before starting the presentation distribute the participant handout 4.2.1 on MOHFW Guidelines for Safe Handling and Transportation of LMO
- Ask the participants to refer to Chapter 1 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 maintenance of liquid medical oxygen.

**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 V Pressure Swing Adsorption (PSA) Plant

### Objectives

The participants will be able to:

- Describe the effectiveness and efficiency parameters, pros and cons of a PSA plant
- Understand the structural design of PSA plant
- Learn about the air sample collection procedure, importance of testing criteria, and parameters, and NABL accredited oxygen testing facilities
- Know the operations, maintenance and troubleshooting

### Session 5.1 Technical specifications of PSA plant

#### Context

The fifth session of the module is on pressure swing adsorption (PSA) plant. The trainer through this session will introduce the participants to the PSA plant and discuss about its components, specifications, working, and its performance parameters.

#### Activity 5.1.1

45 mins

#### Technical specifications of PSA plant

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Introduction to PSA plant</li><li>➤ Learn about the components and specifications of PSA plant</li><li>➤ Understand the working of a PSA plant</li><li>➤ Become familiar with the performance parameters of a PSA plant</li><li>➤ Know the pre-requisites for a PSA plant</li><li>➤ Get to know about the pros and cons of PSA plant</li></ul>	<ul style="list-style-type: none"><li>Presentation slide deck</li><li>Participant Handout</li><li>Chart papers (one per group)</li><li>Marker pens</li><li>Pin up board</li></ul>	<ul style="list-style-type: none"><li>Presentation and discussion</li><li>Group activity</li></ul>

#### Part 1: Presentation and discussion (30 minutes)

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management System.

- Ask the participants to refer to Chapter 3 for detailed information. Familiarise yourself with the content of Chapter 3 in the guidebook.
- Use PowerPoint slides from Trainer's Handout to introduce the concept of PSA plant.
- Ask the group to draw a PSA plant layout design.

#### 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: Exercise (15 minutes)

- Distribute the printout of the Participants Handout Session 5.1.1.in as many copies as the number of the participants.
- Allow the participants a few minutes to read it.
- Invite clarifying questions about the handout from the participants.
- Ask them to attempt the exercise individually.
- Give them five (05) minutes to draft their responses to the questions.
- Once completed, collect the response sheets from everyone and then discuss the answers.

#### Notes for the facilitator

- Check with the participants if they have any doubts.
- Allow the participants to ask their questions and clear their doubts. Repeat the case study, if required.

## Session 5.2 Installation of PSA plant

### Context

This is a session on installation of pressure swing adsorption (PSA) plant. The trainer, through this session, will provide information on prerequisites for installation of a PSA plant, how to select the site, selecting the size of a PSA plant, site readiness certificate, and PESO compliance.

#### Activity 5.2.1

45 mins

#### Installation of PSA plant

Learning Objectives	Materials	Methodology
➤ Become familiar with the guiding criteria and pre-	Presentation deck	Presentation and discussion

requisites for installing a PSA plant ➤ Understand the process of site selection for installation of PSA plant ➤ Understand the eligibility criteria for installation of a PSA plant at a facility ➤ Get to know about the process of site readiness	Participant Handout- Case study Flipchart Marker pens	Group activity
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### Part 1: Presentation and discussion (30 minutes)

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management Systems
- Ask the participants to refer to Chapter 3 for detailed information. Familiarise yourself with the content of Chapter 3 in the guidebook.
- Use PowerPoint slides from Trainer’s Handout to discuss installation of PSA.
- Take them through each section of the PSA plant installation in detail.

### 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.

### Part 2: Case Study discussion (15 minutes)

- Distribute the printout of the problem in this handbook as Participants Handout 5.2.1 and ask them to read the case and its questions.
- Allow the participants a few minutes to read it.
- 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 response.

### Notes for the facilitator

- Check with the participants if they have any doubts on how to work on the case study.
- Allow the participants to ask their questions and clear their doubts. Repeat the case study, if required.

## Session 5.3 Managing PSA plant operations

### Context

This is a session on operations of pressure swing adsorption (PSA) plant. The trainer, through this session, will provide information on human resources required for plant operations initial start-up, shutting down a PSA plant, dos and don'ts for plant operations, power backup for PSA Plant, back-up/buffer stock in case of interruptions in PSA plant. During this session, the trainer will introduce the participants to post operations PSA plants monitoring and elements to monitor hourly – normal range.

#### Activity 5.3.1

60 mins

#### Managing PSA plant operations

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Understand the human resource deployment for operations of a PSA plant</li><li>➤ Know the normal start-up and shutting down of PSA plant</li><li>➤ Know the dos and don'ts for PSA plant operations</li><li>➤ Know the ambient environment needed for the management of a PSA plant</li><li>➤ Understand the post operations PSA plant monitoring</li><li>➤ Learn about the back-up stocks and Power backup for operations of PSA plant</li><li>Become familiar with costs related to the operations of PSA plant</li></ul>	<ul style="list-style-type: none"><li>Presentation deck</li><li>Participant handout</li><li>Chart paper (one per group)</li><li>Flipchart</li></ul>	<ul style="list-style-type: none"><li>Presentation and discussion</li><li>Group activity</li></ul>

#### Part 1: Presentation and discussion (45 minutes)

- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management Systems
- Ask the participants to refer to Chapter 3 for detailed information. Familiarise yourself with the content of Chapter 3 in the guidebook.
- Use PowerPoint slides from Trainer's Handout to discuss key considerations for PSA plant operations.

#### 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.

#### Part 2: Activity (15 minutes)

- Distribute the printout of the participant handbook 5.3.1.
- Allow the participants a few minutes to read it.
- Ask them to attempt the exercise individually.
- Give them five (05) minutes to draft their responses to the questions.
- Once completed, collect the response sheets from everyone and then discuss the answers.

#### Notes for the facilitator

- Check with the participants if they have any doubts on understanding the questions.
- Allow the participants to ask their questions and clear their doubts. Repeat if required.

## Session 5.4 Preventive and corrective maintenance

### Context

This is a session on operations of pressure swing adsorption (PSA) plant. The trainer, through this session, will provide information on preventive maintenance and troubleshooting of common PSA problems and how to conduct oxygen audit at PSA plant.

#### Activity 5.4.1

**30 mins**

#### Preventive and corrective maintenance

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Understand the preventive maintenance</li> <li>➤ Become aware of general troubleshooting and</li> </ul>	Presentation deck	Presentation and discussion

common PSA problems and solutions ➤ Become familiar with the process of oxygen audit at PSA plant		
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- Before starting the presentation, ensure that every participant has the Guidebook for Medical Oxygen Management Systems
- Ask the participants to refer to Chapter 3 for detailed information. Familiarise yourself with the content of Chapter 3 in the guidebook.
- Use PowerPoint slides from Trainer's Handout to discuss about the preventive maintenance and troubleshooting of PSA plant.

#### **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.

### Objectives

The participants will be able to:

- Learn about the sources, piping network, valves, warning and alarm systems, outlets and inlets of MGPS
- Understand the pipeline distribution system
- Learn about the safety and handling of MGPS

### Training Simulation

#### Context

In this session three participants will prepare themselves and do demonstration of training session that has happened on the Day 1 of the ToT and subsequently orient other participants. The selected participants will act as trainer and conduct the training.

#### Activity

40 mins

#### Training Simulation

Learning Objectives	Materials	Methodology
➤ The selected participants will act as trainer to conduct the training and orient other participants	Presentation slide Participants are free to use any training delivery method Flipcharts Marker pens	Presentation, and discussion

- Identify any two people voluntarily among the participants before simulation.
- This activity requires two people, one trainer and another as co-trainer. Rest of the group will act as observer to give feedback.
- Give the identified participants the training material including the presentation deck for the particular session (e.g., Oxygen cylinder) and ask them to prepare 40 mins of presentation. Rest 20 mins will be used for providing feedback. The participants can conduct group activities as well.
- For the feedback session please use two flipcharts. One of the flipcharts will be used to capture points around 'what happened well' and on the other points related to 'what could have been better' will be captured.

#### Instruction for participants

- We are going to conduct simulation training based on the session conducted on day 1 of the workshop.

- Visualize the selected/identified participants as trainers, rest of the group will act both as participants and observer.

## Feedback

20 mins

- Participants to give their feedback on:
  - What happened well
  - What could have been better
- The trainer and co-trainer to reflect on:
  - What happened well
  - What could have been better
- Facilitator to give their feedback on (at the end):
  - What happened well
  - What could have been better

## 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 one section of the presentation is complete.
- You may give them inputs on the delivery method and their connect with other participants, but you should not be the first one to give feedback.

## Session 6.1 Medical Gas Pipeline System (MGPS) and Its Components

### Context

This is a session on medical gas pipeline system (MGPS). The trainer, through this session, will provide information on the various components and sources of MGPS.

### Activity 6.1.1

60 mins

#### Introduction to medical gas pipeline system

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Learn about the MGPS and its components</li> <li>➤ Know the sources of supply</li> </ul>	Presentation slide deck	Presentation and discussion

### Part 1: Presentation and discussion (60 minutes)

- Ask the participants to refer to Chapter 4 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 key considerations for MGPS components.

#### 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 6.2 Pipeline Distribution System, Safety and Handling

### Context

This is a session on medical gas pipeline system (MGPS). The trainer, through this session, will provide information on pipeline distribution system, pipeline testing, and color coding of gas pipelines. During this session, the trainer will also provide insight on safety and handling of MGPS and troubleshooting tips.

#### Activity 6.2.1

60 mins

#### Pipeline distribution system, safety and handling

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Understand the pipeline distribution system and pipeline testing</li> <li>➤ Know the colour coding for gas pipeline</li> <li>➤ Become aware of the safety and handling of MGPS</li> </ul>	Presentation deck Post-training questionnaire Chart papers/flipchart Marker pens (multiple colours)	Presentation and discussion Group activity

#### Part 1: Presentation and discussion (45 minutes)

- Ask the participants to refer to Chapter 4 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 key considerations for MGPS components.

### **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.
- Discuss the outcome of the group activity

### **Part 2: Group activity discussion – mix match (15 minutes)**

- Distribute Participant handout 6.1.1
- Divide the participants into group of 3-5 participants.
- Ask every group to match the gases to the right color code as per their knowledge. Give 10 minutes to each group.
- After this activity is completed, ask to show the right color coding and whichever group has got the highest number of color-coding right will receive a prize.
- This activity must be performed before describing the color-coding session in detail.

### **Notes for the facilitator**

- Check with the participants if they have any doubts on colour coding of different gases in MGPS as per ISO standard.
- Allow the participants to ask their questions and clear their doubts.
- Explain to learners' tank colours. That many gases are stored/ transported in cylinders, it is critical to be able to distinguish one from the next to avoid a potentially lethal situation by administering the wrong gas. Distinguishing between gas cylinders is primarily achieved by understanding the difference in tank colours, connection systems and cylinder nomenclature.
- Ask learners for the different colour for oxygen and risks.
- With ISO-standards, the oxygen cylinder itself is either black (for industrial purposes), green (in the food industry) or white (for medical purposes) but the shoulders have different colours depending on the gases they contain. These colours can be seen on the ISO legend, where medical oxygen cylinders will always have a white top or white "shoulders".
- In the USA, oxygen cylinders are completely green.
- Emphasize: In either case, it is important to know which is being used by your facility/ distributor so that oxygen can be differentiated from other substances that are stored in similar containers.

## Session VII Oxygen Concentrators (OC)

### Objectives

The participants will be able to:

- Learn about setup and prepare oxygen concentrators
- Understand the fundamentals of OC and its basic components
- Get to know about the operation of oxygen concentrator, particularly operating hazards, disinfecting OCs when used for COVID-19 cases
- Learn about the preventive the maintenance of OC

### Session 7.1 Functional Characteristics of Oxygen Concentrator

#### Context

This is a session on oxygen concentrator. The trainer, through this session, will provide information on its characteristics, advantages, disadvantages, pre installation requirements, maintenance, and troubleshooting of oxygen concentrator.

#### Activity 7.1.1

120 mins

##### Introduction to oxygen concentrator

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Understand the functional characteristics of oxygen concentrator</li><li>➤ Know about the advantages and disadvantages of concentrators</li><li>➤ Know about the user setup and working</li><li>➤ Know about the monitoring and maintenance of oxygen concentrator</li></ul>	<p>Presentation deck</p> <p>Post-training questionnaire</p> <p>Demonstration: Oxygen concentrator (based on availability)</p>	<p>Presentation and discussion</p>

#### Part 1: Presentation and discussion (100 minutes)

- Ask the participants to refer to Chapter 5 of the guidebook for detailed information. Familiarize yourself with the content of the chapter in the guidebook.
- Use PowerPoint slides from Trainer's Handout to discuss key considerations for pulse oximetry.

### **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 (20 minutes)**

- You should have 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.

### **Notes for the facilitator**

- Check whether device required during the session are available and functional with you beforehand.
- 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

### Objectives

The participants will be able to:

- Learn about oxygen therapy, high flow nasal oxygen therapy (HFNC), and ventilator
- Understand pulse oximetry
- Knowing decontaminating and disinfecting oxygen supply devices
- Know the preventive maintenance and troubleshooting guidelines

### Session 8.1 Other oxygen equipment and Ventilators

#### Context

This is a session on other oxygen equipment. The trainer, through this session, will provide ins on ventilators, its types, components and functioning, risks using a ventilator. During this session, the trainer will provide information on how to disinfect oxygen supply devices when used for COVID-19, its maintenance and troubleshooting.

#### Activity 8.1.1

75 mins

#### Introduction to other oxygen equipment and ventilators

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"> <li>➤ Understand the functioning and learn about the components of ventilators</li> <li>➤ Know the types of ventilators (CPAP, BiPAP)</li> <li>➤ Know the risks of using ventilators</li> <li>➤ Understand the hygienic use of respiratory care equipment</li> </ul>	Presentation slide deck Post-training questionnaire Demonstration of: Ventilators (based on availability) <ul style="list-style-type: none"> <li>➤ CPAP</li> <li>➤ BiPAP</li> <li>➤ Manual resuscitator bags and</li> </ul> Oxygen equipment (based on availability) <ul style="list-style-type: none"> <li>➤ Canula</li> <li>➤ Face mask</li> <li>➤ Tubes</li> <li>➤ Humidifiers</li> <li>➤ Oxygen analysers</li> <li>➤ Venturi mask</li> </ul>	Presentation and discussion Device Demonstration

### Part 1: Presentation and discussion (60 minutes)

- Ask the participants to refer to Chapter 7 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 key considerations for ventilator.

#### 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)

- 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.

#### Notes for the facilitator

- Check whether all the materials required during the session are available with you beforehand.
- 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 8.2 Pulse Oximetry

### Context

This is a session on pulse oximetry. The trainer, through this session, will provide information on the purpose of oximetry, application areas of oximetry, user set up instructions, maintenance, troubleshooting, and do's and don'ts of oximetry.

#### Activity 8.2.1

45 mins

##### Introduction to pulse oximetry

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Understand the purpose of pulse oximetry.</li><li>➤ Learn about the main application areas and</li></ul>	<ul style="list-style-type: none"><li>Presentation deck</li><li>Post-training quiz</li></ul>	Presentation and discussion

characteristics of pulse oximetry ➤ Know the user setup properly ➤ Know the maintenance and troubleshooting	Demonstration: Pulse oximetry (based on availability)	
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### Part 1: Presentation and discussion (30 minutes)

- Ask the participants to refer to Chapter 6 of the guidebook for detailed information. Familiarize yourself with the content of the chapter in the guidebook.
- Use PowerPoint slides from Trainer's Handout to discuss key considerations for pulse oximetry.

#### 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 (5 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.

#### Notes for the facilitator

- Check whether all the materials required during the session are available with you beforehand.
- 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.

### Part 3: Quiz (10 minutes)

- Distribute the printout of the participant handbook 8.2.1.
- Allow the participants a few minutes to read it.
- Ask them to attempt the exercise individually.
- Give them five (05) minutes to draft their responses to the questions.
- Once completed, discuss the responses to the questions.

#### Notes for the facilitator

- Check with the participants if they have any doubts on understanding the questions.
- Allow the participants to ask their questions and clear their doubts. Repeat if required.

### Objectives

The participants will be able to:

- Learn about the prevention of fires in oxygen systems through information and training, preventing oxygen enrichment, oxygen cleanliness
- Learn about protection of personnel using firefighting equipment, emergency response and rescue
- Know about the emergency plan during leakage, safety signs, labelling and signages on devices
- Learn about the decontamination and disinfection procedures for oxygen supply devices

### Exposure Visit

#### Context

The exposure visit will enable participants to connect the learning session on LMO, PSA plant, MGPS, ventilators, pulse oximetry and other oxygen equipment with live demonstration at a health facility and interact with the operations and maintenance department of the facility.

#### Activity

**120 mins**

#### Exposure visit

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Know the installation and working of LMO, PSA plant, MGPS, ventilators</li><li>➤ Maintenance and troubleshooting</li></ul>	-	Visit to the health facility

### Training Simulation

#### Context

In this session three participants will prepare themselves and do demonstration of training session that has happened on the Day 1 of the ToT and subsequently orient other participants. The selected participants will act as trainer and conduct the training.

**Activity****40 mins****Training simulation**

Learning Objectives	Materials	Methodology
➤ The selected participants will act as trainer to conduct the training and orient other participants	Presentation slide Participants are free to use any training delivery method Flipcharts Marker pen	Presentation and discussion

- Identify any two people voluntarily among the participants before simulation.
- This activity requires two people, one trainer and another as co-trainer. Rest of the group will act as observer to give feedback.
- Give the identified participants the training material including the presentation deck for the particular session (e.g., Oxygen cylinder) and ask them to prepare 40 mins of presentation. Rest 20 mins will be used for providing feedback. The participants can conduct group activities as well.
- For the feedback session please use two flipcharts. One of the flipcharts will be used to capture points around 'what happened well' and on the other points related to 'what could have been better' will be captured.

**Instruction for participants**

- We are going to conduct simulation training based on the session conducted on day 1 of the workshop.
- Visualize the selected/identified participants as trainers, rest of the group will act both as participants and observer

**Feedback****20 mins**

- Participants to give their feedback on:
  - What happened well
  - What could have been better
- The trainer and co-trainer to reflect on:
  - What happened well
  - What could have been better
- Facilitator to give their feedback on (at the end):
  - What happened well
  - What could have been better

### 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 one section of the presentation is complete.
- You may give them inputs on the delivery method and their connect with other participants, but you should not be the first one to give feedback.

## Session 9.1 Medical Oxygen Handling and Safety

### Context

This session is on medical gas handling and safety. The trainer, during this session, shall orient the learners on importance of safe handling of oxygen and the precautions one needs to take care while 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 on different safety signs that one must put up to guide people on safe handling of oxygen.

#### Activity 9.1.1

90 mins

#### Medical gas handling and safety

Learning Objectives	Materials	Methodology
<ul style="list-style-type: none"><li>➤ Know the key dos and don'ts when working with oxygen production, storage, and delivery equipment</li><li>➤ Know the prevention of fires in oxygen systems</li><li>➤ Become aware of the safety signs that needs to be put in hospital premises where oxygen devices are placed</li></ul>	<p>Presentation slide deck</p> <p>Case study (as many as number of participants)</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 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 9.2 Precaution and Maintenance of LMO, PSA Plant, MGPS**

### **Context**

This final session is on precaution and maintenance of LMO, PSA plant, MGPS, other equipment. The trainer, during this session, shall orient the learners on precautions while handling oxygen cylinders, decontamination and disinfection procedures for oxygen supply devices, safety considerations for storage of liquid oxygen, PSA plant and MGPS operations. This session will also provide knowledge on preventing maintenance, troubleshooting guidelines for oxygen equipment.

#### **Activity 9.2.1**

**30 mins**

#### **Precaution and maintenance of LMO, PSA plant, MGPS, other equipment**

<b>Learning Objectives</b>	<b>Materials</b>	<b>Methodology</b>
<ul style="list-style-type: none"> <li>➤ Know the precautions when handling oxygen cylinders</li> <li>➤ Understand the process of decontaminating and disinfecting of oxygen supply devices</li> <li>➤ Become aware of the routine checks and maintenance actions</li> </ul>	Presentation slide deck	Presentation and discussion

- 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 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 X 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 10.1.1

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 –
  - Basics of oxygen management system
  - Oxygen cylinders
  - Liquid medical oxygen
  - Pressure swing adsorption (PSA) plant
  - Medical gas pipeline system
  - Ventilators, pulse oximetry and other oxygen equipment
  - Oxygen concentrators
  - Medical oxygen handling and safety
- 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 10.2.1

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 10.2.1) 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