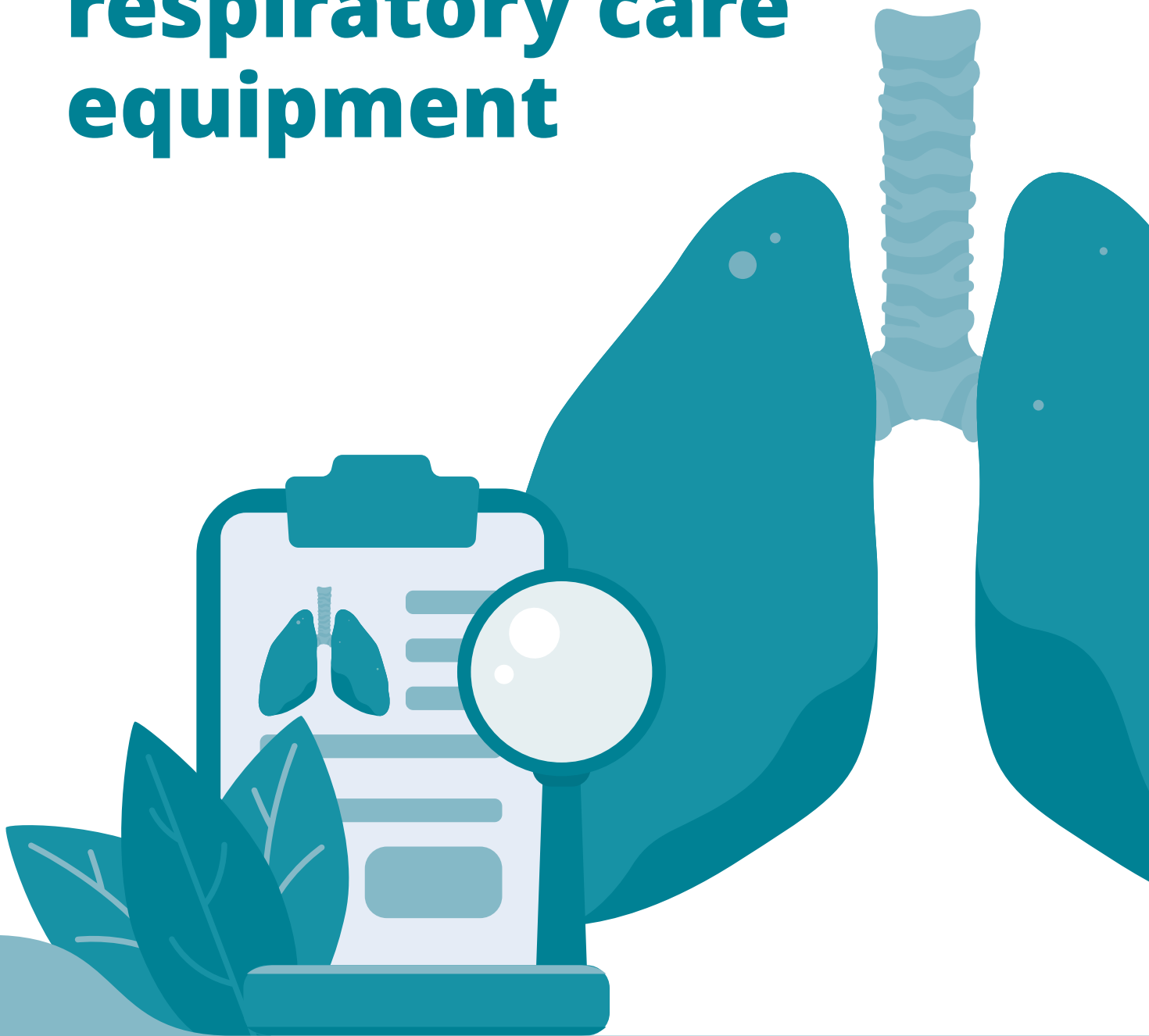




World Health
Organization

South-East Asia Region

Generic training modules on oxygen/ respiratory care equipment



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South-East Asia Region

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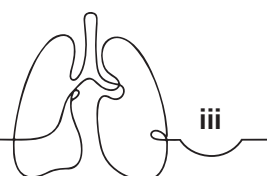
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Foreword



Medical oxygen is an essential medicine with no substitute. It is a critical component of quality health-care delivery, indispensable for the management of respiratory illnesses, emergency care, surgery, critical care, maternal and child health services, and pandemic preparedness and response.

The COVID-19 pandemic highlighted both the importance of oxygen systems and the significant gaps that exist in ensuring reliable, safe, and equitable access to oxygen and respiratory care services across many Member States, including in the South-East Asia Region. In recognition of this, the 76th World Health Assembly in 2023 adopted resolution WHA76.3 on increasing access to medical oxygen—a landmark commitment to treating oxygen as the essential medicine it is.

During the pandemic, Member States rapidly expanded oxygen infrastructure and deployed large numbers of oxygen and respiratory care devices—including oxygen concentrators, cylinders, oxygen generation plants, ventilators, patient monitors, and other related equipment. Even as these efforts significantly strengthened capacity, they also exposed major challenges. These related to planning, procurement, installation, operation, maintenance, safe utilisation, and lifecycle management of medical oxygen systems and biomedical equipment.

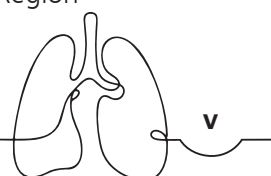
A resilient oxygen ecosystem requires more than the availability of equipment alone. It depends on strong systems, trained personnel, appropriate infrastructure, effective governance, and sustainable operational and maintenance mechanisms. Biomedical engineers, technicians, and health workers are responsible for ensuring that medical devices remain functional, safe, and available for patient care. Yet practical, standardised, and context-appropriate guidance to support these professionals in their day-to-day responsibilities is lacking.

This Trainer's Handbook has been developed to address these gaps and to strengthen biomedical capacity and oxygen ecosystem across the Region. Together with the *Regional manual with operating guides on respiratory care equipment and devices*, it supports the development of a skilled workforce capable of ensuring the availability, accessibility, safe utilisation, and sustainability of oxygen and respiratory care systems.

The handbook reflects the collective experience and technical expertise of Member States and partners, including lessons learned during the COVID-19 response and beyond. It also aligns with ongoing global and regional efforts to strengthen health systems resilience, improve access to medical oxygen, and support preparedness for future respiratory emergencies.

The World Health Organization appreciates the efforts of all experts, contributors, reviewers, and partners who made this handbook possible. As a valuable resource for Member States to strengthen safe, reliable, and sustainable oxygen and respiratory care systems, it will ultimately contribute to improved patient outcomes and stronger health systems throughout the Region.

Dr Catharina Boehme
Officer-in-Charge
WHO South-East Asia Region



Acknowledgments

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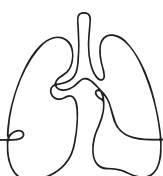
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Abbreviations

ABG	arterial blood gas
ASUs	air separation units
BiPAP	bi-level positive airway pressure
CPAP	continuous positive airway pressure
HFNC	high-flow nasal cannula
LMO	liquid medical oxygen
LOX	liquid oxygen
MGPS	medical gas pipeline system
OC	oxygen concentrator
PPE	personal protective equipment
PSA	pressure swing adsorption
VPASA	vacuum pressure swing adsorption
VSA	vacuum swing adsorption



Introduction to trainer's handbook

Context

The health sector relies heavily on medical equipment to deliver essential health-care services, underscoring its critical importance. With the wide range of devices used in clinical settings, biomedical engineers and technicians must build confidence in operating equipment and performing basic troubleshooting. As technology evolves rapidly, users also require regular training and updates to ensure proper handling and safe operation. This need becomes even more urgent during public health emergencies, such as the COVID-19 pandemic, when medical equipment play a vital role in patient care. In many cases, equipment has been underutilized or left idle due to insufficient user knowledge and skill.

Purpose of the training

The purpose of the training on oxygen equipment for biomedical engineers and technicians is to provide them with the knowledge needed to understand the components, operation, installation, routine checks, maintenance, troubleshooting and safe handling of oxygen and respiratory care equipment used in health facilities.

Training objectives

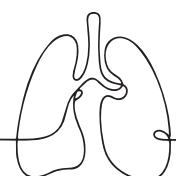
At the conclusion of this training, participants will be able to:

- grasp the concepts of medical oxygen and oxygen therapy, comprehend their purpose and be knowledgeable about the devices employed for oxygen therapy;
- understand the appropriate usage of oxygen, and communicate accurately about oxygen generation technologies and equipment, oxygen storage and delivery devices, oxygen distribution and medical gas pipeline system (MGPS), and equipment used for monitoring blood oxygen saturation of patients with respiratory issues;
- be aware of the installation and commissioning requirements for oxygen and other respiratory care equipment; and
- acquire knowledge regarding preventative and corrective maintenance, common issues and troubleshooting solutions for respiratory equipment, while also understanding safe equipment handling.

The training curriculum is composed of standardized printed materials, PowerPoint slides, case studies, exercises and pre-test/post-test questions.

Training approach

This guide proposes a training programme spanning five days, which is organized according to the following session outline. The training will employ participatory learning techniques, such as interactive presentations, case studies and group discussions, led by both trainers and trainees. The course design



entails individual participation in exercises, as well as opportunities for trainees to engage with the facilitator and seek clarification or support in addressing any challenges or enquiries.

Facilitator's/Trainer's Guide

The Facilitator's Guide has been designed to guide trainers (preferably senior biomedical engineers who have experience and expert level of knowledge in the area of oxygen and respiratory care devices, including medical gas pipeline system). The Facilitator's Guide contains a suggested session outlined with allocated time (can be modified as per the intended users and the specific need) for each session and the resources/materials required, including clear instructions for each training activity. Presentation slides for the sessions will be furnished to trainees where/when necessary. The training must be carried out in the language preferred by the participants to ensure maximum comprehension. To maintain the quality of the training and ensure better results, 20 participants should be included in each session.

Trainers

The lead trainer will preferably be a senior biomedical engineer with an expert level of knowledge and experience in the area of oxygen and respiratory care devices/system. The trainer must have commendable technical and management knowledge and experience in the area of oxygen and respiratory care devices/system.

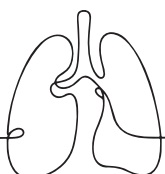
Intended participants/trainees

The participants could be biomedical engineers, service engineers/technicians and personnel responsible for management, maintenance and operations of oxygen and respiratory care devices/system.

Equipment and supplies

It is recommended that preparations be made well in advance of the training to ensure that all necessary materials and supplies are available at the training site throughout the training period. The following equipment are suggested for use during the training:

- flip charts with stands;
- flip chart markers of distinct colours;
- laptop/computer, speaker, projector and screen;
- extension cord;
- double-sided tape for posting flip charts on the wall;
- notepads (for every participant);
- pens and pencils (for every participant);
- adequate number of copies of the handbook and reference materials for each participant:
 - WHO Regional Manual on Respiratory Care Devices and Equipment, 2025;
 - WHO Foundations of Medical Oxygen Systems, 2023 (with annexes).



- WHO Technical Specifications for Health Facility-Based Medical Oxygen System, 2024; and
- WHO Priority Medical Devices List, 2020;
- adequate number of copies of job-aids such as counselling kits, flip books, etc.;
- adequate number of copies of pre- and post-test questionnaires for participants; and
- adequate number of copies of course evaluation forms for participants.

(The details of resource materials required for each session are mentioned in the session outline and the training activity for the session).

Equipment and accessories list for skill session

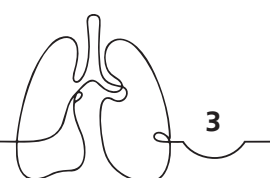
Parts and accessories	Quantity
Oxygen concentrator	2
Humidifier bottle (different types)	2 (each)
Oxygen tubing	2
Oxygen cylinder with cylinder key, pressure gauge, pressure regulator, valves (pin index and bullnose) and trolley	2 (each)
Mask with resuscitation bag	2
Continuous positive airway pressure (CPAP)	1
Bi-level positive airway pressure (BiPAP)	1
High-flow nasal cannula (HFNC)	1
Pulse oximeter (fingertip and handheld) with accessories	1 (each)
Personal protective equipment (PPE) (gloves, mask, goggles, etc.)	20
Cleaning cloth	100

Assessment of training

Pre-course and post-course test

The participants will be assessed for their knowledge and skills related to the thematic area of the course and counselling skills at the beginning of the training. The purpose of the assessment is to measure the improvement in knowledge and skills gained through the training. Trainers should administer the pre-test at the beginning of the training and the post-test at its conclusion. The pre-test will help trainers gauge the participants' initial knowledge level, strengths and weaknesses, and adjust the training as needed.

The post-test will measure how well the trainees understood the content. Trainers should address the knowledge gaps identified in the post-test based on the participants' responses. To successfully complete the training, each participant should achieve a minimum of 80% in the post-test knowledge and demonstrate standard counselling skills by the end of the course. If an individual is unable to meet the predetermined benchmark, the trainer can hold a separate short session to address the key areas where participants have scored less.



Course evaluation form

At the conclusion of the five-day training, a course evaluation form will be provided to the participants to assess their overall satisfaction with the training and identify any areas for improvement. The purpose of this evaluation is to gather feedback on the training process as a whole and identify any strengths and weaknesses.

Icebreaker

The purpose of icebreakers is to assist attendees in socializing, easing any tension and encouraging them to communicate with each other. As the facilitator, your responsibility is to facilitate this process rather than participate in it.

Energizers

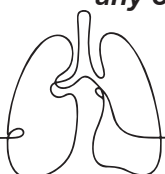
Energizers are designed to increase energy levels in a group of attendees who have been sitting and listening for an extended period. Energizers should be brief, lasting a few minutes, and include physical movement, humour and diversion. During an energizer, participants should stand up and engage in some physical activity. When selecting energizers, it is important to be mindful of the cultural, gender and religious norms of the group. ***Please refer to the trainee handouts folder for the set of energizers.***

Notes for the trainer

Prior to the training, the trainer should:

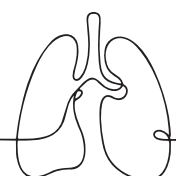
- read the ToT Facilitator's Guide and learn about the content in each module;
- refer and read out the reference materials and handouts for the participants/trainees;
- review the training goals, session outlines and training activity for each session provided in the Facilitator's Guide;
- become familiar with the slides for each session and prepare the necessary notes, handouts and other materials in advance;
- ensure that audio-visual equipment is checked, and that the training venue is suitable, with appropriate arrangements for seating, lighting and refreshments;
- ensure the internet connection is stable so that videos can play continuously without any interruptions throughout the session;
- be working with a co-facilitator and sharing responsibilities for facilitating the sessions;
- during the training guide participants through group work and discussions, while keeping an eye on the time and making sure that all activities are completed within the allotted time;
- speak clearly and encourage participants to contribute, while avoiding unnecessary information overload; and
- ensure that the participants understand key points and summarize each session with examples, and praise the contributions made.

All exercises, methods and lesson plans are only suggestions. You are encouraged to adapt any of the materials or timing of activities to meet the needs of your learners (trainees).



Session outline

Sessions	No. of slides	Duration (in min.)
Day 1: (9 am to 6 pm, with overall 90 min. of break including lunch)		
Tea and registration of participants		30
Session 1: Opening session and introductory activity	6	60
Session 2: Oxygen generation – introduction	5	30
Session 2.1: Pressure swing adsorption technology	6	30
Session 2.2: Oxygen concentrator (with demonstration)	42	120
Session 2.3: PSA plant (last day exposure visit)	61	180
Day 2: (9:30 am to 5:30 pm, with overall 90 min. of break including lunch)		
Session 3: Oxygen storage – introduction	5	30
Session 3.1: Oxygen cylinder (with demonstration)	23	120
Session 3.2: Liquid oxygen storage tank (last day exposure visit)	28	120
Session 4: Oxygen distribution – MGPS (last day exposure visit)	36	120
Day 3: (9:30 am to 5:30 pm, with overall 90 min. of break including lunch)		
Session 5: Oxygen regulation and conditioning devices		
Session 5.1: CPAP and BiPAP (with demonstration)	24	120
Session 5.2: HFNC (with demonstration)	20	90
Session 5.3: Ventilator (with demonstration)	24	150
Session 5.4: Humidifier (with demonstration)	13	30
Day 4: (9:30 am to 5:30 pm, with overall 90 min. of break including lunch)		
Session 6: Oxygen monitoring devices		
Session 6.1: Pulse oximeter (with demonstration)	24	120
Session 6.2: Multiparameter patient monitor (with demonstration)	31	150
Session 6.3: ABG analyser (with demonstration)	23	120
Day 5: (9:30 am to 5:30 pm, with overall 90 min. of break including lunch)		
Exposure visit		240
Post-training assessment and transfer-out		60



Session 1: Opening session

Context

This being the first session of the training, it is important to ensure a strong start. While many participants may already be familiar with one another, the hallmark of an effective beginning lies in creating an environment where the trainer and participants not only get acquainted but also align their expectations with the objectives of the training. This will help the participants stay focused during the sessions.

Session objectives

- Get to know each other.
- Identify participants' expectations from the course.
- Establish training norms, positive climate and spirit of cooperation.
- Identify the goal and objectives of the training workshop.
- Get familiar with the handbook and the training agenda.
- Participate in pre-course knowledge assessment.



Time: 60 minutes



Method: Presentation and interaction



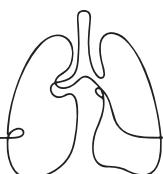
Resources/materials needed

- Daily attendance sheets to be filled by the participants before commencement of the session
- Participant packets/folders, containing agenda, handbook, counselling job-aids and notebook
- Presentation on the goals, objectives of the training workshop and key messages for the session
- Flip chart, stand and markers
- Day's agenda made on the flip chart paper and posted on the wall
- Copies of the pre-test for participants

Instructions for delivery

Introduction (30 minutes)

- Greet participants and give them a name tag, get the attendance sheet filled out and distribute training workshop packets before this session starts.



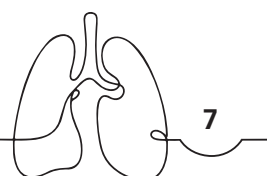
- Formally open the training.
- Welcome the participants and introduce the trainers.
- Ask the participants to introduce themselves to each other. You can do this by:
 - asking the participants to pair off;
 - asking each pair to spend five minutes interviewing each other, covering three points: partner's name, worksite and at least one thing his/her partner hopes to gain from the training;
 - having each participant present his/her partner's name, worksite and one key expectation to the group; and
 - starting with the participant standing first to your left-hand side.
 - Make note of the participant's expectations on a flip chart and post the flip chart paper on the wall.
 - Thank all participants for introducing themselves.

Expectations setting (20 minutes)

- Provide an overview of the training by reviewing the training goals and objectives.
- Using a PowerPoint presentation, provide an overview of the training by reviewing the purpose, objectives and schedule of the training.
- Prepare two flip charts: label one "Expectations" and the other "Apprehensions", and place them on separate 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 the 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 flip charts.
- During the training, display the flip charts "Expectations" and "Apprehensions" on the walls using scotch tape.
- Assure the participants that you will try to meet their expectations and address their apprehensions during the training.

Pre-course assessment (10 minutes)

- Distribute pre-test questionnaires. Give them 10 minutes 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 2: Oxygen generation – introduction

Context

In healthcare facilities, medical oxygen can be produced either onsite or at offsite manufacturing plants. The concentration of medical oxygen is achieved through air separation units (ASUs), which extract nitrogen, oxygen and, sometimes, other rare gases, such as argon, from atmospheric air. Different methods of separation are used to obtain concentrated oxygen, including cryogenic fractional distillation that produces liquid oxygen (LOX), pressure swing adsorption (PSA) and vacuum swing adsorption (VSA) that generate gas oxygen product, and vacuum pressure swing adsorption (VPSA), a combination of PSA and VSA. This section presents an overview of the onsite technologies for the production of medical oxygen with a greater focus on PSA and oxygen concentrators.

Session objectives

- acquire knowledge on medical oxygen, including its therapeutic applications, production and generation methods and safety precautions; and
- understand the principle of operation and key system components involved in oxygen generation using the PSA process.



Time: 30 minutes



Method: Presentation

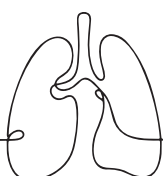


Resources and materials needed:

- trainees' handout;
- presentation deck;
- oxygen concentrator for demonstration; and
- PPE and cleaning supplies.

Instructions for delivery

- Distribute the handout for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives, using slide no. 2 from the slide deck session 2.1 – Principle of operation and system components for oxygen generation.
- Familiarize the participants with medical oxygen, its use and technologies used to generate medical-grade oxygen using PowerPoint slides 3–5.



Session 2.1: Pressure swing adsorption (PSA) technology

Session objective is to:

- understand the principle of operation and key system components involved in oxygen generation using the PSA technology.

 **Time: 30 minutes**

Instructions for delivery

- Commence the session by walking them through the session objective using slide nos. 6–10 from the slide deck session 2.1 – Principle of operation and system components for oxygen generation.

Session 2.2: Oxygen concentrator

Session objectives:

- Gain knowledge about oxygen concentrators, their applications, different types and capacities.
- Understand the components of an oxygen concentrator, how they function and how various accessories are used in conjunction with oxygen concentrators.
- Learn how to instal and set up the oxygen concentrator.
- Understand the preventive and corrective maintenance required for oxygen concentrators.
- Become familiar with common problems and troubleshooting solutions related to oxygen concentrators.
- Understand the process of cleaning and decontaminating oxygen concentrators and learn about the safe handling of oxygen concentrators.

 **Time: 120 minutes**



Method: Presentation, group activity, case study and live demonstration

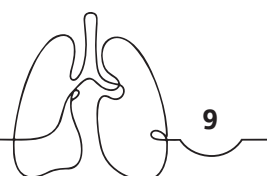


Resources and materials needed:

- trainees' handout;
- presentation deck;
- oxygen concentrator for demonstration and accessories; and
- PPE and cleaning supplies.

Instructions for delivery

- Distribute the handout for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objective using slide no. 2 from the slide deck session 2.2 – Oxygen concentrator.



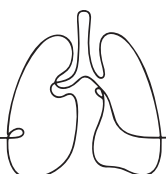
- Familiarize the participants with oxygen concentrators and their use, as well as the different types and capacities available, using PowerPoint slides 3–4.
- Explain the different components of an oxygen concentrator and how they function, using slides 5–7.
- Explain to the participants the various accessories commonly used with oxygen concentrators, using slide 8.
- Provide a step-by-step procedure for installing and setting up an oxygen concentrator, using slides 9–18, and demonstrate the process using an actual device present in the classroom and with assistance from the co-trainer. Demonstrate how to set up an oxygen concentrator using a video on slide 15.
- Discuss the daily and weekly checks required, and the preventive and corrective maintenance required for oxygen concentrators, using slides 19–33. Demonstrate how to perform preventive maintenance using a video on slide 22 and how to perform corrective maintenance using a video on slide 33.
- After discussion, introduce the participants to the case study on slide 34, using handout 2.2.1. The instructions for the delivery of the case study are mentioned below.
- Discuss cleaning and decontamination of oxygen concentrators using slides 35–39 and demonstrate the process through a video using slide 39.
- After discussion, introduce the participants to the group activity on slide 40 using handout 2.2.2. The instructions for the delivery of activity are mentioned below.
- Provide safety precautions to be taken while using oxygen concentrators, using slide 41.

Case study (30 minutes)

- Distribute the handout 2.2.1 printout to the trainees and ask them to read the case and its questions.
- Allow the participants for a few minutes to read it.
- Invite clarifying questions about the case study and respond to questions from the participants.
- Once all questions are addressed, ask them to form groups of five people each. 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 10 minutes to draft their responses to the questions in the case study.
- Ask each group to share their responses with the larger audience. Allow five minutes per group to share their responses.

Group activity: Cleaning and decontaminating oxygen concentrators (30 minutes)

- After discussion, introduce the participants with the group activity as outlined in the handout 2.2.2 for trainees.
- Divide the participants into groups of two or three in each.
- Provide each group with an oxygen concentrator and the necessary cleaning supplies.



- Instruct the participants to follow the manufacturer's instructions for cleaning and decontaminating the oxygen concentrators.
- Encourage the participants to work together to complete the cleaning and decontamination process.
- Once the cleaning and decontamination process is complete, ask each group to present their work to the other groups, explaining their cleaning process and the rationale behind their choices.
- Give each group 5–7 minutes to present their work.

Notes for the facilitator

- Screen the video demonstration twice and prompt participants to seek clarification by posing questions after the second playback.
- The trainer has the flexibility to select from a range of interactive activities, based on availability of time. They may choose to conduct a live demonstration, engage the group in an activity or present a case study or they can choose to conduct it all.
- Ask your co-facilitator to make arrangements for the planned activity, at least 10 minutes prior to closing the session.
- Check beforehand if the required equipment, supplies and accessories for the session are available and functioning properly.
- You may allow the participants to ask questions between the demonstrations or you may also ask them 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 responses to the question.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introduce an energizer activity among the participants using a slide deck in the Trainee Handouts folder – it could help boost their energy and reignite their interest.

Session 2.3: Pressure swing adsorption (PSA)

Session objectives:

- Gain knowledge about pressure/vacuum swing adsorption (VSA), and understand the sizing and configuration of a PSA/VSA oxygen generation plant.
- Know about the various requirements for installation of a PSA/VSA oxygen generation plant.
- Understand the operation of a PSA/VSA oxygen generation plant.
- Learn about the monitoring and preventive maintenance of a PSA/VSA oxygen generation plant.
- Become familiar with corrective maintenance, common problems and troubleshooting solutions related to a PSA/VSA oxygen generation plant.
- Become familiar with the booster compressor and its troubleshooting at the facility level.



Time: 180 minutes



Method: Presentation, group activity, case study and exposure visit



Resources and materials needed:

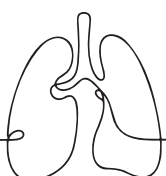
- trainees' handout
- presentation deck
- board pin/scotch tape
- board
- printed flip card (refer to the training handout 2.3).

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objective using slide no. 3 from the slide deck session 2.3 – Oxygen generator plant (PSA/VSA/VPSA).
- Familiarize the participants with PSA/VSA/VPSA, using PowerPoint slides 3–4.
- Explain the sizing and configuration of a PSA plant using slides 5–12.
- Before moving to the next session, introduce the group activity to the participants, using handout 2.3.1. The instruction for delivery is mentioned below.
- Provide a step-by-step procedure to the participants for the installation and commissioning of a PSA plant and tell them about the various requirements using slides 13–28.
- Discuss the operations of a PSA plant, using slides 29–40.
- Discuss the preventive and corrective maintenance required for a PSA plant, using slides 41–49.
- Discuss the common problems and their troubleshooting solutions, using slides 50–55.
- After discussion, introduce the participants to the case study using slide 56 and handout 2.3.2. The instructions for the delivery of case study are mentioned below.
- Wrap the session by introducing them to the last topic of the session, “Booster compressor”, using slides 57–61.

Group activity: Arrange it in correct order (20 minutes)

- Using handout 2.3.1, introduce the activity to the participants.
- Allow them a few minutes to read the activity.
- Divide the participants into four groups, ensuring that no group has more than 5–6 members.
- Ask the groups to occupy one of the boards placed in the room.
- Ask the co-facilitator to distribute one set of flip cards to each group.
- Allow the participants 2–3 minutes to go through each flip card.



- Now ask each group to arrange the flip card on the board. Allocate five minutes to complete this activity.
- Once completed, walk through each group and discuss their activity. Allocate 2–3 minutes per group only.

Case study (30 minutes)

- Distribute the handout 2.3.2 printout to the trainees 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 questions are addressed, ask them to form groups with five in each group. 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 10 minutes to draft their responses to the questions in the case study.
- Ask each group to share their responses to the larger audience. Allow only five minutes per group to share their responses.

Notes for the facilitator

- A day prior to executing the activity, prepare the flip charts using trainees' handout 2.3.1. Print each component on a flip card and make a set of five or six for the activity.
- Screen the video demonstration twice and prompt participants to seek clarification by posing questions after the second playback.
- The trainer has the flexibility to select from a range of interactive activities, based on availability of time. They may choose to conduct a live demonstration, engage the group in an activity or present a case study or they can choose to conduct it all.
- Ask your co-facilitator to make arrangements for the activity planned, at least 10 minutes prior to closing the session.
- Check beforehand if the required equipment, supplies and accessories for the session are available and functioning properly.
- You may allow the participants to ask questions in between the session or you may also ask them to park their questions till you complete.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.

Session 3: Oxygen storage

Context

In health-care facilities, medical oxygen produced either onsite or at offsite manufacturing plants is stored, transported and distributed using high-pressure gas cylinders, cryogenic cylinders and pipeline networks. This section presents an overview of the storage system of medical oxygen with a focus on oxygen cylinders and liquid oxygen tanks.

Session 3.1: Oxygen cylinder

Session objectives:

- Acquire knowledge on medical oxygen, storage and the different types of oxygen cylinders.
- Know about the high-pressure medical oxygen cylinder and become familiar with the criteria used for cylinder naming, sizing, cylinder labelling and colour coding.
- Know about the various components of a medical oxygen cylinder and the accessories used in conjunction with a medical oxygen cylinder.
- Learn how to change/replace medical oxygen cylinders.
- Understand the preventive and general corrective maintenance of a medical oxygen cylinder.
- Understand the necessary precautions for handling medical oxygen cylinders and considerations related to medical oxygen cylinders.



Time: 120 minutes

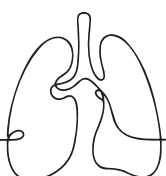


Method: Presentation, group activity, live demonstration



Resources and materials needed:

- trainees' handout;
- presentation deck;
- oxygen cylinder for demonstration;
- board and board pin/scotch tape;
- valves (pin-index and bull nose);
- accessories: humidifier, oxygen tubing, mask with reservoir bag, trolley, pressure regulator, pressure gauge and cylinder key; and
- printed flip card (training handout 3.1.1).



Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives using slide no. 2 from the slide deck session 3.1 – Oxygen cylinders.
- Familiarize the participants with medical oxygen and oxygen cylinders, using PowerPoint slides 3–4.
- Using slide 5, walk them through the different types of oxygen cylinders and then describe the gaseous oxygen cylinder using slides 6–7.
- Familiarize them with the criteria used for colour, naming and sizing of gaseous oxygen cylinders, using slides 8–10.
- Before introducing the next concept, introduce the group activity among the participants using slide 11, the instructions for the delivery of which are mentioned below.
- Explain the various components of oxygen cylinders using slide 12.
- Then tell them about the different types of valves and accessories used in conjunction with oxygen cylinders using slides 13–16.
- Discuss how to change oxygen cylinders using slide 17.
- Demonstrate how to set up an oxygen cylinder ready for use through a video on slide 18 and then conduct the live demonstration using the accessories, the steps for which are mentioned below.
- Discuss the preventive maintenance required for oxygen cylinders, using slide 22.
- Discuss the common problems and their troubleshooting solutions, using slide 23.
- Close the session by providing precautions to be taken while handling oxygen cylinders, using slides 24–27.

Live demonstration (30 minutes)

- You should have the oxygen cylinder and the accessories present with you so that it can 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.

Group activity: Map the gas with the correct colour code (20 minutes)

- Using trainee handout 3.1.1, introduce the activity to the participants.
- Allow them a few minutes to read the activity.
- Divide the participants into 3–4 groups. Make sure each group does not have more than 5–6 participants.
- Ask groups to occupy any one board placed in the room.
- Ask the co-facilitator to distribute one set of flip cards to each group.
- Allow the participants 2–3 minutes to go through each flip card.

- Now ask each group to arrange the flip card on the board. Allocate five minutes to complete this activity.
- Once completed, walk through each group and discuss their activity. Allocate 2–3 minutes per group only.

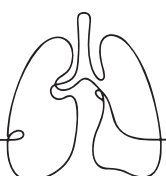
Notes for the facilitator

- A day prior to executing the activity, prepare the flip charts using the trainees' handout 3.1.1. Print each component on a flip card and make a set of 5 or 6 for the activity.
- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- The trainer has the flexibility to select from a range of interactive activities, based on availability of time. They may choose to conduct a live demonstration, engage the group in an activity or present a case study or they can choose to conduct it all.
- Ask your co-facilitator to make arrangements for the planned activity, at least 10 minutes prior to closing the session.
- Check beforehand if the required equipment, supplies and accessories for the session are available and functioning properly.
- You may allow the participants to ask questions in between the demonstration, or you may also ask them 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.

Session 3.2: Liquid medical oxygen

Session objectives

- Familiarize the participants with liquid oxygen (LOX) and LOX storage tank/system.
- Familiarize the participants with the types and component functions of an LOX storage tank/system.
- Become acquainted with the safety considerations while handling LOX and cryogenic storage tank/systems.
- Become acquainted with the common monitoring activities to be performed at a facility by in-house service engineer/staff.
- Become acquainted with the common issues related to cryogenic storage tank/systems and their troubleshooting solutions.



- Become acquainted with cleaning and disinfection of an LOX storage tank/system.



Time: 120 minutes



Method: Presentation, case study, exposure visit



Resources and materials needed:

- trainees' handout
- presentation deck
- printed flip card (trainees' handout 3.2.1)

Instructions for delivery

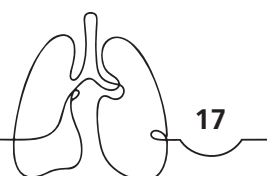
- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives using slide no. 2 from the slide deck session 3.2 – Liquid oxygen (LOX) storage tanks.
- Familiarize the participants with an LOX storage tank, its types and components, using slides 3–10.
- Familiarize the participants with the principle of operation, supply of oxygen to bedside and safety precautions related to an LOX system through slides 11–14.
- Discuss the monitoring and troubleshooting of LOX systems through slides 15–22.
- Discuss cleaning and disinfection using slide 15.
- Before closing the session, introduce the case study among the participants using trainees' handout 3.2.1.

Case study (30 minutes)

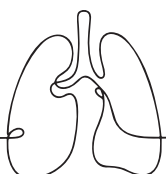
- Distribute the handout 3.2.1 printout to the trainees and ask them to read the case and its questions.
- Allow the participants a few minutes to read it.
- Invite clarifying questions about the case study and respond to questions from the participants.
- Once all questions are addressed, ask them to form groups each with five 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 10 minutes to draft their responses to the questions in the case study.
- Ask each group to share their responses to the larger audience. Allow only five minutes per group to share their responses.

Notes for the facilitator

- Ask your co-facilitator to make arrangements for the planned activity, at least 10 minutes prior to closing the session.



- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- Check beforehand if the required equipment, supplies and accessories for the session are available and functioning properly.
- You may allow the participants to ask questions in between the session, or you may also ask them to park their questions till you complete.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.



Session 4: Medical gas pipeline system (MGPS)

Context

The oxygen distribution system is a critical component of the MGPS in health-care facilities. It provides a safe and reliable supply of oxygen to patients in need. The system typically consists of a central oxygen source, such as a manifold or a liquid oxygen storage tank, which is connected to a network of pipelines that distribute oxygen to patient care areas throughout the facility. This section presents an overview of the oxygen distribution system with a focus on the MGPS and changeover system (manifold).

Session 4.1: MGPS

Session objectives

- Know about the MGPS, medical gas types and colour coding.
- Become acquainted with MGPS components.
- Become familiar with the MGPS, its components and pipeline testing.
- Become acquainted with the manifold changeover system.
- Learn safety precautions for handling MGPS.
- Become acquainted with preventive maintenance, common issues and troubleshooting solutions related to MGPS.



Time: 120 minutes



Method: Presentation, case study, exposure visit

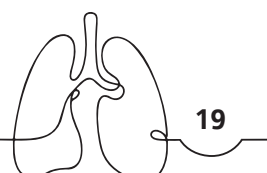


Resources and materials needed:

- trainees' handout
- presentation deck
- printed flip card (training handout 4).

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives using slide no. 2 from the slide deck session 4 – Medical gas pipeline system.
- Familiarize the participants with the colour coding and components for MGPS using slides 3–13.



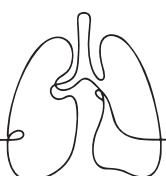
- Describe the medical gas manifold changeover system through slides 14–21.
- Familiarize the participants with MGPS pipeline testing and safety precautions to take for handling MGPS using slides 22–27.
- Familiarize the participants with monitoring/preventive maintenance and general troubleshooting through slides 28–35.
- Before moving onto the next session, introduce a case study among the participants using slide 36.

Case study (30 minutes)

- Distribute the printout of handout 4 to the trainees 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 questions are addressed, ask them to form 3–4 groups, with 5–6 participants each. Adjust extra people/ungrouped in one or more groups. Make sure a new group is created every time.
- Ask the groups to discuss the case study and work together to come up with responses to questions in the case study. Give them 10 minutes to draft their responses to the questions in the case study.
- Ask each group to share their response with the larger audience. Allow only 2–3 minutes per group.

Notes for the facilitator

- Ask your co-facilitator to make arrangements for the planned activity, at least 10 minutes prior to closing the session.
- Check beforehand if the required equipment, supplies and accessories for the session are available and functioning properly.
- You may allow the participants to ask questions in between the session, or you may also ask them to park their questions till you complete.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.



Session 5: Oxygen regulation and conditioning devices

Context

The oxygen distribution system plays a vital role in delivering various forms of respiratory support to patients with breathing difficulties, such as those suffering from sleep apnoea, chronic obstructive pulmonary disease (COPD) or respiratory failure. This training module will cover the different respiratory support devices that rely on the oxygen distribution system to function effectively. This section presents an overview of oxygen regulation and conditioning devices with a focus on continuous positive airway pressure/bi-level positive airway pressure (CPAP/BiPAP), high-flow nasal cannula (HFNC), ventilator and humidifier.

Session 5.1: BiPAP/CPAP

Session objectives

- Know about CPAP/BiPAP and their components.
- Understand the installation and operationalization of CPAP/BiPAP.
- Learn how to get the equipment ready for use.
- Become familiar with the routine checks and preventive maintenance of CPAP/BiPAP.
- Get acquainted with the troubleshooting and corrective maintenance of CPAP/BiPAP.



Time: 120 minutes



Method: Presentation, demonstration (video and live)



Resources and materials needed:

- trainees' handout
- presentation deck.

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objective using slide no. 3 from the slide deck session 5.1 – CPAP/BiPAP.
- Familiarize the participants with CPAP and BiPAP, using slides 4–6.
- Familiarize the participants with components, different types of masks used and knobology used for CPAP/BiPAP through slides 7–11.

- Familiarize them with the installation and operating principle of CPAP/BiPAP using slides 12–15.
- Discuss the routine checks and common troubleshooting using slides 16–22.
- Before closing the session, demonstrate the corrective maintenance through a video on slide 22.

Notes for the facilitator

- You may allow the participants to ask questions in between the session/demonstration or you may also ask them to park their questions till you complete.
- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.

Session 5.2: High-flow nasal cannula (HFNC)

Session objectives

- Know about HFNC and its components.
- Understand the installation, commissioning and working principle of HFNC.
- Learn how to get the equipment ready for use and routine checks for HFNC.
- Become acquainted with the preventive maintenance of HFNC.
- Be acquainted with the maintenance and troubleshooting of HFNC.

 **Time: 90 minutes**

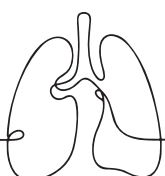
 **Method: Presentation, demonstration (live/video)**

 **Resources and materials needed:**

- trainees' handout
- presentation deck
- HFNC with accessories for demonstration.

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.



- Commence the session by walking them through the session objective using slide no. 3 from the slide deck session 5.2 – High-flow nasal cannula (HFNC).
- Familiarize the participants with HFNC, describe its operation, and its components and knobology used for HFNC using slides 4–7.
- Using slide 12, describe the different components and consumables used.
- Tell them about the installation, commissioning and operationalization procedure using slides 8–10, and then demonstrate how to get the equipment ready for use using a video plugged in slide 11.
- Discuss the routine checks, preventive and corrective maintenance/troubleshooting of HFNC using slides 12–15, and then demonstrate it through a video on slide 16.
- Before closing the session, discuss the common troubleshooting problems and their solutions for the equipment using slides 18–20.

Notes for the facilitator

- You may allow the participants to ask questions in between the session/demonstration or you may also ask them to park their questions till you complete.
- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.

Session 5.3: Ventilator

Session objectives

- Know about mechanical ventilators, their types and components.
- Understand the working principle of a ventilator.
- Learn how to get the equipment ready for use and how to use a mechanical ventilator.
- Become acquainted with the routine checks/preventive maintenance for a ventilator.
- Be acquainted with the maintenance and troubleshooting of a ventilator.



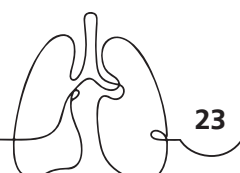
Time: 150 minutes



Method: Presentation, demonstration (live/video)



Resources and materials needed:



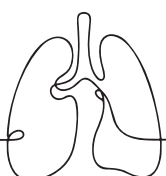
- trainees' handout
- presentation deck.

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objective using slide no. 3 from the slide deck session 5.3 – Ventilators.
- Familiarize the participants with the ventilator using slide 4.
- Familiarize them with the various types of mechanical ventilators, their components, the knobology used for ventilators and the working principles using slides 5–10.
- Describe the different modes of ventilation using slides 11–13.
- Familiarize them with the various types of mechanical ventilators, their components and the knobology used for ventilators using slides 5–9.
- Use slides 10–12 to familiarize them with the working principles and the steps for preparing the equipment, and then demonstrate "How to set up the ventilator ready for use" using a video plugged in slide 13.
- Discuss routine checks using slides 15–17 and then demonstrate "preventive maintenance" using a video plugged in slide 18.
- Present the maintenance of the ventilator using slide 31, then demonstrate it with the video on slide 32.
- Before closing the session, use slides 19–23 to discuss common ventilator troubleshooting problems and their solutions, and then demonstrate a video on "Corrective maintenance of ventilator" using slide 24.

Notes for the facilitator

- You may allow the participants to ask questions in between the session/demonstration or you may also ask them to park their questions till you complete.
- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.



Session 5.4: Humidifier

Session objectives

- Know about oxygen humidifiers and understand the differences between heated and non-heated humidifiers.
- Gain an understanding of the installation of a humidifier.
- Learn about the safe handling of humidifiers.



Time: 30 minutes



Method: Presentation, demonstration (live)



Resources and materials needed:

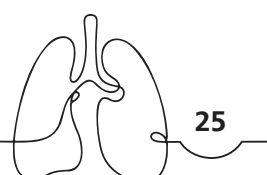
- trainees' handout
- presentation deck
- humidifiers for demonstration.

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objective using slide no. 3 from the slide deck session 5.4 – Humidifiers.
- Familiarize the participants with oxygen humidifiers and their types using slides 4–6.
- Provide the step-by-step procedure for installation of the device, safe handling and when to replace the humidifier, using slides 7–12, and then demonstrate.

Notes for the facilitator

- You may allow the participants to ask questions in between the session/demonstration or you may also ask them to park their questions till you complete.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.



Session 6: Oxygen monitoring devices

Context

Oxygen monitoring devices are critical tools used in health-care facilities to measure the oxygen saturation levels in a patient's blood and ensure that they receive the appropriate level of respiratory support. This section will cover the different types of oxygen monitoring devices and their functions with a greater focus on pulse oximeter, multiparameter patient monitor and ABG analyser.

Session 6.1: Pulse oximetry

Session objectives

- Know about the pulse oximeter and its components.
- Become familiar with the knobology used for pulse oximetry and different types of pulse oximeters.
- Know about the working principle and operation of a pulse oximeter.
- Become familiar with routine checks, preventive maintenance and common troubleshooting for pulse oximeters.
- Become acquainted with safe handling of pulse oximeters.



Time: 120 minutes



Method: Presentation, demonstration (live/video)

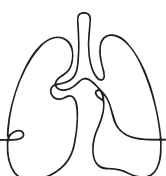


Resources and materials needed:

- trainees' handout;
- presentation deck; and
- different types of pulse oximeters and accessories including probes for demonstration.

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives using slide no. 3 from the slide deck session 6.1 – Pulse oximetry.
- Familiarize the participants with a pulse oximeter and its components using slides 4–6.
- After that, introduce the knobology used for pulse oximeters and different types of pulse oximeters using slides 7–10.



- Familiarize the participants with the working principle and operation of a pulse oximeter using slide 11 and demonstrate “how to get the equipment ready for use” through a video plugged in slide 12.
- Discuss routine checks using slides 13–15 and then demonstrate preventive maintenance of the device through a video plugged in slide 16.
- Discuss common troubleshooting problems and solutions using slides 17–20 and demonstrate the video on corrective maintenance using slide 21.
- Before closing the session, discuss the safety and handling of the device using slides 22 and 23.
- Wrap the session by conducting a short demonstration with a pulse oximeter. The instructions for the delivery of the activity are mentioned below.

Demonstration (30 minutes)

- You should have the pulse oximeter and pulse oximeter probe present with you so that these could be physically shown in the classroom while you explain the structure and mechanism.
- Take assistance from the co-trainer while showing the devices to the participants.
- Demonstrate the following aspects:
 - how to charge the oximeter battery and store the accessories ready for clinical use;
 - the battery condition indicator – what the reading shows;
 - how to switch on the monitor and describe the self-check routine;
 - the features of the main display;
 - the features of the waveform or pulse indicator;
 - how to adjust the alarm limits;
 - how to adjust the pulse sound volume; and
 - how to turn the backlight on or off.

Notes for the facilitator

- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- Check beforehand if the required equipment, supplies and accessories for the session are available and functioning properly.
- You may allow the participants to ask questions in between the session or you may also ask them to park their questions till you complete.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees’ energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the

participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.

Session 6.2: Multiparameter patient monitor

Session objectives

- Become familiar with a multiparameter patient monitor, its types, components and common accessories.
- Become acquainted with the knobology, installation and operation of the multiparameter patient monitor.
- Become acquainted with the routine check and preventive maintenance for the multiparameter patient monitor.
- Become acquainted with the common issues, probable cause and troubleshooting steps for multiparameter patient monitors.
- Get familiar with safe handling of multiparameter patient monitors.



Time: 150 minutes



Method: Presentation, demonstration (live/video)

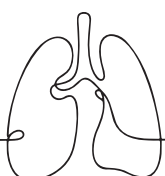


Resources and materials needed:

- trainees' handout
- presentation deck.

Instructions for delivery

- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives using slide no. 3 from the slide deck session 6.2 – Multiparameter patient monitor.
- Familiarize the participants with a multiparameter patient monitor, its types, components and common accessories using slides 4–10.
- Familiarize the participants with the knobology used for a patient monitor, installation and operation of a patient monitor using slides 13–17 and then demonstrate with the “ready for use” video on slide 18.
- Make them familiar with the routine checks using slides 19–21 and then demonstrate “preventive maintenance” through slide 22.
- Discuss the common troubleshooting of the device using slides 23–26 and then demonstrate it with a video plugged into slide 27.
- Familiarize the participants with safe handling of a patient monitor using slides 28–30 and then conduct a demonstration using the patient monitor.



Notes for the facilitator

- You may allow participants to ask questions in between the session/demonstration or you may also ask them to park their questions till you complete.
- Screen the video demonstration twice and prompt the participants to seek clarification by posing questions after the second playback.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.

Session 6.3: ABG analyser

Session objectives

- Know about ABG analysers and the importance of blood gas analysers.
- Become familiar with the components of ABG analysers.
- Understand the working principle and knobology used for ABG analysers.
- Become familiar with the routine checks and troubleshooting of the device.
- Become familiar with safe handling of ABG analysers.



Time: 120 minutes



Method: Presentation, demonstration (live/video)

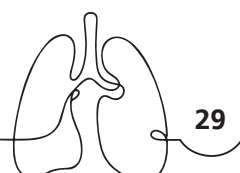


Resources and materials needed:

- trainees' handout
- presentation deck.

Instructions for delivery

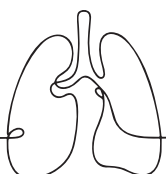
- Distribute handouts for reference and extra reading materials to the participants before commencing the session.
- Commence the session by walking them through the session objectives using slide no. 3 from the slide deck session 6.3 – ABG analyser.
- Familiarize the participants with an ABG analyser and its importance using slides 4 and 5.
- Tell them about the various components and consumables of ABG using slides 6–8.
- Familiarize the participants with the working principles and knobology used for ABG analysers using slides 9–12.



- Describe the routine checks and troubleshooting of the device using slides 13–19.
- Discuss the safe handling of ABG using slides 20–22 and then conduct the demonstration with an ABG analyser (during exposure visit).

Notes for the facilitator

- You may allow the participants to ask questions in between the session/demonstration or you may also ask them to park their questions till you complete.
- 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.
- Keep an eye on the time to ensure that the activity and discussion are completed on schedule.
- If you notice that the trainees' energy levels are decreasing or they are becoming less engaged or even sleepy, especially after a break or lunch, introducing an energizer activity among the participants using a slide deck in the Trainee Handouts folder could help boost their energy and reignite their interest.



Session: Exposure visit

Context

The exposure visit will enable the 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.

Session objectives

Conduct live demonstration to know and understand the operation and common issues with oxygen and respiratory care devices such as LOX tank, PSA/VSA plant, MGPS, ventilator, HFNC, CPAP/ BiPAP, pulse oximeter, multiparameter patient monitor and ABG analyser.



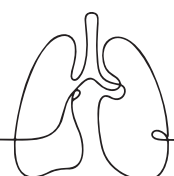
Time: 6 hours



Method: Site visit to the health facility

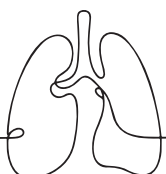
Instructions for delivery

- Prior to the site visit to the health facility, the following steps can be followed:
- Define the objectives of the exposure visit: Before the visit, it is essential to define the objectives of the visit, such as gaining a practical understanding of the equipment operation, maintenance and troubleshooting.
- Identify the health-care facility: Outline the selection criteria used to choose the health facility for the site demonstration. The selected criteria include proximity to the training centre, allowing for easy travel, as well as the presence of a fully operational PSA plant, manifold and LMO at the facility.
- Develop a schedule: Develop a schedule that outlines the timing and duration of the visit, as well as the activities that will take place during the visit. The schedule should allow enough time for the participants to observe and interact with the equipment and the maintenance department.
- Arrange for logistics: Arrange for logistics, such as transportation to and from the health-care facility, and meals.
- Prepare the participants: Prepare the participants by providing them with relevant information about the equipment, such as manuals, schematics and other documentation. They should also be briefed on the safety protocols and regulations they need to adhere to during the visit.
- Conduct the exposure visit: During the visit, the participants should observe the equipment operation, interact with the maintenance department, and ask questions to gain a practical understanding of the equipment operation, maintenance and troubleshooting. The visit should cover all necessary aspects related to the equipment, such as LMO, PSA plant, MGPS, ventilators,



pulse oximetry and other oxygen equipment. The visit should explain the MGPS in the facility, the different types of colour coding for gases, how the various sources have been connected to the MGPS and how each source is used in the facility. For example: Are there specific running hours for PSA? Are shifts of timings allocated for the operation of LMO, PSA and cylinders? Explain the working of PSA and LMO, outline what needs to be addressed during preventive maintenance and troubleshooting, and provide details of accessories and consumables that should be kept in stock.

- Debrief and evaluate the visit: After the visit, the participants should be debriefed to discuss their experiences and observations. The visit should also be evaluated to identify areas of improvement and to ensure that the objectives were met.



Session: Post-training assessment and transfer-out

Context

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

Session objectives

- Recall and refresh the key lessons from the previous sessions.
- Participate in post-training knowledge assessment.



Time: 60 minutes



Method: PowerPoint and interaction



Resources and materials needed:

- Flip charts
- Marker pens of different colours
- Flip chart stands
- Scotch tapes/magic tapes
- Copies of the post-test for participants

Instructions for delivery

- 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 the 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. Allow the participants to choose the topic they wish to present in the given session:
 - Oxygen production;
 - Oxygen storage;
 - Oxygen distribution;



- Oxygen monitoring devices; and
 - Oxygen regulatory and conditioning devices.
- Ask the groups to record "What did we learn in this session?" on the flip chart.
- Instruct the groups to:
 - put each lesson or takeaway in bullets, with one bullet for each lesson;
 - identify a presenter from the group to present it back to the larger group; and
 - complete the task in 15 minutes.
- Invite each group to present the key takeaways of their session. Give each group 2–3 minutes to present their takeaways.
- After that, distribute the post-training questionnaire to all participants.
- Ask the participants to respond to the questions and hand over their responses to the co-facilitator.
- Discuss each question and its correct answer.
- Before closing the session, distribute the course evaluation form to the participants.
- Ask the participants to respond and hand over the responses to the co-facilitator.
- Thank all attendees for their great enthusiasm and participation, and formally close the training.

Trainees' handouts

Please refer to the Trainee Handouts folder.

