

## TECHNICAL SCENARIO

# Oxygen Concentrator 1

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

PURPOSE:  Teaching / Practice  
 Test Result: Pass / Fail / Retest

## Scenario Overview

The scenario is set in the newborn care ward where an oxygen concentrator has malfunctioned. Participants should assess and troubleshoot the device, implement needed repairs and return the device for use.

### Reminder to Facilitator

The facilitator team decides what is essential for participants' understanding. We suggest the team underline or mark these essential items in the **INFORMATION/RESULT** column before beginning the session to ensure these are highlighted throughout the practice.

#### ALWAYS REMEMBER THE CANDIDATE SHOULD START WITH THE 4 Ss

**Safety:** for you, the staff around you and the patient on the device

**Setting:** for possible checks and repairs to the devices

**Supplies:** adequate tools and spare parts for this device

**Shout:** for additional technical support if necessary

### Begin Scenario

**SETTING THE SCENE:** The nursery ward has sent a note to your department with the ward messenger. He says that Sister says to tell you that it is the third requisition note they have sent! **WHAT DO YOU DO?**

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	Go to the ward and introduce yourself to the in-charge.	Sister Lucia is glad to see you.	
2	Ask what the problem is.	The oxygen concentrator is turning on but is making a very loud sound when it is used.	
3	Ask to see the device.	The oxygen concentrator is in a corner of the newborn care unit. It is not currently in use.	
4	Ask if it is okay for you to do some minor checks on the device where it is.	Sister Lucia is happy for you to do so in the ward.	
5	Perform minor checks on the device.  Put on a pair of gloves. Make sure the device is plugged into the wall and switched on at the wall.  Make sure the power cable is pushed well into the socket on the back of the oxygen concentrator.  Press the power switch to 'on.'	The device is plugged into the wall and the wall socket is switched on.  The power cable is slightly loose.  The device audibly powers on, making a loud sound.	
6	What will you do next?  Check the display of the concentrator for any alarms.  Check the gross-particle intake filter for dust build-up.  Test the oxygen output using an oxygen analyser.	A "Low Oxygen" indicator light is displayed.  The gross-particle intake filter is well-cleaned.  The oxygen output is at 67%.	
7	Explain your findings to Sister Lucia.  The loud sound the oxygen concentrator is making is usually due to the compressor wearing out over time. Internal components need to be replaced. The "Low Oxygen" indicator light indicates that the concentrator has also been producing low oxygen, in this case 67%.	Explain to Sister Lucia the low oxygen output.  Sister Lucia is shocked to discover that the oxygen output has been so low.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
8	<b>Explain next steps needed to prevent this from happening again.</b>  This issue happens with extended use but can be aggravated with poor cleaning of the oxygen concentrator intake filters. The clean external intake filter indicates this is not the issue, so the team should continue cleaning the filters as they have done in the past. However, the team should note the "Low Oxygen" indicator light and its implications.	The problem is explained to Sister Lucia.  Sister Lucia is happy to hear that her ward has been performing user maintenance well, and will pass on the message to her team. She will also orient them on the use of the "Low Oxygen" indicator light in clinical care.	
9	<b>Decide where to work on the oxygen concentrator (e.g., at the ward or in the workshop).</b>  The compressor assembly must be assessed which requires opening the device and removing components. Best practice is to remove to workshop for further examination.	The device should be removed to the workshop.	
10	<b>Check with the in-charge if it is okay to remove the oxygen concentrator and if she has a working one to use while this concentrator is being repaired.</b>	The ward has two other oxygen concentrators that they can use whilst waiting for the return of this device. However, this is the only concentrator with 10 L/min capacity, so its fast return would be appreciated.	
11	<b>You remove the oxygen concentrator to the workshop. What will you do next?</b>  Document device information and note all components received with the device.  Put on gloves. Disinfect the device housing using 70% alcohol.	The oxygen concentrator has come to the unit with power cable, humidifier and gross particle intake filter.  The housing is disinfected.	
12	<b>Begin further troubleshooting of the device. Check the condition of the internal components.</b>  Remove device housing screws and remove housing. Set aside screws in separate container.  Check the condition of the fine particle intake filter.  Access the compressor by opening the compressor cabinet. Remove connections to the starting capacitor, heat exchanger and other components as necessary to remove the compressor.	The housing is removed.  The fine particle intake filter is in good condition.  The compressor connections are safely and easily removed.	
13	<b>Open the compressor assembly.</b>  Mark the sides of the compressor to ensure that the correct orientation is maintained. Use a ratchet to remove the bolts securing compressor head. Lift off the compressor head and assess head gaskets for damage.  Turn over valve plate and assess O-rings and reeds for damage.  Remove compressor sleeves and assess for visible damage. Clean interior with alcohol and a cotton swab.  Remove the screw holding the compressor piston plate and cup in place. Check plates and cups for damage.	The head gaskets show some sign of wear and tear.   The O-rings show some sign of wear and tear, although the reeds appear intact.  The compressor sleeves are slightly worn and dirty. They are cleaned with alcohol.  The compressor piston plate is cracked and damaged.	
14	<b>Repair the compressor assembly.</b>  Check for a spare compressor rebuild kit for this device model.  Remove piston plates, cups, gaskets and O-rings. Replace with new kit and reassemble compressor assembly, maintaining original orientation. Replace the compressor in the device.	There are 5 compressor rebuild kits for this model in stock at the workshop.  The compressor is reassembled correctly.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
15	<p>Test the device to see if the repair has been successful.</p> <p>Turn on the oxygen concentrator and allow to run for 10 minutes. Check for the "Low Oxygen" alarm indicator.</p> <p>Test the oxygen output using an oxygen analyser.</p>	<p>Test the device to see if the repair has been successful.</p> <p>The "Low Oxygen" alarm indicator does not come on.</p> <p>The oxygen output is now at 95%.</p>	
16	<p><b>Return the oxygen concentrator to the ward.</b></p> <p>Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well.</p> <p>Use the oxygen analyser to demonstrate the change in oxygen output.</p> <p>Arrange a time when you can train the nursery staff on maintaining the oxygen concentrator.</p> <p>Document corrective activities taken and next steps in maintenance &amp; repair records.</p>	<p>Sister Lucia is happy to receive back the device. She plugs in and turns on the device. It appears to function well, with a quieter operating noise.</p> <p>Sister Lucia is also happy to see the oxygen output is at 97%, and the "Low Oxygen" alarm indicator is not on.</p> <p>Sister arranges a time for you to come during the nurses' weekly CPD session.</p> <p>Activities and next steps are documented.</p>	

## THANK YOU

### REMIND PARTICIPANTS

Nearly all sick infants benefit from oxygen, especially those with respiratory distress. Hypoxia contributes to both morbidity and mortality.

### INFECTION PREVENTION AND CONTROL

Be sure to wash your hands thoroughly and to put on gloves before handling any equipment. After every use, remember to disinfect all consumables and equipment before using them again.

## Scenario end

## TECHNICAL SCENARIO

# Oxygen Concentrator 2

NAME: \_\_\_\_\_ DATE: \_\_\_\_\_

PURPOSE:  Teaching / Practice  
 Test Result: Pass / Fail / Retest

## Scenario Overview

The scenario is set in the newborn care ward where an oxygen concentrator has malfunctioned. Participants should assess and troubleshoot the device, implement needed repairs and return the device for use.

### Reminder to Facilitator

The facilitator team decides what is essential for participants' understanding. We suggest the team underline or mark these essential items in the **INFORMATION/RESULT** column before beginning the session to ensure these are highlighted throughout the practice.

#### ALWAYS REMEMBER THE CANDIDATE SHOULD START WITH THE 4 Ss

**Safety:** for you, the staff around you and the patient on the device

**Setting:** for possible checks and repairs to the devices

**Supplies:** adequate tools and spare parts for this device

**Shout:** for additional technical support if necessary

### Begin Scenario

**SETTING THE SCENE:** Sister in-charge of the nursery has rung you to say she is worried as the babies who are put on oxygen remain a poor colour and do not seem to be doing well. She wonders if the oxygen concentrator is working properly. **WHAT DO YOU DO?**

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	Go to the ward and introduce yourself to the in-charge.	Sister Maria is glad to see you.	
2	Ask what the problem is.	The nurse is concerned that the neonates are not achieving oxygen saturations as expected. She suspects the concentrator is providing low levels of oxygen.	
3	Ask to see the device.	The oxygen concentrator is pushed against a wall in the corner of the nursery. One patient is attached to the device.	
4	Assess the device's alarms. Check the interface for a "Low Oxygen", "System Failure" or other alarm.	The "Low Oxygen" indicator is displayed.	
5	Ask the in-charge if she can coordinate moving the patient attached to the device to another, working concentrator.	Sister Maria arranges with a fellow nurse to place the patient on another oxygen concentrator.	
6	Ask if it is okay for you to do some minor checks on the machine where it is.	Sister Maria is happy for you to do so.	
7	Perform minor checks on the device.  Put on a pair of gloves. Make sure the device is plugged into the wall and switched on at the wall.  Make sure the power cable is pushed well into the socket on the back of the oxygen concentrator.  Press the power switch to 'on.'	The device is plugged into the wall and the wall socket is switched on.  The power cable is slightly loose.  The device compressor audibly powers on.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
8	<p><b>What will you do next?</b></p> <p>Move the oxygen concentrator away from the wall, allowing for 30 to 35 cm of space between the wall and the housing. Allow the device to run for five minutes.</p> <p>Check the gross-particle intake filter for dust build-up.</p> <p>Test the oxygen output using an oxygen analyser.</p> <p>Check the combined flow rates of the concentrator.</p>	<p>The oxygen concentrator is moved away from the wall. The "Low Oxygen" indicator light remains on.</p> <p>The gross-particle intake filter is well-cleaned.</p> <p>The oxygen output is at 59%.</p> <p>The concentrator has a capacity of 8 L/min. The flowmeters are set at 2 and 4 L/min, which sum to 6 L/min (which is within the capacity of the concentrator).</p>	
9	<p><b>Explain your findings to Sister Maria.</b></p> <p>The "Low Oxygen" indicator light indicates that the concentrator has also been producing low oxygen, in this case 59%. The absence of dust on the gross-particle intake filter and the lack of loud sounds from the compressor imply that the issue is with the sieve beds.</p>	<p>The problem is explained to Sister Maria. Sister Maria is shocked to discover that the oxygen output has been so low.</p>	
10	<p><b>Explain next steps needed to prevent this from happening again.</b></p> <p>Sieve beds can become contaminated through constant use over time, highly humid environments or long periods of disuse. Users should provide preventive maintenance by turning on the device and letting it run for 15 minutes every week.</p>	<p>Next steps are explained to Sister Maria.</p> <p>Sister Maria believes that additional orientation is needed for the staff on the ward and sets a date for you to come and help explain the background on why this type of preventive maintenance is necessary.</p>	
11	<p><b>Decide where to work on the oxygen concentrator (e.g., at the ward or in the workshop).</b></p> <p>The operating pressure must be assessed, which requires opening the device. Though this can be conducted on the ward, the sieve bed replacement will require more extensive disassembly. Best practice is to remove to workshop for further examination.</p>	<p>The device should be removed to the workshop and reasoning explained to the in-charge.</p>	
12	<p><b>Check with the in-charge if it is okay to remove the oxygen concentrator and if she has a working one to use while this concentrator is being repaired.</b></p>	<p>The ward has only one other oxygen concentrator that they can use whilst waiting for the return of this device. Urgent repair is needed so the patients on the ward can get the oxygen support they need.</p>	
13	<p><b>You remove the oxygen concentrator to the workshop. What will you do next?</b></p> <p>Document device information and note all components received with the device.</p> <p>Put on gloves. Disinfect the device housing using 70% alcohol.</p>	<p>The oxygen concentrator has come to the unit with power cable, humidifier and gross particle intake filter.</p> <p>The housing is disinfected.</p>	
14	<p><b>Begin further troubleshooting of the device. Check the condition of the internal components.</b></p> <p>Remove device housing screws and remove housing. Set aside screws in separate container.</p> <p>Check the condition of the fine particle intake filter.</p> <p>Check internally for leaks. Complete a first quick test audibly and then use soapy water or leak testing fluid to check connections for leaks.</p> <p>Check the operating pressure using a pressure gauge at the operating pressure testing port.</p>	<p>The housing is removed.</p> <p>The fine particle intake filter is in good condition.</p> <p>There are no audible hissing sounds, and no bubbles are formed with soapy water or leak testing fluid is used on the tubing connections.</p> <p>The operating pressure is at 45 psi.</p>	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
15	<p><b>What will you do next?</b></p> <p>The operating pressure is high and the oxygen concentration is low, indicating that the sieve beds should be replaced. What is a normal operating pressure?</p> <p>Check for a spare sieve bed pair for this device model.</p> <p>Remove sieve bed screws or nuts and detach assembly. Remove all tubing attached to sieve beds and set aside. Replace sieve bed pair with spare pair. Set aside used sieve bed pair.</p> <p>Request additional spare sieve bed pair be procured.</p>	<p>Operating pressure above 40 psi indicates that there is an issue.</p> <p>Only one spare sieve bed pair is available.</p> <p>The sieve beds are detached from the assembly and the tubing and put aside.</p>	
16	<p><b>Reassemble the oxygen concentrator.</b></p> <p>Check that all internal connections are stable.</p> <p>Reattach housing.</p>	<p>All internal connections are secure.</p> <p>The housing is reattached</p>	
17	<p><b>Test the device to see if the repair has been successful.</b></p> <p>Turn on the oxygen concentrator and allow to run for 10 minutes. Check for the "Low Oxygen" alarm indicator.</p> <p>Test the oxygen output using an oxygen analyser.</p>	<p><b>Test the device to see if the repair has been successful.</b></p> <p>The "Low Oxygen" alarm indicator does not come on.</p> <p>The oxygen output is now at 95%.</p>	
18	<p><b>Return the oxygen concentrator to the ward.</b></p> <p>Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well.</p> <p>Use the oxygen analyser to demonstrate the change in oxygen output.</p>	<p>Sister Maria is happy to receive back the device. She plugs it in and turns on the device. It appears to function well, with a quieter operating noise.</p> <p>Sister Maria is very pleased to see that the oxygen output is at 95% and the "Low Oxygen" alarm indicator has not stayed on.</p>	
19	<p><b>Return to the maintenance unit. Put on gloves. Disassemble and assess the sieve bed assembly removed from the device.</b></p> <p>Take apart the sieve bed assembly. Remove and assess for reuse sieve bed rod, nuts, barrier paper, stationary and moving piston and baffle.</p> <p>Place in Spare Parts storage and label with device model, ward location and repair details.</p> <p>Document corrective activities taken and next steps in maintenance &amp; repair records.</p>	<p>All internal components are in good condition and may be reused.</p> <p>Documentation is completed and spare parts are labelled and stored.</p> <p>Activities and next steps are documented.</p>	

## THANK YOU

### **i REMIND PARTICIPANTS**

Nearly all sick infants benefit from oxygen, especially those with respiratory distress. Hypoxia contributes to both morbidity and mortality.

### **⚠ INFECTION PREVENTION AND CONTROL**

Be sure to wash your hands thoroughly and to put on gloves before handling any equipment. After every use, remember to disinfect all consumables and equipment before using them again.

**Scenario end**

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