NEST-ED Technical Scenarios

February 2021

Newborn Essential Solutions and Technologies-Education (NEST-ED) Technical Scenarios provide simulations for each technology included in the NEST360° bundle for newborn care.

FACILITATING THE CLINICAL USE AND TECHNICAL REPAIR OF TECHNOLOGIES FOR NEWBORN CARE IN LOW-RESOURCE SETTINGS

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DISCLAIMER

Newborn Essential Solutions and Technologies-Education
Technical Scenarios

Suggested citation Liaghati-Mobarhan, S., Molyneux E., Werdenberg J. & Langton J., NEST360. *Newborn Essential Solutions and Technologies-Education – Technical Scenarios*. (February 2021). License: CC BY-ND 4.0.

TECHNICAL SCENARIO

Pulse Oximeter

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a pulse oximeter 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 nurse in the nursery cannot make the pulse oximeter give a good trace reading. She has been trying for quite some time. She has called you for help.* ***WHAT DO YOU DO?***

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	**Go to the ward and introduce yourself to the in-charge.**	Sister Amissah is glad to see you.	
2	**Ask what the problem is.**	The nurse has been trying to use the pulse oximeter all morning but has been unable to get a stable trace.	
3	**Ask to see the device.**	The pulse oximeter is in a patient cot next to a newborn patient.	
4	**Advise the in-charge of the link between device location and infection prevention on the ward.** Pulse oximeters should never be kept in the cot with the patient to ensure appropriate infection prevention control. As pulse oximeters are used on many patients, you may find that infections are passed from bed to bed with the pulse oximeter.	Sister Amissah is advised about the link between infection and devices. Alarmed, she immediately removes the pulse oximeter and probe from the patient cot and disinfects it.	
5	**Ask if it is okay for you to do some minor checks on the machine where it is.**	Sister Amissah is happy for you to do so.	
6	**Perform minor checks on the device.** Put on a pair of gloves. Turn on the pulse oximeter. Attach the pulse oximeter probe and check the screen for any alarms.	The pulse oximeter shows the alarm "No Probe Connected".	
7	**Interpret these results for Sister Amissah.** The pulse oximeter does not seem to be recognising the provided probe. Is there another probe available that we can try? Advise Sister Amissah to clean the probe. Plug in the replacement probe. Check the screen for any alarms.	Explain the results to Sister Amissah in layman's terms. There is another pulse oximeter probe, but it is currently connected to another device. Sister Amissah removes it and brings it to this pulse oximeter to try. Sister Amissah cleans the probe. No alarms are visible.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
8	**What do you do next?** Advise Sister Amissah to try using the probe with the pulse oximeter on a patient.	Sister Amissah places the probe on the foot of a newborn patient. A trace appears and begins to stabilise.	
9	**Advise the in-charge that an additional replacement probe should be procured.** You tell the in-charge that you will return to the maintenance unit and check in your stocks for an appropriate probe.	Three additional paediatric clip probes with generic ports are available.	
10	**Return to the Newborn Care Unit.** Return to the Newborn Care Unit. Plug in and test one of the generic probes with the same pulse oximeter. Check the screen for any alarms.	No alarms are visible.	
11	**Remove the inappropriate probe to the Maintenance Unit.** Place in Spare Parts storage and label ward location and repair details, including that the probe appears to be malfunctioning or for a non-generic pulse oximeter. Document probe delivery in Equipment Maintenance & Repair Records.	Documentation is completed.	

THANK YOU

REMIND PARTICIPANTS

Poorly fitting probes and patient movement can lead to inaccurate readings. Pulse oximeters should also never be placed in the cot of a patient to ensure appropriate infection prevention on the ward.

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. Pulse oximeters should also never be placed in the cot of a patient to ensure appropriate infection prevention on the ward.

Scenario end

TECHNICAL SCENARIO

Suction Pump 1

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a suction pump 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: *You are called to the newborn care ward where the nurse in-charge has alerted you that the suction pump is not sucking 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 suction pump comes on but does not seem to have any 'power.'	
3	**Ask to see the device.**	The suction pump is on the floor beside the cot of a baby.	
4	**Ask if it is okay for you to do some minor checks on the device where it is.**	Sister Maria 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 suction pump. 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 motor audibly powers on.	
6	**The device has powered on. What will you do next?** Check the collection reservoir is attached and not full. Check that all tubing connections are tight. Ensure there is a filter in the pump circuit and that the long patient suction tube is attached to the outlet. Check that the float valve on the collection reservoir is moving up and down.	 The collection reservoir is a quarter full. All tubing connections are tight. There is a filter in the pump circuit and the patient suction tube is attached. The filter appears discoloured. The float valve appears to be sticking or jammed.	
7	**Explain your findings to Sister Maria.** The float valve is sticking and the filter appears discoloured. The pump assembly should be examined.	'Sister Maria, I've found the problem. The float is sticking and the filter is discoloured. I will have to look inside the device to check the pump properly.'	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
8	**Explain to Sister Maria what next steps are needed to prevent this from happening again.** The internal pump assembly can be damaged if the suction pump collection reservoir is allowed to get too full and liquid enters past the bacterial filter into the suction pump. Users should regularly empty and clean the reservoir to prevent this from happening.	The problem is explained to Sister Maria. Sister Maria agrees that additional orientation is needed for the staff on the ward and sets a date for you to come and help provide this orientation.	
9	**Decide where to work on the suction pump (e.g., at the ward or in the workshop).** The pump assembly must be assessed, which requires opening the device. Best practice is to remove to workshop for further examination.	The device should be removed to the workshop.	
10	**Check with the in-charge if it is okay to remove the suction pump and if she has a working one to use while this pump is being repaired.** Put on gloves. Disinfect the device housing using 70% alcohol and empty the collection reservoir.	She is anxious not to be without it for long as it means taking a suction pump from one cot-side to another and re-plugging it in every time a baby needs it. The housing is disinfected and the collection reservoir is emptied.	
11	**You remove the suction pump to the workshop. What will you do next?** Document device information and note all components received with the device. Inspect the tubing, reservoir and float valve. Follow facility protocols to clean and disinfect tubing, reservoir and float valve in a tub of 0.5% chlorinated water.	The suction pump has come to the unit with power cable, collection reservoir, float valve and tubing. The float valve is clogged with dried blood and debris. The pump tubing shows signs of having been contaminated with fluid. The tubing is disinfected.	
12	**Begin further troubleshooting of the device.** Check the condition of the internal pump. Remove device housing screws and detach chassis ground and housing. Set aside screws in separate container.	The internal pump shows signs of having had fluid in it and the internal housing shows dried fluid-debris build-up.	
13	**What will you do next?** Clean build-up on internal housing using 70% alcohol. Check for a spare pump assembly for this device model. Remove pump assembly screws and detach assembly. Replace assembly with spare. Set pump assembly aside in a cleanable tray for later maintenance. Request additional spare pump assembly be procured.	The internal housing is cleaned. Only one spare pump assembly is available.	
14	**Reassemble the suction pump.** Check that all internal connections are stable. Reattach chassis ground and housing. Reassemble device tubing, collection reservoir and float valve.	All internal connections are secure. Device chassis and ground are reattached and tubing, collection reservoir and float valve reassembled.	
15	**Return the suction pump to the ward.** Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well. Check with Sister Maria for a convenient time to can come and teach her staff about suction pump ward maintenance.	Sister Maria is happy to receive back the device. She plugs in and turns on the device; it suctions well. Sister arranges a time for you to come during the nurses' weekly CPD session.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
16	**Return to the maintenance unit. Put on gloves. Disassemble and assess the pump assembly removed from the device.**		
	Take apart the pump assembly. Check the assembly piston, bearing and motor rotor for fluid-debris build-up.	There is fluid-debris build-up within the bearing and motor rotor.	
	Clean pump assembly using a cloth with soapy water, being careful not to drip water into the components. Allow to dry.		
	Place in Spare Parts storage and label with device model, ward location and repair details.	The device is properly labelled and stored.	
	Document corrective activities taken in maintenance & repair records.	Activities are documented.	

THANK YOU

REMIND PARTICIPANTS

All suctioning must be done gently, not too vigorously and not for too long.

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

Suction Pump 2

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a suction pump 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: *You are called to the newborn care ward where the nurse in-charge has alerted you that the suction pump is not suctioning well and is making a very loud noise during use.* ***WHAT DO YOU DO?***

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	**Go to the ward and introduce yourself to the in-charge.**	Sister Theresa is glad to see you.	
2	**Ask what the problem is.**	The suction pump comes on but is making a very loud sound when it is used.	
3	**Ask to see the device.**	The suction pump is on a radiant warmer shelf, where it is in use.	
4	**Ask if you should wait until the device is not in use to do some minor checks.**	The procedure will be done in 2 minutes, after which the nurse using the pump will empty the collection reservoir and give it for you to test. You have observed that the suction pump was making a sound outside normal operation.	
5	**The procedure is complete and the nurse has cleaned the collection reservoir. 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.	The device is plugged into the wall and the wall socket is switched on.	
	Make sure the power cable is pushed well into the socket on the back of the suction pump.	The power cable is slightly loose.	
	Press the power switch to 'on.'	The device motor audibly powers on, with the same loud sound.	
6	**The device has powered on. What will you do next?**		
	Check that all the tubing connections are tight.	All tubing connections are tight.	
	Ensure there is a filter in the pump circuit and that the long patient suction tube is attached to the outlet.	There is a filter in the pump circuit and the patient suction tube is attached. The filter is inserted in the wrong orientation.	
	Check that the float valve on the collection reservoir is moving up and down.	The float valve appears to be functioning well.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
7	**Explain your findings to Sister Theresa.** The filter was inserted in the wrong orientation, but the problem appears to be with the pump assembly which should be examined.	'Sister, the problem appears to be with the pump itself, but I also see that the filter in in the wrong way around.'	
8	**Explain next steps needed to prevent this from happening again.** This part of the internal pump assembly can be damaged with normal wear and tear over time. If this issue is happening repeatedly, it could be due to users leaving the suction pump on when not in use. Users should be sure to turn off the suction pump after using.	The problem is explained to Sister Theresa. Sister Theresa agrees that additional orientation is needed for the staff on the ward and sets a date for you to come and help provide this orientation.	
9	**Decide where to work on the suction pump (e.g., at the ward or in the workshop).** The pump assembly must be assessed, which requires opening the device. Best practice is to remove to workshop for further examination.	The device should be removed to the workshop.	
10	**Check with the in-charge if it is okay to remove the suction pump and if she has a working one to use while this pump is being repaired.**	The ward has one other suction pump that they can use, but as this is an emergency device, she is anxious not to be without it for long.	
11	**You remove the suction pump to the workshop. What will you do next?** Document device information and note all components received with the device. Put on gloves. Disinfect the device housing using 70% alcohol. Disassemble tubing and collection reservoir. Inspect the tubing, reservoir and float valve. Follow facility protocols to clean and disinfect tubing, reservoir and float valve in a tub of 0.5% chlorinated water.	The suction pump has come to the unit with power cable, collection reservoir, float valve and tubing. The housing is disinfected and tubing disassembled. The float valve, tubing and reservoir are undamaged.	
12	**Begin further troubleshooting of the device.** Check the condition of the internal pump. Remove device housing screws and detach chassis ground and housing. Set aside screws in separate container. Check the condition of the pump's components, including the motor stator, pistons and piston diaphragms.	**Begin further troubleshooting of the device.** The internal pump shows no signs of fluid. The piston diaphragms appear worn and cracked.	
13	**What will you do next?** Check for a spare pump assembly for this device model. Check for a replacement diaphragm of an appropriate size. Remove diaphragm and replace with spare. Clean internal housing of dust and debris.	No spare pump assemblies are available. A spare diaphragm is available from a decommissioned suction pump. The old diaphragm is removed and replaced with the spare.	
14	**Reassemble the suction pump assembly.** Check that all internal connections are stable. Reattach chassis ground and housing. Reassemble device tubing, collection reservoir and float valve. Make sure the filter is correctly aligned. Test the suction pump by suctioning water.	All internal connections are secure. The suction pump suctions well.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
15	**Return the suction pump to the ward.** Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well. Arrange a time when you can train the nursery staff on assembling and maintaining the suction pump. Document corrective activities taken and next steps in maintenance & repair records.	Sister Theresa is happy to receive back the device. She plugs in and turns on the device; it suctions well, with normal operating noise. Sister Theresa arranges a time for you to come during the nurses' weekly CPD session. Activities and CPD session orientation information are documented.	

THANK YOU

REMIND PARTICIPANTS

All suctioning must be done gently, not too vigorously and not for too long.

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 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	**Explain next steps needed to prevent this from happening again.** 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	**Decide where to work on the oxygen concentrator (e.g., at the ward or in the workshop).** 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	**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.**	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	**You remove the oxygen concentrator to the workshop. What will you do next?** 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	**Begin further troubleshooting of the device. Check the condition of the internal components.** 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	**Open the compressor assembly.** 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	**Repair the compressor assembly.** 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	**Test the device to see if the repair has been successful.** Turn on the oxygen concentrator and allow to run for 10 minutes. Check for the "Low Oxygen" alarm indicator. Test the oxygen output using an oxygen analyser.	**Test the device to see if the repair has been successful.** The "Low Oxygen" alarm indicator does not come on. The oxygen output is now at 95%.	
16	**Return the oxygen concentrator to the ward.** Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well. Use the oxygen analyser to demonstrate the change in oxygen output. Arrange a time when you can train the nursery staff on maintaining the oxygen concentrator. Document corrective activities taken and next steps in maintenance & repair records.	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. Sister Lucia is also happy to see the oxygen output is at 97%, and the "Low Oxygen" alarm indicator is not on. Sister arranges a time for you to come during the nurses' weekly CPD session. Activities and next steps are documented.	

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	**What will you do next?** 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. Check the gross-particle intake filter for dust build-up. Test the oxygen output using an oxygen analyser. Check the combined flow rates of the concentrator.	The oxygen concentrator is moved away from the wall. The "Low Oxygen" indicator light remains on. The gross-particle intake filter is well-cleaned. The oxygen output is at 59%. 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).	
9	**Explain your findings to Sister Maria.** 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.	The problem is explained to Sister Maria. Sister Maria is shocked to discover that the oxygen output has been so low.	
10	**Explain next steps needed to prevent this from happening again.** 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.	Next steps are explained to Sister Maria. 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.	
11	**Decide where to work on the oxygen concentrator (e.g., at the ward or in the workshop).** 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.	The device should be removed to the workshop and reasoning explained to the in-charge.	
12	**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.**	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.	
13	**You remove the oxygen concentrator to the workshop. What will you do next?** 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.	
14	**Begin further troubleshooting of the device. Check the condition of the internal components.** Remove device housing screws and remove housing. Set aside screws in separate container. Check the condition of the fine particle intake filter. Check internally for leaks. Complete a first quick test audibly and then use soapy water or leak testing fluid to check connections for leaks. Check the operating pressure using a pressure gauge at the operating pressure testing port.	The housing is removed. The fine particle intake filter is in good condition. There are no audible hissing sounds, and no bubbles are formed with soapy water or leak testing fluid is used on the tubing connections. The operating pressure is at 45 psi.	

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

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

Flow Splitter

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a flow splitter 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: *A nurse sends a patient attendant to your department with a note that says the flow splitter in the nursery doesn't seem to be working properly and please could someone come and help as soon as possible.* ***WHAT DO YOU DO?***

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	**Go to the ward and introduce yourself to the in-charge.**	Sister Ngazi is glad to see you.	
2	**Ask what the problem is.**	The nurse has been trying to use the flow splitter all morning with various oxygen sources. She says that the flow splitter flowmeters are going up, but no flow is coming out of the ports.	
3	**Ask to see the device.**	The flow splitter is on a shelf on the wall. It is plugged into a walled oxygen flowmeter that is set at 10 L/min. No patients are currently hooked up to the flow splitter.	
4	**Ask if it is okay for you to do some minor checks on the machine where it is.**	Sister Ngazi is happy for you to do so.	
5	**Perform minor checks on the device.** Put on a pair of gloves. Open each flow splitter regulator and check for flow by placing a finger near each of the flow splitter outlet port. The oxygen source seems to be functioning well. The third port should be inspected further.	Flow is coming out of all ports except the third of five ports.	
6	**What will you do next?** Visually inspect the third port for debris or blockages.	There is what appears to be dirt and debris in the flow splitter port.	
7	**Explain your findings to Sister Ngazi.** One of the flow splitter ports has build-up in the oxygen port that connects to the patient. It must be further assessed and cleaned.	Sister Ngazi is told and shown what the problem is.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
8	**Explain next steps needed to prevent this from happening again.** Debris can build up over time in flow splitter ports, although usually not to this extent. Users should provide preventive maintenance by turning on the device and letting it run for 15 minutes every week.	Sister Ngazi is told how to prevent such a problem from occurring. She believes that additional orientation is needed for the staff on the ward and sets a date for you to come and help explain why this type of preventive maintenance is necessary.	
9	**Decide where to work on the flow splitter (e.g., at the ward or in the workshop).** The flow splitter housing should be removed to look at the condition of the internal tubing. This can be performed at the nurse's station to prevent the device being removed from the ward.	Sister Ngazi Is asked If It okay to do some minor repairs at the nurse's station. She agrees that you may use the nurse's station to provide basic maintenance.	
10	**You remove the flow splitter to the nurse's station. What will you do next?** Document device information and note all components received with the device. Put on gloves. Disinfect the device housing using 70% alcohol.	The flow splitter has been brought to the nurse's station with oxygen source tubing.	
11	**Begin further troubleshooting of the device. Check the condition of the internal components.** Remove device housing screws and remove housing. Set aside screws in separate container. Visually assess the internal tubing connections for additional debris.	The device housing is removed. Dirt and debris are present inside the tube connected to the third port that is currently blocked.	
12	**Repair the port and tubing.** Gently remove the soiled internal tubing from the device. Using a cotton swab and soapy water, wash the tubing until all debris are removed. Rinse with 70% alcohol. Using forceps wrapped in cotton gauze or a test tube brush and soapy water, clean the flow splitter port. Reconnect the internal tubing to the flow splitter. Connect oxygen source tubing and oxygen source and let run for 5 minutes until any beads of liquid are dried.	The soiled tubing is removed and cleaned with soapy water. The port is cleaned The tubing is rinsed through with 70% alcohol and replaced. Oxygen is connected and run through for 5 minutes.	
13	**Test the flow splitter.** Open the third flow splitter regulator and check for flow by placing a finger near the flow splitter outlet port.	The flow splitter outlet port is relaying oxygen.	
14	**Return the flow splitter to the ward.** Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well. Document corrective activities taken and next steps in maintenance & repair records.	Sister Ngazi is happy to receive back the device. She turns it on and is pleased with the results. She asks you not to forget to come and train the staff on the appointed day. Activities and CPD session orientation information are documented.	

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

bCPAP

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a bCPAP device 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: *A nurse from the nursery has called you to say they are having a problem with the bCPAP device as no oxygen seems to be reaching it.* ***WHAT DO YOU DO?***

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	**Go to the ward and introduce yourself to the in-charge.**	Sister Thoko is glad to see you.	
2	**Ask what the problem is.**	The nurse has been trying to use the bCPAP all morning with various oxygen sources. The oxygen flow meter will not move.	
3	**Ask to see the device.**	The bCPAP is on a shelf on the wall. It is in use and plugged into a walled oxygen flowmeter that is set at 3 L/min.	
4	**Ask if it is okay for you to do some minor checks on the machine where it is.**	Sister Thoko is happy for you to do so.	
5	**Perform minor checks on the device.**		
	Put on a pair of gloves. Remove the oxygen tubing from the walled oxygen flowmeter.	Gloves are donned and oxygen tubing is removed.	
	Make sure the device is plugged into the wall and switched on at the wall.	The device is plugged into the wall and the wall socket is switched on.	
	Make sure the power cable is pushed well into the socket on the back of the bCPAP.	The power cable is slightly loose.	
	Open the Oxygen Flowmeter. Press power switch 'on.'	The device pump audibly powers on.	
6	**What will you do next?**		
	Press a finger against the oxygen source port on the bCPAP. Check for an audible and visible rattle of the Oxygen Flowmeter bead.	The bead does not rattle.	
	Visually inspect the Oxygen Flowmeter base for debris.	There is some minimal debris at the base of the flowmeter.	
	Connect the oxygen tubing from the walled oxygen flowmeter to the oxygen source port on the bCPAP. Lightly tap the Oxygen Flowmeter and check if the flowmeter bead rises.	The bead does not rise.	

continue to the following page

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
7	**Explain your findings to Sister Thoko.** The bCPAP seems to have a problem with either the Oxygen Flowmeter or internal tubing connections. More investigation is needed to determine which failure is occurring.	The problem is explained to Sister Thoko. Sister Thoko will wait for your feedback, and will confirm your instructions with the rest of the ward staff.	
8	**Decide where to work on the oxygen concentrator (e.g., at the ward or in the workshop).** The internal tubing connections should be assessed before taking apart the flowmeter. Ask if you can perform this at the nurse's station to prevent the device being removed from the ward.	Sister Thoko agrees that you may use the nurse's station to provide basic maintenance.	
9	**You remove the bCPAP to the nurse's station. What will you do next?** Document device information and note all components received with the device. Put on gloves. Disinfect the device housing using 70% alcohol.	The bCPAP has been brought to the nurse's station with power cable, patient circuit and bottle.	
10	**Begin further troubleshooting of the device. Check the condition of the internal components.** Remove device housing screws and remove housing. Set aside screws in separate container. Check the internal tubing connections. Replace the tubing. Secure in place with a zip tie or metal crimp.	Device housing is removed. The tube connecting the oxygen source to the oxygen flowmeter has become dislodged. The tubing is repositioned and secured in place.	
11	**Test the bCPAP.** Plug in the bCPAP. Press a finger against the oxygen source port on the bCPAP. Check for an audible and visible rattle of the Oxygen Flowmeter bead. Connect oxygen tubing from an oxygen source to the oxygen source port on the bCPAP. Lightly tap the Oxygen Flowmeter and check if the flowmeter bead rises.	The bead rattles. The flowmeter bead rises to 3 L/min.	
12	**Explain your findings to Sister Thoko.** The internal tubing connections for the Oxygen Flowmeter popped off. They have been secured in place.	Sister is shown what happened and how it was fixed.	
13	**Return the bCPAP to the ward.** Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well.	Sister Thoko is happy to receive back the device and places a patient with severe respiratory distress on it immediately. She arranges for a training session for the ward staff next week and asks you to come.	

continue to the following page

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
14	**Explain next steps needed to prevent this from happening again.** If the Oxygen Flowmeter is not opened before attaching the oxygen source, pressure can build up and pop off the internal tubing. Users should ensure that they open the Oxygen Flowmeter prior to connecting an oxygen source. There was also some additional build-up on the Oxygen Flowmeter that could present a problem at a later stage. Users should provide preventive maintenance by turning on the device and letting it run for 15 minutes every week.	Sister Thoko is told that this happens if the oxygen flowmeter is off when the oxygen source is turned on. The nurses must be careful to always turn the flowmeter on before the oxygen source. Sister Thoko is also asked to turn the device on for 15 minutes every week to stop debris building up in the flowmeter. Sister Thoko believes that additional orientation is needed for the staff on the ward and sets a date for you to come and help provide background on why this type of preventive maintenance is necessary.	
15	**Document corrective activities taken and next steps in maintenance & repair records.**	Activities and CPD session orientation information are documented.	

THANK YOU

REMIND PARTICIPANTS

How CPAP works: CPAP devices use a pump to provide air or a mixture of air and oxygen at a continuous positive pressure. This pressure keeps airway spaces open and increases alveolar recruitment throughout respiration in a spontaneously breathing infant. This improves oxygenation and reduces work of breathing.

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

Glucometer

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a glucometer 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 nurse has a 7-week-old boy in the ward who is said to be very drowsy. She cannot get the glucometer to work and is worried that the baby may have a low blood glucose. She has rung you and asked for your help.* ***WHAT DO YOU DO?***

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
1	**Go to the ward and introduce yourself to the in-charge.**	Sister Edith is glad to see you.	
2	**Ask what the problem is.**	The nurse has a 7-week-old boy in the ward who is said to be very drowsy. She cannot get the glucometer to work and is worried that the baby may have a low blood glucose.	
3	**Ask to see the device.**	The glucometer is on a cabinet in the newborn care unit. Associated glucometer strips are stored next to it.	
4	**Ask if it is okay for you to do some minor checks on the machine where it is.**	Sister Edith is happy for you to do so.	
5	**Perform minor checks on the device.** Check the expiry date on the glucometer strips. Does the nurse have access to new glucometer strips?	The glucometer strips are expired. Sister Edith says that the pharmacy should have additional strips, and sends a messenger to request them.	
6	**What will you do next?** Assess whether or not the expired glucometer strips were leading to inaccurate results by performing a quality control test with the device. Is a Quality Control solution available?	There is a Quality Control solution available in the stores behind the nurses' station.	

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#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
7	**Quickly perform a Quality Control test with the nurse.** Turn on the glucometer. Select Quality Control setting if available. Insert one of the new strips into the glucometer. Wipe the first droplet away from the tip of the Quality Control solution bottle, and allow the second drop to fall on the strip. Check that the device passes the Quality Control test.	The device passes the Quality Control test.	
8	**Explain your findings to Sister Edith.** The device has passed the Quality Control test with the new strips, so the expired strips must have been the problem. It can be used immediately.	Sister Edith is told what the problem was. She quickly takes the blood sugar of the patient. His blood sugar is very low, and she takes steps to increase his blood sugar.	
9	**Wait for Sister Edith to assess and treat the patient. Then, explain next steps needed to prevent this from happening again.** Expired strips should never be used with the glucometer. However, even strips that are not expired may give poor or inconsistent results, if they have been stored without the lid being completely closed. Staff should perform Quality Control tests regularly to ensure the device is functioning well in an emergency.	Sister Edith believes that additional orientation is needed for the staff on the ward and sets a date for you to come and help explain why this type of preventive maintenance is necessary for situations like the one just experienced.	
10	Document corrective activities taken and next steps in maintenance & repair records.	Activities and CPD session orientation information are documented.	

THANK YOU

REMIND PARTICIPANTS

Never use the back or the inner part of the heel for blood collection. This may cause artery, nerve, or bone damage. Readings should correspond with the clinical condition of the patient; if strips are expired or the patient's measurement site is not clean, measurements can be inaccurately high or low.

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

Radiant Warmer

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a radiant warmer 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: *There has been a phone call from the nursery, asking for help. Sister is really worried. She has a premature baby in isolation under a radiant heater and the heater is not working.* ***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 radiant warmer is turning on and reading the patient's body temperature, but isn't heating.	
3	**Ask to see the device and check the current device settings.**	The radiant warmer is in the isolation ward, plugged into an extension board with an oxygen concentrator. One patient is currently under the warmer. The radiant warmer is in servo/automatic mode and is registering a patient temperature of 33.5°C. The displayed heater output is at 100%.	
4	**Ask if it is okay for you to do some minor checks on the device where it is.** As the patient's temperature is critically low, advise that the patient be moved to another, working radiant warmer whilst your checks are made. Advise the in-charge that radiant warmers should not be plugged into extension boards, especially when other devices are connected.	Sister Maria is happy for you to do so in the ward and moves the patient to another warmer immediately.	
5	**Perform minor checks on the device.** Turn off the radiant warmer and remove its plug from the extension board. Plug directly into the wall and turn on. Feel for heat output along the heating element. Change the setting from servo/automatic to manual. Set the heating output to 100% and again feel for heat output along the heating element.	The radiant heater Is switched off, unplugged and replugged directly into a wall socket. The heating element is not producing any heat. The heating element is still not producing any heat.	

continue to the following page

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
6	**Explain your findings to Sister Maria.** The heating element for the radiant warmer appears to have a fault.	Sister Maria is unhappy as this is the second radiant heater that has stopped working.	
7	**Explain next steps needed to prevent this from happening again.** This issue happens with extended use over time but can also be aggravated with poor power quality. The radiant warmer should always be plugged into its own socket with an independent surge protector, if available.	Sister had not realised that an extension lead should not be used with a radiant heater. Sister Maria will orient her team on the appropriate power requirements for radiant warmers.	
8	**Decide where to work on the radiant warmer (e.g., at the ward or in the workshop).** The heating element for the radiant warmer will need replacement. Best practice is to remove from the ward to a larger space for further examination. Is the nurses' station sufficiently large to troubleshoot the device without removing to the workshop?	The nurses' station is sufficiently large, and Sister Maria is happy to have you work there as it means that the device will not be removed far from the ward.	
9	**You move the radiant warmer to the nurses' station. What will you do next?** Document device information and note all components received with the device. Plug in and turn on the device. Check the device control panel for any alarms. Make sure the device is removed from power and turned off. Put on gloves. Disinfect the device housing using 70% alcohol.	The radiant warmer has come to the nurses' station with power cable and a temperature probe. As you turn on the device at the nurses' station, the "System Failure" alarm comes on. The device housing is disinfected.	
10	**Begin further troubleshooting of the device. Check the condition of the internal components.** Remove device housing screws for the radiant warmer head and remove housing. Set aside screws in separate container. Visually check the condition of the heating element control circuit board. Use a multimeter to assess the resistance across the heating element.	Device housing is removed. The heating element control circuit board shows no visible damage. The resistance across the heating element approaches infinity.	
11	**Interpret these results for the in-charge.** The resistance across the heating element is very high, which confirms that the heating element has failed. It needs to be replaced. Confirm that you will check for a replacement part at the workshop and return to repair.	'Sister, I have done a check and the heating element isn't working. It needs to be replaced. I will need to find out if we have a replacement in the workshop.'	
12	**Return to the Maintenance Unit and check for a spare heating element.**	Three spare heating elements are available for this device model.	
13	**Return to the Newborn Care Unit and replace the heating element.** Disconnect the heating element leads from the heating element control board. Mark which leads go to which points on the control board. Remove any bracketing clips keeping the heating element in place, and then remove the element. Replace with spare heating element and reassemble.	The old heating element is disconnected and removed and replaced with the new element.	

continue to the following page

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
14	**Test the device to see if the repair has been successful.** Turn on the radiant warmer and set it to Manual mode at 100% heater output. Check for the "System Failure" alarm indicator. Feel for heat output along the heating element.	**Test the device to see if the repair has been successful.** The "System Failure" alarm indicator does not come on. Heat can be felt emanating from the heating element.	
15	**Return the radiant warmer to the ward.** Go through repair and maintenance steps taken with the in-charge. Ask her to turn on and verify that the device is working well.	Sister is told that the old heating element has been replaced with a new one. Sister Maria is happy to receive back the device. She plugs in and turns on the device. It appears to function well.	
16	**Return to the Maintenance Unit with the broken heating element.** Decommission heating element by disposing of ceramic parts appropriately. Remove reusable wires and wire clips and test for continuity before placing in Spare Parts storage and labelling with device model, ward location and repair details. Document corrective activities taken and next steps in maintenance & repair records.	The maintenance and repair records are filled and the decommissioned element stripped of any useful wiring and then disposed of. The wiring and clips are labelled and stored correctly.	

THANK YOU

REMIND PARTICIPANTS

Radiant warmers are usually used for short periods of time before a baby is place in a warmer cot or an incubator or when a baby is having a procedure done that is difficult to do in an incubator or cot. In Obstetrics/Labour Ward, a radiant warmer provides an area post-delivery to prevent hypothermia. The radiant warmer should be clean, working and already warm when the baby arrives. All emergency treatment equipment that could be needed should be at hand.

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

Phototherapy Light

NAME: _____ DATE: _____

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

Scenario Overview

The scenario is set in the newborn care ward where a phototherapy light is not working well. 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 nurse calls you to say that the babies are not improving as quickly as they used when receiving phototherapy, and she wonders if it 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 the neonates are not improving as quickly after having been put on phototherapy as usual. She suspects the phototherapy light has deteriorated.	
3	**Ask to see the device.**	The phototherapy device is in use on a patient that is being managed on a radiant warmer.	
4	**Ask the in-charge if it is possible to test the delivered irradiance at the patient's bed site using your lightmeter.**	Sister Maria is happy to help. Using your lightmeter, she ascertains that the delivered irradiance at the bedside is 15 $\mu W/cm^2$.	
5	**Interpret the results for the in-charge.** 15 $\mu W/cm^2$ is low for phototherapy treatment, which should typically be 25 to 30 $\mu W/cm^2$ for standard treatment.	Sister Maria is told normal therapeutic range of irradiance required and the results of this reading. Sister Maria arranges with a fellow nurse to try to find another phototherapy unit to use instead.	
6	**Using the lightmeter, show the in-charge how lowering the head of the phototherapy light increases the treatment irradiance.**	While waiting for the replacement and after your demonstration, Sister Maria angles the phototherapy light farther towards the patient, and retakes the reading. The phototherapy light is now delivering 20 $\mu W/cm^2$. The reading is still too low.	
7	**What will you do next?** Ask the in-charge if you can remove the phototherapy light from the patient's radiant warmer cot to another, empty bassinet to test the device when it is directly overhead the patient.	Sister Maria is happy for you to do so. The additional phototherapy light is available and not in use; she switches this phototherapy light for the other and rolls it to an empty bedside for you to complete your tests.	

continue to the following page

#	ACTION REQUIRED	INFORMATION / RESULT	COMMENTS:
8	**Perform minor checks on the device.** With the phototherapy light set at normal brightness at a height of 30 cm directly above the mattress, test the delivered irradiance with a lightmeter. With the phototherapy light set at high brightness at a height of 30 cm directly above the mattress, test the delivered irradiance with a lightmeter.	The phototherapy light is now delivering 23 µW/cm^2. The phototherapy light is now delivering 28 µW/cm^2.	
9	**Explain your findings to Sister Maria.** The phototherapy light is beginning to deteriorate and the bulbs will need replacement. You will check at the workshop for replacement bulb assemblies, but in the meantime, the medical staff should check the delivered irradiance for each patient and lower the head of the phototherapy light or increase the settings if needed.	Explain your findings and what you intend to do. Sister Maria will wait for your feedback, and will confirm your instructions with the rest of the ward staff.	
10	**Return to the maintenance unit.** Check for a spare bulb assembly for this device model. Request additional spare bulb assembly be procured. Document corrective activities taken and next steps in maintenance & repair records.	No spare bulb assemblies are available. Activities and bulb procurement follow-up steps are documented.	

THANK YOU

REMIND PARTICIPANTS

Any jaundice on day one needs urgent investigation and treatment.

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