Using the Lifebox oximeter

Tutorial 2 – advanced
The Lifebox Pulse Oximeter

In this tutorial you will learn about:

• Using the oximeter correctly
• What can interfere with an oximeter reading
• How to care for the Lifebox pulse oximeter
• Managing a falling SpO₂ during anaesthesia
The Lifebox oximeter probe

- The Lifebox oximeter can be supplied with two types of probe:
  - Universal probe
  - Wrap around probe

- Probes contain an LED that shines light through the finger. Transmitted light is detected by the photo detector on the other side of the finger

- The probe needs to be put on the patient correctly!

- Probes are fragile!
What do you think of these two probes?
This probe is well positioned on the finger.

- Fits well
- Not too tight
  - Does not constrict the circulation
- Not too loose
  - Will not fall off or let other light in.
• This probe is too small for the toe

• Forcing the probe on to a large digit in this way will damage it

• The probe will not pick up the light
Paediatric probes

• Paediatric probes are made for small children (less than a year old).

• Alternatively a universal probe can be tried on the thumb or big toe.

• If a good signal is obtained, the oximeter is working
What can prevent a pulse oximeter reading accurately?

Can you think of 5 things that might stop a pulse oximeter reading accurately?
Answers

• Nail varnish or pigment on the finger
• Bright light on the probe
• Patient movement
• Low perfusion
• Carbon monoxide poisoning
Nail varnish....why does it interfere?

The colour absorbs the light

Interferes with the detection of oxygenated haemoglobin

Try placing the probe on sideways.....
Here are two patients with henna on their fingers

What do you think will happen to the oximeter reading?
• The oximeter may detect a pulse but is unable to measure SpO₂ due to the pigment blocking the signal.

• Select a toe instead!
Bright light

• Bright light such as the operating light may interfere with the light detector

• Avoid shining bright light directly on the probe!
Movement

Here is an oximeter attached to a patient. The SpO$_2$ is 95% and pulse 84bpm.

The trace shows a waveform with a regular pulse.

What is the difference between the two traces on the next slide?
The pulse waveform is erratic and not being well detected. This patient may be moving or shivering...

Hold the hand steady or wait until the patient has stopped shaking.

Shivering is a common problem in recovery, but not common in theatre. **Check the patient carefully before deciding the oximeter is not correct!**
How can you check if an oximeter is working?

If you are concerned whether an oximeter is working correctly - how could you check it?
Is the probe working?

Put the probe on your own finger to check!
Perfusion

• Oximeters need a flow of blood through the finger to function. Some oximeters give an indication of the blood flow detected.

• In this oximeter there is a scale which is an indication of the blood flow. Sometimes these have numbers on them.

• Why might this scale be important during anaesthesia?
Low perfusion..

Peripheral vasoconstriction will result in low perfusion

This is commonly due to:
- Cold
- Hypovolaemia

Note fast pulse rate and low perfusion alarm in the second image
Carbon monoxide poisoning

• Patients who have inhaled smoke may have carbon monoxide (CO) poisoning

• CO combines with haemoglobin and displaces oxygen

• CoHb is bright red

• Most oximeters cannot detect this and tend to exaggerate the $\text{SpO}_2$
Caring for the Lifebox oximeter
Lifebox power supply

The oximeter can use:

- Mains power
- Rechargeable battery
- Normal (AA) alkaline battery – do not try to recharge these batteries
Mains supply

Charge the battery in case of power failure!
Making the Lifebox rechargeable battery last longer

• Optimise your battery when you first receive it
  – Place the rechargeable battery in the oximeter
  – Charge fully (4 hours)
  – Use until fully discharged
  – Recharge fully (4 hours)

• Then use/recharge as required

• The oximeter should run for 12-16 hours between charges

• NOTE: readings may be inaccurate when the battery is very low
If the Lifebox rechargeable battery is no longer working

• Take the battery out

• Use normal AA batteries

or

• Run the oximeter directly from the mains supply with the BATTERY REMOVED
Caring for your oximeter

Clean the probe gently between patients with a damp cloth or alcohol swab
Caring for your oximeter

• The screen is delicate: take care not to press on the screen, particularly when changing the batteries

• Position safely to avoid dropping or damage from spillages

• Consider connecting to a pole or trolley using the clip supplied
Caring for your oximeter

• When connecting the oximeter probe or lead, always insert the plug correctly. Check carefully to avoid damage.

• Note that the lead only ever inserts one way – check the shape before inserting
Caring for your oximeter

• When disconnecting and connecting a probe, grip the plug firmly and not the cable.

• If the cable is pulled, small wires inside will break.
Caring for your oximeter

When not in use, always coil the lead and position the probe where it cannot be damaged.

Too tight a coil will damage the lead.

Leaving the lead dangling will result in damage.
What should we do if the patient becomes hypoxic?
What should we do if the patient becomes hypoxic?

The hypoxia action plan describes steps to deal with hypoxia.

By using the plan, a logical approach to hypoxia is followed.

Study the hypoxia action plan in your handout for a few minutes.
Action plan for \(\text{SpO}_2 < 94\%\)
What is the normal level of SpO$_2$ during anaesthesia?

1. 85 - 89%
2. 90 - 94%
3. 95 - 99%
4. 100%

• Select one answer
What is the normal level of SpO₂ during anaesthesia?

1. 85 - 89%
2. 90 - 94%
3. 95 – 100%
4. 100%

• Select one answer

Normal SpO₂ is 95% or above. This level should be maintained during anaesthesia.

We need to be concerned with SpO₂ readings of below 95%. The hypoxia action plan helps us plan what to do when the SpO₂ is less than 94%.
When to take action

All anaesthetists should start to investigate why the SpO$_2$ is 94% or below during or after anaesthesia.

When the SpO$_2$ falls below 90%, the patient is becoming seriously hypoxic and the Lifebox pulse oximeter will alarm.

Urgent action is needed!
When a patient becomes hypoxic during anaesthesia what should we consider?
When a patient becomes hypoxic during anaesthesia what should we consider?

A = Airway  
B = Breathing  
C = Circulation  
D = Drugs  
E = Equipment

The action plan shows us how to do this during anaesthesia.
Action plan for SpO₂ < 94%

The next few slides will look at each part of the plan in turn and describe how to use it.
Immediate checks

What should you do when the saturation falls?

Check ABCDE
Immediate checks

Immediately the $\text{SpO}_2$ falls below 95% - **CHECK THE PATIENT**

**TAKE ACTION:**
- Increase the oxygen flow
- Ventilate the patient by hand to make sure the lungs are filling with oxygen

**THEN TRY TO SOLVE THE PROBLEM:**
- Check the probe is on correctly
- Is the problem with the patient or the equipment?
- Call for help if needed

Check ABCDE
Immediate checks

Always call for help early.

Hypoxia worsens rapidly and needs emergency treatment. It is better to call someone unnecessarily than not to have help with a deteriorating patient.

HELP!!
Action plan for \( \text{SpO}_2 < 94\% \)

The next set of actions - CHECK ABCDE

Using the plan will remind you to check everything and manage the patient logically.

The treatment will depend on whether the problem is in the patient or the equipment. This is a crucial decision to make.
Patient Problems
Airway

AIRWAY
Use chin lift / jaw thrust if using a mask
Reposition LMA if necessary
Check position of tracheal tube
If in doubt take LMA or tracheal tube out
Treat laryngospasm if present

The most common cause of hypoxia in theatre is airway obstruction or inadequate breathing!
Breathing

The most common cause of hypoxia in theatre is airway obstruction or inadequate breathing!
Circulation

An inadequate circulation may be caused by a number of factors -

Can you think of some causes?
Circulation

- Hypovolaemia
- Cardiac failure
- Sepsis
- Anaesthesia overdose
- High spinal
- Anaphylaxis
- Arrhythmia

CIRCULATION
Check pulse
Check blood pressure
Check ECG
Blood loss / dehydration / fluid loss?
Consider IV fluid replacement
Circulation

Normally circulation failure presents as a deteriorating pulse signal which the oximeter finds difficult to pick up.

In shocked patients oxygenation in the lung becomes less efficient and it is common for the $\text{SpO}_2$ to fall.
Circulation

If no pulse is present – start CPR and find out what is causing the problem.

CIRCULATION
Check pulse
Check blood pressure
Check ECG
Blood loss / dehydration / fluid loss?
Consider IV fluid replacement

If no pulse / BP / signs of life
Start CPR
Find and treat the cause
Drugs

Anaesthesia drugs may cause respiratory depression, muscle weakness or paralysis.

A high spinal may cause respiratory failure.
Can you think of problems with the anaesthesia equipment that might cause hypoxia?
Equipment problems

**EQUIPMENT**
Check oxygen supply / concentrator / cylinder
Check for breathing circuit disconnection
Check for breathing circuit obstruction

*If problem not resolving:*
Eliminate circuit - use self inflating bag

*If self inflating bag not available consider:*
Mouth to mouth / tracheal tube ventilation
Now try to draw the whole plan for treating hypoxia from memory!
Did you get it correct?
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• How to care for the Lifebox pulse oximeter
• Managing a falling SpO$_2$ during anaesthesia
Summary – in this tutorial you have learnt:

- How to use an oximeter correctly
- Certain factors can interfere with oximeters
- Oximeters and probes need looking after carefully
- What action to take when the SpO₂ starts to fall

Immediate checks
- Airway
- Breathing
- Circulation
- Drugs
- Equipment