BLOCKED ANAESTHETIC CIRCUIT

MODULE: PATIENT SAFETY

TARGET: ALL ANAESTHETISTS

BACKGROUND:
Numerous case reports have described incidents where anaesthetic breathing circuits have become blocked by foreign objects either from the manufacturing stage or at the time of use in the anaesthetic room or operating theatre. Formal, careful and thorough machine checking before each list, and appropriate checks between cases, are critical steps in the safe conduct of anaesthesia, and anaesthetic training must continue to reflect this.

In 2012 the AAGBI updated its safety guideline for checking anaesthetic machines and equipment prior to use. The first step in this updated checklist is checking that a self-inflating bag is available – thus ensuring a method of isolating the patient from the anaesthetic machine while maintaining ventilation at all times.

This scenario has been designed for use during the Oxford Novice Anaesthetist Training Course. However, it is suitable for delivery to anaesthetists at all stages of training and practice.

RELEVANT AREAS OF THE ANAESTHETIC CURRICULUM

<table>
<thead>
<tr>
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<td>Demonstrates appropriate checking of equipment prior to induction, including equipment for emergency use</td>
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| IG_BK_03 | In respect of the equipment in the operating environment:  
  - Demonstrates understanding of the function of the anaesthetic machine including  
    - Performing proper pre-use checks  
    - Changing/checking the breathing system |
| IG_BS_06 | In respect of monitoring:  
  - Manages monitors appropriately e.g. set alarms; start automatic blood pressure  
  - Demonstrates proficiency in the Interpretation of monitors |
| IO_BS_09 | Able to respond in a timely and appropriate manner to events that may affect the safety of patients [e.g. hypotension, massive haemorrhage] |
| CI_BK_02 | Unexpected fall in SpO₂, with or without cyanosis |
| CI_BK_03 | Unexpected increase in peak airway pressure |
| CI_BK_18 | Difficulty with IPPV, sudden or progressive loss of minute volume |
| CI_BS_01 | Demonstrates good non-technical skills such as: effective communication, team-working, leadership, decision-making and maintenance of high situation awareness |
| CI_BS_02 | Demonstrates the ability to recognise early a deteriorating situation by careful monitoring |
| CI_BS_05 | Demonstrates ability to recognise when a crisis is occurring |
| CI_BS_06 | Demonstrates how to obtain the attention of others and obtain appropriate help when a crisis is occurring |
| CI_IS_01 | Demonstrates leadership in resuscitation room/simulation when practicing response protocols with other healthcare professionals |
| CI_IS_02 | Demonstrates appropriate use of team resources when practicing response protocols with other healthcare professionals |
INFORMATION FOR FACULTY

LEARNING OBJECTIVES:

• Rapid method of identifying and differentiating between equipment-related and patient-related causes of ventilatory failure during anaesthesia

SCENE INFORMATION:

• Location: Anaesthetic Room
• Expected Duration of Scenario: 10-15 mins
• Expected Duration of Debrief: 30-35 mins

EQUIPMENT & CONSUMABLES

Manikin – Male.
Anaesthetic machine – Ensure that a self-inflating bag is present on the back of the machine.
**Anaesthetic circuit – blocked at junction of catheter mount and angle piece by cellophane**
Stocked airway trolley
Self-inflating bag
Infusion/TIVA pumps
(Simulated) Propofol for infusion ready to be drawn up into 50ml syringes
Simulated anaesthetic drugs

PERSONS REQUIRED

Anaesthetic Junior Trainee
Anaesthetic Assistant
Anaesthetic Senior Trainee

PARTICIPANT BRIEFING: (TO BE READ ALOUD TO PARTICIPANT)

Mr Levi Caine is a 60 year old man who is undergoing a right total knee replacement. He has hypertension, mild COPD and arthritis. His regular meds are amlodipine, seretide and salbutamol. There are no known allergies.

He has had a right femoral nerve block awake with 30ml of 0.25% bupivacaine.

Please continue his anaesthetic care by inducing general anaesthesia, inserting an LMA and continuing his peri-operative care.

‘VOICE OF MANIKIN’ BRIEFING:

Unresponsive. Under General Anaesthetic.

‘IN SCENARIO PERSONNEL’ BRIEFING:

ANAESTHETIC ASSISTANT

Support the anaesthetist during the scenario, but do not volunteer solutions.
**CONDUCT OF SCENARIO**

**INITIAL SETTINGS**
A: Patent and Self-maintained
B: Spontaneously ventilating. RR 14. SaO2 98%. EtiO2 does not increase despite pre-oxygenation
C: HR 90. BP 138/90.
D: GCS 15/15. Eyes open.
E: Hospital gown.

**INDUCTION**
B: RR reduces to 0 as induction agent given. SaO2 trend falls to 60% over 6 mins.
C: HR 110 transiently during induction. BP falls to 85/60.

**ONGOING FAILURE TO VENTILATE**
B: Ventilation restarts gradually after 4 mins delay. SaO2 falls to 60% over 4 mins if no effective ventilation takes place.
C: Bradycardia on profound hypoxia.

**EXPECTED ACTIONS**
- Insertion of LMA (before or after attempting to ventilate)
- Attempt to ventilate – FAIL
- Recognise problem occurring
- Call for help
- Attempt to identify whether problem is machine-side or patient-related

**EXPECTED ACTIONS**
- Attempting Bag-Mask Ventilation
- Once patient-related problem is excluded. Attempt to identify cause on equipment side.
- If cause found, consider maintaining anaesthesia and continuing case
- If cause not found, wake the patient up

**LOW DIFFICULTY**
- Spontaneous ventilation restarts after 4 mins and SaO2 starts to rise – unless patient is still attached to the blocked circuit
- Help arrives early.

**HIGH DIFFICULTY**
- Spontaneous ventilation restarts after 5 minutes and SaO2 starts to rise slowly unless patient is still attached to the blocked circuit.

**RESOLUTION**
Either once alternative ventilation source has been established or it is clear that this is not going to occur
*Anaesthesia Record Sheet*

**Patient Details**
- **Surname:** Levi Caine
- **DOB:** 60 years old

**Address:** Ward/Hospital

**Procedure(s) Proposed:**
- RHS Total Knee Replacement

**Anaesthetic's Preoperative Assessment by**

<table>
<thead>
<tr>
<th>Name</th>
<th>Grade: Cons □ □ AS □ □ SG □ □ Trainee □ □</th>
</tr>
</thead>
<tbody>
<tr>
<td>Date</td>
<td>Time</td>
</tr>
</tbody>
</table>

**Anaes / Surg History:**
- Previous Appendicectomy

**Medical History:**
- Hypertension
- COPD (mild) – no hospital admission
- Arthritis
- Good exercise tolerance – swims >200m weekly
- Walking limited by arthritis

**Amlodipine 10mg OD**

**Seretide 1 puff OD**

**Salbutamol INH PRN**

**Previous Appendicectomy**

**Hypertension**

**COPD (mild) – no hospital admission**

**Arthritis**

**Good exercise tolerance – swims >200m weekly**

**Walking limited by arthritis**

**NBM since**
- Solids: 2200 yesterday
- Clear Fluids: NAD
- Pregnancy: Neg
- Lactation: NAD

**Relevant Medication:**
- Amlodipine 10mg OD
- Seretide 1 puff OD
- Salbutamol INH PRN

**VTE Risk:**
- High □ Low □

**ASA**
- BP: 
- HR: 
- Temp: 
- Weight: 
- Height: 
- BMI: 
- Smoke: 
- Alcohol: 

**Apfel Score**

**Unremarkable**

**Airway Assessment**
- **Mouth Opening:**
  - MP Score: 1 2 3 4
- **Jaw:** Good mouth opening
- **Neck:** Neck ROM OK

**TEETH**
- 87654321 12345678
- X = missing
- G = caps / crowns
- D = damaged

**ALLERGIES**
- NKDA

**INVESTIGATIONS**

<table>
<thead>
<tr>
<th>Haematology</th>
<th>Biochemistry</th>
<th>Coag.</th>
</tr>
</thead>
<tbody>
<tr>
<td>FBC</td>
<td>U &amp; E</td>
<td>NAD</td>
</tr>
<tr>
<td>Hb 12.8</td>
<td>NAD</td>
<td>NAD</td>
</tr>
<tr>
<td>Plt 311</td>
<td></td>
<td></td>
</tr>
</tbody>
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**Sickle:**
- Blood Sugar: NAD
- Gp. & Save: NAD
- X - Match: NAD

**CONSENT:**
- □ GA
- □ Sedation
- □ Epidural
- □ Spinal
- □ Regional
- □ Suppository
- □ PCA
- □ EPCA
- □ Other

**Notes / Discussion / Technique proposed:**
- Consented for GA with LMA + RHS femoral nerve block
- Risks explained and consented

**Anaesthetic Information leaflet received by patient**

**For attention of ward staff:** (Further investigations, fasting, continue/omit current medication, etc.)
DEBRIEFING

POINTS FOR FURTHER DISCUSSION:

- Rapid method of identifying and differentiating between equipment-related and patient-related causes of ventilatory failure during anaesthesia

DEBRIEFING RESOURCES

1. Protecting the breathing circuit in anaesthesia. DoH. Report to the Chief Medical Officer of an Expert Group on blocked anaesthetic tubing. May 2004. [http://www.frca.co.uk/documents/Protecting%20the%20PBC.pdf](http://www.frca.co.uk/documents/Protecting%20the%20PBC.pdf)


INFORMATION FOR PARTICIPANTS

KEY POINTS:

- Rapid method of identifying and differentiating between equipment-related and patient-related causes of ventilatory failure during anaesthesia

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FURTHER RESOURCES:

   http://www.frca.co.uk/documents/Protecting%20the%20PBC.pdf

   http://www.aagbi.org/sites/default/files/September.pdf

**PARTICIPANT REFLECTION:**

What have you learnt from this experience? (Please try to list 3 things)

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How will your practice now change?

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What other actions will you now take to meet any identified learning needs?
PARTICIPANT FEEDBACK

Date of training session:............................................................................................................................

Profession and grade:........................................................................................................................................

What role(s) did you play in the scenario? (Please tick)

- Primary/Initial Participant
- Secondary Participant (e.g. ‘Call for Help’ responder)
- Other health care professional (e.g. nurse/ODP)
- Other role (please specify):
- Observer

<table>
<thead>
<tr>
<th>Strongly Agree</th>
<th>Agree</th>
<th>Neither agree nor disagree</th>
<th>Disagree</th>
<th>Strongly Disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I found this scenario useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I understand more about the scenario subject</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>I have more confidence to deal with this scenario</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>The material covered was relevant to me</td>
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Please write down one thing you have learned today, and that you will use in your clinical practice.

How could this scenario be improved for future participants?

(This is especially important if you have ticked anything in the disagree/strongly disagree box)
**FACULTY DEBRIEF – TO BE COMPLETED BY FACULTY TEAM**

What went particularly well during this scenario?

What did not go well, or as well as planned?

Why didn’t it go well?

How could the scenario be improved for future participants?