SAFE ANAESTHESIA LIAISON GROUP

PATIENT SAFETY UPDATE

January–June 2020

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LEARNING POINTS FROM REPORTED INCIDENTS

January–June 2020

This document aims to achieve the following:

- Outline the data received, the severity of reported patient harm and the timing and source of reports
- Provide feedback to reporters and encourage further reports
- Provide vignettes for clinicians to use to support learning in their own Trusts and Boards
- Provide expert comments on reported issues
- Encourage staff to contact SALG in order to share their own learning on any of the incidents mentioned below.

The SALG Patient Safety Updates contain important learning from incidents reported to the National Reporting and Learning System (NRLS). The Royal College of Anaesthetists (RCoA) and the Association of Anaesthetists would like to bring these Safety Updates to the attention of as many anaesthetists and their teams as possible. We would like to encourage you to add this update to the agenda of your next morbidity and mortality meeting and we would also like to hear your feedback on learning points.

Feedback from M&M meetings on how the Patient Safety Update has informed action can be sent to the SALG administrator at SALG@rcoa.ac.uk

Foreign body aspiration during intubation, advanced airway management or ventilation

This topic has been the subject of a case report in PSU before and now there is a national alert.[1] Anaesthesia practice exposes our patients to all manner of potential 'foreign object debris', including but not limited to ECG electrode backings, i.v. administration set end caps, cannula end caps, bungs and pieces of packaging. Often these items are manufactured in clear or translucent plastic, making them easy to overlook. There are numerous ways these items can be transferred to the airway or breathing circuit components, either by hand or by adherence to airway devices. Simple design improvements may in the future reduce the risk, for example captive bungs and use of high visibility, high conspicuity materials to manufacture items deemed to present a risk. For the present, clinicians and organisations should follow the directions of the alert, be highly vigilant to the risk and (a step not mentioned in the alert) should ensure disposal of all small objects immediately and directly into a waste bin wherever possible.

1. Foreign body aspiration during intubation, advanced airway management or ventilation, NHS England

Working during the COVID-19 surge

Two reports specifically mention that they occurred in environments dealing with the Covid-19 surge.

Case 1: *"Noradrenaline infusion running from a bag at 4 mls/hour. Safety checks completed at the start of shift and infusions checked against pump values. [Subsequently] … pump alarmed air in line. Infusion had run down the line despite the pump saying 6 mls remaining. Patient's systolic blood pressure dropped to 60. Bag replaced and line primed, patient reconnected and blood pressure improved…. Patient cared for during surge with ICU nurse supervising support staff. 'Volume to be infused' set had not accounted for priming volume which led to the incident..."*

Case 2: A pharmacist made this report: *"Upon arriving in ITU COVID area… I went to see the new patient admitted in the unit and read their notes. When reviewing their critical care prescription chart, a heparin infusion chart was attached. When I reviewed the heparin chart, I noticed that… staff wrote INR 1.1. This is a major clinical error as heparin infusion uses APTT ratio monitoring and not INR. The nursing staff then used INR as the measure instead of APTT ratio and based the adjustment of doses on INR. INR 1.1 was used… and the policy states if APTT ratio was less than 1.2 then increase rate by 0.4ml / hour. This led to the increase of infusion rate from 1.5ml / hour to 1.9ml / hour. Similarly, when coagulation screen was measured again [approximately four hours later], the INR came back as 1.1 which again meant that the infusion rate was increased to 2.3ml / hour… [The next day] the APTT ratio was 2.1 which by policy meant to not change the rate of infusion (1.5ml / hour). [Approximately four hours later], APTT ratio was 4.8 which advise to stop infusion for 60 minutes and reduce infusion rate by 0.3ml / hour when restarted. Because of the wrong parameter used to adjust the heparin infusion rates, this added cause for the patient to bleed from the left leg overnight."*

The first case may have been prevented by using a syringe driver, as is the norm in many units for vasopressors, rather than a volumetric pump. Both of the reports have their own lessons around ensuring familiarity with equipment and with clinical protocols and but both raise the question whether the incidents were facilitated by unfamiliarity of staff in a new clinical environment at a time of high workload and high stress. At the time of writing, case numbers are rising again towards an expected second wave and it is important that we remain alert to such consequences and mitigate against them.

Proximal femoral fractures and frailty – recurring lesson #1

Almost every issue of PSU in recent times has contained cases illustrating the increased frailty and vulnerability of elderly patients having surgery for proximal femoral fractures. The two cases below amply illustrate the need

for multidisciplinary management of these patients before and after surgery, for evidence-based choice of a suitable anaesthesia technique and for a standardised approach to all femoral fractures in any given organisation. The Association has updated its 2011 guidance on the management of proximal femoral fractures and the 2020 revision is imminently due for publication.

Case 1: *"… patient [in late 80s] with co - morbidities (ASA3) and VRE [Vancomycin-resistant Enterococcus infection] was on trauma list for revision of DHS to hemiarthoplasty. After cementing in the prosthesis, became profoundly hypotensive and was given several vasopressor agents and inotropes. Patient developed SVT and fast AF after the cementing and was treated with amiodarone. Patient was extubated and went to ICU post-op on an infusion of noradrenaline with a normal ABG. Patient deteriorated rapidly in ICU over the next 2-3 hours with a severe metabolic acidosis and was commenced on haemofiltration. Despite this, patient continued to deteriorate and died 8-10 hours after completion of surgery. After cementing it was difficult to reduce the hip and various prostheses were tried, eventually a THR was performed - attempted reductions of hip went on for longer than usual. Total surgery time was about 4 hours. The infection control VRE protocol is for limited staff and equipment to be inside the theatre and to have runners outside of the theatre to pass in additional equipment as required. A large amount of additional equipment was required in this case. This resulted in delays both for the surgeons and anaesthetists. Estimated additional surgical time of 30 mins for this case due to the VRE protocol."*

Case 2: A report was received of a patient in their late eighties who had surgery for a periprosthetic hip fracture. The patient was very fragile, with a metastatic intra-abdominal malignancy with ascites and heart failure. The patient had a DNACPR document in place. An anaesthetic review was undertaken but because this was a periprosthetic fracture, the patient did not have the same multidisciplinary work-up as 'straightforward' fractured neck of femur patients in the unit. The orthopaedic team documented the need for medical review, but this did not happen. The possibility of conservative options, including palliation, was not given an airing. There was no pre-optimisation of her condition. She had general anaesthesia with a pink cannula (20 G) and an arterial line. At the end of the patient had a spinal anaesthetic before wakening, with a stated dose of 3 ml (the report does not state which local anaesthetic) when the department recommends "1.5 ml – 1.7 ml". Neuromuscular blockade monitoring was not used. In recovery the patient had signs of high spinal block and maybe incomplete reversal of neuromuscular blockade, with hypotension and "high CO_2" (it is not stated whether this was on capnography or on arterial blood gas). Hypotension was managed with vasopressor, but the patient died in recovery.

Complications of nasogastric tube insertion – recurring lesson #2

Three reports were received on this topic. Misplacement of an oro- or naso-gastric tube, undetected before it is used, is a Never Event,[1] which has featured before in PSU, highlighting its frequency. The NHS has issued an alert[2] and has clearly specified the checks that must be undertaken before an oro- or naso-gastric tube is used.[3] It is not clear in these cases whether or not these checks were fully adhered to, but the point remains that this is a relatively frequently reported event and we should all ensure that we follow all recommended steps before administering anything via an oro- or naso-gastric tube in our practice.

Case 1: *"Elective anterior resection with planned HDU. Developed abdo pain/vomiting on ward. NG tube inserted… CT scan showed perforated stomach, NG tip lying outside of stomach Returned to theatre – exploration and wash out. Findings - gastro perforation. Admitted to ITU, ventilated, became septic. Sudden deterioration, cardiac arrest, RIP…"*

Case 2: *"Pneumothorax possibly caused by NG tube insertion… Patient's NG tube removed due to misplacement whilst proned. Re-inserted by nursing staff, x-ray taken for confirmation. When x-ray checked unable to confirm position possibly in lung so removed and new one reinserted by doctor. During this process saturations dropped significantly to 60 and BP increased, nurse noted these changes and called for consultant. ITU working within pandemic escalation plans at 200% capacity with pandemic staffing plans in place."*

Case 3: *"Cardiac arrest of COVID-19 patient due to inadvertent administration of nasogastric feed into pleural cavity. Clinical deterioration over 48 hours suspected to be due to Klebsiella and Pseudomonas ventilator associated pneumonia. Developed tense swollen abdomen on afternoon… CT abdomen requested and performed. CT demonstrates nasogastric tube in pleural cavity with very large iatrogenic pleural effusion, compression of venous return to the heart and compromise of right ventricle and atrium. On return to ICU, cardiac arrest due to tamponade. 20 minute resuscitation with peri-arrest siting of intercostal catheter. ROSC achieved. Post event review of CXRs performed [two days before]… show the NGT in the wrong place… The NGT was confirmed by 2 doctors as being safe to use. The series of films was subsequently reported by a consultant radiologist as NGT safe to use."*

1. Never Events list 2018, NHS Improvement.
2. Patient safety alert: Nasogastric tube misplacement: continuing risk of death and severe harm, NHS England.
3. Initial placement checks for nasogastric and orogastric tubes: resource set, NHS Improvement.

LEARNING POINTS FROM REPORTED INCIDENTS

Arterial lines

We are used to the high level of vigilance given to selecting correct flush solution for arterial lines, itself the subject of a (now archived) NHS alert,[1] with a potent reminder provided by a recent high-profile case.[2] However, in this issue of PSU, we received four reports of ischaemia or necrosis following arterial line insertion.

Case 1: *"Right thumb and hand ischaemia following arterial line removal. Has necrotic tip of right thumb and persistent tissue necrosis."*

Case 2: *"Patient had an ulnar arterial line on <date>. Removed at some point after that. New arterial line inserted [three days later] right brachial. Removed overnight… due to ischaemic finger (white). Subsequently little finger right hand has remained ischaemic and there is no revascularisation option. Likely embolic event. Vascular involved. No surgical option. Likely to lose finger."*

Case 3: *"Patient readmitted to critical care unit on <date> following previous admission [three days before]. On readmission, patient noted to have a dusky forearm and no brachial or radial pulse. Following regular vascular reviews and imaging concluded that left brachial artery may have dissected, possibly as a complication of left brachial arterial line inserted on previous admission on [first admission]… No surgical management appropriate, medical management to continue."*

Case 4: *"[Patient in 20s] admitted… after was hit by a car. GCS 3. Main injuries are closed head trauma (frontal subdural haematoma and subarachnoid haemorrhage with interventricular extension) conservatively treated; left clavicular fracture; right upper and middle lobes traumatic lung contusions. In early hours [two days after admission] patient became very unstable: severe septic shock secondary to chest infection (repeated CT scan ruled out bowel ischaemia or any other cause), with extremely high pressors and renal replacement. [The next day] it was noted a subtle difference of perfusion on his right hand compared to feet and left hand. He had a right brachial arterial line, and had had right radial art line. Art line was removed and new one inserted on the left arm. Duplex and review requested. Pulses were equal in all limbs. Overall patient improved and vasopressors were weaned down, but right hand remained mottled and worse perfused. Duplex pending. Close monitoring. [The next day] at 8am his right hand was ischaemic and lost pulse…"*

The stories are varied, but they remind us of the need for careful evaluation of the proposed site of any arterial line (with a view to any potential downstream complications), labelling of lines, of the need for systematic and regular monitoring for signs of any such problems (including scrupulous infection prevention measures at the insertion site and during sampling) and of the need for prompt action including specialist opinion if any such problems are detected or suspected. Another important risk with arterial lines that can lead to distal ischaemia is unintentional arterial drug injection and this may remain unrecognized after an event which may later result in ischaemia.[3] To make a real impact on preventing rare but serious errors such as these, working with manufacturers and regulators to facilitate system changes through engineered solutions is needed.[4]

1. Problems with infusions and sampling from arterial lines, National Patient Safety Agency.
2. Doctors say they were bullied by managers trying to identify whistleblower, *BMJ*.
3. Description of a new non-injectable connector to reduce the complications of arterial blood sampling, Association of Anaesthetists.
4. Hospital errors led to patient's death, finds coroner, *BMJ*.

Tracheal tube change in ICU

There are two cases:

Case 1: *"Prior to proning a hypoxic patient with ARDS, bedside checks discovered that the endotracheal tube was displaced and above the vocal cords. The endotracheal tube was a PneumX tube [supraglottic suction type]. Immediate action consisted of replacing the PneumX tube with a standard size 8.0 endotracheal tube. The endotracheal tube was confirmed to be in the trachea with the presence of a capnograph trace. The patient was difficult to ventilate. The patient had a cardiac arrest. CPR was started immediately. The patient was still difficult to ventilate and the endotracheal tube was replaced with a size 7.5. The correct placement of the second endotracheal tube was confirmed by a second anaesthetist. ROSC occurred after 30 minutes but subsequently there was a number of further cardiac arrests. Resuscitation was stopped… The ICU consultant was informed following the first cardiac arrest and following this the ICU consultant came in to supervise the resuscitation."*

Case 2: *"I was called to review patient due to leak from ET tube. It has led to decrease in tidal volume and difficulties in oxygenation. Before airway instrumentation I have increased FiO2 to 100%. We have prepared airway equipment with the ITU nurse. Initially, I inserted bougie via ET tube (after soft clamping the ET and disconnecting from ventilator) and tried to push the ET forward deeper into trachea blindly. The ET was repositioned and refixed at 24.5 - 25 cm and refixed, however, this has not improved the leak. Therefore I have decided to railroad different ET tube (original was size 7.5) as It had been possible to maintain the safety of the airways via the bougie (could feel the tracheal rings on insertion of bougie). We have prepared videoscope, airway equipment, checked several different sizes of ETs and after preparation*

I have under direct laryngoscopy with bougie removed the original 7.5 and tried to railroad another ET, size 7.5. It was not possible to establish the airways even with different size tubes. I did 3 or 4 attempts to reinsert the tube, however, due to bleeding and swelling this had become impossible as I have lost the view. The SpO2 started to drop very quickly, probably during the 2nd attempt. I have asked [staff] to call the intubation team to help and requested the kit for FONA. This had promptly arrived and the FONA was attempted. The trachea was very deep and narrow. I was able to insert the bougie to trachea after about 5-7 mins. Unfortunately, the bougie and ET went upwards towards the mouth on first attempt and this had become apparent as we started to ventilate... At this stage CPR was in progress and the airway management difficult due to movement and bleeding. During the CPR pause I removed the ET from trache, reinserted the bougie caudally and railroaded ET this time we got the EtCO2 confirmation of position. Unfortunately, the patient was asystolic and CPR was stopped after approx. 20 minutes due to futility. ENT was requested after the 1st insertion of FONA failed."

Unintended extubation is common in the ICU reported at a median rate of 7.3% and has been linked to a worsened prognosis.[1] It is essential that endotracheal tubes are secured well. The security of a twill taped tube depends on the knotting technique used and may become loose over time as twill tape "relaxes" once wet. Proprietary tube holders should be considered.

Flexible tubes require a greater depth of insertion at the lips and may require greater vigilance.

Tube tip position should be checked after insertion clinically and by X-ray and be approximately 5 cm above the carina with the head in a neutral position. Bronchoscopy may also be used at the bedside.

Care should be taken with a dedicated, experienced provider supervising the tube during higher risk procedures such as proning, transfers or substantial position changes. Continuous care should prevent unintentional pulling or drag from the ventilator tubing and there should be vigilance regarding sedation levels.

Recording of the tube position at the lips should be made to ensure migration is not occurring (hourly, if slippage is suspected or after risk procedures).

Air leaks may occur if the cuff has pulled back into the larynx or upper pharynx; in this situation, some ventilation and ETCO2 detection may continue but a bougie may pass into the oesophagus.

Unintended extubation risk and its management may be worsened by surges in the COVID-19 pandemic with increased proning, working in PPE, lower staffing ratios and redeployed non-critical care providers.

These cases highlight the need for vigilant supervision, bedside capnography and the need for immediate access to expert airway providers at the bedside in the ICU.

1. COVID-19 putting patients at risk of unplanned extubation and airway providers at increased risk of contamination, *Anesthesia & Analgesia*.
2. A modified tie technique for securing endotracheal tubes, *Respirotary Care*.

A miscommunication

"Staff nurses [A] and [B] commenced a morphine infusion on patient… [A] said to [B] that the medics had asked for the infusion to be run at '40', miscommunication meant that the infusion was commenced at 40mls/hr instead of 40mcg/kg/hr, this was a huge overdose for the patient."

A valid prescription requires units to be specified. This information should be carefully communicated and followed. Local operating procedures should specify what units are used in cases such as this, where confusion could arise. The use of programmable infusion pumps with drug-specific prescriptions pre-programmed could contribute to reducing the possibilities for error.

Dental damage

"During intubation the patient's complete tooth and another fragment of tooth was accidently removed/avulsed. Both specimens were removed from the airway immediately and the anaesthetic/surgery continued as planned."

A reminder of a thankfully uncommon occurrence. Each unit should have a protocol for dealing with dental damage and dental avulsion, which should include actions to preserve any avulsed tooth in case reimplantation can be attempted.

Syringe swap error

"Syringe switch between midazolam (intended) and rocuronium (given). Quickly realised and managed appropriately. Old discoloured light colour made colours look more similar than usual."

Syringe swap errors, particularly those involving neuromuscular blocking drugs figure amongst the most disastrous medical errors; ten were reported in the NAP 5 audit of accidental awareness.[1] The report makes recommendations about personal, institutional and industry strategies to reduce the likelihood of syringe swaps (equally applicable to all classes of drugs), including addressing ampoule appearance, presentation and packaging and processes at the time of administration. Labelling of all syringes by users is a key part of the safety strategy and the

Association will be publishing new guidance on labelling in due course.

This story also highlights an overlooked aspect of medical errors, namely workplace lighting. There are clear requirements laid down for both level and quality of illumination in medical workspaces[2,3] and it is an employer's responsibility to ensure that the workplace is kept up to a safe standard. The light output of fluorescent and LED light units diminishes over time and light diffusors may degrade and become discoloured with age; these changes affect acuity of vision and colour perception and differentiation ('colour rendition'). All lighting equipment needs periodic replacement. Practitioners should not work in environments that are not safe and this would include areas where illumination is sub-standard. They should hold their organisations to the current published standards.

1. Drug errors and awake paralysis, NAP5.
2. BS EN 12464-1. Light and lighting. Lighting of work places. Part 1. Indoor work places.
3. LG02: Lighting for healthcare premises (2019).

Drug error

These events take place over approximately one hour in intensive care. *"[Baby]… was noted to be black/grey in colour, ventilated… on HFOV…. Pushed 20mls/kg 0.9% Nacl as per Consultant request. …initial gas… was severely acidotic and following this I gave x2 3ml/kg 4.2% Sodium Bicarbonate pushes. I did the next gas [20 minutes later] and gave a further x2 3ml/kg boluses of 4.2% Sodium Bicarbonate with a 20ml/kg 0.9% NaCl bolus. Further gas [20 minutes later] showed continued persistent metabolic acidosis, with a MetHb 99.2%. Medical team present and aware of all gases done. …a dose of methylene blue was given by another nurse… [Fifteen minutes later], I noticed the heart rate starting to drop … HR continued to drop so crash bell pulled and CPR commenced. CPR lasted 4 minutes 30 seconds, requiring x2 adrenaline, x2 doses sodium bicarb and x2 10ml/kg 0.9% NaCl before we had a HR above 60bpm - baby still required 4 inotropes - dopamine, dobutamine, adrenaline and noradrenaline… The consultant and nurse in charge investigated and an open box, containing only 1 vial out of 5 vials left, and found a used ampoule of sodium nitrite in the sharps bin."*

The exact reason for the baby's admission to intensive care is not stated and it is not stated how sodium nitrite came to be present in the unit; however, it can be inferred that the intention was in fact to give sodium bicarbonate. This story reminds us how easy it is not to read an ampoule in the height of an emergency and even if we do, how confirmation bias may predispose to us simply seeing what we expect to see. The NHS has just published an alert on sodium nitrite,[1] limiting its availability only to emergency departments; its only clinical indication is the treatment of cyanide poisoning.

1. Risk of death from unintended administration of sodium nitrite.

Airway injury

"Patient was reviewed by ENT as had swelling and difficulty in breathing post [non-ENT] surgery. ENT registrar performed a thorough examination including a flexible nasendoscopy which showed blood in the proximal trachea and area of something unusual - like excoriation. A diagnosis of tracheal perforation was made and an urgent CT performed which confirmed this."

The report does not specify the method of airway management. Thankfully, this type of injury is uncommon, but it serves as a reminder of the potential harm we can cause.

Obstetric neuraxial blocks

Case 1: *"Patient had an epidural for pain relief during labour and presented after approx. 4-5 days with numbness of her legs. On examination we suspected cauda equina and wanted to get an urgent MRI scan on her spine. A request was made for the scan. However, we were told to get permission from the radiology consultant on call. When the obstetric SHO spoke to the radiology consultant, they were told that the referral should be made by a consultant only. When I (consultant anaesthetist) spoke to the radiology consultant, they wanted me to get an approval from neurosurgical/neurologist team to approve of the need for scan."*

The Association has recently published guidance on neurological monitoring associated with obstetric neuraxial block.[1] This case rehearses the difficulties that many practitioners will have encountered when trying to get imaging done in similar cases. The success of surgery of a compressing spinal haematoma or abscess is directly related to the promptness of getting it done. Allowing hurdles in the process of getting the imaging done to contribute to an adverse outcome would be viewed as a disaster by all concerned. It is understandable that criteria exist to avoid unnecessary use of resources, but organisations should have agreed protocols to facilitate imaging in time-critical situations such as this, as soon as a reasonable request is made.

Case 2: *"Patient had epidural in labour. Decision made for LSCS as unsatisfactory progress in labour. Spinal given prior to LSCS as epidural assessed as not adequate - patient able to lift both legs. No concerns immediately pre-op.*

Anaesthetic review identified foot drop with no sensation from above the ankle to the toes. MRI performed - long spinal cord identified which had been perforated during the epidural/spinal procedure."

The levels of the neuraxial interventions and the injury are not given, nor is it clear which procedure caused the lesion. In her seminal 2001 paper on such injuries, Professor Felicity Reynolds reminds us that the lower extent of the spinal cord is very variable and that notoriously anaesthetists often underestimate the height of the level at which they are passing the needle. She concludes: "*Given the inaccuracy of methods of identifying lumbar interspaces, and the variability of the position of the conus, it cannot be logical to aim to insert a needle intrathecally above the spinous process of* L_3.". The paper remains an essential read, even nearly two decades after publication.

1. Safety guideline: neurological monitoring associated with obstetric neuraxial block 2020, Association of Anaesthetists.
2. Damage to the conus medullaris following spinal anaesthesia, Association of Anaesthetists.

Pre-operative assessment

A hospital's mortality review group reported: *"The patient was a complex neuromuscular patient who attended for… lap chole… and who should have been reviewed by a consultant anaesthetist, due to complex past history during pre-op assessment. It is not clear whether [the pre-operative assessment clinic] had access to the patient's respiratory/ neuromuscular status prior to surgery. The mortality review group believe that the patient should have been referred to the sleep and ventilation team regarding the patient's respiratory status. Had this been undertaken, a more extensive risk assessment would have been performed pre-operatively. Following this, either the patient could have been optimised prior to surgery and a post-op weaning plan could have been constructed or the patient could have been told there was a risk of death/tracheostomy ventilation and an informed decision of whether or not to proceed made. During surgery, the patient arrested on the table in theatres, and subsequently died in ICU."*

There is little to add to the mortality review group's conclusion, except perhaps to reiterate that it is always appropriate for an anaesthetist to cancel or delay surgery on the day of surgery if pre-operative assessment has failed.

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