Safe Anaesthesia Liaison Group

PATIENT SAFETY UPDATE

Including the summary of reported incidents relating to anaesthesia

1 OCTOBER TO 31 DECEMBER 2014

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 of Great Britain and Ireland (AAGBI) 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.

ON THE SALG AGENDA

Collaboration with NHSLA

SALG is working with the NHSLA with the aim of including some information from the NHSLA’s claims management system database in the Patient Safety Update, as a supplement to NRLS critical incident reports.

Button Battery Alert

NHS England released an alert on 19 December 2014 titled: ‘Risk of death and serious harm from delays in recognising and treating ingestion of button batteries’. The alert has been released via NHS England’s Central Alerting System to all providers of NHS-funded care in England. An alert was released by NHS Wales on the same day.

The alert followed five incident reports in a four-year period of severe tissue damage occurring after apparent delays in suspecting, diagnosing or treating button battery ingestion in small children; one child died. Incident reports suggested that when ingestion was reported, healthcare staff did not recognise the need for this to be treated as a medical emergency. Additionally, symptoms of tissue damage such as haematemesis, haemoptysis and respiratory difficulties can manifest up to 28 days after ingestion of the battery.

NHS England is now exploring options for disseminating the message more widely to warn parents and the general public of this issue.

SALG Safety Initiative Survey

SALG will shortly be contacting the Patient Safety Network to ask you to complete a short survey with the aim of measuring awareness and the impact of SALG communications. We ask that you circulate this survey widely among your colleagues. Your answers will help to inform future SALG communications.
Save the Date: Patient Safety conference 2015
The annual SALG Patient Safety Conference will be held on 4 November 2015 in Birmingham (venue TBC). Further details will be circulated closer to the time.

LEARNING POINTS FROM REPORTED INCIDENTS

Rare events happening in association with general anaesthesia

➤ Patient was admitted for the removal of a prosthetic graft and revision above knee stump… maintenance phase was uneventful… 250mls of 6% hydrogen peroxide was used in 50ml aliquots under pressure to cleanse the wound… the stump was lifted and the surgeon bandaged the limb. At this stage there was a sudden drop in etCO2… from 4.6 to 1.3kPa… rapidly followed by a loss in the oxygen saturation trace… a weak carotid pulse was noted. Developed ST segment changes, bradycardia of 40bpm, followed by an RSR pattern to the QRS complex… PEA arrest… CPR commenced. ROSC followed 1mg of adrenaline and 1 cycle of CPR. A 12 lead ECG and echo showed acute right heart strain and a diagnosis of pulmonary embolus was made. CTPA showed no sign of pulmonary emboli and repeat ECG 4 hours following the event showed normal sinus rhythm. 6 hours after the incident sedation was stopped: oxygen requirements and inotropic support were minimal. Patient was extubated with no neurological deficit. The diagnosis of oxygen embolism was retrospective… not aware that the surgeon had used hydrogen peroxide. Clinical picture is in keeping with an acute embolic event following the use of hydrogen peroxide. A pulmonary thrombus with right heart strain and cardiovascular collapse would not be expected to undergo endogenous fibrinolysis quickly enough to avoid detection on CTPA. The clinical course of events, rapid recovery, and repeated echocardiography findings do not support a coronary event.

➤ Patient for sclerotherapy under GA for AV Malformation on arm. Previous lobectomy for bronchiectasis, active with no cardiac comorbidities. ECHO showed good left ventricular function with LA and RA dilatation. ECG showed normal sinus rhythm. Patient was induced… was very stable until alcohol was injected by the interventional radiologist… injected a total of 20 mls. Patient had received vasopressors prior to alcohol injection… seemed stable for 10 min post-injection… then desaturated, dropped blood pressure to a systolic of 50… treated with more vasopressors and fluids… responded adequately. But again dropped blood pressure to a systolic of 40 and then had a cardiac arrest.

Oxygen embolus involving the use of hydrogen peroxide¹ and cardiovascular collapse following alcohol sclerotherapy² are rare events occurring in association with anaesthesia. The Medicines Healthcare Products Regulatory Agency (MHRA) have reviewed historical reports, and produced an alert regarding potential oxygen embolus with hydrogen peroxide use.³ Anaesthetists are advised that the use of hydrogen peroxide in closed body cavities and deep or large wounds in contraindicated due to the risk of gas embolus.

Alcohol is the preferred agent for sclerotherapy but can lead to problematic hypotension if there is significant absorption of alcohol into the vascular compartment. Anaesthetists providing anaesthesia for sclerotherapy on an occasional basis may not be aware of the risks. Rare anaesthetic/surgical complications can be commented upon during team brief, alerting the team to the potential for adverse events.


Team brief

➤ Patient was listed for laparotomy… reviewed preoperatively… fit and healthy, not on any medication. Plan for GA + epidural for pain relief. At team brief explained about epidural and GA. Epidural was performed and catheter inserted, test dose give… patient was anaesthetised… later noticed that patient had received Tinzaparin 3500 iu two hours preoperatively. Anaesthetist not informed… the surgical registrar prescribed the Tinzaparin and took part in the brief. Patient was monitored for any neurological deficit and back pain. Surgical consultant + team and ward staff informed.
Communication is a significant source of error in patient care. The surgical team brief sets out to provide a structured approach for sharing information and understanding within the perioperative team.\(^1\) This brief should make reference to local DVT prophylaxis policy when indicated and should include all medicines prescribed and administered. Effective communication depends upon adequate transmission and receipt of information and confirmation of understanding. The Patient Safety First website provides a range of information relating to team briefing and five steps to safer surgery.\(^2\)


**Patient-reported allergy**

➤ Patient, anaesthetised by me three months previously, had a documented allergy to penicillin but patient said this was not accurate as they had penicillin many times without incident. Gave Augmentin… after 30 mins patient became tachycardic with high airway pressures and circulatory collapse… PEA arrest. Full ALS treatment initiated for suspected anaphylaxis. Suspected offending agents stopped. Patient regained spontaneous circulation after 25 minutes… remained sedated and ventilated for 24 hours… made full recovery.

Many patients claim to be allergic to antibiotics and particularly the penicillins. These drugs often form the first-line therapy in antibiotic prophylaxis for surgery. The anaesthetist’s dilemma is then whether to uphold the patient’s account and possibly deny them the ideal prophylaxis, or make a judgement and give the drug. Emphasis must be placed on taking an accurate, detailed history and then making a judgment on whether the reaction was indicative of true hypersensitivity response. If uncertainty remains, chose an alternative drug and/or consider referral for skin testing.

The next National Audit Project (NAP6) will focus on the topic of perioperative anaphylaxis. It will collect uniquely comprehensive information concerning these life-threatening events, thus enabling the anaesthesia and allergy communities to collaborate in order to improve the quality of patient care.\(^3\) For further information about this project, please contact: nap6@rcoa.ac.uk.

**Further reading**


**Pitfalls in pre-assessment**

➤ Elderly patient with multiple co-morbidities and medications presented for laparoscopic cholecystectomy. Local pharmacy pre-packs all her drugs into blister packs to enable safe consumption of her medications… included rivaroxaban… Advised to omit rivaroxaban two days prior to admission based on eGFR… was unable to identify the Rivaroxaban so continued to take it. Surgery had to be cancelled. With increasing numbers of patients taking advantage of this facility from pharmacies, this problem will increase.

➤ Patient with hydronephrosis listed for cystoscopy. Seen in pre-assessment clinic. Patient’s BP was high and as is usual practice, surgery was deferred and routine letter sent to GP to control blood pressure. Patient subsequently admitted with renal failure requiring critical care and bilateral nephrostomies. The high blood pressure may well have been caused by the hydronephrosis.

The vast majority of patients are referred for review at a pre-assessment clinic and as many as 75% might be expected to follow a day-case pathway. Streamlined pre-op processes have reduced short-notice cancellations and added to patient safety, however, areas of special requirement (elderly, patients with learning difficulties) remain challenging, as witnessed in the case above, with the use of blister-packs (also known as dosette boxes) for patients with poly-pharmacy medication issues.\(^1\),\(^2\)
Pre-assessment service standards are outlined in the RCoA Guidelines for the Provision of Anaesthetic Services (GPAS) document. Assessing, planning and organising appropriate care for complex patients take time and an outline of the necessary resources are set out in this document.  


Lessons from Anaesthetic Sprint Audit of Practice (ASAP)

➤ Elderly patient for left hemiarthroplasty was profoundly hypotensive after cement insertion. Improved when supine in head-up position… taken to recovery breathing spontaneously. Sat 94–95% haemodynamically stable, unresponsive and agitated. Failed extubation. Intubated and ventilated again. Hypotension and PEA arrest, one cycle of CPR. Taken to ITU, deteriorates, therapy withdrawn.

➤ Patient with BMI 43.43… DVT/PE on warfarin… snoring and OSA… previous respiratory arrest in PACU after GA. Stopped warfarin a week ago and the INR was 1.1… multiple orthopaedic procedures under regional techniques. This time patient was keen to have a GA but agreed to have spinal+ / epidural… spinal anaesthesia administered. Two IV lines and A – line inserted. Patient said did not like the noise of drill / saw and insisted on having a GA. Given propofol 180 mg with LMA size#5 with minimal dose sevoflurane. Blood loss was 2500ml… replaced with 4 units of blood… also received Hartman 1L+gelofusine 1.5L. Cardiovascularly stable until 90 minutes later when the BP dropped to 50/35 with HR of heart rate 110. Call for help. CPR started with DC cardioversion x3-4 and adrenaline 1mg x4 doses, atropine 1mg, CaCl 10% (10ml) NaHCO3 8.4% x50 ml. Echo was done… no reversible cause found… ABGs repeated and no signs of improvement after 80 minutes. CPR stopped.

The National Hip Fracture Database Anaesthetic Sprint Audit of Practice¹ (NHFD ASAP) demonstrated that up to 19% of the patients having cemented prostheses had potential Bone Cement Implantation Syndrome (BCIS) reactions with a further 2.7% suffering severe hypotension and/or hypoxia. Patients having a response may require cardiovascular and respiratory support well into the recovery period.²,³ A guideline on BCIS is currently out for consultation at http://bit.ly/1zR4JCe.

Situations such as the one described above where the patient has a change of mind part way through a procedure under regional anaesthesia are a reality and pose considerable difficulty to the anaesthetist. The NHFD ASAP also identified that the highest prevalence of hypotension was in association with combined neuraxial and general anaesthesia,. A possible explanation offered was that hypotension ensued from a ‘combined effect of reduced heart, contractility, blood vessel tone in people without the reserve to cope with such stress.’¹ A full explanation pre-operatively will minimise the issue but will not eliminate it.

Delays in care

➤ Patient with chronic kidney disease admitted with worsening renal function… discussed with renal SPR in regional centre for advice about further management… main concern was resistant hyperkalaemia. Advice from regional renal team was to discuss with local ITU to stabilise patient pending bed availability in renal unit. Patient was reviewed by ICU 90 minutes later… hyperkalaemia treated on AMU but renal function continued to worsen… generalised oedema so difficult to manage with IV fluids. Following morning, patient
reviewed by medical registrar and AMU consultant... requested medical SPR to liaise regional centre. ICU advised repeat potassium check after insulin/dextrose infusion... if potassium and renal function continue to worsen then to contact ICU again. ICU was contacted again... worsening potassium level and renal function... they agreed to review the patient. However one hour later patient had a cardiac arrest.

Last quarter's Patient Safety Update (data from July–September 2014) highlighted five cases relating to the deteriorating patient and delays in care with variety of causes (inadequate monitoring, failure to recognise and escalate care). These cases may be explained by local organisation issues and should be managed by local processes. However SALG will continue to monitor for cases of serious harm where delays might be the cause.

Errors involving drugs and infusions

➤ Patient anaesthetised and undergoing surgical procedure. A cannula placed in the hand and kept under a blanket, tissued, causing extravasation of IV fluid, and drugs into the dorsum of the hand. Cannula was removed and fluid expelled from the cannula site and from a needle puncture site. A hand surgeon reviewed the patient’s hand; advised washout was not necessary and that the arm should be elevated overnight.

➤ Patient found to have omeprazole infusing down the same port as noradrenaline. Potential for omeprazole pushing noradrenaline back down the line as blood noted to be back-tracking. Patient’s blood pressure dropped to between 50-60 systolic and had a cardiac arrest. One cycle of CPR delivered and 1 vial of adrenaline given. Cardiac output returned. CPR stopped.

➤ Elderly patient undergoing spinal anaesthesia for hip hemiarthroplasty. Incorrect dose (10 times) of morphine administered intrathecally. (Two separate case reports – very similar but separate events).

➤ TCI pump wrongly programmed. Intended delivery 4 nanograms per ml of remifentanil, in fact pump was incorrectly set to deliver 4 micrograms per ml of propofol therefore large overdose given.

Al-Benna’s study suggests that extravasation is not as rare as once thought and that the dorsum of the hand is one of the more common sites.1 Anaesthesia removes awareness of pain, the usual presenting symptom. Regular visual checks, reduced rate of flow of IV fluids and pumps sounding their alarms will all raise detection rates.

The MHRA issued a medical device alert on the safe use of intravenous extensions with multiple ports,2 following reports of serious incidents with back-tracking drugs and inadvertent bolus administration.

There were two separate reports involving drug calculation errors reported to the NRLS. Simple arithmetical error can lead to serious harm when administering injectable drugs, and never more so than when using the intrathecal routes. Independent double-checking is an important and readily available safeguard in preventing drug errors.3,4

NAP5 detailed the insertion of the remifentanil into the pump programmed for the propofol (and vice versa) as one problem when delivering TIVA. Measures for prevention and detection include prominent displays of drug name and colour-coded LCD displays to match the drug label colour.5 Independent double-check may be of use here too.

SALG has also produced an alert on guaranteeing drug delivery in TIVA.6


5 NAP5 Accidental awareness during general anaesthesia in the United Kingdom and Ireland. http://nap5.org.uk/NAP5report

The SALG Patient Safety Conference 2014 was held on Wednesday, 1 October. In addition to the varied and stimulating programme, five posters were presented at the conference and their content has been summarised below. If you would like the references for these summaries, further information on any of the topics covered, or if you would like to get in touch with any of the authors, please do so at salg@rcoa.ac.uk. Please note that these summaries are provided for information only and SALG does not necessarily encourage the replication of the proposed practices below.

**Anaesthetic Takeoff and Landing**
*R Copeland, A Keeley, S Robinson*
*Royal Belfast Hospital for Sick Children, Northern Ireland*

The aviation industry recognises take-off and landing as key times that require maximum focus and minimal distraction. Interruptions and distractions reduce situational awareness, task management and decision-making. The “Sterile Cockpit” concept has now become a rule – below 10,000ft the pilots refrain from engaging in non-essential, unrelated activities. With this, flight safety has improved. Anaesthetic induction and wake-up are comparable to these times. A snapshot survey of induction and wake-up in our theatres revealed high levels of unrelated conversations, phones/ pagers ringing and people/equipment entering and leaving theatre at these times. Additionally, non-essential patient interventions were occurring before induction was complete. By introducing the Sterile Cockpit to our theatres via multi-disciplinary staff meetings, tearoom posters, door signs and general increased awareness, interruptions and distractions have reduced and patient safety has improved.

**Do we flush our cannulae following anaesthesia? – An audit of practice**
*K Kennedy, L Dias, J Goodship, SM Carey*
*Wirral University Hospital NHS Foundation Trust, Merseyside, UK*

Residual anaesthetic drugs in intravenous lines pose a serious threat to patient safety. Following two incidents at our trust with residual Suxamethonium we audited 94 surgical cases to identify existing practice. We looked at flushing of cannulas at the end of the surgery, handover to recovery staff and flushing of cannulas prior to ward transfer. We found evidence of cannula flushing in only 16% of cases and verbal handover of flushing was rare (5%). Following education of anaesthetists and theatre staff together with incorporation of cannula flushing into the theatre sign-out checklist, our re-audit found 65% of cases had documentation of cannula flushing before leaving theatre. We recommend incorporation of cannula flushing into theatre sign-out check lists to reduce the risk of inadvertent administration of anaesthetic drugs in recovery or on the ward.

**Emergency laparotomy: Reducing length of stay and mortality**
*P Mehrotra, A Chana, V Banks*
*Nottingham University Hospitals NHS Trust*

A substantial amount of the emergency surgical workload involves critically ill patients at high risk of deterioration and death. In 2013, we audited emergency laparotomies, constructing timelines depicting the patient pathway from admission to operation. This revealed deficiencies in early identification of high-risk patients, delays in imaging and transferring patients to theatre.

We developed an admission pro-forma designed to identify high-risk patients, incorporated dedicated CT scan slots, implemented targets for consultant presence in theatre for high-risk cases, and developed a post-operative scoring tool which triggers a critical care review.

Re-audit in 2014 showed a reduction in critical care and hospital length-of-stay, and reduced in-hospital mortality (13.1% to 9.6%).

Using timelines of the patient pathway allows targeted service improvement. Continuous data collection provides up-to-date outcomes, allowing identification of new targets for improvement.
NUH Guidelines app – a mobile app for improving accessibility to trust-approved and national guidelines for Nottingham University Hospitals NHS Trust
A Kwa, T Wilson, M Carter, D Page, M Brown, B Baxendale
University of Nottingham, Trent Simulation and Clinical Skills Centre, Nottingham

Accessibility to clinical guidelines is a major problem in most NHS hospital trusts. At Nottingham University Hospitals NHS Trust (NUH) these are only accessible via the trust network computer system, which was difficult to navigate and cumbersome to use. This has led to a number of near misses and has been highlighted within investigations of actual patient harm.

Using a user-centred design approach, we developed a mobile app which holds all NUH-approved guidelines, aide-memoires and other useful information that is intuitive to use for all healthcare professionals within NUH. We ran focus groups with over 100 clinical staff within the trust, performed field testing with a further 145 staff. Subsequent analysis using System Usability Scale achieved a score of 83 (top 5th centile).

The app was launched to strong acclaim. It achieved 1000 downloads by day 52. It should significantly reduce time required to access critical information at the patient’s bedside, increasing compliance with key guidelines and improvement in patient safety. We aim to share this technology with other NHS trusts on a not-for-profit basis.

Emergency Equipment Bag Check Safety Audit
P McMackin, R Davies, J Colgan, L Connor, M Johnston
Mater Infirmorum Hospital, Belfast

It is a patient safety standard that emergency equipment must be checked and maintained in a state of constant readiness. There had been critical incidents surrounding missing and incompatible essential equipment in the anaesthetic emergency airway bag in our hospital. Routine procedure for maintenance of this bag had yet to be established.

It was agreed at the local governance meeting that a diagrammatic emergency bag checklist would be displayed, and the bag checked twice daily during trainee handovers and signed for. Subsequent audit revealed that the 100% compliance standard was largely achieved for night-time checks, but not morning checks. Further education resulted in improved compliance during re-audit. DGHs without dedicated anaesthetic assistants require anaesthetists to carry out frequent routine emergency equipment bags checks as a patient safety standard.

APPENDIX: INCIDENT DATA SUMMARY

A total of 8,012 anaesthesia-related incidents were reported during the specified time period. Twelve incidents were reported using the anaesthetic eForm; eight (67%) of these incidents were reported to the National Reporting and Learning System (NRLS) within one day of occurrence. Seven (58%) of the incidents reported via the eForm were reported as ‘near-miss’ (harm was prevented from reaching the patient). 8,000 incidents were reported using Local Risk Management Systems (LRMS); 29 (0.4%) of these incidents were reported within one day and 3907 (49%) were reported more than 30 days after they had occurred. Of the incidents reported via LRMS, 1010 (13%) were reported as near-miss.

All incidents reported via the eForm, and all those reported to the LRMS graded as ‘death’ or ‘severe harm’, were reviewed by the Patient Safety Team, now part of the Patient Safety Function within NHS England (formerly the NHS Commissioning Board). Consultant anaesthetists from the RCoA or AAGBI reviewed incidents identified as having potential cause for concern. No information about the trusts was disclosed in this review; only information about the incident. Most reports via the eForm were completed by consultant anaesthetists, although the eForm is available to all members of the perioperative team.

As with any voluntary reporting system, interpretation of data should be undertaken with caution as the data are subject to bias. Many incidents are not reported, and those that are reported may be incomplete having been reported immediately and before the patient outcome is known. Clarity of ‘degree of harm’ to patients who experience a patient safety incident is an important aspect of data quality.
ANAESTHETIC EFORM

The anaesthetic eForm was designed to allow specific clinical information relating to anaesthetic incidents to be reported by anaesthetists and other members of the anaesthetic team, and can be found at: www.eforms.nrls.nhs.uk/asbreport.

The RCoA and AAGBI continue to work with the NRLS team at Imperial and the patient safety function of NHS England. SALG would like to emphasise that processes for sharing and learning incidents remain firmly in place. Staff are urged to continue to use the eForm (or their local reporting systems) to report patient safety incidents, so that trends and incidents can be acted upon and learning maximised. The eForm is particularly useful as it provides a mechanism by which high quality information can be reported rapidly by members of the anaesthesia team and disseminated nationally.

DEGREE OF HARM (ACTUAL INCIDENTS)

*Figure 1* shows the numbers and the degree of harm incurred by patients within the anaesthetic specialty during the period 1 October 2014 to 31 December 2014. Nineteen deaths were reported through LRMS and none via the anaesthetic eForm.

<table>
<thead>
<tr>
<th>Degree of harm</th>
<th>Number of reports</th>
</tr>
</thead>
<tbody>
<tr>
<td>No harm</td>
<td>5,870</td>
</tr>
<tr>
<td>Low</td>
<td>1,776</td>
</tr>
<tr>
<td>Moderate</td>
<td>323</td>
</tr>
<tr>
<td>Severe</td>
<td>24</td>
</tr>
<tr>
<td>Death</td>
<td>19</td>
</tr>
</tbody>
</table>

*Figure 1*
INCIDENT TYPE

Figure 2 shows the numbers and types of incidents that occurred within the anaesthetic specialty that were reported using LRMS or the anaesthetic eForm for the period 1 October 2014 to 31 December 2014. The categories were determined at local level.