Safety Incidents in Critical Care

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The Faculty of Intensive Care Medicine™

Introduction

This is the second bulletin based on NHS England/NHS Improvement reports from Datix and related reporting from 1 Feb 2020 to 31 Oct 2020, and includes data from the first surge of COVID-19.

There were 53 adult events classified as severe and 212 as moderate severity. A further three severe and two moderately severe events were reported in the 2 to 16 year old group, and 10 severe and 31 moderately severe events reported in the under two year old group.

Once again it is worth reiterating that this is not a scientific quantitative report. Reasons for reporting and not reporting can be affected by many factors, including work pressures, which can lead to a reduction in reporting as well as shifting the priorities of well-known problems to become either more or less important. Quantification may not be reliable, but the individual reports often highlight new problem areas or important reminders of areas to need to focus on. The report deliberately maintains separation between those involved or reporting and the data presented, relying on what has been reported without further investigation to maximise people's willingness to report when they feel necessary.

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Airway, Ventilation and Oxygen

Airway interventions to correct leaking endotracheal tube (ETT) cuffs or tracheostomy tubes demonstrated the potential life-threatening nature of such situations. These led to rapid deteriorations in some patients, often due to loss of airway control, even when bougies had been employed to aid tube exchange. In some cases, this difficulty was at least partly due to laryngeal oedema.

Air leak from an endotracheal tube

A patient with high ventilator pressures who had been turned supine from prone, was then found to have a leak from the ETT. It was decided to change the ETT over a bougie, but the size 8.0 ETT was too snug. A size 7.0 was passed, however the cuff burst and ventilation was ineffective. The ETT was removed and two-person bag and mask ventilation commenced via a Guedel airway. Laryngoscopy revealed an oedematous airway. A new size 7.0 ETT was passed, but the airway was lost. Front of neck access (FONA) was achieved with a size 6.0 ETT. CPR commenced, but eventually abandoned when no return of spontaneous circulation (ROSC) was achieved.

A patient developed an air leak around an ETT. A railroad technique over a bougie, applied to the existing ETT failed to produce a better position. An attempt was made to exchange the ETT over a bougie. Cardiac arrest followed the 2nd attempt. Intubation was very difficult with blood in the airway and CPR in progress so FONA was attempted. This partially succeeded, but the ETT passed up the trachea emerging inside the mouth, so was redone with bougie passing caudally. The ETT was passed into the trachea successfully and an end-tidal CO2 (ETCO2) trace obtained. Unfortunately, CPR was subsequently abandoned because of prolonged asystole.

A recently inserted tracheostomy in a patient with COVID-19 developed a leak, thought to have been contributed to by an unusually wide trachea relative to the tracheostomy tube. Despite cuff inflation ventilation was compromised. The patient was anticoagulated due to a DVT. Attempts to railroad a new tracheostomy tube over an Aintree catheter led to airway bleeding and failed. Hypoxic cardiac arrest occurred. Laryngeal

intubation was attempted but the view was obscured by blood and not possible. FONA was used and a 6mm ETT inserted successfully into the trachea and ventilation with an appropriate ETCO2 trace achieved. However, resuscitation was ultimately unsuccessful.

Ventilation issues during transfer

A patient was transferred from theatre, post operatively, on a portable ventilator. In the ICU they were connected onto an ICU ventilator, but quickly desaturated and cardiac arrest ensued. CPR was commenced and the ICU ventilator was found still to be in 'stand-by'.

A patient who had had bilateral neck dissection, resection of floor of mouth, tongue, free flap and elective tracheostomy was transferred to a COVID side room on the ICU because of respiratory distress and potential COVID pneumonitis. Unfortunately, the tracheostomy may have been dislodged during the transfer onto the ICU bed. Surgical emphysema was found to be present and hypoxia occurred with subsequent cardiac arrest. Bronchoscopy via the tracheostomy confirmed loss of the airway. Oral intubation very difficult but achieved during CPR. Bilateral chest drains were inserted in case of tension pneumothoraces. ROSC occurred after 30 minutes.

Loss of airway during suctioning and vigorous coughing in an intubated and ventilated patient.

Humidification

In the early days of COVID, a switch to non-active humidification was often advocated in COVID patients which resulted in reports of filter clogging, impeding ventilation. This included an invasively ventilated ARDS patient who developed hypoxia and hypercarbia, which resolved immediately on changing the HME filter.

Plugging off occurred in a ventilated patient resulting in severe desaturation and hypoxic cardiac arrest.

Spontaneous pneumothoraces and complications during tracheostomy insertion

In COVID, pnemothoraces appear to be relatively common.

A tension right pneumothorax shortly after intubation was diagnosed clinically and confirmed by ultrasound, then relieved by a chest drain. The left lung was occluded by thick mucous. Soon afterwards a pneumothorax was suspected on the left side, possibly due as a complication of a new CVC. This was also confirmed by ultrasound and a chest drain was inserted on the left. In this case, diagnosis was helped by the rapid availability of ultrasound and an experienced user.

A low minute volume alarm sounded in a ventilated patient with a tracheostomy in situ. This was not improved by changing the inner tube and a suction catheter passed easily. The tracheostomy was removed, as saturations and BP were falling, and the patient was intubated via the trache site with an ETT and the situation improved. Chest Xray (CxR) subsequently showed left sided pneumothorax.

A difficult percutaneous tracheostomy was abandoned in a COVID-19 patient with ARDS. The patient developed a right sided pneumothorax and pneumomediastinum.

A tracheostomy had been downsized earlier in the day. A massive haemorrhage occurred from the tracheostomy site, which required treatment with the major haemorrhage protocol, vasopressors and ENT surgery to rectify.

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Capnography availability and intubation

The need for rapid access to capnography was illustrated by a patient who failed extubation and required urgent reintubation. The capnograph was 'not warmed up' and so no trace was possible. The patient was intubated with a good view of the cords, but no chest movement occurred when ventilated. Therefore, extubated and bagged, then reintubated with the same result. The patient was given adrenaline because of bradycardia and size 16 cm cannula inserted in both sides of chest, but no improvement and no air release. CPR commenced. Once again the patient was extubated and a new ETT railroaded into position over a bougie. Ventilation was successful. Vasopressin and adrenaline was given and bilateral chest drains placed, but no obvious pneumothoraces detected.

Nasogastric tubes

A nasogastric (NG) tube was inserted blindly into the lung periphery via the R main bronchus. This misplacement was seen on a CxR. The NG tube was removed, but this was immediately followed by a tension pneumothorax.

Another patient also developed a pneumothorax caused by insertion of an NG tube into lung.

An NG tube was passed via the larynx and trachea through the lung, into the pleural cavity, resulting in very large iatrogenic pleural effusion. CxRs all reported as showing adequate placement of NG tube. The true situation was only later revealed by CT.

Arterial and venous lines

> A radial arterial line was accidentally cut through at the hub when the dressing was removed. The line was lost into the patient and had to be removed surgically.

Brachial arterial lines

A major trauma patient with severe sepsis and high vasoconstrictor requirement developed an ischaemic right hand. They had had a right radial arterial line followed by right brachial line.

A second patient with a radial ulnar line followed by a brachial arterial line, rapidly developed an ischaemic little finger.

Dissection of the left brachial artery resulting in ischaemia to the hand followed a brachial arterial line.

A radial arterial line was accidentally cut through at the hub when the dressing was removed. The line was lost into the patient and had to be removed surgically.

Central Venous Lines

Central venous access led to two broad types of problems: those related to insertion and those related to disconnection and air embolism. There was a clear need to ensure central venous lines were transduced at the time of insertion, all wires accounted for and all lumens secured.

A central venous catheter (CVC) was accidentally inserted into the carotid artery requiring transfer to a vascular surgical centre for repair.

A pulmonary artery flotation catheter introducer was accidentally placed in the carotid artery rather than right internal jugular vein. This was detected when transduced immediately afterwards. The patients suffered a right MCA infarct, which may also have been influenced by emboli from surgical repair of a cardiac valve.

A CVC was found to be in the carotid artery on the day after insertion. It had not initially been transduced.

A Vascath for Continuous Renal Replacement Therapy (CRRT), targeted at right internal jugular vein, was placed in the right carotid artery.

ECMO via Right Femoral Vein and Right Femoral Artery resulted in an ischaemic leg.

A seldinger wire was found in a patient's aorta following CVC and a CRRT line insertion.

A CVC was disconnected to allow a patient to mobilise, but a tap was left open on an unclamped lumen resulting in bleeding and an air embolism.

A hypoxic patient deteriorated and so was rapidly intubated and ventilated. It was then noted that the CVC line had no bionector in place and no clamp. This had resulted in an air embolism.

A CVC line was disconnected from an antibiotic infusion, but the bionector and tap were removed as well as the clamp on the same lumen being left open. This resulted in air embolism.

A CVC quad line had the end of one lumen cut, but the clamp in place. The cut end was covered with a tegaderm dressing.

Insertion of right femoral CVC resulted in a large haematoma.

Removal of a femoral CVC with INR 1.7, resulted in major bleed requiring four units fresh frozen plasma, three units of packed cells, tranexamic acid and vitamin K, plus noradrenaline support.

Peripheral lines

Arginine, sodium benzoate and sodium phenylbutyrate were infused via a triple lumen cannula. Oedema and extravasation resulted.

20% and 50% glucose were infused via a peripheral line. The site became swollen and blistered. An extravasation injury occurred right in the antecubital fossa.

An abscess on the dorsum of the hand, at the site of recently removed peripheral venous cannula required incision and drainage.

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Medication Errors

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Administration errors included high-risk medicines such as noradrenaline and heparin.

A noradrenaline infusion ran out and activated the air in line alarm, despite indicating 6ml were remaining in the infusion bag. An incorrect volume had been entered into the pump at the commencement of the infusion.

A second patient received an IV bolus of heparin via the CRRT haemofilter, resulting in a systemic APTT ratio of 1.5. Soon afterwards this was followed by an intracranial haemorrhage.

A Monitoring error occurred with heparin when the infusion rate was accidentally titrated against INR rather than APTT ratio, resulting in high APTT ratios and haemorrhage. Staff education on anticoagulant monitoring and support systems such as therapeutic drug monitoring guidelines and medication-specific charts may reduce the risk of such errors.

An accidental administration error resulted in an overdose of oral propranolol. BP fell from 170 to 110 systolic and heart rate from 80 to 60 bpm. However, no major consequences occurred.

An intravenous (IV) ketamine 500mg dose was given at induction instead of the intended 100mg because of confusion over the concentration of parenteral ketamine presentations available in the Emergency Department. This highlights the importance of including a set procedure prior to IV drug administration, including label check and dose confirmation steps. System responses such as keeping only one strength, or segregation of parenteral product(s) in an area can also reduce risk of such administration errors.

Confusion over dosage times which had been altered resulted in two doses of 30000 units heparin being given six hours apart on electronic prescribing.

A missed day of antibiotics occurred because of confusion over electronic prescribing.

A transplant patient was accidentally prescribed 90mg bd tacrolimus rather than 9mg. After administration, the error was identified and the drug was discontinued and supportive treatment given. No long-term adverse effects resulted. Undertaking or cross checking medication reconciliation reduces the risk of prescribing errors with important chronic medication. Electronic prescribing systems with dose range constraints would minimise such prescribing error risk. Systems such as cross-checking unusual doses (e.g., large number of ampoules or solid dosage forms) with the pre-admission medicines reconciliation will help reduce such prescribing errors being administered.

Infections

Emergency admission of pneumometavirus pneumonia, complicated by myocarditis in a pregnant lady, requiring intubation and ventilation, rapidly leading to perimortem Caesarean Section and death.

Klebsiella oxytoca infection found in a patient, possibly transmitted from a patient in an adjacent bed.

Hospital acquired COVID infection complicated by disseminated sepsis due to staphylococcus aureus

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Equipment, staff, bed availability

A lack of staff reduced capacity and the ability to admit patients.

There were two reports of PPE shortage limiting staff being able to work in a COVID zone.

Lack of bed space to admit a patient with COVID for NIV on critical care.

A lack of promised agency nurse led to a staff shortage on ICU.

Normal running and ordering of stock on an ICU was impaired by a lack of nursing staff.

A nurse who had failed on testing for all types of FFP3 mask available was given a PreFlo 3000 hood, but found this noisy and heavy resulting in headaches.

PPE damage from masks to face and noses occurred in ICU staff.

A COVID positive patient was mistakenly admitted to a non-COVID area in the ICU because ICU staff were not aware that they had tested positive.

There were two instances of patients on hiflo nasal oxygen were on an open unit, in whom swab tests for both were later found to be positive for COVID-19.

A shoulder dislocation was thought to have occurred during proning in a patient with COVID-19.

Assault - A health care assistant was kicked in the head, neck and shoulder area by a confused patient.

Pressure ulcer reports

35 sacral/buttock sores were reported as well as 18 sores on limbs (frequently heels), six cervical collar related, four NG tube related, one related to an NIV mask, two related to the flanges on trachestomies and three related to tension on urinary catheters (plus a urethral injury due to a catheter balloon being inflated when it was not in the bladder).

Two abdominal pressures sores were reported in addition to 29 on the face and 19 on the mouth. Of these, 19 were explicitly reported as being in proned patients, although the number is potentially higher.

Two patients developed a paraphimosis when the foreskin was not reduced after urinary catheter insertion.

Click here to view previous issues of the Safety Bulletin along with other safety reports and the ViRUS COVID-19 reports.

Unwitnessed events, lack of observations or instructions

A patient was on the commode and given privacy behind a curtain, but fell onto the floor, suffering a head injury.

A patient was found on the floor after she slipped trying to retrieve her nurse call button. A fractured clavicle resulted.

An older patient in a side room was found bleeding from the head on the floor after a fall.

A ventilated patient was alone in a side room with alarms set low or turned off. A passing physio noted saturations of 85%. The nurse was busy with another patient.

A patient on end-of-life care, who had had all cannulas removed, was very breathless. A lack of observations may have contributed to the unrecognised increase in symptoms. A syringe driver of medication had been prescribed but was not connected. Therefore, rapid access for symptom relief was limited to sc, im or oral routes.

An awake, conscious, dying patient lacked end of life prescriptions.

A patient who was two hours postop still had a chest drain clamped when handed over by recovery staff. No chest drain suction had been applied in recovery even though this was part of the surgical plan.

Pressure sores were noted on a patient review. Documentation up to that point had not been completed.

A vascular surgery patient had limb pulse observations omitted overnight. No pulses were present when patient was reviewed in the morning.

Conclusions

Based on the events discussed in this bulletin, we have highlighted important areas and made some suggestions for development and change in practice. There may be a flavour of the impact of reduced staff to patient numbers and lower levels of critical care experience in staff who are looking after patients in difficult circumstances.

Staff shortages were reported together with the impact on the running and supply of units. Errors of omission occurred and, at times, staff did not appear empowered to create short term solutions.

Errors during transfer occurred including a failure to take a ventilator out of standby (further guidance is being prepared), when a patient was moved from the transport ventilator to the ICU ventilator.

Rechecking COVID status from electronic results databases prior to admission to allow correct positioning on the ward has proved important.

The potential severity of airway-related incidents is likely to be familiar to those who have cared for large numbers of critically ill COVID-19 patients. It is with this in mind that these reports may help already stretched staff focus on areas of high return.

Airway: Changing or manipulating ETT in patients may present a serious risk especially when the upper way is oedematous. These manoeuvres should be planned as high risk, with appropriate staff and difficult airway equipment immediately available. Staff should be familiar with the intensive care emergency airway guidance and these should be immediately available:

- British Journal of Anaethesia - Guideline for the management of tracheal intubation in critically ill adults
- Difficult Airway Society - DAS ICU ntubation guidelines
- Faculty of Intensive Care Medicine - Endotracheal tube revision checklist

Ventilation issues during transfer show the importance of precise care of the airway during transfer and emphasise the risk of surgery in potential COVID or COVID exposed patients.

Capnography: Effective capnography should be immediately available wherever there is potential for intubation on critical care. These devices should be switched on early in any preparations for intubation and should be continued, where possible, when ventilators are changed. Ensure they are functioning before intubation begins.

NG tubes: Visualisation of the larynx and pharynx is important where possible when passing an NG tube on an intubated ventilated patient, illustrated by cases of perforation of the lung when passed down the trachea.

Arterial lines: The combination of a recent previous radial or ulnar line and a brachial arterial line has produced reports of upper limb ischaemia.

Pressure ulcers: Key areas were sacral pressure sores, facial, mouth and abdominal sores inevitably also including when proning, tension on urinary catheters and ng tubes. Attention to detail and a check on each line/tube and risk areas is vital to avoid hours of pressure.

Central venous lines: There have been episodes where accidental carotid cannulation has not been recognised due to failure to transduce and document the pressures seen in the new line immediately after insertion. Seldinger wires need to be confirmed as removed during each line insertion. Most importantly lines must be closed when disconnected from infusions to reduce the risk of air embolism.

Medications: Checking concentrations of drug ampoules, whilst attempting to standardise the range of dilutions available and labelling syringes with their concentration is important.

Labelling target ranges and appropriate measures for each type of anticoagulant on drug systems, so all staff can rapidly understand which measure is appropriate is important.

Electronic drug administration systems should be intuitive and logical to use, with appropriate dosage checks when prescribing. Current systems often are complex and do not cope well with dose times.

Infections: Over the coming months, extra vigilance may become even more important now that immune modulating drugs such as tociluzimab are in common use with COVID-19, which have the capacity to suppress immune and CRP response for months.

- COVID-19 rapid evidence summary: Tocilizumab for COVID-19 Evidence summary [ES33]
- Tocilizumab for COVD-19 Evidence Review

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