HSIB

HEALTHCARE SAFETY INVESTIGATION BRANCH

WWW.HSIB.ORG.UK

Interim bulletin

Residual drugs in cannulae and extension lines

July 2020

Publication ref: I2019/013/IB

This interim bulletin contains facts which have been determined up to the time of issue. It is published to inform the NHS and the public of the general circumstances of events and incidents and should be regarded as tentative and subject to alteration and correction if additional evidence becomes available.

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

Notification of event and decision to investigate

The Healthcare Safety Investigation Branch (HSIB) was notified of a patient safety incident by the anaesthetic department of a district general hospital. The incident (referred to in this bulletin as the reference event) involved a patient who had stopped breathing while on a ward, several hours after having a procedure under general anaesthetic. The referrer was concerned that a quantity of the muscle relaxant drug used during the general anaesthetic had been retained in the tubing of the intravenous cannula (a device through which medicines are delivered into a vein, usually sited in a patient's hand or arm), which was later unintentionally administered to the patient.

The reference event involved a patient with a complex health history who needed an emergency procedure under general anaesthetic to drain an infected kidney. The procedure took place in the interventional radiology department, where imaging techniques such as X-rays and ultrasound are used to guide medical procedures. The interventional radiology department was in a different location to the hospital's main suite of operating theatres.

The issue of residual drugs in cannulae has existed for many years. Actions have been taken to mitigate the likelihood of such events occurring, such as the publication of papers within the anaesthetic community and the issuing of patient safety information.

The reference event highlighted potential national safety risks. These include:

- changes in the use of ported cannulae (which have a built-in opening covered by a cap) and

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

non-ported cannulae (which have no additional opening) and the associated requirements to use additional items such as connecting valves and extension lines (tubes)

- human factors associated with the perioperative pathway (the pathway of care for patients before, during and after surgery), such as how the World Health Organization (WHO) surgical checklist is used

- the approach to flushing (clearing a cannula by passing fluid through it) as a safety-critical task.

HSIB conducted a preliminary investigation, following which the Chief Investigator authorised a full investigation as the risk met the following criteria:

Outcome impact – what was, or is, the impact of the safety issue on people and services across the healthcare system?

- Where a period of apnoea (when breathing temporarily ceases) occurs and is not acted upon, the patient is at risk of brain injury or death as a result of a lack of oxygen reaching the brain.

- Patients who receive an unintended dose of muscle relaxant when general anaesthesia is not being delivered will be awake and aware. The level of paralysis may vary and range from a feeling of heaviness through to full paralysis and inability to breathe. The psychological impact on patients is significant and can lead to distress or harm in the short, medium or long term.

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

Systemic risk – how widespread and how common a safety issue is this across the healthcare system?

- Cannulae, extension lines and other types of consumable items, such as three-way taps and Y-connectors, are used extensively in hospitals for a range of different types of treatment.

- The focus on the potential infection control risks associated with different types of cannulae (ported and non-ported) and associated items can vary within a hospital. For example, medical wards may convert to using non-ported cannulae whereas operating departments commonly continue to use ported cannulae. This variation may mean that staff could be unfamiliar with devices sited in patients being transferred to their clinical area.

- The number of general anaesthetics taking place outside the operating theatre environment has increased due to more procedures being undertaken in other areas such as interventional radiology.

Learning potential – what is the potential for an HSIB investigation to lead to positive changes and improvements to patient safety across the healthcare system?

The investigation is an opportunity to:

- understand how and why drugs could be retained in intravenous cannulae and associated consumables

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

- explore the human factors associated with the existing safeguards to prevent/reduce the risk of patient safety events relating to the retention of residual drugs in cannulae.

Healthcare delivery goal

Cannulae used during an operation should contain no residual drug when the patient returns to the ward.

The reference event

The patient, a man aged 42 with a complex health history, was admitted to hospital with a kidney infection. On his second day in hospital, it was decided that he needed an operation to drain the infected kidney. The procedure, known as a nephrostomy, involves using X-ray imaging to guide the operation, and was therefore undertaken in the interventional radiology department. The procedure is less invasive than carrying out an equivalent operation in the main operating theatres. As no anaesthetic team was assigned to the interventional radiology department, a team was formed on the day to support the procedure.

The procedure was scheduled for early afternoon. It began around 90 minutes later than expected because the patient needed a blood test before the operation, and the team on the ward had found it difficult to access a vein in order to take the blood. The patient arrived at the interventional radiology department with a non-ported intravenous cannula already in place. Anticipating that it would be difficult to insert a further ported cannula (the type more commonly used for an anaesthetic), the anaesthetist opted to induce anaesthesia via the existing cannula.

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

After the patient was asleep, a further cannula was inserted, and the remainder of the anaesthetic was managed via this second cannula. This was due to the patient being turned onto his side for the procedure, which obscured the first cannula.

The procedure was completed, and the patient was woken from the anaesthetic. The team used the WHO checklist (sign-out) and the cannulae were reported to have been flushed. At that point, it would be usual for the patient's recovery to be monitored by a specialist practitioner, such as a recovery nurse, but on this occasion, one was not available. The interventional radiology department was about to close for the day, and this meant arrangements had to be made to move the patient to an alternative recovery area. The ODP working with the anaesthetist was tasked with identifying an alternative recovery area. They attempted to have the patient accepted into the day-case operating theatre and main theatre recovery areas, but both initial attempts were unsuccessful as the units were full. However, the anaesthetist decided that the safest course of action was to return to the main theatre recovery area as the interventional radiology department was now closing and it was therefore not appropriate to continue recovering the patient there. Upon arrival at the main theatre, recovery space had become available for the patient. It was noted by the receiving recovery nurse that the patient was now awake and that he could return to the ward. The usual process for admitting and discharging patients from recovery was not undertaken. The patient was taken back to the ward and his care was handed over to the ward nursing staff.

A few hours later, the patient complained of feeling

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

unwell and feverish (due to ongoing infection). A doctor prescribed intravenous paracetamol to help reduce the patient's temperature and make him more comfortable. The nurse who was asked to administer the paracetamol infusion flushed both cannulae with saline (a solution of sodium chloride and water) to ensure they were not blocked. Soon after the flushing was done, the patient started to complain of feeling strange, stating he could not move. He subsequently stopped breathing. Fortunately, the event was witnessed by a doctor who immediately commenced manual ventilation of the patient (to introduce air into the patient's lungs). The patient began to breathe on his own a few minutes later and suffered no physical harm. However, the experience of being awake but unable to move or breathe had a significant psychological impact on him.

National context

Since 2009 the Medicines and Healthcare products Regulatory Agency, NHS England and NHS Improvement have issued safety alerts regarding the risk of medicines being retained in, or **'back-tracking'** up, intravenous cannulae and associated extension lines.

The WHO surgical checklist has been used for many years and includes sections which guide the operating theatre team's actions and behaviours at each point of a patient's perioperative pathway. The checklist is commonly adapted, and additional steps may be added to suit local requirements.

The investigation has heard that the issue of residual drugs in cannulae and extension lines

may occur more commonly than is reported. The reporting of this type of event may not be consistent and may be subject to misclassification. Muscle relaxants contain no anaesthetic properties and therefore patients will usually be aware of any symptoms they experience. In incidents such as in this case, these types of events may be mis-classified as 'awareness' or as allergic reactions to drugs subsequently given.

Accidental awareness during general anaesthesia (AAGA) is the unintentional or accidental return of consciousness during intended general anaesthesia and therefore differs to the circumstances in this case. The inadvertent administration of a muscle relaxant or other drug retained in a cannula after a general anaesthetic is not considered to be an episode of AAGA as there is no intention to provide anaesthesia and unconsciousness. The circumstances and risk factors associated with the incidents may therefore be quite distinct. AAGA was comprehensively studied in the 5th National Audit Project by the Royal College of Anaesthetists and the Association of Anaesthetists of Great Britain and Ireland and specifically excluded events such as those described in this case.

Misclassification may also arise due to the range of responses each patient may have to the drug which has been inadvertently given (from mild symptoms through to stopping breathing). Additionally, the onset of symptoms may not be linked to residual drug in the cannula.

Identified safety issues

HSIB has analysed the reference event and has identified potential safety risks that will be explored within the national investigation, including:

HSIB
HEALTHCARE SAFETY INVESTIGATION BRANCH

- exploring the design and procurement of intravenous consumables such as cannulae and extension lines, and how changes in the types of consumables used are managed in the clinical setting

- observing how checklists are used in operating theatre and non-theatre settings to ensure that cannula flushing is undertaken

- examining medicines safety, management and governance arrangements – this may include prescribing arrangements, record keeping, medicines dosage and presentations, and reporting of incidents

- seeking to develop safety recommendations.

The investigation will focus on:

- the pathways of care for patients in the operating theatre and non-theatre settings

- developing an understanding of the factors that influence changes to the types of cannulae used

- how staff are involved in the selection of cannulae and related consumables, how they are made aware of changes in the types of items used, and how they are trained to use items that are introduced.

Next steps

The HSIB investigation will continue to explore the identified safety issues and welcomes further information that may be relevant from any source.

HSIB will report any significant developments as the investigation progresses.