Adverse events in children due to residual anaesthetic drugs in IV line – a survey among members of APAGBI.

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Introduction

Serious adverse events due to flushing of residual drugs in IV lines after a general anaesthetic have been reported in children and adults returned to the wards after a general anaesthetic. 6 cases of late muscle paralysis caused by flushing residual suxamethonium[1] were reported by one group and 4 cases where anaesthetic drugs such as neuromuscular blockers were left in the IV line and were flushed in recovery were reported by another[2]. A signal alert was issued by National Patient Safety Agency in November 2009[3].

Various factors may contribute to occurrence of such adverse events. Flushing IV lines with normal saline following drug administration during induction, maintenance and at the end of anaesthesia, is considered a standard practice in paediatric anaesthesia. This not only ensures delivery of the entire drug administered into the patient's circulation but also removes any residue in the dead space of the IV line. Fatigue and distractions during busy lists with high turnover, cases out of hours, handover of cases half way through the procedure due to changes in working pattern may all contribute to accidental omission of routine flushing. In addition, there has been a move towards use of non ported cannula to reduce IV catheter related infection[4], which necessitates the use of extensions with needle free injectable ports with larger dead space volumes when compared to a ported cannula. Dead space as small as 0.2 ml can harbor small yet significant amounts of drug residues that can result in respiratory depression in both adults and children post operatively[5,6].

Aims:

This survey was undertaken to

- Capture as many of such incidents
- Look for factors that may contribute to accidental or deliberate omission of the routine practice of flushing
- Look for preventive measures adopted by anaesthetists
- Recommend a standard of practice that could be implemented to prevent such adverse events in future.

Methods:

An electronic survey questionnaire email link was sent out to the members of the APA. Each individual could respond once only and all the responses were anonymous. The completed responses were analysed by application of appropriate filters.

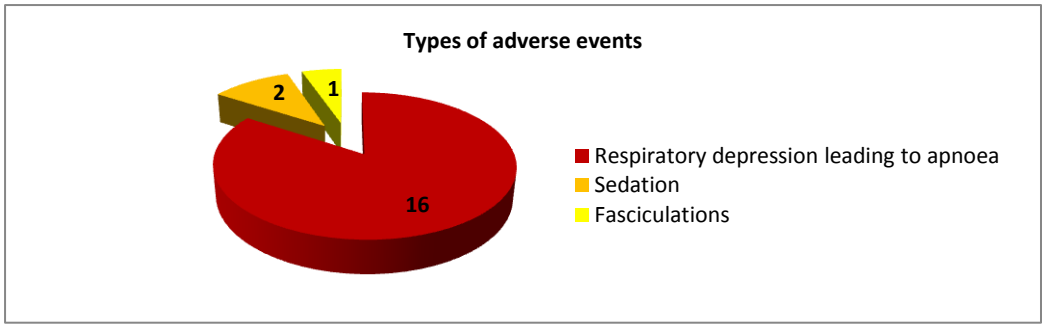
Results:

249 questionnaires were completed and returned.

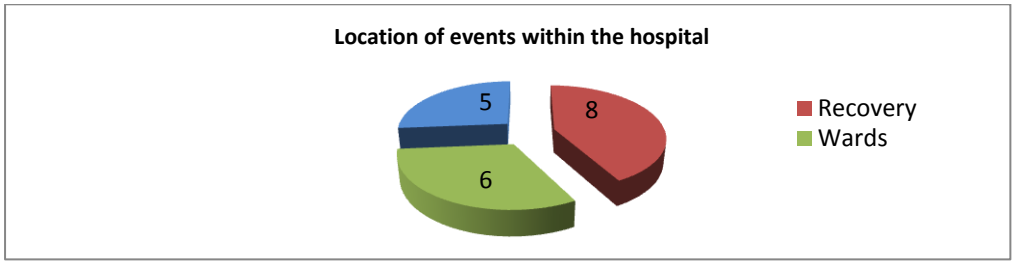
156(62%) anaesthetists reported to be working in a combined adult paediatric hospital while **92(38%)** in a pure paediatric hospital

Adverse events:

Total number of adverse events reported: 19



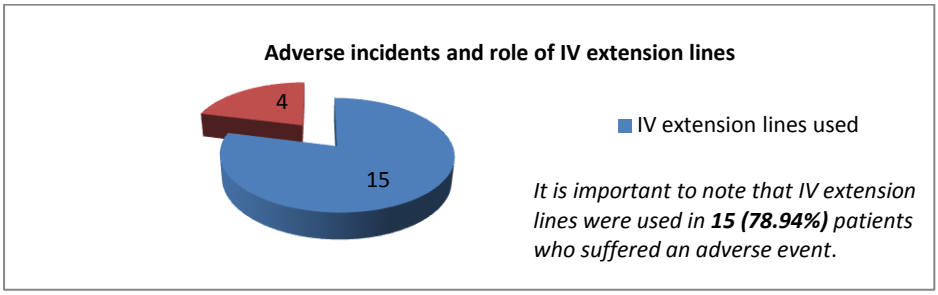
- Most of the adverse events (84%) resulted in respiratory depression leading to apnoea and the patients were resuscitated with brief periods of manual ventilation.
- Cardiac arrest, death or other sequel were not reported in our survey.
- In 3 cases, suxamethonium, rocuronium and remifentanil were identified as the drug residues.



Distribution of adverse events in different hospital settings

Combined Paediatric – adult set up	**11(57.9%)**
Pure Paediatric set up	**8 (42.1%)**

Contributing factors



None of the events were due to flushing of long term IV lines such as Hickmann line, PICC line or portacaths.

The most common reasons reported for not flushing IV lines before the patient left theatre were

- Forgetfulness
- Distractions and attending to another emergency.
- Deliberate omission if the IV access was expected to be removed in recovery and if there was ongoing IV fluid infusion

Changes to practice adopted

84% of the anaesthetists whose patients suffered an adverse event have reported to have changed their practice.

50(22.7%) who did not have an adverse event on their patient, changed their practice since the knowledge of such an event.

The most commonly adopted changes to practice in that order have been:

- 'Witnessed' flush of all IV lines before the patient left theatre.
- Removal of all extension lines in theatre before flushing
- Double flushing, with a second witnessed flush in recovery area
- A notice displayed above every bed space in recovery to confirm IV line flushing

Guidelines:

Presence of departmental guidelines towards preventing such adverse events was indicated by **118(48.2%)** of the anaesthetists, 70 of whom worked in combined hospitals and 48 in pure paediatric hospitals.

National level reporting:

Only **6 (33.3%)** of the above incidents were said to be reported to the National Patient Safety Agency through National Reporting and Learning

Conclusions and recommendations:

- Use of IV extension lines coupled with forgetfulness and distractions seem to contribute to adverse events due to residual anaesthetic drugs in the IV lines.
- Though the use of non ported cannulae has been reported to reduce hospital acquired infections it seems to be associated with a hidden increase in morbidity due to injection of drug residues.

Hence:

- Disconnecting IV extensions at the end of the anaesthetic whenever possible might prevent such incidents.
- The current practice of flushing the IV access before the patient leaves theatre if 'witnessed' by a team member and documented in the patient's anaesthetic chart might add another barrier to the occurrence of such incidents.
- Double flushing in recovery during handover, witnessed by the recovery nurse and documented in the anaesthetic record, especially when flushing is omitted in theatre, might add another layer of barrier to help prevent such events.

Presence of and compliance to guidelines improves patient care when interventions with proven benefits are advocated. Though none of the above practice changes have been proven to prevent adverse events, they are reasonable standards of care that when consistently employed could prevent such adverse events. Such guidelines would also considerably enhance awareness of an under recognized yet significant problem.

References:

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5. Smith CE, Donati F, Bevan DR. Dose response curves for succinylcholine: single versus cumulative techniques. Anesthesiology 1987; 67: A358.
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