

Identifying and Preventing Local Anesthetic Systemic Toxicity

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Introduction

Local anesthetics are an important class of drug that have many applications in the perioperative space. However, they also carry a risk of local anesthetic systemic toxicity (LAST), a potentially fatal complication, when a dose exceeding the maximum recommended dose is administered, or the drug is rapidly absorbed after injection into a highly vascular site.

Background

LAST is a complication of local anesthetic administration that leads to, most often, excitatory CNS symptoms, including vision changes, muscle excitation, and seizure activity. These symptoms are classically followed by symptoms of cardiac toxicity, including conduction disturbances, myocardial dysfunction, lability of peripheral vascular tone, and ultimately cardiac arrest. It is relatively uncommon for doses above the toxic dose to be administered, as it has an estimated incidence of approximately 0.03%. However, LAST prevention should still be a priority for providers, given the seriousness of the complication.

Objectives

The goal of this project was to understand the incidence of LAST both nation-wide and at Michigan Medicine, what is being done nation-wide to prevent LAST, what is being done at Michigan Medicine to prevent LAST, what limitations there are to effectively preventing LAST, and what improvements are likely to further reduce the risk of LAST at Michigan Medicine. In order to potentially implement these improvements, the goal was to present this information at the monthly anesthesiology quality assurance meeting.

References

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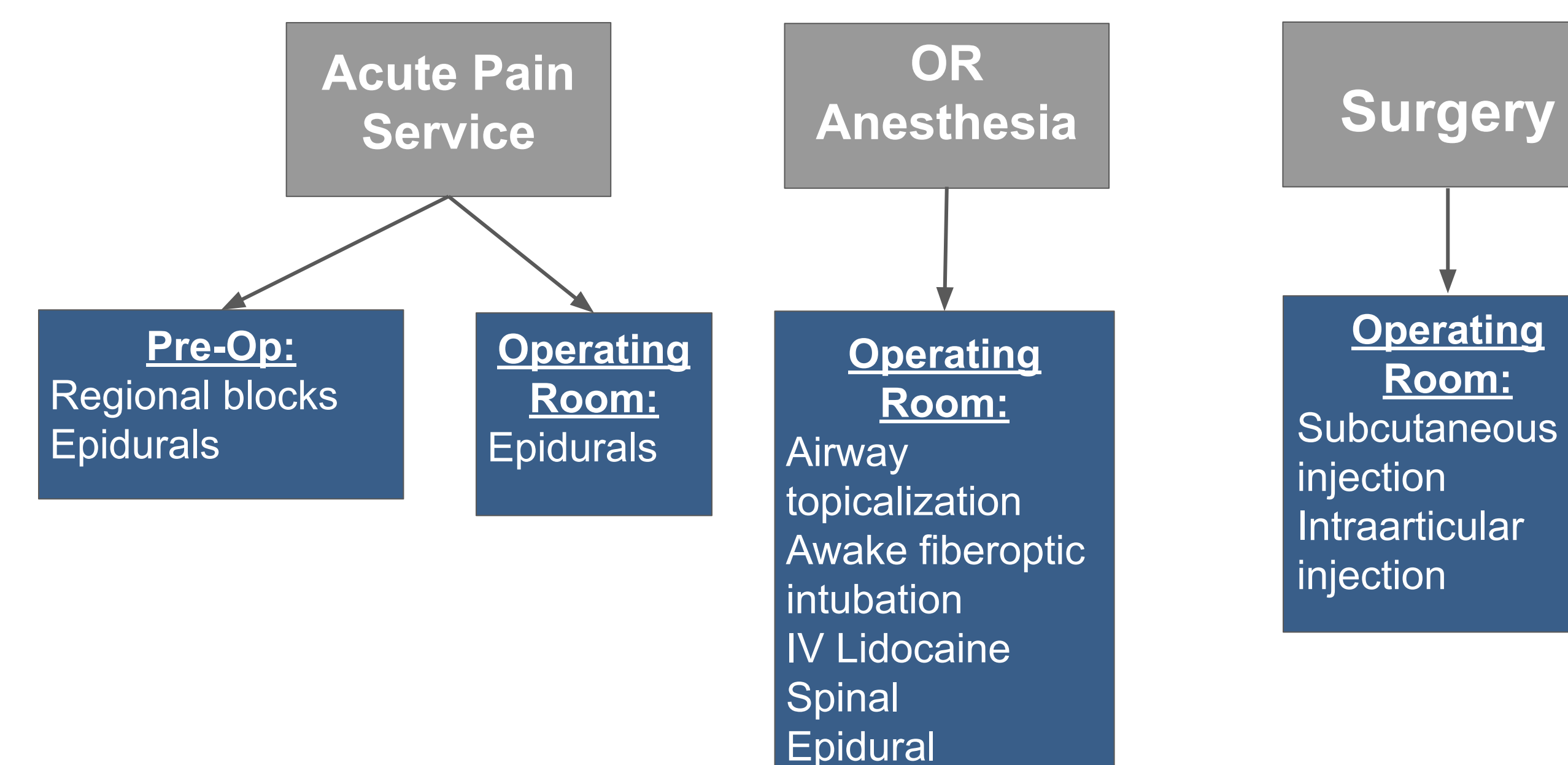
Methods

- Utilized current peer-reviewed research to understand the nation-wide incidence and current practice on LAST prevention.
- Accessed the Centricity database to identify cases of possible LAST at Michigan Medicine and the estimated incidence.
- Talked to current faculty and residents about workflow in the perioperative space and what barriers there are to effective communication regarding maximum allowable dose of local anesthetics.

Results

- Based on a query of Centricity data, the estimated incidence of LAST at Michigan Medicine is 0.0015%.
- The major barriers to preventing LAST at Michigan Medicine include administration of local anesthetics by multiple teams separated in time and space, and lack of effective communication between these teams, as well as lack of documentation of local anesthetic doses administered.
- There are workflow improvements that can be made to reduce the number of near-misses relating to LAST, as well as LAST itself to patients at Michigan Medicine.

Administration of Local Anesthetic by Team



Limitations

The cases queried in Centricity were cases in which local anesthetic was used and “seizure-like activity” was reported between the dates 1/1/2004 - 9/1/2019. Therefore, cases of LAST that present atypically, without CNS excitation as the presenting symptom, would not be included in the above query. Although it appears that Michigan Medicine has a very low incidence of LAST based on the above query, it is also possible that some of the cases included in the query described above may have had a seizure unrelated to the use of local anesthesia. Additionally, there may also be cases of LAST that have occurred, but have not been reported in Centricity, or have been documented differently.

Conclusions and Future Directions

- Although LAST is relatively uncommon both nation-wide and at Michigan Medicine, there are still steps that can and should be taken to reduce the risk of its occurrence in addition to near-miss events.
- These interventions include booking cases including all procedures that require local anesthetic, flagging cases in the EMR that include multiple procedures requiring local anesthetic, requiring a conversation about required procedures and maximum allowable local anesthetic dose prior to the day of surgery, as well as during the pre-incision time out.
- Define how LAST should be documented for a more accurate understanding of the incidence at Michigan Medicine.
- Present these interventions to the Michigan Medicine Department of Anesthesiology Quality Assurance meeting.

Reflections

- Although a problem may affect a seemingly small number of people, if it is a serious problem, there may still be important risk-reduction measures that can be taken and are worthwhile for patient safety.
- However, it is important to note that garnering interest in the topic as well as institutional support will likely be more difficult if the problem affects a relatively small number of people.
- Documentation is critically important in understanding the incidence of quality improvement events.