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# Improving Perioperative Management of Patients Experiencing Local Anesthetic Systemic Toxicity: An Assessment of a Staff Educational Program

Sarah O'Leary BSN, RN

## **Introduction of the Problem**

Local anesthetics have become one of the most commonly used drugs in the field of anesthesia (Goyal & Shukla, 2012). Despite efforts to prevent local anesthetic systemic toxicity (LAST), this rare event still occurs and has the potential to lead to life-threatening outcomes (Dickerson & Apfelbaum, 2014). The management of a LAST event requires collaboration of an interdisciplinary team; therefore, all perioperative healthcare professionals must be properly educated to facilitate better patient outcomes should this potentially fatal event occur.

## **Literature Review**

Administration of local anesthetics has become a cornerstone of multimodal analgesia in anesthetic practice (Collins, Neubrander, Vorst, & Sheffield, 2015). Peripheral nerve blocks, epidurals, and spinals allow patients to undergo a wide variety of surgical procedures safely while providing both operative and postoperative pain relief (Collins et al., 2015). In addition, local anesthetics have the potential to improve quality of recovery, decrease the use of opioids, decrease postoperative nausea and vomiting, improve patient satisfaction, and decrease hospital length of stay (Dickerson & Apfelbaum, 2014). Despite the myriad of benefits and acceptable safety profile, local anesthetics have been associated with significant morbidity and mortality related to inadvertent intravascular injection and the use of excessive doses resulting in LAST (Kamel, Trehan, & Barnette, 2015).

LAST is the result of rapid absorption of local anesthetics into systemic circulation. This rapid absorption of local anesthetic results in high levels that may accumulate and cause toxicity

to the brain and heart, potentially leading to life-threatening complications (Noble, 2015).

Collins and colleagues (2015) found that rates of local anesthetic toxicity have declined over the last 25 years, but toxicity still occurs in approximately 1 in 2,500 epidurals and between 1 in 500 and 1 in 1,200 peripheral nerve blocks. Studies have shown that LAST occurs most frequently from accidental intravascular injection of LA during performance of peripheral nerve blocks and even with the widespread use of ultrasound-guided regional anesthesia, the incidence of LAST has remained stable over the past decade (Bryne & Engelbrecht, 2013; Collins et al., 2015).

Safe administration of local anesthetics reduces the risk of toxicity. Suggestions for safe administration include limiting the cumulative dose, using ultrasound-guidance for direct visualization of injection, test dosing, incremental injections, negative aspiration, and adherence to standard guidelines (Dickerson & Apfelbaum, 2014). Another key to prevention of LAST is vigilance in patient monitoring and assessment. Ongoing assessment by the perioperative nurse and anesthesia providers should be used to screen for the development of toxicity during injection and following injection (Noble, 2015).

The need for optimized management of LAST has led to the development of safety steps in LA administration, the discovery of lipid emulsion therapy, and treatment and prevention guidelines utilizing checklists (Dickerson & Apfelbaum, 2014). Treatment of LAST had historically been supportive only; however, there is now evidence for the use of lipid emulsion therapy for management of the severe cardiotoxic effects of LAST (Beecroft & Davies, 2016).

Anesthesia providers and perioperative staff may never treat a life-threatening episode of LAST during their career, but they must be prepared. With the increase in popularity of regional anesthetic techniques, the need for a better understanding of toxicity is greater now than ever. LAST still occurs despite improvements in injection techniques and the ability to visualize drug

delivery with ultrasound during performance of regional anesthesia (Dickerson & Apfelbaum, 2014). Therefore, comprehensive education and training about best practices for the care of patients receiving LA, thorough patient assessment, and knowledge of appropriate treatment for LAST are essential for effective management of this emergent situation to promote positive patient outcomes.

In order to facilitate the learning process, basic principles can be taught via a computer-based learning (CBL) module. CBLs have been increasingly used in healthcare over the last several decades to deliver knowledge and skills training (Esche, Warren, Woods, Jesada, & Iliuta, 2015). The use of a CBL enables distribution of information, acknowledgement of receipt of information, and a means of testing knowledge in a convenient manner for healthcare professionals (Kobewka et al., 2014). Additionally, CBL modules improve access to education, provide flexibility in instruction, and can be just as effective as face-to-face education (Cook et al., 2008; Esche et al., 2015). Thus, the use of a CBL module offers an effective way to individualize instruction to meet the needs of all types of learners and enhance the knowledge of healthcare professionals on the management of a rare, life-threatening event.

### **Project Methods**

The goal of this doctoral practice project was to educate perioperative staff at a tertiary care center in central Illinois on the current state of knowledge surrounding LAST in order to help with prevention, identification, and management of this complication. Recognition and rapid treatment of LAST is vital to improve survival (Noble, 2015). Anesthesia providers and healthcare professionals providing care in the perioperative areas are in key positions to appropriately identify and treat this potentially life-threatening event. Therefore, the purpose of this project was to summarize the most recent literature regarding LAST and integrate the

resulting material into a computer-based learning module in order to promote preparedness among staff should this rare, but devastating, complication occur. This project's long-term objective was utilization of the LAST CBL education module by all affiliated care facilities within the targeted health system in central Illinois and Wisconsin on an annual basis to reduce patient morbidity and mortality associated with local anesthetic use.

This project was a non-experimental pretest-posttest design for nurse anesthetists, anesthesiologists and perioperative, intensive care unit (ICU), obstetric (OB), and pediatric nurses in a tertiary care center in central Illinois. The project's design assessed participants before and after implementation of the CBL module to evaluate the effect on staff knowledge and management of LAST. The same questions were utilized in the pretest and posttest to more accurately compare knowledge gained after completing the CBL module.

Prior to implementation, this project's proposal was submitted for evaluation and deemed exempt by Southern Illinois University Edwardsville's Institutional Review Board (IRB). Additionally, the Hospital's Research Review Committee evaluated and approved the project.

### **Evaluation**

The outcomes measured were perioperative staff knowledge of LAST and its management. To determine the project's goal attainment of enhancing knowledge, a pretest-posttest questionnaire was utilized. The knowledge questions were in multiple choice format and addressed the definition, characteristics, prevention, symptoms, and treatment of LAST. Participant pretest and posttest results were compared to determine the effectiveness of the computer-based learning program in enhancing knowledge of LAST.

### **Impact on Practice**

It is impossible to know if specific knowledge was enhanced after completion of the CBL because individual data for each question was not made available. However, the improvement in participant scores, as evidenced by posttest results obtained, would lead one to assume that there was knowledge gained about LAST from the CBL. This enhanced knowledge will be used to improve outcomes should a LAST event occur. The long-term impact is the CBL will become a part of annual continuing education and will be utilized by all facilities within the targeted health system in central Illinois and Wisconsin. This project could be replicated or utilized at any institution that is in need of education on LAST or any other rare, life-threatening event.

### **Conclusion**

Local anesthetic systemic toxicity is a low incidence, high mortality event that requires healthcare providers to be educated on an annual basis about prevention, identification, and management in order to improve patient outcomes. This project assessed the impact of a computer-based learning module on staff knowledge and management of LAST. The results of this study indicated an enhancement in knowledge with the potential to improve patient outcomes should this infrequent and potentially fatal complication occur.

Administration of local anesthetics has become a cornerstone of multimodal analgesia in anesthetic practice; therefore, all healthcare providers involved in the care of a patient receiving local anesthetics must be aware of adverse events that can occur with administration and how to accurately assess and treat a patient if LAST develops. Overall, promoting awareness, vigilance, and preparedness among healthcare providers has the potential to keep patients safe should this rare but life-threatening complication occur.

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