Local Anesthetic Toxicity and Lipid Rescue: Designing an Educational Effort that will LAST

Wendy Ferguson, RN, BSN, CEN
Consultation and advisement on this project from:

Carlana Coogle, RN, MSN, CEN
Joshua Leppert, CRNA, MSN
Barbara Richardson, RN, BSN, RN-BC
Mark Harrell, CRNA, MHS
Mark Brinkman, MD
Kim Beckman, RN, CPAN
Trent Munyer, CRNA, MSN
At the end of this presentation, the RN will be able to correctly identify and understanding the following objectives:

• What is LAST
• What patients are at risk for LAST?
• What are the signs and symptoms of LAST
• How is LAST treated
• What is the role of the RN during a LAST event
• How can LAST be prevented
• Case Study
• EBP: Research findings and significance
Local Anesthetic Systemic Toxicity (LAST) is a potentially life-threatening event in which a bolus of local anesthetic (LA) is injected into peripheral tissue and/or **venous** or **arterial circulation** during a block procedure. The LA is rapidly absorbed into systemic circulation where it accumulates in high, toxic levels resulting in cardiovascular and/or neurological collapse.

(Noble, 2015; Clifford, 2011)
LAST

Low Incidence

- 1 in 1,000 peripheral nerve blocks.
- 4 in 10,000 epidural blocks.
- Symptoms have been reported to occur in as little as 56 seconds and as long as 30 minutes or more after an injection.

High Acuity

(ASRA, 2011; Noble, 2015, AORN, 2017)
Which patients are at risk?

- Any patient receiving local anesthetic injections:
  - Peripheral nerve blocks
  - Epidurals
  - Subarachnoid blocks
  - Field infiltration

(Katzung, Masters & Trevor, 2008; Leppert, 2017)
What are the signs and symptoms of LAST?
Initial (early) signs and symptoms:

- Metallic taste in mouth
- Tinnitus
- Shivering/fine tremors
- Confusion
- Lightheadedness, dizzy, drowsiness
- Slurred speech
- Tingling tongue, lips
- Cardiovascular excitement

(AORN, 2017; ASRA, 2010; Noble, 2015)
Symptoms can quickly progress...

- Sudden change in LOC: excitement, agitation, irritability
- Cardiovascular changes: hypertension & tachycardia
- Seizures
Severe (late) symptoms of LAST

- Respiratory and cardiovascular depression: progressive hypotension and bradycardia
- Conduction block delays: prolonged PR and QRS intervals
- V-tach, V-fib, torsades
- Cardiovascular collapse, coma and death.

(Noble, 2015; Clark, 2008; ASRA, 2011; Dewaele & Santos, 2013; Schick & Windle, 2010; AORN, 2017)
How is LAST treated?

- Supportive care and intralipid infusion.

The most widely accepted treatment modalities are based on the research and findings of ASRA and have been presented as a step-by-step Checklist.
Lipid emulsion therapy provides a “lipid sink” or pool of lipids that binds with the fat-loving local anesthetic, pulling it out of tissues and reducing the concentrations of LA in the patient’s blood, thus halting and reducing the symptoms and consequences of LAST.

(Noble, 2015; Manavi, 2010; Fencl, 2015).
The Checklist

Checklist for Treatment of Local Anesthetic Systemic Toxicity, is attached to all lipid bags as a quick reference guide during a LAST event.

Lipids are stocked in all departments where all block procedures are performed.

(ASRA, 2011)
Current LAST recommendations:

• **Call for help!**

• **Support airway** and ventilate with 100% oxygen

• **Seizure suppression** but AVOID propofol

• **ACLS** (may be prolonged), *recommended*
  • Epi < 1 mcg/kg.
  • Avoid vasopressin, calcium channel blockers, beta blockers and additional local anesthetic.
Current LAST recommendations:

- **Lipid Emulsion Therapy (Liposyn):**
  - bolus 1.5ml/kg over 1 minute (100ml).
  - May repeat 1-2 times.
  - Continuous infusion 0.25 ml/kg/min for upper limit of 10 ml/kg over 30 minutes.
  - Continue infusion for *at least* 10 minutes.

- Pt will transfer to ICU for continued care.

*(ASRA, 2011)*
What is the role of the RN?

• Facilitate patient safety:
  • Pre-procedure checklist and assessment
  • Verify Consent
  • Time-Out
  • Continuous 1:1 monitoring
  • Documentation
  • Availability of emergency equipment
What is the role of the RN?

• **Educate** patient on S/S toxicity
What is the role of the RN?

• **Continuous cardiac monitoring**
  
  • vitals q 5 min during procedure
  
  • Then, vitals q 15 min as appropriate for level of care.
What is the role of the RN? con’t...

• Assist anesthesia:
  • Ultrasound use and observance of spread, slow injections with gentle aspirate q 5ml.
What is the role of the RN?

- **Frequent communication** and continuous patient assessment.

- **Early recognition and rapid treatment** of LAST

What is the role of the RN?

• Know the **location of lipids** in your department and key terms

• Understand your hospitals peripheral **block policy** and your state nurse practice act.

Speak up!

If you suspect a LAST event is occurring, advocate for your patient and take action.
Get the lipids!

Located in select department’s Pyxis:

- Log in
- Select a patient
- “Override”
- Type: “lipid” or “Liposyn” and tap select.
- Pull medication!
And here it is!

- LAST checklist is attached to the back.
- Make sure to grab free-flowing (non-pump) tubing for rapid administration.
- Call Pharmacy for additional bags of lipids and have it sent STAT!
Checklist attached to lipid bag
Documentation

“Peripheral Nerve Block”

...as documented in Meditech.
“Time-Out”

...as documented in Meditech.
ASPAN Standards:

“The nurse effectively serves as the anesthesiologists extra pair of hands”

“The RN should facilitate patient safety…verifying consent, IV access, timeout, emergency equipment availability...and continuous 1:1 monitoring of the patient”
How can LAST be prevented?
How can be LAST prevented?

• Careful, continuous **monitoring**

• Frequent **communication** with patient AND provider
How can be LAST prevented?

• **Ultrasound** guidance and observation of spread

• **Slow, incremental injection of 5cc** followed by aspiration

• Understand **medications** being used
Ultrasound!

Video of interscalene block "spread" via ultrasound
Main OR, PACU, Pre-Op and KOS:

- Naropin (Ropivacaine) 0.5% and 0.2%, Maricaine (Bupivacaine) 0.25%-0.5%, Lidocaine 1% and 2%.
- Exparel is also used in the OR.
Common Meds

Labor & Delivery

- Naropin (Ropivacaine) 0.2% with Fentanyl 3 mcg/ml for continuous labor epidurals.
- Maricaine (Bupivacaine) 0.75% is used for spinal blocks and C-Sections.
Lipid therapy is still an emerging practice.

RN’s need to stay current with best practice.

- American Society of PeriOperative Anesthesia Nurses (ASPN)
- Association of PeriOperative Nurses (AORN)
- American Society of Regional Anesthesia (ASRA)
- Association of Women’s Health, Obstetric and Neonatal Nurses (AWHONN)
- Emergency Nurses Association (ENA)
- American Nurses Association (ANA)
Meet Greg.

Greg is a 66-year-old white male s/p left TKA. He received an ultrasound guided left adductor canal block in the PACU for postoperative pain control.

- Within two minutes of block being completed, Greg had LOC and seized with immediate cardiovascular collapse. He was intubated, CPR was started and IV intralipids were started.
Fat saved Greg’s life.

Within 15 minutes, ROSC was achieved with mild hypotension. Within 30 minutes, Greg was awake and alert, VSS and extubated. He was transferred to the ICU for overnight observation. He was stable and complained of chest and rib pain from CPR.

- Total dose of intralipid during event: 600ml

(lipid rescue.org, 5/5/2016)
Evidence-Based Practice Project
Description of the problem

Nurses working in areas where block procedures are performed must be knowledgeable and efficient in providing rescue methods in the event of a LAST occurrence.

Nurses did not possess the knowledge or confidence to ensure that they fully understood how to manage a LAST event.
The Question!

Will implementing an evidence-based educational intervention about LAST events improve nurses' knowledge and confidence?
Setting of the project

This project occurred at a Level II trauma center, 292 bed community owned hospital in northern Idaho.

The educational intervention was given to 70 Registered nurses in the Pre-Op, PACU, OR, labor and delivery unit and at Outpatient Services.
Project Design: Evidence-Based Practice (EBP)

• **STEP 1: Identify Gaps**

*All projects start with a question or idea. There was a lack of knowledge and best practices among nurses related to LAST.*

Do registered nurses know the signs and symptoms to identify a LAST event and do they know the recommended treatment and prevention of future events?
• **STEP 2: Identify Stakeholders**

*Forming a group of key stakeholders and developing an interprofessional team is key.*

• Physicians
• CRNA’s
• Pharmacists
• Nurses
Evidence-Based Practice (EBP)

- **Step 3: Literature Review and Evaluation of the Evidence**
  
  - Literature proved there was a lack of knowledge and information about LAST events
  
  - Expert consultations assisted with knowledge content and development of process for KH
Step 3: Literature Review and Evaluation of the Evidence

Resources for this project included a literature review of peer-reviewed journals, academic journals and white papers from 2008-2017, 19 articles were reviewed.
Evidence-Based Practice (EBP)

• **Step 4: Translating the Evidence**

  Assessment of our organization current practice did not match what the best practice was. Therefore, the EBP project methodology was implemented.
Evidence-Based Practice (EBP)

• Step 4 Translating the Evidence

  Develop the implementation plan:
  ▪ Pre-survey assessment of learners knowledge
  ▪ Educational intervention
  ▪ Post-survey assessment of learners knowledge
  ▪ Assessment of the process to treat a LAST event
  ▪ Access to Lipids and Protocols
  ▪ Development of policy and procedure for LAST
Education Sessions were given to all departments where blocks were performed: Pre-Op, PACU, OR, L&D and Outpatient Services.

- Sessions were typically 30-minutes long and given at monthly staff meetings.
- RN’s were given a pretest, presented information, then a post-test.
- Department specific block medications were discussed. Both meds and lipid bags were available for hands-on viewing.
LAST Pre & Post Presentation Assessment Tool

PACU: Pre-Presentation Knowledge Measurement Tool for LAST

- LAST is a potentially life-threatening event in which a bolus of local anesthetic is inadvertently injected into _______________________ and/or _______________________ circulation during a block procedure. It is then rapidly absorbed into systemic circulation, resulting in _______________________ collapse. (Fill in the blanks)

- What can the RN do prior to the initiation of peripheral or spinal block? (Circle all that apply)
  A. Verify consent, allergies and past reactions to blocking agents.
  B. Check IV access and patency.
  C. Establish procedural time-out.
  D. Verify availability of emergency equipment.
  E. Place patient on continuous monitoring including cardiac monitoring, blood pressure, respirations rate and pulse oximetry.
  F. Bed in lowest position, side rails up and call light in place.
  G. Establish baseline LOC of the patient.

- Which symptoms would you teach your patients to report immediately to the RN prior to receiving a peripheral or spinal block? (Circle one)
  A. Dry mouth, mild dehydration and nausea.
  B. Tinnitus, shivering, feelings of excitement or agitation.
  C. Sensation of small poke and burn during initial needle insertion.
  D. Report loss of temperature sensation, loss of pain perception and loss of movement.

- Which group of signs or symptoms are indications that a LAST event is occurring? (Circle one)
  A. Respiratory acidosis, sudden heat production and skeletal muscle rigidity.
  B. Complaint of metallic taste in mouth, tinnitus, blurred speech, cardiovascular excitement.
  C. High fever, headache, backache, malaise and vomiting.
  D. Descending flaccid paralysis with bulbar palsy, clear sensorium and no fever.

- Littles are located in the Pyxis under key words: “___________” or “___________” and the Blue Anesthesia cart, top drawer under “___________” (Fill in the blank).

- On a scale of 1-10, with 1 being not comfortable and 10 being very comfortable, what would you rate your comfort level of your role during a LAST event? (Circle one)

  1 2 3 4 5 6 7 8 9 10
Last is a potentially life-threatening event in which a bolus of local anesthetic is inadvertently injected into ________ and/or ________ circulation during a block procedure. It is then rapidly absorbed into systemic circulation, resulting in ________ collapse (fill in the blank).
What can the RN do prior to the initiation of peripheral or spinal block? (circle all that apply)

A. Verify consent, allergies and past reactions to blocking agents.
B. Check IV access and patency
C. Establish procedural time-out
D. Verify availability of emergency equipment
E. Place patient on continuous cardiac monitoring, blood pressure, respirations rate and pulse oximetry.
F. Bed in lowest position, side rails up and call light in place.
G. Establish baseline LOC of patient
What symptoms would you teach your patients to report immediately to the RN prior to receiving a peripheral or spinal block? (circle one)

A. Dry mouth, mild dehydration and nausea
A. Tinnitus, shivering, feelings of excitement or agitation
A. Sensation of small poke and burn during initial needle insertion.
A. Report loss of temperature sensation, loss of pain perception and loss of movement.
Which group of signs or symptoms are indications that a LAST event is occurring? (circle one)

A. Respiratory acidosis, sudden heat production and skeletal muscle rigidity.

A. Complaint of metallic taste in mouth, tinnitus, slurred speech, cardiovascular excitement.

A. High fever, headache, backache, malaise and vomiting.

A. Descending flaccid paralysis with bulbar palsies, clear sensorium and no fever.
Lipids are located in the Pyxis under the keywords, “____________” or “____________” and the Blue Anesthesia cart, top drawer under “____________”.

(fill in the blank)
On a scale of 1-10, with one being not comfortable and 10 being very comfortable, what would you rate your comfort level of your role during a LAST event?
Evidence-Based Practice (EBP)

• **Step 5: Dissemination**

  ▪ Presented EBP project at Professional Nursing Council
  ▪ Submitted manuscript to the Journal of Perianesthesia Nursing
  ▪ Conference podium presentation
A formal protocol for peripheral nerve blocks was established. The draft was sent through committees until final approval.
Test Score Results:

*Pre-Quiz* presentation results had a median average of 73.0%.

*Post-Quiz* results improved to a median average of 100.0%.
How Comfortable are you with a LAST event?

Pre-Test results:
RN’s from PACU, Pre-Op, KOS, L&D and OR answered a median 3.0 out of 10 in overall comfort.

Post-Test results:
After receiving an educational in-service on LAST, the same RN’s stated their median comfort level improved to 8.0.
Registered nurses did indeed have a knowledge deficit related to LAST events.

Education improved the nurses recognition, treatment and overall comfort level during a LAST event.
The next step will be the development of annual LAST simulations and online education modules to provide reinforcement on signs and symptoms and necessary treatment of LAST events.
This project all started from one nurse’s simple desire to keep her patient’s safe during a block procedure.
Be the advocate!
References:

References:

- Cowmey, Philip MD. Local Anesthetic Systemic Toxicity or when fat is good for you. NPANA Annual Fall Conference, October 18, 2015. Missoula, MT.
- Kraft, Kim, BSN, RN, CPAN. Anesthesia Agents and adjuncts regional anesthesia: A Competency based orientation and credentialing program for the registered nurse in the perianesthesia setting (2014). American Society of PeriAnesthesia Nurses. Ch. 10: 221-226
References: