APM ANESTHESIA & PAIN MEDICINE

Anesth Pain Med 2025;20:166-174
https://doi.org/10.17085/apm.24146
pISSN 1975-5171 • eISSN 2383-7977

Original Article

Evaluation of a multidisciplinary simulation training curriculum for local anesthetic systemic toxicity management: a quasi-experimental study using the Kirkpatrick model in India

Pooja Bihani[1], Naveen Paliwal[2], Rishabh Jaju[3], and Vikas Rajpurohit[4]

[1]Department of Anaesthesiology, All India Institute of Medical Sciences, Bhubaneswar, [2]Department of Emergency Medicine, Dr. S.N. Medical College, Jodhpur, [3]Department of Anaesthesiology, All India Institute of Medical Sciences, Deoghar, Jharkhand, [4]Department of Anaesthesiology, Dr. S.N. Medical College, Jodhpur, India

Received October 10, 2024
Revised November 18, 2024
Accepted December 7, 2024

Corresponding author
Naveen Paliwal, M.D.
Department of Emergency Medicine, Dr. S. N. Medical College, Residency road, Sector-D, Shastri Nagar, Jodhpur, Rajasthan 342003, India
Tel: 919950230213
Fax: 91-0291-2434374
E-mail: drnaveenpaliwal@yahoo.com

Background: Local anesthetic systemic toxicity (LAST) is a rare life-threatening complication of regional anesthesia. Simulation-based training offers an effective educational approach to improve the management of infrequent events. This quasi-experimental study assessed the impact of a multidisciplinary simulation-based educational intervention on managing LAST as a real peri-operative team.

Methods: Twelve anesthesia trainees and eight nursing staff members participated in the study. The intervention included pre-course learning materials, cognitive aids, and immersive simulation scenarios. Simulation scenarios were conducted at baseline (O1), one week after a boot camp (O2), and six months later (O3). Participants' reactions to the training were evaluated using a 5-point Likert scale, while knowledge acquisition was measured through pre- and post-test questionnaires. Team-based skills acquisition and retention were assessed using a modified checklist from the simulation team assessment tool. Data were analyzed using paired *t*-tests, with P < 0.05 considered statistically significant.

Results: All participants rated the LAST curriculum as satisfactory to very satisfactory. Significant improvements in both technical and non-technical skills were observed post-intervention (O2), with checklist scores increasing from an average of 39 (4.2) (95% confidence interval [CI], 34.88; 43.11) at O1 to 83.5 (5.7) (95% CI, 77.91; 89.08) at O2 (mean difference, 44.5; P < 0.001). At six months (O3), skill retention was indicated by an average score of 72 (7.8) (95% CI, 62.36; 77.64).

Conclusions: Multidisciplinary, simulation-based educational interventions remarkably improve knowledge and skills related to LAST management, with effective skill retention observed at six months when implemented by multiprofessional teams in real-world settings.

Keywords: Checklist; Curriculum; Local anesthetic; Questionnaires; Regional anesthesia; Simulation; Team.

INTRODUCTION

Local anesthetic systemic toxicity (LAST) is a rare yet potentially life-threatening complication associated with regional anesthesia. Advances in ultrasound-guided nerve blocks have significantly reduced its incidence from 1.6–2 per 1,000 cases in the 1990s to 0.08–0.98 per 1,000 cases between 2003 and 2013 [1-3]. Despite these reassuring statistics, LAST remains a critical concern due to its severe cardiovascular and neurological consequences, which can occasionally result in fatalities. Early detection and prompt intervention are crucial to prevent life-threatening outcomes of LAST, complementing primary prevention strategies. The American Society of Regional Anesthesia (ASRA) and Pain Medicine strongly recommend the early administration of lipid emulsion therapy in managing LAST, highlighting the need to equip clinical staff and treating physicians with comprehensive knowledge of this approach [4].

Simulation-based multidisciplinary training provides a dynamic and immersive educational experience, allowing participants to develop critical skills within a realistic yet controlled environment. This approach has demonstrated effectiveness in enhancing knowledge retention and improving both technical and non-technical skills for managing rare but critical events like LAST [5,6].

This quasi-experimental study evaluated the impact of multidisciplinary simulation-based team training on the management of LAST in the perioperative setting, guided by Kirkpatrick's evaluation model [7]. The study hypothesized that the training would significantly improve both technical and non-technical skills, with retention of these skills six months post-training. The primary objective was to assess skill improvement among real teams after the training. Secondary objectives included evaluating skill retention after six months and identifying changes in clinical practices and behaviors during real-world patient management scenarios.

MATERIALS AND METHODS

This quasi-experimental study was conducted over eight months, following approval from the Institute Ethics Committee (SNMC/IEC/IIP/2023/079, dated 22/09/2023) and registering with the Clinical Trials Registry- India (CTRI/2024/02/062950). Anesthesia resident trainees and staff nurses involved in perioperative care were recruited as participants. Participation was voluntary, and individuals who declined to participate were excluded. All participants provided written informed consent and agreed to maintain strict confidentiality regarding the scenario details. Moreover, they consented to the audio and video recording of their performance. The study adhered to the principles in the Declaration of Helsinki, 2013, and guidelines for good clinical practice.

The curriculum for LAST management comprised learning materials, cognitive aids, and multidisciplinary immersive simulation-based training. A WhatsApp (WA) group was created for participants and facilitators to promote communication and resource sharing. Learning materials were distributed via the WA group one week prior to the scheduled simulation sessions. Additionally, educational videos and cognitive aids endorsed by the ASRA on regional anesthesia safety were provided through this platform [8]. The simulation sessions were conducted in a simulation laboratory designed to replicate an operating room (OR) environment. The laboratory was equipped with two CAE Ares healthcare simulators (CAE Healthcare) and all necessary equipment to create a realistic and immersive experience for the participants.

Furthermore, a questionnaire was developed to evaluate participants' responses to the educational intervention, focusing on their attitudes toward the content, environment, and facilitators, using a 5-point Likert scale [9]. Pre-test and post-test questionnaires, each consisting of 10 multiple-choice questions, were prepared to measure knowledge acquisition (Supplementary Table 1). These questionnaires were reviewed by four subject matter experts uninvolved in the study, and modifications were made based on their suggestions. The Scale Content Validity Index-Average (S-CVI/Ave) and Scale Content Validity Index-Universal Agreement (S-CVI/UA) scores for relevance, clarity, and ambiguity were noted to be 0.97/0.90, 0.87/0.70, and 0.90/0.60 for the pre-test, and 0.90/0.70, 0.85/0.60, and 0.87/0.60 for the post-test, respectively.

Two anesthesiologists involved in the study created a multidisciplinary scenario script and an evaluation checklist. The scenario script was developed using the Simulation Scenarios Quality Instrument (Supplementary Table 2) [10], while the checklist, aimed at assessing both technical and non-technical team skills, was based on ASRA guidelines and the Simulation Team Assessment Tool (Appendix) [4,11]. Four experts validated these tools, and their feedback was used to improve content. The S-CVI/Ave and S-CVI/UA values for the scenario script and checklist were observed to be 0.92/0.8 and 0.94/0.84, respectively. Before implementation, the scenario script was rehearsed by both faculty members, a technical expert, and an embedded participant. In addition, the checklist was tested for inter-rater variability through a pilot run with different groups of learners.

All participants completed a pre-test questionnaire before the simulation session. A baseline boot camp session (O1) was conducted, featuring an immersive multidisciplinary simulation scenario focused on LAST. Participants were divided into four groups: anesthesia faculty, senior residents, junior residents, staff nurses, and anesthesia technicians. An embedded participant played the role of a surgeon. Psychomotor and non-technical team skills were evaluated during the scenario using a checklist given to two trained simulation facilitators. Checklist items were scored as follows: 2 for complete and timely actions, 1 for incomplete or untimely actions, and 0 for actions that were necessary but not performed. The maximum possible score was 110. The total scores of both facilitators were averaged to determine the final score of the team.

Upon completing the scenario, a debriefing session was held using the plus-delta-plus approach, encouraging participants to share key learning points and exit plans. The scenario was repeated one week after the boot camp (O2), followed by another debriefing session. Afterward, participants completed a post-test questionnaire. Six months later, the same simulation scenario was conducted again to evaluate skill retention (O3). Additionally, participants were asked to describe two positive behavioral changes and two ongoing challenges using keywords.

The impact of the educational intervention was evaluated using the first three levels of Kirkpatrick's evaluation model. For level 1 (Reaction), participants' attitudes towards the content, environment, and facilitators were measured using a 5-point Likert scale following the baseline scenario run (O1). For level 2 (Learning), participants' knowledge was assessed through pre-tests at baseline and post-tests after the O2 debriefing. Each item on the pre- and post-test questionnaire was scored 1 point, with a total possible score of 10. Team skill acquisition, encompassing both technical and non-technical skills, was evaluated by comparing checklist items recorded during the boot camp (O1) and one week later (O2). Each checklist item was scored on a scale of 0 to 2: 2 for complete and timely actions, 1 for incomplete or untimely actions, and 0 for necessary by missing actions. The checklist consisted of 55 items, yielding a maximum possible score of 110. Six months later, team skill retention was assessed by comparing checklist scores from O2 to O3. For level 3 (Behavior), participants were asked to identify two positive behavioral changes and two challenges they encountered.

A convenience sample of 20 participants was selected based on voluntary participation, considering feasibility and available resources for the preliminary evaluation of the educational intervention. Data were entered into a Microsoft Excel spreadsheet and analyzed using MedCalc for Windows, version 19.3 (MedCalc Software). Descriptive statistics, including counts and percentages, were used to summarize participants' demographic and background characteristics. Responses to the educational intervention were expressed as median (range) and mean Likert scores. Pre- and post-test scores were compared using paired t-tests to determine the significance of knowledge acquisition before and after the intervention. Furthermore, checklist scores assessing skill acquisition were analyzed to compare performance at various stages of the scenario (O1, O2, and O3). The results of checklist scores were presented as means (standard deviation), mean differences, and 95% confidence intervals (CI) for continuous variables. A P value of < 0.05 was considered statistically significant.

RESULTS

The study included 20 participants categorized into four teams (Table 1). The mean pre-test score for knowledge acquisition was noted to be 9.1 (0.8) (95% CI, 8.75; 9.45), while the post-test score was 9.5 (0.7) (95% CI, 9.19; 9.8), resulting in a mean difference of 0.4 (P = 0.1). This indicates no significant knowledge gap before the simulation scenario. For level one of Kirkpatrick's evaluation, participants rated their experience as satisfactory across multiple aspects, such as the learning material, simulation environment, facilitator attitude, debriefing sessions, and their willingness to recommend the curriculum to colleagues (Table 2).

Table 1. Baseline Information of Participants

Baseline information	Number (n=20)
Anesthesia trainees/nursing staff	12/8 (60/40)
Years of experience (< 12 mo/> 12 mo)	
Anesthesia trainee	8/4 (66.6/33.3)
Nursing staff	7/1 (87.5/12.5)
Prior exposure to simulation training (yes/no)	3/17 (15/85)
Prior exposure to any local anesthetic systemic toxicity incidence	2/18 (10/90)

Values are presented as number (%).

Table 2. Reaction of Participants to Educational Intervention on a 5-Point Likert Scale

Reaction question	Likert score
The scientific material is appropriate and as per recent guidelines	4 (4, 5)/4.3
The simulation scenario is appropriate, and the learning objectives are as per the learner's group	5 (4, 5)/4.6
The simulation session closely resembles the real-world scenario	5 (4, 5)/4.55
The course helped me strengthen my skills in teamwork, communication, and collaboration.	4 (3, 5)/4.15
Facilitators created a non-threatening environment and provided constructive feedback	4 (3, 5)/4.25
The debriefing session by facilitators helped think for possible solutions	4(3, 5)/4.4
I would recommend my colleagues to participate in this curriculum	5 (4, 5)/4.5

Values are presented as median (1Q, 3Q) or average. 1: strongly disagree, 2: disagree, 3: neutral, 4: agree, 5: strongly agree.

Table 3. Skill Acquisition and Retention Assessed by Checklist Scores

Parameter	O1	O2	O3
Composite checklist score	39 (4.2)/34.88, 43.11	83.5 (5.7)/77.91, 89.08	72 (7.8)/62.36, 77.64
Change in score from O1 to O2	(Mean difference: 44.5, DF: 6; P < 0.001)		
Change in score from O2 to O3	(Mean difference: -11.5, DF: 6; P = 0.06)		

Values are presented as mean (SD) or 95% confidence interval. O1: Baseline simulation scenario, O2: Post-bootcamp simulation scenario, O3: At 6 months simulation scenario, DF: degree of freedom

For level two of Kirkpatrick's evaluation, a notable improvement in performance was observed from the baseline scenario (O1) to the post-boot camp session (O2). The average checklist scores for all four teams increased from 39 (4.2) (95% CI, 34.88; 43.11) at O1 to 83.5 (5.7) (95% CI, 77.91; 89.08) at O2, demonstrating a statistically significant enhancement ($P < 0.001$). At O3, six months post-training, the average checklist score was noted to be 72 (7.8) (95% CI, 62.36; 77.64), suggesting skill retention (Table 3). The highest retention was observed in technical skills, such as correct intralipid administration and protocol-based LAST management. In contrast, there was a partial decline in non-technical skills, including early calls for assistance and effective communication.

For level three of Kirkpatrick's evaluation, participants reported positive behavioral changes following the educational interventions (Fig. 1). However, challenges persisted, including time commitment for simulation sessions, limited access to resources, skill retention, communication difficulties, and the need for multidisciplinary involvement. Meanwhile, participants noted several system improvements, such as the preparation of a LAST rescue kit in the OR and the display of a flowchart outlining LAST management, in accordance with ASRA guidelines, in both the OR and post-anesthesia care unit.

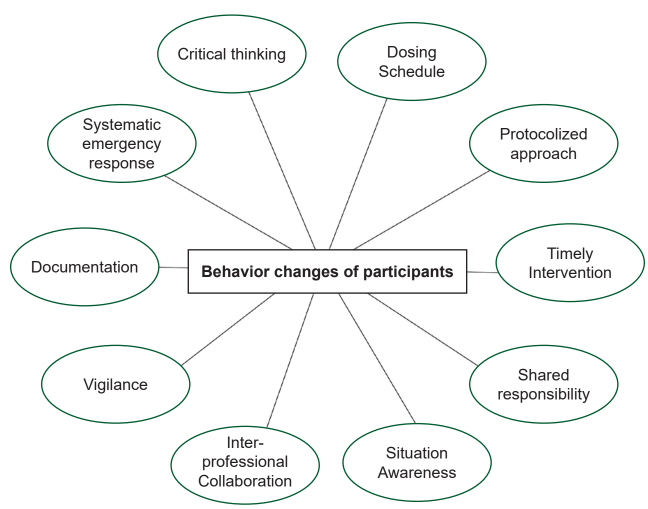

Fig. 1. Behavior change of participants.

DISCUSSION

This study evaluated the efficacy of simulation-based training in managing LAST using validated evaluation tools. The results showcased significant improvements in both technical and non-technical skills following the intervention. Skill retention was evident six months later, though a slight decline in non-technical skills, such as prompt help-seeking and effective communication, was noted. Overall, participants rated the simulation-based LAST curriculum as satisfactory to very satisfactory. Additionally, the training fostered positive behavioral changes, including system improvements such as the preparation of LAST rescue kits and the display of LAST management flowcharts.

LAST is a rare but critical event typically addressed in classroom settings either as a standalone topic or as part of other didactic lectures. Resident trainees may lack exposure to LAST management during their residency, and staff nurses are often not routinely trained to recognize and respond to its symptoms despite their involvement in regional anesthesia procedures. Multidisciplinary simulation training provides a valuable platform for participants to practice and develop skills in realistic clinical situations as a team [12,13]. A systematic review by Agbo et al. [14] highlighted promising evidence for the effectiveness of multidisciplinary simulation-based team training in emergency and acute care. However, the available data remain limited, warranting further research to fully optimize and refine such training programs.

The average checklist scores exhibited a significant improvement from the baseline scenario (O1) to the post-boot camp session (O2), highlighting participants' increased ability to perform critical tasks associated with LAST management as a team. This finding aligns with previous studies emphasizing the benefits of simulation-based training in improving technical proficiency and teamwork for managing rare but critical events [15,16]. For example, a study involving perianesthesia nursing staff demonstrated improved test scores and increased confidence in handling crisis scenarios through high-fidelity simulation [5]. Similarly, Ackerman et al. [6] reported that simulation-based training improved the knowledge and confidence among pain clinic procedural staff in managing LAST.

The evaluation of skill retention at six months (O3) indicates the long-term effectiveness of simulation-based training. Technical skills, such as intralipid administration and adherence to LAST management protocols, were well-retained, though a decline was observed in non-technical skills, particularly early calls for help and effective communication. Edgar Dale's Cone of Experience [17] suggests that learners retain more skills when they actively "do" a task rather than passively "hear, read, or observe." This principle underpins the foundation of simulation-based education. While simulation training effectively facilitates skill acquisition, previous studies indicate that these skills may degrade over time [18], underscoring the need for periodic refresher sessions to sustain proficiency in both technical and non-technical domains.

The observed positive behavioral changes and the implementation of system improvements, such as the development of a LAST rescue kit and the placement of LAST management flowcharts, indicate a broader impact of the educational intervention beyond individual skill enhancement. Research has shown that simulation-based training can lead to improved patient care and reduced patient morbidity [20,21].

The study is strengthened by its comprehensive curriculum that incorporated pre-course learning, cognitive aids, and immersive simulation scenarios, all of which enhanced participant engagement and learning outcomes. The design allowed for both immediate and long-term assessment of skill acquisition and retention, providing a thorough evaluation of the training's effectiveness. The use of a quasi-experimental design and validated checklists ensured reliable data collection and analysis, further contributing to the robustness of the study. Additionally, this research addressed a gap in the literature by evaluating multidisciplinary, real team-based performance in managing LAST within a simulated clinical environment.

However, the study has some limitations. First, both researchers and participants were from the same institution, which may have introduced potential biases due to researcher-participant affiliations. To minimize this, the researchers used a validated checklist during the simulation scenarios to ensure objectivity. Additionally, responses to the pre- and post-test questionnaires were collected anonymously, further reducing the risk of response bias. While skill retention was assessed, the long-term impact of the educational interventions on patient safety and system-level changes was not evaluated. Moreover, the study was limited to a single institution, highlighting the need for further research to explore the applicability and effectiveness of this curriculum in broader settings, including in situ simulations and low-resource environments [21]. Future studies should investigate strategies to enhance the retention of non-technical skills and assess their direct impact on patient care outcomes. A subgroup analysis based on years of experience could provide additional insights, though the study was not initially powered for such analysis due to the small sample size.

Conclusion

This study demonstrates that a multidisciplinary simulation-based educational intervention significantly improves the knowledge and skills of anesthesia trainees and nursing staff in managing LAST, with sustained skill retention over time. The findings also support positive behavioral changes among participants following the simulation-based training.

SUPPLEMENTARY MATERIALS

Supplementary data is available at https://doi.org/10.17085/apm.24146.

FUNDING

None.

ACKNOWLEDGMENTS

Pawan Singh Bhati, Nursing Officer, Dr. S.N. Medical College, Jodhpur and Garima Raichandani, Junior Resident, Department of Anaesthesiology, Dr. S.N. Medical College, Jodhpur.

CONFLICTS OF INTEREST

No potential conflict of interest relevant to this article was reported.

DATA AVAILABILITY STATEMENT

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

AUTHOR CONTRIBUTIONS

Writing - original draft: Pooja Bihani, Naveen Paliwal. Writing - review & editing: Pooja Bihani, Naveen Paliwal, Rishabh Jaju, Vikas Rajpurohit. Conceptualization: Pooja Bihani, Naveen Paliwal, Rishabh Jaju. Data curation: Pooja Bihani, Naveen Paliwal, Rishabh Jaju. Formal analysis: Pooja Bihani, Naveen Paliwal, Rishabh Jaju, Vikas Rajpurohit. Methodology: Pooja Bihani, Naveen Paliwal. Project administration: Pooja Bihani, Naveen Paliwal, Vikas Rajpurohit. Visualization: Pooja Bihani, Naveen Paliwal. Investigation: Pooja Bihani, Naveen Paliwal. Resources: Pooja Bihani, Naveen Paliwal. Software: Pooja Bihani, Naveen Paliwal. Supervision: Pooja Bihani, Naveen Paliwal, Vikas Rajpurohit. Validation: Pooja Bihani, Naveen Paliwal, Rishabh Jaju, Vikas Rajpurohit.

ORCID

Pooja Bihani, https://orcid.org/0000-0001-8790-1466
Naveen Paliwal, https://orcid.org/0000-0002-3773-4708
Rishabh Jaju, https://orcid.org/0000-0001-8555-0869
Vikas Rajpurohit, https://orcid.org/0000-0002-8978-2197

REFERENCES

1. Liu H, Brown M, Sun L, Patel SP, Li J, Cornett EM, et al. Complications and liability related to regional and neuraxial anesthesia. Best Pract Res Clin Anaesthesiol 2019; 33: 487-97.
2. Radkowski P, Fadrowska-Szleper M, Podhorodecka K, Mieszkowski M. Neurological complications of regional anesthesia: an updated review with clinical guidelines. Med Sci Monit 2023; 29: e940399.
3. Gitman M, Barrington MJ. Local anesthetic systemic toxicity: a review of recent case reports and registries. Reg Anesth Pain Med 2018; 43: 124-30.
4. Neal JM, Neal EJ, Weinberg GL. American Society of regional anesthesia and pain medicine local anesthetic systemic toxicity checklist: 2020 version. Reg Anesth Pain Med 2021; 46: 81-2.
5. Bevil KM, Klesius LL, Chambers T, Borden SB. Educating perioperative nurses about local anesthetic systemic toxicity using high-fidelity simulation. Pain Manag Nurs 2020; 21: 271-5.
6. Ackerman R, Riley M, Anwar MAF, Mitchell D, Vorenkamp K, Udani A, et al. Multidisciplinary simulation of local anaesthetic systemic toxicity improves diagnostic and treatment skills and self-confidence for pain clinic procedural staff. BMJ Open Qual 2023; 12: e002213.
7. Mohammed Saad AY, Mat N. Evaluation of effectiveness of training and development: the Kirkpatrick model. Asian J Bus Manag Sci 2013; 2: 14-24.
8. Neal JM, Barrington MJ, Fettiplace MR, Gitman M, Memtsoudis SG, Mörwald EE, et al. The third American Society of Regional Anesthesia and Pain Medicine practice advisory on local anesthetic systemic toxicity: executive summary 2017. Reg Anesth Pain Med 2018; 43: 113-23.
9. Norman G. Likert scales, levels of measurement and the "laws" of statistics. Adv Health Sci Educ Theory Pract 2010; 15: 625-32.
10. Mujlli G, Al-Ghosen A, Alrabah R, Munshi F, Ozdemir B. Devel-

KSRA

opment and validation of Simulation Scenario Quality Instrument (SSQI). BMC Med Educ 2023; 23: 972.
11. Reid J, Stone K, Brown J, Caglar D, Kobayashi A, Lewis-Newby M, et al. The Simulation Team Assessment Tool (STAT): development, reliability and validation. Resuscitation 2012; 83: 879-86.
12. Hinde T, Gale T, Anderson I, Roberts M, Sice P. A study to assess the influence of interprofessional point of care simulation training on safety culture in the operating theatre environment of a university teaching hospital. J Interprof Care 2016; 30: 251-3.
13. Paliwal N, Bihani P, Jaju R, Mohammed S, Prakash P, Tharu V. Striving for excellence in ventilator bundle compliance through continuous quality improvement initiative in the intensive care unit of a tertiary care hospital in India. Acute Crit Care 2024; 39: 535-44.
14. Agbo C, Koshoedo SK, Sridharan S, Spearpoint K, Sharma S, Ashaye K. Multidisciplinary team-based simulation training in acute care settings: a systematic review of impact on team performance. J Surg Simulation 2022; 9: 1-12.
15. Murphy M, Curtis K, McCloughen A. What is the impact of multidisciplinary team simulation training on team performance and efficiency of patient care? An integrative review. Australas Emerg Nurs J 2016; 19: 44-53.
16. Pande A, Muthiah T, Ramachandran R, Sundaraperumal B, Kaur M, Baidya DK. Integration of simulation-based teaching in anaesthesiology curriculum. Indian J Anaesth 2024; 68: 24-30.
17. Dale E. Audio-visual Methods in Teaching. New York, Dryden Press. 1954, pp. 37-51.
18. Balachander B, Rajesh D, Pinto BV, Stevens S, Pn SR. Simulation training to improve aseptic non-touch technique and success during intravenous cannulation-effect on hospital-acquired blood stream infection and knowledge retention after 6 months: the Snowball effect theory. J Vasc Access 2021; 22: 353-8.
19. Sollid SJM, Dieckman P, Aase K, Søreide E, Ringsted C, Østergaard D. Five topics health care simulation can address to improve patient safety: results from a consensus process. J Patient Saf 2019; 15: 111-20.
20. Murphy M, Curtis K, Lam MK, Palmer CS, Hsu J, McCloughen A. Simulation-based multidisciplinary team training decreases time to critical operations for trauma patients. Injury 2018; 49: 953-8.
21. Paliwal N, Bihani P, Pai DR, Sinha A. Low-cost seizure simulation in low-technology mannequins for resource-constrained settings: An innovative approach to enhance fidelity. Indian J Anaesth 2024; 68: 118-20.

Appendix

PRE-TEST

Q1. Local anesthetic systemic toxicity (LAST) is most likely to occur with which route of administration of local anesthetics?
A) Topical
B) Subcutaneous
C) Intravenous
D) Infiltration

Q2. Which of the following patient is most susceptible to LAST?
A) 40 years old Hypertensive male
B) 25 years old tennis player
C) 7 months old infant
D) 30 years old Hypothyroid woman

Q3. What is the primary cause of LAST?
A) Use of dilute local anesthetic solution
B) Rapid absorption of local anesthetic
C) Infection at the injection site
D) Mixing of local anesthetic agents

Q4. Which of the following is the most common organ system involved in LAST?
A) CVS
B) Renal
C) Hepatic
D) CNS

Q5. Which of the following symptoms is NOT typically associated with LAST?
A) Metallic taste
B) Seizures
C) Crepitation in chest
D) Hypotension

Q6. LAST is most commonly associated with which type of local anesthetic?
A) Ropivacaine
B) Bupivacaine
C) Lidocaine
D) Mepivacaine

Q7. What is the most common initial symptom of LAST?
A) Cardiac arrest
B) Ventricular fibrillation
C) Seizures
D) Metallic taste

Q8. What is the primary mechanism of toxicity in LAST?
A) Blockage of calcium channels
B) Inhibition of GABA receptors
C) Blockage of sodium channels
D) Activation of potassium channels

Q9. What is the most important preventive measure for reducing the risk of LAST during a procedure using local anesthetics?
A) Using the highest possible dose of anesthetic
B) Using a vasoconstrictor with the anesthetic
C) Performing frequent aspiration to check for intravascular injection
D) Administering anesthetic as quickly as possible

Q10. What is the initial treatment of choice for suspected LAST?
A) Administration of vasopressors
B) Intravenous lipid emulsion therapy (ILE)
C) Intravenous fluid bolus
D) Administering more local anesthetic

POST TEST

Q1. Why are neonates and infants more prone to LAST?
A) Reduced levels of plasma proteins
B) Immature renal and hepatic systems
C) Both of the above
D) None of the above

Q2. Which of the following factors can increase the risk of developing LAST?
A) Hyperthyroidism
B) Hypothermia
C) Slow administration of the local anesthetic
D) Use of a vasoconstrictor with the local anesthetic

Q3. Which of the following measures reduce the incidence of LAST?
A) Using the lowest possible dose of LA
B) Use of Epinephrine with LA
C) Slow administration of LA
D) All of the above

Q4. What is the First step in management of severe LAST?
A) Administer LA Antagonist
B) Administer IV 50% Dextrose
C) Maintain Airway, Breathing with 100% Oxygen
D) Administer IV Epinephrine

Q5. What is the percentage of Lipid used in IV Lipid therapy ?
A) 10%
B) 15%
C) 20%
D) 25%

Q6. What is the initial dose of IV Lipid therapy for a 70 kg. patient?
A) 1 ml/kg
B) 1.5 ml/kg
C) 2 ml/kg
D) 2.5 ml/kg

Q7. Which is the first step in managing a suspected case of LAST?
A) Administer intralipid
B) Secure airway and provide oxygen
C) Administer benzodizapines for seizures
D) Start CPR

Q8. The maximum recommended dose of IV lipid therapy is?
A) 3 ml/kg
B) 5 ml/kg
C) 8 ml/kg
D) 10 ml/kg

Q9. What is the rationale behind administration of lipid emulsion therapy in LAST
A) To increase blood pressure
B) To bind and sequestrate Local anaesthetic
C) To provide an energy source for the myocardium
D) To reduce seizure threshold

Q10. Which of the following is not a component of LAST rescue kit
A) Intralipid
B) Syringes
C) Propofol
D) Emergency drugs