What risk factors are known to increase the risk of failed spinal anesthesia in obese obstetric patients, and what be done to improve patient outcomes? A Quality Improvement Project.

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Introduction

- Neuraxial anesthesia for obstetric patients provides high-quality pain relief without some of the negative effects of general anesthesia.
- Spinal anesthesia is a single injection of local anesthetic (and sometimes an opioid) into the subarachnoid space and epidural anesthesia involves placement of a catheter into the epidural space to inject local anesthetic (Gaiser, 2016).
- Administering neuraxial anesthesia to obese obstetric patients is more difficult and can be associated with an increase in failed anesthetics.
- Identification of risk factors that increase the chance of failed spinal anesthesia can facilitate the application of interventions to improve patient outcomes.
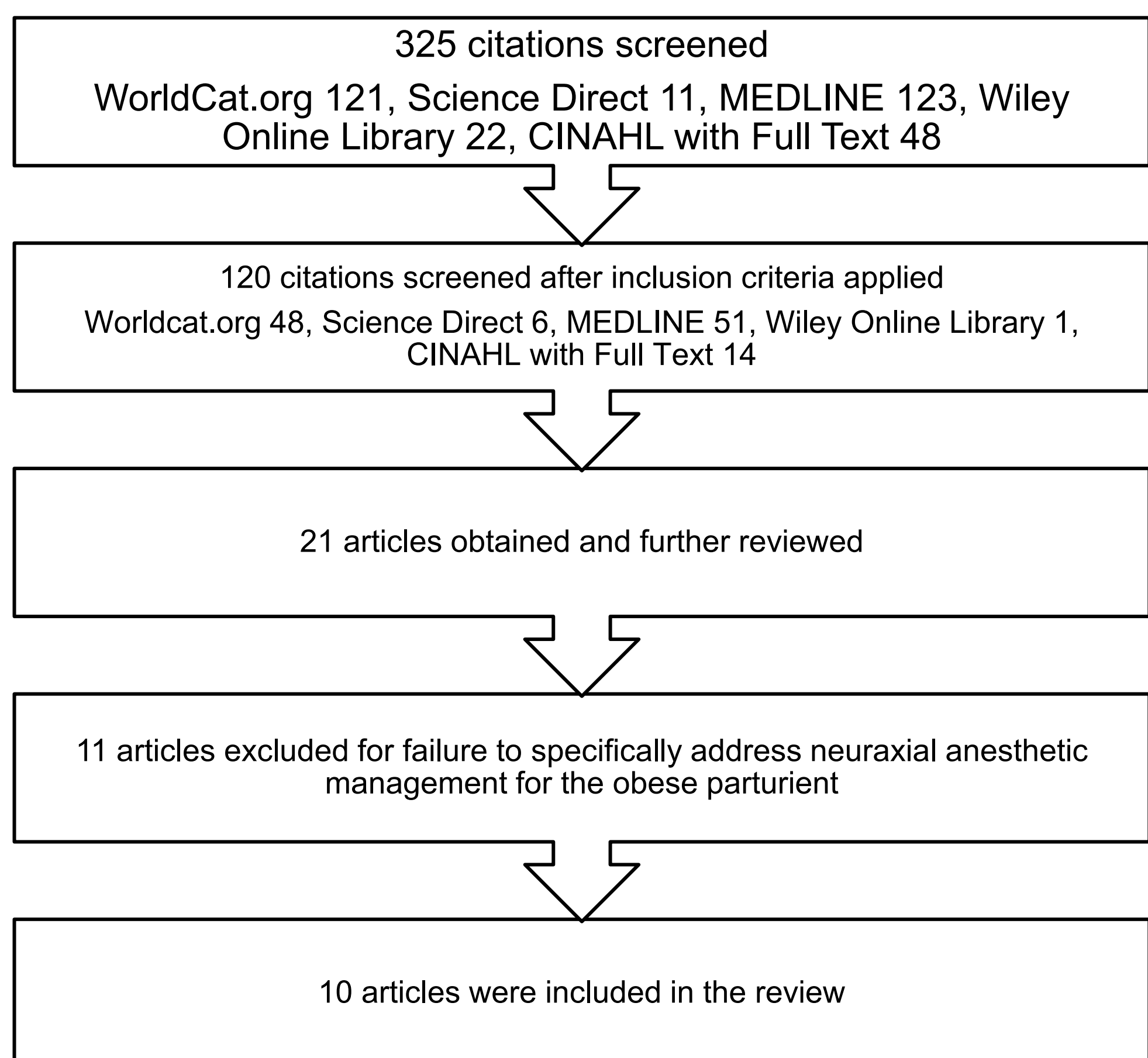
Background

- Clinical interventions to improve the success of neuraxial anesthesia in obese obstetric patients have been identified.
- By summarizing research and synthesizing a more complete perspective, this quality improvement project (QIP) will clarify the body of knowledge regarding the challenges and solutions in providing obese obstetric neuraxial anesthesia.
- This perspective will contribute to the nursing knowledge base and improve clinical practice.

Methods

- The objective of this DNP quality improvement project is to identify risk factors for failed spinal anesthesia in adult obese obstetric patients with a BMI greater than $30Kg/m^2$ and techniques to improve patient outcomes.
- A clinical decision-making tool will be synthesized after the review of research studies and expert opinions regarding the known risks of failed neuraxial anesthesia in obese obstetric patients and interventions to mitigate the risks.
- The review and integration of multiple information sources into one source of evidence-based practice recommendations may facilitate use in clinical practice.
- Participants of this study were all adult students of the Union University DNP Nursing Anesthesia class of 2021 cohort.
- The participants were asked to review a clinical-decision tool synthesized from the review of research studies and expert opinions regarding the known risks of failed anesthesia in obese obstetric patients and interventions to improve patient outcomes.

Clinical Decision Tool

Results

325 citations screened
WorldCat.org 121, Science Direct 11, MEDLINE 123, Wiley Online Library 22, CINAHL with Full Text 48

120 citations screened after inclusion criteria applied
Worldcat.org 48, Science Direct 6, MEDLINE 51, Wiley Online Library 1, CINAHL with Full Text 14

21 articles obtained and further reviewed

11 articles excluded for failure to specifically address neuraxial anesthetic management for the obese parturient

10 articles were included in the review

- Interventions identified from review of literature include increased training, use of low concentration local anesthetic with opiates, frequent assessment of sensory block, leaving increased length of catheter in the epidural space, identification of vertebral midline using tactile feedback from supraspinous ligament, and identification of the vertebral midline using patient feedback from placement attempt.

- Of the 25 students emailed, 12 completed the review and subsequent survey.
- 75% strongly agreed the information is relevant to their clinical practice.
- 33.3% strongly agreed and 66.7% agreed the tool is clear and concise.
- 33.3% strongly agreed, 50.0% agreed, 8.3% neither agreed nor disagreed 8.3%, and 8.3% disagreed the organization and presentation of the tool was logical and coherent.
- 33.3% strongly agreed and 66.7% agreed the tutorial format to be an effective means of learning the material.
- 50% strongly agreed and 50% agreed the clinical decision-making tool encouraged them to integrate theoretical knowledge with clinical practice of neuraxial anesthesia management. T
- 25% strongly agreed, 58.3% agreed, and 16.7% neither agreed nor disagreed the clinical decision-making tool has improved the ability to manage neuraxial anesthesia for obese parturients

Conclusions

- The results of the implementation of the clinical decision tool revealed an overall positive learning experience.
- Responses revealed the graphical presentation of the tool may be too complicated to quickly draw inferences.
- A simplified graphical format may allow easier use for future users.
- This tool will help to develop strategies for improving patient outcomes, but hands-on experience may provide the best format to develop abilities of managing neuraxial anesthesia for obese parturients.
- The anesthetic management of obese parturients involves careful planning and identification of patient concerns.
- Increased training of the clinician was a clear indication to improve patient outcome for all the neuraxial failure causes examined by this project.
- Potential areas for future research might include comparison of neuraxial training programs, reliability of dural puncture epidurals, epidural securement techniques, comparison of epidural insertion length, and comparison of techniques for titration of sympathetic block.
- This QIP identified and incorporated various sources of information regarding obstetric neuraxial failure, unfortunately there is a lack of quantitative studies focusing on the obese parturient.
- The production of randomized controlled trials (RCTs), cohort studies, case-control studies, and qualitative studies specific to neuraxial anesthesia for the obese parturient patient population would provide valuable data to infer cause and effect.

Bibliography

1. Albornsdez, D. L., Kuposteri, Y., Kuposteri, C., McGlennan, A., Fountain, S., & Kaasivananthan, R. (2015). Analgesia for labour: An evidence-based insight for the obstetrician. The Obstetrican & Gynaecologist, 17(3), 147-157. https://doi.org/10.1111/tog.12196
2. Arnolds, D., Hofer, J., & Seavone, B. (2019). Inadvertent neuraxial block placement at or above the L1-L2 interspace in the super-obese parturient: A retrospective study. International Journal of Obstetric Anesthesia. https://doi.org/10.1016/j.ijoa.2019.11.005
3. Arunmaria, J., & Mann, Z. (2020). JBI Manual for Evidence Synthesis. JBI. https://doi.org/10.46658/JBIMES-20-01
4. Bomberg, H., Albert, N., Schmitt, K., Gräber, S., Kessler, P., Steinfeldt, T., ... Kubulus, C. (2015). Obesity in regional anesthesia—a risk factor for peripheral catheter-related infections. Acta Anaesthesiologica Scandinavica, 59(8), 1038-1048. https://doi.org/10.1111/aas.12548
5. Butwick, A. J., Wong, C. A., & Guo, N. (2018). Maternal body mass index and use of labor neuraxial analgesia: A population-based retrospective cohort study. Anesthesiology, 129(3), 448-458. https://doi.org/10.1097/ALN.0000000000002322
6. Cheryl Holly, E. R., Susan Salmond, E. R. F., & Maria Sainbert, P. M. M. R. (2012). Comprehensive Systematic Review for Advanced Nursing Practice. Springer Publishing Company.
7. DeLeon, A.M. & Wong, C.A. (2020). Spinal anesthesia: Technique. In Crowley, M., Maniker, R. (Eds), UpToDate. Available from https://www.uptodate.com/contents/spinal-anesthesia-technique?search=spinal%20anesthesia&source=search_result&selectedTitle=1~150&usage_type=default&display_rank=1
8. Doo, A. R., Shin, Y. S., Choi, J., Yoo, S., Kang, S., & Son, J. (2019). Failed dural puncture during needle-through-needle combined spinal-epidural anesthesia: A case series. Journal of Pain Research, 12, 1615-1619. https://doi.org/10.2147/JPR.S178640
9. Einhorn, L. M., & Habib, A. S. (2016). Evaluation of failed and high blocks associated with spinal anesthesia for cesarean delivery following inadequate labour epidural: A retrospective cohort study. Canadian Journal of Anaesthesia, 63(10), 1170-1178. https://doi.org/10.1007/s12630-016-0701-3
10. Eley, V. A., Chin, A., Tham, I., Poh, I., Aujla, P., Glasgow, E., ... van Zundert, A. (2018). Epidural extension failure in obese women is comparable to that of non-obese women. Acta Anaesthesiologica Scandinavica, 62(6), 839-847. https://doi.org/10.1111/aas.13085
11. Gaiser, R. (2016). Anesthetic considerations in the obese parturient. Clinical Obstetrics & Gynecology, 59(1), 193-203. https://doi.org/10.1097/GRF.0000000000000180
12. Gonoch, E., Iannuccelli, F., Broghi, N., & Gilsanz, F. (2017). Failed epidural for labor: What now? Minerva Anestesiologica, 83(11), 1207-1213. https://doi.org/10.23736/S0375-9393.17.12082-1
13. Higgins JPT, Thomas J, Chandler J, Cumpston M, Li T, Page MJ, Welch VA (editors). Cochrane Handbook for Systematic Reviews of Interventions version 6.0 (updated July 2019). Cochrane, 2019. Available from www.training.cochrane.org/handbook.
14. Hoefnagel, A., Yu, A., & Kaminski, A. (2016). Anesthetic complications in pregnancy. Critical Care Clinics, 32(1), 1-28. https://doi.org/10.1016/j.ccc.2015.08.009
15. Kula, A. O., Riess, M. L., & Ellinas, E. H. (2017). Increasing body mass index predicts increasing difficulty, failure rate, and time to discovery of failure of epidural anesthesia in laboring patients. Journal of Clinical Anesthesia, 37, 154-158. https://doi.org/10.1016/j.jclinane.2016.11.010
16. Lamon, A. M., & Habib, A. S. (2016). Managing anesthesia for cesarean section in obese patients: Current perspectives. Local and Regional Anesthesia, 9, 45-57. https://doi.org/10.2147/LRA.S64279
17. Liberati, A., Altman, D., Tetzlaff, J., Mulrow, C., Gøtzsche, P., Ioannidis, J., ... Moher, D. (2009). The prisma statement for reporting systematic reviews and meta-analyses of studies that evaluate health care interventions: Explanation and elaboration. Journal of Clinical Epidemiology, 62(10), 34. https://doi.org/10.1016/j.jclinepi.2009.06.006
18. LoBiondo-Wood, G., & Haber, J. (2014). Nursing research : Methods and critical appraisal for evidence-based practice (8th edition. ed.). St. Louis, Missouri: Elsevier.
19. Lucas, D. N., & Elton, C. D. (2016). Through a glass darkly : ultrasound imaging in obstetric anaesthesia. Anaesthesia, 71(6), 617-622. https://doi.org/10.1111/anae.13466
20. Mehdorar, V., Mushanbi, M. (2019). Anaesthetic implications of morbid obesity in pregnancy. Update in Anesthesia, 34, 56-62. Retrieved from https://www.wfsahq.org/
21. Polin, C. M., Hale, B., Mauritz, A. A., Habib A. S., Jones, C. A., Strouch, Z. Y., & Dominguez, J. E. (2015). Anesthetic management of super-morbidly obese parturients for cesarean delivery with a double neuraxial catheter technique: A case series. International Journal of Obstetric Anesthesia, 24(3), 276-280. https://doi.org/10.1016/j.ijoa.2015.04.001
22. Polit, D. F., & Beck, C. T. (2014). Essentials of nursing research : Appraising evidence for nursing practice (8th ed. ed.). Philadelphia: Wolters Kluwer Health /Lippincott Williams & Wilkins.
23. Ray, S., & Bradley, B. (2018). Maternal and fetal outcomes with failure of epidural anesthesia. AANA Journal, 86(3), 234-241.
24. Taylor, C. R., Dominguez, J. E., & Habib A. S. (2019). Obesity and obstetric anesthesia: Current insights. Local and Regional Anesthesia, 12, 111-124. https://doi.org/10.2147/LRA.S186530
25. Torraco, R. J. (2016). Writing integrative literature reviews: Using the past and present to explore the future. Human Resource Development Review, 15(4), 404-428. https://doi.org/10.1177/1534484316671606
26. Vääninen, A. J., Kainu, J. P., Eriksson, H., Läng, M., Tekay, A., & Sarvela, J. (2017). Does obesity complicate regional anesthesia and result in longer decision to delivery time for emergency cesarean section? Acta Anaesthesiologica Scandinavica, 61(6), 609-618. https://doi.org/10.1111/aas.12891
27. Veliškovič, I., Pojic, B., Baysinger, C. W., & Baysinger, C. L. (2017). Continuous spinal anesthesia for obstetric anesthesia and analgesia. Frontiers in Medicine, 4, 133. https://doi.org/10.3389/fmed.2017.00133
28. Vernon, T. J., Vogel, T. M., Dalby, P. L., Mandell, G., & Lim, G. (2020). Ultrasound-assisted epidural labor analgesia for landmark identification in morbidly obese pregnant women: A preliminary investigation. Journal of Clinical Anesthesia, 59, 53-54. https://doi.org/10.1016/j.jclinane.2019.05.023