Early Extubation After Cardiac Surgery: An Evidence-Based, Nurse-Driven Protocol

Emily Brooks, MN, RN-BC
College of Nursing & Health Sciences, University of Texas at Tyler, Tyler, TX, USA

Prolonged mechanical ventilation in cardiac surgery patients has been associated with increased hospital stay, increased intensive care unit (ICU) length of stay, higher health care costs, and higher morbidity from atelectasis, intrapulmonary shunting and pneumonia. Early extubation is defined as the removal of the endotracheal tube within six hours of end anesthesia time. Early extubation of post-operative cardiac surgery patients has been associated with shorter ICU and overall hospital stays, reduced mortality, decreased resource use, and is safe and effective in elderly patients with no increased risk of reintubation. Therefore, a nurse-driven protocol outlines evidence-based actions and places the decision-making responsibility for the determination of extubation readiness into the hands of the bedside nurse. As such, the question arises in intubated post-operative cardiac surgery patients, how does a nurse-driven extubation protocol compared to no standardized protocol affect extubation rates within six hours post-operative? The search for best evidence began by considering the elements of the PICOT question. Critically appraising the evidence ensures relevance and transferability of the evidence to the specific population for whom the clinician provides care. In critically appraising the body of evidence on nurse-driven protocols and extubation in cardiac surgery patients, synthesis tables were created for type of evidence, major variables and outcomes of early extubation and interventions present in the evidence. Per evidence synthesis, the recommendation was to develop and implement a nurse-driven multidisciplinary protocol to facilitate standardized early extubation (i.e, within six hours post-operative) in cardiac surgery patients. The Iowa Model helped to craft the implementation plan that was extracted from the evidence, with a clear outline from the synthesis to intervention, outcomes and process. The theoretical framework was based on the AACN Synergy Model of Patient Care. The data was analyzed in several ways. Data was collected on six cardiac surgery procedures; coronary artery bypass graft (CAB), aortic valve replacement (AVR), AVR/CAB, mitral valve repair (MVR), MVR/CAB, and mitral valve replacement. Numbers of those extubated under six hours, as well as the surgeon, procedure, admission temperature, utilization of fluid warmers, and any factors important for extubation such as intra-aortic balloon pump and need for ongoing sedation are recorded. Length of stay for the intensive care unit and length of stay for the overall hospital visit was collected in both hours and days. Because the Society of Thoracic Surgeons (STS) records their benchmark in percentage for extubation in less than six hours post-operative, all numbers were also expressed as percentage. The percentage of patients extubated in less than six hours went from 10.4 to 39.8 for AVR; 6.9 to 29.1 for AVR/CAB; 21.7 to 38.1 for CAB; 7.7 to 50.4 for MVRepair; 0 to 13.8 for MVRepair/CAB; 23.8 to 50 for MVReplace. In 2016 the average percentage for cardiac surgery patients extubated less than six hours post-operative was 11.7. For the data February through August 2018, the average percentage for cardiac surgery patients extubated less than six hours post-operative was 36.9; an increase of 25.2%. Prior to implementation, 2016 had approximately 105 patients extubated in less than six hours post-operative. With an average length of ICU stay of approximately 1.9 days, an average of $5166 per patient per ICU day, for 332 patients extubated less than six hours post-operative, is $3.3 million dollars. Our baseline data was 105 patients at 1.0 million dollars. The implementation of this project therefore has a difference of 227 patients extubated within six hours, a cost savings of 2.2 million dollars. The project plan was grounded in planning for sustainability. All process makers and data collection were selected to move early extubation from project to standard of care.

Title:
Early Extubation After Cardiac Surgery: An Evidence-Based, Nurse-Driven Protocol

Keywords:
Evidenced-based, Extubation and Nurse-Driven

References:

Becker, D., Kaplow, R., Muenzen, P., & Hartigan, C. (2006). Activities performed by acute and critical care advanced practice nurses: American association of critical care nurses study of practice. *American Journal of Critical Care, 15*, 130-148.

Brewer, B., Wojner-Alexandrov, A., Troila, N., Pacini, C., Cline, M., Rust, J., & Kerfoot, K. (2007). AACN synergy model's characteristics of patients: Psychometric analysis in a tertiary care health system. American Journal of Critical Care, 16(2), 158-167.

Cove, M., Ying, C., Taculod, J., Oon, S., Oh, P., Kollengode, R., MacLaren, G., Tan, C. (2016). Multidisciplinary extubation protocol in cardiac surgical patients reduces ventilation time and length of stay in the intensive care unit. *Annals of Thoracic Surgery, 102*(28), 28-34.

Crawford, T., Magruder, J., Grimm, J., Sciortino, C., Conte, J., Kim, B., & Whitman, G. (2016). Early extubation: A proposed new metric. *Seminars in Thoracic and Cardiovascular Surgery, 28*(2), 290-299.

Curley, A.L., & Vitale, P.A. (2016). *Population-based nursing: Concepts and competencies for advanced practice* (2nd ed.). New York, NY: Springer.

Curley, M. (1998). Patient-nurse synergy: Optimizing patient outcomes. *American Journal of Critical Care, 7*(1), 64-72.

Davidson, S., Weberg, D., Porter-O'Grady, T., & Malloch, K. (2016). *Leadership for Evidence based Innovation.* Jones & Bartlett: Burlington, MA.

Dreher, H.M., & Glasgow, M. (2011). *Role development for doctoral advanced nursing practice.* New York, NY: Springer Publishing Company, L.L.C.

Fitch, Z., Debesa, O., Ohkuma, R., Duquaine, D., Steppan, J., Schneider, E., & Whitman, G. (2014). A protocol-driven approach to early extubation after heart surgery. *The Journal of Thoracic and Cardiovascular Surgery, 147*(4), 1344-1350.

Gutsche, J., Erickson, L., Ghadimi, K., Augoustides, J., Dimartino, J., & Ochroch, E. (2014). Advancing extubation time for cardiac surgery patients using lean work design. *Journal of Cardiothoracic and Vascular Anesthesia, 28*(6), 1490-1496.

Harden, S. (2015). Vulnerability of older patients in critical care. Critical Care Nurse, 35(3), 55-61.

Hefner, J., Tripathi, R., Abel, R., Farneman, M., Galloway, J., Moffatt-Bruce, S. (2016). Quality improvement intervention to decrease prolonged mechanical ventilation after coronary artery bypass surgery. *American Journal of Critical Care, 25*(5), 423-430.

Kaplow, R. & Reed, K. (2008). The AACN synergy model for patient care: A nursing model as a force of magnetism. Nursing Economics, 26(1), 17-25.

Kohr, L., Hickey, P., & Curley, M. (2012). Building a nursing productivity measure based on the synergy model: First steps. *American Journal of Critical Care, 21*(6), 420-430

Miller, A., Wagner, C., Song, Y., Burns, K., Ahmad, R., & Weinger, M. (2014). Implementing goal-directed protocols reduces length of stay after cardiac surgery. *Journal of Cardiothoracic and Vascular Anesthesia, 28*(3), 441-447.

Melnyk, B. & Fineout-Overholt, E. (2015). *Evidence-based practice in nursing & healthcare: A guide the best practice.* (3rd edition). Philadelphia, PA: Lippincott, Williams & Wilkins.

Soltis, L. (2015). Role of the clinical nurse specialist in improving patient outcomes after cardiac surgery. *AACN Advanced Critical Care, 26*(1), 35-42.

Swiniarski, G., Mah, J., Bulbuc, C., Norris, C. (2015). A comprehensive literature review on hypothermia and early extubation following coronary artery bypass surgery. *Applied Nursing Research, 28,* 137-141.

Tingsvik, C., Johansson, K., Martensson, J. (2014). Weaning from mechanical ventilation: factors that influence intensive care nurses' decision-making. British Association of Critical Care Nurses, (20)1, 16-24.

Ulhassan, W., von Thiele Schwarz, U., Westerlund, H., Sandahl, C., Thor, J. (2015). How visual management for continuous improvement might guide and affect hospital staff: A case study. *Quality Management of Health Care, 24*(4), 222-228.

Wong, W., Lai, V., Chee, Y., Lee, A. (2016). Fast track cardiac care for adult cardiac surgical patients. Cochrane Database of Systematic Reviews, 9.

Zaccagini, M. & White, K. *The doctor of nursing practice essentials: A new model for advanced practice nursing.* (2011). Sudbury, MA: Jones and Bartlett Publishers.

Abstract Summary:
Following the steps of evidence-based practice, implementation of a sustainable nurse-driven protocol in post-operative cardiac surgery patients is described including patient, nurse and system outcomes.

Content Outline:

Background and Significance

PICOT Question

Systematic Search

Critical Appraisal

Recommendations from the Evidence

Implementation Plan and Timeline

Budget and Financial Impact

Outcomes

Sustainability

Dissemination

First Primary Presenting Author
Primary Presenting Author
Emily Brooks, MN, RN-BC
University of Texas at Tyler

College of Nursing & Health Sciences
Student
Tyler TX
USA

Professional Experience: Critical Care RN >15 years Nursing Leader 3 years Current DNP Student with University of Texas at Tyler, graduation May 2019 Board Certified Content Expert in Cardiothoracic Surgical Nursing AACN Member

Author Summary: Emily Brooks is the Director of Nursing for Critical Care and Nursing Clinical Practice at a 528- bed tertiary care Magnet designated hospital. Educated in Canada, Emily moved in the US in 2002 where she began a nursing career in Critical Care. Her current role in nursing leadership has enabled her to become an effective and impactful change agent. Emily is a DNP student in her final year at the University of Texas at Tyler.