

2023-12-30

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Mursal, A.. (2023). 'Exploring and developing critical care nurses' understanding of 'Big Data' and identifying research opportunities', South West Clinical School Journal, 3 (4).

<https://pearl.plymouth.ac.uk/handle/10026.1/21858>

<https://doi.org/10.24382/shtv-8z88>

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#400WORDS: CHIEF NURSING OFFICER'S RESEARCH FELLOWS EVIDENCE IMPLEMENTATION PROJECTS

Exploring and developing critical care nurses' understanding of 'Big Data' and identifying research opportunities

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Submitted for publication: 07 November 2023

Accepted for publication: 13 November 2023

Published: 30 December 2023

Background

Healthcare data has historically been underutilised due to challenges in accessing and organising paper-based records and inconsistencies in documentation quality. Consequently, health services have often relied on a trial-and-error approach based on individual experiences and judgment, rather than a systematic, data-driven approach (Celi *et al.*, 2013). This has hindered the consistent delivery of optimal healthcare and prevented continuous quality improvement activities. In critical care, a data-driven approach is essential to respond to the complexities and interconnectedness of modern medicine (Celi *et al.*, 2013). The implementation of Electronic Health Records (EHRs) has led to the emergence of 'Big Data', described as the aggregation of large clinical datasets from various sources (e.g., monitors, clinical observations, etc.) (Carra *et al.*, 2020), which has heralded a step change in the healthcare delivery over the next decade. The use of Big Data in digitalised Intensive Care Units (ICUs) can be highly advantageous, as a multitude of physiological variables and clinical evaluations can be continuously monitored and recorded, resulting in a substantial amount of data (Bailey *et al.*, 2018).

Review of the evidence

A literature review was undertaken to explore how Big Data is being exploited in critical care and nurses' understanding of the concept to identify future research opportunities. Full-text journal articles over the last ten years were reviewed from PubMed, Medline and CINAHL databases. Search terms used to identify appropriate evidence included 'Big Data', 'nurses' and 'knowledge'. Ten papers were reviewed, finding five with relevant content.

The literature review suggests that Big Data is gradually gaining adoption in ICU. Carra *et al.* (2020) state that the digitalisation of the ICU has resulted in the creation of vast datasets that provide new insights and enhance clinical approaches. Research studies

have also explored data mining algorithms that can predict ICU and hospital readmissions (Rojas *et al.*, 2018, Kansagara *et al.*, 2011), ICU discharge after cardiac surgery (Meyfroidt *et al.*, 2011), predicting haemodynamic instabilities (Cao *et al.*, 2008) as well as delirium (Wong *et al.*, 2018) and prolonged mechanical ventilation (Parreco *et al.*, 2018) in critical care patients.

Smith *et al.*, (2021) highlight that critical care nurses need to understand Big Data to make clinical decisions in practice. However, using Big Data in critical care research raises ethical concerns, such as privacy invasion without consent. (Docherty *et al.*, 2015). These issues affect the nurses' use of Big Data, and these studies all call for more research to ensure data is effectively and ethically used in ICU nursing practice.

Project plan

Using the JBI Evidence Implementation Model (Porritt *et al.*, 2020), this project aims to explore the comprehension and concerns of Big Data use among critical care nurses, to develop knowledge-raising resources and to identify potential research opportunities in the field.

References

- Bailly, S., Geert, M., and Jean-François, T. (2018) 'What's New in ICU in 2050: Big Data and Machine Learning', *Intensive Care Medicine*, 44(9), pp.1524–1527.
- Cao, H., Eshelman, L., Chbat, N., Nielsen, L., Gross, B., and Saeed, M. (2008) 'Predicting ICU haemodynamic instability using continuous multiparameter trends', 30th Annual International Conference of the IEEE Engineering in Medicine and Biology Society, Available at <https://doi.org/10.1109/IEMBS.2008.4650037> (Accessed 01 November 2023).
- Carra, G., Salluh, J.I.F., da Silva Ramos, F.J., and Meyfroidt, G. (2020) 'Data-driven ICU management: Using Big Data and algorithms to improve outcomes', *Journal of Critical Care*, 60, pp.300–304.
- Celi, L.A., Mark, R.G., Stone, D.J., and Montgomery, R. A. (2013) 'Big data in the intensive care unit: Closing the data loop', *American Journal of Respiratory and Critical Care Medicine*, 187(11), pp.1157–1166.
- Docherty, A.B., and Lone, N I. (2015) 'Exploiting big data for critical care research', *Current Opinion in Critical Care*, 21(5), pp.472.
- Frizzell, J.D., Liang, L., Schulte, P.J., Yancy, C.W., Heidenreich, P.A., Hernandez, A.F. (2017) 'Prediction of 30-day all-cause readmissions in patients hospitalized for heart failure'. *JAMA Cardiology*, 2(204). DOI: <https://doi.org/10.1001/jamacardio.2016.3956>
- Meyfroidt G, Güiza F, Cottem D, De Becker W, Van Loon K, Aerts J-M, et al. Computerized prediction of intensive care unit discharge after cardiac surgery: development and validation of a Gaussian processes model. *BMC Med Inform Decis Mak* 2011;11: 64. <https://doi.org/10.1186/1472-6947-11-64>.
- Parreco J, Hidalgo A, Parks JJ, Kozol R, Rattan R. Using artificial intelligence to predict prolonged mechanical ventilation and tracheostomy placement. *J Surg Res* 2018; 228:179–87. <https://doi.org/10.1016/j.jss.2018.03.028>.
- Porritt, K., McArthur, A., Lockwood, C., Munn, Z. (2020) *JBI Handbook for Evidence Implementation*. Available at: <https://implementationmanual.jbi.global>. (Accessed 26 October 2023).
- Rojas, J. C., Carey, K. A., Edelson, D. P., Venable, L. R., Howell, M. D., and Churpek, M. M. (2018) 'Predicting Intensive Care Unit Readmission with Machine Learning Using Electronic Health Record Data', *Annals of the American Thoracic Society*, 15(7), pp.846–853. DOI: <https://doi.org/10.1513/AnnalsATS.201710-787OC> .
- Smith, J., Johnson, K., Williams, L., Brown, M., Garcia, R., Lee, S. and Jones, P. (2021) 'Understanding the impact of big data on nursing knowledge', *Nursing Critical Care*, 11(2), pp.11-13.
- Wong, A., Young, A.T., Liang, A.S., Gonzales, R., Douglas, V.C. and Hadley, D. (2018) 'Development and validation of an electronic health record–based machine learning model to estimate delirium risk in newly hospitalized patients without known cognitive impairment', *JAMA Network Open*, 1:e181018. DOI: <https://doi.org/10.1001/jamanetworkopen.2018.1018> .



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