Contents lists available at ScienceDirect

International Emergency Nursing

Editorial

Using clinical data to effect practice change

Emergency nurses are the front line of patient care and routinely strive to deliver safe, quality care to their patients. Globally, the World Health Organization (WHO) emphasizes the need for quality health care delivery systems and recommends that nations create clear initiatives to improve quality along with clear benchmarks for progress [1].

The medical record aims to facilitate communication between providers and as an enduring record of individual patient treatment plans. The electronic health record (EHR) is now implemented to various degrees worldwide, and while there is pervasive implementation in countries like Australia, the United Kingdom and the United States, other countries still maintain traditional paper charts. Aggregate data found in the medical record can be examined to evaluate population care outcomes and identify opportunities for improvement in any care milieu, including the Emergency Department (ED). Health data analytics is "the process of deriving insights from patterns and correlations found in healthcare big data and used to make better health care decisions" [2].

Patient medical records can be examined to identify average patient wait times, length of stay and acuity levels. Other outcomes such as medication errors, fall rates, appropriate ordering of imaging studies and adherence to patient care protocols can also be examined.

How can health care providers affect patient care in the emergency setting via data analytics? Analyzing data from the medical record can be used to describe or characterize current care delivery and its' effectiveness; known as descriptive analytics. Mortality, complication or infection rates are all good examples of data that can be derived from descriptive analytics. Diagnostic analytics seek to analyze descriptive data and understand why certain outcomes or phenomena have occurred. Relationships between resources and outcomes can be determined with diagnostic analytics, such as poor staffing being related to longer patient wait times. Once diagnostic analytics are determined, predictive analytics can be performed to forecast future events based upon understanding of past-accrued data, such as workplace violence and position turnover costs to an institution. Finally, prescriptive analytics seek to influence future health care outcomes based upon an understanding of past analytics [3]. Prescriptive analytics can be used to substantiate the argument for change, either to reduce costs, liabilities of safety events or improve patient satisfaction. Once change has been implemented, descriptive analytics can be called upon again to measure the effectiveness of care changes, either via financial analysis, patient outcomes or efficiency of care delivery.

It seems clear that data analytics can result in quality improvement. What are the challenges? First is the volume of patient data. The amount of data generated from the EHR is so large it is difficult to conceptualize; in the United States alone is approaching zetabyte levels (10^{21} bytes of data) [4]. The usability of the data collected to address clinical initiatives varies. While data is being generated at record rates, some describe health care as being "data rich and information poor" [5]. Veracity describes the uncertainty or imprecise nature of the data [6]. Issues such as missing data, unstructured data (free text data not in numeric form), unorganized data and outlier data all impact data quality and limit the strength of data analysis [7]. Separate data systems track patient care received in a health care facility; nursing data are entered into one data system, while pharmacy data, medical imaging data or surgical data are housed in other unique data sets that may not interface, making it difficult to merge each dataset via a unique patient identifier to track patient outcomes documented in various locations.

EHR is not ubiquitous worldwide, and many institutions still resort to single chart audits to collect aggregate patient data. Manual chart audits are time and labor intensive and it is difficult to identify a specific patient population of interest, such as all patients who present to the ED with head injury unless tracked by a manual registry. Additionally the skillset required to analyze big data in healthcare is unique and relatively new; most nurses have not received education on how big data analytics can influence quality improvement. Dataset and variable construction requires data cleaning (assuring the data is correct, consistent and useable) and coding (transforming data into meaningful categories) and a plan for analysis. Additionally, patient data sets need secure storage to avoid unintended disclosure of protected health information. Finally, analyzed data needs to be examined to assure it has meaning to the clinician and potential points for action. Much analysis of big data requires statistical analysis. Informatics nurses are trained in data analytics to develop data systems that support safe patient care.

Creating clinical data repositories on our patients to identify patient care dilemmas is one way to address quality of care. One example is the establishment of a hybrid electronic medical record (HEMR), a computerized trauma registry in South Africa by Laing and colleagues (2014) [8]. This database sought to collect data on all trauma patients admitted to a metropolitan trauma service and record morbidity and mortality data along with other patient characteristics and outcomes. During the first year of data collection, clinicians were able to start to identify the most frequent types of trauma patients, mechanism of injuries and injury severity scores (ISS). All of this data can be used towards efforts at injury prevention and better resource allocation.

Where to start? Emergency nurses need to understand the power of data analytics to improve patient care. Nurses are many times able to identify clinical concerns that need better characterization possible through data analytics. For instance, do patients with acute spinal cord injuries receive the standard care recommendations during the first 24 h after injury? The data will help identify how this might relate to poorer neurological outcomes or hospital length of stay. What prevents

the delivery of standard of careas related to resources such as nursing staff, stocked medications and imaging capabilities? In assessing outcomes of care nurses can also provide invaluable context on care delivery, what additional data should be collected, and finally how to improve the care delivery to improve patient outcomes. In the era of data science, nursing contributions matter.

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