

# Big Data in Nursing

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**Abstract:** Big data refers to a large, complex data set that can be analyzed to reveal patterns and trends related to human behavior and interactions. Today, it affects the way nurses learn, practice, conduct research, and develop policy. Nurses have used big data to improve patient outcomes. This paper explores how incorporating big data in nursing can help nursing leaders in decision-making and policy development.

**Keywords:** *Big Data, Nursing, Healthcare*

## I. INTRODUCTION

We live in the age of data promising sweeping changes in all areas of healthcare, including nursing. The digitalization of our world has greatly increased the quantity of data we collect and process. The economic value of health and care data is exploding, and the ability to store and combine such data to perform analyses has become crucial. Many healthcare providers feel like they are drowning in a deluge of data. Our problem now is how to effectively and efficiently transform relevant data reliably into useful information.

Nurses are care coordinators and an integral part of the healthcare system. The discipline of nursing is charged with several core missions including protecting, promoting human health, alleviating suffering, and preventing injury and illness. The discipline needs to maximize the benefits of big data to advance the vision of promoting human health and wellbeing [1].

## II. IMPORTANCE OF BIG DATA IN NURSING

The area of big data has attracted significant interest over the past few years, with applications to several domains including business, finance, advertising, healthcare, education, industry and the Internet of things. In nursing, several forces are triggering an increase in the digitization of data and will continue to fuel exponential growth: technology, healthcare reform, and the movement toward patient-centered care.

Documentation is an integral part of what nurses do and data are the core of documentation. In documenting patient information, nurses include relevant information about the patient's home, behavioral factors, lifestyle choices, health literacy, etc. They contribute to big data through their documentation in the electronic health record (EHR). Many hospitals have now deployed (EHR) systems that can be used to study patients.

EHRs are not the only source of big data. Healthcare data are being generated by patients and processed by computers. Big data is being collected through sensors, tracking devices, real-time self-reports, web data, medical imaging, and registries throughout the continuum of care: at home and in the hospital, and public health environments [2].

Understanding big data should be a top priority for nurse leaders as they aim to provide the best possible care to patients. Using big data technologies can help nurses improve care quality, optimize outcomes, and reduce the cost of healthcare. Healthcare needs nurses who are tech-savvy and

can analyze big data technologies from both the bedside and IT perspectives

## III. BIG DATA BASICS

More organizations are generating, storing, processing, and extracting value from data of all forms and sizes. They are using big data to improve their operations and produce new products and services. This type of data is very difficult and often impossible to analyze using traditional text analysis methods.

Big data (BD) are often described with the five "Vs": volume, velocity, variety, veracity, and value [3].

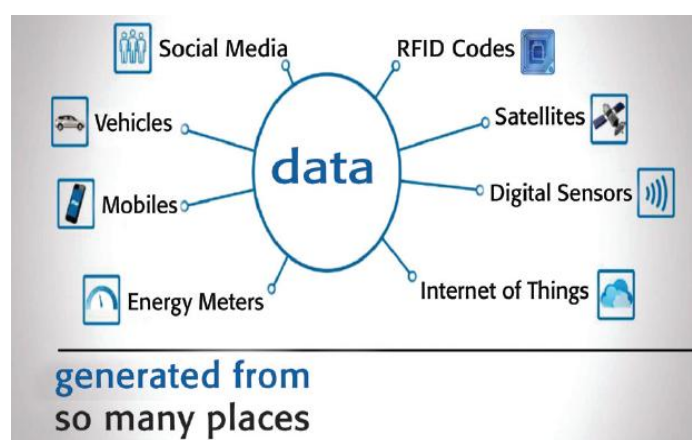


Figure 1: Sources of big data [4].

- **Volume:** This refers to the size of the data being generated both inside and outside organizations and is increasing annually. The sources may include text, audio, video, images, social networking, medical data, weather forecasting, etc. Typical sources of big data are shown in Figure 1 [4].
- **Velocity:** This depicts the unprecedented speed at which data are generated by Internet users, mobile users, social media, etc. Data are generated and processed in a fast way to extract useful, relevant information. Big data could be analyzed in real time, and it has movement and velocity.
- **Variety:** This refers to the data types since big data may originate from heterogeneous sources and is in different formats (e.g., videos, text, logs). BD comprises of structured, semi-structured or unstructured data. Structured data (such as bank transactions) is easy to analyze and validate using structured Queries. Unstructured data (such as email, text, images, etc. originating from social networking sites) is difficult to handle. Most data is unstructured
- **Veracity:** By this, we mean the truthfulness of data, i.e. whether the data comes from a reputable, trustworthy, authentic, and accountable source. It suggests the inconsistency in the quality of different sources of big data. The data may not be 100% correct.

- **Value:** This is the most important aspect of the big data. It is the desired outcome of big data processing. It refers to the process of discovering hidden values from large datasets. It denotes the value derived from the analysis of the existing data. If one cannot extract some business value from the data, there is no use managing and storing it.

On this basis, small data can be regarded as having low volume, low velocity, low variety, low veracity, and low value.

#### IV. BENEFITS

Nursing and patients can benefit from the application of data science methods to the massive amount of data now emerging from the healthcare systems. Large healthcare delivery systems are using their vast databases to predict probable outcomes depending on the treatment a patient chooses. Big data can reveal patterns shared by thousands of patients [5].

Big data can help health care organizations to reduce healthcare related complications. Advanced big data techniques can reveal new insights and make information more actionable. Big data can support research and develop a greater understanding of trends and impacts of policy initiatives.

#### V. CHALLENGES

Nursing documentation in some care settings is not always sharable and comparable with that of the rest of the care team. Lack of standardization makes comparison of data challenging. It is important that data is structured in standard ways to enable sharable, comparable information.

Healthcare data is generated at an incredible rate and the capabilities of tools to interpret data has not kept pace. We still lack powerful tools for both data curation and data analysis.

Using big data at the macro level is hindered by a lack of shared data definitions, shared documentation practices, and standardized assessment tools. The federal Office of the National Coordinator (ONC) for Health Information Technology (under the U.S. Department of Health and Human Services) has the goal of achieving health data exchanges that are not only interoperable, but are also secure, standardized by 2021 [6].

Most of the EHRs used in several hospital are high dimensional and sparsely populated, and analyzing such data sets is a big data challenge. Another challenge concerns data quality and veracity of the insights. Visual representations, which play a crucial role in helping nurses, will only prove to be a valuable tool if the data quality is assured [7].

Although some of these challenges of big data are not unique to the nursing community, addressing them will improve the collective wisdom of the community and result in actions that will improve the quality of all areas of patient care [8].

#### CONCLUSION

Currently, nurses lack the required skills and competencies necessary for meaningful use of big data. The need for preparation of nurses in big data research and translation of findings from big data nursing science into practice has been recognized. Nursing leaders must understand the value of big data science and how it affects their profession.

Big data is here to stay. Nursing needs big data, and big data needs nursing [5]. Since big data techniques have the potential to revolutionize health professional education, nursing students should be involved in the effort to increase big data literacy in nursing [9].

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