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Health Professionals' Perception about Big Data Technology in Greece

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ABSTRACT

Introduction: Big data is massive amounts of information that can work wonders. In the healthcare industry, various sources for big data include hospital records, medical records of patients, results of medical examinations, and devices that are a part of internet of things. **Aim:** The research aim of this study is to investigate the perceptions of the Health Professionals about the Big Data Technology in Healthcare. **Methods:** An empirical study was conducted among 151 health professionals (doctors and nurses) to assess their knowledge about the Big Data Technology and their perceptions about using this technology in healthcare. A questionnaire was developed in order to measure the aforementioned dimensions. **Results:** The survey's population was formed by 151 doctors and nurses who are working at private and public hospitals in Greece. The majority of the population have never heard about Big Data. As a result, most of them were not aware of the format of Big Data. **Conclusion:** Based on the study findings, it can be assumed that the majority of the responders did not have knowledge about the Big Data Technology. It is also important that most of them had never been informed about Big Data. It can be assumed that the Healthcare Sector in Greece is not familiar with Big Data Technology yet. Finally, the current study reveals a rather positive attitude toward the usage of Big Data in the Healthcare domain, although there are some doubts about the implementation of the aforementioned technology in the Greek national healthcare system.

Keywords. Big Data, empirical study, health professionals, Greece

1. INTRODUCTION

Big data is a term that includes large volumes of complex, high velocity, and variable data that needs advanced techniques and technologies to enable the capture, storage, distribution, management and analysis of the information (1). The factors influencing big data are "Volume", "Velocity", "Variety" and "Veracity". On the other hand, the healthcare industry historically has generated large amounts of data, driven by record keeping, compliance and regulatory requirements, and patient care (2). While most data are stored in hard copy form, the current trend is toward rapid digitization of these large amounts of data (3). Driven by mandatory requirements and the potential to improve the quality of healthcare

delivery, meanwhile reducing the costs, these massive quantities of data (known as 'big data') hold the promise of supporting a wide range of medical and healthcare functions, including among others clinical decision support, disease surveillance, and population health management (4,5). With its diversity in format, type, and context, it is difficult to merge big healthcare data into conventional databases, making it enormously challenging to process, and hard for industry leaders to harness its significant promise to transform the industry (6). Despite these challenges, several new technological improvements are allowing healthcare big data to be converted to useful, actionable information. By leveraging appropriate software tools, big data is informing the movement toward

value-based healthcare and is opening the door to remarkable advancements, even while reducing costs. With the wealth of information that healthcare data analytics provides, caregivers and administrators can now make better medical and financial decisions while still delivering an ever-increasing quality of patient care (7).

2. AIM

The aim of this study is to assess the knowledge of health professionals in Greece about Big Data technology. Also, this survey tries to investigate the perceptions and the attitude of health professionals about the potential implementation of Big Data in the Greek Healthcare system.

3. METHODS

In order to investigate the healthcare professionals' knowledge and perceptions about Big Data technology a qualitative survey was conducted. A questionnaire was developed, based on related scientific work, in order to measure the aforementioned dimensions (8) (9). The questionnaire was divided in three parts. The first part included the demographical data and the second part included questions about the knowledge and usage of the Big Data Technology in Healthcare. The third part included questions used for measuring the attitude of the respondents about the implementation of Big data technology in healthcare. These questions used a 7 point Likert scale from 'Strongly Disagree' (coded as 1) to 'Strongly Agree' (coded as 7). The gender, the age, the job status (doctor or nurse), the specialty and the working experience were also recorded. All questions were in Greek language. The questionnaire was anonymous and was distributed through Google forms. The respondents took part on this survey, in 2019, in Greece. The data analysis was performed using the SPSS. Cronbach's alpha was used to estimate the reliability and the validity of the survey. Statistical parametric and non parametric tests were applied to test hypotheses using a significance level of 0.05.

4. RESULTS

The survey's population was formed by 151 doctors and nurses who are working at private and public hospitals in Greece. In total 56% of the sample was female and 44% male, 52% was doctor and 48% nurse. The age range varied from 21 years to 67 years. The mean age was 38.9 years. In total 64% of the women and 59% of the men did not know the Big Data terminology. Furthermore, 62.8% of the doctors and 59.7% of the nurses are unaware of Big Data. Also, the 91.3% of doctors and 93% of nurses with professional experience (counted as years) did not know about the Big Data terminology.

The survey reveals that 47.3% of the doctors and 52.7% of the nurses believed that Big Data Technology refers to structured data, whereas 38.9% of the doctors and 61.1% of the nurses believed that Big Data Technology refers to semistructured data. Finally the major-

Figure 1. Big Data knowledge for doctors

Figure 2: Big Data knowledge for nurses

Questions	Mean
I believe that the application of Big Data technology in Healthcare is useful.	6,04
I believe that the application of Big Data technology in Healthcare could increase the effectiveness of the Health Services.	6,00
I believe that the application of Big Data technology in Healthcare would help Health Professionals in clinical decision support.	5,30
I believe that the application of Big Data technology in Healthcare would make it possible to provide health services adjusted to patients' needs.	5,50
I believe that the application of Big Data technology in Healthcare would provide more effective prevention to high-risk population.	5,59

Table 1. Mean score of Likert questions

ity of the doctors (83.3%) believed that Big Data Technology refers to unstructured data while only 16.7% of nurses had the same opinion. It is remarkable that only few health professionals obtained knowledge of the Big Data technology through Newspapers and Journals, University Lectures or Seminars, the World Wide Web, Social Media and Books. The vast majority of the health professionals believed that Big Data Technology could be used in Healthcare (86.4%). Also both the nurses and the doctors responded that Big Data could not be used for Research and Education, in the Public Sector, Finance and Energy.

The results show that 98.2% of doctors and 95% of nurses did not know use cases of the Big Data Technology abroad. Those who knew mentioned healthcare data, the data of insurance companies and electronic medical record. Also 97% of doctors and 93.4% of nurses did not know use cases of the Big Data Technology in Greece. Those who knew, mentioned AMKA (Social Security Number), electronic medical record and IASIS. IASIS is a European research project which uses Big Data for precision medicine. Also, the doctors reported the following data as an appropriate source for data collection: Healthcare data (43.3%), Internet (4%), Sensor data (6%), Social media (2.4%), Online transactions (22.2%), PACS images (4.4%), Scientific Journals (2%), Social Media Data (2%). Additionally nurses reported the following data as an appropriate source for data collection: Healthcare data (36.4%), Internet (6.6%), Sensors' data (14.5%), Social media (2.4%), Online transactions (25.1%), PACS images (7.2%), Scientific Journals (11.2%), Social Media Data (5.2%). Finally, the

31.7% of the doctors and 33.7 of the nurses believed that the Big data technology could be implemented in Healthcare.

The results of the third part of the questionnaire, which included Likert scale questions, are presented in Table 1.

From Table 1 we notice a positive attitude toward the usefulness of Big Data technology in healthcare. Additionally, the health professionals believe that the application of Big Data technology in Healthcare could increase the effectiveness of the Health Services. Furthermore they are rather positive about the contribution of the Big Data in the effectiveness of the Health Services adjusted to patients' needs and in clinical decision support. Finally, their response was positive to the question that the Big Data technology in Healthcare would provide more effective prevention to high-risk population.

5. DISCUSSION

Based on the study findings, the majority of the respondents does not have knowledge about the Big Data Technology. Also the responders do not know that Big Data is a combination of structured, semi-structured and unstructured data. Furthermore, they are positive about the technology without knowing what it stands for. It is remarkable that some respondents report that they expect Big Data to reduce the amount of paper files in Greek hospitals, as they believe that this technology is going to replace medical records. As a consequence, we cannot measure the attitude of health professionals about the implementation of Big Data technology in healthcare. Although viewed as beneficial and satisfying, inspiring both innovation and new thinking, there is a wrong perception about the purpose of this technology. Also, most health professionals reported that they have never heard of this technology in their workplace, which means that no actions have been taken by Healthcare National authorities to adopt this technology. So, what do nurses and doctors need to know about Big Data? First, the professions must understand the distinct differences between Big Data and other electronic data sets. This could be done by attending seminars, webinars and conferences, organized by Greek Healthcare National authorities, in order to obtain knowledge about this technology. Second, these differences mean this emerging domain requires a new way of thinking and working, one which health professionals need to become accustomed with if we are going to leverage Big Data to improve patient care (11). Finally, the professions need to know what potential benefits Big Data offers and how to contribute to the data science movement. The promises of this new realm encompass improvements in clinical research, practice and health service delivery.

6. CONCLUSIONS

A survey was conducted to present the perceptions of the health professionals about the Big Data Technology in Healthcare. The majority of the responders are un-

aware about the Big Data Technology and they do not know exactly the structure of data. It can be assumed that Healthcare Sector in Greece is not familiar with Big Data Technology yet. It is important that most health professionals reported that they have never heard of this technology in their workplace, which means that no actions have been taken by Healthcare National authorities to adopt this technology. Another important thing is that the respondents do not know exactly what the appropriate data format for Big Data is. Also, both doctors and nurses most frequently reported EMR data as an appropriate source for data collection. In addition, many respondents commented that the implementation of the Big Data technology in Greek hospitals is difficult. Also, some of the respondents commented that they do not know about Big Data technology but they have a positive attitude toward this technology. A limitation of the current study is sample size as we expected more health professionals to respond on this survey. Another limitation is that we cannot measure the perception of health professionals about the use of Big Data technology in Greek hospitals as they do not know much about this technology. This survey is going to be repeated in the future in order to make safer conclusions about the knowledge and perception of the health professionals about Big Data. Afterwards, a Big Data application in Healthcare will be developed (10). The aim of this application is to emphasize the potential of the Big Data technology in healthcare.

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REFERENCES

1. KKudyba SP. Data Mining in Healthcare Informatics: Improving Efficiency and Productivity, CRC Press, New York, 2010: 4: 2-4.
2. Burghard C. Big Data and Analytics Key to Accountable Care Success. IDC Health Insights, 2012: 2-4.
3. Raghupathi W, Raghupathi V. Big data analytics in healthcare: promise and potential, Brooklyn, 2014.
4. Nadhini S, Lavanya V, Kokilam K. Big Data Analytics in Health Care, IJIRT. 2015; 123: 127-129.
5. New Vantage Partners LLC, Big Data Executive Survey 2016, New York, 2016.
6. Vodafone Institute for society and Communications. Big Data: A European Survey on the Opportunities and Risks of Data Analyt-

- ics, London, 2016.
7. IDG Enterprise. Big Data and Analytics survey 2015, Framingham, 2015
8. Mathisen BM, Weinhofen L, Roman D. Empirical Big Data Research: A Systematic Literature Mapping. 2016; 8: 2–10.
9. Fernandes L, O'Connor M, Weaver V. Big data bigger outcomes. *AHIMA*. 2012; 83(15): 38–43.
10. Gallos P, Minou J, Routsis F, Mantas J. Investigating the Perceived Innovation of the Big Data Technology in Healthcare. *Stud Health Technol Inform*. 2017; 238: 151–153.
11. Minou J, Routsis F, Gallos P, Mantas J. Health Informatics Scientists' Perception About Big Data Technology. *Stud Health Technol Inform* 238: 144–146, 2017.
12. Manyika J, Chui M, Brown B, Bughin J, Dobbs R, Roxburgh C, Hung Byers A. Big Data: The next frontier for innovation and productivity. McKinsey Global Institute, 2011.
13. Brin S. Extracting Patterns and Relations from the World Wide Web. *WebDB 98 Selected papers from the International Workshop on The World Wide Web and Databases*, 1999; 1590(2): 172–183.
14. Kushmerick N. Wrapper induction for information extraction. *Citeseer*, 1997.
15. Masic I, Ridjanovic Z, Pandza H, Masic Z. Medical informatics. *AVICENA*, 2010: 544 pp. ISBN: 978-9958-720-39-0.
16. Ellison D, Humphreys BL, Mitchell J. Presentation of the 2009 Morris F Collen Award to Betsy L Humphreys, with remarks from the recipient. *Journal of the American Medical Informatics Association*. 2010; 17(4): 481–485. doi:10.1136/jamia.2010.005728.
17. Bodenreider O. The Unified Medical Language System (UMLS): integrating biomedical terminology. *Nucleic Acids Res*. 2004; 32: D267–D270. doi: 10.1093/nar/gkh061.
18. Ortega LF. Introduction to IBS's Watson and its services. Available: <https://www.ibm.com/watson>. Accessed on Sep 2019.
19. Jonquet C, Shah N, Youn C, Callendar C, Storey M, Musen M. International Semantic Web Conference, Poster and Demo session. NCBO annotator: semantic annotation of biomedical data. 2009, Washington, D.C., WA, USA.
20. Christen V, Groß A, Rahm E. A reuse-based annotation approach for medical documents. In: Groth P, Simperl E, Gray A, Sabou M, Krötzsch M, Lecue F, Flöck F, Gil Y. (eds.), *ISWC 2016*. LNCS. 9981: 135–150. Springer Cham. 2016; 9981: 135–150. doi: 10.1007/978-3-319-46523-4_9
21. Savkov A, Carroll J, Koeling R, Cassell J. Annotating patient clinical records with syntactic chunks and named entities: the Harvey corpus. *Lang Resour Eval*. 2016; 50:523–548. DOI 10.1007/s10579-015-9330-7
22. Salgado D, Krallinger M, Depaule M, Drula E, Tendulkar AV, Leitner F, Valencia A, Marcelle C. MyMiner: a web application for computer-assisted biocuration and text annotation *Bioinformatics*. 2012; 28: 2285–2287.
23. Kyriazis D, Autexier S, Boniface M, Engen V, Jimenez-Peris R, Jordan B. et al. The CrowHEALTH Project and the Hollistic Health Records: Collective Wisdom Driving Public Health Policies. *Acta Inform Med*. 2019 Dec; 27(5): 369–373. doi: 10.5455/aim.2019.27.369–373.
24. Magdalinou A, Mantas J, Montandon L, Weber P, Gallos P. Disseminating research Outputs. The CrowdHEALTH Project. *Acta Inform Med*. 2019 Dec; 27(5): 348–355. doi: 10.5455/aim.2019.27.348–355.
25. Malliaros S, Xenakis C, Moldovan G, Mantas J, Magdalinou A, Montandon L. The Intergrated Holistic Security and Privacy Framework Deployed in CrowdHEALTH Project. *Acta Inform Med*. 2019 Dec; 27(5): 333–340. doi: 10.5455/aim.2019.27.333–340.
26. Perakis K, Miltiadou D, De Nigro A, Torelli F, Montandon L, Mantas J. et al. Data Sources and Gateways: Design and Open Specification. *Acta Inform Med*. 2019 Dec; 27(5): 341–347. doi: 10.5455/aim.2019.27.341–347.
27. Wajid U, Orton C, Mogdalinou A, Mantas J, Montandon L. Generating and Knowledge Framework: Design and Open Specification. *Acta Inform Med*. 2019 Dec; 27(5): 362–368. doi: 10.5455/aim.2019.27.362–368.
28. Rak R, Rowley A, Black W. et al. Argo: an integrative, interactive, text mining-based workbench supporting curation. *Database*. 2012; 2012: bas010.