

The byzantine role of Big Data Analytics in cardiovascular care: a mixed-method integrative review

Gianluca CONTE^{a,1}, Federica DELLAFIORÉ^a, Arianna MAGON^a,
Greta GHIZZARDI^a, Davide AUSILI^b, Maura LUSIGNANI^c,
Francesco PITTELLA^a and Rosario CARUSO^a

^a*Department of Research and Innovation in Health Professions, IRCCS Policlinico San Donato, Italy*

^b*Department of Medicine and Surgery, University of Milano-Bicocca, Italy*

^c*Department of Biomedical Sciences for Health, University of Milan, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy*

Introduction

Big Data are rapidly giving rise to a new era of healthcare innovation, due to their unique predictive properties. Nevertheless, huge volumes of data, even if compelling at first, are meaningless without an interpretative structure. The confluence of increasing data availability and the pressing need to improve patient outcomes and cost-effectiveness, actively led healthcare providers and researchers to focus more on Big Data Analytics (BDA), representing the process of examining large and varied collection of data to uncover hidden patterns, unknown correlations or trends. Appropriate use of BDA in cardiovascular care – due to the intrinsic characteristics and the complexity of this field – possesses a tremendous potential impact and could be applied to multiple stages of research, health management and risk prediction. However, despite Big Data represent a very active debate in literature, there is a lack of knowledge that support the feasible impact of BDA in this area of healthcare. So far, no comprehensive synthesis of evidence is available in the field of cardiovascular care. For this reason, the aim of this study was to conduct an integrative review and to synthesise the main evidence related to the usage of BDA in cardiovascular care.

Method

A revised framework for mixed-method integrative reviews of the literature guided the analysis (Whittemore & Knafl 2005). The SPICE Framework was used to address the search process, shaping the queries (Booth & Brice 2003). Then, the information collected were retrieved on PubMed, Scopus and Web of Science. The four-step PRISMA flowchart was used to manage the selection process. The eligibility phase (*i.e.*

¹ Corresponding Author: Gianluca Conte, Department of Research and Innovation in Health Professions, IRCCS Policlinico San Donato, Via Agadir 20-24, 20097 San Donato Milanese, Italy; E-mail: gianluca.conte@grupposandonato.it

PRISMA third step) was characterised by the quality appraisal of each selected paper, performed using a proper qualitative assessment.

Results

The initial search identified 413 papers. They were selected in a three-blinded review process, divided in four stages based on: titles screening ($n = 86$), removal due to duplicates ($n = 35$), quality appraisal ($n = 19$) relevancy of the abstract and full-text ($n = 12$). Eight articles were selected, critically evaluated and synthesised in order to allow the synthesis and the comparison process.

Discussion

While some papers focused on general considerations about the topic (Pah *et al.* 2014; Kim 2017), others pointed to a more specific subtopic such as paediatrics (Asante-Korang & Jacobs 2016), nursing care (Gleason & Dennison Himmelfarb 2017), cardio-oncology (Mandawat *et al.* 2017) and gender differences (Joynt *et al.* 2015). Rumsfeld *et al.* provided a significant contribution on *Nature Reviews Cardiology* (2016) describing the areas of application of BDA, but also delineating the need for evidence, effectiveness, safety, ethical implications and a solid methodological approach. Moreover, Hemingway *et al.* highlighted on *European Heart Journal* (2017) diverse type of data collected across early and late stages of translational cardiovascular research, within the *BigData@Heart Consortium*.

Conclusion

To date, the literature does not provide definitive evidence that Big Data Analytics will translate into higher quality of healthcare. Furthermore, the small number of studies analysed in this review limits the conclusions that can be drawn. BDA in cardiovascular care have the considerable potential to improve both individual and collective health, even if at a prodromal stage and in such byzantine nuances.