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Computer modelling and simulation in clinics: mapping usage and opinions for advancing in silico medicine

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1. Introduction

In silico medicine is the application of computer modelling and simulation (CM&S) in the study, diagnosis, treatment or prevention of a disease. Incredible advances in the research have been realised to use CM&S for aiding clinical applications. Nevertheless, the spread of CM&S in clinical practice is not always reflected timely and accurately in the literature. How advanced is the translation of CM&S in clinics? Which are the factors limiting the diffusion of CM&S in healthcare? A clear view on the current awareness, actual usage and opinions from the clinicians is needed to identify the real barriers and opportunities for the future of in silico medicine. The aim of this study was capturing the current state of CM&S in clinics to identify potential opportunities, strengths and barriers for the advance of in silico medicine.

2. Materials and Methods

An online survey made of 25 questions was designed by authors and reviewed by the VPHi Board of Directors. It assessed: levels of awareness and familiarity with silico concepts, experiences in clinics, opinions on barriers and opportunities to use in silico medicine for patients' care. Data were collected through SurveyMonkey [1] using VPHi communication channels, engagement with clinical societies, hospitals and individual contacts, between December 2020 and March 2021. Statistical analyses were done with R [2].

3. Results

163 responses were collected from all over the world (majority in Europe). Clinicians were mostly aged between 35 and 64 years old, with heterogeneous experiences (from junior doctors to head of unit) and areas of expertise (e.g. 48% cardiology , 13% musculoskeletal , 8% General surgery, 5% paediatrics). The CM&S terms 'Personalised medicine' and 'Patient-specific modelling' were the most known within the respondents. 'In silico clinical trials' and 'Digital Twin' were the least known. The familiarity with different methods (e.g. finite element analysis, AI) depended on the medical specialty, highlighting possible cultural and background differences. Figure 1 shows the applications of CM&S in clinics. 50% of the respondents who used CM&S in clinics did so to plan interventions. However, the usage frequency is still scarce. A well-recognized strength associated to CM&S was the increased trust in planning procedures. Overall, the level of trust for CM&S was high and not proportional to awareness level. We also identified potential barriers such as access to computing resources, perception that CM&S is slow, low accuracy of the results. However, clinicians do see a role for CM&S expertise in their team in the future.

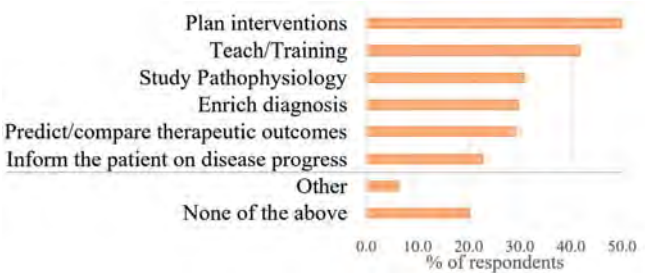

Figure 1: Applications of CM&S by clinicians

4. Discussion and Conclusions

This survey offers a snapshot of the current situation in the clinics. Although the sample size and representativity could be increased, the results provide the community with actionable data and lessons to build a responsible future for in silico medicine. New iterations and follow-up engagement activities are planned to involve the medical community and accelerate uptake of CM&S tools.

5. References

1. *https://www.surveymonkey.co.uk/r/9ZTBW87*
2. *R Core Team (2018). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. URL https://www.R-project.org/.*

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