World Physiotherapy
Europe region

Guidance Document - Information and Guidance on Big Data in Physiotherapy

Professional Practice Working Group (PPWG)

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CONTENTS

1. INTRODUCTION

New technologies, innovations and the increasing digitalisation of health care services and organisations, creates an enormous amount of information generally termed “big data” (BD). Because of the sheer volume of data, which is constantly generated, appropriate analysis must be utilised to organise it in a meaningful way for use. The processes often include methods, such as machine learning (ML) and artificial intelligence (AI). In using the term “big data” we refer not only to the collection of data but also to these and other aspects of analysis and utilisation.

Big Data can allow for the exploration of the complex interactions and interdependencies of the various systemic and personal aspects and provide insights that will serve to improve health care services and treatment. Using Big Data will also help building an effective predictive models around individual patients which will offer improved diagnosis ability and better personalisation of treatment. Using predictive models, Big Data can also provide a more individualised, efficient and timely prevention making it more economical and therefor accessible to those who will best benefit from such interventions.

At the organisational and systemic level Big Data could provide the ability to understand issues related to processes of care such as timing, service availability, service utilisation and cancellations, and thus provide valuable information and an opportunity for both improvement of service and savings in costs.

Quality of care, at both at systemic and specific levels can be addressed using Big Data, and it might be used to address patterns of care, effectiveness, adherence to recommended practice or evidence and patients' outcomes and satisfaction. This will probably involve costs analysis and undoubtedly will lead to changes in care. We will be required to prove the value of our practice and probably get rid of what will be ascertained as being low-value care.

Big Data also has the potential to radically change research, using real-world data, rather than tightly controlled methods. This enables exploration of concepts, processes and outcomes in a novel way gaining a deeper understanding of several aspects such as causation, effect of specific interventions and patients' characteristics, all within complex contextual and environmental factor, potentially turning 'confounding factors' into contributing ones.

There is also a potential for machine learning (ML) and artificial intelligence (AI) to revolutionise both research and clinical practice by automating the review and meta-analysis process. Instead of a laborious, time-consuming process, it will maintain an ongoing search, analysis and updating providing an updated tool for clinicians including Clinical Decision Support systems possibly promoting a shorter knowledge gap.

So, as big data utilisation and applications become common, extensive and even essential, it is clear that it will have a huge impact on health care and physiotherapy. It is imperative that the profession would be aware of this, be proactive and get involved in developments, initiatives, opportunities and alliances with public and commercial organisations. At this time, it might be prudent to think of strategies that best achieve that goal and to start implementing them.

2. CONSIDERATIONS

Facilitating use of big data in physiotherapy needs consideration of a range of issues.
What do we need to consider?

1. While there is clearly huge potential for big data to enhance care, right now much of the optimism is based on its potential, rather than its demonstrated effectiveness. In other words, big data will not remove the need for substantial investment and training in healthcare and physiotherapy
2. The importance of big data is collating the same information on a large scale. It requires different organisations to collect the same data. This means the data needs to be relevant to the organisation at a local level as well as at a macro data level, otherwise it may be difficult to get buy in.
3. As with all research and digital health; data privacy, and potential de-personalisation of care must be addressed.
4. As with any form of personal data, informed consent about what data is being used for, and by whom, should be obtained.
5. Compliance with ethical, legal and regulatory issues (including GDPR).

The importance of the information being acquired at both systemic and specific level is of such potential significance that issues of consideration should be satisfactorily addressed so as not to become barriers to implementation.

Additional reading: Cummins N and Schuller BW (2020) Five Crucial Challenges in Digital Health. Front. Digit. Health 2:536203. doi: 10.3389/fdgth.2020.536203

3. PHYSIOTHERAPY RELATED RESEARCH USING BIG DATA

The use of Big Data in physiotherapy research is growing and several examples are included at the end of the document.
Researchers note the major potential, but most work so far is on diagnostic categories or labels, predictors of rather than machine learning or artificial intelligence enhancing treatment.

4. USE OF BIG DATA BY A MEMBER ORGANISATION

One example where a Member Organisation uses big data is to quality assure treatment. The physiotherapy association of the Netherlands (KNGF) has developed a dash board on its website into which members can submit their treatment outcomes and measure their outcomes against the national average. Further information is available on KNGF data dashboard: https://ldf-acc.mediquest.nl/
Physical Therapy Outcomes Registry | PTOR (ptoutcomes.com) and LDF (landelijke database fysiotherapie) (kngf.nl)

5. EXAMPLES OF BIG DATA RESEARCH IN PHYSIOTHERAPY RELEVANT AREAS

This section is a list of articles that are examples of where big data has been used in physiotherapy. The provide further reading and insight into the relevance of physiotherapy in big data:

Amorim, P., Paulo, J.R., Silva, P.A., Peixoto, P., Castelo-Branco, M., Martins, H. Machine Learning Applied to Low Back Pain Rehabilitation – A Systematic Review. International Journal of Digital Health. 2021; 1(1): 10, 1–14. DOI: https://doi.org/10.29337/ijdh.34

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Hewett, T. E., & Webster, K. E. (2021). EDITORIAL: The Use of Big Data to Improve Human Health - How Experience from Other Industries Will Shape the Future. *Int J Sports Phys Ther*, *16*(6), 29856. https://doi.org/10.26603/001c.29856

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Jones, M., Collier, G., Reinkensmeyer, D. J., DeRuyter, F., Dzivak, J., Zondervan, D., & Morris, J. (2020). Big Data Analytics and Sensor-Enhanced Activity Management to Improve Effectiveness and Efficiency of Outpatient Medical Rehabilitation. *Int J Environ Res Public Health*, *17*(3). https://doi.org/10.3390/ijerph17030748

Joseph, G. B., McCulloch, C. E., Sohn, J. H., Pedoia, V., Majumdar, S., & Link, T. M. (2022). AI MSK clinical applications: cartilage and osteoarthritis. *Skeletal Radiol*, *51*(2), 331-343. https://doi.org/10.1007/s00256-021-03909-2

Matsangidou, M., Liampas, A., Pittara, M., Pattichi, S., Constantinos. Zis, P. Machine Learning in Pain Medicine: An Up-To-Date Systematic Review Pain Ther (2021) 10:1067–1084 https://doi.org/10.1007/s40122-021-00324-2

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6. RECOMMENDATION

The Europe region recommends that Member Organisations would make their members aware of Big Data and explore the benefits it can have for the profession and for practice and research.

7. ACKNOWLEDGEMENTS

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