Understanding methods of assessing health intervention behavior through data-driven approaches

ANASTASIYA ZAKREUSKAYA, Machine Learning and Data Analytics lab, University of Erlangen-Nuremberg, Germany

This is an application for the CHI'23 Doctoral Consortium from Anastasiya Zakreuskaya, supervised by Prof. Bjoern Eskofier.

ACM Reference Format:

The digital transformation has triggered a fundamental change in the delivery of healthcare and its services. Many of these services enable patients to be more involved in their treatment or healthcare, leading to higher patient satisfaction and measurable improvements in health outcomes [1], [2]. Patient access to electronic health records has been found to have further positive effects such as reassurance, reduced anxiety and increased awareness [5] and improved decision making for physicians [4]. To understand how patients use health interventions, engagement data can be a valuable source to explain usage behavior and detect individual preferences.

In previous work, I have conducted a systematic literature review [3] about quantitative models in research that aim to measure or predict usage behavior with digital health interventions. Furthermore, the identified models have been discussed in semi-structured interviews with experts in the digital health sector to evaluate them from an application development perspective. With this work I aim to contribute to a better understanding how to achieve a beneficial division of digital and analogue components in the therapy process, based on individual engagement needs. The results are visualized in an interactive web interface (called *eXhebe= 'explain health behavior'*), that displays findings from one single study, as well as a summary for all studies to a chosen variable.

The results from analyzing the literature to data-driven prediction models for health intervention engagement suggest that this research is still at the beginning. Most studies applied a type of regression analysis to detect correlations between an average of nine predictor variables and a target variable. Similarly, the interviewed experts showed to be at the beginning of including such evaluations into their health applications. Interview partners expressed doubts about transferring the content of single scientific publications about user engagement to their own work as they felt that this question was very multidimensional and could not be answered by a single study. Instead, experts were rather interested in overall recommendations from the conducted studies and would prefer to use scientific publications to gasp an overall picture of trends, study settings and theories. This leads to the following question of how to effectively measure engagement within research studies and translate this knowledge into a care process. Therefore, the web

Author's address: Anastasiya Zakreuskaya, Machine Learning and Data Analytics lab, University of Erlangen-Nuremberg, Carl-Thiersch-Straße 2b, 91052 Erlangen, Erlangen, Germany, anastasiya.zakreuskaya@fau.de.

Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and the full citation on the first page. Copyrights for components of this work owned by others than ACM must be honored. Abstracting with credit is permitted. To copy otherwise, or republish, to post on servers or to redistribute to lists, requires prior specific permission and/or a fee. Request permissions from permissions@acm.org.

© 2022 Association for Computing Machinery.

Manuscript submitted to ACM

Manuscript submitted to ACM

78 79 80

87

88

89

91

92

93

eXhebeEvery patient is different > Overview of all papers Details about a selected paper Click on a paper that interests you to get more information Underlying Dataset Study-Aim Study-Implementation Results Show 10 ~ entries Search: Analyzing mHealth Engagement: Joint Models for Intensively Collected User Engagement Data Year Title Design programmes to maximise participant engagement: a predictive study of programme and participant characteristics associated with engagement in paediatric weight DIGITAL: mobile Can joint modeling be used in the 342 relapse prevention adults between 18-60 years with psychotic disorders who have recently been discharged from a psychiatric hospitalization propmted (3 times per day) and self-Initial engagement and attrition in a national weight management program: demographic and health predictors initiated use, starting with a self-assessment and educational + 2016 er of days in a week that the t used the mHealth intervent d each week for up to 6 mor intervention content "This treatment can really help me" - A 6 months longitudinal analysis of treatment readiness 2017 and its predictors in patients undergoing alcohol and drug rehabilitation treatment Analyzing mHealth Engagement: Joint Models for Intensively Collected User Engagement 2017 Factors Associated With Dropout During Recruitment and Follow-Up Periods of a mHealth-Based Randomized Controlled Trial for Mobile. Net to Encourage Treatment Adherence for People With Serious Mental Health Problems 2017 High Level of Integration in Integrated

Fig. 1. Final screen view of the 'eXhebe' database interface. The left table shows all included publications included in the 'eXhebe' database. The box on the right-hand side shows a selected paper, that investigates 342 adults with psychotic disorders with a mobile application. The black top bar allows to summarize all publications based on a filter, such as the Study aim (e.g., target variable)

Interface eXhebe, which is displayed in Figure 1, is currently being developed with the aim to make empiric knowledge about health application engagement more accessible.

REFERENCES

- [1] Ronald M. Epstein and Richard L. Street. 2011. The values and value of patient-centered care. Annals of Family Medicine 9, 2 (April 2011), 100-103. https://doi.org/10.1370/afm.1239
- Stewart MA, J Brown, A Donner, I McWhinney, J Oates, Wayne Weston, and John Jordan. 2000. The Impact of Patient-Centered Care on Outcomes. The Journal of family practice 49 (Oct. 2000), 796-804.
- David Moher, Alessandro Liberati, Jennifer Tetzlaff, Douglas G Altman, and PRISMA Group*. 2009. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. Annals of internal medicine 151, 4 (2009), 264-269.
- Paul C Tang, Joan S Ash, David W Bates, J Marc Overhage, and Daniel Z Sands. 2006. Personal health records: definitions, benefits, and strategies for overcoming barriers to adoption. Journal of the American Medical Informatics Association 13, 2 (2006), 121-126.
- [5] Archana Tapuria, Talya Porat, Dipak Kalra, Glen Dsouza, Sun Xiaohui, and Vasa Curcin. 2021. Impact of patient access to their electronic health record: systematic review. Informatics for Health and Social Care 46, 2 (2021), 194-206.