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Can mHealth bridge the digital divide in rheumatic and musculoskeletal conditions?

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Abstract

Background The impact of rheumatic and musculoskeletal diseases is significant worldwide. Progress in disease management has put current care models under pressure. Mobile Health solutions may constitute a solution for these changes. However, vulnerable populations groups including people with a migration or ethnic background different from the host country, people with low socio-economic status and people with low (digital) literacy skills seem to be underrepresented in mHealth research and practice.

Main body In this editorial, we propose tailored interventions with mobile health applications on three levels including patient-related strategies, healthcare provider-related strategies and healthcare system-related strategies to solve this unmet need for patients from vulnerable populations groups with rheumatic and musculoskeletal diseases. Patient-related mobile health strategies should focus on increasing self-efficacy and enabling peer-education. Gamification could be a solution to motivate patients to use mobile health. On the level of the healthcare provider, we propose strategies including technology-enhanced learning and adaptative communication strategies, to tailor mobile health towards vulnerable populations groups with rheumatic and musculoskeletal diseases. Regarding healthcare system-related strategies, the aim is to increase minority participation in research in a cost-effective manner by remote longitudinal data tracking, using teleconsultation or remote symptom monitoring devices to ensure quality care for all patients with rheumatic and musculoskeletal diseases, even in vulnerable populations groups that are normally hard to reach.

Conclusion Vulnerable population groups in rheumatic and musculoskeletal diseases are underrepresented in mobile health research and practice. Evidence is sparce on the scale of the digital divide between patients using or not using mobile health. Interventions that directly attempt to reduce health disparities among vulnerable populations groups are needed to guarantee all patients with rheumatic and musculoskeletal diseases might be engaged in the rheumatology care of the future.

Keywords Rheumatic and musculoskeletal diseases, Rheumatoid arthritis, Mobile health, Vulnerable population groups, Digital divide, digital gap,

Background

Rheumatic and musculoskeletal diseases (RMDs) are a group of around 200 musculoskeletal conditions that affect joints, bones, muscles, and soft tissues [1]. RMDs are characterized by pain, fatigue, stiffness, and sleep disturbances and thus pose a major threat to the quality of life of patients suffering from a RMD [2]. Moreover,

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significant numbers of people in all age spans and ethnicities are affected by these conditions. Luckily, over the past two decades, progress is made in diagnostic accuracy, and in treatment options and strategies for patients living with RMDs [3]. However, these shifts in treatment strategies have made ambulatory care for RMDs more labour-intensive and several countries now face a shortage of rheumatologists and allied healthcare professionals because of the labour-intensive treat-to-target and tight control treatment strategies and person-centered care [4]. Moreover, this shortage of work force also influences partially the delay to diagnosis and treatment in people with RMDs. Although early treatment has shown to be a window-of-opportunity for a good clinical outcome in many RMDs, a recent study still showed that the delay to start treatment was substantial for many patients with Rheumatoid Arthritis (RA) [5]. Early access to specialised rheumatological care is not always readily obtainable. Therefore, attention is turning towards new care models for RMDs, including the use of mobile health (mHealth) applications, such as mobile apps and wearables.

It seems that mHealth offers patients and healthcare providers new ways how to engage in healthcare. It has the potential to improve well-being, engage in prevention and reduce suffering from diseases [6]. Additionally, mHealth applications seem particularly relevant, because of their ease of use, broad reach, and wide acceptance. Although the enthusiasm for mHealth has skyrocketed the last decade, vulnerable populations groups including people with a migration or ethnic background different from the host country, people with low socio-economic status and people with low (digital) literacy skills seem to be underrepresented in mHealth research and practice. In the ArthritisPower app from the United States, over 90% of users suffering from any RMD were white [7]. Moreover, in the Cloudy with a chance of pain app that aimed to record data from patients suffering from chronic pain, the age range of 35–65 years seemed overrepresented compared to younger and older people suffering from chronic pain [8].

The existence of health disparities for vulnerable populations groups in health service use and access is well established. Studies consistently show a lower likelihood of having a usual source of care, fewer physician visits, and fewer health expenditures among vulnerable populations groups [9–12]. Therefore, it is not surprising that the use of mHealth services and adherence to mHealth in clinical practice is found to be lower in such vulnerable populations. This is in stark contrast with reports that there were more than 7 billion mobile telephone subscriptions across the world in 2015, over 70% of which were in low- or middle-income countries. In many such countries, people are more likely to have access to a mobile telephone than to clean water, a bank account or electricity [13]. Ownership of a smartphone will suffice for neither high quality mHealth research nor care.

There is a digital divide, an unequal access to digital technology for patients from vulnerable populations groups in RMDs. As recommended by the EULAR points-to-consider developing mHealth applications, apps should be personalised to the individual needs of people with RMDs and consider accessibility of people with RMDs across all ages and abilities. Optimal applicability of mHealth options for these patients remains an unmet need, particularly in a society that becomes ever more heterogenous and digitalised. This editorial wants to go deeper in the discussion how mHealth could offer opportunities to bridge the digital divide for vulnerable populations groups living with rheumatic and musculoskeletal conditions.

Main text

We propose interventions on three levels including patient-related strategies, healthcare provider-related strategies and healthcare system-related strategies to improve access and involvement for vulnerable populations groups suffering from RMDs [14]. Table 1 summarizes these 3 levels. Programs that directly attempt to reduce health disparities among vulnerable populations groups are needed and should rely on systems that measure, track, and aim to improve disparate outcomes; factors that can potentially be addressed by mHealth strategies.

Patient-related strategies

Self-management/self-efficacy is an effective individual level strategy to improve health disparities in minority populations. Studies reported positive results supporting the use of arthritis self-management as an intervention to improve health care quality and quality of life for disadvantaged populations with OA [9].

Self-tracking mHealth technologies convert a patient's health state, activities, sleeping patterns, etc. into continuous numerical data that allow new practices of quantified self-observation. Hence, mHealth has the potential for a highly personalized medical care, with an augmented focus on prevention through real-time, continuous monitoring of selected vital signs whereas previously focus was on episodic and reactive care. By encouraging patients to change their behaviour through personal accountability, these apps can benefit prevention, clinical diagnosis, and disease management. As such, health disparities can be reduced by offering numerous functionalities including home based exercise programs, symptom trackers, medication diaries, educational information,

Table 1 Strategies to improve health disparities in general, and specified for vulnerable patient populations

Strategies to improve health disparities for vulnerable populations groups in general	mHealth Strategies to improve health disparities vulnerable populations groups
Patient-related strategies	*Patient-related strategies*
- Self-management	- mHealth self-management interventions
- Peer mentoring	- mHealth peer-education
- Motivation	- Gamification
Healthcare provider-related strategies	*Healthcare provider-related strategies*
- Education	- Technology-enhanced learning (TEL)
- Patient-healthcare communication	- Adaptative communication strategies
Healthcare system-related strategies	*Healthcare system-related strategies*
- Increasing minority participation in research	- Remote longitudinal data tracking
- Cost-effective measures	- Tele-consultations Remote monitoring of symptoms

and movement analysis to increase self-management, and indirectly keeping healthcare more affordable [15].

Peer mentoring can be another effective strategy to improve health disparities in minority populations. Peer mentoring provides a mechanism for creating a social network on a small scale which a person receives "support from a person who has successfully coped with the same condition. This commonality and credibility can establish trust, increase communication and, in turn, decrease disparities in healthcare outcomes [16]. Studies highlight the potential of peer mentoring as a culturally sensitive means to improving health behaviors and outcomes in minority populations [17–20]. mHealth can help streamline peer workflow and communication with patients in different ways. For example: by providing a platform to engage more easily in collaborative action planning and completion of tasks, and by educating non-clinically trained peers to safely support people living with RMD's. Previous studies indicated that mobile tools that facilitate the work of peers have been found to be both feasible and acceptable [21, 22].

Motivation is a factor which might explain why individuals either fail to adopt an intervention, or commit to it. The intrinsic motivation of an individual can be influenced by a personal belief that the condition is severe enough that it needs an intervention or that the intervention will yield sufficient benefits to the individual [23]. One way to increase and maintain the motivation for mHealth adoption is the use of gamification. This concept which gained popularity the past decade refers to the "inclusion of game design elements in non-game contexts" [24]. The use of gamification in a web-based intervention for people with rheumatoid arthritis showed an increase in physical activity and empowerment and decrease in healthcare utilization [25]. Creating gamification aspects targeted for at risk RMD populations, could help motivate them to use and commit to mHealth interventions.

Healthcare provider-related strategies

It is important to acknowledge and overcome implicit bias amongst healthcare providers to reduce health disparities in vulnerable populations. Majority of the healthcare systems in the USA now mandate healthcare providers to attend workshops, conferences, and training modules on racial, cultural, religious, and linguistic sensitivities specific to minority communities [14]. Educating healthcare providers on both cultural and digital competences has the potential to decrease health disparities. Cultural competence, in general, is the process and ability of an individual or organization to function effectively within different cultural situations [26]. Technology-enhanced learning (TEL) could stimulate cultural competence education to healthcare providers. TEL offers many benefits for learning and teaching, whether used on its own or in conjunction with face-to-face teaching through blended learning. The ubiquity of mobile devices in clinical settings means TEL is ideal for busy clinicians [27].

While mHealth-applications have the potential to improve communication with healthcare practitioners and therefore increase understanding of diseases, there are some caveats. Out of networked mHealth technologies emerges a more decentralized form of health practice, that is scattered by mHealth software developers, heterogeneous non-medical and medical information, a variety of practitioners and (supposedly well-informed) patients. Where previously the health care professional was a sort of 'gatekeeper' of relevant medical information, the dominance of physicians and specialists in healthcare risks to crumble [28]. Non-medical trained individuals increasingly search for and discover health and medical information within the information landscape and non-evidence based mHealth solutions. Often vulnerable groups have problems with the dominant language and/or health literacy and numeracy. Studies in the United States show over 90 million people have basic or below basic literacy skills and 110 million people have limited quantitative skills [29]. Persons with lower literate and numerate skills often struggle with understanding health information, and often rely on verbal communication about their health. The interpretation of digital information is thus not without danger. Notwithstanding the new opportunities for patients to self-inform, the discrepancy between the tech-savvy patients and the digital illiterates risks to further deepen and add to the skewed distribution of resources towards the well-informed at the expense of others.

The techno-fetishist view that the adoption of mHealth solutions will bring advancement only is unrealistic. As Anderson noted, "newer technologies may mobilize the old, or they may counter or even contradict each other as competing rationalities, creating new complexities in interaction" [30]. Deployment of mHealth solutions will require additional focus to bridge the knowledge gap between the digital and health literate and illiterate, and to provide explainable information for all patients. For example, automated calls recorded in multiple languages, offering translated voice messages of disease specific values, or offering pictographs can benefit patients who either spoke non-dominant languages or reported literacy barriers. Those type of digitally delivered interventions can improve communication, self-management and therefore decrease health disparity.

Healthcare system-related strategies

Disparities are systemic issues and require structural change and community level actions. Increasing minority participation in research can be a strategy that can be implemented at the "healthcare system" level. Ensuring minority participation will ensure that therapy is guided by a representative population sample that reflects the unique genetic and epigenetic make up of minority patients, which should help address disparities and improve outcomes [14]. mHealth applications could facilitate clinical research in these minority patient group by enabling investigators to collect patient outcomes more reliably and precisely through remote longitudinal data tracking [31, 32].

In addition, these populations often experience cost-related barriers to care and difficulties attending in-person office visits [33]. mHealth-applications could present a cost-effective measure for these populations by providing tele-consultations or remote monitoring of symptoms [34].

Conclusions

While mHealth thus offer opportunities to battle health disparities, mHealth applications in RMDs seems to be mostly used by non-vulnerable population groups. Moreover, not only are vulnerable population groups underrepresented in mHealth research and practice, but there is also an enormous paucity in mHealth research on these vulnerable population groups suffering from RMDs. Currently, we have no insight on the scale of the digital divide gap between patients regularly using mHealth in research and practice and those patients less engaged in research or clinical practice with mHealth tools. Moreover, there is no evidence on the perceptions of vulnerable population groups with RMDs on their use of mHealth. These understandings are needed to personalise mHealth applications for vulnerable population groups to ensure these patients are also engaged in the rheumatology care of the future.

Ethical guidelines

Not Applicable.

Authors' contributions

LS and DDC drafted the main text. All authors contributed to content and reviewed the manuscript. The author(s) read approved the final manuscript.

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Authors declare no competing interests.

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