Five principles for the development of minimally disruptive digital medicine
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To cite this version:
Tiphaine Lenfant, Philippe Ravaud, Victor M Montori, Gro R Berntsen, Viet-Thi Tran. Five principles for the development of minimally disruptive digital medicine. BMJ - British Medical Journal, 2023, p2960. 10.1136/bmj.p2960. hal-04355365
Experts predict that no society or healthcare system will be able to sustainably care for patients with chronic conditions in the next 20 years. Similarly, healthcare is increasingly unsustainable for patients, overwhelmed by the work of accessing and using healthcare services and enacting self-care routines.

Digital medicine is often envisioned as the solution to this crisis. Digital medicine complements traditional consultations at the “point-of-care” with remote and real-time follow-up and interventions “at the point-of-life” where patients live, work, and rest. Technological solutions are emerging for every patient problem. Patients with Parkinson’s disease, for example, should have smart-socks monitoring the risk of falls, smartwatches for vital signs, smart-patches measuring L-dopa blood levels, arm-based fall detectors, or even robot assistants. While each of these innovations may independently respond to a therapeutic or preventive indication, we argue that their sum may be maximally disruptive to patients’ lives and generate an unmanageable workload for clinicians.

Building on the concept of minimally disruptive medicine, we propose five principles for minimally disruptive digital medicine.

Firstly, digital medicine should respect the humanistic nature of care. Technology should respect both “biotechnical” and “human” aspects of care. While biotechnical aspects are amenable to technical efficiencies, human aspects follow the tempo of healing. Currently,
digital medicine relies on algorithms that ignore the full breadth of patients’ life circumstances, responding to their biology while blind to their biography. Trying to replace in-person interaction with technology risks designing away the careful attention healthcare professionals pay to each patient’s situation and the compassionate and competent co-creation of a response oriented by “what matters” to each patient. Blended care, a novel model that augments care with digital solutions rather than replace it, offers a path forward. Designing blended care requires active involvement of the end-users to develop a strong understanding of why digital tools are needed, which are helpful, in what care processes, for whom, and under what circumstances.

Secondly, digital medicine should not be imposed indiscriminately onto all patients. Digital tools shift part of the workload from care systems to patients. For most patients, this may alleviate the burden of treatment, for example time spent travelling to appointments or in waiting rooms, and delays. However, digital solutions can exclude some groups, for example, people who have limited access to digital tools, those who have disabilities that prevent their use of digital tools, those who lack familiarity or have anxiety with using technology, and those with poor digital literacy. Like other aspects of care, responding to the needs of each patient will require in-person or “analog” care for some patients in some circumstances.

Thirdly, digital medicine should aim for long term patient engagement. Between 55% to 90% of patients drop out of remote digital monitoring programmes. Existing solutions demand time, energy, and attention regardless of patient circumstance. To be useful, digital solutions should be responsive to and reflective of patients’ beliefs, capacities, competing demands, and social support. Thus, users should be able to adjust digital tools to personalise their use at enrollment and over time. For example, patients should be able to increase monitoring frequency when they feel unwell and to turn it off, thereby co-creating their care and reducing its intrusiveness.

Fourthly, digital medicine should account for multimorbidity. Most current digital solutions respond to individual conditions or even signs, ignoring not just the personal but also the biological context. For example, 82% of patients with diabetes have at least one additional chronic condition while most apps for diabetes do not consider multimorbidity. These patients and their clinicians would need to connect to multiple platforms and apps, one for each of their problems. One solution could be to offer a unified and personalised interface to data from multiple applications, for example, SaaS (Software as a Service) integrators that present calendars, communication, and to-do lists in one view. This type of integrator would
provide one app for patients and a single-pane view for clinicians thanks to care traffic command centers at hospitals processing all incoming data.6

Finally, digital medicine should promote the human sustainability of healthcare. Remote and high-frequency follow-up of patients increases the number of touchpoints and data inputs. Alarms and demands from the digital system may disrupt and divert clinicians’ attention, adding to their workload. Clinicians will be overwhelmed by complex login and platform access procedures, entering and checking data, and ordering interventions, potentially leading to errors and burnout. To be effective, both digital solutions and care teams need to be designed primarily to enable care.

These principles assume that the safe and effective use of digital solutions is backed by trustworthy evidence of efficacy and safety when used as intended, and that patient privacy and trust are zealously safeguarded. Adherence to these five principles represents minimal criteria for digital medicine as a method of care that happens with patients and clinicians, not to them.

Competing interests: The authors declare no conflicts of interest. The article was realised in the context of the @Hotel-Dieu project, funded by the “Banque Publique d’Investissement” (BPI) in France.

Provenance and peer review: not commissioned, not externally peer reviewed.

<bok>1 Thuemmler C, Bai C. Health 4.0: How Virtualization and Big Data are Revolutionizing Health Care. Springer, 2017 doi:10.1007/978-3-319-47617-9.</bok>


