



# Patient Empowerment through Health Technology and Education

Kibibi Muthoni L.

Faculty of Science and Technology Kampala International University Uganda

## ABSTRACT

Patient empowerment has emerged as a critical component of modern healthcare, transforming the traditional doctor-patient dynamic into a more collaborative and participatory model. This paper examines how digital health technologies and educational strategies are reshaping patient roles, enabling individuals to take an active part in managing their health. Through an examination of telemedicine, wearable health devices, and personalized education, we analyze the multifaceted approach required to foster empowerment. The paper highlights the significance of health and digital literacy, the role of healthcare professionals in curating accurate information, and the ethical considerations surrounding data use and shared decision-making. Case studies of e-patients provide practical insights into the benefits and challenges of empowerment in real-world settings. Despite technological advances, barriers such as limited access, low literacy, and concerns over privacy persist, necessitating inclusive, ethical, and supportive approaches. Ultimately, the convergence of health technology, patient education, and interdisciplinary cooperation offers a promising path toward enhanced patient outcomes and a more equitable healthcare landscape.

**Keywords:** Patient Empowerment, Health Technology, e-Patients, Digital Health Literacy, Telemedicine, Wearable Devices, Health Education.

## INTRODUCTION

The doctor-patient partnership model relies on both the doctor's and patient's roles for recovery. Established in the late 20th century, patients' rights were bolstered by the empowerment movement, leading to informed consent and shared decision-making. A patient-centred care model demands that providers consider patients' needs and experiences, promoting partnership. However, ethical or legal compliance alone does not guarantee patients' empowerment. Some patients feel empowered without being e-patients, while others, despite being e-patients, harbor distrust towards professionals. Patients seek empowerment mainly through information and community support, with reputable medical websites serving as primary sources before engaging with broader communities. Interviewees highlighted the necessity of carefully curating social networks, reserving paper channels for formal complaints. Technology aids in fostering two-way trust, which is fundamental in this partnership. Two critical areas for deeper discussion are education and accommodation; education is essential for proactivity, and patients value the educational efforts of health professionals. However, medical professionals often emphasize medical education over improving digital or health literacy. Access to technology can empower e-patients, but challenges like misinformation and information overload arise. Health professionals have a role in filtering false data. Technology should enhance communication, reinforcing a lasting doctor-patient relationship. Participants affirmed that empowerment is contingent on being healthy and educated. Numerous barriers exist, including accessibility challenges such as financial and educational disadvantages, which hinder empowerment processes. Health and digital literacy, English proficiency, and adequate financial resources are crucial. Additionally, motivation, interest, and concerns regarding trust, privacy, security, and liability play significant roles in the empowerment journey [1, 2].

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

### **The Role of Technology in Healthcare**

Technology has always been a driving force behind any kind of business or progress. It has entered all sectors of life and cannot be separated from the human way of living anymore. In recent times, due to the rapid increase in technical developments, technology has stepped into the world of healthcare as well. It became inevitable to create a technology-based health structure. Digital health has become ubiquitous and patient engagements with digital health technologies are growing rapidly. The future of healthcare cannot be imagined without technology since it gives hope in solving basic problems of healthcare. The internet provides to have a source of information, which can be the start of changing a patient's or a caregiver's role, and another revolution is on the edge of happening in terms of treatment plans and doctor-patient partnerships. The importance of technology in healthcare cannot be denied. Patients have a get-together with digital health technologies that are personal health technologies, internet-connected devices, mobile health technologies, personalized genomics, artificial intelligence applications, virtual/augmented reality technologies, health insurance tech. Economic factors will influence the future of digital health. The pace of digitization of the healthcare industry will accelerate. Technologies will continue to dilute the waiting times and costs of treatments. These digitalized services will gain more popularity than traditional care components. Patients usually are seeing as in passive roles. Patient education is also a common way of upskilling patients. A higher-than-expected amount of patient education is needed as digital visual thinking strengthens opportunities and creates trust in a digital care pathway. Healthcare providers and care delivery services have been missing the opportunity of involving patients in their agendas and empowering them [3, 4].

### **Telemedicine and Remote Monitoring**

Health outcomes rely on access to care, effective treatments, and recognition of diseases, coupled with enhanced education and technology. When patients comprehend their health status, adherence improves. The information revolution and new devices foster empowerment, shifting healthcare delivery toward education and technology. With proper support, patients can manage conditions and lower health risks. Remote monitoring, a part of telemedicine, utilizes electronic technologies to aid healthcare across distances. Telemonitoring involves using various technologies to monitor patients remotely, incorporating audio and video. In practice, either the device travels with the patient, or they move to an equipped location for services. Advanced telecommunications now facilitate consultations between patients and providers. Traditional telemedicine services, primarily relying on telephone communication, have existed for years. However, telemonitoring may necessitate adjustments in healthcare practices, with existing delivery systems sometimes impeding its integration. Several pilot studies are evaluating the clinical and cost-effectiveness of networked monitoring systems with web access. Present remote monitoring systems are often specialized for specific patients or limited in the vital signs they track, usually managed by healthcare professionals, leading to a lack of integration. While the USA presents more comprehensive remote monitoring prospects, few have undergone rigorous evaluation [5, 6].

### **Wearable Health Devices**

A multitude of wearable health devices, evidently ranging from wristbands to insoles for shoes, contain various sensors that can monitor patient health data and remotely summarize the information with graphic trends. The collection of heart rate and electrocardiogram (ECG) data is the common tasks in wearable devices. Labeled wearables, including the widely popular health monitoring watches, can also assess blood oxygen concentration and sound out the users' alertness of potential arrhythmia. These devices measure distances, tracks change rates, and find speeds in motion with location-tracking. On the other hand, there are wearable motion sensors and electrodes that can track knee flexion/extension, neck range of motion (ROM), and surface electromyography (sEMG) signals. Some wearable devices are newly marketed to detect human body temperatures, sweat salts, and blood glucose levels. Wearable health technologies fall into two categories. The first category includes non-invasive and pseudo-invasive wireless sensor-based health monitoring devices. These devices allow for long-term long distance health monitoring while providing unparalleled accessibility to care providers and increasing health data to healthcare professionals/companies for developing care methods. The heart rate (HR) monitor, ear-oximeter, glucose sensor, and T-shirt sensors are examples of non-invasive devices, while the continuous glucose monitoring (CGM) is an example of the pseudo-invasive device. The second category focuses on the development of emerging smart fabrics for analyzing posture, gait, and audio frequency. Smart fabrics comprise wearable health sensors and textile substrates resulting in displacement, temperature, chemical compound, motion, posture, and audio frequency responsive character while preserving the properties of conventional fabrics. The fully integrated textile sensors can sense forces originating from body motion

**This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**

in the longitudinal and transverse directions, showing potential application in muscle fatigue detection. The audio frequency detection textiles can potentially serve as sleep quality and comfort-sensitive textiles. Overall, these approaches provide a comprehensive wearable health technology catalogue and update on recent trend analysis and comparison insight [7, 8].

#### **Educational Strategies for Patient Empowerment**

The approaches to empower patients from both a cognitive and emotional perspective that were specifically designed for the surgical process of ambulatory patients, as well as the patients' profiles, expectations, health literacy, and previously received education, are discussed in this section. The educational strategies for the cognitive and emotional empowerment of patients are based on. The educational strategies for cognitive empowerment include (a) clear and understandable principles on how to provide knowledge about effective anaesthesia and surgery both before and after surgery and (b) pre-surgical on-site informational events about the clinic's working procedures, which enhance the understanding of the process and provide an opportunity to ask questions. To meet patients' information needs leading to cognitive empowerment, it is important to provide individual on-demand information about anaesthesia and surgery through a variety of channels. The educational strategies for emotional empowerment include the attention, information, and use of effective distractions of the privileged adult child, who may be an important person to provide support during the process. The program starts with a couple of face-to-face contacts (in person or via phone), based on which a specific algorithm is applied. This algorithm consists of several stages: patient assessment, information provision, barrier identification and management, decision to participate, execution of the allocated activities, and impact assessment. Further, there is a procedure manual aiming to create and maintain the working environment, preparation, and reinforcement of the educational program and activities. The overall educational strategy is assessing readiness to change, barrier management, and DSMES delivery according to the ownerpatient's needs and expectations, shared decision-making, goal setting, and monitoring. It includes a multidisciplinary team participation and involves social partners in the process. The intervention assessment is carried out at various times, and both quantitative and qualitative measures of attitudes, beliefs, and knowledge are collected [9, 10].

#### **Barriers To Patient Empowerment**

Though patients may have initial access to health technology and education, they may still face obstacles in empowering themselves in health management. Not all patients are adept at the use of health technology. A poor understanding of technology could constitute a barrier to patient empowerment. Language issues may also exclude patients from the benefits of health technology that is designed specifically to support the health of individuals with chronic illnesses. For patients with limited ability to read or write in their native language, these barriers could be compounded. Older individuals may also have difficulty using some of the more recent technological innovations due to the potential unfamiliarity with these applications. Health literacy is key to the comprehension of health technology or materials. Health literacy refers to the roles of education, situational needs, personal needs and interests, complementary health care, and intermediary behavior. Lower health literacy may relate to lower health knowledge for both chronic and general health conditions. Patients who encounter literacy problems may feel ashamed and exclude themselves from the benefits of patient empowerment through technology. Patients who are incapable of converting knowledge into beneficial behavior may also not benefit from health technology and education. Access barriers may comprise the inability to control how knowledge, information, and health technology are used. For example, some applications are capable of sending inappropriate advertisements to patients' phones or collecting and selling private health information to third parties who may use data for unethical purposes. Since the concerns surrounding the protection of private patient information on the internet are not fully addressed, some patients may hesitate to share personal information to access the benefits of technological empowerment. Some patients may not be aware of all the available apps and resources or how to assess the quality of available apps and their appropriateness for their situation specifically [11, 12].

#### **Case Studies in Patient Empowerment**

E-patients are those who empower themselves and others by using information technology in their health care role. The trend of e-patients is spreading quickly globally, which may affect the physician-patient relationship. E-patients were interrogated to get their insights on digital health, e-patients, empowerment, and the future of the physician-patient relationship in an online survey. The answers help out understand the society and influence of e-patients better. Four main topics on trends of e-patients and technology were analyzed by the qualitative content analysis method. Considerations on the role of

**This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**

technology and empowerment of patients that e-patients are in authority to share their vision of care were asked. With empowering themselves, e-patients should also empower others; therefore, they shared their vision about empowering patients. Moreover, foreseeing in the future of patients, possibilities and challenges in the coming decades of patients were observed. In the survey about 500 American patients, e-patients are individuals who share their experience, filter the information using their knowledge, and empower others by informing what they know. E-patients also have a crucial role in validating the doctor and therapists, and they have the authority to share their vision of patient empowerment. Moreover, help to identify what to do with packet test results. By helping people to save lives, a patient empowered at Gilda's Club NYC. For psychosocial support and to promote the quality of life of individuals diagnosed with cancer, a patient empower with the Cancer Support Community is using technology globally. Other participants developed a peer coach program, a collaborative web application for patients and their families suffering from Michon's Disease. E-patients also foresee that the coming decades about digital health will change in terms of access to patient controlled data, transparency of health statistics and expectations about better health care. Access to health data will be permitted by regulation, genome and microbiome data will be used for health decisions, and hospital databases will be available and comparable globally. The transparency of health statistics will compare health of neighborhoods globally and assess health disparities in the thought the neighborhood perspective. Acknowledging that health care is a human right and that transparency protects individual rights, the critical information regarding cost and quality will be disclosed [13, 14].

### **The Impact of Patient Empowerment on Health Outcomes**

The empowerment of patients through technologies is a more recent approach that has proven beneficial for health outcomes, especially after the emergence of the COVID-19 pandemic. Overall, well-informed patients who are engaged in their own care and who are empowered by health technologies related to treatment can be expected to have improved health outcomes [15]. Health technologies can also help in knowing disease information and therefore empowerment. Empowered patients are those who know how their medications work, what to expect, and what possible complications or side effects there are following therapy. They know how to manage themselves at home and when their condition requires professional advice. With the use of health technologies, patients gain access to treatment-related information, such as what the examination will be like, how to prepare for MRI, CT, or ultrasound tests, or the questions to be discussed with physicians. This type of patient education can significantly decrease medication and treatment-related anxiety. The outcomes of the interdisciplinary group meetings conducted in both experts' and patients' compliance stages showed that there was a measurable increased confidence in the multidisciplinary team. Group members reported that interdisciplinary education improved patient compliance with medication and care. When all the healthcare workers involved in patient care work together to build a holistic picture of patients, the probability of such patients being compliant with treatment also increases. That is the magic of interdisciplinary health education, which uses social sciences and patient engagement techniques collectively. The empowering of patients through technology is an innovative approach that has a positive effect on treatment outcomes. It increases the chance of success in a health condition and improves the quality of life. The expected outcome of the e-patient initiative is a much lower expenditure for the drug which is achieved by a much better understanding and compliance with treatment [16, 17].

### **Future Trends in Patient Empowerment**

The health technology landscape is changing rapidly, with new usages, regulations, technologies, implementations, standards, services, and solutions appearing regularly. Patient empowerment, health literacy, and the new roles of patients and caregivers are evolving this field at the same pace. Artificial Intelligence (AI) is spreading in various ways and will eventually affect all aspects of life. Data management is becoming complicated as privacy regulations change in the European Union. These emerging technologies will change relationships. The interaction with teachers, mentors, parents, and physicians is out of control in many ways. It will need ethics-driven solutions to save the quality of these relationships. Further, within the next few years, a new era will emerge when Generation Z worldwide will change the digital ability of societies regardless of its economic, political, and educational status. These forces stimulate the changes in understanding and addressing patient empowerment and changing perspectives about health technology and education in the healthcare space. The digitisation of health education, the online presence of e-patients will increase rapidly via new formats and social media sites. The current e-patients' basic needs are health gathering, peer-to-peer knowledge sharing and support,

**This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**

and understanding views, questions, and preferences of professionals across social platforms. The next decade will mark the age of convergence, the online presence of medical doctors, and open information sources consisting of personal knowledge and health education platforms through social net sites. Expecting financially supported knowledge fulfilment and education for free from the commercial healthcare providers and biotechnology companies should be the priority in this rising market. Understanding patients' key views about empowerment via the parallel use of qualitative and quantitative methods might improve future health technology design [13, 18].

#### **Ethical Considerations**

Scholars argue that ethical dilemmas in eHealth are inevitable and require dedicated ethics research. The broad range of implicated stakeholders will create a complex network of responsibility that cannot be solved by technological or organizational measures alone without ethical examination. The following points outline ethical implications of the (possible) application of eHealth in primary care. Patients need to invest time and effort to understand the complex eHealth tools and their health information. There is a risk that patients are forced into a role for which they are not equipped and that patients without these necessary skills fall behind in care. In addition, this new role of patients requires a paradigm shift in primary care that should be considered by the implicated healthcare stakeholders. The (perceived) division of tasks between health technology and PCP has consequences for the professional identity of PCPs and their role in care, as well as for the role of health technology. In addition, responsible technology and health data handling policies regarding privacy require careful attention from implicated stakeholders. Shared Decision Making (SDM) is a process with ethical implications: is it desirable and is it ever possible to obtain truly shared decisions? If eHealth applications promote awareness of differences in perspectives, values, and beliefs between various stakeholders, they may have an important potential for reducing autonomy-related and trust-related problems. A third, more controversial possibility is for stakeholders to agree to disagree. The impact of this on primary care requires further exploration [19, 20, 21].

#### **CONCLUSION**

Empowering patients through health technology and education signifies a paradigm shift in healthcare delivery, promoting autonomy, engagement, and improved outcomes. As digital tools become more integrated into healthcare systems, the role of patients is expanding beyond passive recipients to active participants in their own care. However, this transformation is not without challenges. Inequities in access, literacy, and digital competence must be addressed through targeted education, supportive policies, and ethical standards. Healthcare professionals must collaborate with patients, offering guidance and reliable information while fostering trust. With continued innovation and a focus on inclusivity and human-centered design, the future of empowered healthcare will be characterized by greater transparency, stronger partnerships, and improved health equity.

#### **REFERENCES**

1. Vainauskienė V, Vaitkienė R. Enablers of patient knowledge empowerment for self-management of chronic disease: an integrative review. *International journal of environmental research and public health*. 2021 Jan;18(5):2247. [mdpi.com](https://doi.org/10.3390/ijerph18052247)
2. Hickmann E, Richter P, Schlieter H. All together now—patient engagement, patient empowerment, and associated terms in personal healthcare. *BMC health services research*. 2022 Sep 2;22(1):1116.
3. Mbunge E, Muchemwa B, Jiyane SE, Batani J. Sensors and healthcare 5.0: transformative shift in virtual care through emerging digital health technologies. *global health journal*. 2021 Dec 1;5(4):169-77.
4. Benis A, Tamburis O, Chronaki C, Moen A. One digital health: a unified framework for future health ecosystems. *Journal of Medical Internet Research*. 2021 Feb 5;23(2):e22189. [jmir.org](https://doi.org/10.2196/22189)
5. Omboni S. Connected health in hypertension management. *Frontiers in cardiovascular medicine*. 2019 Jun 13;6:76.
6. Ugwu CN, Ugwu OP, Alum EU, Eze VH, Basajja M, Ugwu JN, Ogenyi FC, Ejemot-Nwadiaro RI, Okon MB, Egba SI, Uti DE. Sustainable development goals (SDGs) and resilient healthcare systems: Addressing medicine and public health challenges in conflict zones. *Medicine*. 2025 Feb 14;104(7):e41535.
7. Nangalia V, Prytherch DR, Smith GB. Health technology assessment review: Remote monitoring of vital signs—current status and future challenges. *Critical Care*. 2010 Oct;14:1-8.

**This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.**

8. Jiang W, Majumder S, Kumar S, Subramaniam S, Li X, Khedri R, Mondal T, Abolghasemian M, Satia I, Deen MJ. A wearable tele-health system towards monitoring COVID-19 and chronic diseases. *IEEE Reviews in Biomedical Engineering*. 2021 Mar 30;15:61-84.
9. Wang WH, Hsu WS. Integrating artificial intelligence and wearable IoT system in long-term care environments. *Sensors*. 2023 Jun 26;23(13):5913.
10. Pardo M, editor. *Miller's Basics of anesthesia*. Elsevier Health Sciences; 2022 Jul 5.
11. Tobiano G, Carlini J, Chaboyer W, Liang R, Addy K, Sung L, Gillespie BM. Developing Implementation Strategies for the Adoption of the Enhanced Recovery After Surgery (ERAS) Protocols: A Co-Design Study. *Health Expectations*. 2025 Apr;28(2):e70254. [wiley.com](https://doi.org/10.1093/heap/28.2.e70254)
12. Schillinger D. Social determinants, health literacy, and disparities: intersections and controversies. *HLRP: Health Literacy Research and Practice*. 2021 Jul 1;5(3):e234-43.
13. Shahid R, Shoker M, Chu LM, Fréhlick R, Ward H, Pahwa P. Impact of low health literacy on patients' health outcomes: a multicenter cohort study. *BMC health services research*. 2022 Sep 12;22(1):1148. [springer.com](https://doi.org/10.1186/s12913-022-09113-1)
14. Nguyen AM, Rivera AM, Gualtieri L. A new health care paradigm: the power of digital health and e-patients. *Mayo Clinic Proceedings: Digital Health*. 2023 Sep 1;1(3):203-9. [sciencedirect.com](https://doi.org/10.1016/j.mcpdh.2023.09.001)
15. Frennert S, Petersson L, Muhic M, Rydenfält C, Nymberg VM, Ekman B, Erlingsdottir G. Materiality and the mediating roles of eHealth: A qualitative study and comparison of three cases. *Digital health*. 2022 Jul;8:20552076221116782.
16. Samoocha D, Bruinvels DJ, Elbers NA, Anema JR, van der Beek AJ. Effectiveness of web-based interventions on patient empowerment: a systematic review and meta-analysis. *Journal of medical Internet research*. 2010 Jun 24;12(2):e1286.
17. Aminabee S. The future of healthcare and patient-centric care: Digital innovations, trends, and predictions. In *Emerging Technologies for Health Literacy and Medical Practice 2024* (pp. 240-262). IGI Global Scientific Publishing. [\[HTML\]](#)
18. Kang HS, Exworthy M. Wearing the future—wearables to empower users to take greater responsibility for their health and care: scoping review. *JMIR mHealth and uHealth*. 2022 Jul 13;10(7):e35684.
19. Ramos M. Emerging Technologies in Radiotherapy: Advances in Health Literacy and Healthcare Practice. *Transformative Approaches to Patient Literacy and Healthcare Innovation*. 2024:89-110. [\[HTML\]](#)
20. Jacob C, Lindeque J, Müller R, Klein A, Metcalfe T, Connolly SL, Koerber F, Maguire R, Denis F, Heuss SC, Peter MK. A sociotechnical framework to assess patient-facing eHealth tools: results of a modified Delphi process. *NPJ Digital Medicine*. 2023 Dec 15;6(1):232. [nature.com](https://doi.org/10.1038/s41746-023-01000-0)
21. de Thurah L, Kiekens G, Weermeijer J, Uyttbroek L, Wampers M, Bonnier R, Myin-Germeyns I. Understanding appropriation of digital self-monitoring tools in mental health care: Qualitative analysis. *JMIR Human Factors*. 2025 Mar 3;12:e60096. [jmir.org](https://doi.org/10.2196/humanfactors.2024.12)

**CITE AS: Kibibi Muthoni L. (2025). Patient Empowerment through Health Technology and Education. Research Output Journal of Public Health and Medicine 5(2):38-43. <https://doi.org/10.59298/ROJPHM/2025/523843>**