

PATIENT AND PROFESSIONAL PERCEPTION OF AI IN HEALTHCARE IN EUROPE

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Innovation, Sustainability, and the Future of Healthcare Chapter 5 The success or failure of AI in patient care, treatment or management, hinges on patient and professional acceptance of these digital technologies.

However, we still have a limited understanding of how these innovations may be perceived by the professionals and patients who are expected to use them to make important healthcare decisions. This chapter draws together the existing literature to bridge this gap, covering results from multiple surveys and interviews with clinicians across various disciplines, different patient populations and the general public.

Two important messages emerge from the literature. Firstly, out of all the hopes and concerns, both **patients and professionals consistently agree that AI** healthcare innovations should be fully integrated within healthcare systems and **should complement the work of clinicians**, instead of replacing them.

Secondly, studies in this area are still relatively limited, particularly regarding patients' perspectives. **There is a pressing need for the development of comprehensive, large-scale studies** to understand patients' needs, expectations and concerns when it comes to AI applications. The results will be essential for developing a successful and patient-centred medical AI innovation pathway.

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1. INTRODUCTION

While, as previous chapters have outlined, there is a great amount of debate regarding the promise or hype surrounding the application of AI in healthcare, a recent United Kingdom House of Lords Select Committee on Artificial Intelligence report notes that the success or failure of AI in patient care, treatment or management, will hinge on patient and professional acceptance of these technologies [1]. Although research outlining direct patient responses to the prospect of AI-based healthcare innovations is underdeveloped [2], the commentaries that do exist paint a cautious picture [3] with clear preferences and fears that will be explored within this review.

2. HEALTHCARE PROFESSIONALS' PERCEPTION OF AI

As noted by the previous chapter [4], the professional group who are most active in their support of AI and machine learning are radiologists [5], [6]. However, not all clinical specialities are so positive regarding the prospect of the widespread deployment of AI healthcare technologies. A recent survey of 791 Psychiatrists [7], representing 22 countries across the world, 47% of which were European, found that 83% of participants predicted that AI would replace human clinicians in tasks of documentation in the future, with 47% of these agreeing that this would likely happen in the next four years. 47% of participants also believed that it was likely that AI would be able to replace clinicians in data synthesis and diagnostic tasks. The results from this study are, however, not clear cut. Most participants (83%) believed that AI would not replace the key task of providing empathy to patients and 67% believed that AI would not be able to undertake mental health examinations. Participants were also asked whether they believed the potential benefits outweighed possible risks. Within the European sample, 38% believed the potential benefits did outweigh the potential risks, 24% believed they did not and the remaining 37% were uncertain. Finally, the study recognized that it would be important to examine the views of patients suffering from mental illness regarding the impact of AI on psychiatry and mental health services. Yet, no study of this kind has been undertaken.

A qualitative study of 720 general practitioners' (GPs) views on AI carried out in the United Kingdom [8] found an overwhelming consensus that the potential of AI was quite limited. In agreement with the previous study [7], the authors found that the dominant view of GPs was that AI would reduce the burden of administrative tasks, such as writing referral letters or analysing pathology reports. But there was also strong agreement that AI would and should not replace the GP in both clinical reasoning and empathy related tasks.

A novel interview-based qualitative study of 40 healthcare AI specialists in France [9] found widespread concern that AI innovations in healthcare might become 'consumer goods' with little practical utility. This claim highlights the concern that private interests may overrun clinical utility in the development and deployment of AI innovations in the healthcare

setting, and the cost would be felt by the patients. In this study there was an overwhelming consensus that AI should not replace healthcare professionals making clinical decisions but would best serve as an aid in clinical decision making (they use the term 'supervised machine-learning techniques' to describe this). And while they reported that there was overall support for AI in the healthcare context, this was a measured support, with several respondents stating that they believe that some tasks may be fully automated at some point in the future.

3. PATIENT PERCEPTION OF AI IN HEALTHCARE

Promoting patient co-production

We currently lack sufficient empirical evidence to develop a clear understanding of how patients will perceive or react to AI innovations in healthcare. While much of the existing literature draws on the views of healthcare professionals, who often infer what the interests of patients may be [9] [10], there is little research documenting the patients' own views [2], [6]. In Laï et al.'s [9] study, a patient association representative explained that this may be because patients find it difficult to express an informed view when there is little consensus even among those developing the innovations as to what constitutes AI and/or machine learning. The patient association representative also claimed that patients felt as though they had not been effectively consulted by industry with regards to their needs. The report by the Royal Society for the Encouragement of the Arts (RSA) on patients and AI [10] similarly noted the importance of patient involvement in the medical innovation, development and translational pipeline, and pointed out the scepticism that is often voiced by patients is rarely a consequence of ignorance or a lack of interest (the report quotes an NHS clinical chair stating that patients often had an acute understanding of some of the consequences of AI in the healthcare context; they specifically questioned what would happen if the clinician disagrees with the AI system).

There are no clear guidelines for patient involvement currently in place in the United Kingdom. The recommendation given by the RSA report was that formal guidance documents should be produced to tackle unanswered questions, such as the one given by the patient cited above, and that patients should be involved in the production of, and have easy access to, this guidance. The fundamental point here is to understand the patient as part of the community that arrives at the consensus of what constitutes AI in healthcare, and what that innovation is for, and as an active participant in defining how such innovations could best be developed to suit existing needs and preferences.

Patient trust and innovation

A commentary written by patients and published in the British Medicinal Journal (BMJ) [3] identified key concerns regarding the integration of AI innovations within the healthcare context. While the authors of this commentary do not represent the general patient population as they all have a professional interest in healthcare, the concerns they identify are further explored here in relation to the issues raised by healthcare professionals in the previous section. In the same vein as the critique offered in the French study of healthcare AI specialists [9], the first concern relates to the consequences of overly "hyped" innovations that may be prematurely translated into the healthcare context, leading to patients bearing the brunt of unmet promises. Such a concern was voiced by patients within a Syneos Health Care Communications study of patient perceptions of AI innovation in healthcare [6]. The preferred providers of AI in healthcare were doctors (56%), hospitals (44%) and the National Healthcare System (39%); whereas the least "trustworthy" providers were drug manufacturers (8%) and technology companies, such as Google, Amazon and Facebook (14%).

AI and the "Human Touch"

Other concerns identified in the BMJ commentary [3] can be categorized under the umbrella of the inability of AI to replace the "human" aspects of healthcare. Much like the points raised by psychiatrists [7] and GPs [8], the authors do not believe AI will be able to replace humans in providing empathic responses to patients. They are also concerned that reducing patients to data will diminish doctor-patient relationships, leading to less shared decision-making in healthcare practice. The BMJ commentary can be summarized with the argument that while AI has the potential to become a powerful aid in healthcare, it will never replace humans in doctor-patient interactions because AI cannot care in the same way as a human can. While this commentary is helpful in framing some of the humanistic concerns relating to the prospect of AI in healthcare, the authors' expert involvement in the issue leads to a perspective that may not reflect that of the broader European public. Thorough empirical studies of patient perceptions of specific AI applications will be needed to fully understand these emerging dynamics. I discuss some starting points for such an investigation below.

Keeping healthcare professionals in the driving seat

In a large online survey of 12,000 participants across Europe, the Middle East and Africa, PricewaterhouseCoopers (PwC) attempted to gather the views of the general public regarding the perceived advantages and disadvantages of AI robotics in healthcare [11]. They reported widespread support for AI and medical robotics in general, with only those in the United Kingdom and Germany being more unwilling than willing to engage with AI and robotics for

their healthcare needs. However, when breaking down AI and robotics into specific services the extent of support becomes less clear. Across all countries included in the survey participants were more willing than unwilling to use an intelligent healthcare assistant via their mobile phones, tablets or personal computers. Yet, when specific scenarios of services were presented, there was no AI service that the majority of participants were willing to receive. There was, however, a clear preference for monitoring services such as cardiac monitoring (37% were willing to receive this service). When asked about more invasive interventions such as surgery, participants were less willing to replace humans with AI or robotics. The only European countries whose population were more willing than unwilling to have minor surgery conducted by a robot were the Netherlands (47%) and Norway (46%).

The main advantages of AI and robotics in healthcare, according to the PwC study, relate to efficiency. 34% of participants agreed that AI would make gaining access to healthcare easier, and 31% agreed that AI had the potential to lead to faster and more accurate diagnoses. The main disadvantages of AI and robotics in healthcare were related to the risk associated with the absence of specialist, human professionals to provide the "human touch" (47%), to deal with unexpected issues (38%), and to be trusted to make the right decisions (36%). This mirrors the concern voiced by healthcare professionals detailed in the previous section.

Although the PwC report is misleading in its assumption of overwhelming support for AI and robotics in healthcare by the general public, the data presented identifies an interesting set of issues worth further exploration. It shows that participants are in principle more willing to accept less invasive healthcare AI for monitoring. There is also broad acceptance for mobile intelligent healthcare assistants, and a clearly positive perception for the role of AI in improving the efficiency of, and access to, healthcare. However, it is quite clear that there is little support for scenarios in which AI or robotics fully replace healthcare professionals, and support decreases as the invasiveness of the medical intervention increases. Further research is needed to validate or qualify these findings.

In their survey of approximately 800 participants with existing chronic conditions from across Germany (16%), Spain (14.7%), France (15.5%), Italy (14.5%), the United Kingdom (19.5%) and the United States (19.8%), Syneos [6] found that when patients were initially asked to define AI, they drew upon science fiction analogies such as robotics, but during focus groups this was refined to voice fears regarding machine autonomy and the need to maintain human control. When asking more specific questions regarding the prospect of the use of AI in healthcare, Syneos found that 63% of European participants were at least "somewhat excited" about how AI might change healthcare; however, they equally found that 57% of European participants were at least "somewhat concerned" about how AI may change healthcare. This split in patient perception reflects the wide range of possibilities offered by AI innovators in the healthcare field. When given more specific choices, patients did not show a clear preference, yet it was clear that the least favoured option was the use of AI to replace a function currently fulfilled by a healthcare professional, with only 16–24% agreeing this

would be favourable. The preferred scenario was complementarity, in which the AI works with healthcare providers in a "supportive capacity" (28–34% of participants agreed with this scenario).

AI in healthcare and autonomy

In the previous sections I have noted that both patients and healthcare professionals are concerned by the prospect of autonomous AI healthcare innovations that work independently of healthcare professionals. However, one of the major benefits of AI in healthcare identified by patients and professionals is the imagined ability of new technologies to improve the efficiency of existing systems to increase professional autonomy by freeing healthcare professionals from bureaucratic tasks.

An additional aspect of autonomy that deserves further exploration is the role of AI in improving patient autonomy. Concerns regarding patient autonomy have been given considerable attention by advocates and critics of AI innovations in the healthcare context. For example, in her argument for value-flexible AI in medicine, McDougall [12] critiques IBM Watson for Oncology. She notes how it informs clinical decision-making by generating treatment recommendations in a manner that is essentially concealed from the patient. The system gathers information from a variety of sources, such as patient records, demographic information and stage and type of cancer; the data is then analysed and a list of generated treatment options are presented, with supported evidence listed against each option. McDougall's concern is that the goal for the technology is to maximize lifespan, which may be considerably different to the goal of the patient receiving the treatment. McDougall's observation contradicts the IBM Watson for Oncology promotional material which is framed around facilitating shared decision-making between clinicians and patients. However, she argues that the position of IBM Watson for Oncology challenges the fundamental nature of patient autonomy as it pre-assumes patient values, and as such offers a restricted set of options biased towards a certain outcome.

In contrast, a clinical evaluation study carried out on 20 patients, as part of the development of an intelligent decision-support system for patients with chronic conditions [10], was specifically designed to capture patient preferences as part of their shared decision-making (SDM) platform. The study pre-empted the critique offered by McDougall [12] by designing the SDM pathway to elicit patients' preferences in a tool alongside evidence-based medicine. For example, they included indicators such as subjective perception of health; and they included in their decision model patient preferences including No Therapy, even in situations in which such an outcome would substantially increase the risk of an adverse event. While this study does not comment on how the patients reacted to the SDM model, it does show the potential of developing an AI application that engages with patients' needs and preferences and circumvents some of the issues relating to patient autonomy in the deployment of AIbased SDM tools discussed previously.

A study utilizing the French 'Community of Patients for Research' (ComPaRe) cohort aims to investigate how chronic patients perceive wearable biometric monitoring devices and AI in healthcare [2]. A total of 1183 participants were enrolled, with 54% having more than one chronic condition. Although there is no information regarding prior use of AI-based healthcare technologies, 50% of participants report using e-health or m-health tools (these include direct-to-consumer technologies, such as smartphone applications or wearable health monitoring devices, as well as prescribed monitoring devices, such as continuous glucose monitoring, and internet-based health services, such as online appointment booking services). Much like the Syneos study [6], this research found that 50% of patients felt that the development of AI tools in healthcare was an important opportunity, while 11% thought it was a danger. Moreover, they found that 35% of participants would refuse to integrate one or more of the AI interventions presented to them into their care. They also gathered open-ended responses regarding the perceived benefits and risks of digital technologies and AI in healthcare as has been summarized in Table 1.

The authors note that the most common risk or barrier to using AI in healthcare is opposition to the replacement of human care, followed by concerns over data security [6]. The greatest benefit identified is related mostly to AI innovations, combined with wearable biometric monitoring, and the ability to improve patient follow-up via remote monitoring and telecare. While the authors of this study recognize that members of ComPaRe do not represent the general patient population due to their interest in research, this remains one of the few examples in which research was undertaken to assess patients' perception of the use of AI in healthcare beyond specific use cases, such as AI-based Diabetic Retinopathy screening [13]. As such, it provides important initial insight into an under-researched area. The authors of the study claim that their results may help explain the low levels of follow-up in large-scale digital monitoring strategies, such as MyHeart Counts [14]. The results of this study and the Syneos [6] study highlight that European patients prefer AI technologies that help clinicians come to decisions, but believe that the decisions and recommendations should ultimately remain a human task. Even those most willing to adopt AI technologies in their care viewed AI as complementing human care, not replacing it. This has important consequences for the future of direct-to-consumer AI healthcare technologies, such as Babylon Health, which is supported by the United Kingdom's NHS as discussed in detail in Case Study 1 of this report [15].

Table 1. A summary of perceived risks and benefits of AI in healthcare by patients with chronic conditions (Adapted from Tran et al (2019)) [2]

	Risks/Barriers		Benefits
٠	Technology will require an overhaul of the	٠	Improving access to care
	care system	•	Improving the follow-up of patients
•	Increasing risk of data misuse	•	Reducing the burden of
٠	Intruding in patients' lives		treatment/improving patient responsibility
•	Risk of hacking	•	Improving caregivers' work/improving
•	Reliability issues/risk of errors		efficiency and increasing automation of
•	Replacing the human in care is unwanted		repetitive tasks
•	Impairing patient-caregiver	•	Improving communication in care
	relationships/reducing patients' voice	•	Facilitating the prediction and prevention
•	Having a negative impact on patients'		of health events
	health behaviours/false reassurance	•	Lowering the risk of medical
•	May not be accessible to everyone		mistakes/improved traceability of data
		•	Economic and environmentally friendly
		•	Accelerating research

4. CONCLUSION

The number and scale of innovations related to AI in healthcare have grown exponentially over recent years. Yet, we still have a limited understanding of how these innovations may be perceived by the professionals that will be working with them and by the patients that will be experiencing them in their therapeutic trajectories. This chapter draws together the existing literature in an attempt to bridge this gap.

A clear message that emerged from initial research in this area is that both patients and professionals believe that AI healthcare innovations should be fully integrated within healthcare systems to complement healthcare professionals, instead of replacing them. This concern encompasses many of the fears associated with AI in healthcare as identified by patients, such as the risk of unchecked errors and the fear associated with the consequences of private industrial interests on personal healthcare choices. Moreover, it explains other emerging insights from the literature, such as support for AI innovations that aid administrative clinical tasks, improve the communication between patients and clinicians, and increase patient autonomy within shared decision-making models or diagnosis, treatment and chronic condition management.

Finally, it is important to recognize the position patients could take in the AI healthcare innovation pathway. It is clear that patients across Europe have a strong sense of their preferences and needs in relation to AI healthcare innovations. Integrating their perspective within the development and translation of AI healthcare innovations could circumvent many of the challenges currently experienced by innovators.

REFERENCES

- [1] Select Committee on Artificial Intelligence, "AI in the UK: Ready Willing and Able?," House of Lords, London, 2018.
- [2] V.-T. Tran, C. Riveros and Ravaud, "Patient' Views of Wearable Devices and AI in Healthcare: Findings from the ComPaRe e-cohort," *NPJ Digital Medicine*, vol. 2, no. 53, pp. 1-8, 2019.
- [3] M. Mittelman, S. Markham and M. Taylor, "Patient Commentary: Stop Hyping Artificial Intelligence - Patients will always need Human Doctors," *British Medical Journal*, vol. 363, pp. 1-2, 2018.
- [4] B. O'Carrigan and S. Ahmed, "Is the European healthcare system ready for the AI revolution? An appraisal of the skills," 2020.
- [5] SFR-IA Group; CERF; on Behalf of the French Radiology Community, "Artificial intelligence and Medical Imaging 2018: French Radiology Community White Paper," *Diagnostic and Interventional Imaging*, vol. 99, pp. 727-742, 2018.
- [6] Syneos Health Communications, "Artificial Intelligence for Authentic Engagement: Patient Perspectives on Healthcare's Evolving AI Conversation," Syneos Health Communications, North Carolina, 2018.
- [7] P. M. Doraiswamy, C. Blease and K. Bodner, "Artificial Intelligence and the Future of Psychiatry: Insights from a Global Physician Survey," *Artificial Intelligence in Medicine*, vol. 102, 2020.
- [8] C. Blease, T. Kaptchuk, M. Bernstein, K. Mandl, J. Halamka and C. DesRoches, "Artificial Intelligence and the Future of Primary Care: Exploratory Qualitatice Study of UK General Practitioners' Views," *Journal of Medical Internet Research*, vol. 21, no. 3, pp. 1-10, 2019.
- [9] M.-C. Laï, M. Brian and M.-F. Mamzer, "Perceptions of Artificial Intelligence in Healthcare: Findings from a Qualitative Survey Among Actors in France," *Journal of Translational Medicine*, vol. 18, no. 14, pp. 1-13, 2020.
- [10] A. Singh, "Patient AI: Towards a Human-Centres Culture of Technological Innocation in the NHS," The Royal Society for the Encouragement of The Arts, Manufacturing and Design, London, 2019.
- [11] PricewaterhouseCooper, "What Doctor? Why AI and Robotics will Define New Health," PricewaterhouseCooper, 2017.

- [12] R. J. McDougall, "Computer Knows Best? The Need for Value-flexibility in Medical AI," *Journal of Medical Ethics*, vol. 45, pp. 156-160, 2019.
- [13] S. Keel, P. Y. Lee, J. Scheetz, M. A. Kotowicz, R. J. MacIsaac and M. He, "Feasibility and Patient Acceptability of a Novel Artificial Intelligence Based Screening Model for Diabetic Retinopathy at Endocrinology Outpatient Services: A Pilot Study," *Nature: Scientific Reports,* vol. 8, no. 4330, pp. 1-6, 2017.
- [14] M. V. McConnel, A. Shcherbina, A. Pavlovic, J. R. Homburger, R. I. Goldfeder, D. Waggot, M. K. Cho, M. E. Rosenberger, W. L. Haskell, J. Myers, M. A. Champagn, E. Mignot, M. Landray, L. Tarassenko, R. A. Harrington, A. C. Yeung and E. A. Ashley, "Feasability of Obtaining Measures of Lifestyle From a Smartphone App: The MyHeart Counts Cardiovascular Health Study," *JAMA Cardiology*, vol. 2, no. 1, pp. 67-76, 2017.
- [15] S. Ahmed, "Case Study 1: Babylon," This report, 2020.
- [16] A. Sissons, "Chapter 6: The path towards integrating," 2020.
- [17] S. Nundy, T. Montgomery and R. M. Wachter, "Trust in Health Care: Promoting Trust Between Patientt and Physicians in the Era of Artificial Intelligence," *Journal of the American Medical Association*, vol. 322, no. 6, pp. 497-498, 2019.
- [18] L. Sacchi, S. Rubrichi, C. Rognoni, S. Panzarasa, E. Parimbelli, A. Mazzanti, C. Napolitano, S. G. Priori and S. Quaglini, "From Decision to Shared-Decision: Introducing Patients' Preferences into Clinical Decision Analysis," *Artificial Intelligence in Medicine*, vol. 65, pp. 19-28, 2015.