From HCI to HCE (Human-Computer Extraction): Opposing the Shift Toward Data-Centric AI in Patient Care

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ABSTRACT

The tension between Human-Computer Interaction (HCI) and healthcare stems from differences in priorities, methodologies, and constraints, such as user-centred design vs clinical constraints, innovation vs regulation, participatory design vs medical authority, and technology acceptance vs clinical workflow integration.

This tension is evident in AI-driven health agents, which are reshaping patient-clinician interactions and shifting the paradigm from Human-Computer Interaction (HCI)—augmenting human agency—to Human-Computer Extraction (HCE), where patients are primarily data sources for system optimisation. This shift introduces cognitive burden, patient frustration, and ethical concerns regarding autonomy and trust.

Balancing AI efficiency with meaningful human interaction remains a challenge. While HCI emphasises user-centred design, healthcare prioritises accuracy and safety, often at the cost of patient experience. For example, AI-driven symptom collection tools, though intended to standardise data, risk making patients passive contributors rather than active participants in their care.

This provocation critiques the human cost of AI efficiency in healthcare and calls for a broader discussion on what constitutes a valid interactive health contribution and raises the question of how HCI & Health should assess AI's role in patient engagement.

CCS CONCEPTS

• Human Centered Computing • Interaction Design

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KEYWORDS

Human Computer Interaction, Artificial Intelligence, Healthcare, Symptom Checkers, patient experience, Human Centred design

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1 From HCI to HCE: The Growing Role of AI as an Intermediary

Human-Computer Interaction (HCI) has historically aimed to enhance user experience, empowering individuals in their interactions with technology. However, AI-driven healthcare tools are moving toward Human-Computer Extraction (HCE), where the primary goal is to collect structured, standardised patient data, with limited intention to facilitate meaningful interaction.

Recently, we began working on a project funded by NIHR titled *'Artificial Intelligence to support early diagnosis in general practice'* (AI-DIP). This project aims to evaluate and adapt an artificial intelligence agent that gathers medical history and symptoms from patients before the clinical consultation, with the goal of improving early cancer detection. From our experience working with AI agents for symptom extraction to enhance diagnosis, we have found that while these tools aim to streamline clinical workflows, they often introduce challenges that compromise patient experience. For instance, patients are frequently required to manually input medications by name, a process that is both time-consuming and prone to errors, thereby increasing cognitive load. Additionally, these AI systems pose repetitive and non-contextual questions, failing to adapt to individual patient inputs and leading to frustration. Moreover, patients often encounter irrelevant queries that do not pertain to their

specific symptoms or are expected to interpret unfamiliar clinical terminology (e.g. 'productive cough'), further disengaging them from the process. Consequently, these AI agents can burden users with rigid, impersonal processes that prioritise data collection over meaningful human interaction.

A systematic review by You et al. (2023) also found similar issues. The authors highlighted that while symptom checkers are designed to assist users in identifying potential diagnoses, they frequently lack comprehensive medical history support and flexible symptom input methods. This inflexibility can lead to increased cognitive load and frustration among patients. Additionally, the study found that users often perceive these tools as lacking comprehensible questions and adaptability to individual inputs, resulting in a rigid and impersonal interaction.

Moreover, the lack of transparency in these AI systems leaves patients uninformed about the rationale behind specific questions or data collection methods. This opacity can lead to confusion and diminish trust in the system (Quinn et al., 2021).

2 The Consequences of Extraction: Erosion of Patient Autonomy and Trust

The HCE design risks alienating patients in several ways:

- Patients become passive data providers, reducing their engagement and sense of agency in their own care.
- Direct patient-clinician engagement is diminished if clinicians over-rely on AI-extracted summaries, potentially leading to diagnostic anchoring, biases and overlooking nuanced patient narratives.
- Clinical trust is undermined when AI-generated reports fail to reflect patients' actual concerns, compromising trust in the clinical process.

Research on AI-driven symptom collection highlights similar concerns: AI may introduce biases, reduce physician autonomy, and undermine patient trust, particularly when systems prioritise structured data over contextual understanding. This approach can lead to erroneous medical evaluations, potentially resulting in misdiagnoses and patient dissatisfaction. For instance, a review on the fairness of AI in healthcare highlights concerns about biases in AI systems leading to discrimination and impacting patient health outcomes (Ueda et al., 2024). Additionally, discussions on trust and medical AI emphasise that failures in AI systems can erode public trust in healthcare, especially when these systems lack transparency and contextual sensitivity (Quinn et al., 2021).

3 LEARNING FROM INTERDISCIPLINARY CONTRIBUTIONS

In the realm of Human-Computer Interaction (HCI) and healthcare, several studies have critically examined the limitations of a purely human-centered design (HCD) approach, especially when it lacks integration with clinical workflows and considerations.

For example, van Velsen et al (2022) critically examine the constraints of human-centred design in eHealth, highlighting that while HCD emphasises user needs, it often overlooks the complexities of clinical environments, leading to solutions that may not align with healthcare practices.

Similarly, Sharma and Shrestha (2024) propose an integrative framework for incorporating HCI principles into AI-driven healthcare technology through interdisciplinary collaboration. Their work emphasises the development of systems that enhance human capabilities while considering ethical aspects, advocating for responsible AI and effective human-AI collaboration.

These studies underscore the necessity for a balanced and more interdisciplinary approach that integrates human-centred design with the practical demands of clinical settings to create effective and adoptable healthcare technologies.

4 Call to Action: Defining Valid Contributions in AI-Driven Healthcare

To better align AI-driven healthcare solutions with both HCI principles and clinical priorities, it may be beneficial to consider the following criteria when assessing contributions:

1. Patient-Centred AI: Contributions should demonstrate how AI enhances patient autonomy, trust, and engagement rather than treating individuals as passive data sources.
    - *Reflective Question*: Should AI-driven symptom collection be judged purely by efficiency, or by its impact on patient experience and autonomy?
2. Contextual Adaptability: AI systems must be adaptive to diverse patient needs, adjusting questioning dynamically rather than following rigid decision trees.
    - *Reflective Question:* How can we balance the AI "need" to gain as much information as possible from the patient to just enough information to enhance diagnostic accuracy?
3. Integration with Clinical Workflow: Contributions must illustrate how AI complements existing healthcare processes without increasing cognitive burden for clinicians or patients.

- *Reflective Question:* What strategies can be employed to ensure AI-driven tools integrate seamlessly into existing clinical workflows without introducing additional cognitive burdens for healthcare providers?

4. Ethical, Transparent, and Explainable Design: AI systems must uphold ethical standards by ensuring transparency and providing clear, understandable explanations for their operations and decisions to both patients and clinicians. This approach fosters informed consent, enhances patient understanding, and builds trust in AI-driven healthcare solutions.

    - *Reflective Question:* How can AI systems be designed to prioritise patient privacy, data security, and offer intuitive explanations that enhance patient engagement and trust?

5. Bridging HCI and Healthcare Constraints: Contributions should balance user-centred design with clinical realities, ensuring solutions are both usable and clinically valid.

    - *Reflective Question*: In what ways can interdisciplinary collaboration between HCI researchers and healthcare professionals be fostered to create AI solutions that are both user-centred and clinically effective?

By contemplating these criteria and associated questions, researchers and practitioners can engage in a more nuanced discourse on developing AI-driven health innovations that are ethical, effective, and aligned with both patient and clinical needs. This provocation paper serves as a catalyst for discussing what constitutes a meaningful contribution within the eHealth community, particularly in the realm of interactive health technologies.

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