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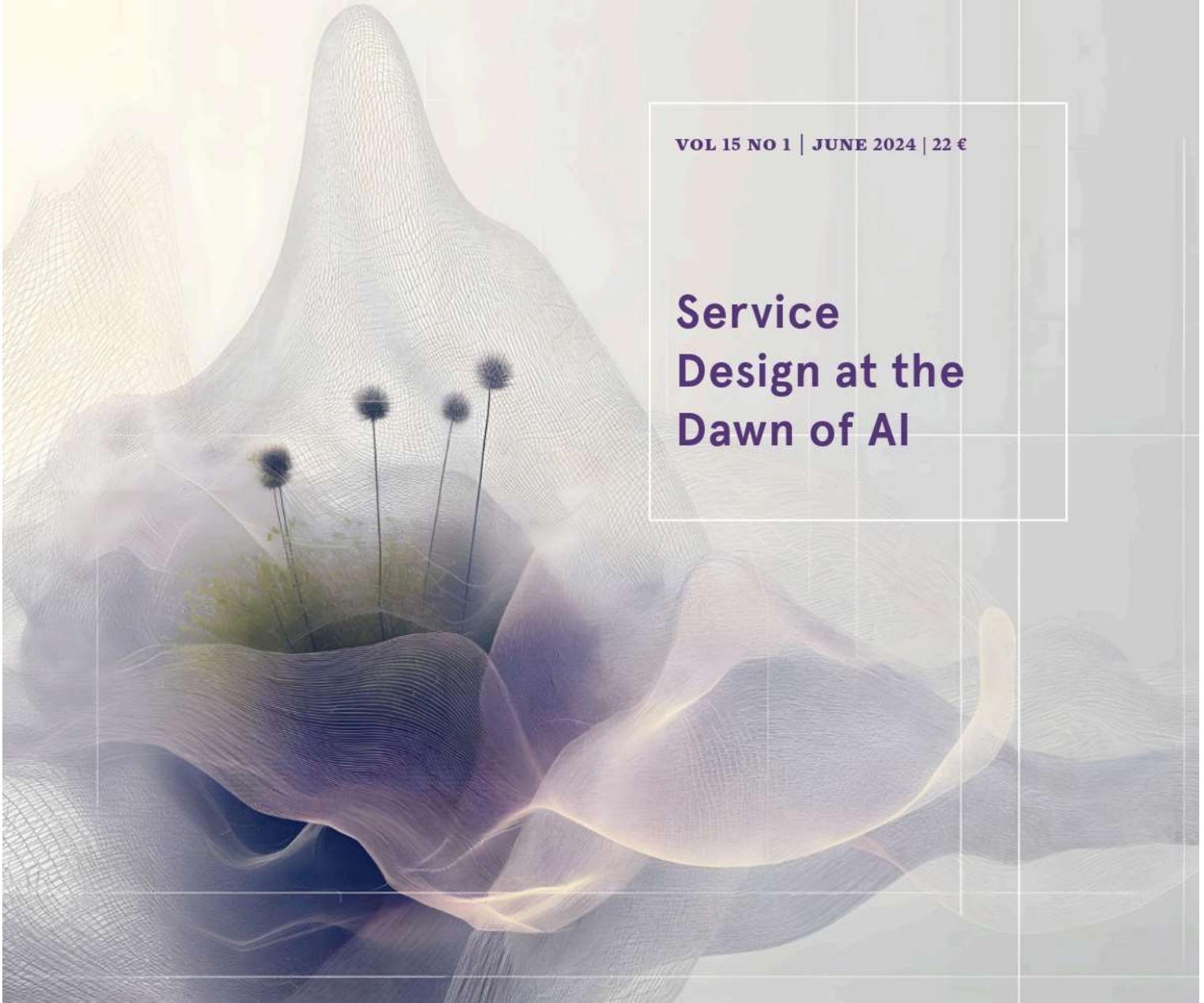
Service Design at the Dawn of AI



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A Blueprint for 'Care-Centred AI'

Placing patients and caregivers at the forefront of academic medicine's AI strategy

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Artificial Intelligence (AI) promises to revolutionise how healthcare organisations serve patients but harnessing this technology to design better services is fraught with unknowns and confounders. This is particularly true at academic medical centres, where orchestrating care is complex. To help leaders and clinicians at academic medical centres consider, develop and roll out AI-enabled services, we are proposing a blueprint called 'Care-Centred AI' (CCAI). This framework reimagines technology's place in the delivery of complex care and reprioritises the patient-caregiver relationship in care delivery. Furthermore, the CCAI framework takes into account the strategic importance of leveraging data in an ethical way to further enable innovation and care across clinical pathways and operational value chains.

The role of data and AI in academic medicine

The integration of data and AI stands as a pivotal element in transforming healthcare, particularly within the realm of academic medicine. As healthcare executives across both private and public healthcare institutions unite to forge impactful data and AI strategies, the disparity in success among academic medical institutions becomes evident due to balancing the complexities of care orchestration and the intricate lifecycle of academic research and discovery. Still, the opportunity for data and AI to drive exponential transformation within academic medicine is vast and still largely untapped, presenting endless possibilities for innovation, efficiency and improvement in patient outcomes.

AI is changing the way medical knowledge is created, shared and applied. Researchers can now swiftly and accurately analyse multimodal datasets, expediting discoveries and providing diagnostic support in critical fields such as genomics, epidemiology, pharmacology, radiology and pathology. By unveiling patterns and connections that might remain obscure to human researchers, AI is fast-tracking the identification of disease markers,

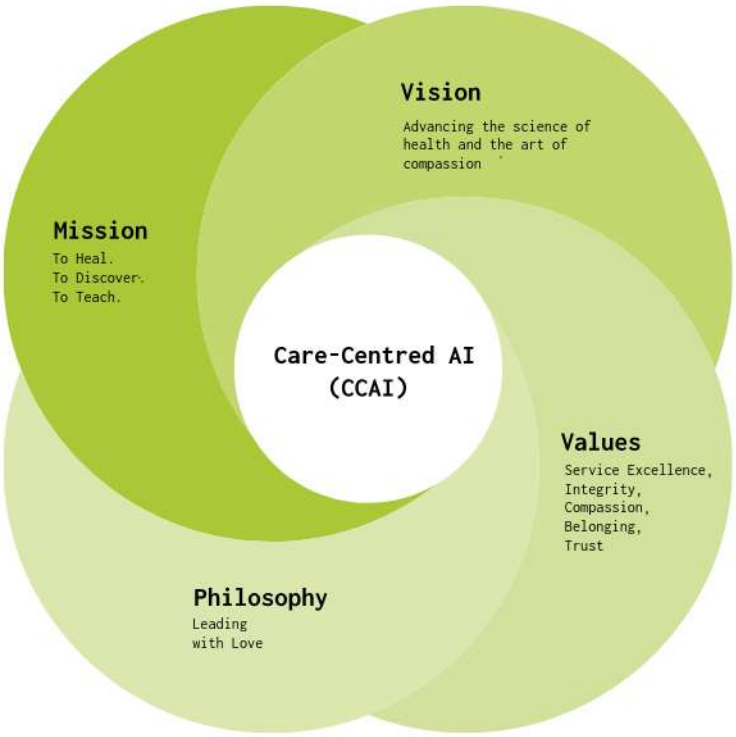

Fig. 1: Foundational components of the 'Care-Centred AI' framework

therapeutic targets and insights into disease mechanisms. Furthermore, AI is refining the efficiency of clinical trials by enhancing patient selection, trial design and data discovery, which enables institutions to establish new revenue mechanisms in collaboration with industry partners and drive better outcomes more efficiently. Lastly, predictive analytics, powered by AI, is being used to uncover insights from multi-source datasets to forecast disease outbreaks and the effects of public health measures, thereby informing research directions and policy decisions.

Despite the advancements in clinical technology, healthcare has only just begun to realise AI's potential when it comes to reimagining the patient-caregiver relationship, the cornerstone of care.

Rethinking care delivery

As we embark on the new era of AI in healthcare, we have an opportunity to rethink the disruptive presence of technology in healthcare and thoughtfully re-centre the patient-caregiver relationship as the central touchpoint. Over the past year, University Hospitals Ventures has been collaborating with key internal system stakeholders and external subject matter experts to ideate and formally deploy an enterprise data and AI care delivery strategy. Throughout this journey, we needed to construct principles to guide the effort that work for an academic medical institution like UH. Building upon our organisational mission, vision and values[1], and the 'Leading with Love'[2] philosophy, we created the Care-Centred AI (CCAI) framework. This framework transcends our hospital system and can be applied broadly to healthcare delivery.

'Care-Centred AI' defined

Care-Centred AI proposes a holistic and integrated framework that balances and honours the needs, values and well-being of both patients and caregivers through the implementation and use of AI. The revolutionary element of this framework is the emphasis placed on the needs of caregivers. Historically, healthcare has implemented technology on to caregivers, rather than with them. By taking their needs into account, we are able to reduce technological burden and frustration, assign technology a more appropriate place in care delivery, and re-centre the crucial patient-caregiver relationship.

Core tenets of Care-Centred AI:

- **Put the patient-caregiver relationship at the centre** – Acknowledge the foundational patient-caregiver care relationship and equally prioritise the needs, preferences and values of both, ensuring that AI tools are designed and deployed to enhance the quality of care, support decision-making processes and improve outcomes for all.
- **Create a healthcare stakeholder ecosystem** – Assemble and engage a collaborative team with active participation from a diverse group of stakeholders, including patients, caregivers, policymakers and technologists.
- **Define the problem** – Support cross-functionals team to identify the problem first. Ensure the problem considers multiple perspectives before evaluating AI technology as a possible solution.
- **Ensure transparency and clarity** – Emphasise the importance of transparency and clarity in AI systems, so that caregivers and patients can comprehend how decisions are made. This aspect is crucial for building trust between humans and AI systems, ensuring that users can rely on AI recommendations with confidence.
- **Build from human behaviours, ethics and norms** – Ensure that AI systems are developed in a way that is compatible with human behaviours, ethics and societal norms. This principle ensures that AI technologies are not only technically proficient but also align with the moral and ethical expectations of society, making them desirable tools for healthcare practitioners and patients alike.
- **Inspire innovation and creativity for all caregivers** – Encourage the collaborative development of AI that inspires and enables innovation and creativity among healthcare professionals. By providing tools and insights, AI can uncover new opportunities for improving care delivery, diagnostic processes and treatment methodologies, benefiting the entire healthcare ecosystem.

The patient-caregiver relationship

By acknowledging the foundational care relationship with patients on one side and caregivers on the other, CCAI deeply integrates the considerations of human needs, ethical standards and societal values into the lifecycle of AI technologies.

Historically, technology in healthcare has been given to caregivers, with little consideration of the impact on their relationship with patients. This approach has led to the dominance of computers in clinical settings, sitting directly between the caregiver and their patient. This is a frustrating experience for both. It is critical to balance the needs of both and recognise the way they impact each other. We have taken each group's needs into account by creating principles for each group, and we prioritise both equally. These principles are thoughtfully considered through the

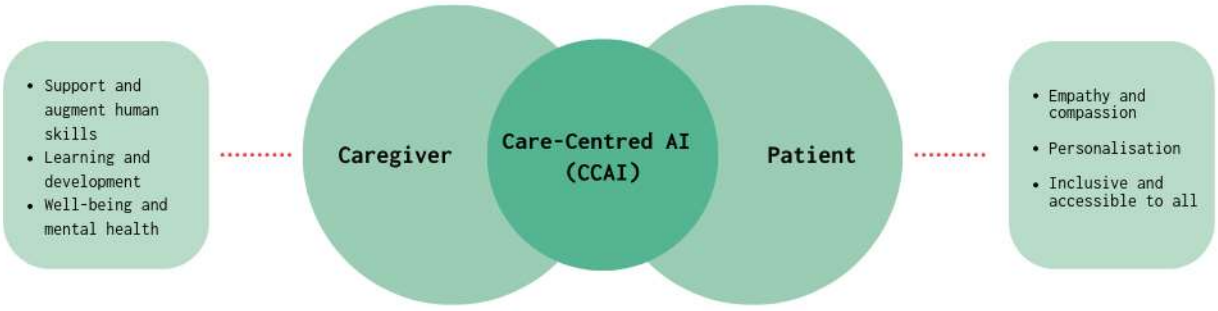

Fig. 3: Care-Centred AI as the interface between caregiver tenets and patient tenets

conception, development, deployment and usage phases, ensuring that these technologies enhance the healthcare experience for patients and empower caregivers.

Core tenets of the patient side:

— **Prioritise empathy and compassion** – AI technologies are designed and implemented to understand and adapt to the emotional states, needs and preferences of patients, ensuring that care is compassionate and empathetic.
— **Make it personalised** – Leveraging AI to provide personalised care plans that consider the patient's medical history, genetic information, lifestyle and preferences, thereby improving outcomes and patient satisfaction.
— **Inclusive and accessible to all** – Ensuring AI tools are accessible to all patients, including those with disabilities or those from underrepresented backgrounds, to overcome disparities in healthcare access and quality.

Core tenets of the caregiver side:

— **Support and augment human skills** – AI serves as a tool to augment the caregivers' capabilities, assisting with diagnostic processes, administrative tasks and predictive analytics to alleviate burnout and allow more time for direct patient care.
— **Incorporate learning and development** – Build AI into educational tools that facilitate ongoing learning and professional development for caregivers, keeping them abreast of the latest medical research, treatments and care practices.
— **Prioritise well-being and mental health** – Recognising the mental health challenges faced by caregivers, AI applications offer support through reducing caregiver burden, monitoring well-being and providing resources for mental health.

Designing with all stakeholders: Applying care-centred AI for healthcare transformation through collaborative innovation ecosystems

One of the core tenets of Care-Centred AI is the creation of a collaborative stakeholder group. This approach fosters interdisciplinary research and development by encouraging collaborations among medical professionals, patients, AI researchers, ethicists, social scientists and designers. It is critically important that the stakeholder team identifies impactful problems to solve before identifying AI as the solution. In a world where AI is the proposed solution to all the world's challenges, remaining focused on the problem ensures that solutions that meet patient and provider needs are created and evaluated.

To support this agenda, specialised AI programs, such as the 'UH Veale Initiative for Healthcare Innovation'[3] and the 'UH Radiology AI & Diagnostic Innovation Collaborative'[4] (RadiCLE) are driving care-centred AI transformation. These endeavours are ultimately guided by comprehensive policies and governance structures that uphold the ethical use of AI, ensuring that the integration of technology into healthcare amplifies the quality of care without compromising the rights and well-being of patients and caregivers. Through this collaborative ecosystem, CCAI seeks to harness the collective expertise and values of all stakeholders to navigate the complexities of integrating AI into healthcare responsibly and effectively.

One example, led by the 'Veale Initiative for Health Care Innovation', is UH's 'Intelligent Hospital Room' project. UH has long known, like most hospitals systems, that nursing capacity is limited, and that the pipeline of new nurses is not keeping up with demand. By early 2023, addressing this issue had become one of UH's top priorities. Nurses were experiencing acute challenges with their workload and were reporting historic levels of burnout. Without additional support, their ability to meet their patient's needs was beginning to fray. As we began to lay the groundwork for the Veale Initiative, we identified this space as a critical area to explore. We assembled a team of clinicians, nurses, nursing leaders, technologists and innovators to approach this issue, which we framed in the following way: 'Our limited nursing capacity drives frustration, harm, inefficiency and attrition'.

From this simple problem statement, we developed the following solution hypothesis (i.e. the way in which we believe we might make a meaningful impact on the problem): 'We believe a state-of-the-art 'Intelligent Hospital Room'

platform, which uses AI-enabled AV technology, could act as a force multiplier, helping to reduce the burden on our caregivers and free up urgently needed capacity'.

In one scenario, the AI system has been trained to spot patients who might be at risk of a fall and alert the remote nurse who can, in turn, communicate with the patient and co-ordinate with bedside staff. Averting a fall is a big 'win' for all involved. Doing so more efficiently and effectively lightens the load for overburdened caregivers and prioritises personalised interactions with patients.

The system offers countless such examples of ways to simultaneously improve care and the caregiver experience. In collaboration with our technology partner, we have installed an initial 130 systems across four hospitals, with additional pilot sites on the way. Nurses have long desired to reclaim their time and offer better bedside care. The 'Intelligent Hospital Room' aims make that a reality.

Another example at UH that is grounded in the CCAI framework is the 'Radiology AI & Diagnostic Innovation Collaborative', known as 'RadiCLE'. RadiCLE was borne out of the increasing demand for industry-academic collaboration. Big and small radiology solution providers began to ramp up R&D initiatives around AI solutions, which meant they needed real-world data for model training, testing and clinical validation to get through FDA approval.

Knowing this, cross-functional leaders from the Department of Radiology, IT and UH Ventures collaborated to construct a programme dedicated to advancing the frontiers of radiology AI and drive clinical integration through industry partnerships, while also acting as an additional revenue driver for the institution. The initiative collaborates closely with industry stakeholders to design, develop, train, validate and implement AI solutions in radiology.

A tangible example that showcases RadiCLE's approach is a recent collaboration with a France-based radiology AI start-up to train, test and validate an AI solution aimed at boosting the speed and accuracy of fracture diagnosis and solve for the problem of missed fractures.[5] This process along with all other RadiCLE projects are carried out with the highest ethical standards, ensuring that all data is de-identified, anonymised and utilised in a manner that respects patient privacy and ethical guidelines.

Moreover, RadiCLE places a strong emphasis on developing AI solutions that are not only beneficial but also desired by the radiology community. It prioritises technologies that complement rather than replace the expertise of radiologists, ensuring these innovations enhance rather than disrupt their workflow. To this end, RadiCLE engages directly with clinical champions from within UH for every project, fostering a collaborative environment where technology meets practical clinical needs. This approach ensures that the advancement of AI in radiology are responsible, aligned with the real-world demands of healthcare professionals, and care-centred.

Conclusion

The Care Care-Centred AI framework is resonating well within University Hospitals. We continue to design care delivery experiments that leverage the approach. Thoughtfully centring the patient-caregiver relationship and developing tenets for both sides ensures new AI technology meets the needs of both and improves care delivery for all.

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