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Human-centered design approaches in health sciences research

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Introduction

In the rapidly evolving field of health sciences, traditional paradigms of research and innovation are being challenged by a growing recognition of the need for more inclusive, empathetic, and context-sensitive approaches. Human-Centered Research Design(HCRD) has emerged as a transformative methodology that prioritizes the lived experiences, beliefs and values, socio-economic and religious contexts, and needs of individuals and communities into the core of health research and innovation.[1-2] HCRD is recognized for addressing complex social challenges related to health, development, and well-being.[3] This editorial highlights the principles, applications, benefits, and challenges of HCRD in health sciences, arguing for its central role in shaping equitable and impactful health interventions.

Principles of human-centered research design

HCRD can be broadly conceptualized as a methodological framework that integrates iterative cycles of divergent and convergent thinking.[4] Through these alternating modes of exploration and synthesis, the process seeks to harness the benefits of addressing complex challenges and generating solutions from a human-oriented perspective.[2-4] At its core, this approach emphasizes the prioritization of human needs, experiences, and values, while simultaneously negotiating the constraints imposed by practical, technological, and organizational realities.HCRD focuses on engaging end-users to understand their needs, behaviors, values, and preferences to create products, services or systems that are effective, efficient, and enjoyable.[5,6]

By balancing empathy-driven inquiry with feasibility considerations, HCRD facilitates the creation of solutions that are not only innovative but also contextually viable, socially acceptable and sustainable.[4] Thus, the essence of HCRD lies in understanding the emotional, social, and cultural dimensions of health experiences.

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Empathy is the cornerstone of HCRD.[6] It requires researchers to engage deeply with the perspectives of patients, caregivers, and communities. An empathy map provides a way to gather experiences at the individual level, allowing the collection of narrative stories and observations, and facilitating their organization into categories such as sensory perceptions, needs, and insights.[2] This empathetic engagement fosters trust and opens avenues for richer insights. For example, in designing maternal and child health interventions in low-resource settings, it is crucial for researchers to understand local beliefs around marriage, pregnancy, childbirth, immunization and family dynamics to improve community acceptance and better outcomes. Empathetic listening is important for the development of culturally sensitive tools that resonate with local and marginalized populations.

Co-creation is another defining feature of HCRD.[1,2] It is often described as an iterative, collaborative and people-centered approach for solving complex challenges. It involves stakeholders in every phase of the research process, from problem identification, planning, implementation, monitoring, and evaluation. This participatory approach democratizes knowledge production and ensures that solutions are not only scientifically sound but also socially acceptable, technically feasible, economically viable, and environmentally friendly. Co-creation also empowers communities by validating their expertise and fostering a sense of ownership over health innovations.

The iterative nature of HCRD allows for continuous refinement of interventions based on user feedback.[1] Unlike linear research models, HCRD resolves ambiguity and adapts to emerging insights.[2] Prototypes are tested in real-world settings, and modifications are made in response to user experiences. This flexibility is particularly valuable in complex health systems where variables are dynamic and unpredictable. For example, using HCRD hospitals can effectively redesign patient flow and reduce waiting times by iteratively mapping and improving service touchpoints. By mapping patients' journeys and listening to frontline staff, researchers can identify pain points not just in the system but in human interactions. This ensures that solutions are grounded in the realities of those who use and deliver health services.

Methodological Approaches

HCRD is both a methodological framework and a mindset that prioritizes human needs in problem-solving. It employs tools and techniques to identify opportunities and generate innovative solutions, ensuring outcomes are meaningful and relevant to users.[2] The design process often begins with in-depth exploration and incorporates diverse perspectives during problem identification.[6] It is important to assemble a diverse team within and outside of academia. The team explores existing research and evidence and also seeks aspirations from the potential users. The team critically reviews the gathered evidence to evaluate past successes and failures and discusses with real users about the potential intervention approaches. After hearing the opinions, the study team includes diverse voices and feedback.[2, 6]

HCRD makes use of qualitative or mixed methods to study and improve health systems and patient experiences. These methods include ethnographic research, journey mapping, participatory workshops, and rapid prototyping.[1] Together, they provide a comprehensive approach that combines observation, visualization, collaboration, and experimentation to generate meaningful insights and practical solutions.

Ethnographic research plays a central role in this process by allowing researchers to observe behaviors and interactions in natural settings. This method helps capture the everyday realities of patients, caregivers, and health professionals, offering a deeper understanding of social and cultural contexts.[2] Journey mapping complements ethnography by visually representing the patient's experience over time. It highlights key stages, challenges, and emotions in the care process, making complex experiences easier to analyze and communicate.

In addition, participatory workshops create spaces for collaborative ideation, where diverse stakeholders can share perspectives and co-design solutions. Rapid prototyping further strengthens this process by enabling tangible exploration of ideas. By testing and refining prototypes, researchers and participants can evaluate potential interventions in practice, ensuring that solutions are both innovative and grounded in real-world needs. Together, these methods make HCRD a dynamic and inclusive approach to health research and design.

Applications of HCRD in Nepal

HCRD has been adopted widely for global health innovations, focusing on marginalized and underserved populations. In public health, HCRD has enhanced the effectiveness of interventions by aligning them with community norms and behaviors.

In Nepal, the adoption of HCRD in health innovations will be useful in addressing the needs of marginalized and underserved populations. For example, digital appointment systems could be designed in hospitals with patient input to ensure they are accessible even to those with low digital literacy. By emphasizing culturally sensitive approaches, HCRD will help the development of patient-centered care models for

chronic disease management, community-driven strategies for infectious disease prevention and digital health literacy.

Evidences from various studies suggest that interventions designed with HCRD principles enhance acceptability, usability, and community engagement, fostering stronger trust between healthcare providers and patients.[1-4] In the Nepali context, long-term empirical data on health outcomes is still scarce, underscoring the need for rigorous evaluation frameworks that integrate HCRD with health impact assessments to ensure sustainability and measurable improvements in public health.

Challenges

Although HCRD offers significant promise in improving health systems and patient experiences, it also faces several challenges that limit its wider application. One major concern is resource intensity, as the approach requires considerable time, funding, and skilled facilitation to be effective. In addition, researchers must undergo specialized training to develop competencies in design thinking and cultural sensitivity, which are essential for engaging diverse communities and ensuring meaningful outcomes.

The use of HCRD involves a broad range of methods and techniques that are applied selectively based on the requirements of each design case. Given the diversity of reporting formats, evaluators and researchers must be able to assess study quality through an evidence-based lens.[1]

Reporting standards for HCRD in health research are difficult to apply in single studies due to complex multimethod processes.[1] Separate reports and innovative formats, such as registered reports, can strengthen methodological rigor. Future work should also establish practitioner guidelines for stakeholder engagement that account for roles, expertise, and power dynamics.

Beyond these practical demands, HCRD often encounters institutional inertia, with traditional academic and clinical structures resisting change and innovation. This reluctance can slow the adoption of new methods and limit opportunities for experimentation. Furthermore, scalability remains a persistent issue, as solutions developed through highly customized processes may not easily generalize across different populations or contexts. These challenges highlight the need for sustained investment, capacity building, and institutional openness to fully realize the potential of HCRD.

Conclusion and way forward

For health sciences to develop lasting interventions, HCRD must move beyond small-scale, specialized uses and be adopted as a mainstream approach. This transition requires significant changes in how academic work is valued and practiced. Incentives must shift to reward co-design with communities and recognize impact in real-world contexts. Methodological innovation is also essential, including the development of clear reporting standards and clear approaches to evaluation. Equally important is ethical rigor, ensuring that participation is equitable and that benefits are fairly shared among those involved.

Interventions designed through HCRD are more likely to be usable, acceptable, and equitable. They stand a greater chance of delivering meaningful health improvements because they are shaped by the realities of those who will use them. In this way, HCRD strengthens both the scientific validity and the practical relevance of health research.

At its core, HCRD asks researchers to adopt a new mindset. It calls for humility about the limits of existing knowledge and confidence in the value of listening. It encourages trading some certainty for relevance and some speed for durability. Placing humans—with all their complexity, context, and dignity—at the center is not simply a design preference. It is the ethical, scientific, and pragmatic path forward.

By centering human experiences, HCRD challenges the power dynamics inherent in traditional research. It calls for genuine participation, transparency, and ongoing informed consent. It also raises questions about data ownership and benefit sharing, emphasizing the need for communities to retain control over their contributions.

Declaration

During the preparation of this work, the author used ChatGPT to improve the readability of the manuscript. The author then reviewed and edited the content as needed and takes full responsibility for its content.

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