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Human-Centric Information Systems Research on the Digital Future of Healthcare

Indranil Bardhan,[a] Rajiv Kohli,[b] Eivor Oborn,[c] Abhay Mishra,[d] Chuan Hoo Tan,[e] Monica Chiarini Tremblay,[b] Suprateek Sarker[f,*]

[a] McCombs School of Business, The University of Texas at Austin, Austin, Texas 78712; [b] Raymond A. Mason School of Business, William & Mary, Williamsburg, Virginia 23186; [c] Warwick Business School, The University of Warwick, Warwick CV4 7AL, United Kingdom; [d] Ivy College of Business, Iowa State University, Ames, Iowa 50011; [e] Department of Information Systems and Analytics, National University of Singapore, Singapore 117417; [f] McIntire School of Commerce, University of Virginia, Charlottesville, Virginia 22903

*Corresponding author

Contact: indranil.bardhan@mccombs.utexas.edu, https://orcid.org/0000-0002-4265-5780 (IB); rajiv.kohli@mason.wm.edu, https://orcid.org/0000-0001-6588-6664 (RK); eivor.oborn@wbs.ac.uk, https://orcid.org/0000-0003-0566-4327 (EO); abhay@iastate.edu, https://orcid.org/0000-0002-2448-0139 (AM); tancho@comp.nus.edu.sg, https://orcid.org/0000-0003-4031-6010 (CHT); monica.tremblay@mason.wm.edu, https://orcid.org/0000-0003-1289-6679 (MCT); ss6wf@virginia.edu, https://orcid.org/0000-0002-8079-3121 (SS)

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1. Introduction

Over the past decades, information systems (IS) scholars have explored a wide variety of healthcare research topics involving emergent challenges and the technologies to address them. The enduring characteristics of healthcare, such as its complexity, stakeholder groups with competing interests, and diversity of healthcare systems worldwide, continue to provide a rich and challenging research landscape. Being at the intersection of two dynamic industry sectors—information and communication technology (ICT) and healthcare—digital health has played a pivotal role in addressing challenges within the healthcare sector. Its importance to society's economic prosperity, human wellness, dignity, and prosperity further underscores the significance of healthcare IS research. The rapidly evolving healthcare landscape calls for sustained attention from IS scholars as emerging technologies create unprecedented opportunities for impactful research.

Artificial intelligence (AI) applications in healthcare offer significant potential for transformative impact. For example, digital avatars powered by AI are a promising treatment for schizophrenia-related auditory hallucinations, offering hope to patients for whom traditional therapies have fallen short.[1] Similarly, the integration of AI into healthcare workflow extends to precision medicine as demonstrated by the Parkland Center for Clinical Innovation (PCCI) in Dallas, TX (Julka and Alvarez 2019, p. 7). As an illustrative example of precision medicine, PCCI's Prevention of Adverse Drug Events (PARADE) system exemplifies how machine learning can enhance clinical decision making by analyzing 59,000 data points across 140 patient features to identify high-risk patients and trigger preventive pharmacist consultations. Such personalized innovations represent a growing potential for AI to make a substantial difference in delivering health and well-being.

These innovations not only advance clinical practice but also, contribute to theory development in healthcare IS research. PARADE's implementation has revealed unexpected sociotechnical patterns that challenge existing assumptions about adverse drug events. For instance, Spanish-speaking patients, despite being categorized as high risk, demonstrated lower consultation needs because of the mediating role of interpreters in the medication process. Similarly, the system uncovered how institutional contexts affect risk profiles, revealing that patients from jails or correctional facilities faced elevated risks because of delays in

medication reconciliation processes. These findings exemplify how AI-driven systems can uncover complex interactions between social, technical, and organizational factors, contributing to what Tremblay et al. (2021, p. 456) term "theories in flux."[2]

Nevertheless, as IS scholars, we must acknowledge that our tendency to focus on technology's positive potential should be balanced with careful consideration of its unintended consequences and contextual challenges (e.g., Chatterjee and Sarker 2024, Yoo et al. 2024). Technological implementations often create unexpected ripple effects throughout healthcare organizations, affecting workflows, professional relationships, and patient care in ways that may not be immediately apparent (Essén and Värlander 2019). Field research is particularly crucial in uncovering these nuanced impacts as many of these unintended consequences become visible through observation and engagement with healthcare practitioners in their natural settings.

We study the evolving landscape of healthcare IS research in this editorial. Drawing on our collective expertise in health IS research, we begin with our perspective on past research, focusing on research published in the most recent decade, which we classify into six themes ranging from online patient-physician engagement to digital health strategy. We then identify four clusters of emerging healthcare IS research to highlight the most recent topics. Based on these emerging research clusters, we identify three areas of future research opportunities, which include ICTs in health crises, innovation across health systems, and AI-enhanced treatments. Through an examination of health IT research across diverse healthcare systems worldwide, we aim to inspire scholars to undertake impactful studies that advance both theory and practice in healthcare IS. Finally, we present a guiding framework for healthcare research that integrates these various perspectives.

2. Evolution of Healthcare IS Research

In an earlier *Information Systems Research* (*ISR*) special issue, Fichman et al. (2011) identified three key themes for future healthcare research: evidence-based medicine, social media in healthcare, and personalized healthcare. Subsequently, in an *MIS Quarterly* editorial, Bardhan et al. (2020) emphasized the need to expand research beyond healthcare providers to include other stakeholders, such as patients, payers, and pharmaceuticals. They advocated for an ecosystem approach toward value-based healthcare, where value constitutes efficient and effective delivery of "outcomes that matter" (Teisberg et al. 2020, p. 682). In a curation of healthcare-related articles published in *MIS Quarterly*, Baird et al. (2020) noted the role of information technology (IT) in healthcare as a strategic asset in the process of IT adoption and use, privacy and security, information and communication technologies for development, and their increasing focus on patient impact. Together, these editorials and the curation highlight the need to further grow scholarship around an expanding field with a variety of perspectives and methods.

To develop insight into the research conducted on healthcare IS, we employed topic modeling to extract themes from the abstracts of published editorials and healthcare papers in five leading journals, *ISR*, *MIS Quarterly*, *Management Science*, *Journal of Management Information Systems*, and *Journal of the Association for Information Systems*, from 2013 to 2023. Our editorial does not aim to be exhaustive by covering a wider range of IS journals and conferences; instead, by focusing on these journals, we hope to shed light on the current fields of work and provide meaningful directions for future research. The keywords generated by topic modeling analysis were used as inputs to large language models (LLMs) to generate topic names. We then refined these topics for coherence and interpretability to identify six themes. Within each theme, we synthesize the key research ideas and discuss a few selected papers in greater detail. Appendix A summarizes the distribution of IS publications by research theme.

2.1. Theme 1: Online Patient-Physician Engagement

The papers on this theme emphasize online interactions between patients and physicians, online reviews provided by patients on physicians, and the relationships between these reviews and patient care outcomes. Studies examining interactions among patients contribute to understanding how digital technologies assist patients in managing their health, self-care, and relationships with healthcare providers. This research suggests that social support in online healthcare communities benefits patients' mental health and aids in self-management of their disease (Yan and Tan 2014). For example, mobile health (mHealth) platforms have been found to empower patients and improve health behavior, self-management, and health outcomes among chronic disease patients (Ghose et al. 2022). Liu et al. (2023b) studied how physician-driven online health communities facilitate patient-physician collaborative care and the impact of patient self-management and the patient-physician relationship in managing conditions, such as diabetes and depression.

Further, the role of online platforms, mobile health tools, and personalized recommendations have been examined to study their impact on patient engagement and empowerment (Jiang and Cameron 2020, Bao and Bardhan 2022). Studies examining interactions between patients and physicians suggest that personalized patient-physician interactions assist individuals in identifying interventions that suit their needs,

fostering continuous engagement in health management (Zhou et al. 2023a). These interactions achieved through online communities as well as in hospital settings can also increase patient and physician participation and improve patient-physician relationships and well-being (Liu et al. 2023b). Finally, studies on online reviews of physicians by patients suggest that although there is no significant relationship between physicians' adherence to clinical guidelines and their online reviews (Saifee et al. 2020), there is some evidence of an association between clinicians' use of electronic health records (EHRs) and their overall star ratings.

Research on this theme has significantly contributed to our understanding of how patient participation in the care process, through online interactions, can have beneficial effects on their health. We believe that this stream of research can contribute further to the extant literature by examining whether such interactions can lead to changes in treatments, use of health IT among providers, and offline patient-physician interactions.

2.2. Theme 2: Health Risk Prediction

The papers on this theme focus on managing health-related risks through advanced quantitative models and analytics and developing predictive tools to address chronic diseases and adverse health events, such as patient readmissions, emergency room visits, and mortality. Studies examining risk identification and mitigation focus on a wide variety of health conditions. For instance, Meyer et al. (2014) examined improving treatment strategies for type 2 diabetes mellitus by predicting and eliminating treatment failures based on electronic medical records. Ahsen et al. (2019) developed a bias-aware classification algorithm to reduce the impact of bias on breast cancer diagnosis, improve expected patient life years, and improve the accuracy of decisions based on mammography. Other studies have examined the role of patient engagement and care coordination for healthcare risk management and predictive analytics by drawing on data from online health communities, social media, and electronic health records (Ghose et al. 2022, Xie et al. 2022).

These insights inform the design of interventions and strategies to improve patient engagement, adherence to treatment, and health outcomes. For example, advanced AI methods, such as natural language processing and deep learning, have been used to extract insights on medication adherence, treatment planning for diabetes patients, and opioid use disorders. These include a sentiment-enriched deep learning method to extract reasons for medication nonadherence from social media data (Xie et al. 2022) and classification techniques to improve decision-making strategies in dynamic environments. Studies examining patient risk prediction for adverse health events have developed machine learning-based models to predict patient readmission risk. For instance, Bardhan et al. (2020) observed that implementation of cardiology and administrative information systems was associated with a reduction in the propensity and frequency of future readmissions, respectively.

Research on this theme has demonstrated the efficacy of quantitative models and machine learning in predicting health risks and treatment methods that are likely to be effective. We believe that this stream can contribute further to our understanding of health risk prediction in new areas by developing machine learning- and AI-inspired models for patient risk stratification, disease progression modeling, and prediction of drug-drug interactions.

2.3. Theme 3: Healthcare Pathways and Health Outcomes

With a strong individual-level focus, research on this theme has focused on structured clinical pathways[3] to identify "at-risk" patients, provide preventive care, and coordinate care by deploying health information technology to evaluate and improve healthcare delivery processes. These studies demonstrate the potential of health IT to optimize healthcare pathways, reduce costs, and enhance patient health outcomes. Specifically, these studies focus on clinical interventions, treatment regimens, and decision-making processes, and they examine technological innovations for preventive and more active care. For example, recent research highlights how telehealth can be utilized to improve preventive and reactive care at the individual patient level (Ayabakan et al. 2024). In a study examining the potential of AI, Jussupow et al. (2021) examined computer-aided diagnosis systems within hospitals, demonstrating that AI-supported decision making provides greater insights into the cognitive challenges of augmenting decision making and that human decision makers can compensate for technological errors.

It is interesting to note that research on this theme has also examined the temporal displacement of activities in clinical care pathways, which entails deviations from the ideal or planned timing of specific interventions or procedures within care pathways developed by clinicians (Thompson et al. 2020). These deviations can be warranted if specific patients, providers, or other health factors necessitate departures from established protocols. AI has emerged as an important area of study across several clinical areas as well as the changing nature of workforce skills (Lebovitz et al. 2021). Although AI-supported healthcare can overcome human biases, studies have shown that AI can also introduce new systemic biases, which can have significant outcomes on clinical pathways and patient care (Arora et al. 2023b).

Hence, research on this theme has demonstrated that IT can play an important role in standardizing *and*

personalizing patient care. The key challenges that remain are to examine how to combine data and analytics-based information with physicians' intuition and training to obtain optimal outcomes for patients by standardizing and/or personalizing treatments in different combinations.

2.4. Theme 4: Societal Health

With greater availability and access to health-related data, healthcare IS research has turned toward studying the impact of information technologies on societal-level phenomena, such as population-level mitigation of chronic diseases, and online social initiatives that provide health advice to the general public, often outside formal healthcare settings. Research on this theme has generally dealt with preventative care rather than reactive care within a hospital or healthcare organization. A focus on prevention enables early detection of diseases and intervention, resulting in lower healthcare costs and improved societal health. One example is the development of the Smart Asthma Management system, a healthcare IS that utilizes Bluetooth-enabled inhalers to collect detailed usage data, enhancing asthma self-management and improving the detection of abnormal inhaler use patterns. This innovation offers significant advancements over traditional clinical trial methods by providing real-time, high-resolution data for analysis (Son et al. 2020). Similarly, research frameworks have been proposed to address chronic health conditions by identifying at-risk populations, such as diabetes patients, and accelerating their screenings, testing, and treatment to earlier stages to improve long-term outcomes (Thompson et al. 2020). For instance, a recent case study demonstrated how a state government built data and technology capabilities to learn from the opioid crisis and develop digital resilience during coronavirus disease 2019 (COVID-19) to address health crisis management, enhance public health infrastructure, and create value in healthcare systems (Tremblay et al. 2023).

Prior research on this theme has also examined racial and gender inequities in healthcare and the roles that peripheral actors play in societal health. For example, taking a qualitative ethnographic approach, Barrett et al. (2016) observed that peer support in online health communities can increase citizen engagement in their health needs. Their study shows how actors who have often been considered peripheral to care, such as health charities and pharmaceutical firms, can add value to these online communities. Such studies demonstrate that societal-level engagement with the formal healthcare system can deliver greater patient value. Another aspect of societal health is the growing focus on resource-limited settings and the potential to learn across global care contexts. For instance, ICT initiatives have been shown to positively impact maternal health outcomes in rural India by addressing key success factors in patient care (Venkatesh et al. 2020).

Research on this theme has contributed significantly to our knowledge of how information technology and digital health initiatives can enable appropriate interventions and improve societal health. The key challenges remaining in this domain are to examine how the twin aspects of societal/public health initiatives and the healthcare system can jointly share timely information and improve health outcomes.

2.5. Theme 5: Privacy and Security

Studies on this theme focus on security threats and protection of health information to maintain privacy while leveraging advanced technologies for healthcare. Privacy and security of patient health data are particularly important because of regulations related to the use and storage of strictly protected health information (PHI). Prior studies in this domain address challenges related to data security, privacy-preserving data collection, and securing health information systems. Migration to EHR systems raises significant privacy and security concerns, particularly regarding PHI leaks. For example, Kim and Kwon (2019) observed that implementation of EHR systems leads to a 3.081 times higher risk of a breach of patient information, whereas adoption of meaningful use initiatives increased the risk of accidental breaches 1.771 times. By examining access control policies and leak scenarios gathered from healthcare practitioners, Valecha et al. (2021) developed and tested a model to detect and mitigate these leaks, improving privacy protections in healthcare systems.

Because data sharing is essential to enhance the timeliness and quality of healthcare data, Anderson et al. (2017) proposed balancing information sharing with privacy protection. Their longitudinal case study of a health information exchange demonstrates the practical application of information security control theory in healthcare and addresses the tension between information sharing and privacy protection in mobile health applications. Other researchers have focused on the important role of regulations on the privacy of health data. For instance, Miller and Tucker (2018) examined state-level genetic privacy laws, and they found that regulations that give individuals control over redisclosure encourage the spread of genetic testing but receiving notifications about privacy risks deters them from obtaining genetic tests. Along the same lines, Buckman et al. (2023) observed that the need to verify personal information with government-approved documentation decreased vaccine demand, but this effect was offset when individuals were able to remove information from an immunization registry. Overall, this theme highlights the importance of understanding the regulatory and governance context of data and systems and

how they work together in enabling or constraining liability.

Research on this theme has contributed significantly to our knowledge of the privacy and security aspects of patient health data and sharing among different stakeholders, the adverse implications of data breaches, and policies and practices to prevent such breaches. This stream of research can be further enhanced by examining data ownership policies, patient empowerment, and analytical frameworks for addressing ransom requests by hackers.

2.6. Extant Theme 6: Digital Health Strategy

Published research on this theme investigates how technology and analytics support strategic decision making in healthcare organizations and health systems. This research has focused on the business value and impact of health IT while evaluating its role in helping healthcare providers assume greater risk as the market shifts toward value-based care reimbursement models. Research examining value-based care is important to address the need to maximize healthcare quality while managing rising costs, especially with new payment reforms shifting away from fee-for-service reimbursement. Focusing on these aspects, Bao and Bardhan (2022) studied the performance of accountable care organizations (ACOs) and the role of health IT in mitigating trade-offs between quality and efficiency objectives of ACOs. They observed that ACOs with meaningful use of health IT demonstrate better patient health outcomes, highlighting the importance of effective IT use for care coordination between healthcare providers. Further, Bardhan et al. (2023) developed a novel approach to measure the value of healthcare delivery and observed that tighter integration between hospitals and physician practices creates greater value if it is aligned with hospital EHR sourcing strategies.

Research on the impact of health IT investments is important to understand strategic priorities of and decision making in health provider organizations. In this vein, Salge et al. (2015) studied the behavioral and institutional search mechanisms that underpin IT investment decisions of hospitals. They argue that in addition to measuring the impact of IT, it is important to understand how organizations decide how to allocate IT investments from legitimacy and predictability perspectives. Extending prior work on the impact of health IT investments on other stakeholders, Atasoy et al. (2018) found that although health IT adoption increases costs at the focal hospital, it has significant spillover effects by reducing the costs of neighboring hospitals, emphasizing the need to consider externalities when evaluating the benefits of health IT.

Research on this theme has contributed significantly to our knowledge on how health provider organizations adjust their strategies and IT investment decisions to new value-based reimbursement models. This stream can be further enhanced by examining the role of health IT in enabling patient-centered care models as well as mergers and acquisitions in the healthcare industry. More broadly, we believe that there are significant opportunities to extend this research theme through an examination of general incentive design facilitated by advanced health IT systems.

Our synthesis of prior healthcare research as reflected in the six themes described in this section suggests that research efforts have generally focused on developing and utilizing health IS to improve patient care, going beyond organizational and operational challenges, with an emphasis on broader societal health. It also indicates a growing interest in using IT for preventative and self-driven health management, predominantly at the individual patient level, with a greater interest in patient-centered and consumer-focused care, in recent years. This aspect of prior research is reflected in the title of this editorial, where the "human-centric" focus refers to different stakeholders in the patient care journey, which include not only patients but also, their family members and caregivers, healthcare providers, payers, and plan sponsors, each of whom play important roles in managing the delivery of healthcare in an effective and efficient manner.

3. Emerging Research Clusters

Fueled by breakthroughs in AI, high-speed mobile communications, and geolocation capabilities coupled with the ubiquitous availability of patient health data and quantum computing, the landscape of healthcare IS research continues to change. Further, clinical and institutional pressures to drive more proactive and preventative care rather than reactive care have shifted the locus of care away from hospitals and health systems to outpatient and home-care settings (Waldman and Terzic 2019). Such technological and institutional changes have created significant opportunities for the digital transformation of healthcare and present new opportunities for researchers to explore novel research questions, drive innovation, and shape the future of human-centric healthcare. We identify emerging research clusters that are particularly geared toward consumer-centric patient care, care that extends beyond conventional institutional boundaries, the changing role of healthcare providers, and increasingly, the use of AI to improve the effectiveness and personalization of decision making while also surfacing new tensions around equity in care delivery. These growing research clusters provide important insights that can help advance the discipline.

In this section, we outline the dynamic landscape of emerging health IS research, which we condense into a framework with two dimensions: the *type of care delivered* and the *locus of care delivery*. The type of care

delivered focuses on the nature of care delivery, which we locate on the horizontal axis. We conceptualize three care delivery models: *preventive*, *reactive*, and *proactive*. This is particularly important as healthcare systems seek to promote wellness and efficiency by influencing downstream and upstream trajectories of patient health. On the vertical axis, the locus of care directs attention to the level of intervention, which may be at the *organizational* or *societal* level. Our 3 × 2 research framework, as depicted in Figure 1,[4] allows us to map the type and locus of care delivery across the health IS research landscape and identify four emerging research clusters. It provides illustrative examples of recent studies that we map to this framework based on the type and locus of care delivery of their phenomena of interest. We observe that some of these studies may span multiple areas across the "care delivery type" spectrum.

As mentioned above, the horizontal axis in Figure 1 depicts three types of care delivery, where *preventive care* aims to prevent adverse health events, such as patient hospitalization, readmission, emergency room visits, or deterioration of health conditions. Such care can involve educating patients about healthier choices, easier/alternate access to care, vaccinations, and regular screenings. *Reactive care* refers to care provided in response to a disease, injury, or symptom that has been detected. Examples of reactive care include administering pain relief or surgery for a broken bone, extending home care, and outpatient consultation. *Proactive* care refers to specific healthcare decisions that need to be taken before serious symptoms of a disease manifest. Examples include lifestyle modification based on early-stage markers to preempt future health issues, early intervention for high-risk individuals (e.g., high low-density lipoprotein cholesterol or hypertension) through community programs, and personalized lifestyle planning. The World Economic Forum estimates that one third of the global population has more than one chronic condition (Adler-Waxman 2017). Therefore, management of multiple chronic diseases requires personalized treatment plans and lifestyle changes. We note that although the boundaries between different types of care delivery may be blurred in some cases, interventions may be administered across all three types of care delivery.

Along the vertical axis in Figure 1, we classify the locus of care delivery at two levels: organizational (patient specific) and societal (population specific). Organizational care refers to patient treatments based on institution-specific treatment protocols (e.g., a general/specialist hospital) and organizational care (e.g., a patient receiving acute care from a general hospital and subsequently undergoing rehabilitation at a community hospital) guidelines for specific diseases. The focus is on providing patient-specific care that is personalized to individual characteristics, such as social determinants of health, genomic markers, and family medical history. On the other hand, societal care refers to the delivery of care based on wider (sub-)population characteristics or population-level approaches to care, which include subgroups of patients based on disease type, gender, racial and/or ethnic identity, insurance, and level of healthcare access. Societal care involves actively engaging citizens in enhancing their health and well-being. This is guided by population-specific health management guidelines, which aim to standardize treatment and care practices. Further, it includes tools and digital resources tailored to

Figure 1. Research Framework Based on Type vs. Locus of Care Delivery

Type of Care Delivered

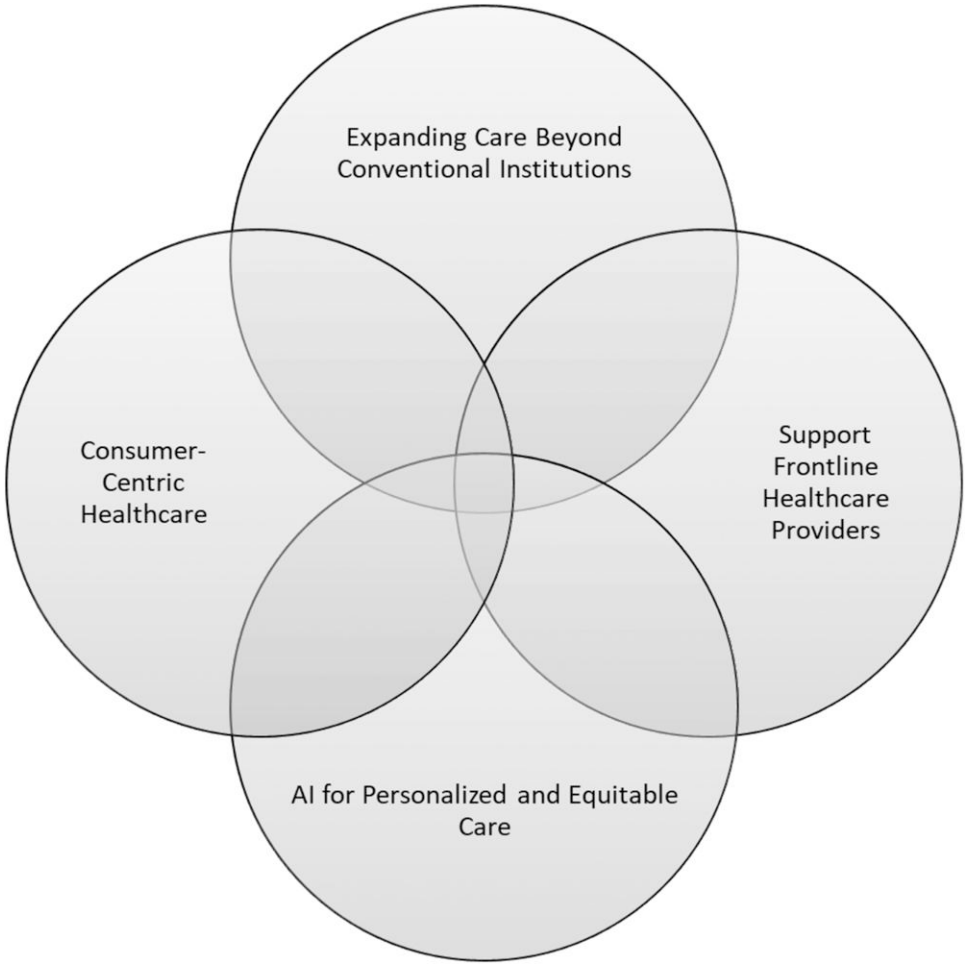
Locus of Care Delivery	Preventive	Reactive	Proactive
Organizational (patient-specific; intra- and inter-healthcare organizations)	Online wellness program (Barbar et al., 2022)	Electronic medical record (Bardhan et al., 2023; Ganju et al., 2022) Hospital-wide IT (Du and Tanriverdi, 2023; Janakiraman et al., 2023; Mishra et al., 2022; Skyes et al. 2022) IT investment (Salge et al., 2022) Clinical DSS (Liang and Xue, 2022; Pumplun et al., 2023) Health IT and clinical trial (Alban et al., 2023) AI-Augmented Diagnosis (Abdel-Karim et al., 2023)	Wearable sensor (Baucum et al., 023)
	Motion-sensor (Yu et al., 2024)	Telehealth for outpatients (Ayabakan et al., 2024) Teleconsultation (Fan et al., 2023) AI health monitoring (Park et al., 2022)	
Societal (population/sub-population-specific; community/platform/ecosystem-based)	Healthcare platform (Zhou et al., 2023) Mobile push notification (Liu et al., 2023) Wearable device (Adjerid et al., 2022; Hydari et al., 2023; James et al., 2022) Mobile app (Fu et al., 2023; Kwon et al., 2023) Ubiquitous healthcare IT (Kim et al., 2022) Mobile gaming (Cheng et al., 2022)	Inter-hospital IT network (Nwafor et al., 2023) Multi-organizational collaboration system (Thiebes et al., 2023) Healthcare IT (Bao and Bardhan, 2022; Montanera et al., 2022; Tong et al., 2022) Teleconsultation (Hwang et al., 2022) Digital resilience (Tremblay et al., 2023)	Medical fee crowdfunding (Hur et al., 2023; Wu et al., 2024) Online market for mental healthcare (Zhou et al., 2022) Multitask learning framework (Yu et al., 2022) mHealth adoption by chronic disease patients (Ghose et al., 2022)
	Health Q&A platform (Chen and Walker, 2023) Dashboard design for crisis response (Ruoff et al., 2023)	Online health community (Connolly et al., 2023; Liu et al., 2023; Zhou et al., 2023) Deep learning on medication nonadherence (Xie et al., 2022) Data privacy and accountability in healthcare IT (Sjöström et al., 2022) mHealth adoption by community health workers (Pandey and Zheng, 2023)	

different patient subgroups, drawing on evidence-based research.

Using our framework as a guide, we unveil four clusters of health IS research to highlight emerging topics in healthcare IS research.[5] These emerging research clusters are depicted in the Venn diagram in Figure 2 and underscore a growing research trend that spans multiple loci of care delivery. The Venn diagram reflects overlaps between emerging research clusters based on their type and loci of care delivery. For example, insurance organizations and nongovernmental entities may engage in patient care management through medication adherence support (reactive care) or patient health literacy and/or counseling (proactive care) as shown in the emerging research cluster of *expanding care beyond conventional institutions*. Similarly, wellness-focused citizens might engage in preventive care through lifestyle changes supported by wellness technologies and benefit from interconnected digital services across networks of hospitals and healthcare institutions through remote patient monitoring systems that enable reactive care as documented in the *consumer-centric healthcare* research cluster (Nwafor et al. 2023). Furthermore, AI can be used for personalized and equitable care based on patient health status and other social determinants of health, and such personalized care plans can be deployed for proactive care across patient subgroups. In addition to personalized care planning, AI can also be deployed to support frontline care providers by reducing the administrative burden of responding to patient inquiries through intelligent chatbots and improving the accuracy of clinical documentation through generative AI tools. Hence, the overlaps between emerging research clusters represent opportunities to improve the effectiveness of care delivery across multiple stakeholders.

Although there has been an overwhelming focus on managing existing illnesses in a reactive manner, we observe a trend toward emerging research that focuses on preventive and proactive care, especially at the societal level. These emerging research clusters retain a population-level, societal approach to better understand and address challenges in care delivery that are relevant in a value-based healthcare environment. As we summarize emerging research streams as productive spaces

Figure 2. Emerging Research Clusters



for further inquiry, we note the emphasis on digitally enabled ways to retain *wellness* proactively and *personalization of* care processes around individual needs and disease profiles, which provide fertile ground for data and technologies to be applied to solve emerging health challenges.

3.1. Emerging Research Cluster 1: Consumer-Centric Healthcare

The digitalization of hospital operations and care services (Mishra et al. 2022, Sykes and Aljafari 2022, Du and Tanriverdi 2023, Janakiraman et al. 2023) and patient records (Ganju et al. 2022, Bardhan et al. 2023) has opened new avenues for care personalization and collaboration between care teams within a hospital and across the healthcare ecosystem (Saghafian et al. 2022). Recent attention toward interconnected digital services, sharing of patient health records, and collaborative care (Thiebes et al. 2023) across networks of hospitals and healthcare institutions (Nwafor et al. 2023) has enhanced our understanding of crossinstitutional collaboration, with a focus on reactive and preventive care. This emerging cluster expands on existing research on online physician engagement by focusing on the patient as a consumer of services. It highlights a shift from a historically passive role of patients to a more active one, where they actively sought control over healthcare services and decisions. This shift paves the way for seamless sharing of medical history, test results, and treatment plans across different healthcare institutions in the ecosystem. New technological innovations, including virtual care, mobile apps, wearable devices, and remote patient monitoring systems, have democratized access to medical advice and information. However, consumer centric technologies offer potential for new forms of exploitation: for example, by integrating quantified self (Lupton 2016) as a new data resource for commodification as well as fueling new anxieties among the worried well—individuals in relatively good health who believe themselves to be ill or likely to become ill.

The ongoing digital revolution in consumer-centric healthcare holds immense promise for future research. An immediate benefit from digitalization would be greater affordability and care quality (Bao and Bardhan 2022), whereas a broader implication could be to bridge gaps in healthcare access by reaching underserved populations (Tong et al. 2022). However, the emergence of new technologies also creates a new range of privacy and data ownership challenges along with concerns about new forms of surveillance and control. With greater proliferation of consumer data on mobile and wearable devices, it is important to study their impact on the development of patient-specific solutions on the preventive and reactive care dimensions of our research framework. As we continue to explore innovative solutions, we call for more research on evolving interinstitutional, societal, regulatory, and geopolitical challenges to ensure equitable access, affordability, and high-quality care for all. For instance, the World Health Organization has released new guidance on the ethics and governance of large multimodal models—a type of generative artificial intelligence technology with applications across healthcare. We believe that such principles and guidelines can be particularly helpful for digital healthcare research with a human-centric focus and point to the active role that IS researchers must play in assessing, debating, refining, and helping in the widespread adoption of these principles and guidelines.

Advancements in technology and data growth also provide unprecedented opportunities to engage patients in the care provision process and make them central to care access and delivery. Leaning on the significant interest among scholars and policymakers in patient empowerment (Essén and Oborn 2017, Bretthauer and Savin 2018), we call for more research on this topic. Important research questions in the domain of consumer-centric healthcare include the following. How are new data-human assemblages influencing care processes, including biases in access, treatment, and trajectories of patient care? How are LLMs influencing the expertise of healthcare providers and consumers? How can new standards for data interoperability influence care coordination as well as the costs and quality of healthcare delivery? What are the critical factors that drive greater patient engagement, and does this empowerment translate into better patient health outcomes and quality of life?

3.2. Emerging Research Cluster 2: Care Beyond Conventional Institutions

In the evolving landscape of healthcare, unconventional stakeholders—digital platforms, technology firms, private equity firms, and start-ups—have emerged to address unmet patient needs. Their presence extends beyond the confines of traditional institutions, ushering in new forms of care that transpire across the primary types (e.g., interlacing reactive care with preventive and proactive care). For example, healthcare platforms (Zhou et al. 2023a), which enable pull-based (Chen and Walker 2023) and push-based information dissemination (Liu et al. 2023a) through continuous monitoring of individuals' activity using wearable devices (Adjerid et al. 2022, James et al. 2022, Hydari et al. 2023), have emerged and are constantly evolving. This suggests that there is a need to understand unconventional institutions better with respect to their ability to provide high-value care and the challenges in integrating them into the prevailing healthcare ecosystem (Dai and Tayur 2020, Montanera et al. 2022). Nascent research on such challenges is built predominantly around organizational

levels of care delivery and has moved beyond specific health organizations, such as hospitals, to intermediaries (Oborn et al. 2021). For example, hospital innovation hubs can engage with their wider ecosystem to pivot or innovate quickly in emerging crisis as witnessed during the COVID-19 pandemic, allowing for new technologies and new ways of working to scale.

Future research may examine the impact of government and industry regulations on healthcare IT as data increasingly become ubiquitous, accessible beyond conventional health institutions, and aggregated in new ways to target societal health needs. Some specific subareas of research thrust may include the following. What are the impacts of IT privacy policy and tort regulations on health equity? How can payers and other stakeholders influence the use of new forms of ICT-facilitated care delivery and treatment? What are the impacts of various national, regional, and local policies on the use of AI tools among clinicians and hospitals? It will be useful to study how IT-enabled innovations will improve population health and whether they widen the digital health divide between those who can afford it and those who must rely on public health systems.[6] Questions such as how existing (and different) healthcare regulatory frameworks impact the entry of new players; what roles technology can play in transforming preventive, reactive, and proactive care; and what innovative approaches new entrants can bring to healthcare delivery, patient engagement, or data management will need to be answered.

Telehealth and virtual care enable care beyond conventional boundaries and are increasingly promoted for reaching underserved communities and as a medium for combating exacerbated disparities in treatment and disease diagnoses, such as the use of LLMs for mental health treatment. The emergence of new care models, such as minute (or retail) clinics and "hospital at home" care, has upended traditional healthcare delivery models, which calls for research into the effectiveness and efficiency of these business models and their impact on bending the cost curve and value added to patient health, welfare, and experience (Aanestad et al. 2019). At the same time, there is recognition that virtual forms of care may sharpen the unanticipated challenges of stakeholders' competing expectations (Oborn et al. 2021). Useful research questions include the following. How might healthcare ecosystems be nudged to integrate start-up organizations that address clinical pain points? How might private equity investors change the value creation at the loci of care, and what is their long-term impact on patient health? As organizational boundaries disappear between payers, providers, and pharmacy benefits managers, how does this impact the value of care delivered? What types of managerial and IT capabilities are necessary to support new types of value-based healthcare organizations?

3.3. Emerging Research Cluster 3: Supporting Frontline Healthcare Providers

Although patients and citizens occupy the spotlight, IT must support the efforts of those who work behind the scenes—doctors, nurses, caregivers, social workers, and case managers—because they form the bedrock of patient care delivery and help transform patient care from reactive to proactive. The work practices of healthcare providers have undergone significant changes because of IT. Challenges, such as longer working hours and the speed of new digital innovations (e.g., AI- and machine learning-enabled applications and systems), weigh on the responsibilities of the doctors and nurses, resulting in burnout, mental health challenges, physical strain, and various forms of technostress (Califf et al. 2020, Singh et al. 2022, Sykes and Aljafari 2022). Rising costs put additional pressure on efficiency, leading professionals to question their role in patient care. Information systems and AI-driven analytics contribute to the threat, but scholars can respond by building coordination systems that allow professionals to perform at their highest level of skill and training. Generative AI software can alleviate administrative burden related to clinical documentation by enabling more efficient and accurate coding and claims adjudication as well as by providing greater support for patient engagement and customer service, thereby reducing stress and burnout among clinicians (Sarkar and Bates 2024).

Likewise, caregivers, whether family members or professionals, often provide round-the-clock support during postdischarge recovery, especially when patients have mobility challenges. Entrepreneurs have employed digital technologies to lessen the caregiving load on family members who tend to be primary caregivers in a home setting. For example, a start-up, Caregiver Saathi, has launched a digital platform to create an ecosystem of caregivers, healthcare professionals, well-wishers, and the corporate sector to support the well-being of caregivers and patients.[7] As we delve into technology's role in healthcare service delivery, we must broaden our focus on the collective well-being of these unsung heroes, which is integral to a healthier society (Scheer et al. 2024).

Emerging research may focus on questions related to the role of virtual care in alleviating or exacerbating caregiver burnout. Anecdotal evidence suggests that generative AI technologies have the potential to improve clinician productivity and cognitive load and to reduce burnout by enabling more efficient ways to complete cumbersome clinical documentation tasks. Similarly, AI-powered chatbots may improve patient-provider engagement by supporting conversational communication and administrative tasks. On the other hand, research should examine how emerging technologies increase stress levels and care management tasks for frontline workers. Finally, researchers could examine how digital platforms may be used to assemble an ecosystem of

skilled and semiskilled caregivers and to train and deploy them to relieve the stress on primary caregivers. Rigorous empirical research and field-based studies examining these issues will go a long way in extending healthcare IS research to provide insights beyond patient-related outcomes. Relevant research questions include the following. What new data-driven business models and forms of value can help support overstretched health systems? What is their impact on the preventive and proactive dimensions of healthcare delivery? How can payers, such as Medicare, incentivize at-home care programs in a manner that complements the role of frontline care providers?

3.4. Emerging Research Cluster 4: AI for Personalized and Equitable Care

Applying AI tools and systems to provide personalized, flexible, and equitable patient care presents an opportunity to revolutionize healthcare. Research has examined the use of AI for disease detection and diagnosis (Abdel-Karim et al. 2023), treatment planning (Chen et al. 2021), and drug discovery (Lou and Wu 2021). The importance of AI in patient engagement and care has grown as it has been used as a virtual assistant to answer patients' questions by understanding and processing human language, including analyzing and summarizing physician documentation (e.g., AI Scribe Medical), completing documentation through automation of data entry in EHRs (Pinto-Coelho 2023, Obuchowicz et al. 2024), and analysis of images and videos for medical devices (Oren et al. 2020). It is important to note that the U.S. Food and Drug Administration approved the use of AI-based medical devices in 2017 and that the Korean Ministry of Food and Drug Safety approved such use in 2018. These approvals have spurred the use of AI-enabled medical devices in the process of patient care. It is important to evaluate how such tools can be used to shape and deliver healthcare solutions in a manner that anticipates potential adverse events, reduces algorithmic bias, and identifies corrective action before they occur.

There are widespread concerns regarding algorithmic bias and inaccuracies around the representation of different population subgroups when adopting AI technologies in clinical practice (Obermeyer et al. 2019). Before integrating AI-powered solutions within clinical care pathways, there is a critical need to address healthcare inequity, ethical concerns, and disparities to ensure that racial and ethnic minorities and underserved, vulnerable, and safety-net communities are adequately represented in AI-enabled patient decision aids (Coiera and Liu 2022). This offers a fertile research area for IS scholars, who can include considerations related to algorithmic bias, fairness, and patient privacy in the design, implementation, and use of AI algorithms.

We believe that the importance of AI on the organizational locus of care delivery holds significant potential for contributions to the IS literature. Future research may seek answers to research questions such as the following. Does the use of AI result in better clinical decision making by physicians and nurses, and if so, in what contexts? What is the role of the patients in such decision making? Do such decisions save lives and make treatments less expensive, and if so, in what contexts? Does AI enable personalized, flexible, and equitable care of patients? In other words, can clinicians devise personalized treatment regimens at the point of patient care? What types of AI-enabled tools can medical device manufacturers include in their devices to influence patient care? Furthermore, in the health equity concerns and bias against patients of certain demographic characteristics (Braveman 2010, Ganju et al. 2020, Arora et al. 2023a), how can AI be deployed to provide customized and flexible equitable care that can improve health equity in underserved sectors of society (e.g., maternal health)? There is an opportunity to expand these research areas to consider how proactive and preventative care might be enabled beyond reactive care. In Table 1, we summarize these emerging research clusters and identify several future research opportunities that we further discuss in the next section.

4. Future Research Opportunities

So far, we have identified six major research themes in the extant literature and identified four emerging research clusters. The six research themes include *online patient-physician engagement*, *health risk prediction*, *healthcare pathways*, *societal health*, *privacy and security*, and *digital health strategy*. These themes emphasize the importance of digital tools in improving patient care, managing health risks, enhancing healthcare delivery, addressing societal health challenges, ensuring data privacy, and supporting strategic decision making in healthcare organizations. Subsequently, we took a closer look at recently published works to unveil four emerging research clusters, which include *consumer-centric healthcare through digitalization*, *expanding care beyond conventional healthcare institutions*, *supporting frontline healthcare providers*, and *AI for personalized and equitable care*. These emerging clusters focus on the impact of digitalization on personalized care, the role of nontraditional stakeholders in healthcare, the importance of supporting frontline workers, and the potential of AI to provide personalized and equitable care.

In this section, we propose three future research opportunities that extend these clusters to explore broader societal and more complex issues related to the impact of digitalization on global healthcare problems. These opportunities focus on three areas: (1) *the role of ICTs in mitigating health crises*, (2) *facilitating innovation across healthcare systems and the digital divide*, and (3) *AI to enhance societal health and develop new business models and markets*. These research opportunities focus on the

Table 1. Summary of Emerging Research Clusters

Emerging research cluster	Key ideas	Representative studies	Future research
Consumer-centric healthcare through digitalization	• mHealth solutions for care management • Patient engagement and empowerment	• Bao and Bardhan (2022) • Ghose et al. (2022) • Tong et al. (2022) • Nwafor et al. (2023) • Thiebes et al. (2023)	Impact of consumer-centric technologies on care trajectory and biases in treatment and access to care
Care beyond conventional healthcare institutions	• New care models blur organizational boundaries • Role of digital platform intermediaries, tech start-ups, etc.	• Dai and Tayur (2020) • Adjerid et al. (2022) • Montanera et al. (2022) • Chen and Walker (2023) • Zhou et al. (2023a, 2023b)	Influence of government policies and industry regulation on new forms of care delivery and treatment
Role of frontline healthcare providers	• New technologies and their impact on clinician workload, productivity, and stress • Future of healthcare work with human-AI collaboration	• Califf et al. (2020) • Singh et al. (2022) • Sarkar and Bates (2024) • Scheer et al. (2024)	Role of virtual care in alleviating clinician burnout; the emergence and impact of new care models on productivity and value of care delivery
AI for personalized and equitable care	• Impact of AI on care personalization • Can AI address health equity challenges?	• Abdel-Karim et al. (2023) • Arora et al. (2023a) • Coiera and Liu (2022) • Obermeyer et al. (2019) • Roderick et al. (2021)	Role of AI in mitigating biases in access and treatment of care based on gender, race, and ethnicity

use of IT and data analytics in crisis management, opportunities for cross-system learning and innovation, and the transformative potential of AI in healthcare.[8] They highlight the need for expansion of the research horizon beyond a single care type and locus of care delivery and to identify future opportunities that may arise by addressing challenges at the intersection of two or more emerging research clusters. For instance, addressing significant health crises requires interconnectedness among different healthcare systems at the organizational and governmental levels and effectively maps out reactive and proactive care measures. Furthermore, although there is an ongoing emphasis on managing existing illnesses (reactive care) that remains at the organizational level, we also recognize that future research opportunities may overlap. For example, utilizing ICTs to mitigate health crises may necessitate establishment of IT and process infrastructure that enable data exchange across healthcare systems. Therefore, we encourage researchers to look for opportunities beyond silos and consider how these areas might intersect.

4.1. Role of ICTs in Mitigating Health Crises

Calamities such as natural disasters, infectious disease outbreaks, and humanitarian crises, including wars and famines, have been increasing in frequency and intensity. Each creates a unique health crisis that can have serious long-term consequences combined with economic disparities. In a recent special section of *Information Systems Research* (volume 35, issue 2, 2024), IS scholars examined how ICT and data analytics can help organizations and policymakers manage these crises. For example, climate changes can be detected through large data sets; their impact and emerging demands require robust information infrastructure to coordinate responses in real time. Furthermore, health disparities because of significant variations in social determinants of health may exacerbate the global impact of epidemics and demand a coordinated response across several global and national entities.

Similarly, antimicrobial resistance (AMR) is infiltrating human immune systems and food supply chains, and it may result in significant disruptions to society (Mukherjee and Sahay 2024). Not only does AMR affect patient treatment pathways, which will require ongoing adjustment and monitoring, but diverting global disasters also requires extensive surveillance efforts to coordinate data management (Thakral et al. 2022, 2024). Data management, which is critical to containing AMR, is particularly lacking in low-resource contexts, where infrastructure, storage, and availability of devices are often challenged, requiring improvisation, new methods of working with old technology, and coordination with policymakers. The pharmaceutical company Eli Lilly partnered with OpenAI to develop new ways to use AI to discover novel antimicrobials that can combat drug-resistant pathogen.[9]

Although new AI-enabled solutions can mitigate such health crises, it is important to recognize the major challenges for future research in this area. Relevant research questions may include the following. How can emerging digitally connected devices coordinate effectively with older technologies that may be in use in disaster-affected areas? How might low-quality data be augmented with new types of analytics and technological innovations to help bridge the digital divide and deliver healthcare? Can low/no code technologies be helpful in training frontline workers to manage health concerns arising from major disasters?

The intersection of global concerns with complexities arising from crises provides IS scholars with an important role in addressing emerging coordination challenges. War zones require a nimble setup of field hospitals for civilians that may be coordinated from a distance using telemedicine and remote support systems. New technologies, such as drones, can help coordinate and support relief following earthquakes, and better data management can augment child and maternal health in regions of growing famine. Coordinating temperature control across transportation logistics and delivery proved critical in vaccine deliveries, with implications for harnessing new technologies and infrastructures. An important topic for future research will entail leveraging a range of systems to influence outcomes on the ground, including means of data exchange, brokering, adjustment efforts, and transfer of learning. Related research themes might include human and machine coordination challenges and improvisation efforts with heightened contextual sensitivities and intersectional influences on IS performance.

Relevant research questions include the following. How might distributed virtual agencies, such as algorithms or other technologies, become more aware of the contextual contingencies during a health crisis? How can we analyze historical data to identify vulnerable populations or regions to better prepare for response? How can we design and deploy algorithms and systems to customize coordination and response based on the nature of the health crisis and known vulnerabilities (Roderick et al. 2021)? Adding to this, IS scholars may study how to deploy algorithms and activate a response plan in the event of a natural disaster or disease outbreak. They may also investigate how mobile technologies, such as drones, can capture new data forms that inform coordination challenges: for example, during a global pandemic or nuclear disaster.

4.2. Facilitate Innovation Across Health Systems and the Digital Divide

Technology now enables people from a broader geographic region to codevelop solutions for a growing range of healthcare problems. However, the threat of rising costs continues to challenge nations on how to fund healthcare, making access to high-quality care increasingly difficult (Blumenthal et al. 2024, p. 7). Emerging technologies may raise the cost of healthcare, further exacerbating the digital divide between the haves and have-nots. For example, patients with sepsis, a life-threatening infection, require immediate intervention, and algorithm-driven analytics have helped enable faster response, resulting in saved lives (Adams et al. 2022). However, such technologies may be unaffordable to some community hospitals or patients in rural areas. For example, patients in home-based care settings may need sensor technologies for 24 × 7 monitoring, which can be costly to provide in underserved areas or to patients who cannot afford them.

With wider participation, there is an opportunity for healthcare systems to learn from each other, including new ways of using technologies such as rapid diagnostics, AI, robotics, or screening tools. IS researchers must design new business models to make the economic case for democratizing emerging technologies: for example, by demonstrating that early investments can save healthcare costs in the long term. There are opportunities for health systems in developed economies to learn from practices deployed and tested in developing economies. Many such opportunities are *not* in the innovation of medical sciences per se but occur during the process of *healthcare delivery* with constrained resources to facilitate healthcare access and treatment at scale in a context-specific manner (Govindarajan and Ramamurti 2018). For example, in India, low-cost technologies, such as health kiosks and mobile health apps, are deployed in rural areas, where nonmedically qualified but trained professionals provide noncritical care.

However, deploying less experienced practitioners comes with risks; research has shown that insufficient training can lead to errors that may jeopardize patient safety (Das and Barnwal 2018). This challenge underscores a valuable area for future research to design and assess low-cost local technologies, such as context-specific telehealth implementations, that empower less experienced practitioners to make informed decisions, thereby reducing errors and improving patient outcomes in resource-limited settings. For example, eHealth kiosks have been implemented in rural India to address critical issues, such as infant mortality (Venkatesh et al. 2016). In Brazil, 220,000 community health agents work alongside doctors and nurses to reach more than 100 million residents (Sahni and Myers 2014). These technologies connect informal healthcare workers with general physicians and specialists to consult on more serious health issues. These hospitals also utilize telehealth to perform remote diagnosis and treatment, provide home-based care, and create low-cost alternatives for medical devices and supplies (Govindarajan and Ramamurti 2018). Such innovations help to scale healthcare solutions and shorten the time that it takes for these solutions to impact patient outcomes.

Developed economies can benefit from innovative models for care because of an aging population, rising costs, and labor shortages. In cardiology, portable handheld ultrasound devices allow diagnostics to be brought to remote areas and administered by unskilled or semiskilled workers, who can be connected in real time to trained medical imaging specialists operating remotely. Such devices are used by entrepreneurial physicians to create access for marginalized groups in the global south. Yet, in developing low-cost and effective health treatments, it is unclear whether incumbents in other health

systems will adopt new ways of working that break with traditional roles and institutionalized ways of working, potentially hindering scale-up (Delana et al. 2023). Regulations requiring healthcare workers to receive formal training and certification will likely influence the uptake of these innovations. There will also be issues of data compatibility, system-level integration or storage, data privacy, and demonstration of technical and economic feasibility, all real-world challenges that can engage IS researchers.

Understanding how to scale technology use across diverse sociotechnical care systems is a challenge that IS scholars will need to take on. These new and emerging systems of care, with integrated potential for technology, are likely to surface new problems, such as data poverty and new forms of data colonialism (Arora et al. 2023a), and the need to establish health effectiveness and efficiency using new tools, such as synthetic data sets, that are attentive to population-specific needs. Further, there is potential to examine how new forms of communication, including social media and mobile/digital platforms, are important means through which change can be scaled to promote preventive care. An important research focus will entail understanding the limits of data usability, particularly across systems of care such as free market versus socialized healthcare, and insight into the power dynamics among policymakers and corporate interests in health technology evolution.

Relevant research questions may include the following. How can innovations from developing economies and health systems be adapted to developed economies? What might be the unintended consequences of translating data from one context of use to another healthcare system? What implications do such transfers of innovation have for regulatory and privacy policies? What testing and validation requirements would nations impose, especially for technologies that gather large amounts of patient data? Would geopolitical considerations help or hinder crossborder, crosshealth system innovations for fear of data and privacy leaks? More broadly, researchers can examine how varying forms of power dynamics that uphold current systems might be challenged.

4.3. AI to Enhance Societal Health and Create New Business Models and Markets

The use of AI to develop new digital therapeutics and drugs has proliferated in recent years. Digital pharmacy and drug research and development (R&D) innovations now account for a significant share of venture capital investments in the healthcare sector (Klein 2023). AI applications in diverse areas, such as radiology, pathology, and cancer treatment, offer effective disease management capabilities that allow healthcare providers to test and deploy alternative treatment pathways faster. Recent advances in quantum computing offer great potential for pharmaceutical firms to develop more effective R&D pipelines for drug discovery and development.[10] AI-powered technological and process innovations offer great potential to improve drug discovery as well as the development and commercialization of the treatment of chronic and rare diseases. The speed of change enables healthcare providers to develop new business models by enabling remote patient monitoring capabilities that allow patients to receive care without hospitalization. Successful deployment of new technology-driven business models can increase access to underserved patients and offer new ways to slow the unsustainable growth in healthcare spending.

With the proliferation of AI in healthcare, it will be critical to develop new methods to manage algorithmic bias arising from incorrect assumptions about specific patient populations, which can result in inappropriate care (Obermeyer et al. 2019). Although AI tools can automate and scale up such biases, they can be detected through appropriate regulatory oversight and by providing training data not only to developers but also, to researchers and policymakers. Such research will include developing new approaches that ensure accountability for health equity and fairness in patient treatment and explicit identification of risks because of healthcare algorithmic fairness and trade-offs. Important research topics that deserve careful investigation include studying the role of digital health transformation to support these changes as patient care moves from acute care to ambulatory surgical centers, outpatient, and home-based care settings and from traditional medicine to precision medicine.

Relevant research questions include the following. How does remote care offer new opportunities for more actors to become involved in developing care pathways? How can AI expand labor and clinical capacity while enhancing care coordination across a distributed healthcare sector? In what ways are AI technologies deskilling frontline clinical workers or creating greater disparities? How can health IT level the playing field for healthcare workers and provide patient access across health systems? What innovation and market opportunities can health IT create for a new class of health entrepreneurs? How can AI tools utilize existing text, quantitative, and multimodal data and create new synthetic data to enhance care provision to all types of patients and help all types of care providers? How can researchers employ machine learning techniques to establish heterogeneity of treatment effects, which are critical for subgroup identification and personalizing treatment recommendations?

5. Guiding Framework

Never have healthcare and information technology been so critical to humanity. At this critical juncture, IS research can unlock digital opportunities to guide the future of healthcare. There are significant opportunities

for IS researchers to identify and conduct research in areas that we have highlighted and to lead and shape the ongoing debate on the role of technology in charting the future of healthcare. We observe a robust role for IS researchers to explore new research frontiers in several areas, such as studying the role of ICT in mitigating health crises caused by environmental, natural, and human-induced disasters and epidemics; developing innovations that leverage learning and best practices across global health systems; and developing and implementing AI-powered innovations to enhance treatments, design and test new types of business models, and enter new markets. This creates opportunities for design science research in developing practical IT artifacts, such as interoperable data platforms that improve crisis response, AI-driven diagnostics that enhance treatment precision, and business models such as virtual health services that broaden access to care. Other opportunities involve developing new theory-driven artifacts and frameworks that explain the adoption and diffusion of new types of technologies that address emerging healthcare challenges. Through these efforts, IS researchers can contribute significantly to building more resilient, accessible, and effective healthcare systems.

In this endeavor, we aim to leverage interdisciplinary knowledge from various academic fields to address emerging research challenges that can significantly impact healthcare organizations, government policies, and most importantly, patient health and quality of life. To facilitate this process, we present Figure 3 as a guiding framework for future healthcare information systems research. We intend for this framework to serve as a road map for outlining healthcare IS research initiatives, although we do not claim it to be exhaustive. The framework consists of five core elements to conceptualize healthcare IS research.

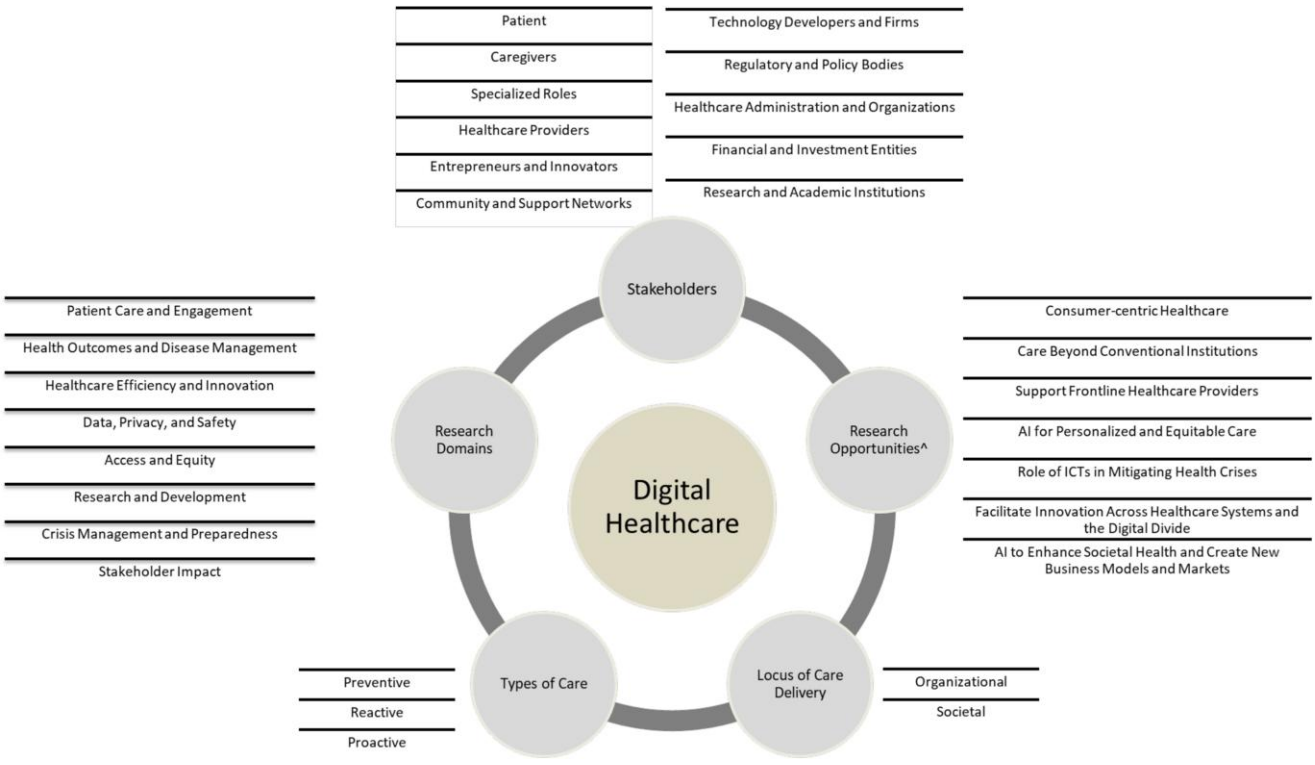
1. Stakeholders. This includes the intended beneficiaries and all involved participants. Stakeholders can extend beyond patients and traditional care providers, such as physicians and nurses, to encompass a wider range of participants, including technology developers, regulatory bodies, community support networks, and healthcare administrators. Further, the definition of a "patient" is broad and includes impacted populations, like family caregivers, underserved communities, and the general public. This evolving understanding of "humans" in a healthcare context opens up new research avenues. For examples of stakeholders, refer to Figure B.1 in Appendix B.

2. Locus of care delivery. The locus of care delivery can be the organizational level, the societal context, or a combination.

3. Type of care. The type of care delivered includes preventive, reactive, proactive, or a mix of these three types.

4. Research domains. These represent broad areas of inquiry based on the emerging research clusters

Figure 3. (Color online) A Guiding Framework for Digital Healthcare Research



Note. ^The research opportunities focus on emerging research clusters and future research areas that we aim to highlight.

discussed in Section 3. For example, research related to crisis management and emergency preparedness might involve integrating advanced and traditional technologies and improving data management in low-resource settings among other goals. Figure B.2 provides specific examples of research domains.

5. Research opportunities. These include knowledge gaps and emerging unanswered issues in the field. Although not intended to be exhaustive, they are based on the emerging research clusters and future research opportunities that we have identified previously. These opportunities encompass a wide array of IT applications and solutions that can be designed, implemented, and harnessed (see Figure B.3 in Appendix B for examples of illustrative IT solutions).

Researchers can use this framework to define their research goals, identify relevant stakeholders, evaluate research opportunities, and develop a better understanding of the type of care and locus of care delivery to guide their research initiatives.

6. Conclusion

The objective of this editorial is threefold. First, we provide an overview of the prior healthcare IS research in the past decade and identify six major research themes that have been studied. Next, we identify four emerging research clusters based on recent healthcare IS papers that were published across a cross-section of top-tier journals in the last three years. Finally, we identify areas that offer significant potential for future research opportunities. This editorial is not a comprehensive road map for emerging and future research; it provides our point of view on human-centric, digital healthcare research. We hope that IS researchers will address many of the issues identified in this editorial and shape the future of research by examining carefully the transformative potential and pressing challenges presented by digital technologies.

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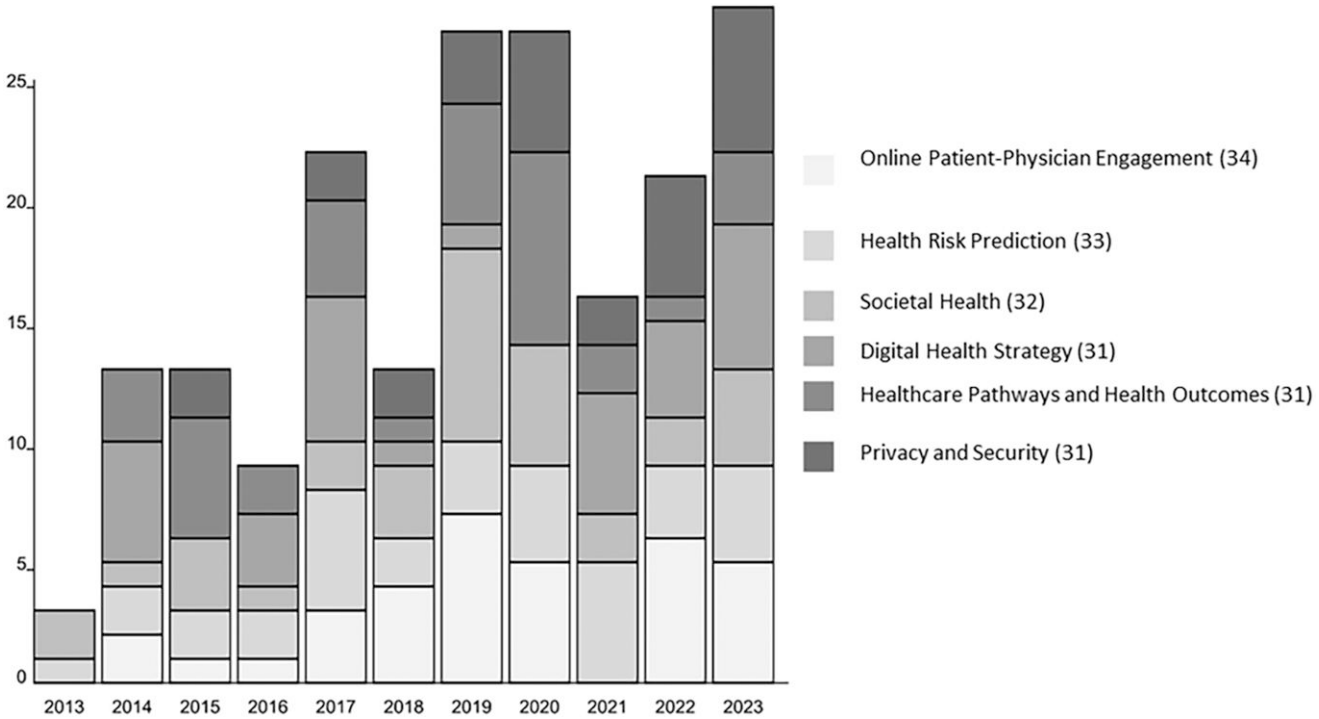
Appendix A. Research Themes Based on Literature Review

Figure A.1 provides a summary of 192 papers published between 2013 and 2023 in five IS journals, including *ISR*, *Management Science*, *MIS Quarterly*, *Journal of Management Information Systems*, and *Journal of the Association for Information Systems*, and their mapping to the research themes discussed in Section 2. Overall, 2019 stands out as a significant

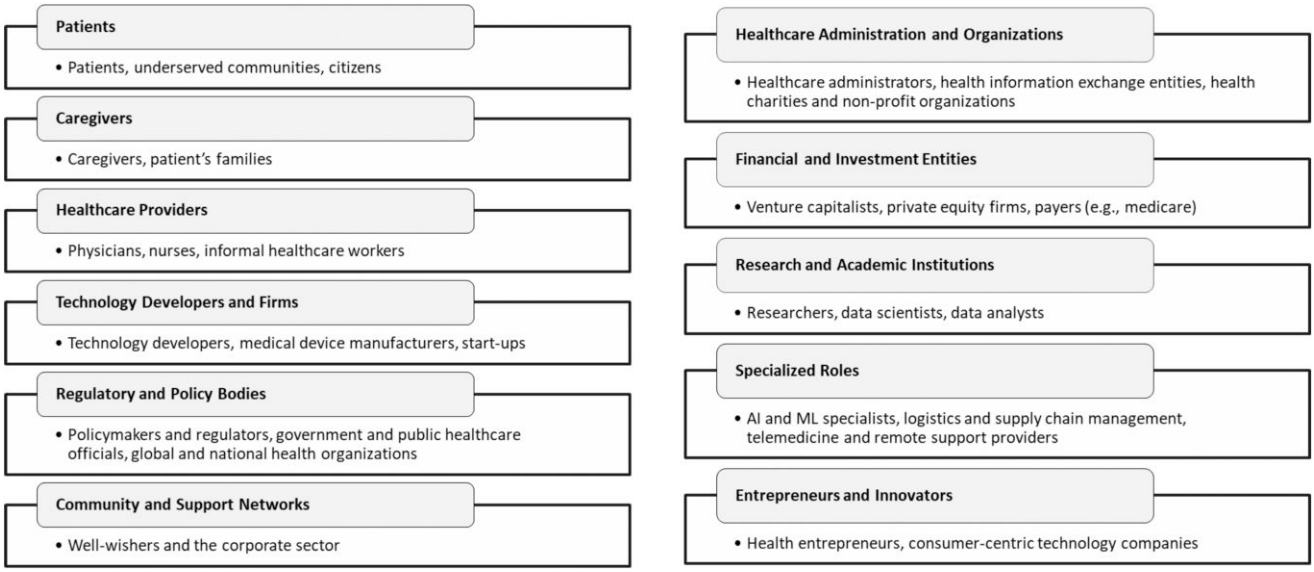
Figure A.1. Distribution of IS publications by Research Theme (2013–2023)



year with the highest counts across multiple topics, whereas 2023 also shows notable activity in several areas, which underscores the diversity of health information systems research. The themes of "online patient-physician engagement" (extant theme 1) and "healthcare pathways and health outcomes" (extant theme 3) have gained more attention in recent years. In contrast, research on "health risk prediction" (extant theme 2) and "privacy and security" (extant theme 5) has remained relatively steady within the broader research landscape.

Appendix B. Supplemental Figures

Figure B.1. Stakeholders in the Healthcare Ecosystem



Note. ML, machine learning.

Figure B.2. Research Domains for Health IS Researchers

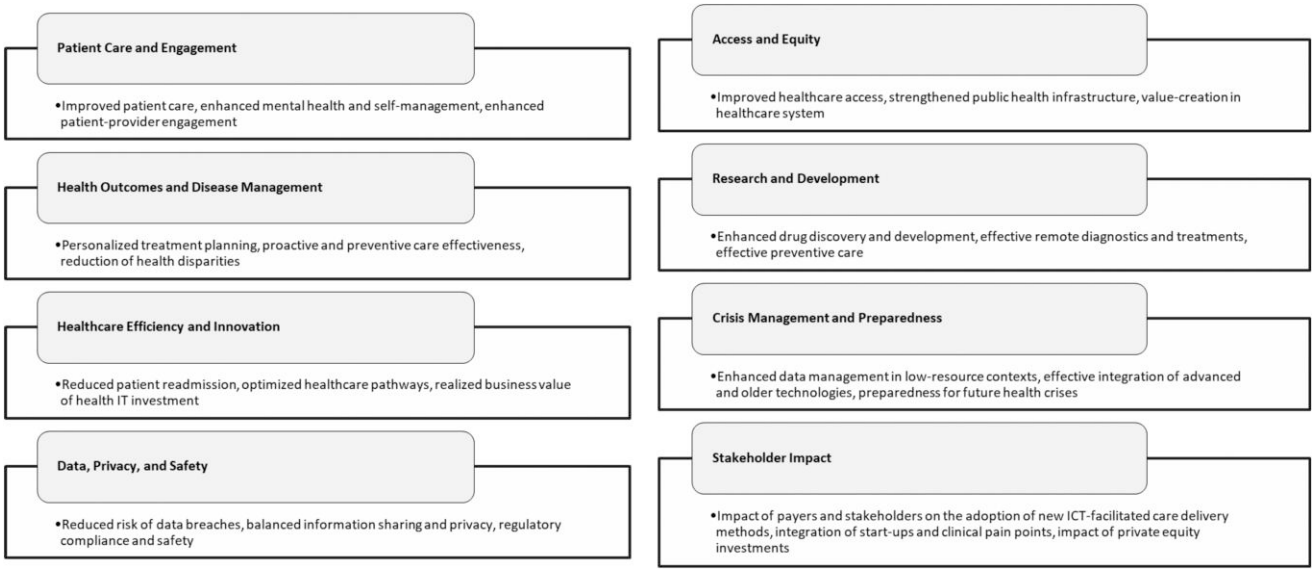


Figure B.3. Illustrative Examples of Healthcare IT Applications

Endnotes

[1] For an exploration of recent AI-driven therapeutic approaches in mental health, including the use of digital avatars to treat schizophrenia-related auditory hallucinations, refer to *Stat News* (October 28, 2024): https://www.statnews.com/2024/10/28/schizophrenia-auditory-hallucinations-treated-by-digital-avatars-nature-medicine-study/.

[2] The term "theories in flux" pertains to evidence-based inferences that arise from the comprehensive analysis of extensive data sets, typically collected from business processes and in collaboration with industry practitioners (Tremblay et al. 2021).

[3] Clinical pathways are standardized, evidence-based treatment plans that outline the appropriate sequence of clinical interventions, time frames, milestones, and expected outcomes for patients.

[4] Representative research in the last three years includes the following papers: Adjerid et al. (2022); Babar et al. (2022); Bao and Bardhan (2022); Cheng et al. (2022); Ganju et al. (2022); Hwang et al. (2022); James et al. (2022); Kim et al. (2022); Liang and Xue (2022); Mishra et al. (2022); Montanera et al. (2022); Park et al. (2022); Salge et al. (2022); Sjöström et al. (2022); Sykes and Aljafari (2022); Tong et al. (2022); Xie et al. (2022); Yu et al. (2022); Zhou et al. (2022, 2023a, 2023b); Abdel-Karim et al. (2023); Alban et al. (2023); Bardhan et al. (2023); Baucum et al. (2023); Chen and Walker (2023); Connolly et al. (2023); Du and Tanriverdi (2023); Fan et al. (2023); Fu et al. (2023); Hur et al. (2023); Hydari et al. (2023); Janakiraman et al. (2023); Kwon et al. (2023); Liu et al. (2023b); Nwafor et al. (2023); Pandey and Zheng (2023); Pumplun et al. (2023); Ruoff et al. (2023); Thiebes et al. (2023); Tremblay et al. (2023); Wu et al. (2024); and Yu et al. (2024).

[5] We synthesize healthcare-related papers published in *Information Systems Research*, *MIS Quarterly*, *Management Science*, *Journal of Management Information Systems*, and *Journal of the Association for Information Systems* in the last three years.

[6] Countries vary in their healthcare and social welfare systems. For example, most treatments and care are largely "free" in Denmark, whereas this may not be the case in other parts of the world. Therefore, the concept of affordability can differ significantly depending on the context.

[7] See https://caregiversaathi.co.in/home.

[8] These research opportunities are not intended to be comprehensive; rather, they are meant to stimulate further thought and inquiry into new areas of research.

[9] See https://investor.lilly.com/news-releases/news-release-details/lilly-collaborates-openai-discover-novel-medicines-treat-drug.

[10] See https://www.mckinsey.com/featured-insights/the-rise-of-quantum-computing.

References

Aanestad M, Vassilakopoulou P, Øvrelid E (2019) Collaborative innovation in healthcare: Boundary resources for peripheral actors. *Proc. Internat. Conf. Inform. Systems* (Association for Information Systems, Atlanta).

Abdel-Karim BM, Pfeuffer N, Carl KV, Hinz O (2023) How AI-based systems can induce reflections: The case of AI-augmented diagnostic work. *MIS Quart.* 47(7):1395–1424.

Adams R, Henry KE, Sridharan A, Soleimani H, Zhan A, Rawat N, Johnson L, Hager DN, Cosgrove SE, Markowski A (2022) Prospective, multi-site study of patient outcomes after implementation of the TREWS machine learning-based early warning system for sepsis. *Nature Medicine* 28(7):1455–1460.

Adjerid I, Loewenstein G, Purta R, Striegel A (2022) Gain-loss incentives and physical activity: The role of choice and wearable health tools. *Management Sci.* 68(4):2642–2667.

Adler-Waxman A (2017) This is the biggest challenge to our health. *World Economic Forum* (December 7), https://www.weforum.org/agenda/2017/12/healthcare-future-multiple-chronic-disease-ncd/.

Ahsen ME, Ayvaci MUS, Raghunathan S (2019) When algorithmic predictions use human-generated data: A bias-aware classification algorithm for breast cancer diagnosis. *Inform. Systems Res.* 30(1):97–116.

Alban A, Chick SE, Forster M (2023) Value-based clinical trials: Selecting recruitment rates and trial lengths in different regulatory contexts. *Management Sci.* 69(6):3516–3535.

Anderson C, Baskerville RL, Kaul M (2017) Information security control theory: Achieving a sustainable reconciliation between sharing and protecting the privacy of information. *J. Management Inform. Systems* 34(4):1082–1112.

Arora A, Barrett M, Lee E, Oborn E, Prince K (2023a) Risk and the future of AI: Algorithmic bias, data colonialism, and marginalization. *Inform. Organ.* 33(3):100478.

Arora A, Alderman JE, Palmer J, Ganapathi S, Laws E, McCradden MD, Oakden-Rayner L, et al. (2023b) The value of standards for health datasets in artificial intelligence-based applications. *Nature Medicine* 29:2929–2938.

Atasoy H, Chen PY, Ganju K (2018) The spillover effects of health IT investments on regional healthcare costs. *Management Sci.* 64(6):2515–2534.

Ayabakan S, Bardhan IR, Zheng Z (2024) Impact of telehealth and process virtualization on healthcare utilization. *Inform. Systems Res.* 35(1):45–65.

Babar Y, Curley S, Ke Z, Liu D, Sheffler Z (2022) The effects of digitally delivered nudges in a corporate wellness program. *J. Assoc. Inform. Systems* 24(1):136–160.

Baird A, Angst C, Oborn E (2020) *MIS Quarterly* research curation on health information technology research curation team. *MIS Quart.* (December 12), https://www.misqresearchcurations.org/blog/2018/6/20/health-information-technology.

Bao C, Bardhan IR (2022) Performance of accountable care organizations: Health information technology and quality–efficiency trade-offs. *Inform. Systems Res.* 33(2):697–717.

Bardhan IR, Bao C, Ayabakan S (2023) Value implications of sourcing electronic health records: The role of physician practice integration. *Inform. Systems Res.* 34(3):1169–1190.

Bardhan IR, Chen H, Karahanna E (2020) Connecting systems, data, and people: A multidisciplinary research roadmap for chronic disease management. *MIS Quart.* 44(1):185–200.

Barrett M, Oborn E, Orlikowski W (2016) Creating value in online communities: The sociomaterial configuring of strategy, platform, and stakeholder engagement. *Inform. Systems Res.* 27(4):704–723.

Baucum M, Khojandi A, Vasudevan R, Ramdhani R (2023) Optimizing patient-specific medication regimen policies using wearable sensors in Parkinson's disease. *Management Sci.* 69(10):5964–5982.

Blumenthal D, Gumas ED, Shah A, Gunja MZ, Williams RD II (2024) Mirror, mirror 2024: Reflecting poorly—Health care in the U.S. compared to other high-income countries. *The Commonwealth Fund* (September 19), https://www.commonwealthfund.org/publications/fund-reports/2024/sep/mirror-mirror-2024.

Braveman P (2010) Social conditions, health equity, and human rights. *Health Human Rights* 12(2):31–48.

Bretthauer KM, Savin S (2018) Introduction to the special issue on patient-centric healthcare management in the age of analytics. *Production Oper. Management* 27(12):2101–2102.

Buckman JR, Adjerid I, Tucker C (2023) Privacy regulation and barriers to public health. *Management Sci.* 69(1):342–350.

Califf CB, Sarker S, Sarker S (2020) The bright and dark sides of technostress: A mixed-methods study involving healthcare IT. *MIS Quart.* 44(2):809–856.

Chatterjee S, Sarker S (2024) Toward a better digital future: Balancing the utopic and dystopic ramifications of digitalization. *J. Strategic Inform. Systems* 33(2):101834.

Chen C, Walker D (2023) A bitter pill to swallow? The consequences of patient evaluation in online health question-and-answer platforms. *Inform. Systems Res.* 34(3):867–889.

Chen W, Lu Y, Qiu L, Kumar S (2021) Designing personalized treatment plans for breast cancer. *Inform. Systems Res.* 32(3):932–949.

Cheng Z, Greenwood BN, Pavlou PA (2022) Location-based mobile gaming and local depression trends: A study of Pokémon Go. *J. Management Inform. Systems.* 39(1):68–101.

Coiera E, Liu S (2022) Evidence synthesis, digital scribes, and translational challenges for artificial intelligence in healthcare. *Cell Rep. Medicine* 3(12):100860.

Connolly R, Sanchez OP, Compeau D, Tacco F (2023) Understanding engagement in online health communities: A trust-based perspective. *J. Assoc. Inform. Systems* 24(2):345–378.

Dai T, Tayur S (2020) OM forum—Healthcare operations management: A snapshot of emerging research. *Manufacturing Service Oper. Management* 22(5):869–887.

Das S, Barnwal P (2018) The need to train uncertified rural practitioners in India. *J. Internat. Medical Res.* 46(1):522–525.

Delana K, Deo S, Ramdas K, Subburaman GBB, Ravilla T (2023) Multichannel delivery in healthcare: The impact of telemedicine centers in southern India. *Management Sci.* 69(5):2568–2586.

Du K, Tanriverdi H (2023) Does IT enable collusion or competition: Examining the effects of IT on service pricing in multimarket multihospital systems. *MIS Quart.* 47(7):1425–1454.

Essén A, Oborn E (2017) The performativity of numbers in illness management: The case of Swedish rheumatology. *Soc. Sci. Medicine* 184(2017):134–143.

Essén A, Värlander SW (2019) How technology-afforded practices at the micro-level can generate change at the field level: Theorizing the recursive mechanism actualized in Swedish rheumatology. *MIS Quart.* 43(4):1155–1176.

Fan W, Zhou Q, Qiu L, Kumar S (2023) Should doctors open online consultation services? An empirical investigation of their impact on offline appointments. *Inform. Systems Res.* 34(2):629–651.

Fichman RG, Kohli R, Krishnan R (2011) Editorial overview—The role of information systems in healthcare: Current research and future trends. *Inform. Systems Res.* 22(3):419–428.

Fu S, Cai Z, Lim E, Liu Y, Tan CW, Lin Y, Deng S (2023) Unraveling the effects of mobile application usage on users' health status: Insights from conservation of resources theory. *J. Assoc. Inform. Systems* 24(2):452–489.

Ganju KK, Atasoy H, Pavlou PA (2022) Do electronic health record systems increase Medicare reimbursements? The moderating effect of the recovery audit program. *Management Sci.* 68(4):2889–2913.

Ganju KK, Atasoy H, McCullough J, Greenwood B (2020) The role of decision support systems in attenuating racial biases in healthcare delivery. *Management Sci.* 66(11):5171–5181.

Ghose A, Guo X, Li B, Dang Y (2022) Empowering patients using smart mobile health platforms: Evidence from a randomized field experiment. *MIS Quart.* 46(1):151–192.

Govindarajan V, Ramamurti R (2018) *Reverse Innovation in Health Care: How to Make Value-Based Delivery Work* (Harvard Business, Boston).

Hur YY, Jin F, Li X, Cheng Y, Hu YJ (2023) Does social influence change with other information sources? A large-scale randomized experiment in medical crowdfunding. *Inform. Systems Res.* 34(4):1476–1492.

Hwang EH, Guo X, Tan Y, Dang Y (2022) Delivering healthcare through teleconsultations: Implications for offline healthcare disparity. *Inform. Systems Res.* 33(2):515–539.

Hydari MZ, Adjerid I, Striegel AD (2023) Health wearables, gamification, and healthful activity. *Management Sci.* 69(7):3920–3938.

James TL, Bélanger F, Lowry PB (2022) The mediating role of fitness technology enablement of psychological need satisfaction and frustration on the relationship between goals for fitness technology use and use outcomes. *J. Assoc. Inform. Systems* 23(4):913–965.

Janakiraman R, Park E, Demirezen EM, Kumar S (2023) The effects of health information exchange access on healthcare quality and efficiency: An empirical investigation. *Management Sci.* 69(2): 791–811.

Jiang J, Cameron AF (2020) IT-enabled self-monitoring for chronic disease self-management: An interdisciplinary review. *MIS Quart*. 44(1):451–508.

Julka M, Alvarez K (2019) Real-time adverse even predictive model reduces readmissions. Accessed December 12, 2024, https://365.himss.org/sites/himss365/files/365/handouts/552693005/handout-185_FINAL.pdf.

Jussupow E, Spohrer K, Heinzl A, Gawlitza J (2021) Augmenting medical diagnosis decisions? An investigation into physicians' decision-making process with artificial intelligence. *Inform. Systems Res.* 32(3):713–735.

Kim SH, Kwon J (2019) How do EHRs and a meaningful use initiative affect breaches of patient information? *Inform. Systems Res.* 30(4):1184–1202.

Kim Y, Ayvaci MUS, Raghunathan S, Ayer T (2022) When it creates legal vulnerability: Not just overutilization but underprovisioning of health care could be a consequence. *MIS Quart.* 46(3): 1483–1516.

Klein DB (2023) AI-enabled prescription digital therapeutics should be an investment priority. *MedCity News* (December 17), https://medcitynews.com/2023/12/ai-enabled-prescription-digital-therapeutics-should-be-an-investment-priority/.

Kwon HE, Dewan S, Oh W, Kim T (2023) Self-regulation and external influence: The relative efficacy of mobile apps and offline channels for personal weight management. *Inform. Systems Res.* 34(1):50–66.

Lebovitz S, Levina N, Lifshitz-Assaf H (2021) Is AI ground truth really true? The dangers of training and evaluating AI tools based on experts' know-what. *MIS Quart.* 45(3):1501–1525.

Liang H, Xue Y (2022) Save face or save life: Physicians' dilemma in using clinical decision support systems. *Inform. Systems Res.* 33(2):737–758.

Liu Y, Jiang Z, Choi BCF (2023a) Pushing yourself harder: The effects of mobile touch modes on users' self-regulation. *Inform. Systems Res.* 34(3):996–1016.

Liu Y, Xu X, Jin Y, Deng H (2023b) Understanding the digital resilience of physicians during the COVID-19 pandemic: An empirical study. *MIS Quart.* 47(1):391–422.

Lou B, Wu L (2021) AI on drugs: Can artificial intelligence accelerate drug development? Evidence from a large-scale examination of bio-pharma firms. *MIS Quart.* 45(3):1451–1482.

Lupton D (2016) The diverse domains of quantified selves: Self-tracking modes and dataveillance. *Econom. Soc*. 45(1):101–122.

Meyers JL, Parasuraman S, Bell KF, Graham JP, Candrilli SD (2014) The high-cost, type 2 diabetes mellitus patient: An analysis of managed care administrative data. *Archives of Public Health* 72:1–12.

Miller AR, Tucker C (2018) Privacy protection, personalized medicine, and genetic testing. *Management Sci.* 64(10):4648–4668.

Mishra AN, Tao Y, Keil M, Oh JH (2022) Functional IT complementarity and hospital performance in the United States: A longitudinal investigation. *Inform. Systems Res.* 33(1):55–75.

Montanera D, Mishra AN, Raghu TS (2022) Mitigating risk selection in healthcare entitlement programs: A beneficiary-level competitive bidding approach. *Inform. Systems Res.* 33(4):1221–1247.

Mukherjee AS, Sahay S (2024) Surveillance of antimicrobial Resistance in the environment: Imperatives for ICT4D research. *Internat. Conf. Implications Inform. Digital Technologies Development* (Springer Nature, Cham, Switzerland), 342–350.

Nwafor O, Ma X, Johnson NA, Singh R, Aron R (2023) Differential impacts of technology-network structures on cost efficiency: Knowledge spillovers in healthcare. *J. Management Inform. Systems* 40(3):840–882.

Obermeyer Z, Powers B, Vogeli C, Mullainathan S (2019) Dissecting racial bias in an algorithm used to manage the health of populations. *Science* 366(6464):447–453.

Oborn E, Pilosof NP, Hinings B, Zimlichman E (2021) Institutional logics and innovation in times of crisis: Telemedicine as digital "PPE." *Inform. Organ.* 31(1):100340.

Obuchowicz R, Strzelecki M, Piórkowski A (2024) Clinical applications of artificial intelligence in medical imaging and image processing—A review. *Cancers (Basel)* 16(10):1870.

Oren O, Gersh BJ, Bhatt DL (2020) Artificial intelligence in medical imaging: Switching from radiographic pathological data to clinically meaningful endpoints. *Lancet Digital Health* 2(9): e486–e488.

Pandey P, Zheng Y (2023) Technologies of power in digital inclusion. *J. Assoc. Inform. Systems* 24(5):1334–1357.

Park EH, Werder K, Cao L, Ramesh B (2022) Why do family members reject AI in health care? Competing effects of emotions. *J. Management Inform. Systems.* 39(3):765–792.

Pinto-Coelho L (2023) How artificial intelligence is shaping medical imaging technology: A survey of innovations and applications. *Bioengineering (Basel)* 10(12):1435.

Pumplun L, Peters F, Gawlitza JF, Buxmann P (2023) Bringing machine learning systems into clinical practice: A design science approach to explainable machine learning-based clinical decision support systems. *J. Assoc. Inform. Systems* 24(4):953–979.

Roderick T, Pengetnze Y, Miff S, Tremblay MC, Kohli R (2021) Building a vulnerability index of biological and socioeconomic risk factors to combat COVID-19 spread. Chandra Kruse L, Seidel S, Hausvik GI, eds. *The Next Wave of Sociotechnical Design. DESRIST 2021*, Lecture Notes in Computer Science (Springer, Berlin, Heidelberg), 22–33.

Ruoff M, Gnewuch U, Maedche A, Scheibehenne B (2023) Designing conversational dashboards for effective use in crisis response. *J. Assoc. Inform. Systems* 24(6):1500–1526.

Saghafian S, Tomlin B, Biller S (2022) The internet of things and information fusion: Who talks to who? *Manufacturing Service Oper. Management* 24(1):333–351.

Sahni N, Myers M (2014) What the U.S. can learn from India and Brazil about preventive health care. *Harvard Bus. Rev.* (November 14), https://hbr.org/2014/11/what-the-u-s-can-learn-from-india-and-brazil-about-preventive-health-care.

Saifee DH, Zheng Z, Bardhan IR, Lahiri A (2020) Are online reviews of physicians reliable indicators of clinical outcomes? A focus on chronic disease management. *Inform. Systems Res*. 31(4): 1282–1300.

Salge TO, Kohli R, Barrett M (2015) Investing in information systems: On the behavioral and institutional search mechanisms

underpinning hospitals' IS investment decisions. *MIS Quart.* 39(1):61–89.

Salge TO, Antons D, Barrett M, Kohli R, Oborn E, Polykarpou S (2022) How IT investments help hospitals gain and sustain reputation in the media: The role of signaling and framing. *Inform. Systems Res.* 33(1):110–130.

Sarkar U, Bates DW (2024) Using artificial intelligence to improve primary care for patients and clinicians. *JAMA Internal Medicine* 184(4):343–344.

Scheer ER, Werner NE, Coller RJ, Nacht CL, Petty L, Tang M, Ehlenbach M, Kelly MM, Finesilver S, Warner G (2024) Designing for caregiving networks: A case study of primary caregivers of children with medical complexity. *J. Amer. Medical Inform. Assoc.* 31(5):1151–1162.

Singh R, Anderson C, Miranda S (2022) Physician burnout: A technology-based reification of competing logics view. Bui TX, ed. *Proc. 55th Hawaii Internat. Conf. System Sci.* (University of Hawai'i at Mānoa, Honolulu), 6270–6279.

Sjöström J, Ågerfalk P, Hevner AR (2022) The design of a system for online psychosocial care: Balancing privacy and accountability in sensitive online healthcare environments. *J. Assoc. Inform. Systems* 23(1b):285–303.

Son J, Flatley Brennan P, Zhou S (2020) A data analytics framework for smart asthma management based on remote health information systems with Bluetooth-enabled personal inhalers. *MIS Quart.* 44(1):237–263.

Sykes TA, Aljafari R (2022) We are all in this together, or are we? Job strain and coping in the context of an e-healthcare system implementation. *J. Management Inform. Systems* 39(4):1215–1247.

Teisberg E, Wallace S, O'Hara S (2020) Defining and implementing value-based health care: A strategic framework. *Acad. Medicine* 95(5):682–685.

Thakral Y, Sahay S, Mukherjee A (2022) Institutional work to routinize the use of a digital AMR monitoring system. Hatakka M, Amadi ES, Hedström MAH, eds. *Freedom Social Inclusion Connected World: Proc. 16th Internat. Conf. Social Implications Comput. Developing Countries*, vol. 657 (Springer, Cham, Switzerland), 89–106.

Thakral Y, Sahay S, Mukherjee A (2024) Microfoundations of data-driven antimicrobial stewardship policy (ASP). *Antibiotics (Basel)* 13(1):24.

Thiebes S, Gao F, Briggs RO, Schmidt-Kraepelin M, Sunyaev A (2023) Design concerns for multiorganizational, multistakeholder collaboration: A study in the healthcare industry. *J. Management Inform. Systems* 40(1):239–270.

Thompson S, Whitaker J, Kohli R, Jones C (2020) Chronic disease management: How IT and analytics create healthcare value through the temporal displacement of care. *MIS Quart.* 44(1): 227–256.

Tong Y, Tan CH, Sia CL, Shi Y, Teo HH (2022) Rural-urban healthcare access inequality challenge: Transformative roles of information technology. *MIS Quart.* 46(4):1937–1982.

Tremblay MC, Kohli R, Forsgren N (2021) Theories in flux: Reimagining theory building in the age of machine learning. *MIS Quart.* 45(1):455–459.

Tremblay MC, Kohli R, Rivero C (2023) Data is the new protein: How the Commonwealth of Virginia built digital resilience muscle and rebounded from opioid and COVID shocks. *MIS Quart.* 47(1):423–450.

Valecha R, Upadhyaya S, Raghav Rao H (2021) An Activity theory approach to leak detection and mitigation in patient health information (PHI). *J. Assoc. Inform. Systems* 22(4):1007–1036.

Venkatesh V, Sykes TA, Zhang X (2020) ICT for development in rural India: A longitudinal study of women's health outcomes. *MIS Quart.* 44(2):605–629.

Venkatesh V, Rai A, Sykes TA, Aljafari R (2016) Combating infant mortality in rural India: Evidence from a field study of eHealth kiosk implementations. *MIS Quart.* 40(2):353–380.

Waldman SA, Terzic A (2019) Healthcare evolves from reactive to proactive. *Clinical Pharmacology Therapeutics* 105(1):10.

Wu Y, Ye H, Jensen ML, Liu L (2024) Impact of project updates and their social endorsement in online medical crowdfunding. *J. Management Inform. Systems* 41(1):73–110.

Xie J, Liu X, Zeng DD, Fang X (2022) Understanding medication nonadherence from social media: A sentiment-enriched deep learning approach. *MIS Quart.* 46(1):341–372.

Yan L, Tan Y (2014) Feeling blue? Go online: An empirical study of social support among patients. *Inform. Systems Res.* 25(4):690–709.

Yoo Y, Henfridsson O, Kallinikos J, Gregory R, Burtch G, Chatterjee S, Sarker S (2024) The next frontiers of digital innovation research. *Inform. Systems Res.* 35(4):1507–1523.

Yu S, Chai Y, Chen H, Sherman SJ, Brown RA (2022) Wearable sensor-based chronic condition severity assessment: An adversarial attention-based deep multisource multitask learning approach. *MIS Quart.* 46(3):1355–1394.

Yu S, Chai Y, Samtani S, Liu H, Chen H (2024) Motion sensor–based fall prevention for senior care: A hidden Markov model with generative adversarial network approach. *Inform. Systems Res.* 35(1):1–15.

Zhou J, Kishore R, Amo L, Ye C (2022) Description and demonstration signals as complements and substitutes in an online market for mental health care. *MIS Quart.* 46(4):2055–2084.

Zhou J, Zhang Q, Zhou S, Li X, Zhang X (2023a) Unintended emotional effects of online health communities: A text mining-supported empirical study. *MIS Quart.* 47(1):195–226.

Zhou T, Wang Y, Yan L(L), Tan Y (2023b) Spoiled for choice? Personalized recommendation for healthcare decisions: A multi-armed bandit approach. *Inform. Systems Res.* 34(4):1493–1512.