

Balancing Technology and Ethics in the Transformation of Modern Hospital Healthcare

Mohamed Suhaimi Yusof^{1*}, Nurul Shuhada Abd Wahab²

¹ School of Technology Management and Logistics, Universiti Utara Malaysia,
06010 Kedah, Malaysia

² Sultanah Nur Zahirah Hospital,
20400 Terangganu, Malaysia

*Corresponding Author: msuhaimi2020@gmail.com

Received	Revised	Accepted	Published
16 March 2021	20 May 2021	31 May 2021	30 June 2021

Abstract

The rapid integration of digital technology into modern hospitals has transformed healthcare delivery, clinical decision-making, information management, and patient access to services. However, technological advancement also creates significant ethical concerns involving patient autonomy, privacy, confidentiality, accountability, fairness, safety, and equitable access. This article examines the relationship between technology and ethics in the transformation of modern hospital healthcare, with particular attention to digital transformation, artificial intelligence, patient data management, and technology-enabled healthcare delivery. The analysis identifies four major challenges: gaps in ethical governance during rapid technological adoption, uncertainty surrounding human accountability in artificial intelligence-supported clinical decisions, increasing risks to patient privacy within connected digital environments, and unequal access caused by the digital divide. The article argues that technological effectiveness should be evaluated not only through efficiency, accuracy, or operational performance, but also through its ability to protect patient interests and maintain professional responsibility. Particular attention is given to the importance of human oversight in artificial intelligence, responsible management of sensitive health information, cybersecurity, and inclusive digital healthcare. The article proposes stronger ethical technology governance, clear human accountability, responsible patient data governance, and equitable digital access as important strategies for sustainable hospital transformation. Ultimately, successful healthcare transformation requires hospitals to balance technological innovation with ethical principles so that digital advancement strengthens healthcare quality while preserving patient trust, professional judgement, fairness, and patient-centred care.

Keywords: *Technology, Ethics, Healthcare, Hospitals, Digitalisation*

How to Cite:

YUsof, M. S., & Abd Wahab, N. S. (2021). Balancing technology and ethics in the transformation of modern hospital healthcare. *The Asian Journal of Professional & Business Studies*, 2(1), 23–41.

<https://doi.org/10.61688/ajpbs.v2i1.146>

Copyright: © 2021 The Author(s)

Published by Kolej Universiti Poly-Tech MARA. This is an open access article distributed under the terms of the Creative Commons Attribution 4.0 International (CC BY 4.0) Licence:

<http://creativecommons.org/licenses/by/4.0/legalcode>

1. Introduction

Modern hospitals are increasingly shaped by digital technologies that influence clinical decision making, patient monitoring, information management, communication, diagnosis, and healthcare delivery. The expansion of electronic health records, telemedicine, artificial intelligence, data analytics, and digital platforms has created new opportunities to improve efficiency, coordination, accessibility, and quality of care. Kraus et al. (2021) describe digital transformation in healthcare as an organisational change that extends beyond the introduction of individual technologies, while Sheikh et al. (2021) emphasise the potential of health information technology and digital innovation to support improvements in healthcare delivery. Electronic health records can strengthen documentation and contribute to patient safety when they are appropriately implemented and used (Tubaishat, 2019). Similarly, interoperability can improve the availability and exchange of clinical information across healthcare systems, with important implications for patient safety (Li et al., 2021). Negro-Calduch et al. (2021) further demonstrate that technological development in electronic and personal health records is increasingly associated with information accessibility, integration, and system functionality. These developments indicate that technology has become fundamental to modern hospital operations. However, technological transformation also changes professional responsibilities, patient relationships, organisational processes, and clinical decision making, creating a need to consider hospital transformation through both technological and ethical perspectives.

Artificial intelligence represents one of the most significant technological developments influencing the future direction of hospital healthcare because of its potential applications in diagnosis, medical imaging, clinical prediction, decision support, administration, and workflow improvement. Jiang et al. (2017) explain that artificial intelligence can process different forms of healthcare data and support a range of clinical activities, while Topol (2019) argues that the convergence of human and artificial intelligence has the potential to improve clinical accuracy, productivity, and healthcare workflow. Nevertheless, the transition from technological potential to routine hospital implementation remains challenging. He et al. (2019) identify data sharing, privacy, algorithmic transparency, interoperability, regulation, and patient safety as important issues surrounding the practical implementation of artificial intelligence in healthcare. Chen and Decary (2020) similarly emphasise that healthcare organisations need appropriate strategies and leadership when introducing artificial intelligence into clinical environments. Furthermore, Shinnars et al. (2020) show that healthcare professionals may be less willing to use artificial intelligence when they do not understand or trust how the technology contributes to patient care. These findings demonstrate that successful hospital transformation requires more than technical performance. Human judgement, professional confidence, organisational readiness, clinical workflows, and ethical responsibility must also remain central to technology adoption.

Ethical concerns become particularly important when digital technologies influence decisions involving patient autonomy, fairness, responsibility, privacy, safety, and access to healthcare. Varkey (2021) identifies autonomy, beneficence, nonmaleficence, and justice as fundamental principles of clinical ethics, providing an important foundation for evaluating technological practices in hospitals. Morley et al. (2020), through a mapping review of artificial intelligence ethics in healthcare, demonstrate that ethical questions arise throughout the development and implementation of intelligent healthcare systems. Murphy et al. (2021) similarly identify privacy, trust, accountability, responsibility, and bias as recurring ethical concerns associated with artificial intelligence in health. Grote and Berens (2020) extend this debate by examining issues involving fairness, paternalism, and moral responsibility when algorithmic systems influence healthcare decisions. Durán and Jongsma (2021) further highlight concerns surrounding black box algorithms whose reasoning may not be readily understandable to healthcare professionals. These challenges have practical implications because clinicians remain professionally responsible for decisions affecting patients even when technological systems contribute significantly to those decisions. McCradden et al. (2020) also demonstrate that patients, caregivers, and healthcare professionals identify important ethical concerns surrounding artificial intelligence. Therefore, hospitals need ethical safeguards that develop alongside technological capability rather than being considered only after new systems have already been implemented.

Patient information represents another critical area where technology and ethics must remain closely balanced. Modern hospitals depend on extensive quantities of digital health data to support diagnosis, treatment, administration, research, and increasingly artificial intelligence applications. However, greater collection, integration, and exchange of patient information creates substantial responsibilities concerning privacy,

confidentiality, consent, security, and control. Gostin et al. (2018) highlight the importance of protecting health information in the digital era, while Murdoch (2021) explains that artificial intelligence creates additional privacy challenges because health data may be accessed and processed across institutional and commercial boundaries. Ethical tensions are also present in established hospital information systems. Layman (2020) argues that electronic health records may create conflicts involving autonomy, confidentiality, beneficence, and justice when patient information is accessed or shared without appropriate safeguards. Issa et al. (2020) similarly identify privacy, confidentiality, security, and patient safety concerns associated with electronic health record use. Jokinen et al. (2021) further demonstrate that ethical issues in eHealth extend across privacy, autonomy, accessibility, and professional responsibilities. Cybersecurity consequently becomes both a technical and ethical requirement. Kruse et al. (2017) show that healthcare organisations face significant cybersecurity threats, reinforcing the importance of protecting sensitive information while hospitals expand their reliance on interconnected digital systems.

Fairness and patient safety further complicate technology adoption because digital systems can reproduce or intensify weaknesses embedded within data, algorithms, system design, and clinical workflows. Obermeyer et al. (2019) provide influential evidence that a widely used healthcare algorithm produced substantial racial bias because the measure used to identify healthcare need systematically disadvantaged particular patients. This finding demonstrates that technological effectiveness cannot be assessed solely through overall accuracy or efficiency. Hospitals must also determine whether technological systems distribute benefits and risks fairly among different patient populations. Geis et al. (2019) argue that artificial intelligence in medical practice should respect human rights, privacy, transparency, accountability, and appropriate human oversight. Technology related risks may also result from poor system usability and its interaction with clinical work. Ratwani et al. (2018) demonstrate considerable variation in electronic health record usability across healthcare systems, with important implications for patient safety. Singh et al. (2020) further argue that electronic health record interventions should be evaluated within their broader sociotechnical environment because outcomes are influenced by technology, people, workflow, organisational culture, and implementation conditions. Accordingly, ethical technology adoption requires continuous evaluation of whether digital innovation genuinely improves patient outcomes while preventing avoidable harm, discrimination, inappropriate dependence on algorithms, or unequal treatment.

The rapid expansion of telemedicine and digital care during the COVID 19 period further demonstrated both the strategic value and ethical complexity of technology enabled healthcare. Jin et al. (2020) observe that telemedicine gained greater prominence as healthcare organisations adapted service delivery to changing conditions, while Patel et al. (2021) identify substantial variation in telemedicine use across clinical and patient groups. Basu et al. (2021) emphasise that telehealth implementation is a multidimensional health system challenge involving regulation, capacity, public engagement, education, and organisational readiness. Within Southeast Asia, Sabrina and Defi (2021) identify the importance of appropriate telemedicine guidelines that consider local circumstances, while Bitar and Alismail (2021) highlight several roles and implementation requirements associated with eHealth, telehealth, and telemedicine. Ethical concerns remain significant because access to digital healthcare can differ according to technological resources, digital skills, health conditions, and communication needs. Ladin et al. (2021) further demonstrate that patient preferences and experiences may differ between telehealth and conventional face to face care. Accordingly, this article examines how modern hospital healthcare can balance technological advancement with ethical responsibility by focusing on digital innovation, patient data protection, fairness, professional accountability, patient safety, and equitable service delivery. Achieving this balance is essential for ensuring that hospital transformation remains technologically progressive while preserving trust, human judgement, and patient centred values.

2. Literature Review

The transformation of modern hospital healthcare increasingly depends on the ability of healthcare organisations to integrate technological advancement with ethical principles that protect patients and support responsible professional practice. Digital technologies have expanded beyond administrative functions and now influence clinical decision making, electronic health records, artificial intelligence, telemedicine, data analytics, and communication between healthcare professionals and patients. Sheikh et al. (2021) explain that health information technology can support learning health systems through improved data infrastructure, interoperability, and information use, although implementation introduces important ethical and organisational challenges. Williams et al. (2021) similarly demonstrate that successful digital transformation in hospitals requires organisational

learning and knowledge transfer rather than technology implementation alone. Ethical considerations become particularly important because technological systems influence privacy, autonomy, professional responsibility, fairness, and access to healthcare. Morley et al. (2020) identify a broad range of ethical concerns associated with artificial intelligence in healthcare, while Beauchamp and Childress (2019) emphasise the continuing importance of autonomy, beneficence, nonmaleficence, and justice in healthcare ethics. Therefore, the literature is examined through four interconnected areas involving digital transformation and responsible technology adoption, artificial intelligence and ethical decision making, patient data privacy and digital security, and equitable technology enabled healthcare delivery.

2.1 Digital Transformation and Responsible Technology Adoption in Hospitals

Digital transformation provides hospitals with significant opportunities to improve information availability, communication, clinical coordination, operational efficiency, and patient care. However, the literature indicates that digital transformation should be understood as organisational change rather than simply the installation of new technological systems. Sheikh et al. (2021) explain that health information technology can enable continuous learning through integrated data infrastructure, electronic health records, artificial intelligence, and improved information exchange. Nevertheless, their analysis also identifies interoperability, usability, data management capability, privacy, security, digital inclusion, and governance as important requirements for effective transformation. Williams et al. (2021) similarly demonstrate that knowledge transfer between hospitals plays an important role in improving digital maturity, suggesting that healthcare organisations can benefit from systematically sharing implementation experience. Electronic health records represent a central element of this transformation because they provide healthcare professionals with access to information that can support diagnosis, treatment, medication management, and care coordination. Tapuria et al. (2021) identify potential benefits associated with patient access to electronic health records while also recognising concerns involving privacy, confidentiality, and patient anxiety. These findings demonstrate that hospital digitalisation should be evaluated not only according to technological capability but also according to its contribution to safe, accessible, understandable, and patient centred healthcare.

Responsible adoption also requires hospitals to consider how technologies interact with healthcare professionals, clinical routines, organisational structures, and patient expectations. Technology may produce limited improvements when systems are poorly integrated into actual clinical work or when employees lack confidence in using them. Marion and Fixson's broader analysis of digital transformation principles is consistent with healthcare research showing that technology changes professional relationships and organisational processes, rather than simply automating existing activities. Within healthcare specifically, Sheikh et al. (2021) emphasise that digital innovation requires appropriate governance, regulation, usability, interoperability, data capability, and ethical safeguards. Furthermore, Layman (2020) demonstrates that electronic health records can create ethical tensions involving beneficence, autonomy, privacy, confidentiality, and justice. Issa et al. (2020) similarly identify concerns among healthcare professionals regarding privacy, confidentiality, security, data integrity, and patient safety associated with electronic health record systems. These concerns indicate that hospitals need clear responsibilities for evaluating technology before and after implementation. Technological effectiveness, clinical usefulness, employee capability, ethical implications, and patient outcomes should therefore be considered together. Responsible digital transformation ultimately requires hospitals to ensure that technological innovation supports healthcare professionals and patients without weakening ethical standards, professional judgement, or public trust.

2.2 Artificial Intelligence and Ethical Clinical Decision Making

Artificial intelligence has become an important area of healthcare innovation because algorithms can assist with diagnosis, prediction, medical imaging, clinical decision support, resource allocation, and the analysis of increasingly complex health data. Nevertheless, AI introduces ethical concerns that are particularly significant when technological recommendations influence decisions affecting patient health. Morley et al. (2020) demonstrate that the ethics of healthcare AI involves questions concerning transparency, responsibility, privacy, trust, bias, autonomy, and justice. Murphy et al. (2021) similarly identify privacy, trust, accountability, responsibility, and bias as recurring concerns across the healthcare AI literature. Grote and Berens (2020) further argue that algorithmic decision making creates ethical challenges involving paternalism, moral responsibility, and fairness. These concerns indicate that clinical effectiveness cannot be the only criterion used to evaluate artificial

intelligence. Hospitals must also determine whether algorithms operate in a manner that is consistent with ethical healthcare practice. Durán and Jongsma (2021) provide an important perspective by examining trust in black box medical algorithms and arguing that algorithmic reliability can support trust, but reliable results alone do not remove ethical concerns surrounding responsibility and appropriate clinical action. Consequently, human professional judgement remains important even when technically reliable artificial intelligence contributes to clinical decision making.

Fairness represents a particularly serious concern because healthcare algorithms can reproduce inequalities contained within their training data, design choices, or clinical assumptions. Obermeyer et al. (2019) demonstrate this problem through their analysis of a widely used population health algorithm that exhibited substantial racial bias because healthcare expenditure was used as a proxy for health need. Their findings show that an algorithm may appear technically effective while still producing unequal consequences for particular patient groups. Vyas et al. (2020) similarly question the incorporation of race correction into clinical algorithms, highlighting the possibility that apparently routine computational practices may contribute to healthcare disparities. These findings strengthen the argument that ethical evaluation should occur throughout the design and implementation of healthcare AI rather than only after adverse outcomes become visible. Morley et al. (2020) also emphasise the need to translate ethical principles into practical governance mechanisms. Hospitals therefore require multidisciplinary evaluation involving clinicians, technology specialists, management, ethics expertise, and where appropriate patient perspectives. Algorithmic accuracy should be considered alongside fairness, explainability, accountability, clinical relevance, and potential consequences for different patient populations. Such an approach can help hospitals adopt artificial intelligence without transferring professional responsibility entirely to technological systems or unintentionally reinforcing existing inequalities.

2.3 Patient Data Privacy, Security and Ethical Information Management

The expansion of digital healthcare has substantially increased the quantity and strategic value of patient information available to hospitals. Electronic health records, artificial intelligence, digital monitoring, data analytics, and interconnected information systems depend on large volumes of health data, creating opportunities for improved clinical decision making while simultaneously increasing ethical responsibilities. Price and Cohen (2019) explain that medical big data creates significant privacy concerns involving consent, governance, discrimination, information use, and data breaches. Electronic health records create similar ethical tensions because the information they contain may be highly sensitive and accessible to multiple healthcare professionals and technological systems. Layman (2020) argues that EHRs can create conflicts among ethical principles, particularly when improvements in accessibility and care are balanced against autonomy and confidentiality. Issa et al. (2020) further demonstrate that nurses identify privacy, confidentiality, security, data integrity, and patient safety as important concerns associated with EHR use. Tapuria et al. (2021) similarly find that providing patients with access to their electronic health records can create benefits but also concerns regarding security, privacy, confidentiality, and the interpretation of medical information. Ethical information management must therefore ensure that improvements in information accessibility do not weaken patients' legitimate expectations of confidentiality and control.

Cybersecurity should consequently be regarded as both a technical responsibility and an ethical requirement within hospital healthcare. Kruse et al. (2017) identify healthcare organisations as vulnerable to cybersecurity threats and highlight the importance of strengthening security measures as digital technology becomes more deeply integrated into healthcare operations. Fernández Alemán et al. (2013), through a systematic review of electronic health record systems, similarly identify privacy and security as major challenges requiring appropriate technological and organisational safeguards. Digital health technologies also create additional difficulties because patient information may be transferred across multiple systems, organisations, devices, or service providers. Thapa and Camtepe (2021) examine security and privacy requirements for precision health data and emphasise mechanisms involving consent management, ethical clearance, secure computation, and privacy preserving technologies. These studies demonstrate that information security cannot be separated from patient trust. Hospitals need technical safeguards, appropriate access controls, employee awareness, clear accountability, and procedures for responsible data collection and use. Patients should also be provided with understandable information regarding how their data are collected, stored, shared, and used where appropriate. Effective data governance can therefore support technological innovation while preserving privacy, confidentiality, autonomy, and public confidence in increasingly data intensive hospital environments.

2.4 Ethical Access, Telemedicine and Digital Healthcare Equity

Telemedicine illustrates how technological innovation can simultaneously improve healthcare access and create new ethical concerns regarding fairness and inclusion. The COVID 19 pandemic accelerated the use of remote healthcare services and demonstrated that digital communication could maintain healthcare delivery when conventional face to face access was restricted. However, increased availability does not necessarily mean that all patients have an equal ability to benefit from digital healthcare. Chang et al. (2021) demonstrate that the rapid transition to telehealth exposed barriers affecting healthcare practices and patients, contributing to concerns surrounding the digital divide. Alkureishi et al. (2021) similarly found that technology access and digital literacy barriers were particularly relevant to older, lower income, minority, and non English speaking patients. Their study shows that patients regarded technology access and digital literacy as important factors that could influence broader health inequalities. Anaya et al. (2021) further argue that patient centred telehealth should be designed around the actual technological resources, language requirements, literacy levels, and circumstances of vulnerable patient populations. These findings demonstrate that the ethical principle of justice has direct relevance to hospital digital transformation. Expanding telemedicine without addressing differences in technological accessibility may unintentionally create new barriers for patients who already experience difficulties accessing conventional healthcare services.

Equitable digital healthcare therefore requires hospitals to balance technological efficiency with patient choice, accessibility, and the preservation of appropriate alternatives. Telemedicine may provide convenience and greater access for some patients, but others may experience barriers involving internet connectivity, devices, digital literacy, language, disability, privacy, or confidence in remote communication. Alkureishi et al. (2021) emphasise that some patients may continue to require lower technology communication options and argue that healthcare systems should avoid allowing digital transformation to widen existing inequalities. Anaya et al. (2021) similarly advocate equity centred telehealth that responds to patient preferences and practical circumstances rather than expecting vulnerable populations to adapt to systems that were not designed around their needs. Sheikh et al. (2021) identify digital inclusivity as an important requirement for national health information technology strategies, reinforcing the relationship between technology implementation and equitable healthcare access. Ethical hospital transformation should therefore preserve multiple pathways to care and evaluate whether new technologies benefit different patient groups fairly. The wider literature indicates that responsible healthcare technology should improve access without reducing patient autonomy or excluding individuals with limited technological resources. Balancing innovation with fairness, accessibility, privacy, and human interaction is consequently essential for ensuring that modern hospital healthcare remains both technologically progressive and ethically responsible.

3. Critical Ethical and Technological Issues in the Transformation of Modern Hospital Healthcare

The growing integration of digital technologies into hospital healthcare has created significant opportunities for improving clinical services, information management, communication, and patient access. However, technological advancement also introduces ethical challenges that can affect patient rights, professional responsibilities, organisational accountability, and public trust. The literature reviewed previously demonstrates that technology cannot be evaluated solely according to efficiency or technical performance because its application directly influences patients, healthcare professionals, and clinical decision making. Morley et al. (2020) identify multiple ethical concerns associated with healthcare artificial intelligence, while Murphy et al. (2021) highlight privacy, trust, accountability, responsibility, and bias as recurring concerns within the field. Similar difficulties are evident in electronic health records, where technological benefits may create tensions involving confidentiality, autonomy, accessibility, and information control (Layman, 2020). Therefore, four critical issues require particular attention in modern hospitals: managing the ethical consequences of rapid digital transformation, maintaining human responsibility in artificial intelligence supported clinical decisions, protecting patient information within increasingly connected digital environments, and preventing technology enabled healthcare from increasing inequalities in access to hospital services.

3.1 The Ethical Governance Gap in Rapid Hospital Digital Transformation

A major issue facing modern hospitals is the possibility that technological adoption can advance more rapidly than the ethical and organisational systems required to govern it responsibly. Hospitals increasingly depend on electronic health records, digital communication platforms, clinical information systems, remote monitoring, and other technologies that change how healthcare professionals work and interact with patients. Although these technologies can improve access to information and coordination, they can also create new responsibilities concerning patient autonomy, confidentiality, consent, safety, and professional judgement. Layman (2020) explains that electronic health records create tensions among ethical principles because the potential benefits of improved healthcare information coexist with concerns involving privacy, autonomy, accuracy, and equitable access. Fernández Alemán et al. (2013) similarly identify privacy and security as persistent challenges within electronic health record systems. The central problem is therefore not whether hospitals should adopt digital technology, but whether governance arrangements develop sufficiently alongside technological implementation. When ethical assessment occurs only after a system has been introduced, hospitals may discover problems involving inappropriate information access, workflow disruption, unclear accountability, or unintended consequences only after patients and professionals have already been exposed to them.

The governance challenge becomes more difficult because digital transformation changes organisational relationships as well as technological processes. Healthcare professionals may be expected to rely on systems designed by external vendors or technical specialists whose priorities and assumptions may differ from clinical practice. This can create uncertainty concerning who should be responsible when technological recommendations, system limitations, or design weaknesses contribute to poor clinical outcomes. Ethical principles may also remain expressed at a general level without being translated into practical procedures for technology selection, implementation, monitoring, and evaluation. Morley et al. (2020) demonstrate that healthcare AI ethics involves numerous concerns across development and implementation, illustrating the difficulty of translating broad ethical principles into operational practice. Kerasidou (2021) likewise argues that artificial intelligence has considerable potential to transform healthcare while creating important ethical questions surrounding the way care is delivered. Hospitals therefore face a governance gap when technological capability develops faster than ethical oversight, employee preparation, or organisational accountability. Without stronger integration between technology management and ethical governance, digital transformation may improve operational capability while simultaneously creating new risks to patient centred care and professional responsibility.

3.2 The Human Accountability Dilemma in Artificial Intelligence Supported Healthcare

Artificial intelligence creates a particularly complex ethical issue because algorithms can increasingly influence diagnosis, prediction, clinical prioritisation, treatment recommendations, and other decisions that directly affect patients. The problem is not simply whether an AI system can produce accurate results, but how clinical responsibility should be managed when human professionals rely on algorithmic recommendations. Murphy et al. (2021) identify accountability, responsibility, trust, privacy, and bias as major ethical concerns surrounding AI applications in health. Morley et al. (2020) similarly demonstrate that healthcare AI raises ethical questions across several stages of technology development and implementation. These concerns become especially important when complex algorithms cannot easily explain how particular recommendations were generated. A healthcare professional may therefore receive an apparently reliable technological recommendation while lacking sufficient understanding of the reasoning behind it. If the professional accepts the recommendation without adequate clinical judgement, responsibility may become unclear when an error occurs. Conversely, consistently ignoring technological recommendations could reduce the potential clinical benefits of AI. Hospitals therefore face the difficult task of defining an appropriate relationship between algorithmic assistance and human professional judgement without allowing technological systems to replace meaningful clinical accountability.

Algorithmic bias creates an additional ethical concern because apparently objective technological systems can produce unequal outcomes when the data or assumptions underlying them reflect existing inequalities. Murphy et al. (2021) identify bias as a recurring concern within healthcare AI ethics, demonstrating that technical innovation can create significant implications for fairness and justice. The problem can become difficult to detect because an algorithm may demonstrate strong overall performance while producing systematically weaker outcomes for particular patient groups. Ethical concerns therefore extend beyond accuracy to questions involving representation, fairness, transparency, and the distribution of healthcare benefits and risks. Hospitals may also

lack sufficient internal technical expertise to independently examine algorithms developed by external companies, increasing dependence on vendor explanations and performance claims. Kerasidou (2021) emphasises that AI can improve healthcare efficiency and diagnostic capability but also requires careful ethical consideration when applied across different healthcare environments. Consequently, hospitals need to confront a fundamental dilemma: technological systems may support more sophisticated clinical decisions, yet healthcare professionals and organisations must retain clear responsibility for ensuring that those decisions remain fair, clinically appropriate, explainable where necessary, and consistent with patient interests.

3.3 Protecting Patient Privacy in an Expanding Digital Health Environment

Patient data protection represents another major issue because hospital digital transformation depends increasingly on the collection, storage, integration, analysis, and exchange of large quantities of health information. Medical records contain highly sensitive information, and their digitalisation can improve accessibility for clinical purposes while simultaneously expanding opportunities for inappropriate access, misuse, cybersecurity incidents, and secondary data use. Price and Cohen (2019) explain that medical big data creates substantial legal and ethical challenges involving patient privacy because information can be combined, analysed, and potentially used in ways that were not anticipated when it was originally collected. Layman (2020) similarly identifies confidentiality and autonomy as significant ethical concerns within electronic health record environments. The problem becomes more complex as hospital information moves across different departments, systems, devices, researchers, service providers, and external technology organisations. Traditional concepts of consent may become increasingly difficult to apply when patients cannot easily understand every possible future use of their information. Hospitals must therefore balance the clinical and organisational value of extensive data use against patients' legitimate expectations of privacy, confidentiality, and appropriate control over personal health information.

Cybersecurity further intensifies this ethical challenge because protecting patient information requires both technological safeguards and responsible human behaviour. Kruse et al. (2017) identify cybersecurity as a major challenge within healthcare organisations, including threats associated with increasingly connected information systems. Their work on electronic health record security also emphasises the importance of protecting patient privacy when healthcare organisations adopt digital records. The ethical significance of cybersecurity extends beyond preventing financial or operational loss. A security failure may expose sensitive health information, undermine patient confidence, interrupt healthcare services, and potentially influence patients' willingness to disclose information necessary for appropriate treatment. Furthermore, cybersecurity responsibilities are distributed across many employees, technical systems, vendors, and organisational processes, creating difficulties in maintaining consistent protection. Price and Cohen (2019) also demonstrate that advanced data analytics complicate conventional assumptions about anonymity because health data can create new privacy risks even when organisations attempt to protect individual identities. Consequently, hospitals face an ongoing ethical tension between maximising the value of health data for clinical improvement and ensuring that increased technological connectivity does not weaken confidentiality, informed consent, data security, or public trust.

3.4 The Digital Divide and Unequal Access to Technology Enabled Hospital Care

Technology enabled healthcare can improve accessibility, but it can also produce new forms of inequality when patients do not possess equal access to digital devices, reliable internet connections, technological skills, language support, or appropriate assistance. This problem became especially visible as telemedicine expanded rapidly during the COVID 19 period. Chang et al. (2021) found that the rapid transition towards telehealth revealed significant barriers and highlighted the continuing importance of the digital divide. Alkureishi et al. (2021) similarly demonstrate that older, lower income, minority, and non English speaking patients may experience greater difficulties involving technology access and digital literacy. These inequalities create an ethical problem because digital transformation may unintentionally provide the greatest benefits to patients who already possess stronger technological resources. A hospital may consider telemedicine successful because overall service accessibility increases, while particular groups experience reduced ability to participate effectively. Consequently, technological accessibility should not be assessed simply by whether a digital service exists. Hospitals must also consider whether patients can realistically use the technology, communicate effectively with healthcare professionals, understand digital instructions, and obtain appropriate alternatives when technology creates barriers.

The digital divide also raises questions about patient autonomy and the preservation of meaningful choice in healthcare delivery. Technology can become ethically problematic when patients feel compelled to use digital systems even though they lack confidence, appropriate devices, privacy, language support, or sufficient technological knowledge. Alkureishi et al. (2021) show that technology barriers can contribute to disparities in telemedicine participation and potentially widen existing inequalities in healthcare access. Haleem et al. (2021) identify substantial opportunities associated with telemedicine but also recognise technological and implementation barriers that can affect its effective use. The issue is therefore not whether hospitals should continue expanding digital care, but how they can prevent technology from becoming an additional condition for obtaining appropriate healthcare. Hospitals that replace conventional services too rapidly with technology dependent alternatives may unintentionally disadvantage patients who require personal assistance or face digital barriers. Equitable transformation consequently requires attention to differences in patient resources, capabilities, and preferences. Without such consideration, technological innovation may improve overall healthcare efficiency while simultaneously weakening the ethical principle of justice by creating unequal opportunities to benefit from modern hospital services.

4. Strategic Discussion on Balancing Technology and Ethics in Modern Hospital Healthcare

The critical issues identified in modern hospital transformation demonstrate that technological advancement and ethical responsibility should not be treated as competing priorities. Digital systems can improve information accessibility, clinical coordination, decision making, and service delivery, but their value ultimately depends on whether implementation protects patients and supports responsible healthcare practice. Ethical concerns become particularly important when technologies influence clinical decisions, collect sensitive information, or determine how patients access healthcare services. Morley et al. (2020) demonstrate that healthcare artificial intelligence raises interconnected concerns involving transparency, privacy, responsibility, trust, bias, and justice. Murphy et al. (2021) similarly identify accountability, privacy, trust, and bias as prominent ethical issues associated with AI in healthcare. The rapid development of hospital technologies therefore requires governance mechanisms that connect technological performance with established healthcare values. Moreover, the digital divide demonstrates that technological availability does not automatically create equitable healthcare outcomes (Eruchalu et al., 2021). Accordingly, the four issues identified previously should be considered collectively. The following discussion examines how hospitals can strengthen ethical digital governance, preserve human accountability in AI supported care, develop responsible health data governance, and promote equitable access to technology enabled healthcare.

4.1 Integrating Ethical Governance into Hospital Digital Transformation

The ethical governance gap indicates that hospitals need to incorporate ethical evaluation throughout the technology adoption process rather than considering ethical concerns only after implementation. Digital transformation involves changes in clinical workflows, professional relationships, information management, patient interaction, and organisational responsibilities. Consequently, evaluating a technology solely according to efficiency, cost reduction, or technical performance provides an incomplete assessment of its value. Morley et al. (2020) demonstrate that ethical challenges can emerge at different stages of healthcare AI development and implementation, supporting the need for ethics to become part of technology governance from the beginning. Mirbabaie et al. (2021) similarly identify multiple ethical considerations surrounding artificial intelligence specifically within hospitals, illustrating that implementation can create organisational as well as clinical concerns. Hospitals should therefore connect technology decisions with principles involving patient autonomy, safety, fairness, confidentiality, transparency, and professional responsibility. This approach requires participation from healthcare professionals, technology specialists, hospital management, and ethics expertise when major digital systems are evaluated. Ethical governance should not function primarily as a mechanism for restricting innovation. Instead, it can improve the quality of technological decisions by identifying potential consequences before technologies become deeply embedded in hospital practices and difficult to modify.

Effective governance also requires hospitals to recognise that ethical responsibility continues after a technology has been introduced. Digital systems can produce unexpected consequences when they interact with actual clinical workflows, patient populations, and organisational conditions. Hospitals therefore need continuing evaluation of whether technologies remain clinically appropriate, understandable to users, secure, and consistent with patient

interests. Zarif (2021) argues that widespread digital healthcare adoption introduces ethical challenges involving privacy, security, accessibility, and the relationship between technology and healthcare practice. Martinho et al. (2021) further demonstrate that medical doctors recognise important ethical considerations surrounding healthcare AI and emphasise the need to align AI with core bioethical principles and involve physicians in its development. These findings reinforce the importance of including frontline professionals in technological governance because they can identify problems that may not be visible during technical development. Hospitals should consequently understand digital governance as a continuous process involving implementation, monitoring, evaluation, and organisational learning. Such an approach can strengthen accountability while allowing technological systems to evolve according to clinical experience. Balancing technology and ethics therefore requires hospitals to create governance structures capable of supporting innovation without allowing efficiency or technological enthusiasm to override patient centred healthcare values.

4.2 Preserving Human Accountability in Artificial Intelligence Supported Clinical Care

The human accountability dilemma requires a clear distinction between using artificial intelligence to support healthcare professionals and allowing technological systems to become substitutes for professional responsibility. AI can analyse complex information and identify patterns that may improve clinical decision making, but algorithmic recommendations are generated through data, computational models, and design choices that may not capture every dimension of an individual patient's circumstances. Grote and Berens (2020) argue that algorithmic decision making in medicine raises significant concerns involving moral responsibility, fairness, and paternalism. Durán and Jongsma (2021) similarly examine the problem of trusting black box medical algorithms and demonstrate that reliability is important but does not eliminate broader concerns regarding appropriate clinical judgement. Consequently, hospitals should maintain meaningful human oversight when AI contributes to diagnosis, treatment, prioritisation, or other clinically important decisions. Healthcare professionals need sufficient understanding of an AI system's intended function, limitations, and appropriate context of use to evaluate its recommendations critically. Human oversight should therefore involve more than formally approving an algorithmic output. It should preserve the ability of healthcare professionals to question, interpret, reject, or seek additional evidence when technological recommendations conflict with clinical knowledge or individual patient circumstances.

Accountability must also address algorithmic fairness because human oversight becomes ineffective when healthcare professionals are unaware that technological systems may perform differently across patient populations. Obermeyer et al. (2019) demonstrated that bias in a widely used healthcare algorithm produced substantial inequalities because healthcare cost was used as a proxy for healthcare need. This influential finding illustrates that an algorithm can operate according to its technical design while still producing ethically problematic outcomes. Murphy et al. (2021) likewise identify bias, responsibility, accountability, and trust as important ethical concerns associated with healthcare AI. Hospitals should therefore evaluate AI performance across relevant patient populations rather than relying only on aggregate measures of accuracy. Clinicians should also participate in the design and evaluation of healthcare AI because their practical knowledge can contribute to identifying inappropriate assumptions or consequences. Martinho et al. (2021) found that physicians considered their participation in AI development important and recognised the need for alignment with bioethical principles. Thus, responsible AI should combine technological capability with clinical expertise and ethical oversight. The objective is not to restrict artificial intelligence but to ensure that its contribution strengthens professional judgement while preserving clear human and organisational accountability for patient care.

4.3 Strengthening Ethical Data Governance and Patient Digital Trust

The expansion of digital hospital systems makes responsible data governance central to the relationship between technology and ethics. Hospitals increasingly rely on electronic health records, digital platforms, analytical systems, and artificial intelligence that require access to substantial quantities of patient information. These data can support better clinical decisions and healthcare research, but greater availability also increases the complexity of privacy, consent, confidentiality, and secondary data use. Price and Cohen (2019) demonstrate that medical big data challenges traditional approaches to privacy because information can be combined and analysed in ways that create new risks for individuals. McKeown et al. (2021) further examine ethical problems surrounding consent for the reuse of information within health data platforms, demonstrating that data reuse raises questions that extend beyond initial collection. Hospitals should therefore view patient data as information held under significant ethical

responsibility rather than simply as a technological resource. Patients need appropriate information concerning how their health data may be collected and used, while organisations require clear rules concerning legitimate access, sharing, retention, and secondary use. Ethical data governance consequently provides an important mechanism for balancing the benefits of data intensive healthcare with respect for patient autonomy and confidentiality.

Patient trust should be recognised as an important outcome of effective data governance because digital healthcare depends substantially on individuals being willing to provide accurate and sensitive information. Security controls remain essential, but responsible governance extends beyond preventing unauthorised access. Hospitals must also consider whether data uses are consistent with patient expectations and whether individuals are given meaningful information about those uses. Thapa and Camtepe (2021) discuss privacy and security mechanisms for precision health information, emphasising consent management and privacy preserving approaches as important components of responsible data practices. Yusof et al. (2020) similarly show that consent becomes ethically complex when information collected for one purpose may subsequently be reused for other health data activities. These concerns indicate that compliance with technical security standards alone may not be sufficient to maintain patient confidence. Hospitals need organisational accountability, employee awareness, appropriate access controls, transparent data practices, and mechanisms for responding to emerging privacy concerns. Data governance should also evolve as technologies create new possibilities for analysing and combining information. By integrating security with ethical principles concerning autonomy, confidentiality, transparency, and responsible use, hospitals can support digital innovation while maintaining the patient trust required for sustainable technological transformation.

4.4 Advancing Digital Healthcare Without Deepening Health Inequality

The digital divide demonstrates that technological transformation should be evaluated according to who benefits from innovation rather than simply how widely technology is implemented. Telemedicine and other digital services can improve convenience and expand healthcare access, particularly when physical attendance is difficult. However, patients differ considerably in internet connectivity, digital literacy, language capability, technological resources, and confidence in using digital services. Eruchalu et al. (2021) explain that healthcare disparities can persist or even be intensified by new technologies, creating a digital divide in which populations experiencing poorer health outcomes may also encounter greater barriers to technology enabled care. Alkureishi et al. (2021) similarly identify digital literacy and technology access as important barriers to telemedicine participation, particularly among vulnerable patient populations. Therefore, hospitals should avoid interpreting the existence of a digital service as evidence of equitable access. Technology enabled healthcare should be evaluated according to whether different patient groups can realistically access, understand, and benefit from it. This perspective places the ethical principle of justice directly within hospital technology strategy. Digital transformation can be considered successful only when improvements in efficiency and accessibility do not systematically disadvantage patients with fewer technological resources or different communication needs.

Equitable digital transformation also requires hospitals to preserve appropriate patient choice and human interaction rather than assuming that digital delivery should replace conventional care whenever technology is available. Some patients may prefer remote consultations, while others may require face to face interaction because of clinical complexity, limited digital skills, communication difficulties, or personal circumstances. Eruchalu et al. (2021) emphasise that technological progress should be implemented carefully to prevent existing health disparities from being reproduced through digital systems. This means that hospitals should consider multiple pathways to care and assess whether technological systems create unintended barriers for particular populations. Digital services can complement conventional healthcare rather than automatically replacing it. Hospitals should also evaluate patient experience and accessibility alongside traditional measures such as efficiency, utilisation, and cost. Such evaluation can identify groups that benefit less from digital transformation and allow organisations to modify service delivery accordingly. Ultimately, balancing technology and ethics requires hospitals to understand accessibility as a fundamental dimension of responsible innovation. Technological transformation achieves its strongest healthcare value when digital systems expand opportunities for care while preserving fairness, patient autonomy, human judgement, and appropriate access for individuals with different technological capabilities and circumstances.

5. Strategic Suggestions for Strengthening Ethical Technology Transformation in Modern Hospital Healthcare

The transformation of modern hospital healthcare requires a strategic approach in which technological advancement is continuously aligned with ethical responsibility. The preceding discussion demonstrates that digital transformation creates benefits for clinical decision making, information management, operational efficiency, and healthcare accessibility, but these benefits can be weakened when hospitals lack effective ethical governance, clear professional accountability, adequate patient data protection, or equitable digital access. Reddy et al. (2020) argue that healthcare artificial intelligence requires governance structures capable of addressing ethical and regulatory responsibilities throughout implementation. Ethical principles concerning autonomy, beneficence, nonmaleficence, and justice also remain fundamental when technologies influence clinical practices and patient outcomes (Varkey, 2021). Meanwhile, Price and Cohen (2019) emphasise that the increasing use of health data creates complex privacy challenges that require stronger organisational responsibility. Digital transformation must also consider differences in patients' ability to access and use technology effectively (Anaya et al., 2021). Therefore, hospitals should adopt an integrated strategy that places ethical responsibility alongside technological capability. Four strategic suggestions are proposed: embedding ethical governance throughout digital transformation, strengthening human accountability in artificial intelligence supported care, establishing responsible patient data governance, and developing inclusive digital healthcare that provides equitable access while maintaining patient centred values.

5.1 Embedding Ethical Governance Throughout Hospital Digital Transformation

Hospitals should establish a formal ethical technology governance structure that evaluates technological innovations before, during, and after implementation. Digital technologies should not be selected solely according to technical performance, operational efficiency, or financial benefits because their implementation can directly influence patient safety, professional practice, privacy, autonomy, and healthcare quality. Reddy et al. (2020) propose a governance model for artificial intelligence in healthcare that integrates ethical principles and regulatory requirements, demonstrating the importance of systematic oversight when technologies become involved in clinical environments. Hospitals should therefore establish multidisciplinary governance committees consisting of clinicians, nurses, information technology specialists, administrators, legal or regulatory personnel, and ethics representatives. Such committees can evaluate whether proposed technologies provide sufficient clinical benefits while maintaining acceptable ethical standards. Varkey (2021) emphasises that autonomy, beneficence, nonmaleficence, and justice continue to provide essential principles for addressing ethical challenges in healthcare. These principles can provide practical criteria when hospitals evaluate technologies that affect patients or professional decision making. Furthermore, McCradden et al. (2020) demonstrate that patients, caregivers, and healthcare professionals identify significant ethical concerns surrounding artificial intelligence. Their perspectives suggest that responsible technological governance should consider the experiences of those directly affected by healthcare innovation rather than depending exclusively on technical assessments.

Ethical governance should continue throughout the operational life of hospital technologies because risks may change as systems interact with clinical workflows, patient populations, and other digital infrastructure. Hospitals should conduct regular assessments of technological performance, patient safety, usability, privacy, fairness, and professional experience. Grote and Berens (2020) highlight important concerns involving fairness, paternalism, and moral responsibility when algorithms influence medical decisions. Such concerns demonstrate that a system that performs technically as intended may still generate ethically problematic consequences. Hospitals should consequently establish clear procedures through which healthcare professionals can report technological problems, inappropriate recommendations, patient concerns, or unexpected ethical consequences. Morley et al. (2020) identify transparency, responsibility, privacy, trust, and fairness among the major ethical concerns associated with healthcare artificial intelligence, reinforcing the importance of continuous evaluation rather than one time approval. Hospitals should also maintain clear documentation concerning technology selection, identified risks, corrective actions, and responsibilities for monitoring. When serious concerns are detected, organisations should be prepared to modify, restrict, or discontinue technological systems until appropriate safeguards are established. Continuous ethical governance can therefore strengthen organisational accountability while allowing hospitals to benefit from innovation. Technology becomes more sustainable when ethical evaluation develops alongside technological capability and remains integrated into hospital decision making.

5.2 Strengthening Human Accountability in Artificial Intelligence Supported Clinical Care

Hospitals should preserve meaningful human oversight whenever artificial intelligence contributes to clinical decisions because professional responsibility cannot simply be transferred to technological systems. AI may improve the ability to analyse large quantities of clinical information, recognise patterns, predict risks, and support diagnosis, but these capabilities do not eliminate the importance of professional judgement. Durán and Jongsma (2021) examine trust in black box medical algorithms and demonstrate that reliability is important when clinicians cannot fully understand the internal reasoning of complex systems. However, reliability alone does not resolve questions concerning responsibility for clinical decisions. Hospitals should therefore define clear accountability pathways that identify who is responsible for evaluating AI recommendations and making final decisions affecting patients. Chen and Decary (2020) emphasise the importance of appropriate organisational strategy when healthcare institutions adopt artificial intelligence, indicating that successful implementation requires managerial and clinical preparation alongside technical capability. Healthcare professionals should receive training that allows them to understand the intended purpose, limitations, and appropriate application of AI systems. Human oversight should involve critical interpretation rather than automatic acceptance of algorithmic recommendations. Murphy et al. (2021) further identify accountability, responsibility, trust, privacy, and bias as significant ethical concerns surrounding artificial intelligence in health. Maintaining professional oversight can therefore help ensure that AI remains a supportive clinical resource rather than becoming an uncontrolled substitute for human responsibility.

Hospitals should also establish procedures for identifying and managing algorithmic bias because artificial intelligence can generate unequal outcomes even when overall system performance appears acceptable. Obermeyer et al. (2019) provide important evidence showing that a healthcare algorithm produced substantial racial bias because healthcare cost was used as a proxy for health need. This demonstrates that apparently neutral computational systems can reproduce structural inequalities through the variables and assumptions incorporated into their design. Yusof et al. (2020) similarly question the continued use of race correction in clinical algorithms and demonstrate the importance of critically evaluating assumptions that may influence treatment decisions. Hospitals should consequently assess algorithmic performance across relevant patient populations rather than relying only on general measures of accuracy. Geis et al. (2019) argue that artificial intelligence in healthcare should maintain appropriate human oversight and respect principles including transparency, accountability, privacy, and human rights. Clinical professionals should therefore retain authority to question or reject algorithmic recommendations when they conflict with patient circumstances or professional judgement. Documenting these situations can also provide valuable evidence for system improvement. By combining algorithmic capability with human judgement and systematic fairness assessment, hospitals can use artificial intelligence more responsibly while maintaining clear accountability for clinical outcomes and protecting patients from unintended technological discrimination.

5.3 Establishing Responsible Patient Data Governance and Digital Trust

Hospitals should establish comprehensive data governance systems that clearly define how patient information is collected, accessed, stored, shared, analysed, and protected throughout digital healthcare activities. Patient information is essential for electronic health records, clinical analytics, research, artificial intelligence, and healthcare coordination, but increased data use also creates greater ethical responsibility. Price and Cohen (2019) explain that medical big data introduces complex privacy challenges because information can be combined and analysed in ways that extend beyond the circumstances in which it was originally collected. Hospitals should therefore establish clear rules concerning legitimate data use and ensure that access is limited according to professional responsibilities and clinical requirements. Murdoch (2021) further argues that artificial intelligence creates significant privacy concerns because extensive health information may be collected and processed by multiple parties. Patient data governance should consequently extend beyond internal hospital systems to external technology providers and other organisations that receive access to health information. Consent

procedures should also provide understandable information about significant uses of patient data whenever appropriate. Thapa and Camtepe (2021) emphasise the importance of privacy and security mechanisms for health information, including consent management and privacy preserving approaches. Together, these measures can enable hospitals to use health data productively while maintaining confidentiality, autonomy, and responsible control over sensitive patient information.

Cybersecurity should form an integral component of ethical data governance because failures in information protection can directly affect patient welfare and trust. Kruse et al. (2017) identify significant cybersecurity threats affecting healthcare organisations and demonstrate the growing importance of protecting electronic health information as healthcare systems become increasingly connected. Hospitals should regularly review system access, authentication practices, employee responsibilities, data sharing arrangements, and procedures for responding to security incidents. Technical protection alone, however, cannot eliminate privacy risks because inappropriate information handling may also result from employee behaviour or unclear organisational responsibilities. Fernández Alemán et al. (2013) identify privacy and security as major challenges associated with electronic health record systems, reinforcing the need for both technological and organisational safeguards. Layman (2020) further demonstrates that electronic health records create ethical tensions involving privacy, confidentiality, autonomy, and beneficence. Hospitals should therefore provide continuous staff education concerning both technical security practices and ethical responsibilities for patient information. Clear accountability should exist when inappropriate access or misuse occurs. Patients should also receive appropriate communication when significant incidents affect their information. Integrating cybersecurity, transparency, consent, employee responsibility, and privacy protection can strengthen digital trust and provide a more ethically sustainable foundation for data intensive hospital transformation.

5.4 Creating Inclusive Digital Healthcare for Equitable Patient Access

Hospitals should design technology enabled healthcare around differences in patient needs and capabilities rather than assuming that every individual can participate equally in digital services. Telemedicine, online communication, digital appointments, and remote healthcare platforms can increase convenience and accessibility, but these benefits depend on patients having suitable technology, internet access, digital literacy, communication skills, and confidence. Chang et al. (2021) demonstrate that the rapid expansion of telehealth exposed significant barriers associated with the digital divide. Hospitals should therefore assess whether particular groups experience difficulties accessing digital services and provide appropriate alternatives when technology becomes a barrier. Anaya et al. (2021) argue for patient centred telehealth approaches that consider technological resources, language, literacy, and the circumstances of vulnerable populations. These considerations are important because equal availability of technology does not necessarily create equitable healthcare access. Patients with fewer digital resources may require technical assistance, simpler communication channels, or conventional healthcare alternatives. Alkureishi et al. (2021) similarly identify technology access and digital literacy as important barriers that may affect telemedicine participation among vulnerable populations. Hospitals should consequently evaluate digital transformation according to actual patient accessibility rather than the number of digital services introduced. Such an approach can prevent technological advancement from unintentionally creating additional barriers to hospital healthcare.

Hospitals should also preserve patient choice by developing a balanced model in which digital services complement appropriate conventional healthcare rather than automatically replacing personal interaction. Certain patients may benefit considerably from telemedicine, while others may require face to face services because of clinical complexity, communication difficulties, disability, technological limitations, or personal preference. Eruchalu et al. (2021) argue that the digital divide can reinforce existing healthcare disparities when vulnerable

populations face greater barriers to technology enabled care. Hospitals should therefore monitor patterns of digital service use and identify patient groups experiencing failed consultations, communication problems, limited access, or dependence on other individuals for technological assistance. Ladin et al. (2021) demonstrate that patients have different preferences and experiences concerning telehealth and in person care, indicating that healthcare organisations should avoid assuming that one delivery model is appropriate for everyone. Sheikh et al. (2021) also emphasise digital inclusion as an important component of health information technology transformation. Hospitals should therefore involve patients in evaluating accessibility and service quality and use their feedback to improve digital healthcare systems. By maintaining multiple pathways to care and responding to differences in patient capability, hospitals can ensure that technological innovation strengthens healthcare accessibility while preserving fairness, autonomy, human interaction, and patient centred values.

6. Conclusion

The transformation of modern hospital healthcare demonstrates that technological progress and ethical responsibility must develop together. Digital technologies such as artificial intelligence, electronic health records, telemedicine, data analytics, and interconnected health information systems offer substantial opportunities to improve clinical decision making, communication, operational efficiency, information accessibility, and patient care. However, the article demonstrates that technological capability alone cannot determine whether digital transformation is successful. As technology becomes increasingly integrated into clinical activities, hospitals must also consider patient autonomy, privacy, confidentiality, fairness, professional responsibility, safety, and equitable access. These concerns are particularly important because digital systems increasingly influence decisions and processes that directly affect patients and healthcare professionals. The article therefore positions responsible digital transformation as an organisational and ethical responsibility rather than solely a technological objective. This perspective is consistent with the article's emphasis on integrating technological innovation with ethical principles that protect patients and support responsible professional practice.

Artificial intelligence and extensive use of patient data create some of the most significant challenges within this transformation. AI can strengthen diagnosis, prediction, clinical decision support, and information analysis, but its use also raises important questions concerning accountability, transparency, bias, fairness, and the continuing role of human judgement. Hospitals should therefore ensure that healthcare professionals retain meaningful responsibility when technological systems contribute to clinical decisions. At the same time, growing dependence on digital health information requires stronger attention to privacy, confidentiality, consent, cybersecurity, and responsible data management. Patient information should not be viewed simply as a resource for technological development because its collection and use carry substantial ethical obligations. The article also demonstrates that technological effectiveness must be considered alongside fairness because algorithms and digital systems can unintentionally produce unequal consequences for different patient populations. Protecting patient interests consequently requires hospitals to combine technological safeguards with clear accountability, professional oversight, ethical governance, and continuous evaluation.

Equally important, digital transformation should contribute to more accessible healthcare without creating additional inequalities. Telemedicine and other digital services can provide greater convenience and extend healthcare access, but differences in digital literacy, internet connectivity, technological resources, language, and individual capability may prevent some patients from receiving the same benefits. The article identifies digital inclusion as an important requirement for responsible hospital transformation and emphasises the importance of maintaining appropriate pathways to care for patients with different technological capabilities. Hospitals should therefore evaluate innovation not only according to efficiency and technological performance but also according to its accessibility, fairness, patient experience, and contribution to healthcare quality. Sustainable hospital transformation ultimately depends on maintaining an appropriate balance between technological innovation and fundamental healthcare values. When ethical governance, human accountability, patient data protection, digital inclusion, and professional judgement are incorporated into technology strategies, hospitals are better positioned to benefit from innovation while preserving patient trust. The future of modern hospital healthcare should therefore be technologically progressive, ethically responsible, patient centred, and inclusive.

References

- Alkureishi, M. A., Choo, Z. Y., Rahman, A., Ho, K., Benning-Shorb, J., Lenti, G., Velázquez Sánchez, I., Zhu, M., Shah, S. D., Lee, W. W., & Arora, V. M. (2021). Digitally disconnected: Qualitative study of patient perspectives on the digital divide and potential solutions. *JMIR Human Factors*, 8(4), e33364. <https://doi.org/10.2196/33364>
- Anaya, Y. B. M., Hernandez, G. D., Hernandez, S. A., & Hayes-Bautista, D. E. (2021). Meeting them where they are on the web: Addressing structural barriers for Latinos in telehealth care. *Journal of the American Medical Informatics Association*, 28(10), 2301–2305. <https://doi.org/10.1093/jamia/ocab155>
- Beauchamp, T. L., & Childress, J. F. (2019). *Principles of biomedical ethics* (8th ed.). Oxford University Press.
- Bitar, H., & Alismail, S. (2021). The role of eHealth, telehealth, and telemedicine for chronic disease patients during COVID 19 pandemic: A rapid systematic review. *Digital Health*, 7, 20552076211009396. <https://doi.org/10.1177/20552076211009396>
- Chang, J. E., Lai, A. Y., Gupta, A., Nguyen, A. M., Berry, C. A., & Shelley, D. R. (2021). Rapid transition to telehealth and the digital divide: Implications for primary care access and equity in a post COVID era. *The Milbank Quarterly*, 99(2), 340–368. <https://doi.org/10.1111/1468-0009.12509>
- Chen, M., & Decary, M. (2020). Artificial intelligence in healthcare: An essential guide for health leaders. *Healthcare Management Forum*, 33(1), 10–18. <https://doi.org/10.1177/0840470419873123>
- Durán, J. M., & Jongsma, K. R. (2021). Who is afraid of black box algorithms? On the epistemological and ethical basis of trust in medical AI. *Journal of Medical Ethics*, 47(5), 329–335. <https://doi.org/10.1136/medethics-2020-106820>
- Eruchalu, C. N., Pichardo, M. S., Bharadwaj, M., Rodriguez, C. B., Rodriguez, J. A., Bergmark, R. W., Bates, D. W., & Ortega, G. (2021). The expanding digital divide: Digital health access inequities during the COVID 19 pandemic in New York City. *Journal of Urban Health*, 98, 183–186. <https://doi.org/10.1007/s11524-020-00508-9>
- Fernández-Alemán, J. L., Señor, I. C., Lozoya, P. Á. O., & Toval, A. (2013). Security and privacy in electronic health records: A systematic literature review. *Journal of Biomedical Informatics*, 46(3), 541–562. <https://doi.org/10.1016/j.jbi.2012.12.003>
- Geis, J. R., Brady, A. P., Wu, C. C., Spencer, J., Ranschaert, E., Jaremko, J. L., Langer, S. G., Kitts, A. B., Birch, J., Shields, W. F., van den Hoven van Genderen, R., Kotter, E., Gichoya, J. W., Cook, T. S., Morgan, M. B., Tang, A., Safdar, N. M., & Kohli, M. (2019). Ethics of artificial intelligence in radiology: Summary of the joint European and North American multisociety statement. *Canadian Association of Radiologists Journal*, 70(4), 329–334. <https://doi.org/10.1016/j.carj.2019.08.010>
- Gostin, L. O., Halabi, S. F., & Wilson, K. (2018). Health data and privacy in the digital era. *JAMA*, 320(3), 233–234. <https://doi.org/10.1001/jama.2018.8374>
- Grote, T., & Berens, P. (2020). On the ethics of algorithmic decision making in healthcare. *Journal of Medical Ethics*, 46(3), 205–211. <https://doi.org/10.1136/medethics-2019-105586>
- Haleem, A., Javaid, M., Singh, R. P., & Suman, R. (2021). Telemedicine for healthcare: Capabilities, features, barriers, and applications. *Sensors International*, 2, 100117. <https://doi.org/10.1016/j.sintl.2021.100117>
- He, J., Baxter, S. L., Xu, J., Xu, J., Zhou, X., & Zhang, K. (2019). The practical implementation of artificial intelligence technologies in medicine. *Nature Medicine*, 25(1), 30–36. <https://doi.org/10.1038/s41591-018-0307-0>
- Issa, B., Al Akour, I., Ibrahim, A., Almarzouqi, A., Abbas, S., Hisham, F., & Griffiths, J. (2020). Privacy, confidentiality, security and patient safety concerns about electronic health records. *International Nursing Review*, 67(2), 218–230. <https://doi.org/10.1111/inr.12585>
- Jiang, F., Jiang, Y., Zhi, H., Dong, Y., Li, H., Ma, S., Wang, Y., Dong, Q., Shen, H., & Wang, Y. (2017). Artificial intelligence in healthcare: Past, present and future. *Stroke and Vascular Neurology*, 2(4), 230–243. <https://doi.org/10.1136/svn-2017-000101>

- Jin, M. X., Kim, S. Y., Miller, L. J., Behari, G., & Correa, R. (2020). Telemedicine: Current impact on the future. *Cureus*, 12(8), e9891. <https://doi.org/10.7759/cureus.9891>
- Jokinen, A., Stolt, M., & Suhonen, R. (2021). Ethical issues related to eHealth: An integrative review. *Nursing Ethics*, 28(2), 253–271. <https://doi.org/10.1177/0969733020945765>
- Kerasidou, A. (2021). Artificial intelligence and the ongoing need for empathy, compassion and trust in healthcare. *Bulletin of the World Health Organization*, 99(4), 245–250. <https://doi.org/10.2471/BLT.20.253757>
- Kraus, S., Schiavone, F., Pluzhnikova, A., & Invernizzi, A. C. (2021). Digital transformation in healthcare: Analyzing the current state of research. *Journal of Business Research*, 123, 557–567. <https://doi.org/10.1016/j.jbusres.2020.10.030>
- Kruse, C. S., Frederick, B., Jacobson, T., & Monticone, D. K. (2017). Cybersecurity in healthcare: A systematic review of modern threats and trends. *Technology and Health Care*, 25(1), 1–10. <https://doi.org/10.3233/THC-161263>
- Ladin, K., Porteny, T., Perugini, J. M., Gonzales, K. M., Aufort, K. E., Levine, S. K., Wong, J. B., & Isakova, T. (2021). Perceptions of telehealth vs in person visits among older adults with advanced kidney disease, care partners, and clinicians. *JAMA Network Open*, 4(12), e2137193. <https://doi.org/10.1001/jamanetworkopen.2021.37193>
- Layman, E. J. (2020). Ethical issues and the electronic health record. *Health Care Manager*, 39(4), 150–161.
- Li, E., Clarke, J., Neves, A. L., Ashrafian, H., & Darzi, A. (2021). Electronic health records, interoperability and patient safety in health systems of high income countries: A systematic review protocol. *BMJ Open*, 11(7), e044941. <https://doi.org/10.1136/bmjopen-2020-044941>
- Martinho, A., Kroesen, M., & Chorus, C. (2021). A healthy debate: Exploring the views of medical doctors on the ethics of artificial intelligence. *Artificial Intelligence in Medicine*, 121, 102190. <https://doi.org/10.1016/j.artmed.2021.102190>
- McCradden, M. D., Baba, A., Saha, A., Ahmad, S., Boparai, K., Fadaiefard, P., & Cusimano, M. D. (2020). Ethical concerns around use of artificial intelligence in health care research from the perspective of patients with meningioma, caregivers and health care providers: A qualitative study. *CMAJ Open*, 8(1), E90–E95. <https://doi.org/10.9778/cmajo.20190151>
- McKeown, A., Mourby, M., Harrison, P., Walker, S., Sheehan, M., & Singh, I. (2021). Ethical issues in consent for the reuse of data in health data platforms. *Science and Engineering Ethics*, 27, 8. <https://doi.org/10.1007/s11948-021-00282-0>
- Mirbabaie, M., Hofeditz, L., Frick, N. R. J., & Stieglitz, S. (2021). Artificial intelligence in hospitals: Providing a status quo of ethical considerations in academia to guide future research. *AI & Society*. Advance online publication. <https://doi.org/10.1007/s00146-021-01239-4>
- Morley, J., Machado, C. C. V., Burr, C., Cowls, J., Joshi, I., Taddeo, M., & Floridi, L. (2020). The ethics of AI in health care: A mapping review. *Social Science & Medicine*, 260, 113172. <https://doi.org/10.1016/j.socscimed.2020.113172>
- Murdoch, B. (2021). Privacy and artificial intelligence: Challenges for protecting health information in a new era. *BMC Medical Ethics*, 22, 122. <https://doi.org/10.1186/s12910-021-00687-3>
- Murphy, K., Di Ruggiero, E., Upshur, R., Willison, D. J., Malhotra, N., Cai, J. C., Malhotra, N., Lui, V., & Gibson, J. (2021). Artificial intelligence for good health: A scoping review of the ethics literature. *BMC Medical Ethics*, 22, 14. <https://doi.org/10.1186/s12910-021-00577-8>
- Negro-Calduch, E., Azzopardi-Muscat, N., Krishnamurthy, R. S., & Novillo-Ortiz, D. (2021). Technological progress in electronic health record system optimization: Systematic review of systematic literature reviews. *International Journal of Medical Informatics*, 152, 104507. <https://doi.org/10.1016/j.ijmedinf.2021.104507>
- 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. <https://doi.org/10.1126/science.aax2342>
-

- Patel, S. Y., Mehrotra, A., Huskamp, H. A., Uscher-Pines, L., Ganguli, I., & Barnett, M. L. (2021). Variation in telemedicine use and outpatient care during the COVID 19 pandemic in the United States. *Health Affairs*, 40(2), 349–358. <https://doi.org/10.1377/hlthaff.2020.01786>
- Price, W. N., II, & Cohen, I. G. (2019). Privacy in the age of medical big data. *Nature Medicine*, 25(1), 37–43. <https://doi.org/10.1038/s41591-018-0272-7>
- Ratwani, R. M., Savage, E., Will, A., Fong, A., Karavite, D., Muthu, N., Rivera, A. J., Gibson, C., Asmonga, D., Moscovitch, B., & Grundmeier, R. (2018). Identifying electronic health record usability and safety challenges in pediatric settings. *Health Affairs*, 37(11), 1752–1759. <https://doi.org/10.1377/hlthaff.2018.0699>
- Reddy, S., Allan, S., Coghlan, S., & Cooper, P. (2020). A governance model for the application of AI in health care. *Journal of the American Medical Informatics Association*, 27(3), 491–497. <https://doi.org/10.1093/jamia/ocz192>
- Sabrina, M. I., & Defi, I. R. (2021). Telemedicine guidelines in South East Asia: A scoping review. *Frontiers in Neurology*, 11, 581649. <https://doi.org/10.3389/fneur.2020.581649>
- Saheb, T., Saheb, T., & Carpenter, D. O. (2021). Mapping research strands of ethics of artificial intelligence in healthcare: A bibliometric and content analysis. *Computers in Biology and Medicine*, 135, 104660. <https://doi.org/10.1016/j.compbiomed.2021.104660>
- Sheikh, A., Anderson, M., Albala, S., Casadei, B., Franklin, B. D., Richards, M., Taylor, D., Tibble, H., & Mossialos, E. (2021). Health information technology and digital innovation for national learning health and care systems. *The Lancet Digital Health*, 3(6), e383–e396. [https://doi.org/10.1016/S2589-7500\(21\)00005-4](https://doi.org/10.1016/S2589-7500(21)00005-4)
- Shinners, L., Aggar, C., Grace, S., & Smith, S. (2020). Exploring healthcare professionals' understanding and experiences of artificial intelligence technology use in the delivery of healthcare: An integrative review. *Health Informatics Journal*, 26(2), 1225–1236. <https://doi.org/10.1177/1460458219874641>
- Singh, H., Sittig, D. F., & Gandhi, T. K. (2020). Fighting a common enemy: A catalyst to close intractable safety gaps. *BMJ Quality & Safety*, 29(2), 141–145.
- Tapuria, A., Porat, T., Kalra, D., Dsouza, G., Xiaohui, S., & Curcin, V. (2021). Impact of patient access to their electronic health record: Systematic review. *Informatics for Health and Social Care*, 46(2), 192–204.
- Thapa, C., & Camtepe, S. (2021). Precision health data: Requirements, challenges and existing techniques for data security and privacy. *Computers in Biology and Medicine*, 129, 104130. <https://doi.org/10.1016/j.compbiomed.2020.104130>
- Topol, E. J. (2019). High performance medicine: The convergence of human and artificial intelligence. *Nature Medicine*, 25(1), 44–56. <https://doi.org/10.1038/s41591-018-0300-7>
- Tubaishat, A. (2019). The effect of electronic health records on patient safety: A qualitative exploratory study. *Informatics for Health and Social Care*, 44(1), 79–91.
- Varkey, B. (2021). Principles of clinical ethics and their application to practice. *Medical Principles and Practice*, 30(1), 17–28. <https://doi.org/10.1159/000509119>
- Vyas, D. A., Eisenstein, L. G., & Jones, D. S. (2020). Hidden in plain sight: Reconsidering the use of race correction in clinical algorithms. *New England Journal of Medicine*, 383(9), 874–882. <https://doi.org/10.1056/NEJMms2004740>
- Williams, P. A. H., Lovelock, B., Cabarrus, T., & Harvey, M. (2021). Improving digital hospital transformation: Development of an outcomes based infrastructure maturity assessment framework. *JMIR Medical Informatics*, 9(1), e24118.
- Yusof, M. S., Salleh, M. N., & Zahari, F. M. (2020). The Relationship between Information Technology Capability and New Product Development Success: A Conceptual Framework. *International Journal of Business and Technology Management*, 2(1), 98–112.
- Yusof, M. S., Salleh, M. N., & Zahari, F. M. (2020). The Relationship between NPD Process and NPD Strategy toward NPD Success in Malaysian Automotive Industry. *Asian Journal of Research in Business and Management*, 2(1), 11–26.

Zarif, A. (2021). The ethical challenges facing the widespread adoption of digital healthcare technology. *Health and Technology*. Advance online publication. <https://doi.org/10.1007/s12553-021-00596-w>