Information Systems and Technologies Applied to Health: The Future Today

Mónica Lopo Tomaz[1], Celso Silva[2*]

[1]School of Management, Hospitality and Tourism of the University of Algarve, Faro, Portugal

[2]School of Health of the Polytechnic Institute of Beja, Beja, Portugal

DOI: https://doi.org/10.51244/IJRSI.2024.11120035

Received: 11 December 2024; Accepted: 16 December 2024; Published: 10 January 2025

ABSTRACT

Information systems and technologies applied to healthcare are fundamental tools for improving the quality, efficiency and scope of healthcare services and, consequently, the care provided to patients. There are many different areas where these systems are essential, including the management of healthcare institutions, direct patient care and clinical research. Today, the use of these systems is essential for the proper functioning of countries' healthcare systems, and the outlook is for the continued evolution of these technologies with the central aim of providing quality and safe healthcare. These systems are crucial to continuing to modernise the healthcare sector, making it more efficient, accessible and sustainable, as well as improving the experience and results for patients. Its application is a fundamental pillar for the advancement of health in the 21st century. The aim of this article is to describe the most relevant systems applied in healthcare and discuss future impacts, possibilities and challenges.

Keywords: Information systems; Information technologies; Quality in health; Safety in health; Future

INTRODUCTION

The future of the application of Information Technology Systems (ITS) in healthcare is promising and could completely transform the way healthcare is delivered, managed and accessible to patients. When applied to the health sector, ITS make it possible to optimise patient care, facilitate information management, improve the quality and safety of clinical decisions and improve patient care [1].

The development of specialised software and the use of advanced technologies such as artificial intelligence have transformed the way we take care of people's health [2].

ITS in healthcare is already prevalent in most countries around the world and this reality brings numerous benefits in healthcare, permanent access to patient data, minimising operating costs, reducing medical errors, data security and improving patient care [2].

ITS significantly improves patient outcomes in the healthcare sector by improving operational efficiency, data accuracy and coordination of care. The integration of advanced technologies, such as electronic health records and artificial intelligence, facilitates better decision-making and reduces medical errors, ultimately leading to improved healthcare for patients.

This technology promotes more effective communication between teams of healthcare professionals, which facilitates the collaborative provision of care [1].

However, there are major challenges in utilising ITS in healthcare, such as ensuring data reliability, acquisition and maintenance costs, training professionals from a user perspective, and the mistrust of some healthcare professionals towards these systems [3,4].

It is therefore important to reflect on existing ITS, the main applications, prospects, as well as the challenges

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

we must face in order to optimise these technologies for the benefit of patient health, since innovation in the healthcare sector is constantly evolving.

Electronic Patient Records

Electronic Patient Records (EPRs) represent a significant advance in healthcare, facilitating improved patient care and operational efficiency. These are digital systems that store and organise patients' clinical and administrative information. These systems replace paper, allowing for more efficient, secure and accessible management of medical data, which facilitates the work of healthcare professionals [5].

A study carried out in Ireland revealed a high level of involvement and satisfaction among healthcare professionals following the implementation of the EPRs, with users appreciating the transparency and accountability it provides [6]. EPRs can greatly simplify processes and consequently improve patient access to healthcare [7].

The main features of EPRs are described in Table 1.

Table I Main Features of Electronic Patient Records

Main Features of Electronic Patient Records	**Complete Medical History**	Detailed history of each patient, including previous diagnoses, treatments, medications, exams, vaccinations and allergies. History is quickly accessible by doctors and nurses.
	Data Integration	Integration with laboratory, radiology and pharmacy systems.
	Security and Privacy	Access authentication and encryption - personal data security.
	Agility and Efficiency	Access to data in real time, which is essential in emergencies and routine situations.
	Telemedicine and Remote Care	Remote consultations and remote care - greater accessibility to healthcare.
	Data-based decisions	The use of artificial intelligence makes it possible to analyze health patterns, predict risk conditions and support medical decisions more accurately.

Clinical Decision Support Systems

Clinical Decision Support Systems are technological tools designed to help healthcare professionals make decisions related to the diagnosis, treatment and management of patients. These systems use algorithms, medical data and patient histories to offer real-time support, promoting more accurate and informed decisions [8].

Table 2 describes the main components of these systems.

Table II Main components of Clinical Decision Support Systems

Main components of Clinical Decision Support Systems:	**Knowledge Base**	A set of guidelines, clinical protocols and scientific data.
	Inference Engine	A tool that interprets the information available on the patient and cross-references this data with the knowledge base, generating suggestions or diagnoses.
	User interface	Information accessible to health professionals, often integrated into the Electronic Patient Record.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

These systems are very useful because they have integrated alert and reminder technology in which drug interactions or contraindications are identified and health professionals are alerted. They can support the diagnosis by suggesting hypotheses based on the patient's symptoms and history. These systems can also recommend suggestions for treatment, such as drug doses, and can also predict and analyse risk, as these systems can assess the risk of developing serious conditions, such as heart disease or post-operative complications [8,9].

Telemedicine

Telemedicine is the use of digital technologies to provide medical care at a distance. It's a combination of digital equipment, software, the internet and qualified specialists, which makes consultations and diagnoses possible via online platforms, improving access to healthcare and optimising the time of patients and professionals, eliminating geographical barriers.

This technology significantly improves patient participation and adherence to treatment plans in various healthcare settings. By providing flexible access to healthcare, telemedicine facilitates continuous communication between patients and healthcare professionals, which is crucial, for example, in the management of chronic diseases.

Telemedicine allows patients to attend appointments remotely, reducing barriers such as transport and time constraints [10]. A good example of the potential of telemedicine is the report of a study on diabetes management, in which telemedicine users showed better glycaemic control and better adherence to treatment compared to those who received face-to-face care [11]. Therefore, this technology is associated with higher levels of patient involvement, as it allows them to take a more active role in managing their health as reported by a recent systematic literature review [12].

Telemedicine promotes continuous interaction, allowing healthcare professionals to monitor the patient's progress and adjust treatment plans as necessary, eliminating constraints such as the distance of diary management [13].

Figure 1 illustrates the numerous possibilities for applying telemedicine.

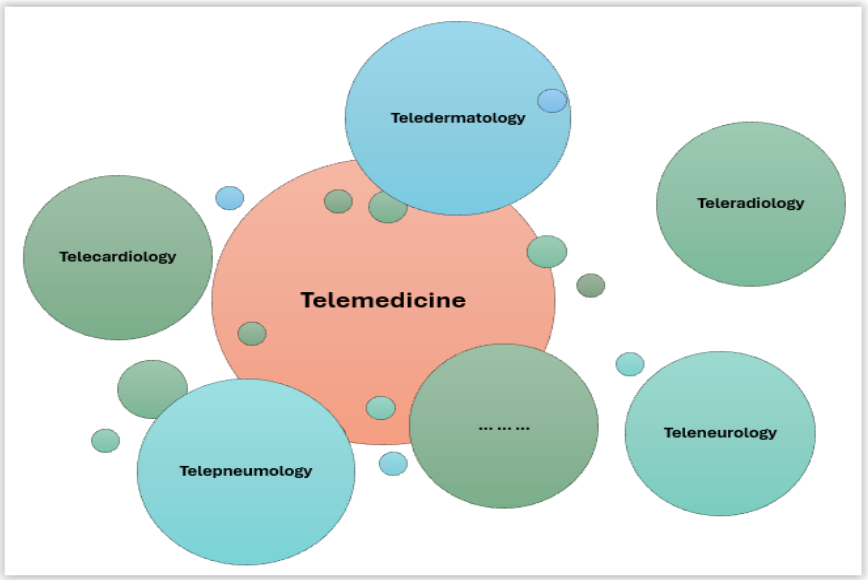

Fig. 1 Numerous possibilities for applying telemedicine

Internet of Medical Things

The Internet of Medical Things (IoMT) represents a transformative integration of the Internet of Things into the healthcare sector, enabling better patient monitoring, data collection and improved healthcare delivery. By connecting various medical devices and systems, the IoMT facilitates the exchange of health data in real time,

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

which can lead to better medical decision-making and improved patient outcomes.

One of the main applications of IoMT is continuous patient monitoring, reducing the need for face-to-face consultations (Nishad & Tripathi, 2020). As we've already mentioned, telemedicine has also seen a huge increase with the IoMT [14].

The integration of IoMT into hospital infrastructures improves operational efficiency and patient care, where wearable devices that monitor vital signs and health metrics in real time guarantee quality and safety [15], and so doctors and nurses, hospitals and clinics, can gather important information using connectivity between devices such as ventilators, monitors, etc. This data supports decision-making. The so-called wearables are devices that have to be worn on the body and can take the form of necklaces, watches, glasses and even clothes, among others, which are equipped with trackers, sensors and monitor biometric data, physical activity and send alerts in real time. If we add artificial intelligence, we can increase the improvement of data analysis for personalised medicine and predictive healthcare, which in this day and age is an extraordinary advance [16].

Robotic surgery has seen significant advances that increase surgical precision and improve patient outcomes, i.e. the dexterity of robotic arms allows surgeons to perform complex surgeries with greater precision. These innovations include the development of sophisticated robotic systems that facilitate minimally invasive procedures, leading to reduced trauma, shorter recovery times and lower complication rates. The implications of these advances are profound, as they not only improve surgical efficiency, but also expand the range of procedures that can be performed by robots [17,18]). Robotic surgery is used in various specialities, including urology, gynaecology and cardiac surgery, demonstrating its versatility [19,20], and this reality is, in fact, extraordinary.

Big Data and Data Analysis

Big data analytics is transforming healthcare by enabling the integration and analysis of vast data sets, which improves disease diagnosis, treatment personalisation and care management. This integration spans several domains, including bioinformatics and medical informatics, enabling the identification of patterns and predictive modelling from electronic health records and other data sources [21,22].

The main applications of Big Data in healthcare are the detection and classification of diseases through techniques such as the HDAOML-BDE model, which uses machine learning to analyse healthcare data to improve the diagnosis of diseases [18]. The personalisation of healthcare, where large volumes of data facilitate precision diagnosis and personalised treatment, driven by innovations such as genomic sequencing and portable devices [21]. Healthcare management, where the use of Big Data optimises processes within medical organisations, improving the overall provision of healthcare [21,22]. Clinical and pharmacological research, through the analysis of clinical data, information on treatment efficacy, disease progression and risk factors, optimisation of clinical trials and pharmacovigilance [23,24].

Augmented Reality

Augmented Reality (AR) has emerged as a transformative technology in surgical procedures, increasing precision and reducing procedure complications. The application of AR is not exclusive to surgical procedures, but this is perhaps one of the areas where AR has most enhanced the success of the healthcare provided. By providing immersive, real-time visualisations of anatomical structures, AR facilitates better surgical planning and execution, ultimately improving patient outcomes. The integration of AR into various surgical fields demonstrates its potential to revolutionise surgical practices.

AR offers three-dimensional visualisations that improve spatial understanding during surgery, particularly in complex procedures such as spinal surgery [25].

The use of AR visors allows the integration of fluorescence-guided techniques, improving control and minimising tissue damage during surgery [26].

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

AR technologies provide valuable tools for medical training, allowing residents to practise in simulated environments without direct supervision, thus improving their skills and confidence in their technique [27].

Hospital Management Systems

Hospital management systems significantly improve results and patient satisfaction by simplifying procedures, improving communication and ensuring quality and safe care. These systems automate administrative tasks, provide real-time access to patient data and facilitate better coordination between healthcare professionals, ultimately leading to more efficient delivery of healthcare to patients.

There are numerous software programmes for managing clinics and hospitals. Perhaps the best strategy is to opt for software that solves the greatest number of tasks with the fewest tools.

Figure 2 identifies the main applications of hospital management systems.

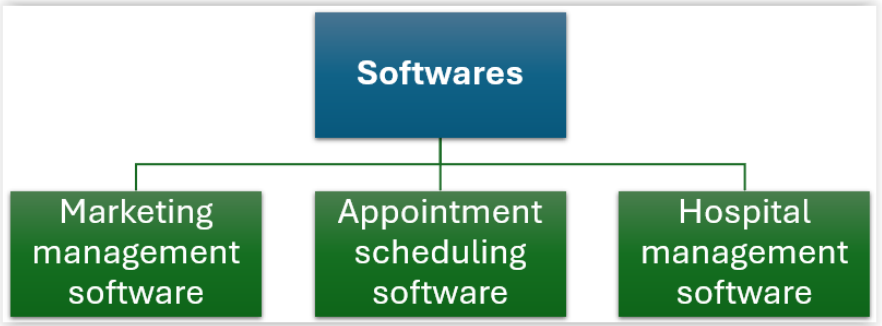

Fig. 2 Main applications of hospital management systems

As far as marketing management software is concerned, we know that people search for information on the internet in order to clarify their doubts, and these doubts can be converted into an enquiry if the institution manages to convey an image of trust, with clear information and intuitive navigation from the user's point of view [28].

With regard to appointment scheduling software, the possibility of booking an appointment online is very useful for patients, as is online self-service to answer questions, 24 hours a day, with agility and autonomy for the patient, which provides a positive user experience [28].

As far as hospital management software is concerned, we know that a hospital is a very complex institution to manage, and this software serves to facilitate this very complex management. These systems optimise workflows, reducing waiting times and improving service delivery [29].

Future impacts, possibilities and challenges

The implementation and adoption of ITS in healthcare faces several significant challenges that need to be considered if effective implementation is to be possible, guaranteeing the quality and safety of healthcare. Looking at the challenges and facing them is, in our view, the only way forward.

These challenges encompass technical, financial, human, regulatory and ethical factors that have implications for the transition from traditional methods to digital solutions.

Technical factors include the integration and interoperability of new systems that respond to existing workflows, which if not taken into account can lead to inefficiencies [30]. In other words, the lack of compatibility between different systems can make data sharing and communication difficult [31]. Another issue is concerns about the security of clinical data, which is a very sensitive issue and one that worries healthcare professionals, as it is necessary to guarantee the privacy of clinical data and respond to cybersecurity threats [32]. The privacy and security of sensitive data must be absolutely controlled. It also seems important to us to centralise patient information, improving diagnoses, treatments and reducing potential

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

medical errors, and this is helped by technologies such as wearable devices and telemedicine that enable real-time monitoring, especially for chronic patients. Sensitive clinical data must be reliable, with quality and up-to-date information.

Financial factors include the high costs of implementing these technologies. The financial burden associated with acquiring and maintaining IT systems can be prohibitive because many healthcare facilities struggle with inadequate financial resources [31,32]. On the other hand, operational efficiency leads to the automation of administrative processes, reducing costs and increasing hospital efficiency. Advanced systems require high investment and constant updating, but these are unavoidable costs that institutions must meet.

Human factors include the resistance to change that some healthcare professionals may have in adopting new technologies due to their comfort with existing practices, fears of substitution or distrust of algorithms, although in general, healthcare professionals express a strong willingness to adopt IT systems, which indicates a potential for successful adoption if the barriers are adequately resolved [33]. In addition, it is important not to forget about training needs as insufficient training can lead to under-utilisation of IT systems, as health professionals may not have the necessary skills to use them effectively [30,34]. Training health professionals to use these tools efficiently must be a constant concern.

Regulatory factors include compliance with data protection laws and regulations, which can make it difficult to implement systems [30], but they naturally have to be taken into account, and this is crucial in order to face ethical challenges and guarantee patient safety, as well as to maintain the trust of patients and healthcare professionals in these systems. A major concern is patient autonomy and ethical issues. Artificial intelligence systems can jeopardise the informed consent process if they limit the patient's ability to make voluntary and informed choices about their treatment options [35]. Dependence on artificial intelligence can lead to an automation bias, where patients and healthcare providers rely excessively on the recommendations of artificial intelligence, diminishing the role of the patient and healthcare professional in decision-making [36]. It seems important to us to adopt ethical frameworks to guarantee transparency in artificial intelligence operations, allowing patients to understand how decisions are made and promoting trust in the systems, because if there is no trust in the systems, the future of this technology falls apart. While the potential benefits of artificial intelligence in healthcare are significant, including improved and more accurate diagnoses and personalised treatments, ethical challenges must be addressed to ensure that patients' rights and safety are respected. Balancing innovation with ethical issues seems to us to be a fundamental aspect of applying these systems to healthcare.

Since patient autonomy is a central issue, all efforts to empower patients seem relevant to us. Health apps and health education platforms can provide access to information about medical conditions and treatments. Patient portals also allow direct access to diagnostic test results, appointment scheduling and interaction with healthcare professionals.

In general, the health gains resulting from the introduction of these technologies are not questionable, but we also need to understand the associated challenges.

Technological development in healthcare is not going to make professionals redundant. Innovation requires increasingly qualified professionals who are prepared to face the challenges of the future. Technology must be at the service of more efficient management of healthcare resources, while maintaining investment in healthcare professionals, so that more and more quality and safe healthcare is provided.

With these innovations, this technology applied to healthcare can offer a more efficient, accessible and patient-centred future, reducing costs and improving clinical results. The challenge will be to balance technology with the empathy and humanity that healthcare requires.

The intersection between ITS in healthcare and the humanisation of care is increasingly recognised as central to improving patient care. While technology can increase efficiency and access, it also runs the risk of depersonalising healthcare interactions. Therefore, integrating the principles of humanisation when thinking about healthcare ITS is crucial to promoting empathetic relationships between patients and healthcare

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

providers.

Humanisation involves prioritising patient-centred healthcare, emphasising empathy, communication and respect. Healthcare teams can enhance humanisation through specific behaviours, such as active listening and comfort, which are vital in hospital environments. Digital technologies can support humanisation through the training of health professionals, however, there is a notable lack of school curricula that effectively combine humanisation with digital health strategies as reported by a recent systematic literature review [37]. The use of technologies can promote humanised care, but this requires a change in health training to include broader humanistic principles to bridge this gap [38].

Humanisation in health professional training curricula is vital for instilling empathy and communication skills in future professionals. Integrating humanitarian values into professional curricula can improve understanding of the psychological and emotional needs of patients [39]. Despite its benefits, there are still challenges in fully realising humanisation in healthcare provision. Issues such as the need to better integrate family and patient involvement in care highlight the complexities of effectively applying the principles of humanisation [40].

In hospital environments, humanisation is reflected in the specific behaviours of healthcare professionals. One study identified critical humanising attitudes such as effective communication, respect and patient comfort as factors that promote the humanisation of healthcare [41].

Although technology offers significant advances in healthcare, it is essential to remain vigilant about its potential to depersonalise care. Balancing technological efficiency with humanistic values is crucial to ensure that patient care remains compassionate and respectful of the patient.

CONCLUSION

The integration of Information Systems and Technologies into healthcare significantly improves patient outcomes and lowers costs through several innovative approaches. By taking advantage of technologies such as artificial intelligence, the internet of medical things and electronic patient records, without forgetting ethical issues and patient autonomy, healthcare professionals can optimise the provision of care and operational efficiency, guaranteeing quality and safe healthcare.

The future of healthcare will be increasingly shaped by the integration of Information Systems and Technologies. Despite the challenges, the potential benefits such as increased accessibility, personalised healthcare, efficient management and the promotion of patient autonomy make the progressive adoption of these technologies in healthcare inevitable. Solving the challenges will depend on clear regulations, investment in infrastructure, continuous training of healthcare professionals and patient involvement.

REFERENCES

1. Ferreira VA de L, Alves MR, Pinto PM, Wanderley SB, Marretto NB, Andrade CP de, et al. IMPLEMENTAÇÃO DE TECNOLOGIAS DE INFORMAÇÃO NA GESTÃO HOSPITALAR: IMPACTOS NA EFICIÊNCIA E QUALIDADE ASSISTENCIAL. Rev Ibero-Americana Humanidades, Ciências e Educ. 2024;10:2504–12.
2. Mucaraku L, Ali M. Importance of Information Systems in the Healthcare Sector. 2022 Int Conf Comput Electron Commun Eng. IEEE; 2022. p. 112–7.
3. Inampudi S, Rajkumar E, Gopi A, Vany Mol KS, Sruthi KS. Barriers to implementation of digital transformation in the Indian health sector: a systematic review. Humanit Soc Sci Commun. 2024;11:632.
4. Oudbier SJ, Souget-Ruff SP, Chen BSJ, Ziesemer KA, Meij HJ, Smets EMA. Implementation barriers and facilitators of remote monitoring, remote consultation and digital care platforms through the eyes of healthcare professionals: a review of reviews. BMJ Open. 2024;14:e075833.
5. Jimmy Triputra, Nurhayati Nurhayati, Risda Choirunisa, Tria Pamungkasari, Vip Paramata. Peningkatan Efektivitas Manajemen Kesehatan Melalui Implementasi Teknologi Informasi. J Ilm Kedokt dan Kesehat. 2023;3:220–5.

6. Brady A-M, Fortune J, Ali AH, Prizeman G, To WT, Courtney G, et al. Multidisciplinary user experience of a newly implemented electronic patient record in Ireland: An exploratory qualitative study. Int J Med Inform. 2024;185:105399.
7. Rosdyana A, Khaira KN, Syahidin Y, Yunengsih Y. Governance of Online Electronic Patient Medical Records Distribution. PIKSEL Penelit Ilmu Komput Sist Embed Log. 2023;11:221–32.
8. Wasylewicz ATM, Scheepers-Hoeks AMJW. Clinical Decision Support Systems. Fundam Clin Data Sci. Cham: Springer International Publishing; 2019. p. 153–69.
9. Mehta P. Clinical Decision Support System. Heal Informatics. 1st ed. Productivity Press; 2022. p. 95–102.
10. Schubach A, Agyingi S, Bittner K, Kothari S, Abdalla M. S1089 Telemedicine Is Here to Stay: The Impact of Telehealth on Adherence to Treatment Plan Among Patients with Inflammatory Bowel Disease. Am J Gastroenterol. 2023;118:S829–S829.
11. Almalki ZS, Imam MT, Ahmed NJ, Ghanem RK, S.Alanazi T, Juweria S, et al. The influence of telemedicine in primary healthcare on diabetes mellitus control and treatment adherence in Riyadh region. Saudi Pharm J. 2024;32:101920.
12. Khanijahani A, Akinci N, Quitiquit E. A Systematic Review of the Role of Telemedicine in Blood Pressure Control: Focus on Patient Engagement. Curr Hypertens Rep. 2022;24:247–58.
13. Vicente MA, Fernández C, Guilabert M, Carrillo I, Martín-Delgado J, Mira JJ. Patient Engagement Using Telemedicine in Primary Care during COVID-19 Pandemic: A Trial Study. Int J Environ Res Public Health. 2022;19:14682.
14. Cassinadane AV, Sridhar A, Sekar P, Sahoo SR. Internet of things in medicine and dentistry. Int J Clin Biochem Res. 2022;9:98–105.
15. Huang C, Wang J, Wang S, Zhang Y. Internet of medical things: A systematic review. Neurocomputing. 2023;557:126719.
16. Nishad DK, Tripathi DR. Internet of Medical Things (IoMT): Applications and Challenges. Turkish J Comput Math Educ. 2020;11:2885–9.
17. Barua R. Innovations in Minimally Invasive Surgery. 2024. p. 110–31.
18. Fancy C, Krishnaraj N, Ishwarya K, Raja G, Chandrasekaran S. Modelling of healthcare data analytics using optimal machine learning model in big data environment. Expert Syst. 2024;
19. Ragusa A, Prata F, Iannuzzi A, Tedesco F, Cacciatore L, Brassetti A, et al. The Evolution of Robotic Surgery through the Machine Design Innovation. Uro. 2024;4:124–35.
20. Reddy K, Gharde P, Tayade H, Patil M, Reddy LS, Surya D. Advancements in Robotic Surgery: A Comprehensive Overview of Current Utilizations and Upcoming Frontiers. Cureus. 2023;
21. Amaka Obijuru, Jeremiah Olawumi Arowoogun, Chinyere Onwumere, Ifeoma Pamela Odilibe, Evangel Chinyere Anyanwu, Andrew Ifesinachi Daraojimba. BIG DATA ANALYTICS IN HEALTHCARE: A REVIEW OF RECENT ADVANCES AND POTENTIAL FOR PERSONALIZED MEDICINE. Int Med Sci Res J. 2024;4:170–82.
22. Verma RK, Kishor K, Jha SK. Big Data Analytics in Bioinformatics and Healthcare. 2024. p. 25–43.
23. Baloch L, Bazai SU, Marjan S, Aftab F, Aslam S, Neo T-K, et al. A Review of Big Data Trends and Challenges in Healthcare. Int J Technol. 2023;14:1320.
24. Lekha Rajaram Dubale, Rutik Ramesh Keer, Waman Radhakrsihna Parulekar. A Review of the Role of Big Data Analytics in Healthcare. Int J Sci Res Sci Technol. 2023;136–41.
25. De Jesus Encarnacion Ramirez M, Chmutin G, Nurmukhametov R, Soto GR, Kannan S, Piavchenko G, et al. Integrating Augmented Reality in Spine Surgery: Redefining Precision with New Technologies. Brain Sci. 2024;14:645.
26. Cipolato O, Fauconneau M, LeValley PJ, Nissler R, Suter B, Herrmann IK. An Augmented Reality Visor for Intraoperative Visualization, Guidance and Temperature Monitoring using Fluorescence. 2024.
27. Canova Barrios CJ, Hereñú MP, Francisco SM. Augmented reality for surgical skills training, update on the topic. Gamification Augment Real. 2023;1:8.
28. Suryadini S, Sriyono. Patient Satisfaction: IT, CRM, Facilities, Price Impact in Hospital Setting. Acad Open. 2023;9.
29. Sudherson M, Atheena MPS, Rashika M, Aparna N, Kriya SM. Improving hospital management: Global insights for better patient care. i-manager's J Life Sci. 2023;2:42.

ISSN No. 2321-2705 | DOI: 10.51244/IJRSI |Volume XI Issue XII December 2024

30. Gupta A, Sharma A, Jha DK. Overcoming Obstacles STEP By STEP: A Comprehensive Review of Challenges and Strategies in Implementing Hospital Management Information Systems in India. 2024.
31. Alamro AA, Aljuma MS, Alateeq SS, Alharbi NM, Alharbi AS, Alghufaili RS, et al. Challenges of Health Informatics Systems in Primary Health Care. Saudi J Med Pharm Sci. 2023;9:717–9.
32. Ayat M. E-Health Implementation Challenges and HIS Evaluation in Accordance with EMRAM in Iran. Heal Technol Assess Action. 2024;
33. Fresku E, Kraja J, Marku M. Perceptions of Health Personnel Regarding the Utilization of Health Information Systems. Albanian J Trauma Emerg Surg. 2024;8:1475–83.
34. Gaucher L, Puill C, Baumann S, Hommey S, Touzet S, Rudigoz R-C, et al. The challenge of adopting a collaborative information system for independent healthcare workers in France: a comprehensive study. Sci Rep. 2024;14:11429.
35. Kochetova JY. Ethical risks of artificial intelligence and prospects for joint decision-making in medicine. Chelovek. 2024;35:96–106.
36. Aldosari B, Alanazi A. Pitfalls of Artificial Intelligence in Medicine. 2024.
37. Gonzalez-Moreno M, Monfort-Vinuesa C, Piñas-Mesa A, Rincon E. Digital Technologies to Provide Humanization in the Education of the Healthcare Workforce: A Systematic Review. Technologies. 2023;11:88.
38. De Campos WNV, De Medeiros MM, De Oliveira RD, Da Silva LAR. TECNOLOGIA SOCIAL, ENSINO EM SAÚDE E HUMANIZAÇÃO DO CUIDADO: algumas reflexões. Obs LA Econ Latinoam. 2023;21:11035–46.
39. Novikova NV, Nechaeva TY, Avezova BS, Dubrovina IA. The humanization of medical education: publications review. Probl Soc Hyg Public Heal Hist Med. 2024;32.
40. Tavares RCM, Reis DBC, Camargo FCM de, Tavares TMCL, Vieira CCAR, Menaguali RR, et al. Humanization of care from the perspective of nurses in a neonatal unit. Connect Expert Multidiscip Dev Futur. Seven Editora; 2023.
41. Phelan A, McCormack B, Dewing J, Brown D, Cardiff S, Cook N, et al. Review of developments in person-centred healthcare. Int Pract Dev J. 2020;10:1–29.