

Legal Perspectives of Serbia's Healthcare Digitalization: COVID-19 as a Catalyst for Change

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Abstract: The COVID-19 pandemic highlighted the critical need for the digitalization of healthcare services worldwide, acting as a catalyst for innovation and prompting governments to reassess healthcare infrastructure and implement legislative and organizational frameworks to support the broader adoption of eHealth solutions. This paper examines Serbia's response during and after the pandemic, addressing whether the experience led to tangible changes in healthcare digitalization. It investigates whether these changes remain largely confined to policy documents and legislation, or if they have been effectively implemented in practice. Furthermore, the study identifies areas where additional improvements are required to ensure that digital healthcare can reach its full potential. Understanding these developments is crucial, not only for preparing for future pandemics but also for responding to other emergencies, improving access to healthcare in remote areas, and supporting vulnerable populations, including older adults. By analyzing Serbia's experience, this paper aims to provide insights into how crises can accelerate digital transformation in healthcare systems and to inform strategies for creating resilient, efficient, and equitable health infrastructures.

Keywords: healthcare digitalization, COVID-19 pandemic, eHealth, telemedicine, health information systems

1. Introduction

The digital transformation of healthcare systems has been an evolving global trend for decades, driven by advances in information and communication technologies, and artificial intelligence (AI)¹ together with the growing need for more efficient, accessible,² patient-centered, and data-driven healthcare delivery. The necessity for digitalization of healthcare services was particularly pronounced during the COVID-19 pandemic. At that time, the “need to reduce physical contact has actualized the necessity for application of

¹ Sofija Nikolić Popadić and Marta Sjeničić, “The Use of Artificial Intelligence in Healthcare and Medicine – Legal Aspects,” *Journal of Ethics and Legal Technologies* 6, no. 2 (2024): 21–39, <https://doi.org/10.14658/pupj-JELT-2024-2-3>.

² Sofija Nikolić Popadić, “Digitalization of Healthcare Services: The Case of Germany,” *Glasnik Advokatske Komore Vojvodine* 92, no. 1 (2020): 89, <https://doi.org/10.5937/gakv92-25688>.

digital technologies³ in the process of prevention, diagnosis and treatment of patients” and to widely introduce healing at a distance.⁴ Therefore, the pandemic acted as a catalyst for innovation, prompting governments to reevaluate existing healthcare infrastructure and introduce legislative and organizational frameworks to enable the wider implementation of eHealth solutions.

The necessity for change was recognized at both the global and regional levels. International organizations, particularly the World Health Organization (WHO), have emphasized digital health as a cornerstone of sustainable healthcare reform. The WHO’s Global Strategy on Digital Health 2020–2025 outlines the importance of integrating digital solutions to “strengthen health systems,” improve service access, and enhance resilience in times of crisis.⁵ The COVID-19 pandemic also influenced the change at the level of the European Union (EU). Although the EU’s role is to “complement national policies” and “encourage cooperation between the Member States,” the COVID-19 pandemic showed that there is room for greater EU involvement in healthcare digitalization.⁶ The European Health Union was initiated in response to weaknesses identified during the pandemic and to the “need for greater coordination and cooperation in health matters at the EU level.”⁷ One of the major steps towards digitalization after the pandemic, which is a significant part of the European Health Union, is the European Health Data Space Regulation, adopted in March 2025.⁸ All this underscores the growing recognition and importance of further digitalization within the healthcare sector.

The pandemic has impacted the global development of healthcare digitalization.⁹ Surveys found that the level of healthcare digitalization before the pandemic, globally and even at the EU level, was unsatisfactory, with some exceptions such as Estonia,

³ Giustina Secundo, S.M. Riad Shams, and Francesco Nucci, “Digital Technologies and Collective Intelligence for Healthcare Ecosystem: Optimizing Internet of Things Adoption for Pandemic Management,” *Journal of Business Research* 131 (2021): 563–72, <https://doi.org/10.1016/j.jbusres.2021.01.034>.

⁴ Sofija Nikolić Popadić, “Introducing Telemedicine – Legal and Other Challenges,” in *International Scientific Conference: Challenges and Perspectives of the Development of Legal Systems in the XXI Century – Conference Proceedings* (Banja Luka: Faculty of Law, University of Banja Luka, 2022), accessed November 8, 2025. <http://iriss.idn.org.rs/1290/>.

⁵ World Health Organization, “Global Strategy on Digital Health 2020–2025,” 2021, accessed November 10, 2025, <https://iris.who.int/server/api/core/bitstreams/1f4d4a08-b20d-4c36-9148-a59429ac3477/content>.

⁶ European Court of Auditors, “Digitalisation of Healthcare: EU Support for Member States Effective Overall, but Difficulties in Using EU Funds,” Publication Office of the European Union, 2024, accessed November 14, 2025, https://www.eca.europa.eu/ECAPublications/SR-2024-25/SR-2024-25_EN.pdf.

⁷ Vincent Delhomme and Carina Van Os, “Building the European Health Union (2019–2024): Successes, Limits and Future Perspectives,” *European Journal of Risk Regulation* 16, no. 3 (2025): 954, <https://doi.org/10.1017/err.2025.10021>.

⁸ Regulation (EU) 2025/327 of the European Parliament and of the Council of 11 February 2025 on the European Health Data Space and Amending Directive 2011/24/EU and Regulation (EU) 2024/2847 (OJ L, 2025/327, 5 March 2025).

⁹ On differences in digitalization efforts in HICs and LMICs, see e.g.: Zisis Kozlakidis, Tracy Wootton, and Karine Sargsyan, “Digital Health: Needs, Trends, Applications,” in *Digitalization of Medicine in Low and Middle-Income Countries*, eds. Zisis Kozlakidis, Armen Muradyan, and Karine Sargsyan (Cham: Springer, 2024), 6–7, <http://dx.doi.org/10.1007/978-3-031-62332-5>; and on the healthcare digitalization level in LMICs in a broader sense: Kozlakidis, Muradyan, Sargsyan, eds., *Digitalization of Medicine in Low and Middle-Income Countries*.

the Netherlands, Denmark and Sweden.¹⁰ The WHO global survey on eHealth found that before the pandemic, only 27% of reporting countries had adopted strategies regarding telemedicine, less than 50% defined medical jurisdiction or liability connected to eHealth services, and less than 30% of countries in the Commonwealth of Independent States and countries of the Central Asian Republics Health Information Network had regulated the use of EHRs.¹¹ The COVID-19 pandemic primarily impacted healthcare digitalization across 4 areas: communication and information, monitoring and surveillance, healthcare provision, and vaccination.¹² In that sense, globally, during the pandemic and even afterwards, countries have made significant efforts toward healthcare digitalization. Several countries have developed apps to provide essential pandemic information, including Italy, Estonia, Finland, Croatia, the UK, and Canada. Similarly, some countries, such as Bulgaria, Austria, Italy, and the UK, adopted tracking mobile phone movements as a measure to achieve social distancing.¹³ The number of remote consultations has heightened globally.¹⁴ Alongside the practical measures, several countries have enacted or amended laws governing the use of eHealth services, particularly e-prescriptions, eSickLeave, and certificates of immunization.¹⁵ In this paper, we will analyze how the COVID-19 pandemic impacted the digitalization of health care services in Serbia. As one of the European countries with the most restrictive lockdown regimes, the need to provide healthcare services through digital systems has become extremely necessary. Namely, besides declaration of state of emergency in the Republic of Serbia (RS), which enabled for derogation from human rights, there was “total ban of movement for citizens over 65 in towns over 5000 inhabitants (and over 70 in smaller towns and villages), nationwide daily curfews for 12 hours including a total ban to leave dwellings during weekends”¹⁶ etc. In such a restrictive situation, with hospitals accepting only emergency cases, providing healthcare services online proved crucial.

We will analyze how Serbia responded during and after the COVID-19 pandemic, aiming to determine whether the pandemic experience has led to changes in the digitalization of healthcare delivery. To compare and identify the extent to which pandemics influenced healthcare, we will first analyze the healthcare situation and level of digitalization before the outbreak of COVID-19. One part of our research will be dedicated to determining whether post-pandemic changes are reflected only in policy documents and legislation, or are actually applied in practice. We will identify the shortcomings, risks,

¹⁰ Nick Fahy and Gemma A Williams, eds., *Use of Digital Health Tools in Europe: Before, during and after COVID-19* (Copenhagen: World Health Organization, 2021), 7, accessed February 4, 2026, https://www.ncbi.nlm.nih.gov/books/NBK576970/pdf/Bookshelf_NBK576970.pdf.

¹¹ World Health Organization, *Global Diffusion of eHealth: Making Universal Health Coverage Achievable. Report of the Third Global Survey on eHealth* (Geneva: World Health Organization, 2016), 13, 107, 93–99, accessed February 4, 2026, <https://iris.who.int/server/api/core/bitstreams/7349d58e-d87b-4330-ab51-82c75ddbfa62/content>.

¹² Fahy and Williams, eds., *Use of Digital Health Tools in Europe*, 18.

¹³ *Ibid.*, 19.

¹⁴ *Ibid.*, 22.

¹⁵ *Ibid.*, 25.

¹⁶ Sofija Nikolić Popadić, Marko Milenković, and Marta Sjeničić, “The Covid-19 Epidemic in Serbia – The Challenges of Finding an Appropriate Basis for Responding to a Health Crisis,” *Medicine, Law & Society* 14, no. 2 (2021): 234, <https://doi.org/10.18690/mls.14.2.229-246.2021>.

and challenges of implementing regulations in practice, while highlighting the need for concrete changes, particularly regarding necessary legislation. In the paper, we will determine which improvements and changes remain necessary so that the provision of digital healthcare can fulfil its full potential. This kind of research is important because digital healthcare services would be crucial for potential future pandemics and other emergencies, enabling access to healthcare in remote areas, especially for older generations, etc. By analyzing Serbia's experience, this paper seeks to contribute to a broader understanding of how crises can accelerate digital transformation in healthcare systems and inform future strategies for building resilient, efficient, and equitable health infrastructures.

2. Digitalization of Healthcare Services in Serbia

2.1. Digitalization before the Outbreak of the COVID-19 Pandemic

The need for digitalization of healthcare services in Serbia was acknowledged several decades ago. During the 1990s, the Military Medical Academy in Serbia initiated the development of telemedicine, which at that time encompassed “digitalization and the establishment of telepathological connections between Belgrade and other medical centers, which brought significant results in medical diagnostics.”¹⁷ The foundation of a legislative framework began with the adoption of the Law on Health Care in 2005. It envisages the development of an integrated health information system (HIS), “for the purpose of planning and efficient management of the healthcare system, as well as collection and processing data related to the health condition of the population and the functioning of the health service.”¹⁸ The government issued the Regulation on the Program of work, development and organization of the integrated health information system – “e-Health” in 2009, which encompassed the development and management of this system until 2015.¹⁹ The establishment of an integrated HIS and the digitalization of healthcare services in Serbia were and remain long-term processes that require the involvement of various sectors, the provision of appropriate infrastructure at different levels of healthcare, the training of healthcare employees, the digitalization of data, and the inclusion of users. Several projects enabled digitalization and the establishment of the integrated health information system (IHIS) as:

a central electronic system in which all medical and health data of patients, data of healthcare workers and associates, data of healthcare institutions, health interventions and services performed in healthcare institutions, data of electronic referrals and electronic prescriptions, data on appointments for specialist examinations, diagnostic procedures and surgical interventions are stored and processed.²⁰

¹⁷ Nikola Bošković, “Digital Transformation of the Healthcare System in Serbia: Attitudes of eZdravlje and HIS Users,” *BizInfo Blace* 16, no. 1 (2025): 105–13, <https://doi.org/10.71159/bizinfo250012B>; Branimir Reljin and Vojin Čučuz, “Projekat Telepatološke Mreže,” *XXV Simpozijum o novim tehnologijama u poštanskom i telekomunikacionom saobraćaju PosTel 2007* (Belgrade), 2007, 101–8.

¹⁸ Law on Health Care, Official Gazette of RS, no. 107/2005.

¹⁹ Regulation on the Program of Work, Development and Organization of the Integrated Health Information System – ‘e-Health,’ Official Gazette of RS, no. 95/2009.

²⁰ Ministry of Health, “Integrated Health Information System of the Republic of Serbia.”

To fully establish and implement it, it was necessary to amend existing laws and enact new ones. The Law on health documentation and records in the field of health, which entered into force in 2014 and has been in effect since January 1, 2017, served as a more detailed foundation for establishing IHIS and the digitalization of health care services.²¹ It regulates health documentation and records that serve as the basis for the functioning of the IHIS, especially the part related to maintaining documentation in electronic form. Data from the patient's medical records were recognized as particularly sensitive personal data, which should be handled in accordance with the law governing the protection of personal data²² – at that time, the Personal Data Protection Law from 2009. Unfortunately, that law recognized only the particular sensitivity of health data and lacked detailed regulation. In 2018, the Law on Personal Data Protection²³ was adopted, which is largely harmonized with the EU General Data Protection Regulation (GDPR). The right to the confidentiality of data on the patient's state of health and the recognition of health data as sensitive personal data were prescribed in that law and in the Law on Patients' Rights,²⁴ both of which are very significant for the digitalization of healthcare. Since 2019, the organization and development of IHIS have also been partly regulated by the Law on Health Care.²⁵ From our analysis, we can conclude that the digitalization of the healthcare sector before the COVID-19 pandemic was still developing, despite the establishment of IHIS. It had weaknesses and implementation inconsistencies, particularly in data protection.

Before the outbreak of the COVID-19 pandemic, certain digital services were available. Since 2015, it has been possible to schedule an appointment with a general practitioner via the My Doctor application; electronic prescriptions were gradually introduced, culminating in full implementation in 2019; and since 2017, it has been possible to check health insurance status via the website of the Republic Health Insurance Institute. But the pandemic has shown that the level of digitalization, especially in the provision of health services, was not satisfactory and that there is a need for change to ensure its availability in the context of a pandemic, when physical contact and the possibility of coming to the clinic were limited.

2.2. Changes in the Digitalization of Healthcare during the COVID-19 Pandemic

Some specific digital services were introduced during the pandemic to reduce physical contact. One of them is the electronic vaccination system (e-vaccine). The first step in this system was online registration for vaccination via e-administration or by phone. After that, citizens received information via email and SMS about when and where to come for vaccination. This system enabled tracking of the serial number of each dose and recording

²¹ Law on Health Documentation and Records in the Field of Health, Official Gazette of RS, no. 123/2014.

²² Ibid., Articles 40, 50.

²³ Law on Personal Data Protection, Official Gazette of RS, no. 87/2018.

²⁴ Law on Patients' Rights, Official Gazette of RS, no. 45/2013, 25/2019, Articles 21, 22.

²⁵ Unfortunately, only one article was dedicated specifically to IHIS. Law on Health Care, Official Gazette of RS, no. 25/2019.

of each citizen who received the vaccine.²⁶ The Digital Green Certificate, introduced during the pandemic, served as a confirmation of COVID-19 vaccination, including test results for infection and recovery, and was compatible with the EU certificate.²⁷

The need to provide health services to non-COVID-19 patients was pronounced, raising questions about the feasibility of introducing telemedicine (healing at a distance). The lack of legal regulation represented a significant obstacle to the wider implementation of telemedicine at that time, when it was most needed. There were some attempts to introduce e-consultations, especially for psychological support during the pandemic. A free national helpline, called “How are you doing?,” was established after the outbreak of COVID-19 to provide psychosocial support by telephone.²⁸ Since May 2021, there has been a “unified free service for mental healthcare of the Ministry of Health of the RS and the Clinic for Mental Disorders Dr Laza Lazarević,” available via phone 24 hours a day.²⁹ Through that helpline, there were more than 30.000 interventions during the pandemic, in the form of “support, counselling, short psychotherapy (crisis) interventions, as well as recommendations related to already prescribed medication,” given by “qualified health workers and consultants of the Clinic.”³⁰ This showed how important telephone consultations are during a crisis.

The pandemic has shown that it is necessary to accelerate the digitalization of healthcare and enable wider application of digital services in practice. The need for the implementation of healing at a distance in conditions of reduced movement and contact has been particularly pronounced, underscoring the necessity of enabling the application of telemedicine on a wider scale, not just within pilot projects as was the case before the COVID-19 pandemic.³¹ But broader digitalization required amending existing regulations and adopting new ones. In the next section, we will dedicate our research to answering whether this has been done after the pandemic and to the current status of healthcare digitalization in Serbia.

2.3. Digitalization Efforts after the COVID-19 Pandemic

Serbia emerged from the pandemic with several e-services introduced in the healthcare sector. Among the most important services currently available to citizens are ePrescription,³² eRadiology, eInvoice, eReferral (with referral validation for surgery still pending),

²⁶ Government of the Republic of Serbia, “New E-Vaccine System for Monitoring Immunization,” 2021, accessed December 9, 2025, www.srbija.gov.rs/vest/512847/pokrenut-novi-sistem-e-vakcina-za-pracenje-imunizacije.php.

²⁷ E-administration, “EU Digital Green Certificate,” 2021, accessed November 29, 2025, <https://euprava.gov.rs/usluge/6962>.

²⁸ Nikolić Popadić, “Introducing Telemedicine – Legal and Other Challenges,” 350. Ivana Stašević-Karličić, “How Much Has the COVID-19 Pandemic Changed Us: The Experience of the Clinic for Mental Disorders ‘Dr Laza Lazarević,’” *Srpski Medicinski Casopis Lekarske Komore* 2, no. 3 (2021): 295–301, <https://doi.org/10.5937/smcl2-33326>.

²⁹ Ibid.

³⁰ Ibid.

³¹ See: Nikolić Popadić, “Introducing Telemedicine – Legal and Other Challenges,” 349.

³² Government of the Republic of Serbia, “ePrescription: The Future Is Now,” accessed December 3, 2025, <https://www.srbija.gov.rs/tekst/329843/erecept.php>.

and the Electronic Health Record (which is not yet fully standardized).³³ Several services are still in the pipeline, with full implementation planned in the near future, such as eSickLeave.³⁴

The most notable progress has been achieved in strengthening the legal framework governing both existing and planned digital services, as well as in establishing a Coordination Body for the Digitalization of the Healthcare System in 2021.³⁵ The Programme of Digitalization in the Healthcare System of the Republic of Serbia for the Period 2022–2026 was adopted in February 2022. The general objective is defined as “the digitalization of the healthcare system and the safe use of digital services and technologies to ensure higher-quality, more efficient, and more accessible healthcare.”³⁶ A key measure identified to achieve this goal is the establishment of a unified Electronic Health Record (EHR). Furthermore, the Programme outlines the IHIS, which comprises both central and local information systems. The central system is designed to facilitate collaboration among all stakeholders in healthcare provision, ensuring data sharing and authorized access. The local systems implemented in public and private healthcare institutions are used to record and track patient medical data and to support day-to-day operations and institutional functions.³⁷ The Programme recognized the importance of telemedicine, through measure 2.7 (Establishment of electronic services for users of health services) and adoption of the “Telemedicine implementation plan in the health care system” as one of the planned activities.

The corresponding Action Plan for the Period 2022–2023 identified activities necessary for the successful implementation of the Programme.³⁸ The most important measures included: aligning the legal framework with the Law on Electronic Government; establishing a legal framework for the development and maintenance of a unified IHIS architecture; creating an organizational unit within the Ministry of Health to manage healthcare digitalization and supporting organizational unit within the Office for Information Technology and E-Government; improving the legal framework for maintaining medical documentation and records in electronic form. The Government has prepared the new 2024–2025 Action Plan, intended to build on numerous international programs

³³ “European Health Data Space: Serbia’s Path Forward,” EIT Health, Serbia Center for the Fourth Industrial Revolution, 2025, 10, accessed December 10, 2025, https://c4ir.rs/wp-content/uploads/2025/11/EHDS-Serbia-White-Paper-Report_FINAL.pdf.

³⁴ Ministry of Health – eHealth Portal, “eSickLeave: Data and Documentation from the Central System,” February 6, 2025, accessed November 29, 2025, <https://e-zdravlje.gov.rs/news/ebolovanje-podaci-i-dokumentacija-iz-centralnog-sistema-ebolovanje-4>; EIT Health, “European Health Data Space,” 10; during the preparation of this paper, the Parliament of Serbia adopted the Law on the Exchange of Data, Documents and Information in Cases of Temporary Incapacity for Work Using the Software Solution “eSickLeave – Employer,” whose implementation is planned for January 2026.

³⁵ Government of the Republic of Serbia, “Formira se Koordinaciono telo za digitalizaciju u zdravstvenom sistemu,” 2021, accessed November 26, 2025, <https://www.srbija.gov.rs/vest/512076/formira-se-koordinaciono-telo-za-digitalizaciju-u-zdravstvenom-sistemu.php>.

³⁶ Government of the Republic of Serbia, “The Digitalization Programme for the Serbian Health Care for the Period 2022–2026,” 2022, 16, accessed December 3, 2025, <https://www.zdravlje.gov.rs/tekst/364590/program-digitalizacije-u-zdravstvenom-sistemu.php>.

³⁷ *Ibid.*, 18.

³⁸ *Ibid.*

and continue the activities initiated under the previous plan. Still, our research shows it is not (yet) publicly available.³⁹

Most of the measures from the Action Plan have not yet been achieved. Our research results show that none of the legal acts intended to be harmonized with the Law on Electronic Government – the Law on Healthcare, Law on Health Insurance, Law on Medicinal Products and Medical Devices, and Law on Patients' Rights – have been amended in accordance with the Action Plan. Exceptionally, measures focused on establishing the legal framework for the IHIS architecture and maintaining medical documentation and records in electronic form were accomplished through the enactment of the Law on Health Documentation and Health Records (LHDHR) in October 2023.

The LHDHR introduces the electronic health record (EHR), defining it as a “unified and centralized register comprising data and documents from mandatory medical documentation maintained in electronic form, exercising rights arising from compulsory health insurance, for analytics, reporting, health system planning and scientific research purposes.”⁴⁰ The law obliges the Ministry of Health to establish and maintain necessary registers (primarily the EHR), e-services, and software solutions,⁴¹ as well as the IHIS, with technical support from the Office for Information Technology and Electronic Government. It contains provisions regarding data security and safety, explicitly stating that the information contained in a patient's medical documentation constitutes a special category of personal data.

To support its effective implementation, several bylaws and supplementary acts have been introduced. Most notably, the Rulebook on the e-Record, the Personal Health Number and the Delivery of Data upon a Patient's Personal Request⁴² is scheduled to come into effect on January 1, 2026. The Rulebook specifies that the EHR is established by retrieving data from the software solutions used by healthcare institutions, private practices, and other legal entities, or from registers managed by the Ministry for Health.⁴³ It further regulates the content of data, the procedures for their collection, and the conditions under which authorized personnel can access them.

Initial steps towards establishing a legal framework for the use of AI have been taken with the adoption of the Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the Period 2025–2030. The Strategy explicitly identifies incentives for the application of AI in healthcare as one of the envisaged measures.⁴⁴ However, it does not include specific provisions on the use of AI in healthcare, and the law that would comprehensively regulate this issue still does not exist.

³⁹ Government of the Republic of Serbia, “Action Plan for the Period 2024–2025 for the Implementation of the Digitalization Program in the Healthcare System of the Republic of Serbia for the Period 2022–2026,” accessed December 13, 2025, <https://ekonsultacije.gov.rs/topicOfDiscussionPage/308/1>.

⁴⁰ The Law on Health Documentation and Health Records, Official Gazette of RS, no. 92/2023, 2023, Article 4, para. 1, item 7.

⁴¹ The Law on Health Documentation and Health Records, Article 34, para. 1.

⁴² The Rulebook on the E-Record, the Personal Health Number and the Delivery of Data upon a Patient's Personal Request, Official Gazette of the Republic of Serbia, No. 45/2025, 2025.

⁴³ *Ibid.*, Article 2, para. 1.

⁴⁴ Government of the Republic of Serbia, Strategy for the Development of Artificial Intelligence in the Republic of Serbia for the Period 2025–2030, Official Gazette of the RS, No. 5/ 2025, 2025, measure 6.7.

Finally, the Law on the Exchange of Data, Documents and Information in Cases of Temporary Incapacity for Work Using the Software Solution “eSickLeave – Employer” was enacted in December 2025, with general purpose of “establishment of a timely, reliable and binding system of electronic exchange of data, documents and notifications in the procedure for exercising the right to salary compensation based on temporary incapacity for work.”⁴⁵ This is primarily achieved through the introduction of mandatory use of the “eSickLeave – Employer” software solution.

Although significant efforts have been made to harmonize the legal framework for healthcare digitalization, gaps remain. The framework is inconsistent, and conflicts between provisions of different laws are common. It is therefore important to continue aligning regulations listed in this section (primarily harmonizing laws listed in the Action Plan with the Law on Electronic Government) to address the problem of essentially identical processes being regulated differently.⁴⁶

3. Analysis of Implementation of eHealth Services in Practice

Even though Serbia has come a long way in digitalizing its healthcare,⁴⁷ with several e-services being available to citizens, there is still hesitance in their practical application. This segment of the paper will examine whether the provided services are being adequately implemented in practice and analyze citizens’ attitudes toward them.

The State Audit Institution of Serbia has highlighted several areas in which the country is falling short of its envisioned goals in this process (stable financing, IT risk management, the lack of educational programs, privacy risks associated with the non-uniformity of user registration, etc.).⁴⁸ Concerning privacy risks, it stressed the inadequacy of relationships with service providers concerning data protection. Although most contracts include confidentiality clauses, there is no mechanism to ensure compliance, which may lead to the disclosure of sensitive health data.⁴⁹ Privacy risks arise from the collection, storage, and transfer of intimate patient data.⁵⁰ Patients in Serbia are often unaware of how the processed data is protected,⁵¹ which increases their distrust in the system. Similarly, medical professionals have expressed concerns about systems’

⁴⁵ The Law on the Exchange of Data, Documents and Information in Cases of Temporary Incapacity for Work Using the Software Solution “eSickLeave – Employer,” Official Gazette of the Republic of Serbia, No. 109/2025, 2025, Article 1.

⁴⁶ European Commission, Interoperable Europe Portal, “Serbia Digital Public Administration Factsheet Supporting Document,” 2024, 4, accessed November 25, 2025, <https://interoperable-europe.ec.europa.eu/collection/iopeu-monitoring/digital-public-administration-factsheets-2024>.

⁴⁷ Some surveys indicate that the overall performance of the IHIS improved by 0.9 points from 2021 to 2024. See: Bosiljka Djikanovic et al., “Serbian Health Information System (HIS) Improvements 2021–2024: Comparison Study Using Stages of Continuous Improvement (SOCi) Methodology,” *Health Research Policy and Systems* 23, no. 1 (2025): 8, <https://doi.org/10.1186/s12961-025-01337-5>.

⁴⁸ State Audit Institution of the Republic of Serbia, “Performance Audit Report – Information Security in Healthcare Information Systems,” 2021, accessed November 25, 2025, <https://www.dri.rs/izvestaj/3410>.

⁴⁹ *Ibid.*, 9.

⁵⁰ Nicholas Cummins and Björn Schuller, “Five Crucial Challenges in Digital Health,” *Frontiers in Digital Health* 2 (2020): 2, <https://doi.org/10.3389/fdgh.2020.536203>.

⁵¹ Cummins and Schuller, “Five Crucial Challenges in Digital Health,” 2.

vulnerability to cyberattacks.⁵² Recognized risks are highlighted by the lack of consent withdrawal in the eHealth portal⁵³ and by the software's ability to permanently store data even after deletion.⁵⁴

The EHR does not provide all necessary data, either due to system errors or because physicians fail to fulfil their obligations. Reports from specialists regarding examinations conducted on referrals are often not visible, which contributes to the system's inefficiency.⁵⁵

The system's shortcomings often stem from outdated hardware and software. More than half of users report occasional system downtime, while a significant percentage find the system interface unintuitive.⁵⁶ The existing infrastructure in rural facilities, combined with unstable internet connectivity, compromises the provision of healthcare services.⁵⁷

One obstacle to the broader use of the eHealth application is the complex registration process.⁵⁸ Many citizens do not have an eGovernment account, which is created in person for authorization and authentication, and electronic registration from home is not possible. Moreover, a large percentage of the population does not have an electronic certificate and is unable to use eHealth services.

Results from surveys aiming to assess the level of users' familiarity with eHealth services and the extent to which they utilize them⁵⁹ show that a large percentage of the population has expressed distrust and reluctance toward the digitalization process, with a significant number not well informed about the available services (in some surveys, 4/5 of respondents are unfamiliar with eHealth applications).⁶⁰ Only a small part of the population uses the application regularly, with only 8.4% of respondents scheduling appointments electronically, and nearly a third still scheduling by phone calls.⁶¹ More than half of the respondents do not use an eHealth application at all.⁶² Healthcare providers typically hold a more positive view; however, a significantly high percentage is dissatisfied with the system's functionality.⁶³ All of this highlights the need for broader

⁵² Marko Milić, "Critical Assessment of the HELIANT System in Healthcare in Serbia: Opportunities, Challenges, and Future Directions," Zenodo, December 29, 2024, 17, <https://doi.org/10.5281/zenodo.14569252>.

⁵³ EIT Health, "European Health Data Space," 14.

⁵⁴ Branko Marović et al., "E-Hospital, Children's University Hospital in Belgrade and HELIANT Hospital Information System," *MD Medical Data* 1, no. 4 (2009): 77.

⁵⁵ NALED, *Grey Book of Healthcare* (Belgrade: NALED, 2020), 12, accessed November 26, 2025, https://naled.rs/htdocs/Files/04612/Siva_knjiga_zdravstva.pdf.

⁵⁶ Milić, "Critical Assessment of the HELIANT System," 14.

⁵⁷ *Ibid.*, 16.

⁵⁸ See more: Ministry of Health, "User Guide – eHealth Patient Portal," accessed December 9, 2025, <https://e-zdravlje.gov.rs/landing/repository/documents/user-manual-sr.pdf>.

⁵⁹ Ilija Gavrilović, "Izazovi u Korišćenju Portala E-Uprava i Elektronskih Usluga u Srbiji," *Politička Revija* 85, no. 3 (2025): 70, <https://doi.org/10.5937/pr85-60522>. See similarly for EU-members: Andrea Floria, Ștefan Burcea, and Corina Folescu, *Challenges Encountered in the Use of Electronic Services in the Public Administration from EU Member States* (Romania: ACZ Consulting, 2019), <https://www.eupan.eu/wp-content/uploads/2019/06/RO-EUPAN-Comparative-Study-Public-Electronic-Services.pdf>.

⁶⁰ Bošković, "Digital Transformation of the Healthcare System in Serbia," 7.

⁶¹ *Ibid.*, 6.

⁶² *Ibid.*, 5.

⁶³ *Ibid.*, 7.

promotion of developed services and for the involvement of NGOs, patient organizations, and healthcare workers in the decision-making and implementation processes.

The extent to which users use the services depends on the level of internet access and digital literacy. Ensuring equal access to healthcare is of utmost significance, particularly in light of the primary objectives established in legislation. Serbia should prioritize ensuring equal access to the internet, increasingly recognized as a human rights issue and a prerequisite for accessing healthcare services. According to data from the Statistical Office of the RS for 2025, 90.1% of households in Serbia had internet access.⁶⁴ However, the results of the 2022 Census showed that only about 46% of the population aged 15 and over can be considered computer-literate (able to perform three basic computer-related activities). Around 30% of the population is partially literate, while 24% is considered computer illiterate.⁶⁵ Disparities in digital literacy can impede patients' ability to navigate digital health portals or assess the reliability of telemedical advice, placing certain groups at a heightened risk of misunderstanding or misuse.⁶⁶

This aligns with similar surveys conducted worldwide, particularly those focused on low- and middle-income countries (LMICs). One study on mobile internet use in LMICs found that 3.4 billion people globally are not using mobile internet, with key barriers including a lack of resources to afford an internet-enabled phone, a lack of (digital) literacy, and security concerns.⁶⁷ On the other side, among those who use mobile internet, only a small percentage use it for health services. The survey found that in most LMICs, the percentage of people who have (even once) accessed eHealth services is concerning low, with only 16% in Pakistan, 23% in Senegal, 29% in Ethiopia, and 30% in Indonesia.⁶⁸ The survey found that eHealth services are among the services users are least aware of.⁶⁹ This only shows that the unsatisfactory level of eHealth service use, as well as the level of digital literacy as one of its factors, is not a problem confined to Serbia but is connected to broader issues in LMICs. When comparing this data to the EU, we

⁶⁴ Internet availability was highest in the Belgrade region, at 95.5%. In the Vojvodina region, it amounted to 88.8%, in the Šumadija and Western Serbia region 88.3%, and in the Southern and Eastern Serbia region 86.7%; Statistical Office of the Republic of Serbia, "Use of ICT – Households, 2025," 2025, accessed December 13, 2025, <https://www.stat.gov.rs/sr-latn/vesti/20251024-upotreba-ikt-a-domacinstva-2025/?s=2701>.

⁶⁵ Statistical Office of the Republic of Serbia, "The 2022 Census of Population, Households and Dwellings: Educational Attainment, Literacy and Computer Literacy," 2023, accessed December 13, 2025, <https://publikacije.stat.gov.rs/G2023/Pdf/G20234006.pdf>.

⁶⁶ Motti Haimi, "The Tragic Paradoxical Effect of Telemedicine on Healthcare Disparities- a Time for Redemption: A Narrative Review," *BMC Medical Informatics and Decision Making* 23, no. 1 (2023): 95, <https://doi.org/10.1186/s12911-023-02194-4>.

⁶⁷ Matthew Shanahan and Kalvin Bahia, "The State of Mobile Internet Connectivity 2025: Barriers to Mobile Internet Adoption and Use," GSMA Intelligence, 2025, 6, accessed February 4, 2026, <https://www.gsma.com/somic/wp-content/uploads/2025/11/The-State-of-Mobile-Internet-Connectivity-2025-Barriers-to-Mobile-Internet-Adoption-and-Use.pdf>

⁶⁸ Matthew Shanahan and Kalvin Bahia, "The State of Mobile Internet Connectivity 2025: Understanding Mobile Internet Use in Low- and Middle-Income Countries," GSMA Intelligence, 2025, 38, accessed February 4, 2026, <https://www.gsma.com/somic/wp-content/uploads/2025/09/The-State-of-Mobile-Internet-Connectivity-2025-Understanding-Mobile-Internet-Use-in-LMICs.pdf>.

⁶⁹ *Ibid.*, 13.

found that the difference in digital literacy levels, even though not drastic, still exists. In 2023, 56% of people aged 16–74 in the EU had (at least) basic digital skills, with some countries exceeding 80%, such as the Netherlands (83%) and Finland (82%). However, some EU countries have shown a higher level of digital illiteracy than Serbia, such as Romania (28%) and Bulgaria (36%).⁷⁰ Similarly, reports have highlighted the uneven use of eHealth services on the EU level, despite their overall “widespread availability,” with 73% of the population accessing their EHR in Finland to only 5% in Germany in 2024. The average EHR use across the EU in 2024 was only 28%.⁷¹

In conclusion, the level of digital literacy as a prerequisite for broader use of eHealth services, albeit on a larger scale in LMICs, still poses a significant barrier to the accessibility and effectiveness of healthcare provision globally.

4. Discussion

Our research results identify several obstacles and challenges that still need to be overcome. As is the case for most developing countries,⁷² Serbia is experiencing a lack of available resources necessary for digitalization; the used hardware and software are often outdated;⁷³ the technological infrastructure is uneven;⁷⁴ and there is a shortage of qualified IT personnel. Investing in adapting hardware and software solutions is a key step toward enhancing service quality.

There is a lack of alignment across health sectors, which poses a barrier to creating a unified EHR. Serbia's healthcare is divided into three sectors – public, private, and military – which operate independently with little to no cooperation. Difficulties arising from the decentralization of collected data include the inability of medical professionals to access all patient information, duplicate medical visits, and generally inefficient healthcare provision.⁷⁵ The private sector is not adequately integrated into the digitalization process; the EHR does not include data on services provided in the private sector;⁷⁶ and electronic appointment scheduling in private institutions is not available through the My Doctor application.⁷⁷

⁷⁰ Eurostat, “Skills for the Digital Age,” April 2024, accessed February 4, 2026, <https://ec.europa.eu/eurostat/statistics-explained/index.php?oldid=628712>.

⁷¹ OECD, “Synthesis Report 2025: Health Policy Reform Trends in the EU,” 2025, 21, accessed February 4, 2026, <https://www.oecd.org/content/dam/oecd/en/publications/reports/2025/12/synthesis-report-2025-health-policy-reform-trends-in-the-eu-f661ffc5/1f6a8e9a-en.pdf>.

⁷² Berislav Vekić et al., “Implementation of the Nationwide Electronic Health Record System in Serbia: Challenges, Lessons Learned, and Early Outcomes,” *Acta Clinica Croatia* 61, no. 3 (2022): 489, <https://doi.org/10.20471/acc.2022.61.03.14>.

⁷³ Petar Rajković et al., “The Role of Resource Awareness in Medical Information System Life Cycle,” *Arxiv*, (2022): 2, <https://arxiv.org/abs/2205.07778>.

⁷⁴ Milić, “Critical Assessment of the HELIANT System,” 3.

⁷⁵ EIT Health, “European Health Data Space,” 10.

⁷⁶ Jelena Bojović, and Milica Stefanović, eds., “Grey Book 16 – Recommendations for Removing Administrative Obstacles to Doing Business in Serbia 2024,” NALED, 2024, 44, accessed December 3, 2025, <https://naled.rs/htdocs/Files/14377/Siva-knjiga-SRB.pdf>.

⁷⁷ Bošković, “Digital Transformation of the Healthcare System in Serbia,” 7.

Our results show a need to unify the data across sectors and integrate the private healthcare system with the public one. This would involve enabling medical professionals employed in private healthcare institutions to access patient data from the public sector, and vice versa. The steps towards achieving this unification have been taken through the enactment of the LHDHR, which established the EHR, but its full implementation is still pending.⁷⁸

The research results and data presented in the previous section show that the level of digital literacy remains a crucial obstacle that Serbia must overcome. A large part of Serbia's population is elderly people with little to no technological skills, raising questions about healthcare accessibility⁷⁹ and availability. The lack of technical training for medical professionals reduces the system's efficiency, leading to an undesirably high number of doctors opting for physical rather than electronic record-keeping. This issue translates into healthcare providers' inability to implement digital solutions and fully understand digital tools in use.⁸⁰ Furthermore, due to employment prohibitions, the positions designated for IT specialists are often filled by individuals of other professional backgrounds.⁸¹ Accordingly, emphasis should be placed on providing healthcare workers and the general public with technological education through courses and continuous programs. Furthermore, users' distrust can be solved by involving NGOs, patient organizations, and healthcare workers in the decision-making process.

When discussing privacy risks connected to digitalization, it is important to acknowledge that Serbia has an established legal framework for the protection of personal data. The Law on Personal Data Protection is largely harmonized with the GDPR. Significant efforts are made to mitigate risks through the authentication process for signing up for e-services. Authentication, enabled by the ConsentID application, uses qualified electronic certificates.⁸² However, IHIS audits continue to identify information security issues related to service providers' access to the database.⁸³

Going forward, a priority should be the development of several envisioned, yet still unrealized services – primarily eSicknessLeave and eReferral, which are still not fully operational in enabling the validation of referrals for surgery.⁸⁴ Proposals have been made to implement AI chatbots⁸⁵ that would allow citizens to acquire basic medical information in real time. Such tools could increase the accessibility of healthcare but pose a number of serious risks, including patient harm due to AI errors, misuse, bias, and

⁷⁸ NALED, "Report on Activities and Implementation of NALED's Strategic Goals for 2023 and Overview up to 2025," 2024, 29, <https://naled.rs/htdocs/Files/14953/Report-on-Strategic-goals-realization-2023-24.pdf>. Similarly see: NALED, "Annual Report on the Activities and Implementation of NALED's Strategic Goals 2024/25," 2025, <https://naled.rs/htdocs/Files/17551/Report-on-Strategic-goals-realization-2024-25.pdf>.

⁷⁹ Government of the Republic of Serbia, "Digitalization Programme," 15.

⁸⁰ EIT Health, "European Health Data Space," 15.

⁸¹ Government of the Republic of Serbia, "Digitalization Programme," 13.

⁸² Marija Zajeganović et al., "Data Security in Mobile Healthcare," *Military Technical Courier* 71, no. 3 (2023): 763, <https://doi.org/10.5937/vojtehg71-44245>.

⁸³ State Audit Institution of the Republic of Serbia, "Performance Audit Report," 2.

⁸⁴ EIT Health, "European Health Data Space," 10.

⁸⁵ Aldina Avdić, "Realizacija Servisa Pametnog Zdravstva i Njihova Integracija u Koncept Pametnih Gradova," (PhD diss., University of Niš, 2021), 73–74, <https://nardus.mpn.gov.rs/handle/123456789/20732>.

gaps in accountability.⁸⁶ The increasing use of AI-driven diagnostic and decision-support systems may also limit patients' understanding of how clinical judgments are formed, thereby complicating informed consent and potentially undermining trust in the physician-patient relationship.⁸⁷ Serbia still has not adopted a law that would regulate the use of AI in detail, and this should be one of the first steps to avoid the realization of previously identified risks.

Regarding legislative efforts, there is a need to harmonize the framework by adopting by-laws established under the LHDHR, as well as the Law on Healthcare and Health Insurance for Military Insured Persons. As previously discussed, none of the laws envisioned to be harmonized with the LHDHR has been amended. Similarly, telemedicine, although its significance was pronounced during the COVID-19 pandemic and later recognized in the Digitalization Programme, remains unregulated, and there are still no draft laws governing it.⁸⁸

The effective implementation of envisioned measures requires the establishment of specialized bodies to oversee their execution. It is necessary to establish a coordination body for digitalization within the healthcare system, alongside a dedicated organizational unit within the Office for IT and eGovernment.⁸⁹

5. Conclusion

The research results highlight the importance of healthcare digitalization not only during crises but also as a means to make healthcare services more accessible, especially in rural areas. In conclusion, it is important to emphasize that Serbia has made considerable improvements in this process following the COVID-19 pandemic. The number of available e-services has substantially increased, notable legislative efforts have been undertaken, and new specialized bodies have been established. Serbia has recognized the importance of digitalization and envisioned it as one of the key objectives to pursue. However, as previously discussed, several challenges continue to hinder invested efforts. Some of these challenges are related to the digitalization process itself and are common to most countries (primarily privacy risks). In contrast, others are specific to Serbia (sectoral fragmentation, digital illiteracy, resource availability, etc.). This paper contributes to the literature by exploring how the pandemic accelerated Serbia's digitalization process and its current status. We analyzed the practical implementation of adopted solutions and users' familiarity with them, concluding that it is not yet satisfactory due to multiple factors. Finally, we provided several recommendations for the future development of healthcare digitalization and proposed actions necessary to overcome the identified obstacles. We hope that this paper will further the discussion recently opened in the literature and serve as a useful guide for policymakers and other stakeholders in their future decisions,

⁸⁶ Nikolić Popadić and Sjeničić, "The Use of Artificial Intelligence in Healthcare and Medicine," 24 and more.

⁸⁷ *Ibid.*, 25–26.

⁸⁸ More on the importance and benefits of telemedicine and its regulation, see: Nikolić-Popadić, "Introducing Telemedicine – Legal And Other Challenges," 348 and more.

⁸⁹ EIT Health, "European Health Data Space," 16–17.

as it identifies challenges and obstacles, highlights legislation that needs to be mutually harmonized, and proposes solutions for the successful implementation of healthcare digitalization.

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