Zdrowie Publiczne i Zarządzanie 2021; 19 (2): 47–59
www.ejournals.eu/Zdrowie-Publiczne-i-Zarzadzanie, doi:10.4467/20842627OZ.21.006.15760

The effect of the pandemics on e-health services in Poland

Anna Sitek [1] https://orcid.org/0000-0003-3550-7349
Jarosław Greser [2] https://orcid.org/0000-0002-1021-6142
Wojciech Knieć [3] https://orcid.org/0000-0002-5500-3749
Anthony Wagstaff [4]
Marcin Kautsch [5] https://orcid.org/0000-0002-4520-3560
Jonatan Martinez-Perez [6]

[1] WE Patients Foundation, Warszawa, Poland
[2] Adam Mickiewicz University, Poznań, Poland
[3] Nicolaus Copernicus University, Toruń, Poland
[4] University of Oslo, Norway
[5] Institute of Public Health, Health Sciences Faculty, Jagiellonian University – Medical College, Krakow, Poland
[6] Spanish Royal Physics Society, Complutense University of Madrid, Spain

Address for correspondence: Anna Sitek, Fundacja MY Pacjenci, Powstańców 35/169, 05-091 Ząbki, ania-sitek@wp.pl

Abstract

The aim of the article is to present selected issues related to the impact of the pandemic on the universality of e-health services, as well as to show the readiness to use such services by the inhabitants of urban and rural areas in Poland. Several hypotheses are launched regarding the COVID-19 effect in relation to the implementation, use and access to e-health services and the skills needed to use them.
The article includes an analysis of the legal and social context accompanying organisational changes in the health care system caused by the presence of the COVID-19 virus, as well as an analysis of the results of quantitative research on the attitude of rural residents to such solutions. Data obtained in a study from the WE Patients Foundation provide some insight into the complexity of factors governing e-health use, showing less differences between city and rural areas than we hypothesised.

Key words: **e-health services, COVID-19 pandemic, Poland, public health**

Słowa kluczowe: **usługi e-zdrowia, pandemia COVID-19, Polska, zdrowie publiczne**

What we have:

1) There is little previous research on the use of e-resources for healthcare in a pandemic situation in relation to health care use, particularly in the rural context in Poland.
2) Although there is an established legal context, there are no previous legal and sociological analysis of the pandemic situation in relation to healthcare use, particularly in rural Poland.

What is new:

Access to technology alone does not necessarily imply an improvement in access to health services.
The COVID-19 epidemic does not seem to have significantly contributed to increased health care availability and use through technological platforms

Introduction

Health is defined as a state of complete well-being. It is an autotelic value that allows individuals to pursue other life goals. However, at present, the healthcare system poses many challenges. This is mainly related to the way healthcare functions, which in the COVID-19 epidemic has suffered many financial and organizational problems.

The 21st century pandemic is in many ways unique, when compared to the ones that occurred in the past. Civilizations have never before been at this stage of development, as the use of technology has in many ways become one of the cornerstones of modern life. Epidemics and pandemics are closely associated with profound social change [1]. Therefore it is necessary to examine them from the perspective of social, legal and health sciences, particularly related to the organization of health systems.

The following research hypotheses were formulated:

- (H1) COVID-19 is a catalyst for change in healthcare delivery;
- (H2) Changing the legal environment and social situation COVID-19 has forced greater use of e-health;
- (H3) There are significant differences in access to health in urban and rural areas;
- (H4) Low digital skills of rural inhabitants affect the possibilities of using e-health services and their overall evaluation.

There were certain regulations regarding e-health before the pandemic, but the outbreak of the pandemic caused the introduction of new regulations, aiming at improving access to e-health solutions. The change in the legal environment is not the only thing that affects the use of healthcare; the social situation in a pandemic causes less contact with other people, which in term may affect the use of health services generally and e-health specifically. Healthcare services in rural areas are, in general, technologically less advanced than in big cities. Therefore, one would expect less access to e-health services also. Furthermore, we assume that there is a significant relationship between the low level of digital skills and ability to use e-health services.

Literature review

The 21st century is the age of digital transformation in which modern technologies play a key role. Its specificity and phenomenon is the introduction to all spheres of everyday life new technologies, the use of which enriches the processes taking place in society [2]. There is no agreement in the literature on the subject as to the unequivocal interpretation of the term "e-health". In the literature on the subject, the term "e-health" is understood as any application of ICT in disease prevention, diagnosis, treatment, control and leading a healthy lifestyle. Most researchers admit, however, that this concept is related to the theory of the information society and the application of modern information and communication technologies in the health sector [3]. Following Manuel Castells, we refer to this form of society as the information society, a society characterised by the ability to use IT systems, computerization and the use of teleinformation services for the transmission and remote processing of information [4]. A society where almost everything is done through the exchange of impulses in the network [5].

Modern technologies in the Polish realities, as in Castells, began to play an increasingly important role. It is thanks to the changes that have taken place in this area, but also the change in the area of legislation, that e-solutions in the area of health have appeared. Although in Western Europe and the United States, the trend of transforming traditional health system into e-health has been observed for years [6], in Poland, until the pandemic occurred, we were dealing with rather trace manifestations of the use of e-services in the area of health.

E-health solutions play an important role in increasing the efficiency of the healthcare system and improving the quality of medical services. The implementation of new e-health solutions removes barriers in accessing medical services from one side and generates new social divisions from the other side. It should be remembered that patients should be able to choose the form of providing health services.

In the conditions of a pandemic, we deeply enter the world of mediated (virtual) relationships [7]. The current communication is based on the Internet and computer technologies, through its prism we can see the current trends and directions of potential social changes [8]. The problem is that not everyone has access to these tools that change the reality in which we operate so profoundly. The world of new technologies is not weakening, but creates new divisions [8].

The risk of virus infection influenced the behaviour of citizens/patients, minimising their visits to healthcare facilities. The need to avoid physical contact has prompted many people, including residents of rural areas and small towns, to use e-health solutions, triggering a number of changes in the way the healthcare system is organised. Some of the legal measures taken by the government have also been aimed at avoiding physical contact and promoting the use of e-health services as the main means of access to health services. The health and economic threats the entire world is currently facing are difficult, but it is also worth noting that they are opportunities to accelerate the desired changes in healthcare both in urban and rural areas [9].

Social context

A pandemic is a source of instability, social insecurity and crisis, manifesting itself through many aspects of the social order. The new reality of the pandemic situation is a direct threat to the social structure and has strongly influenced the scope and form of organization of various areas of social life [10], including that related to prevention measures. Every sphere of human functioning has changed and it seems extremely important to understand these changes and emerging needs in order to maintain the functioning of the system as a whole.

The COVID-19 pandemic and the resulting restrictions have also created conditions for better use of new (mainly: ICT-based) technologies in various spheres of social life. It may contribute to the acceleration of the development of e-services in health care. This was reported, inter alia, in research carried out in the United States, indicating a significant increase in this type of services: the use of telehealth services increased from 0.2% in 2019 to 1.9% in 2020 [11], and the number of telemedicine appointments increased twelve times, i.e. from 7 to 85% [12]. The same research shows that these services are most often used by people aged 18-44, as well as city residents [11, 12].

Information and Communication Technology (ICT) services have accelerated the availability of healthcare during a pandemic. However, despite the technological progress that has undoubtedly taken place, including attempts to adapt the healthcare system to the current situation, there are some persistent problems that prevent the use of ICT solutions in many cases. Such problems seem to be particularly noticed among inhabitants of rural areas and small towns [13]. This is due to the fact that the availability of the Internet in rural areas is lower than in urban areas, even though there are also examples of similar use of technology in rural and urban areas, such as mobile phones. Recent studies carried out during the pandemic on the Chinese population have highlighted these differences. Urban inhabitants use various types of applications and the Internet to obtain information, including health information. During the pandemic, inhabitants of rural areas preferred traditional forms of information exchange based on social interactions [14].

This was result of, among other things, insufficient effectiveness of ICT systems and procedures that would enable data flow between given institutions of the medical system. The pandemic also revealed institutional weakness of digital exchange of medical records between different stakeholders of the healthcare system [15].

One Polish article presented the results carried out on all provincial (voivodeship) outbreak action plans in the event of an epidemic in Poland. Voivodeships are obliged to prepare such documents by the law, however, the provisions are imprecise, and the content of the plans vary. The differences between the plans and their (mostly) poor quality seem to be the result of a mixture of imprecise legislation, lack of ability to write plans, and risk avoidance. This makes the existing documents of little implementation value in the face of the emerging coronavirus threat [16].

When going deeper into the social dimension of the COVID-19 pandemic's influence on e-health services, Zwęglińska-Gałecka analysed it using as background some data on ICT services from local governments. She discovered that before the pandemic, willingness of Poles to use e-services in contacts with government administration, was extremely low, especially for those living in rural areas. Even worse – most local governments did not develop coherent procedures or tools to be offered as local and regional e-administration [17]. However, during the COVID-19 pandemic, administrative efforts to develop proper ICT tools accelerated and attracted the local populations to these tools. This especially included e-health services. Zwęglińska-Gałecka argued that this progress was made mostly by "digital empowerment" of marginalized groups, such as seniors and low-income families. The latter were offered free laptops and tablets with Internet access, speeding up education on digital administration, digital economy and digital society in general. Michalska in her study on rural education in times of pandemia [18] noted rapid adjustment of rural schools to e-learning, which had an effect in "massive social exercise" of (ICT incompetent) parents prefiguratively encouraged to try e-administration tools, including – once again – mostly e-health services.

Posłuszny et al. spotted out a new dimension of informal rural society, where the internal hierarchy of rural communities was re-designed by new superpowers. Individuals who have got ICT skills gained more by getting information from the Internet, social media, but also as "digital advisors" [19]. "The digital advisor" helps other people to use e-tools, but also educates them in order to acquire the access to these services, also in the area of healthcare.

Karwacki and Wróblewski in their large study of 450 pandemic diaries discovered dialectics of COVID-19 everyday life - full of uncertainty and fears on one side and exploration and experimentation of "new ways for old habits" on the other. This means everyday rituals transmitted into online events. They argued that social isolation was adopted and tamed mostly by e-communication techniques [20]. Wróblewski, Meler and Afeltowicz described new resilience strategies based upon rapid update of individuals' and institutional ICT skills [21].

The implementation of many IT solutions aimed at improving the availability, quality and efficiency of healthcare services provided. Also, the organizational potential of healthcare units was strengthened due to the COVID-19 epidemic [22].

Nevertheless, does the Polish healthcare system ensuring equal access to healthcare in pandemic, regardless of where you live? We will try to answer this question – after analyzing the legal context – based on the analysis of existing data and data from our own research.

Legal context

Due to the outbreak of the pandemic, the legal regulations affecting the healthcare system have changed. An important solution for the entire healthcare system was the introduction and popularization of online services [23]. Below is an analysis of the legal acts constituting the basis for the use of modern technologies in health care in the European Union and Poland.

It is worth noting that the pandemic prompted dynamic action by the European Commission. On 8 April 2020, a recommendation was issued on a common EU set of instruments to facilitate the use of technology and data to combat the COVID-19 crisis [24]

In June 2020,Communication Europe's moment appeared: Repair and Prepare for the Next Generation [25] which indicates that the EU's recovery from the pandemic is to be based on digitisation and the development of a digital

single market. In particular, it is to include investment in communication technologies, a stronger presence in strategic digital technologies (e.g. AI, cyber-security, 5G, cloud infrastructure), the development of a data-driven economy and a common European data space, and a fairer environment for facilitating business [26, 27].

However, with reference to Article 168 of the Treaty on the Functioning of the European Union [28], the EU only has a supplementary role in creating a legal environment concerning public health. The EU does not have the authority to influence the organization of the health system in the member states. An exception is made for the situation indicated in paragraph 4 of Article 168. The activity of the EU institutions in shaping healthcare systems relates to fundamental issues such as common values and principles. These include universality, equality and solidarity and, importantly for this analysis, access to high quality care. Paragraphs 5 states the right to "adopt incentive measures designed to protect and improve human health and in particular to combat the major cross-border health scourges" and paragraph state the Council right to 6 adopt recommendations for the purposes set out in Article 168. None of these may constitute an EU authority to impose obligations on member states regarding the public health system. Shared competence between the Union and the Member States applies in the following principal areas: common safety concerns in public health matters, for the aspects defined in this Treaty. Shared competence means that the Member States shall exercise their competence to adopt legally binding acts in that area to the extent that the Union has not exercised or ceased its competence. For the rest, the Member States decide on the organisation and delivery of health services and medical care by defining their national health policy. This is why the EU health policy model is described as one based on supporting, coordinating and implementing complementary actions to those of the Member States.

Nevertheless, from 2020, the strengthening of EU health policy began to be emphasised in the context of the pandemic. The EU activity has focused on taking supportive action within the framework of the soft law adopted [29]. The pandemic significantly accelerated the development of new medical technologies and their practical implementation, as well as the development of the legal environment governing this issue. This is particularly evident in the case of medical Artificial Intelligence [30, 31, 32, 33]. The European Union aims to develop safe, reliable and ethical Artificial Intelligence. These three features are emphasised in both policy and programming documents [34, 27], as well as in expert studies [6] and entities tasked with the protection of personal data [35].

In April 2021, the European Commission published a proposal for a regulation of the European Parliament and of the Council laying down harmonised rules on artificial intelligence [36] and amending certain union legislative acts [37]. Within its framework, regulations were presented for high-risk AI systems. Among them, there is no direct reference to medical applications of Artificial Intelligence except AI systems intended to be used to dispatch, or to establish priority in the dispatching of emergency first response services, including firefighters and medical aid. It should therefore be concluded that this area will be able to develop further without additional regulatory areas. However, it must be borne in mind that for medical devices it is heavily regulated, in particular by Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002 and Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC [38]

Issues related to the possibility of using modern technologies in health care have also found their way into national regulations:

- Resolution of the Council of Ministers of February 14, 2017 Strategy for Responsible Development until 2020 (with a perspective until 2030) M.P. of 2017, item 260, The strategy itself is not a legal basis for introducing specific measures, but it indicates the directions of the government administration's work. The implementation of the objectives indicated in the strategy is carried out, among others, through the implementation of projects: Electronic Platform for Collection, Analysis and Sharing of Digital Resources on Medical Events, Platform for On-Line Sharing of Services and Digital Resources of Medical Registers with Entrepreneurs, "Improving the Quality of Health Care Management through Popularization of ICT Knowledge", "Domain ICT Systems of the Health Care Information System" [29].
- Act of April 15, 2011 on medical activity Provides a direct legal basis for the provision of health services through information and communication systems.
- Act of December 5, 1996 on the professions of doctor and dentist, Art. 2 clause 4 states that the provision of health services by a doctor may be carried out "by means of information and communication systems".

The rapidly developing threat to public health caused by the SARS-CoV-2 virus forced state administration bodies to take measures provided for by the Act of December 5, 2008 on preventing and combating infections and infectious diseases in humans. In connection with the above, the Act of March 2, 2020 on special solutions related to the prevention, prevention and combating of COVID-19, other infectious diseases and the crisis situations caused by them was quickly adopted, which allowed to define the obligations of service providers. Providing advice at a distance using ICT systems or communication systems in primary health care was regulated by the ordinance of the Minister of Health of October 31, 2019 [39].

All those legislative changes introduced on the European level, as well as in Poland, since the beginning of the pandemic indicate the growing importance of using ICT in health care.

Materials and methods

The analysis of changes in the health system due to the use of ICT solutions in rural areas of Poland was carried out on the basis of the legal acts regulating the provision of services in this segment of health care and the public opinion collected.

The analysis also used the results of an omnibus study carried out in February 2021 by the BIOSTAT Research and Development Center at the request of the WE Patients Foundation, which was conducted on a representative sample of 1000 respondents aged 18 to 85 years. The sample was selected based on the survey of fixed-line and mobile phones. The data for the sampling frame was generated from a set of all potentially existing telephone numbers on the basis of telephone prefixes assigned to individual fixed telephony operators by the Office of Electronic Communications. Then, the strings of numbers were entered into the device establishing telephone connections, which verified the correctness of the generated number strings as actually existing subscriber numbers. The address database for mobile phones included a list that met the following methodologically necessary conditions: timeliness, completeness, exclusivity and availability. In order to obtain a return from the sample at the level of responses from 1000 respondents (with the breakdown by sex, age and voivodship), 9347 calls were made, which means that the overall response rate was 10.7%.

The questionnaire included questions related to the perception of new solutions in health care during the pandemic. The survey (omnibus) was the basis for the quantitative and qualitative evaluation of the health care system during the COVID-19 pandemic. For the purposes of our analyses, the responses given by residents of rural areas (villages and small towns) were filtered out (the analysis included responses from 41.7% of the research sample). Significance tests were performed (chi-square test), among others due to the size of the place of residence. The occurrence of single relationships was noted, however, they were relationships of low statistical significance. It should be noted that the study sample was not representative due to the size of the locality, and therefore it should be approached with a great deal of caution, because the risk of committing the first type of error (i.e. recognizing a statistically significant difference, although in reality there is no such difference) is bigger.

Where possible, comparisons were made to the results of a similar study carried out by the Foundation on the nationwide sample of Poles in 2020.

Findings

The results of research carried out by the Foundation show that many people, regardless of their place of residence, used medical services in the last year. However, the use of services provided by the National Health Fund or individual private visits has been slightly lower in rural areas than in urban areas during the pandemic (Figure 1).

This is also confirmed by the data obtained from other research questions, according to which COVID-19 causes difficulties in accessing health services, and thus adversely affects the patient's recovery from illness/surgery. This opinion is shared by about 70% of Poles, regardless of their place of residence (Figure 2).

It is also worth mentioning here that patients not only have limited access to health services, but also often make their own decisions of cancelling appointments. Most often this is due to their fear of contracting the virus. Such concerns are shared by residents of both rural and urban areas (Figure 3).

A key consequence of the coronavirus was the "freezing" of the health system. Counselling in primary health care facilities, as well as in outpatient specialist care, began to be provided remotely, primarily by phone. The limitations of the pandemic situation caused almost every second respondent to use telephone to contact medical staff. However, it is worth noting here that the inhabitants of rural areas used this type of services less frequently than the inhabitants of urban areas (Figure 4).

Regarding the rating of telephone contact as a form of healthcare, responders differed to a large extent. Urban people and rural people did, however, not differ much in their responses to this question. In both groups, many more people assessed this way of providing health services negatively than positively (Figure 5).

Every third of the respondents also indicated the use of e-visit. Inhabitants of rural areas more often indicated not using this form of medical services than inhabitants of urban areas (61 vs. 57%). It is also worth pointing out that the inhabitants of rural areas less often, according to the figure, indicated the lack of technical skills (2% vs. 3%) or the lack of technical facilities enabling the provision of such services by a doctor (4% vs. 6%) (Figure 6).

This form of health care has twice as many allies as people who judge it negatively. Nevertheless, the vast majority of Poles in the sample do not have a definite opinion on this issue (Figure 7).

Although e-services in the field of medicine are more and more often used and relatively well assessed, many people believe that they can lead to a new social division, causing exclusion – such views are expressed by between 20–22% of the respondents.

The number of users of the Patient's Internet Account shows the emergence of new divisions between people regarding the use of health related technology. The account that was meant to allow citizens / patients easy access to medical services was not accepted by a significant number of people – only every tenth person declares that they have and use an account (Figure 8). The Patient's Internet Account requires more time for patients to accept. This may be evidenced by the attitude to other e-solutions in the health care system that have been introduced in recent years and which are now widely used by patients and doctors.

Therefore the solution that could improve the situation of patients is the creation of an effective system combining various forms of appointments: in the office, by telephone and e-visits (Figure 9).

Discussion and conclusions

The COVID-19 pandemic has caused a severe shock to all spheres of society. It forced some changes to the healthcare system in Poland. It has significantly affected the organisation of the healthcare system and contributed to the development of e-health services in the country. Medical

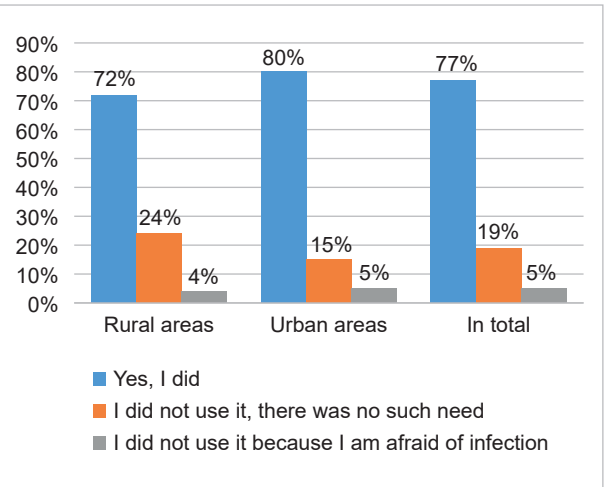

Figure 1. In the period since the beginning of the epidemic in Poland, have you used or tried to use the services provided by the National Health Fund or individual private visits? ($N_{rural\ areas}$ = 417; $N_{urban\ areas}$ = 583)

Source: own study based on the WE Patients Foundation's data.

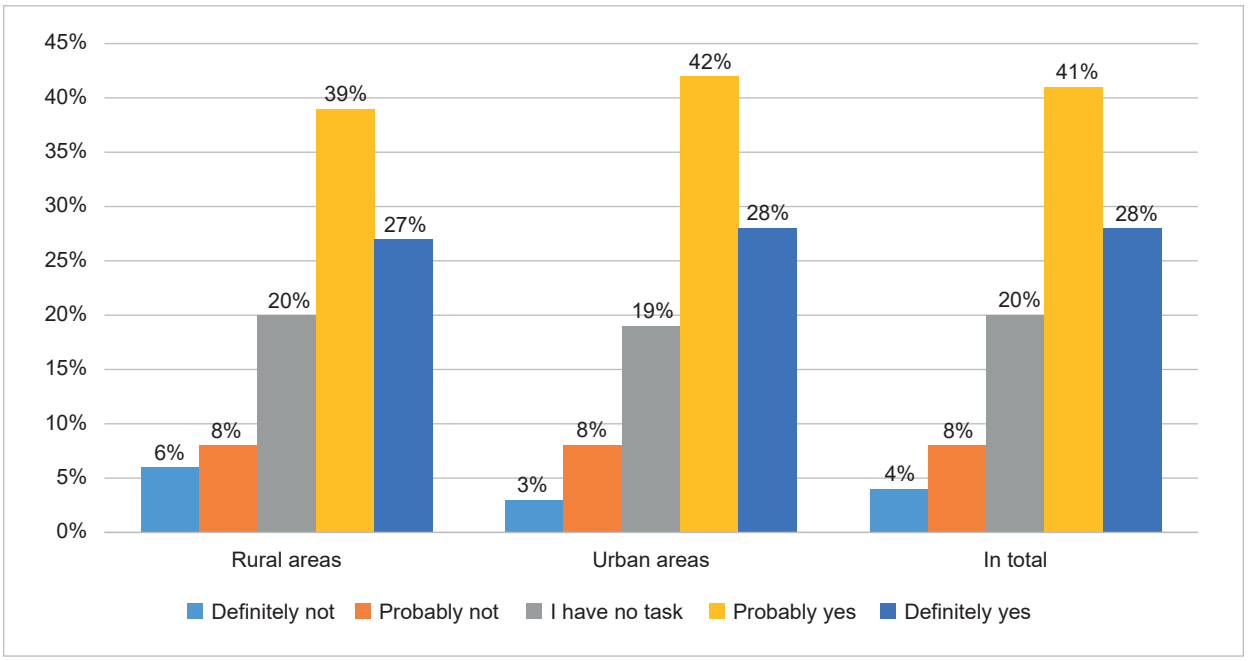

Figure 2. The operation of the health care system during a pandemic makes it difficult for patients to recover from illness/ surgery ($N_{rural\ areas}$ = 417; $N_{urban\ areas}$ = 583)

Source: own study based on the WE Patients Foundation's data.

care very quickly focused on remote solutions. Legislative changes defining and regulating the functioning of telemedicine were necessary, at least in terms of the possibility of providing e-health services. It was especially visible in the area of new legal regulations. The documents that have been mentioned in our analysis were prepared during the pandemic to improve the quality of e-health services. Legislative changes since the beginning of the pandemic allowed the development of certain e-health services that could not be provided to the same extent earlier. This confirms the hypothesis put forward at the beginning that COVID-19 has become a catalyst for changes in the way of delivering health services as well as changing the social and legal environment.

The epidemic accelerated certain processes that made it possible to use e-health services when physical contact

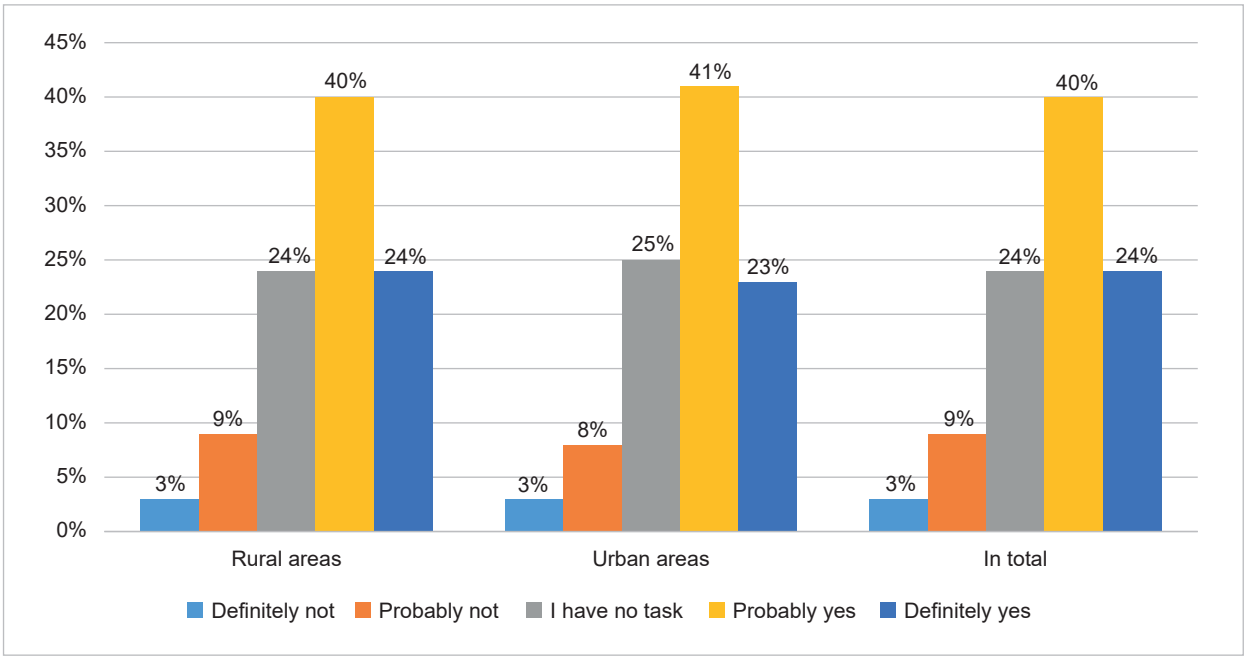

Figure 3. Patients do not use health services, despite the fact that they need them due to fear of contracting the coronavirus ($N_{rural\ areas}$ = 417; $N_{urban\ areas}$ = 583)

Source: own study based on the WE Patients Foundation's data.

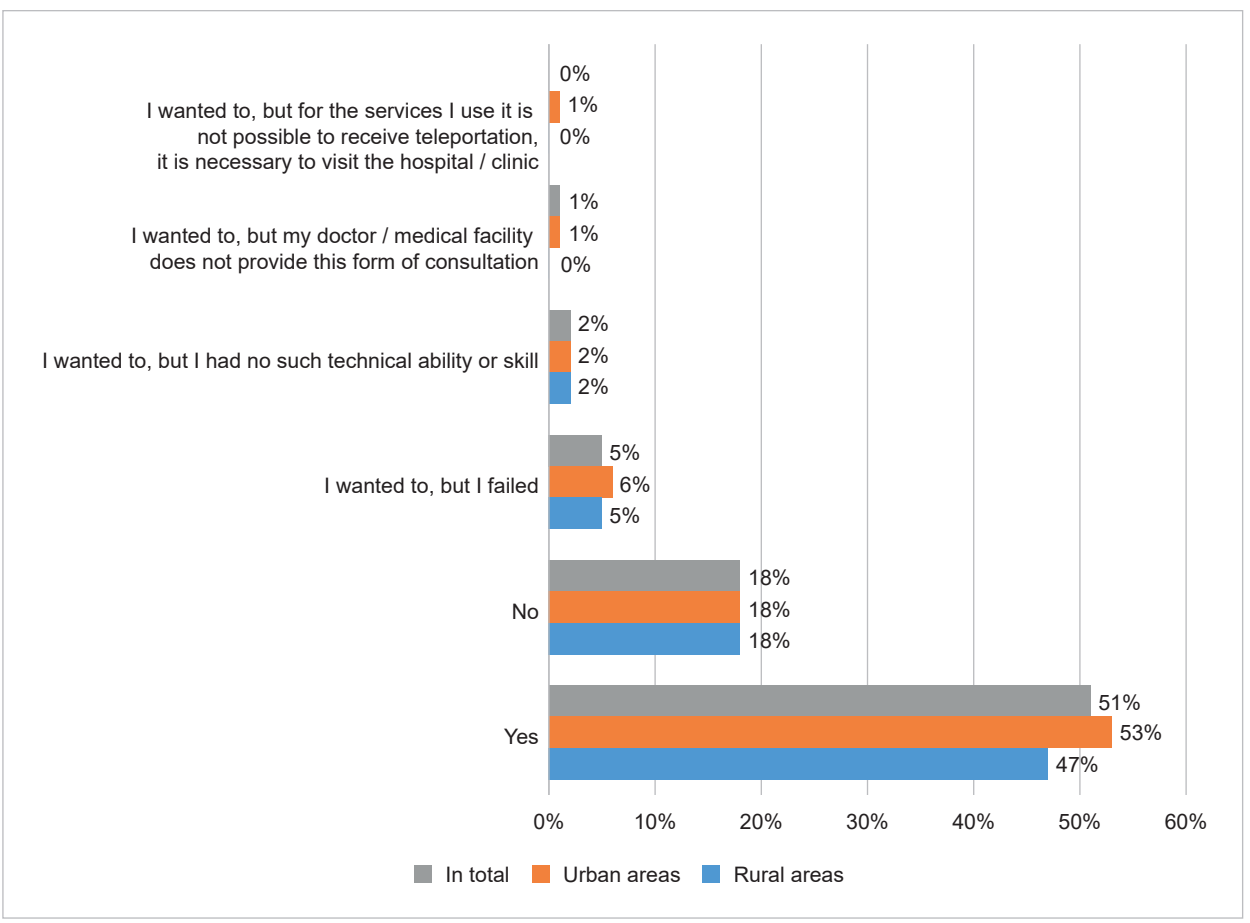

Figure 4. Have you or any of your relatives who are under your care (children, dependent adult) used the possibility of telephone contact with medical staff? ($N_{rural\ areas}$ = 417; $N_{urban\ areas}$ = 583)

Source: own study based on the WE Patients Foundation's data.

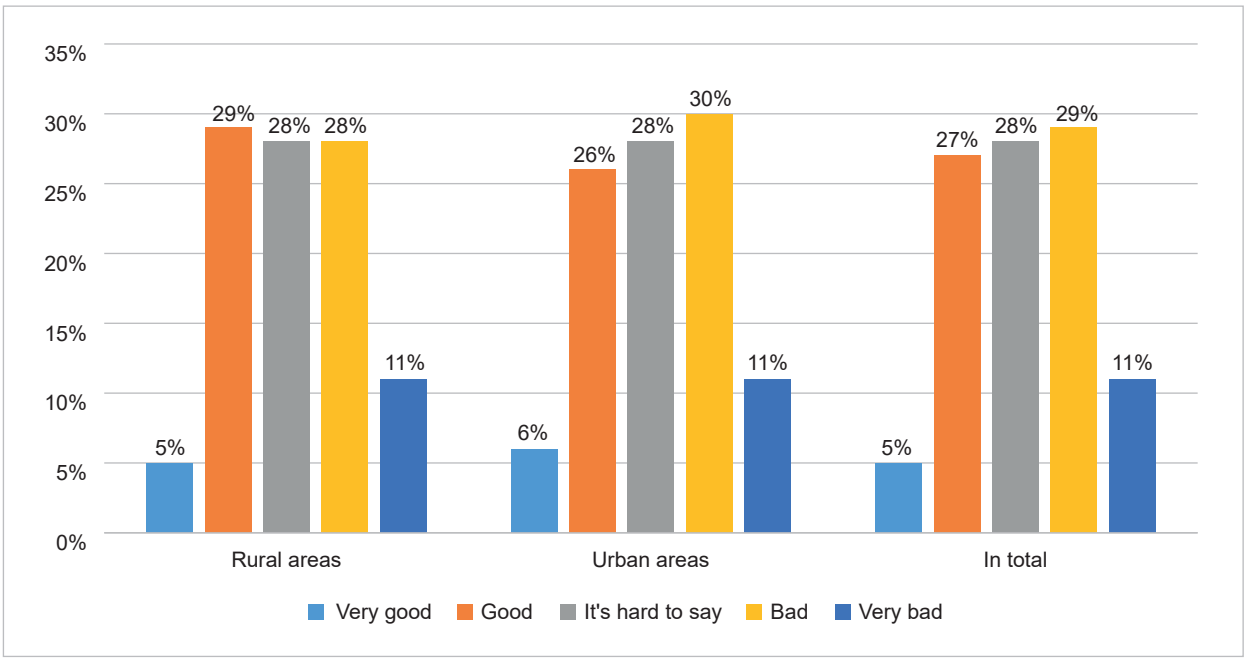

Figure 5. How do you rate this form of healthcare (telephone contact)? ($N_{rural\ areas}$ = 302; $N_{urban\ areas}$ = 465)

Source: own study based on the WE Patients Foundation's data.

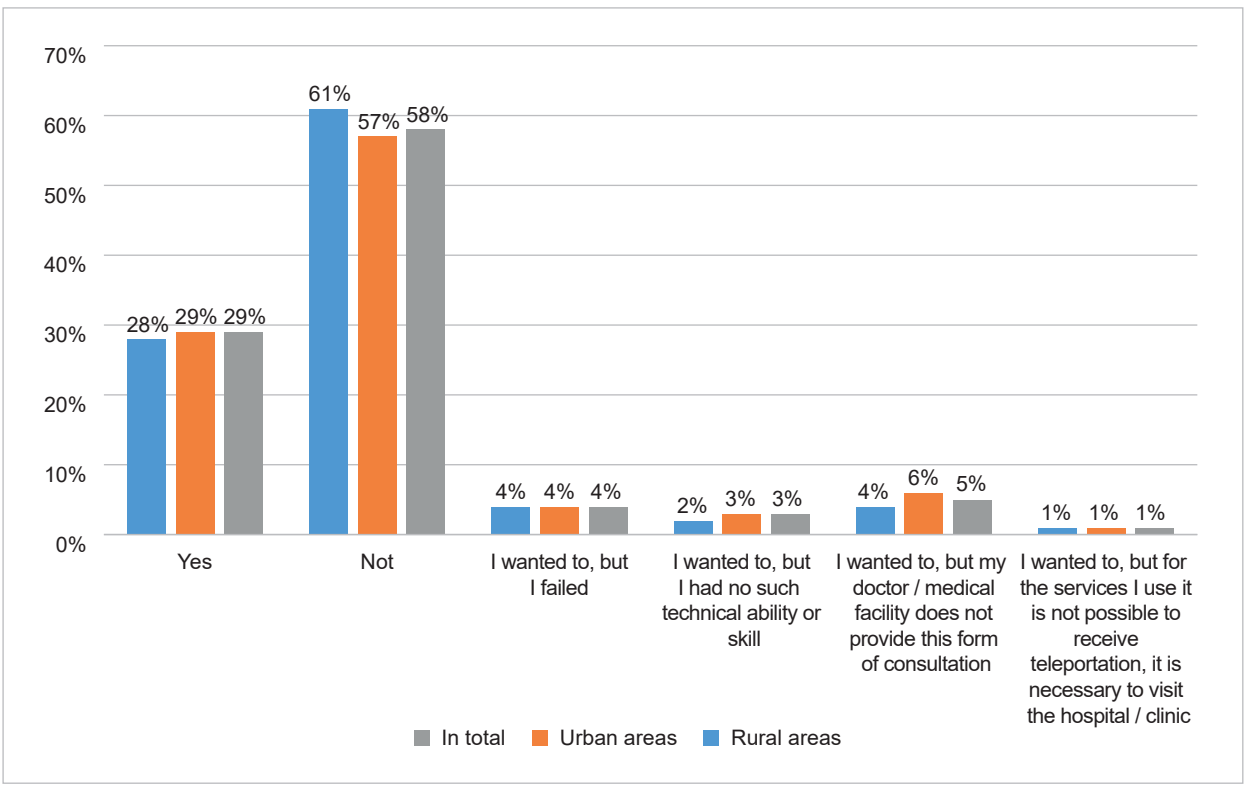

Figure 6. Have you or any of your relatives who are under your care (a child, a dependent adult) availed of the e-visit option (camera visits, where doctor can see the patient)? ($N_{rural\ areas}$ = 302; $N_{urban\ areas}$ = 465)

Source: own study based on the WE Patients Foundation's data.

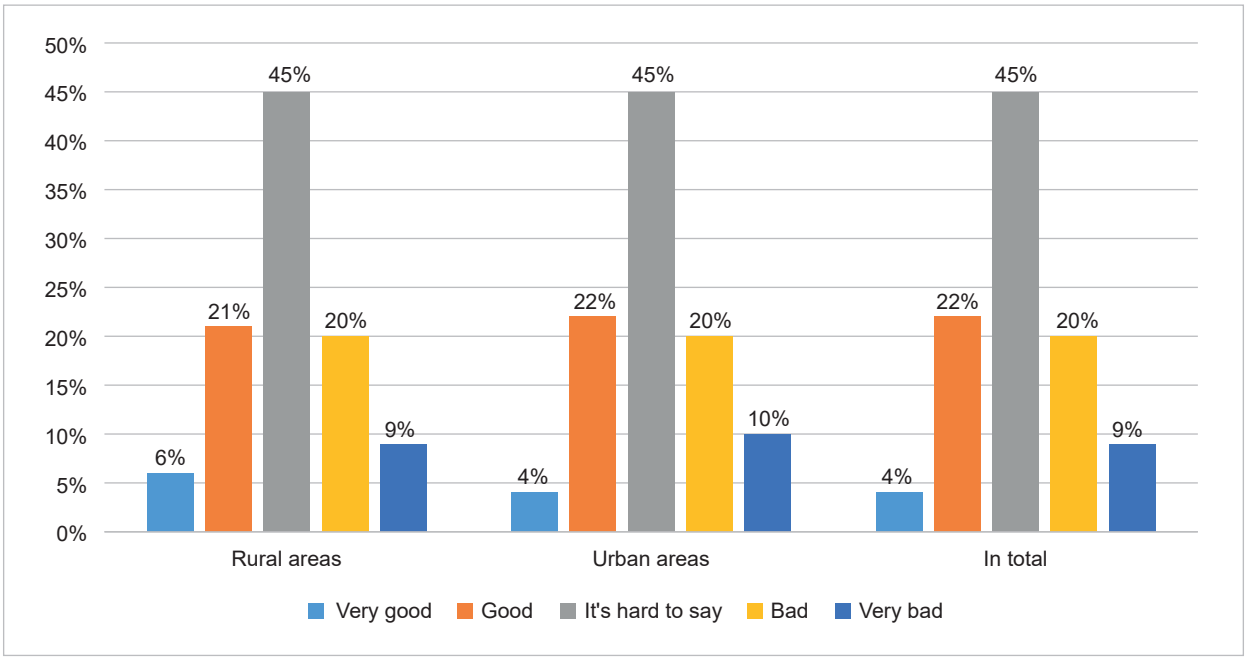

Figure 7. How do you rate this form of healthcare (e-visit)? ($N_{rural\ areas}$ = 302; $N_{urban\ areas}$ = 465)

Source: own study based on the WE Patients Foundation's data.

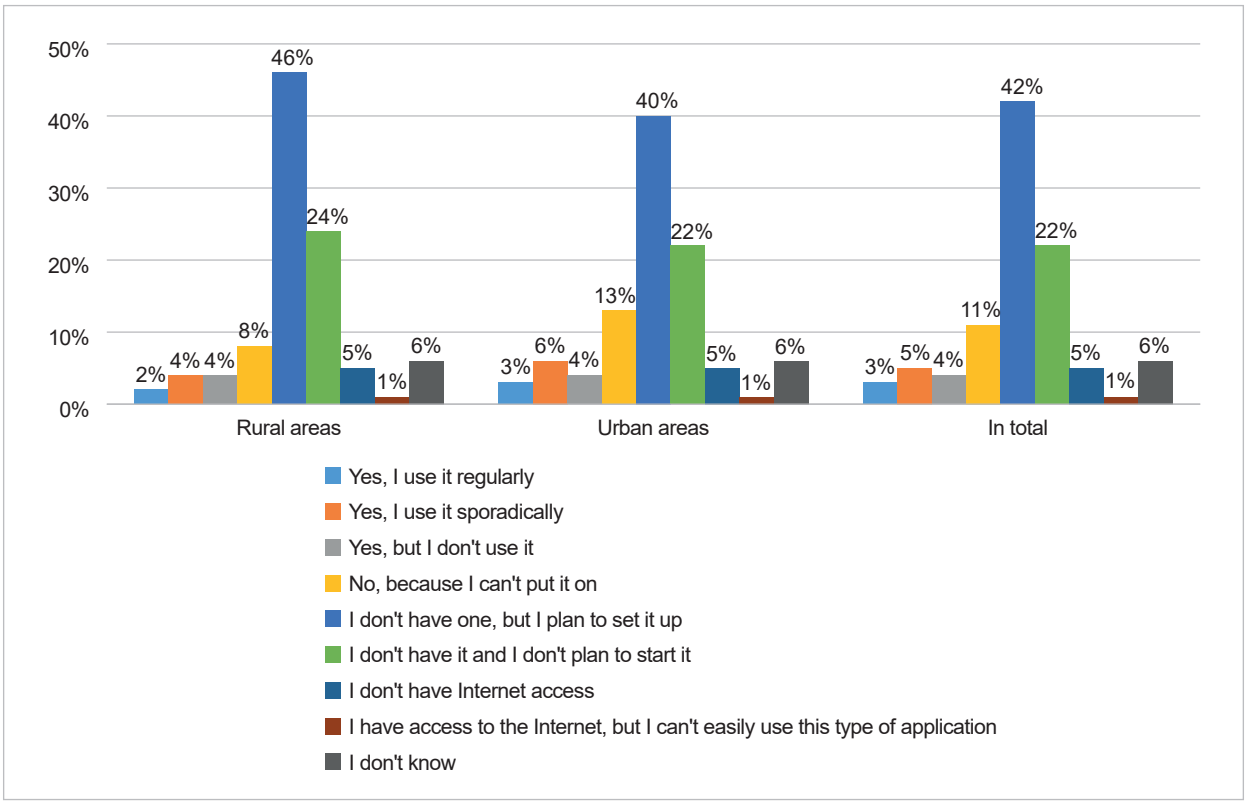

Figure 8. Do you have a Patient's Internet Account? ($N_{rural\ areas}$ = 417; $N_{urban\ areas}$ = 583)

Source: own study based on the WE Patients Foundation's data.

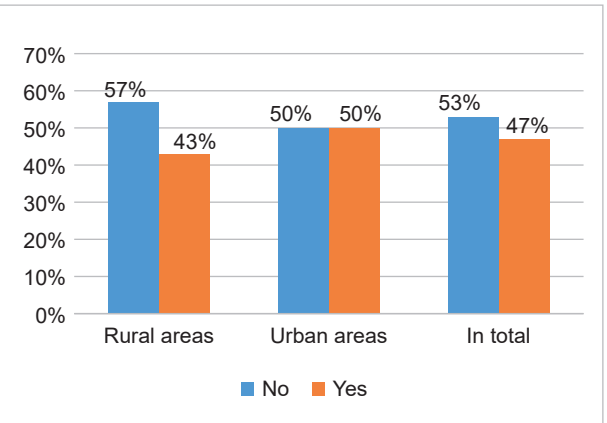

Figure 9. Creating an effective system combining various forms of medical appointments is a solution improving patients situation? ($N_{rural\ areas}$ = 417; $N_{urban\ areas}$ = 583)

Source: own study based on the WE Patients Foundation's data.

with hospitals and doctors was in some cases at risk. Nevertheless, although we see the dynamic development and benefits of the popularization of e-health services in Poland during the COVID-19, the current state of knowledge in the population and technology does not allow e-health to become an alternative to a standard healthcare. This is exemplified by the relatively low level of use of of e-health services found in our study.

We found very small variations in use of e-health between our rural and urban respondents. Our hypothesis (H3) *There are significant differences in access to health in urban and rural areas* was therefore not confirmed. Our hypothesis (H4) *Low digital skills of rural inhabitants affect the possibilities of using e-health services and their overall evaluation* was also not confirmed, as we found very small differences in this respect between rural and urban respondents. Research carried out by the WE Patients Foundation found that remote forms of contact with primary or specialist healthcare personnel are more and more often used (telephone contact was used by nearly 50% of respondents, and e-visit by 30%). However, it should be remembered that the motives of patients when using them often result from their concerns about their own health. Another research conducted on a representative nationwide sample of Poles in June 2020 showed that COVID-19 had a negative impact on the availability of visits to both primary and specialist health care (24% of respondents indicated that their visits to a primary care physician had been cancelled or postponed due to COVID-19, in the case of visits to specialists, as many as 33% of respondents showed that it was cancelled or postponed) [40]**.** Fear for their own health forces patients to use other therapeutic solutions, including e-health services. A significant increase over the onset of the pandemic was found in one study, where, according to Omyła-Rudzka, 33% of respondents used telephone consultation during the pandemic [40]. In this study, this type of medical consultations were most often chosen by residents of the largest cities (14%), as well as people aged 25–34 (7%), university graduates (7%) and people with an income above PLN 3,000 (7%) [40]. Not all medical centres were prepared to provide this kind of service due to insufficient digital competences.

Although the results do not provide the information about availability, it is probable that the availability of ICT-based medical services varies depending on the place of residence (city, village) however the use of the services are similar in rural and urban areas. The use of e-health services reported in this study can be considered quite low, and lower than we expected for both rural and urban areas. This could be due to a lack of representability of the data also since the rural population were mostly from small towns and villages Information bias is a possibility, given the sampling procedure in this study. It is, however, difficult to know if such a bias would be different in the urban and rural subjects. The lack of considerable differences in e-health use between rural and urban areas may be due to the similar use of use of Internet based technology in general. Also, he difference in other factors such as age could be bigger than place of residence regarding the use of electronic media. This might affect our data: although the data set was originally age-balanced, this balance was not necessarily kept after we filtered out rural vs. urban respondents. Further studies using a larger, more controlled sample might therefore be called for.

E-health services offered by medical facilities – although positively assessed – do not necessarily improve access to medical services. The conducted analysis showed that Poles, regardless of their place of residence, decide to use e-health services due to limited access to the healthcare professions and fear of COVID-19 infection. Patient satisfaction with online medical services is quite high. It seems, however, that improving the offer of e-health services and introducing more and more modern solutions should go hand in hand with digital education. Although the research carried out by the Foundation did not show great differences between urban and rural areas, one should bear in mind the existing large gap in access to digital services between the population living in the areas indicated.

In conclusion, as we have seen, the COVID-19 pandemia has modified access to health services by moving

towards e-health, which has generated a series of changes to which society has had to adapt. This fits with our first hypothesis (H1).

These changes have been motivated by the health situation caused by the pandemic, which have forced the introduction of legal measures to reinforce them. This also validates our second hypothesis (H2).

Changes in access to health services do not seem to generate differences depending on the urban or rural situation of the citizens. In this case our third hypothesis (H3) cannot be confirmed with the data collected.

Similarly, it is not detected that the low digital skills of rural areas have hindered their access to health services through new digital and remote routes which contrasts with our fourth hypothesis (H4).

All this invites us to carry out a broader study, with a greater amount of data, as well as to seek an explanation for them that may be related to:

A) The bias introduced in their collection given by a profile in the type of citizens who have agreed to respond.
B) The ease of access and simplicity in the use of the tools of the e-health services.
C) The bias introduced in the profile of users of this type of services.

Notes

1 In this article, we assumed that rural areas are villages and small towns. In making this division, the definitions of the rural area of the EU and OECD were followed. According to the European Union, a rural area is an area with a population density of less than 100 people/km sq. According to the OECD, a rural area is an area with a population density of less than 150 people/sq km.

References

1. Hardt M., *History of Infectious Disease Pandemics in Urban Societies*, Littlefield Publishing, Washington DC 2016.
2. Sitek A., *Społeczeństwo informacyjne na obszarach wiejskich w Polsce*, Wydawnictwo Bezkres Wiedzy, Saarsbrucken 2014.
3. Batko K., *Wykorzystanie technologii informacyjno-komunikacyjnych w transformacji organizacji sektora ochrony zdrowia – koncepcja e-zdrowia*, in: *Technologie informacyjne w transformacji współczesnej gospodarki*, eds. C. Olszak, E. Ziemba, Uniwersytet Ekonomiczny, Katowice 2012.
4. Castells M., *Społeczeństwo sieciowe*, Wydawnictwo Naukowe PWN, Warszawa 2007.
5. Castells M., *Koniec tysiąclecia*, Wydawnictwo Naukowe PWN, Warszawa 2009.
6. Borkowska I., *Rozwój telemedycyny w Polsce – nowe wymiary nierówności w zdrowiu*, in: *Spór o społeczne znaczenie społecznych nierówności*, ed. K. Podemski, UAM, Poznań 2009.
7. Bauman Z., *Intimations of Postmodernity*, Routledge, London–New York 1992.
8. Sasińska-Klas T., *Communication Challenges in Times of a Liquid Pandemic – a Sociological Perspective*,"Roczniki Nauk Społecznych" 2021; 3 (49), No. 1: 85–100.
9. Kazimierska I., *Bez cyfrowych rozwiązań służba zdrowia nie poradziłaby sobie w czasie pandemii,* 2020, May 16, https://www.termedia.pl/poz/Bez-cyfrowych-rozwiazan-sluzba-zdrowia-nie-poradzilaby-sobie-w-czasie-pandemii,40754.html (accessed: 10.04.2022).
10. Strong Ph., *Epidemic Psychology: A Mode,* "Sociology of Health & Illness" 1990; 12 (3): 249–259.
11. Jaffe D. et al., *Health Inequalities in the Use of Telehealth in the United States in the Lens of COVID-19,* "Population Health Management" 2020; 23 (5): 368–377.
12. Pierce B.S. et al., *The COVID-19 Telepsychology Revolution: A National Study of Pandemic-Based Changes in U.S. Mental Health Care Delivery*, "American Psychologist" 2021; 76 (1): 14–25.
13. Padala K.P. et al., *VA Video Connect for Clinical Care in Older Adults in a Rural State During the COVID-19 Pandemic: Cross-Sectional Study*, "Journal of Medical Internet Research" 2020; 22 (9).
14. Zhang J. et al., *Rural–Urban Disparities in Knowledge, Behaviors, and Mental Health During COVID-19 Pandemic: A Community-Based Cross-Sectional Survey,* "Medicine (Baltimore)", 2021; 100 (13).
15. Żakowiecki P. et al.,. *Usługi publiczne w kryzysie. Pandemia w ochronie zdrowia*, Fundacja Przyjazny Kraj, Warszawa 2020.
16. Kautsch M. et al., *Castles in The Air: A Comparative Analysis of Provincial Outbreak Action Plans in The Event of an Epidemic in Poland,* "Health Care and Research Journal", 2021; 2 (2): 97–109.
17. Zwęglińska-Gałecka D., *Koronakryzys. Lokalne zróżnicowanie globalnej pandemii,* "Wieś i Rolnictwo" 2020; 3 (188): 67–90.
18. Michalska S., *Szkoła wiejska w czasie pandemii*, "Wieś i Rolnictwo" 2020; 3 (188): 119–139.
19. Posłuszny Ł. et al., *Społeczny obraz życia codziennego na wsi w pamiętnikach z czasu koronawirusa*, "Wieś i Rolnictwo" 2020; 3 (188): 185–203.
20. Karwacki A. et al., *Życie codzienne w czasach koronawirusa – analiza pamiętników,* 2021, https://pau.krakow.pl/zaproszenia/2021/KZC_Nauki_w_sluzbie_spoleczenstwa_2021_06_2526_materialy_abstrakty.pdf. (accessed: 10.04.2022).
21. Wróblewski M. et al., *Ryzyko, zaufanie, choroby zakaźne. Polki i Polacy o pandemii,* UMK, Toruń 2021.
22. Bukowski H. et al., *Wpływ COVID-19 na polski system ochrony zdrowia,* Innowo, Warszawa 2020.
23. Wrześniewska-Wal I. et al., *Wybrane zagadnienia zmian legislacyjnych w czasie pandemii,* "Wiedza Medyczna" 2020, Numer Specjalny.
24. European Commission, *Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth. COM(2010) 2020 final*, 2020, https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2010:2020:FIN:EN:PDF (accessed: 10.04.2022).
25. European Commission, *Europe's Moment: Repair and Prepare for the Next Generation. COM/2020/456 final*, 2020, https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=COM%3A2020%3A456%3AFIN (accessed: 10.04.2022).

26. European Commission, *Plan działania UE na rzecz administracji elektronicznej na lata 2016–2020 Przyspieszenie transformacji cyfrowej w administracji. COM(2016) 179 final,* 2020, https://eur-lex.europa.eu/legal-content/PL/TXT/PDF/?uri=CELEX:52016DC0179&from=SK (accessed: 10.04.2022).
27. European Commission, *White Paper On Artificial Intelligence — A European Approach to Excellence and Trust. September 20; COM(2020) 65 final,* 2020*,* https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf (accessed: 10.04.2022).
28. European Commission, *Consolidated Version of the Treaty on European Union. Official Journal of the European Union C 326/1,* 2012, https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:C:2012:326:FULL&from=EN (accessed: 10.04.2022).
29. Kokocińska K., *Strategiczne podejście do rozwoju innowacyjnych technologii informacyjno-komunikacyjnych w ochronie zdrowia (kierunki zmian prawnych),* in: K. Kokocińska et al. (eds.), *Jakość w opiece zdrowotnej. Zastosowanie nowoczesnych technologii w czasie pandemii,* Wolters Kluwer, Warsaw 2021.
30. Schneeberger D. et al., *The European Legal Framework for Medical AI,* in: A. Holzinger et al. (eds.), *Machine Learning and Knowledge Extraction,CD-MAKE,* Dublin 2020.
31. Schönberger D., *Artificial Intelligence in Healthcare: A Critical Analysis of the Legal and Ethical Implications, "*International Journal of Law and Information Technol" 2019; 27: 171–203.
32. O'Sullivan S. et al., *Legal, Regulatory, and Ethical Frameworks for Development of Standards in Artificial Intelligence (AI) and Autonomous Robotic Surgery,*"International Journal of Medical Robotics and Computer Assisted Surgery" 2019; 15: 1–12.
33. Molnár-Gábor F, *Artificial Intelligence in Healthcare: Doctors, Patients and Liabilities,* in: T. Wischmeyer et al., *Regulating Artificial Intelligence*, Springer, Cham 2019.
34. European Commission, *Report on the Safety and Liability Implications of Artificial Intelligence, the Internet of Things and Robotics. September 20; COM(2020) 64 final,* 2020, https://ec.europa.eu/info/sites/info/files/report-safety-liability-artificial-intelligence-feb2020_en_1.pdf (accessed: 10.04.2022).
35. European Data Protection Board, *Guidelines 05/2020 on Consent under Regulation 2016/679, Version 1.1.* September 20, 2020, https://edpb.europa.eu/sites/edpb/files/files/file1/edpb_guidelines_202005_consent_en.pdf (accessed: 10.04.2022).
36. European Parliament, *Artificial IIntelligence Act,* 2021, https://www.europarl.europa.eu/RegData/etudes/BRIE/2021/698792/EPRS_BRI(2021)698792_EN.pdf (accessed: 10.04.2022).
37. European Commission, *Proposal for a Regulation of the European Parliament and of the Council Laying Down Harmonised Rules on Artificial Intelligence (Artificial Intelligence Act) and Amending Certain Union Legislative Acts*, 2021.
38. Regulation (EC) No 1223/2009 and repealing Council Directives 90/385/EEC and 93/42/EEC (OJ L 117, 5.5.2017: 1).
39. Fałek A. et al., *Wpływ epidemii wywołanej wirusem SARS-CoV-2 na system opieki zdrowotnej w Polsce*, Modern Healthcare Institute, Warsaw 2020.
40. Omyła-Rudzka M., *Opieka medyczna w czasie epidemii – komunikat z badań,* CBOS, Warszawa 2020.

Others publications

Bauman Z., *Legislators and Interpreters: On Modernity, Post-modernity, and Intellectuals,* Polity Press, Cambridge 1987.
Bhatia R., *Telehealth and COVID-19: Using Technology to Accelerate the Curve on Access and Quality Healthcare for Citizens in India,* "Technology in Society" 2021; 64.
Bjørkdahl K. et al. (eds.), *Pandemics, Publics, and Politics Staging Responses to Public Health Crises*, MacMillan, Palgrave 2019.
Chojnacki W., *SARS-COV-2 Pandemic Versus Personal and Structural Security*, "Transformacje" 2021; 2 (109): 74–84.
Cransac-Miet A. et al., *Impact of COVID-19 Lockdown on Lifestyle Adherence in Stay-at-home Patients with Chronic Coronary Syndromes: Towards a Time Bomb*, "International Journal of Cardiology" 2021; 323: 285–287.
Currie W. et al., *E-Health Policy and Benchmarking in the European Union*, in: E. Kuhlmann at al., *The Palgrave International Handbook of Healthcare Policy and Governance,* Macmillan, Palgrave/London.
European Commission, *Europe's Digital Competitiveness Report — Main Achievements of the i2010 Strategy 2005–2009, 04.08.2009 COM (2009) 390,* European Commission, Brussels 2009.
European Commission, *European Economy. Joint Report on Health Systems,* European Commission and the Economic Policy, Brussels 2010.
High-Level Expert Group on Artificial Intelligence, *Ethics Guidelines for trustworthy AI*, September 20, 2019, https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai (accessed: 10.04.2022).
Korneta P. at al., *The Impact of COVID-19 on the Performance of Primary Health Care Service Providers in a Capitation Payment System: A Case Study from Poland,* "Environmental Research and Public Health" 2021; 18 (4): 1407.
Nojszewska E., *Polska ochrona zdrowia w czasie covid-19*, May 16, 2021, https://gazeta.sgh.waw.pl/meritum/polska-ochrona-zdrowia-w-czasie-covid-19 (accessed: 10.04.2022).
Philips, *Future Health Index 2020 – Era możliwości. Nowe pokolenie akceleratorem zmiany w opiece zdrowotnej*, May 16, 2020, https://www.philips.pl/a-w/about/news/future-health-index/reports/2020/the-age-of-opportunity.html (accessed: 10.04.2022).
Su D. et al., *Does telemedicine improve treatment outcomes for diabetes? A meta-analysis of results from 55 randomized controlled trial,* "Diabetes Research and Clinical Practice" 2016; 116: 136–148.

Others International Legal Acts

Committee (AWG). 2010. Occasional Papers 74, European Commission, Brussels.
COM/2021/118 Final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions 2030 Digital Compass: the European Way for the Digital Decade.
COM/2019/640 Final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions the European Green Deal.
COM/2020/67 Final. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions Shaping Europe's Digital Future.

Directive 2011/24/EU of the European Parliament and of the Council of 9 March 2011 on the application of patients' rights in cross-border healthcare.
Regulation (EU) 2017/745 of the European Parliament and of the Council of 5 April 2017 on medical devices, amending Directive 2001/83/EC, Regulation (EC) No 178/2002.
Regulation (EU) 2017/746 of the European Parliament and of the Council of 5 April 2017 on in vitro diagnostic medical devices and repealing Directive 98/79/EC and Commission Decision 2010/227/EU.
Regulation (EU) 2021/522 of the European Parliament and of the Council of 24 March 2021 establishing a Programme for the Union's action in the field of health (EU4Health Programme) for the period 2021–2027, and repealing Regulation (EU) No 282/2014.

Polish legal sources

Uchwała Rady Ministrów z 14.02.2017 r. Strategia na rzecz Odpowiedzialnego Rozwoju do roku 2020 (z perspektywą do 2030 r.), M.P. z 2017 r. poz. 260. September 20, https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WMP20170000260 (accessed: 10.04.2022).
Ustawa z 5.12.1996 r. o zawodach lekarza i lekarza dentysty, Dz.U. 1997 nr 28 poz. 152. September 20, https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=WDU19970280152 (accessed: 10.04.2022).
Ustawa z 15.04.2011 r. o działalności leczniczej, Dz.U. 2011 nr 112 poz. 654. September 20, https://isap.sejm.gov.pl/isap.nsf/DocDetails.xsp?id=wdu20111120654 (accessed: 10.04.2022).