

Telemedicine technology acceptance - survey research among hospitalized and ambulatory patients in Poland

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Abstract.

Telemedicine can be defined as the use of telecommunication technologies to provide medical information and services. Telecare includes devices which are capable of monitoring vital signs and contact the doctor remotely. In the case of a sudden health problems it is possible to quickly localize patient through built-in GPS.

Aim of the study.

Evaluation of social awareness in the field of telemedicine and patients' willingness to use modern technologies for indirect contact with a physician.

Material and method.

Survey research carried out among hospitalized and ambulatory patients.

Results.

The questionnaire was returned by 198 patients. Only 24.5% of hospitalized and 18.6% ambulatory patients stated that the concept of telemedicine is known to them. 56.1% of respondents declared their willingness to remotely consult a doctor. The greatest interest was expressed by people aged 18-30 - 74.1% of respondents compared to 50.7% among patients over 60 years. The interest of remote consultation was comparable between city dwellers and inhabitants of rural areas (59.3 % compared to 54.12%).

Conclusions.

The results of our study show that public awareness in field of telemedicine is small. Without increasing information policy about possibility of using a remote form of contact with physician among patients, potential of telemedicine will remain unused. High interest in

teleconsultation among young patients gives hope for a wide application in the future.

Keywords: Telemedicine; Telehealth; eHealth

Introduction.

According to Article 68 of the Polish Constitution, every citizen, regardless of the financial status, has a right to healthcare and public administration ensure equal access to medical services financed from public funds. [1] The main source of financing medical treatment in Poland is compulsory insurance in the National Health Fund. [2] In 2017 current expenditure on medical care in Poland accounted for 6.7% GDP and public expenditure amounted 4.6% GDP which was equal to 1 955 USD per 1 inhabitant. This ranked Poland on 25 place among 26 European countries belonging to the OECD (Organization for Economic Cooperation and Development). The countries that spend the most on one citizen are: Switzerland (8 009 USD), Luxembourg (7 049 USD) and Norway (6 351 USD). According to analysis, the main problems of health care in Poland include a long waiting period for an appointment with medical specialist, difficulties in access to medical services between different areas of the country, inadequate distribution of medical personnel and insufficient informatization of health care system. [3] These issues lead to dissatisfaction among society. In the study evaluating patients expectations regarding healthcare, on question whether you are satisfied with functioning of the public healthcare system in Poland a total number of 71 % people answered not or rather not. 76% of respondents claim that access to health services in public sector is not equal for all patients. Almost everyone has expressed the need for reforms in health care. [4] According to Polish Public Opinion Research Center the vast majority of respondents positively evaluates the competence of doctors (70%), believe that doctors engage in their work, care for their patients (65%) but express dissatisfaction with the long waiting time for diagnostic tests (66%), insufficient number of medical staff in hospitals (70%), and difficulties in accessing specialists (83%). [5]

One of the solutions related to insufficient access to qualified medical staff concentrated mainly in urban areas and academic universities, can be telemedicine. The main idea of this field is the possibility of providing health care remotely. [6] According to World Health Organization, telemedicine is defined as: “The delivery of health care services, where distance is a critical factor, by all health care professionals using information and communication technologies for the exchange of valid information for diagnosis, treatment and prevention of disease and injuries, research and evaluation, and for the continuing education of health care providers, all in the interests of advancing the health of individuals and their communities”. [7] Currently, telemedicine services can be provided in the form of remote consultations, carried out using smartphone, tablet or computer with a camera. There are also devices with ability to remotely send registered data to medical centers, where they are further analyzed. These include ECGs, pressure gauges, oximeters, spirometers and glucometers. In the case of a sudden deterioration of health due to the presence of a built-in GPS, it is possible to quickly localize person in need of help. There are reports about the possibility of remote rehabilitation of patients with cardiovascular, orthopedic, respiratory and diabetic diseases. [8,9,10] Telemedicine can also be used to treat patients with mental health problems, including addictions, eating disorders, depression and anxiety. [11] In 2015, doctors and other medical professions in Poland were given legal rights to evaluate patients' health status not only in direct contact but also by using informatics technologies. [12] This provided new tools and opportunities in health care which can positively affect patients' health and facilitate work of doctors. In recent years, many reports have been made about the benefits of using telemedicine. The most frequently mentioned advantages on the side of the patient include: easy and fast access to medical consultations, especially for people living at a

distance from the main medical centers, remote access to test results, fast help in the life threatening event. The advantages of telemedicine for hospitals include: reduction and shorter time of hospitalizations, visits to emergency departments and fewer emergency calls. All these elements allow to reduce the cost of health for hospitals and improve the comfort of patients at the same time. [9] These data are particularly important in the context of aging society. The calculations carried out during the 10-year observation between 2007 and 2017 show that the number of people over 65 in Poland increased by 3.1 percentage points. [13] Data from the European Statistical Office (EUROSTAT) predict that the number of people over 65 in Europe in 2020 will account for 20.4% of the total population, while in 2050 it will increase to 28.1%. [14] The aging population is associated with a significant increase in the occurrence of diseases and their adverse effects, and thus with a more frequent need for doctor visits. Solving legislative problems in 2015 was an important step forward, was an important step forward that facilitated the development of telemedicine in Poland.

Aim of the study.

The aim of the study was to assess the acceptance of telemedicine technology among ambulatory and hospitalized patients. It was based on the assumption that age, level of education, ability to use a computer and health conditions determine the interest in telemedicine.

Material and method.

Questionnaire consist of 17 questions related to concept of the telemedicine. The study was conducted in Poland between November 2018 and March 2019.

Of the total number of 202 questionnaires, we analyzed 198. 100 came from hospital departments: cardiology, endocrinology, gastroenterology, orthopedics and 98 from the hospital outpatient clinic. Analysis was based on questionnaires completed by 106 women (53.5%) and 92 men (46.5%). The largest group of respondents were people over 60 years of age - 38.9% and the least large group were people between 18 and 30 - 13.6%. 27.3% patients were aged 46-60 and 20.2% were between 31-45. More demographic data is presented in Table 1.

Table 1. Characteristics of respondents

Variable		Total	Hospitalized (% of all patients)	Ambulatory (% of all patients)
		73 (100%)	100 (50.5%)	98 (49.5%)
Age	18-30	27 (13.6%)	10 (5.1%)	17 (8.6%)
	31-45	40 (20.2%)	15 (7.6%)	25 (12.6%)
	46-60	54 (27.3%)	22 (11.1%)	32 (16.2%)
	>60	77 (38.9%)	53 (26.7%)	24 (12.1%)
Sex	Male	92 (46.5%)	49 (24.7%)	43 (21.7%)
	Female	106 (53.5%)	51 (25.7%)	55 (27.8%)
Place of residence	Village	67 (34.2%)	27 (13.8%)	40 (20.4%)
	Small town (to 100.000)	40 (20.4%)	25 (12.8%)	15 (7.7%)
	Large town (100.000 – 200.000)	11 (5.6%)	7 (3.6%)	4 (2%)
	City (more than 200.000)	78 (39.8%)	40 (20.4%)	38 (19.4%)
Education	Primary	17 (8.6%)	12 (6.1%)	5 (2.5%)
	Vocational	20 (10.1%)	10 (5.1%)	10 (5.1%)
	Secondary	91 (46%)	46 (23.2%)	45 (22.8%)
	Higher	69 (34.8%)	32 (16.2%)	37 (18.8%)

In our statistical analysis we use Cramér's V factor (φ_c), which determining the level of dependence between two nominal variables, of which at least one takes more than two values. Values of Cramér's V above 0,2 we considered as statistically significant.

Results.

One of the main issue which polish e-health is currently facing is popularizing the idea of telemedicine. Results of our study show that public awareness in this subject is small. Only 21.2% of respondents claimed that they are familiar with concept of telemedicine (24.5% of hospitalized and 18.6% of ambulatory patients).

Technical skills to use devices for remote health care is an important factor determining their use particularly among older patients. In our study 59.1% respondents declared lack of difficulties in using computer, 55.1% were able to use phone app without problem. Growing role of internet health services as a source of information about diseases gives possibility for wide application of telemedicine in the future. [15] In our study, the Internet as one of the three most common sources of health information was declared by 61.6% patients.

Half of the respondents would agree to use remote health monitoring devices, 56.1% were interested in remote consultation with doctor. 70.2% of patients were positive about the computer technology in medicine.

More detailed data about attitude to concepts of telemedicine are presented in Table 2.

Table 2. Respondents' attitude to concept of telemedicine and ability to use computer devices.

Question		Total	Hospitalized (% of all patients)	Ambulatory (% of all patients)
Ability to use a computer	Significant difficulties	9 (4.5%)	4 (2%)	5 (2.5%)

	Medium difficulties	37 (18.7%)	17 (8.6%)	20 (10.1%)
	Lack of difficulties	117 (59.1%)	53 (26.7%)	64 (32.3%)
	I don't use	35 (17.7%)	26 (13.1%)	9 (4.6%)
Ability to use a application	Significant difficulties	11 (5.6%)	5 (2.5%)	6 (3%)
	Medium difficulties	32 (16.2%)	14 (7.1%)	18 (9.1%)
	Lack of difficulties	109 (55.1%)	51 (25.7%)	58 (29.3%)
	I don't use	46 (23.2%)	30 (15.2%)	16 (8.1%)
Source of information about health	Internet	122 (61.6%)	60 (30.6%)	62 (31.6%)
	Different source	74 (38.4%)	38 (19.4%)	36 (18.4%)
Familiarity with concept of telemedicine	I know	42 (21.2%)	24 (12.2%)	18 (9.2%)
	Don't know	153 (77.27%)	74 (37.8%)	79 (40.5%)
Openness to remote health monitoring devices	I agree	99 (50%)	46 (23.2%)	53 (26.8%)
	Disagree	27 (13.6%)	17 (8.6%)	10 (5.1%)
	Hard to say	72 (36.4%)	37 (18.7%)	35 (17.7%)
Openness to remote consultation with a doctor	I agree	111 (56.1%)	56 (28.3%)	57 (28.8%)
	Disagree	36 (18.2%)	23 (11.6%)	13 (6.6%)
	Hard to say	51 (25.8%)	23 (11.6%)	28 (14.1%)
Positive attitude to computer technology in medicine	Yes	139 (70,2%)	69 (35%)	70 (35.5%)
	No	12 (6.1%)	5 (2.5%)	7 (3.6%)
	Hard to say	46 (23.2%)	25 (12.7%)	21 (10.7%)

Age is significant factor influencing use of remote contact with a doctor. Among all patients, 56.1% expressed their interest in remote consultation with doctor. Younger respondents were more interested in that concept compared to older respondents (age: 18-30 - 74.1%, 31-45 - 57.5%, 46-60 - 53.7%, 60 - 50.7%).

Patients without difficulty in using a computer were more likely to consult doctor remotely rather than patients who don't use the computer (63.25% compared to 31.43%, $\phi_c=0.22$, $p=0.00372$), they were also more likely to agree to health evaluation by technical devices (54.7% to 31.43%, $\phi_c=0.19$, $p=0.02584$).

Education level was factor influenced patients usage of Internet as a source of information about health. Higher educated patients more often use Internet than lower educated patients for health information (Higher - 78.26%, Secondary - 61.11%, Vocational - 45%, Primary - 18.75%, $\phi_c=0.255$, $p=0.00016$). They were also more likely to consider teleconsultation and telemonitoring (Teleconsultation: Higher - 68.12%, Secondary - 52.75%, Vocational - 35%, Primary - 47.06%. $\phi_c=0.22$, $p=0.00297$), (Telemonitoring: Higher - 62.32%, Secondary - 49.45%, Vocational - 25%, Primary - 29.41%. $\phi_c=0.19$, $p=0.02452$). Higher educated respondents considered videoconferencing as comparatively effective as a direct visit (Higher - 44.93%, Medium - 28.57%, Vocational - 10%, Primary - 29.41%. $\phi_c=0.22$, $p=0,00467$).

Discussion.

A lot of research confirmed widespread application of telemedicine. One of them is rehabilitation - a key element in treatment patients with cardiac diseases. Insufficient access to education is one of the challenges faced by patients with diagnosed chronic diseases. Absent or inadequate legislation, lack of financing, guidelines and information systems in many European countries are main problems of cardiac rehabilitation. [16] Study of Ji-Su Kim and colleagues showed high interest in smartphone health monitoring system and educational program among patients after heart failure or heart transplantation. 98.5% patients expressed interest in use this application. Such significant interest in remote form of rehabilitation can be caused by popularity of smartphones in South Korea, where in 2016 more than 80% of population use them. [17] According to the Central Statistical Office of Poland in 2017, 82% of households had access to Internet. For health-related information internet was used by 45.0% people between 16 and 74 years old. Group of people using smartphones increased from 25.5% in 2014 to 59.5% of 2017. [15] This data show scale of changes in citizens lives as a result of using computers and show that telemedicine can be one of the solutions to problems with health care.

One of the greatest challenge faced by patients struggling with chronic disease is maintaining high-quality therapy. It is possible through systematic compliance with the doctors' recommendations. Research had been created about the problem of non-compliance with medical recommendations among patients both in Poland and in the world. According to report prepared by the Foundation for the Support of the Development of Polish Pharmacy and Medicine 25% of patient with chronic disease does not follow the doctors' instructions using only part or one of the prescribed drugs. Among the chronically ill, only 65% declared that they always take all the recommended doses. Factors affecting compliance include: quality of the patient-doctor relation, easy access to the doctor and the costs of therapy. The probability that the patient will follow the instructions increases when the patient has trust in doctors' qualifications and when there is easy access to control visits. [18] A study by Kaili Dou and colleagues showed that the main factors determining the willingness to use an application that help control chronic disease include a sense of bad health condition, good contact with a doctor, and ease of use. [19]

Research conducted by Rachel Wade and colleagues evaluated acceptance of telemedicine among the elderly and their caregivers as a factor affecting the willingness to use this technology by completing the questionnaire before and after using telemedicine services. Both before and after the study, the majority of patients said that telemedicine is useful and easy to use. After the end of the study, the perceived ease of use was significantly increased. The study indicates that ease of use and sense of usefulness of telemedicine devices are factors that affecting the willingness to use them in the future. [20]

Another study compared two models of education for patients aged 12-19 with decompensated type 1 diabetes. First by using direct contact in the clinic and second via Skype. Regardless of method, significant improvements of glycemic control occurred. [21]

With the development of telemedicine, more attention is being paid to the view that such a form of contact can lead to dehumanizing medicine and harm patient-doctor relations. A study conducted by Jelle van Gurp and colleagues among patients with advanced cancer disease and chronic obstructive pulmonary disease shows that one of the challenges faced by doctors was the inability to create an atmosphere of privacy and a sense of patient intimacy during teleconsultation. An additional problem was the avoidance of sensitive and emotional topics by doctors due to the sense of distance and lack of sufficient closeness with the patient to be able to comfort him. [22]

Conclusions.

Age affects source for obtaining information about health. Young people use the

Internet more often to search for health information and more often express interest in remote consultation with a doctor. Sense of computer skills and higher education level among respondents was associated with significantly greater willingness to use the doctor consultation through video conference, and effectiveness this form of consultation could be comparable to a direct contact. These patients were also more likely to agree for remote assessment of their health parameters through remote devices. Attitude to telemedicine among patients in the hospital was comparable to ambulatory patients.

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