

Original article

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**DIGITAL TECHNOLOGIES AS SUPPORT TO HEALTHCARE SYSTEMS IN
HEALTH PROMOTION AND PREVENTION OF ONCOLOGICAL DISEASES**

- Raising awareness as an aim of communications -

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ABSTRACT

The paper analyzes the approach to one very important phenomenon in the modern environment, which is defined as digital transformation in the healthcare system. The increasing influx of digital technologies into business processes leads to the point where the provision of healthcare services can no longer be viewed only in traditional frameworks, but it is necessary to look at the unlimited options of digital technologies, digital content and digital communications in the provision of healthcare services.

The needs of the healthcare system and certain changes resulting from the development of communication and information technologies such as the Internet, social networks, mobile applications, etc. they require organized work on the implementation of a strategy for new ways of doing business in healthcare. Health information, early screening awareness of oncological diseases increases the motivation for active participation of people in the implementation of preventive measures, treatments and rehabilitation.

Key words: digital communication, social networks, e-health, m-health, oncological diseases.

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DIGITALNE TEHNOLOGIJE KAO PODRŠKA ZDRAVSTVENIM SISTEMIMA U
PROMOCIJI ZDRAVLJA I PREVENCIJI BOLESTI

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SAŽETAK

U radu je analiziran pristup veoma važnom fenomenu u savremenom okruženju koja se definiše kao digitalna transformacija u zdravstvenom sistemu. Sve veći priliv digitalnih tehnologija u poslovne procese dovodi do tačke na kojoj pružanje zdravstvenih usluga se više ne može posmatrati samo u tradicionalnim okvirima, već je neophodno sagledati neograničene mogućnosti digitalnih tehnologija, digitalnih sadržaja i digitalnih komunikacija u pružanju zdravstvenih usluga. Potrebe zdravstvenog sistema i promene koje nastaju razvojem komunikacionih i informacionih tehnologija kao što je internet, društvene mreže, mobilne aplikacije i dr. zahtevaju organizovan rad na sprovođenju strategije za nove načine poslovanja u zdravstvu. Informisanost o zdravlju, podizanje svesti o ranom skriningu onkoloških bolesti povećava motivisanost za aktivno učešće ljudi u sprovođenju preventivnih mera, lečenju i rehabilitaciji.

Ključne reči: digitalna komunikacija, društvene mreže, e-zdravlje, m-zdravlje, onkološke bolesti.

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INTRODUCTION

With the development of new communication technologies, satellites for communication and Internet connectivity, spatial distance and time are no longer obstacles, the boundaries of national states are being overcome and the world is becoming a "global village"¹. Information flow, connectivity and networking are significant features of the new, reshaped world². The process of globalization itself is often viewed only through the basic aspect: economy - profit - capital³. A significant determinant of a nation's ability to be successful on the path of global progress is the preservation of people's health⁴. The healthcare systems of developed countries, in the basis of their development strategy, highlight the essence of prevention in preserving human health by identifying factors of risk and promoting activities to eliminate them. Medicine, as a humanistic science, has always based its development on the exchange of research experiences and the finding of new diagnostic and therapeutic procedures so that they would be available to humanity in a very short period of time. This requires the constant development of digital technologies, ensuring their availability as well as strengthening the connections between doctors in order to respond to the global market and ensure healthcare know no borders.

At this point, it is necessary to point out the importance of digital medicine^{5,6,7,8}. Namely, this new digital age of medicine indicates the use of digital tools in medical practice, at the core of which is the development of technological solutions for monitoring, processing and integrating huge amounts of data at the individual and population level to help solve health problems and challenges faced by patients, clinicians and health systems.

The essence of its operation is focused on caring and empowering patients to take charge of their health, thereby emphasizing true prevention, while at the same time helping clinicians manage the increasing volume and complexity of patient data in a cost-effective and time-saving manner⁶.

The subject of research in this paper is the review and analysis of the role of digital communications in health promotion, with a special focus on information about oncological diseases. It should be emphasized that digital communication is a phenomenon of modern society⁹, and the basis is the rapid exchange of information and the interaction of people in real time¹⁰. It represents any exchange of data in digital form, which allows people to connect and communicate with each other¹¹. The paper defines the options for improving health activities in order to better inform people and raise awareness about the prevention and early screening of oncological diseases.

METHODOLOGICAL CONCEPT - INSTRUMENT AND RESEARCH RESULTS

In this research is used the questionnaire named *Questionnaire on digital communications in the prevention of oncological diseases* which contains 25 questions and comprises of many sections¹². The questionnaire is distributed on social network *Facebook* to the respondents. In addition to descriptive statistics, statistical analyzes of testing, primary and secondary materials were also used.

The research was conducted on a sample of 150 respondents, of both sexes, chosen by the random selection method. The analysis was carried out in the period from September to December 2019 in the form of a cross-sectional study. The sample was stratified by:

- gender (male-female)
- age (≤ 29 ; 30 to 39; 40 to 59; ≥ 60)
- education (without education, primary school, secondary school, faculty)
- marital status (married, divorced, widower/widow, single).

Respondents of both genders participated in the research, 54% or 81 respondents are female and 46% or 69 respondents are male. There is no significant difference in gender distribution between respondents. According to age, 35% or 52 respondents are younger than 29 years old, 26% or 39 respondents are between 30 and 39 years old, 17% or 26 respondents are 40 to 49 years old, while 10% or 15 respondents are 50 to 59 years old, while 12% or 18 respondents are over 60 years old. If we take into account that the questionnaire was sent on the Facebook page and that this network is mostly followed by younger people, it can be noted that 61% of respondents are under 40. According to *the Pew Research Center's report*, 62% of all online men and 72% of all online women use Facebook (Maddock, et all, 2012) The greater presence of the female population can be explained by the existence of a large number of contents that are in the sphere of activity and interest of women, as well as the presence of numerous ongoing obligations related to work, home, children - which require quick execution. In such an environment, women looking for quick and useful advice and information use the Internet and various other types of social networks significantly more. The largest number, 63 respondents or 43% are married, while 37% or 53 respondents are single, 14% or 23 respondents are divorced, and 6% or 9 respondents are widowed. According to previous reports, marital status is not a parameter for monitoring presence on social networks. However, in today's busy life with little free time and increasing alienation of people, it is a realistic assumption that those who live alone use social networks more often. According to the level of education, the largest number of respondents, 59% or 88 respondents, have secondary education, 25% or 38 respondents have graduated from faculty,

13% or 19 respondents have finished primary school, and 3% or 5 respondents have no education. Referring again to *the Pew Research Center's report*, 60% of adults with secondary degree or less use Facebook, 71% of users hold college degree, while 77% of users hold university degree⁹. Life in the modern world requires a fast pace, many obligations, the need for quick contacts and information, and access to the Internet from a mobile phone offers unlimited possibilities. Easy handling, which does not require special knowledge, is one of the reasons why more and more elderly people are becoming users of social networks.

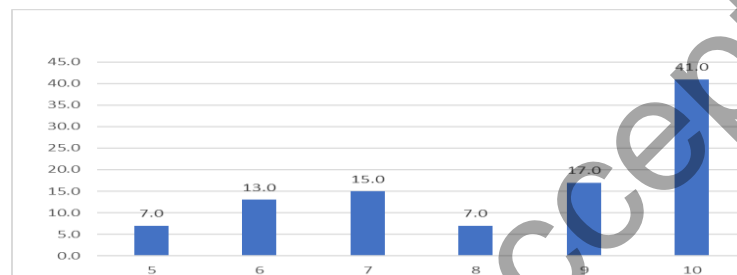
In the following paragraphs we will take a look at an analysis related to the assessment of general health, performed screening and received information about malignant diseases.

Information about malignant diseases was received by 50.7% or 76 respondents, 8% or 12 respondents were never informed, while 41.3% or 62 respondents were not sure if they had ever received information. This can be explained by possible unreliable sources of information when respondents were not sure of the accuracy of information about malignant diseases and whether they could be considered information at all.

The largest number, 114 respondents or 76% have never been screened for any oncological condition, while 21% or 31 respondents are not sure whether the tests they have done before are part of cancer screening. It is found that 3% or 5 respondents had some screening procedure for oncological conditions carried out in the earlier period. Screening represents the recognition of a previously undetected disease, using a screening test in an seemingly healthy, i.e. asymptomatic target population. The goal of breast cancer screening is to reduce mortality, while with organized cervical and colon cancer screening, both incidence and mortality are reduced. Screening methods should be highly sensitive, specific and easy to apply. For early detection of cervical cancer, cytological smear of the cervix (Pap test) is recommended, for early detection of colon cancer - immunochemical test for occult bleeding in the stool and colonoscopy is recommended, and for early detection of breast cancer, mammography is recommended. Screening is a complex process that requires the use of several factors: the functioning of the call system, media companies aimed at the target population, the development of recommendations for doctors and other medical personnel, patient consent, sufficient financial resources and the selection of an appropriate test. According to the recommendations of the European Commission, the acceptable level of population participation in screening is 45%, and the desirable level is 65%. Screening will have the maximum effect if it is carried out as part of an organized program for the target group, which gives social networks an exceptional advantage in the promotion of planned actions.⁸

The subjective assessment of the respondents' health on an ordinal Likert scale from 1 to 10, indicates that the largest number of 41% or 62 respondents evaluate their health as excellent (10), 17% or 25 respondents with a score of 9, 7% or 11 respondents with a score of 8, 15% or 23 respondents with a score of 7, 13% or 19 respondents with a score of 6 and 7% or 10 respondents with a score of 5 (neither good nor bad). There were no respondents with a subjective assessment of health from 1 to 4. Taking into account that most of the respondents in the survey are under 40 years of age, we can assume that the most common assessment of general health is excellent/good in accordance with their age (graph 1).

Graph 1. Subjective assessment of health



Source: Sinanovic¹², 2020: 45.

About 44% of respondents believe that they have no risk of contracting cancer, while only 15% of them (22 respondents) are absolutely certain that they do not have predisposing factors for contracting cancer (Likert scale scores 1, 2, 3, 4, 5). 26% or 40 respondents have a low risk or suspect that there is a possibility of contracting malignant diseases (ratings on the Likert scale 6 and 7), while 16% or 24 respondents believe that there is a more pronounced risk of the disease (ratings on the Likert scale 8 and 9). In assessing the risk of the occurrence of malignant diseases in the future, there is a great risk and anxiety in 7% or 11 respondents, probably because of already existing problems or family burden.

A larger number of them, 51% or 76 respondents were informed about malignant diseases from written sources, 41% or 62 respondents are not sure that they received information in written form. A small number of them, 8% or 12 respondents never received information about malignant diseases in written form. The most common source of information about malignant diseases is the Internet for 38% or 58 respondents, television for 24% or 36 respondents, while only 16% or 24 respondents received information from a doctor. Professional magazines and educational courses are mentioned by 17% or 25 respondents as a source of information about oncological diseases, which we can assume are professionally or educationally related to medicine. Only 5.3% or 8 respondents were not

informed about malignant diseases. The Internet is increasingly used as a key source of information about malignancies among the general public, patients, and caregivers. Approximately 90% of the population regularly accesses the Internet in Europe, North America and Japan *Internet World Stats 2017*¹³. Websites are one of the main sources of cancer information in Japan.

Providing information about cancer on social networks has several advantages e.g. the internet provides quick and easy access to cancer information and information seekers can seek advice anonymously. These benefits of information can enable them to increase their knowledge and ability to actively participate in making personal healthcare decisions¹⁴.

Electronic communication between patients and doctors is currently developed in many rich and better organized healthcare systems. This is why the Internet is a valuable platform for oncology education, although its usage implies the existence of potential threats. Electronic sources for the mass dissemination of useful oncology content often face the potential dissemination of unwanted, uncontrolled and sometimes harmful information. Currently, blogs and social networks are used significantly more for sharing experiences about treatment, disease course, diagnostic procedures and emotional support, and less for the dissemination of scientific oncology information¹⁵.

Serbia is the first country in Europe in terms of the death rate from cancer, and the rate increases annually by an average of 2.5%, which indicates that the problem of malignant tumors is very serious in our country. Every year, some form of malignancy is discovered in about 33,000 people and about 21,000 people die from this disease. Breast, colon and cervical cancer are the most common among women, and that is the reason why we are "among the leading European countries". As for men, they most often suffer and die from lung, prostate and colon cancer. Considering the obvious increase in cancer patients, it is necessary to educate people about early recognition of cancer symptoms, as well as risk factors¹².

Respondents seem to have insufficient understanding of the seriousness of malignant diseases, so that 50% or 75 respondents believe that they need more information about malignant diseases, 21% or 32 respondents do not want more information, while 29% or 49 respondents are not sure whether they have necessary information about oncological conditions. Researches so far have shown that only five to ten percent of cancers are hereditary. This means that non-inherited causes of cancer - lifestyle choices, food and fitness levels have a direct impact on overall cancer risk. Organized education programs should encourage people of all age groups to take care of their health by changing their lifestyle and diet, conducting check-ups, preventive examinations and monitoring their health status in

order to detect any changes that should be consulted with medical experts. In these health promotion activities, digital technologies take precedence: the Internet and numerous social networks because they connect millions of users. According to the data obtained in this research on the representation of social media, all respondents use the Internet, of social networks 46% or 70 respondents use Facebook, 31% or 46 respondents use WhatsApp, while Twitter is used by 23% or 34 respondents. The largest number of respondents 79% or 119 of them access social networks several times during the day, once a day 8% or 12 respondents, once a week 4% or 6 respondents, while 9% or 13 respondents do not use social networks. Such data on the number of the Internet accesses do not deviate from some researches in more developed European countries and the explanation is direct (without the need to log in), easy and fast access via mobile phones and its applications.

The rich content and many innovations of the Internet have particularly attracted the young population, and as a result of this situation, the frequency of using the Internet and social networks has increased significantly, while it should be emphasized that an increasing number of older users are appearing¹². Dissatisfaction with the state of healthcare in our country leads people to increasingly "Google" the symptoms they have in the hope of getting an explanation for their ailments. They often "consult" the Internet even before they decide to go to the doctor. On various forums you can meet people who compare the symptoms they have, they often tend to self-diagnose, which in some cases can be disastrous for the prognosis and outcome of the disease. Real and meaningful information about health should motivate people to visit a doctor and consult about their ailments. According to the research, only 35% or 52 respondents receive information about health on WhatsApp, 35% or 52 respondents sometimes, while 30% or 46 respondents do not use this network for health topics. 42% or 63 respondents receive information about health on Facebook, 36% or 54 respondents sometimes, while 22% or 33 respondents do not use this network to review health topics. Twitter, in contrast to other social networks in the world for receiving and exchanging information about health and diseases, is used by 15% or 23 respondents, 27% or 41 respondents sometimes get information, while 58% of respondents do not use this network for information or communication about health. Most often, this network is used to communicate about current political and social topics and significantly less about health and diseases. It should be emphasized, however, that Twitter is a very popular social network in European countries, the leader in content dealing only with health, so that it provides real-time answers to numerous questions of people about health concerns or symptoms that they try to use to solve their problems. Many Twitter accounts specialize in certain diseases: diabetes, kidney

diseases, depression, heart diseases and many others where you can often get expert health advice.

Our research went a step further, so it emphasized the examination of the influence of messages from social networks on treatment decisions. Thus, the influence of information on social media about health and diseases on decision-making about the method of treatment is present in 30% or 45 respondents while a large number of 53% or 80 respondents sometimes make decisions about health or disease treatment based on information received from social networks. On the other hand, for 17% or 25 respondents the information has no influence on their attitude towards treatment.

It is obvious that frequent and long-term use of social networks can lead to isolation and exclusion from social activities. Life in the virtual world becomes the only real one, and hundreds of information that are received, without even thinking about them, become the only truth⁹. As a result of unreserved trust in information and advice, lack of verification and validity of information and some errors in people's actions can often occur with serious health consequences. Postponement of going to the doctor, incorrect interpretation of symptoms and a mix of multiple therapies from the Internet are often the reason for emergency hospitalizations. It is important for people to be informed about health or diseases in order to take an active role in protecting or maintaining their health as well as treatment, but it is necessary to consult with their doctor about the information from social networks that has left an impression on them.

Information on whether and to what extent health information from social media is checked, suggests that only 25% or 37 respondents check their accuracy in a conversation with a healthcare professional, 21% or 32 respondents check their accuracy sometimes, while 54% or 81 respondents do not check the accuracy of the posted information. Frequently, the reason for this lies in the large number of paramedical articles or comments, which, on the other hand, can affect the formation of a bad attitude towards health. It is also noted that 30% or 42 respondents, based on publications about health, methods of treatment or preparations recommended for treatment, start self-medication without consulting a doctor, 53% or 83 respondents do it sometimes, while 17% or 25 respondents do not undertake independently treatment or does not accept information without expert consultation. Additional information according to the respondents is that 32% or 47 of them get the best information about health on Facebook, 25% or 39 respondents on YouTube, 20% or 29 respondents on Google, while only 14 respondents or 9% presented WhatsApp as a social network with good health information. Published scientific papers and works of signed authors can be read on the

Google search, which justifies the veracity of the information and instills confidence. By the way, YouTube is known for its video displays that provide real-time information from experts in various fields and the existence of the possibility of contact makes this social network acceptable and the information obtained reliable.

Visiting the health forum provides additional information. Thus, they are regularly visited by 43% or 65 respondents, sometimes by 32% or 48 respondents, thus sharing similar experiences, providing support, and publishing actions, experiences and opinions of people on a given topic. Only 25% or 37 respondents do not visit health forums. It should be emphasized that the forums also provide professional advice, because a large number of people comment on the basis of experiences or previously acquired verified information and knowledge. Often, forums have a professional character, with reliable information because they are organized by health workers from a certain specialty. Internet users often look for disease-specific information that will enable them to recognize a particular health problem or confirm that diagnostic and treatment measures have been taken correctly. Certainly, one way to improve the health of Internet users is to encourage them to turn to known and trusted websites when looking for health information. Forums provide insight into the experiences of others, but information from forums can be combined with information on health websites developed and controlled by experts, which can help make informed medical decisions for personal health or the health of loved ones. The importance of sharing experiences about health problems on social networks also has a big impact on health. Therefore, visitors who attend forum about some health problem feel sincerity in the group, support and engagement in order to solve the problem, for that reason 47% or 70 respondents state that the experiences and recommendations of people who have similar health problems mean something to them, 17% or 26 respondents states that this kind of support sometimes means something to them, while 36% or 54 respondents do not experience the forum in that way and the information they receive there does not mean anything to them. Certainly, forums run by health professionals are significantly more visited and provide reliable guidance about health or illness, but the experiences of people who survive health problems and undergo therapeutic procedures can be a significant emotional support for patients or family members. In the context of needs and desires, it is also observed that the largest number of respondents 46% or 68 of them would like to talk and consult with a medical expert online from home, in peace, about their health problems or the health of family members. Also, 47% or 71 respondents would like to be able to establish contact with a doctor online in case of need, which indicates trust in doctors as providers of professional information, while 7% or 11 respondents do not

think that online contact with a doctor would satisfy their needs for health services. A larger number of respondents, 57% or 86 of them are interested in contacting a doctor by phone in case of health problems, 30% or 45 respondents are sometimes interested in contact in case of real needs or uncertainty regarding treatment of health problems, while 13% believe that they do not need contact in this way, because they probably support personal contact with a doctor. 49% or 74 respondents have health applications on their mobile phone, while 76 respondents or 51% do not have a single application, which indicates insufficient knowledge of the content and possibilities of health applications. Of course, the choice of social networks and applications mainly depends on the mobile device that is being used at that moment. Applications created exclusively for mobile phones are on the rise and social connections use all the advantages of smartphones, such as GPS, cameras, speed and constant internet connection. Although at the moment the impact of these applications is not great, thanks to innovative configurations and mass acceptance, applications are becoming an integral part of people's daily lives. A mobile application that aims to maintain and encourage a healthy lifestyle and isn't related to the diagnosis, prevention or treatment of disease cannot be considered a medical device¹². Therefore, mobile applications help people to improve their health behavior, motivate them with positive changes and affecting above all risk factors (obesity, excessive caloric intake, physical inactivity...) gain an important place in providing important health information and raising awareness about a healthy lifestyle.

Although they placed the greatest trust in the doctor as a reliable source of professional information, 58% or 87 respondents believe that the necessary information about health cannot be received at their health center, 26% or 39 respondents believe that they sometimes get required information, while only 24 respondents or 16% believe that they can get the necessary information about health there. Patient autonomy, as one of the basic postulates of medical ethics, enables patients to make their own decisions regarding medical treatment based on their personal knowledge. In order to make that decision, patients must have access to all relevant information about their condition and all options of treatment. For that reason, doctors help the patient in making a decision with timely and truthful information about: risk factors, the nature of the disease, possible consequences, available treatment, as well as about possible positive and/or bad outcomes or risks of treatment. Informing patients is one of the standards of ethical behavior¹⁶, which is expected from doctors and other medical personnel in their daily work with patients. In this way, the medical profession proves that it respects the right of the patient and his autonomy, which enables each user of health services to freely choose a doctor based on the information received, accept or reject advice or

proposed treatment, and make their own decisions about medical treatment and procedures. In this way, the medical profession proves that it respects the right of the patient and his autonomy, which enables each user of healthcare services to freely choose a doctor based on the information received, accept or reject advice or proposed treatment and make their own decisions about medical treatment and procedures.

CONCLUSION

The paper analyzes the approach to one very important phenomenon in the modern environment, which we define as digital transformation in the healthcare system. The increasing influx of digital technologies into business processes leads to the point where the provision of health services can no longer be viewed only in traditional frameworks, but it is necessary to look at the unlimited possibilities of digital technologies, digital content and digital communications in the provision of healthcare services. The traditional way of providing health services with the implementation of digital technologies provides great opportunities in the exchange of knowledge and information between health workers, health associates and patients, increases the accessibility of expert consultations, actively involves patients in the process of diagnosis and treatment, and above all, provides enormous opportunities for preventive action in order to preservation of health. It is certainly necessary to point out that when it comes to receiving information from a doctor through some form of digital communication, the doctor-patient relationship becomes an extremely complex process that requires the education of health workers, with the goal of proper information exchange.

Digital technologies are changing the way of connection of users of healthcare services in terms of realizing the possibility of establishing two-way communication with healthcare professionals in real time and in any place. A number of healthcare systems dealing with the analysis of patients' needs and demands have identified information technologies as key elements to improve the quality of healthcare. There is evidence that digital communication with healthcare providers improves the quality of health^{17,18} and that healthcare consumers would benefit from increased partnerships between health information technology and healthcare providers. Healthcare workers are a source of health information that patients trust more than the Internet, but due to the availability and speed of obtaining information, the Internet is the source most often used by the public to quickly find health information in order to be informed. If health services become available to everyone to the

same extent, they restore trust in the healthcare system and by providing expert information to people, they open up enormous opportunities to work on the prevention of many diseases.

The concept of digital strategy in the healthcare system focuses on the collection of necessary epidemiological information, information on the incidence, prevalence and mortality of certain diseases, risk factors, availability of medical experts with the formation of a sub-strategy of digital business, primarily Web and mobile strategies, with the aim of organizing e-health and m-health, with emphasis to social networks and their capacity to connect people and quickly spread information¹⁹.

Based on the results of the research, we can draw some significant conclusions. The obtained results clearly indicate that digital technologies in the healthcare system are necessary in order to raise awareness about oncological diseases, increase the information of the population and prevent malignant diseases. Another advantage is that the Internet allows us to access health information and healthcare services in any geographical area, which leads to the internationalization of healthcare²⁰. The Internet in a very fast and cheap way ensures communication with the whole world and thus quick identification of the target e-health. At the same time, it enables effective communication at the patient's request. What social media provides us is real-time information²¹ from various health experts and the exchange of patients' experiences. In such conditions, it was noticed that users recognize e-health and m-health as a new type of promotion on prevention, early diagnosis and treatment of oncological diseases. Research has shown that the information provided to cancer patients means a lot in the treatment process, but their information needs are still not met²². In addition, the research showed that social networks with numerous contents about health represent a very effective way of healthcare promotion and disease prevention. Mobile applications help the promotion and control of a healthy lifestyle while forums represent an important form of communication for groups of users, providing professional, experiential and emotional support for a specific medical problem. In the context of the obtained research, there are also numerous studies, which showed that about 60% of doctors increased their interaction with patients via the Internet using social media (Twitter and Facebook) in order to educate patients, monitor their health, and encourage them to change their lifestyle with the hope that those efforts lead to "better health education, greater compliance and better outcomes²³. Information and the dissemination of the latest knowledge have become an important element of business functioning as well as the satisfaction of many life needs of modern man.

All the findings suggest that social media indeed enable healthcare institutions to get closer to their users, share information on health policy and practice issues, promote health

behaviors, interact with the public, educate and motivate patients to take an active role in their treatment and provide meaningful health information to the community²⁴.

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