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ONLINE COMMUNICATION-BASED REHABILITATION MANAGEMENT FOR PATIENTS WITH REPLACED JOINTS: EXPERIENCE AND OPPORTUNITIES

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ABSTRACT — The purpose of this study is to examine online communication as a tool for managing rehabilitation of patients with musculoskeletal pathologies. We have developed a system of interactive personalized online monitoring and feedback between patients and medical organizations. The system functions as a web application. It has proved successful in the frame of practical tests in 2018–2019. Our outcomes show that the proposed online service is an effective tool for managing rehabilitation after joint replacement. The patients benefited from online medical monitoring and social support during postoperative rehabilitation.

KEYWORDS — rehabilitation, online communication, joint replacement, feedback, social support.

INTRODUCTION

Online communication in medicine is becoming a method to promote social support for patients, as it allows effective information and psychosocial resources exchange to overcome difficult life situations [1]. An essential feature of online communication as a tool for improving the effectiveness of healthcare is rapid feedback between the patient and the medical institution, which encourages patients to take active actions thus shaping a behavior pattern necessary to maintain an acceptable quality of life [2]. One of the areas in medicine where the introduction of online communication services is relevant, includes musculoskeletal pathology, and the share of this issue in the overall burden of diseases was recognized by the UN, WHO and the World Bank as dominant in the late 1990s due to the high rate and severity of negative socio-economic effects, such as disability, reduced personal

and economic independence of patients [3]. Hip and knee joint osteoarthritis has a leading position in the structure of this pathology [4]. It is to be noted that surgery involving medical technologies for large joint replacement appears as no specific issue, in particular in Russia since there are special high-tech medicine programs available, which cover over 120 thousand patients annually [5].

However, systemic factors limiting the availability of health care services, implying, first of all, a lack of funding for rehabilitation at the postoperative stage [6, 7], lead to a problem of identifying a large group of patients with implanted structures that do not have permanent rehabilitation follow-up. The resources available through online communication allow access to healthcare services for patients with osteoarthritis based on personalization through receiving recommendations, asking questions about their own health status, and sharing experiences with other patients [8]. This means that the promotion of online communication at all stages of interaction with the health care provider — diagnostic, treatment and rehabilitation — is a strategy that ensures continuity, consistency and accessibility of health services.

Aim of study

was to examine online communication as a tool for managing rehabilitation in patients with musculoskeletal pathologies.

MATERIALS AND METHODS

A Monitoring and Feedback System (Russian acronym — SIMOS) based on online communication was developed the Research Institute of Traumatology, Orthopedics and Neurosurgery (Saratov, Russia). It is aimed to improve the quality of information exchange between patients and medical institutions through the period of medical care and postoperative rehabilitation. The system was registered with the Federal Institute of Industrial Property (Certificate of registration of computer software # 2019663975 of 13/11/2019). It functions as a web application, which embraces, based on the epidemiological priority, patients with coxarthrosis and gonarthrosis.

The SIMOS organizational technology is based on 2-stage online communication with the patient within the system's functional structure (Fig. 1), which is represented by various modules. At Stage 1, a patient who is to be hospitalized at our Institute gets a personal account, after which it is added to the database of sending SMS messages informing the patient about the access to the service. At Stage 2 of interaction, the patient also receives an SMS notification about access to the SIMOS during the postoperative period.

From July 2018 to April 2019, the SIMOS was tested at the prehospital stage and through the postoperative medical rehabilitation period (6 months following the surgery), which included 381 patients. The statistical data processing was performed using the Statistica 6.1 software package. The data was presented in the "Me (25%; 75%)" format since not all quantitative indicators matched the normal distribution by Shapiro-Wilk test. The category indicators are presented as frequencies expressed in percentage.

RESULTS

General details concerning the participants

The age of the patients was 64 (59; 69); minimum — 19, maximum — 81, the gender distribution revealed women predominating (78.1%). The number of patients with planned total hip replacement surgeries was 36.8%, while the number of patients with knee replacement accounted for 63.2%.

Interpretation of the testing outcomes

The key element of evaluating the performance of the created medical and social service is the investigation and measurement of its demand among patients, which explains the development of a set of criteria in order to solve this task; the criteria were developed to evaluate the effectiveness of the SIMOS. The criteria normative were identified based on the experience of the patients' response to the initial SMS message notification at the prehospital stage (Fig. 2) and in view of the functional structure of the system described above.

The results obtained, using the presented criteria, has allowed us to register an acceptable level of demand for the online service at the prehospital stage and through the period of postoperative rehabilitation (Table 1).

The results of using the SIMOS within the age context have shown that older people can actively use the modern means of communication and that they are open to this type of interaction. At the prehospital stage, the use of personal computers (desktops) (58.8%) prevails when working in the system, whereas mobile devices (56.6%) overtake through postoperative rehabilitation.

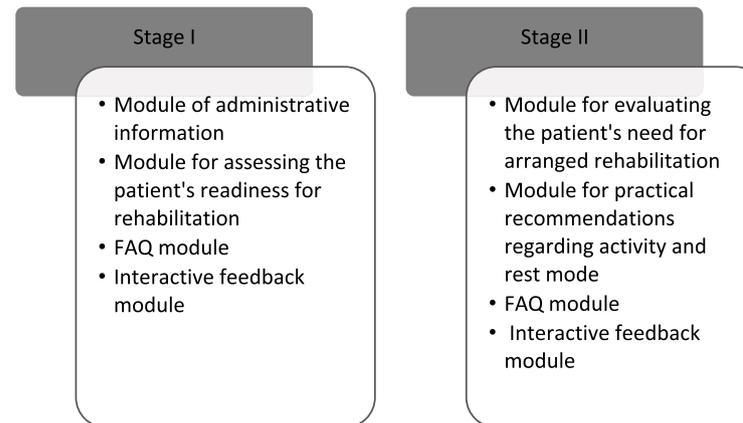


Fig. 1. The SIMOS functional scheme

The study of the acceptability of employing various communication channels by patients to interact with medical specialists shows that after using the SIMOS at the prehospital stage, whereas after the surgery their preferences change from using the traditional means of communication (telephone) to methods involving online interaction (Fig. 3). This change is statistically significant for the methods of communication like Telephone ($p < 0.01$) and Skype ($p < 0.05$).

The SIMOS was used to study the patients' readiness for active postoperative rehabilitation, which proved quite high — 91.3% of the patients confirmed at Stage I of working with the system that they could follow the doctors' recommendations concerning their lifestyle after surgery, etc. Remote online interaction with our experts at the stage of postoperative rehabilitation was considered acceptable by 100% of the patients who had used the SIMOS.

DISCUSSION

The developed and implemented interactive online patient-support service allowed carrying out a study of patients' readiness to interact with a medical institution using digital communication technologies. This system incorporates the major directions of employing online communication through rehabilitation [9], which ensures that patients can obtain social and professional support during this difficult period of recovery. The first area is medical (consultations of specialists, communication with a medical institution, training video programs, assessment of the patient's functional status). The second one is social (protection of the patients' rights and health, information support for patients, prevention of restrictions on everyday social practices). The values of the *recipient's response* indicator observed through testing are consistent with

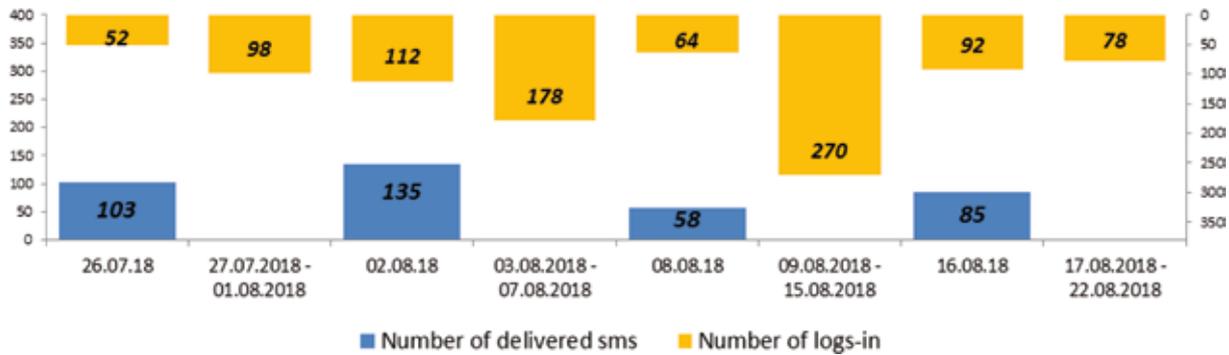


Fig. 2. Dynamics of patients' using the SIMOS at the prehospital stage

Table 1. Demand for the SIMOS by patients

Criterion details	Criterion practical value	Normative value	Result at Stage I	Result at Stage II
Response from the recipient	Evaluates the patient's response to the offer to use the service with a factual log-in	>20%	45.9	19.2
Response time	Estimates the time during which more than 50% of the informed patients logged into the system	<1 day	<1	<1
Reuse ratio	Estimates the development of a stable interest for working with the system in the patient	>1	4.8	1.5
Demand for the system component	Identifies the share of the functional blocks within the system used by the patients	>75%	100	100

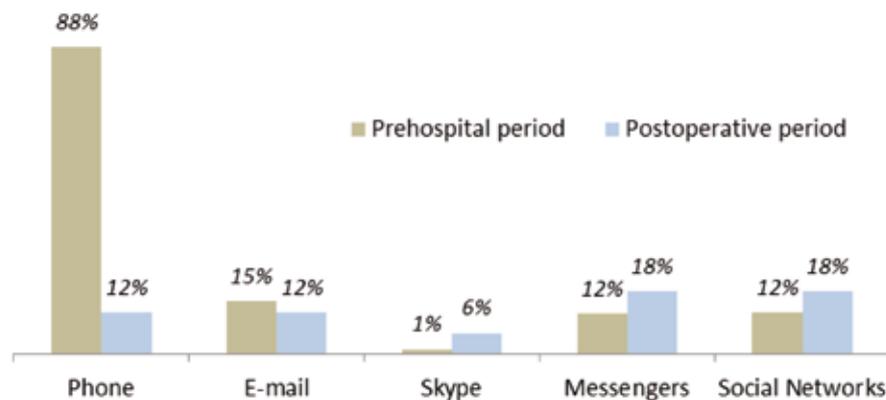


Fig. 3. Acceptance of various communication channels for patients to interact with medical specialists, %

the data reported by other researchers [10, 11], while its decrease at Stage II indicates the need for additional study of patients' response to informing them within an earlier period following the surgery.

The presented monitoring and feedback system has a wide range of functions, which thus allows solving a number of important tasks, including research — it allows acquiring new knowledge and developing vectors for organizing medical care, expanding interaction between the patient and the health system, as well as shaping a patient-centered model of medical care and rehabilitation. The described online service solves an important social issue, which implies increasing the availability of professional medical support for elderly patients [12], creating the conditions for

prolonging their labor activity, which is important in cases where the state runs a policy of increasing the retirement age.

The experience of interaction between patients and medical specialists proves that online services designed for patients solve the most important medical and social issue task related to establishing conditions for reducing the rehabilitation period: monitoring and control by medical specialists, remote professional consultations regardless of geographical location, interactive notification concerning the health status, which serves the basis for patients' self-training, and which, in turn, leads to better compliance [13].

The proposed model serves the basis for quality assurance in medical care and rehabilitation, implementing in practice the fundamental requirements of the ISO 9001-2015 international standard: Understanding the organization and its context (4.1), Understanding the needs and expectations of interested parties (4.2), Customer focus (5.1.2), Actions to address risks and opportunities (6.1), Customer communication (8.2.1), Customer satisfaction (9.1.2), management review (9.3), improvement (10) [14]. In particular, studying the patient's satisfaction with the quality of medical care allows identifying downsides in arranging medical communication and identifying potential areas for its improvement.

Online services for patients implement the philosophy of lean healthcare, ensuring continuity, consistency and accessibility of medical care in view of factors implying territorial remoteness, personnel and infrastructure shortage, while increasing the effectiveness of the available healthcare programs taking no significant investment in the respective industry.

CONCLUSION

Online communication services make an effective tool for managing rehabilitation following joint replacement, offering patients social support during a difficult period of life.

Conflict of interests

The authors herewith declare that there is no conflict of interests involved.

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