Designing and Evaluating an Educational Website for Osteoarthritis

Leila Shahmoradi
Ph.D. in Health Information Management, Health Information Management Department, Tehran University of Medical Sciences, Tehran, Iran.

Mehrbakhsh Nilashi
Ph.D. in Computer Engineering, Faculty of Computing, Universiti Teknologi Malaysia, 81310 Skudai, Johor, Malaysia.

Sana Ahmadi
B.Sc. in Health Information Technology, Health Information Management Department, Tehran University of Medical Sciences, Tehran, Iran.

Sorayya Rezayi ✉
Ph.D. student in Medical Informatics, Health Information Management Department, Tehran University of Medical Sciences, Tehran, Iran. Email: s_rezayi@razi.tums.ac.ir, ORCID: https:// orcid.org/0000-0001-7423-8853.

Abstract

Aim: Using educational websites can be effective in enhancing the health-related knowledge of patients suffering from osteoarthritis. This study aimed to design and evaluate an educational website to improve the awareness of patients with osteoarthritis.

Method: This is a descriptive-applied study. Having reviewed valid scientific articles retrieved from Medline (through PubMed), Scopus, and Google Scholar databases, the contents required for the website were identified and classified. Then, the scientific content extracted from the articles was evaluated by general physicians and Ph.D. of physical medicine and rehabilitation. Different sections of the website were designed by "Google sites," and the content was published. In the last stage of the research, the osteoarthritis educational website was evaluated by students of medicine and health information technology in terms of technical performance by a standard questionnaire.

Results: In this study, an educational website was designed to educate patients with osteoarthritis. Users can log in to the website and learn about symptoms, consequences, predisposing factors, pain relief exercises, nutritional information, and self-care programs. The content provided on the website includes three main sections of general disease information, clinical information, and disease self-care information, which physicians evaluated in the first phase. According to the content evaluation results extracted from the studies and the questionnaire's analysis, the designed website had a good quality. The average scores of the questions related to website usability, screen capabilities, terminology and information, learning ability, and overall website capability were 7.79, 8.15, 8.4, 8.08, and 8.03, respectively, which were at a "good" level.

Conclusion: At the end of this research, an educational website for osteoarthritis was created. Patients can access the site via the link and receive educational information about symptoms, consequences, predisposing factors, exercises to reduce pain, self-care, and nutritional information.

Keywords: Patient portals; Education; Osteoarthritis; Program evaluation

Chronic disease is an increasing challenge for the health and social system, and it accounts for more than 80% of primary care and 70% of medical emergencies. Chronic disease management can play an essential role in improving health and increasing patients' quality of life (1). Bone and joint diseases are among chronic diseases. Osteoarthritis is one of the most common diseases of the musculoskeletal system, which is more common in the population over 65 years; so that the prevalence of this disease is estimated to be about 70% in this age group (2).

In 2030, 70 million people are estimated to be at risk of osteoarthritis due to aging in the United States. In osteoarthritis, articular cartilage, subcutaneous bone, and synovial membrane disappear as the disease progresses, causing pain and swelling, and in some cases, limitation of movement and locking of the joints (3).

It is estimated that people with osteoarthritis see a physician eight times a year on average. Hence, out of 10 patients over the age of 35 referred to medical centers with complaints of knee, back, and neck pain, nine of them have osteoarthritis. Since this disease imposes a great medical, psychological, economic, and social cost on society (4), and with the significant development of information and communication technology and its many benefits in various fields of health, using various technologies has become more common in this field. The use of advanced educational and information-based technologies by patients reduces the cost of care and prevention of disease recurrence. One way of controlling chronic diseases such as osteoarthritis and preventing its complications is to change and modify the lifestyle, in which education plays a significant role (3). New technologies have a great role in controlling chronic diseases, one of which is using websites.

Previous studies in this field show that using educational platforms such as websites, applications, and e-learning packages has made a significant difference in people's awareness in the community about osteoarthritis, which shows the positive effect of educational technologies to prevent such diseases (5-7). Therefore, the use of technological approaches is recommended in hospitals to train patients. Another study has shown that e-learning platforms can improve the behavioral aspects of health and disease management outcomes (8).

Although mobile applications have been designed to educate osteoarthritis patients, these applications have weaknesses compared to the website. The websites can be compatible with every platform (IOS, Android, and Windows). However, supporting and maintenance of websites is easy. Thus, considering the negative consequences of osteoarthritis for the community and individuals and taking into account the important role of self-care in improving the lives of people with osteoarthritis, we designed an educational website for osteoarthritis in this study. After designing the website, the usability of this website was evaluated via a standard questionnaire by some students to identify and correct possible problems.

Method

This descriptive-applied study was conducted in three main phases as follows.

Phase 1: Determination and evaluation of the website's content by narrative review

At this phase, a search was carried out in Medline (through PubMed), Scopus, and Google Scholar databases with these keywords, "Osteoarthritis, Website" and "Education," to select the relevant articles. A total of 54 articles remained after the removal of duplicates.

The type of article in the advanced search was selected, and the search was limited to articles published in 2010-2019. Also, one of the conditions for selecting articles was the availability of their full texts because the desired indicators could be extracted just by studying their full texts. All articles that designed educational platforms such as websites for educating osteoarthritis patients were accepted for this study. About 27 scientifically valid articles on osteoarthritis were studied, various topics related to this disease were classified, and each section's required content was summarized. After extracting the content of the website, it was evaluated by physicians. A questionnaire was also designed to separate the classified topics.

The questionnaire (with 24 questions) had four main parts; the first part was related to the participants' information (4 questions), and the other parts contained general information about osteoarthritis (6 questions), clinical information (10 questions), and self-care information (4 questions). To analyze the content of the website for each level, one to five values (very good = 5 to very poor = 1) were considered, and then for each question, we calculated the average score received. Subsequently, according to the obtained value, we determined the quality level of each part. If the content is on two levels, "good" and "very good," no change in the relevant section will be considered. If it is at a medium level, according to the feedback received from evaluators, the necessary changes will be applied for improvement, and if it is at a "poor" and "very poor" level, the desired section will be removed. The content validity of the questionnaire was confirmed by 15 experts in the field of medical sciences as follows:

To evaluate the content validity quantitatively, the Content Validity Ratio (CVR) and Content Validity Index (CVI) have been used. The panel comprised of 15 experts in rheumatology, internal medicine, and medical informatics were asked to review and complete a checklist that included 47 questions that have three options including "necessary", "useful but not necessary", and "not necessary". In calculating the CVR of the designed questionnaire, 26 questions that did not have an acceptable content validity ratio were removed. The content validity index (CVI) was calculated based on the formula (CVI $= \frac{n_E}{N}$) for all questions, and its value was calculated at 90%. The reliability of the questionnaire was measured by SPSS software using Cronbach's alpha (0.898). To collect data, in the first phase of the study (evaluating the website's content), the questionnaire designed by Google sites along with the website's link was sent to an expert with a Ph.D. in physical medicine and rehabilitation and general practitioners via email and internet messengers. Finally, 14 general practitioners and a Ph.D. in physical medicine and rehabilitation entered the study. The study site was the Tehran University of Medical Sciences hospitals, using the convenience sampling method.

Phase 2: Website design

In this phase, we investigated instructional videos to gain sufficient knowledge on Google website design tools. We also reviewed studies on website design to get acquainted with the study's various dimensions and determined the website framework and its components. Finally, an osteoarthritis educational website was designed, and the Google platform research environment was used to design the educational website (sites.google.com).

Phase 3: Website usability evaluation

To evaluate the usability of the website, the standard questionnaire of user's interface satisfaction (QUISE) (9) was used. The validity of the Persian version of this questionnaire has been confirmed according to available studies (10, 11). Also, the reliability of this questionnaire has been confirmed in previous studies with Cronbach's alpha coefficient of 0.76 (11, 12).

The questionnaire has six parts. A) is related to information of the person completing the questionnaire, B) is related to the general function of the program, C) is related to the screen capabilities, D) is related to the terminology and information of the program, E) is related to the learning capability of the program, and F) is related to the overall capabilities of the program. Each question had an answer with a score of 0 to 9. Scores of 0 to 3 were classified as weak, 3.1 to 6 as intermediate, and 6.1 to 9 as good. The website, along with the questionnaire, was given to 15 students of medicine and health information

technology (HIT) to identify and evaluate its problems. The research sample was chosen from Tehran University of Medical Sciences students selected by convenience sampling method.

Results

1. Website content

Figure 1 shows the main content of the designed educational website. As observed, the website has five main sections.
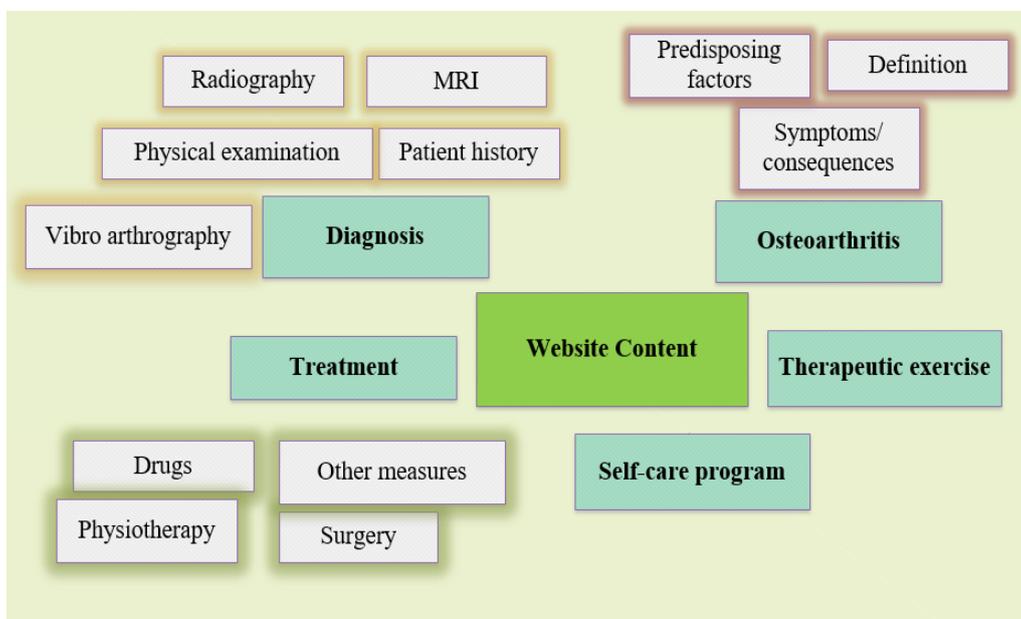

**Figure 1:** The mind map of website content

2. Evaluating the content of different sections of the osteoarthritis educational website by physicians

In this phase, the content extracted from the reviewed studies and the questionnaire results, which included general disease information, clinical information, and self-care information. Finally, all of the contents were evaluated by physicians. The characteristics of the participants, including the age and level of education, are given in Table 1. According to the mean scores reported in Figure 2, the mean scores for general osteoarthritis information, clinical information, and osteoarthritis self-care information were 4.02, 4.06, and 3.85, respectively, rated at a good level and optimal quality.

**Table 1:** Characteristics of people participating in website content evaluation

| Variable	Number	Frequency (%)
Age group	20-30	8 (57.1%)
	30-40	2 (14.3%)
	40-50	3 (21.5%)
	+ 50	1 (7.1%)
Type of degree	General practitioner	12 (87.5%)
	Ph.D. of physical medicine and rehabilitation	2 (14.4%)
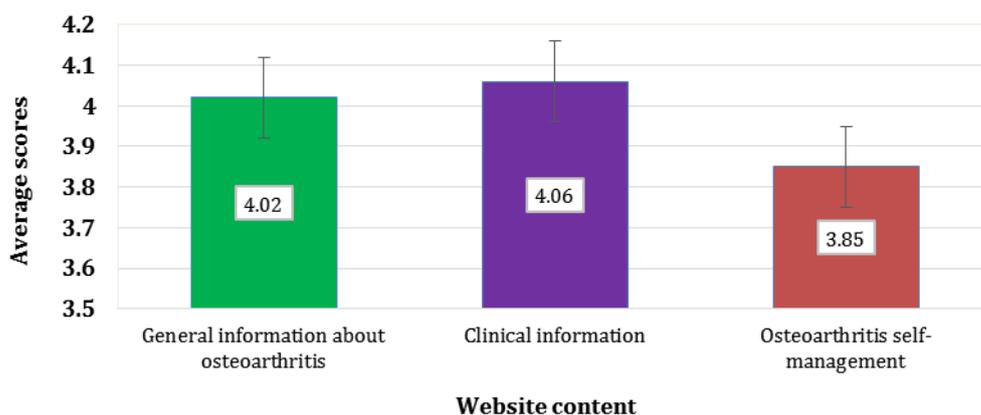
Figure 2: Average scores obtained by the physicians evaluating the website's content

After evaluating the content of the website by physicians, the website was designed by Google sites. The followings are some pages of the osteoarthritis educational website. Figure 3 shows the predisposing factors of the disease, Figure 4 presents the symptoms and consequences, and Figure 5 shows an example of therapeutic exercise.
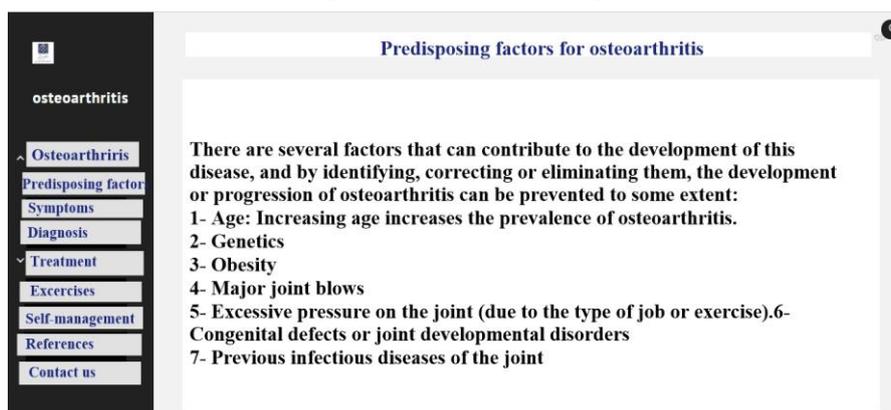
Figure 3: Osteoarthritis page/predisposing factors page
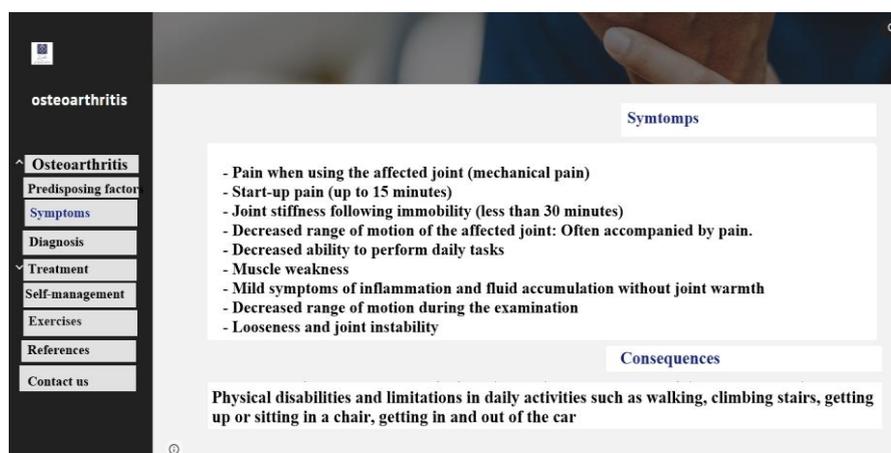
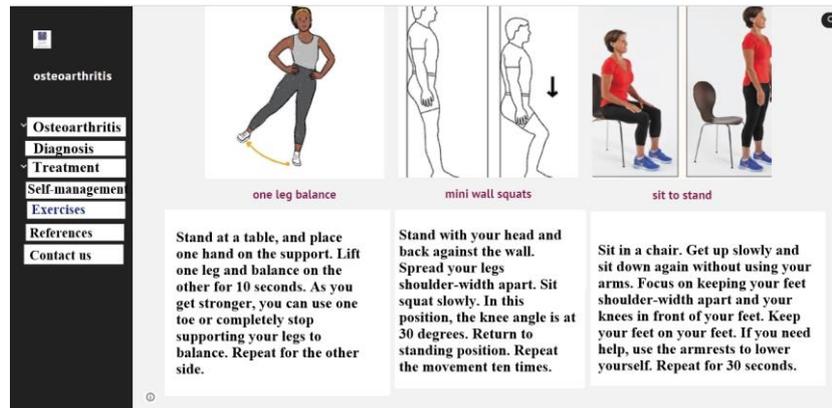**Figure 4:** Osteoarthritis page/symptoms and consequences page

Figure 5; Osteoarthritis exercise page

3. The performance evaluation of the website

To evaluate the performance of the website and measure user satisfaction, the website link was given to participants to complete the questionnaire related to usability status and user satisfaction based on their experience in working with the website. The age range of all participants was between 20 and 30 years. Also, 13 participants were female (87%), and two were male (13%). In terms of education level, 12 of them were undergraduate students, and three were doctoral students. As can be seen in Figure 7, the mean scores of the second to sixth parts of the questionnaire are between six and nine, so it can be concluded that users evaluated the usability, display capabilities, terminology and information, learning capability, and the overall capability of the website at the "good" level.
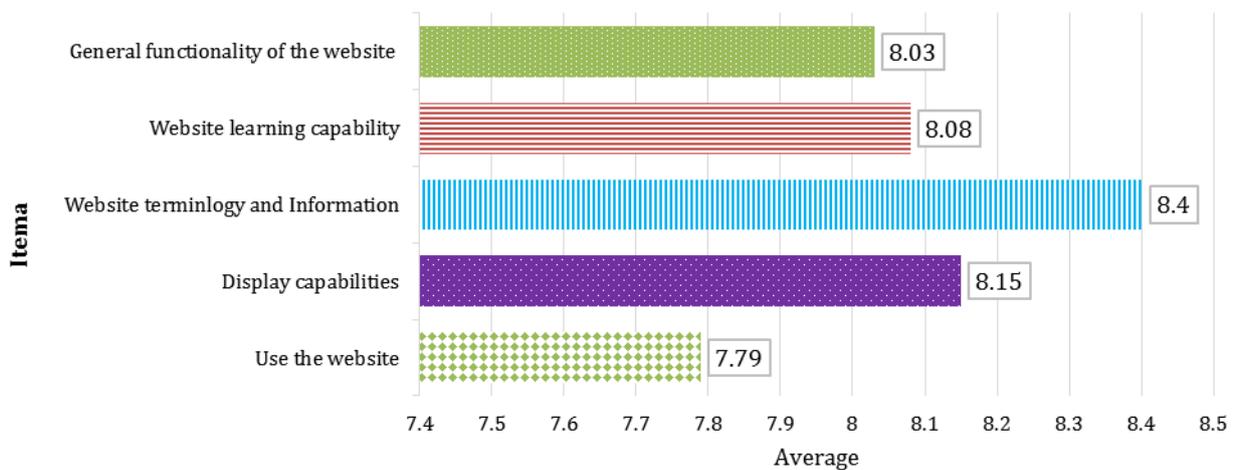

Figure 7: Results of website usability evaluation

Discussion

The present study was conducted to design and evaluate an educational website for osteoarthritis to increase people's awareness about this disease. In this study, the contents required for the website were first obtained from valid scientific sources and then classified. At this stage, a questionnaire was prepared to evaluate the website's content, and for validation, it was given to general practitioners

and Ph.D. of physical medicine and rehabilitation. After evaluating the content, the website was designed by Google sites. In the last stage, participants assessed the website's usability. In each part, after analyzing the questionnaires, the required changes were applied to the website.

The general information part of the website included a description of osteoarthritis and its predisposing factors. In predisposing factors, age, obesity, and nutrition with an average score of more than 4 had a high priority, which is consistent with the results of the LC Garbin study. In this study, lifestyle, obesity, and comorbidities were introduced as the main causes of osteoarthritis (13).

In the clinical information part, the symptoms and consequences of osteoarthritis and diagnostic and treatment methods have been presented. In the treatment methods, education and nutrition with an average score of higher than 4 had a high priority, which is consistent with the results of a study by Yıldırım et al. Accordingly, in this study, education and nutrition were essential to control osteoarthritis. In line with our study, it includes a part to increase awareness of therapeutic approaches to osteoarthritis (14).

In the self-care part, the definition and purpose of self-care, the proposed program for self-care of knee osteoarthritis with an average score of more than 4, and osteoarthritis exercises with an average of 3.76 had high priorities. It is consistent with the study of Abadi, in which the disease management and exercise activities to reduce pain and prevent exacerbation of the disease were used as educational content (15). According to (16), patients welcomed the presentation of osteoarthritis self-care strategies by the software.

In the educational and managerial lifestyle information part, educational information includes symptoms, exercise, and diagnostic procedures; managerial lifestyle information includes exercises that play an essential role in reducing pain. Similarly, in a study by Delberg et al. (17), patients can view educational information in the form of a short video on pelvic osteoarthritis control on the website.

The last stage was dedicated to evaluating the website performance by users. After designing the website, the website link was given to the sample users to evaluate its performance through a questionnaire. The results of this evaluation showed that the performance of the website was at a desirable level. According to (18), a program designed to reduce pain in patients with osteoarthritis has effectively increased patient awareness, but access to this program was not easy due to the limited use of websites caused by poor internet connection.

In another study, a web-based self-care website was designed and evaluated for patients with type 2 diabetes. In this study, like the website designed by our research team, the initial website was given to users to be evaluated, which they evaluated the website at a good level (19). In line with our study, in a study conducted by Marshall D et al. (20), disease management and sports activities are presented as educational content to reduce pain and prevent exacerbation of the disease. However, online treatment approaches and counseling are more prominent in this study.

Conclusion

Osteoarthritis affects the quality of patients' life. Therefore, given the negative effects of this disease influencing various aspects of society, the importance of using websites and educational/self-care programs for this kind of disease is becoming more apparent. One of the educational methods to increase patient awareness about self-care is educational websites, which is a good option to achieve this goal due to the widespread use of the internet.

In this study, we tried to develop an educational website for osteoarthritis.

After extracting the website's content and designing it, the students evaluated the website, and possible problems were identified. The results of this evaluation show the performance of the website at a desirable level. Hence, patients can access the website via the link and receive educational information about symptoms, consequences, predisposing factors, pain relief methods, self-care, and nutritional information.

Disclaimer statements

References

1. Airhihenbuwa CO, Tseng T-S, Sutton VD, Price L. Non–Peer Reviewed: Global Perspectives on Improving Chronic Disease Prevention and Management in Diverse Settings. Preventing Chronic Disease. 2021;18.
2. Vina ER, Kwoh CK. Epidemiology of osteoarthritis: a literature update. Current opinion in rheumatology. 2018;30(2):160.
3. Xing D, Xu Y, Liu Q, Ke Y, Wang B, Li Z, et al. Osteoarthritis and all-cause mortality in worldwide populations: grading the evidence from a meta-analysis. Scientific reports. 2016;6(1): 1-7.
4. Von Porat A, Roos EM, Roos H. High prevalence of osteoarthritis 14 years after an anterior cruciate ligament tear in male soccer players: a study of radiographic and patient-relevant outcomes. Annals of rheumatic diseases. 2004;63(3):269-73.
5. Nadri K, Sajedi H, Sayahi A, Shahmoradi L. Designing a mobile-based self-care application for patients with cutaneous Leishmaniasis: An effective step in patients' self-care and participation. Frontiers in Health Informatics. 2020;9(1):29.
6. Mobasheri A, Costello KE. Podcasting: an Innovative Tool for Enhanced Osteoarthritis Education and Research Dissemination. Osteoarthritis and Cartilage Open. 2020:100130.
7. Jayakumar P, Moore MG, Furlough KA, Uhler LM, Andrews JP, Koenig KM, et al. Comparison of an Artificial Intelligence–Enabled Patient Decision Aid vs Educational Material on Decision Quality, Shared Decision-Making, Patient Experience, and Functional Outcomes in Adults With Knee Osteoarthritis: A Randomized Clinical Trial. JAMA network open. 2021;4(2):e2037107-e.
8. Nilashi M, Ibrahim O, Samad S, Ahmadi H, Shahmoradi L, Akbari E. An analytical method for measuring the Parkinson's disease progression: A case on a Parkinson's telemonitoring dataset. Measurement. 2019;136:545-57.
9. Chin JP, Diehl VA, Norman KL, editors. Development of an instrument measuring user satisfaction of the human-computer interface. Proceedings of the SIGCHI conference on Human factors in computing systems; 1988.
10. Shahmoradi L, Ahmadi M, Haghani H. Defining evaluation indicators of health information systems and a Model Presentation. Journal of Health Administration. 2007;10(28):15-24.
11. Zerehsaz M, Fattahi R, Davarpanah M. Investigation and analysis of elements and features discussed in the Simorgh user interface software and determine students' satisfaction from interacting with this user interface. Library and Information Science. 2006;9(4):127-50.
12. Hasannejad M. Developing a web-based system for self-care management of type 1-diabetes [dissertation]. Tehran: Iran University of Medical Sciences. 2013.
13. Garbin LC, Olver CS. Platelet-rich products and their application to osteoarthritis. Journal of equine veterinary science. 2020;86:102820.
14. Yıldırım N, Filiz Ulusoy M, Bodur H. The effect of heat application on pain, stiffness, physical function, and quality of life in patients with knee osteoarthritis. Journal of clinical nursing. 2010;19(7-8):1113-20.
15. Abadi FH, Sankaravel M, Zainuddin FF, Elumalai G, Choo LA, Sattari H. A perspective on Water Properties and Aquatic Exercise for Older Adults. International Journal of Aging Health and Movement. 2020;2(2):1-10.
16. Rippey RM, Bill D, Abeles M, Day J, Downing DS, Pfeiffer CA, et al. Computer-based patient education for older persons with osteoarthritis. Arthritis & Rheumatism: Official Journal of the American College of Rheumatology. 1987;30(8): 932-5.

17. Dahlberg LE, Grahn D, Dahlberg JE, Thorstensson CA. A web-based platform for patients with osteoarthritis of the hip and knee: a pilot study. JMIR research protocols. 2016;5(2): e5665.

18. Nasiri A, Mahmudi MA, Nobakht Z. Effect of aromatherapy massage with lavender essential oil on pain in patients with osteoarthritis of the knee: A randomized controlled clinical trial. Complementary therapies in clinical practice. 2016;25:75-80.

19. Catherine HY, Parsons J, Mamdani M, Lebovic G, Shah BR, Bhattacharyya O, et al. Designing and evaluating a web-based self-management site for patients with type 2 diabetes-systematic website development and study protocol. BMC medical informatics and decision making. 2012;12(1):1-10.

20. Marshall D, Barber T, Shewchuk B, Mrklas K, Miller J, Teare S, et al. PP115 A mobile health app to improve knee osteoarthritis self-management. International Journal of Technology Assessment in Health Care. 2018; 34(S1):109-10.