


Development and Application of a Web-based Integrated Support Service Program for Infertile Women

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Abstract

Online-based infertility education provides a health management system to patients using electronic information and technology and no face-to-face interaction with patients and experts. This is a study to develop a web-based integrated support service system to meet the health care and nursing needs of infertile women. To develop a system that is most suitable and practically helpful to infertile women, who are end users of this system, research was conducted. This education system consists of introduction to women's health care, information on women's health, information on organizations for women, community for infertile women, and request for consultation for health management and nursing education of infertile women. This study introduced and applied a user-centered design that maximizes the value of use by first understanding the user's convenience and needs when developing a program.

Keywords

nurses, infertility, web-based integrated support service program, health services needs and demand

What do we already know about this topic

For infertile women, the assessment and intervention for infertility treatment and nursing via the Internet is a more comfortable, much less intimidating, and acceptable approach than face-to-face counseling

How does your research contribute to the field?

Based on user-centered design, we develop a web-based integrated support service program that allows infertile women to participate without time and space constraints, and verify its validity. The program developed will help infertile women to acquire accurate awareness and information about infertility, thereby contributing to the improvement of fertility health.

What are your research's implications toward theory, practice, or policy?

The implications of this study is toward practice. This program is highly accessible because users can receive service through the Internet anywhere, regardless of time and place, and it is expected to be effective with high satisfaction of experts and users in this regard.

Introduction

Infertility is the failure to achieve pregnancy within 1 year despite attempts to conceive normally without contraception.¹ Infertility has gradually increased in recent years due to lack of exercise, obesity caused by changes in diet and lifestyle habits, stress, delayed marriage age due to economically active population of women, and so on.² Infertility is recognized worldwide as a public health problem, and the total

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fertility rate in Korea in 2018 was 0.98, which categorizes Korea as an ultra-low fertility country based on the OECD standard, and infertility is considered a nation-wide issue related to low birthrate.³ The development of medical technology has led to the advancement of assisted reproductive technology for solving infertility problems. Accordingly, infertile couples are trying to solve infertility using various procedures such as artificial insemination, in vitro fertilization, egg donation, and surrogacy, as well as induction of ovulation and treatment of genital diseases.⁴ The development of these ART has given infertile couples the opportunity to conceive, but despite the high cost of the procedure and the long-term burden, pregnancy still cannot be guaranteed, increasing not only physical stress but also social, psychological, and economic hardships.⁵ The number of subjects diagnosed with infertility increased by about 6% from 217905 in 2015 to 230802 in 2019 and has been increasing every year except in 2017.⁶ Considering that the success rate of in vitro fertilization and assisted reproductive surgery is <30% to 50%,⁷ and the fact that subjects diagnosed with infertility do not reach pregnancy and childbirth within 1 to 2 years, it is estimated that the number of participants who are diagnosed with infertility and undergo infertility treatment will reach 100s of 1000s.⁸ Infertile women who experience physical, psychological, and relational problems have high demands for specific information on the reproductive system and fertility health altered by interventions and treatments that can solve them.⁹ For this reason, the topic of infertility is one that not only infertility patients, but also medical staff consider difficult. Women with infertility feel distressed consulting directly with medical staff, and medical staff also feel uncomfortable due to lack of knowledge, time, and resources to consult with patients about infertility issues.¹⁰ Although more than 40% of female cancer patients want to consult with medical staff about sex, only 7% discuss practical solutions¹¹ due to exposure to sensitive topics and the possibility of stigma¹² during face-to-face consultation. Therefore, for female infertility, the assessment and intervention for infertility treatment via the Internet is a more comfortable, much less intimidating, and acceptable approach than face-to-face counseling.¹³ In this regard, previous studies related to infertility have been mainly focused on physical and psychological problems of female infertility, and their stress, anxiety, depression, and nursing needs were mainly studied.^{1,2,12} Infertile women undergoing assisted reproductive surgery were found to have high stress,⁵ which caused anxiety and depression, and thus increased the need for nursing care.^{1,2,12} In spite of the high cost of surgery and the long-term burden, pregnancy was not guaranteed, which increased not only physical stress but also social, psychological, and economic burdens.⁵ Moreover, to increase the pregnancy rate of infertile women, it is necessary to correct the lifestyle of prospective parents during pre-pregnancy management.¹⁴ However, the characteristics of infertility interventions that take a long time and require high cost are

leading to low compliance and high dropout rates of patients.¹⁵ To overcome these problems, online-based arbitration is being used. Therefore, it is necessary to strengthen preventive support through fertility education for health promotion and positive pregnancy results in female infertility, and it is necessary to provide accurate knowledge and information in advance to help prevent problems. In particular, this should be composed by faithfully reflecting the needs of the target audience, and it should be provided using a medium with high accessibility. Online-based infertility education provides a health management system to patients using electronic information and technology and no face-to-face interaction with patients and experts¹⁵, reducing patient time costs while providing quality health care. It is a cost-effective arbitration method. Although more than 40% of actual infertile female patients want to consult with medical staff about infertility, only 7%¹¹ discuss practical solutions due to exposure to sensitive topics and the possibility of stigma¹³ during face-to-face consultation. Therefore, for infertile women, the assessment and intervention for infertility treatment and nursing via the Internet is a more comfortable, much less intimidating, and acceptable approach than face-to-face counseling.¹⁵ In face-to-face fertility education for infertile couples in Korea, the necessity of a web-based education program was suggested to solve the discomfort of having to make time to attend the program.¹⁶ In the case of infertility problems, there are many individual problems where patients do not want to be exposed to other people, and the advantage of providing infertility-related education on the web lies in that the subject can use a time and place that is convenient. In addition, web-based education has high use of data and is not limited by time and place to share and use information, saving time and money.¹⁷ The ease of access and anonymity of online-based interventions help patients with infertility to freely express their thoughts and feelings and are useful for emotional and social support.¹⁸ Furthermore, it is possible to provide personalized service for each patient, and it has the advantage of helping patients who are passive in actively participating in interventions through hospital visits to maintain participation.¹⁶ In particular, it can be practically used as an intervention for changing a patient's behavior or habits. Accordingly, it is necessary to develop a web-based infertility women's health program for those experiencing various fertility-related problems, and to develop a friendly and reliable program so that they can identify and continuously manage fertility problems. Health experts have highlighted that the use of health information on the Internet is increasing rapidly, but only 1% of these sites are recommended by doctors because there is a lot of misinformation that can harm the users.¹⁹ Therefore, in developing computer software, it is expected that a user-centered design that first grasps the needs of users and reflects them can solve these problems and increase the effectiveness of the developed program.²⁰ In addition to, based on user-centered design, we develop a web-based integrated support

service program that allows infertile women to participate without time and space constraints, and verify its validity. The program developed will help infertile women to acquire accurate awareness and information about infertility, thereby contributing to the improvement of fertility health.

Objective

The purpose of this study is to develop and apply a web-based integrated support service program to meet the health care and nursing needs of infertile women using user-centered design, and to verify the validity of the developed program. Unlike previous websites, which converse with infertile women in a unidirectional way from anywhere in the world, through the web-based integrated support service program, various intervention methods can be provided in real time according to the individual characteristics of each subject and the path appropriate to the situation in relation to their infertility management.

Methods

Study Design

This is a study to develop a web-based integrated support service system to meet the health care and nursing needs of infertile women. The research process is designed to develop a program that can be effective by sufficiently reflecting the needs of the subject. User-centered design refers to the design process in which subject needs assessment-analysis-design-development-evaluation-revision and supplementation-application are applied to be beneficial to the subject and to maximize practical value in program development²⁰ (Figure 1).

Study Process

To develop a system that is most suitable and practically helpful to infertile women, who are end users of this system, research was conducted according to the user-centered design process suggested.²⁰ To this end, we received advice from 5 professors in women's health nursing, 3 nursing team leaders of infertility specialty hospitals, and 1 professor of information and communication engineering and multimedia, and the homepage was produced in cooperation with a specialized manufacturer.

Assessment: Research on related data and program analysis. First, theses, reports, and books on the health care and nursing needs of infertile women, and existing programs and websites related to infertile women's education developed domestically and abroad were extensively reviewed to compare the strengths and weaknesses of each program and media. To analyze the management and nursing needs, the

core contents of the health management and nursing needs considered necessary for infertile women were extracted.

Analysis: Needs of infertile women's health care program. To develop a system that is most suitable for the characteristics of infertile women and to ensure that their needs are sufficiently reflected and effective, surveys and interviews were conducted as follows to investigate health management and major nursing needs. Their needs for programs for infertile health care were also investigated.

Qualitative interview survey to identify health care and nursing needs of infertile women. Design features contained interviews, purposeful sampling, and qualitative data analysis. The approach was appropriate for this study, which is aimed at exploring health care and nursing needs of infertile women. Purposeful sampling was used to collect information-rich cases. Participants were recruited with the help of unit managers at a fertility hospital in South Korea. The researchers visited 2-unit managers, explained the research purpose and methods, and presented recruitment advertisement. The criteria for the participants were as follows: (i) Women ages 25 to 45 with clinical diagnosis of infertility, defined as having no clinically confirmed pregnancy; (ii) Legally married or in a stable cohabiting relationship; (iii) No living child in current marriage or relationships; (iv) Able to express themselves in Korean. To analyze the health care and nursing needs of infertile women, a 1:1 in-depth interview was conducted with 4 infertile patients receiving treatment at a fertility hospital. The data collection period was from January to February 2019. Each interview lasted 40 to 100 minutes on average. In-depth interviews were conducted to patients with infertility, starting with the question, "What was the most necessary, and curious, part about infertility treatment?." Through exhaustive questions such as "How much do you think you need education about the method and side effects of infertility treatment?," "How much do you think you need education about symptoms that may appear during infertility treatment?," and "How much do you think you need a support system for infertility treatment?," the constituent factors of the nursing needs necessary for infertility subjects were conceptualized. As a result of the analysis, it was observed that infertile women desire contents such as "physical and psychological health management," "request for information on infertility treatment," "requirement for education about infertility diseases," and "support system for infertile women (community, counseling, medical institutions)." By reflecting this in the content structure of the program, efforts were made to be of practical help in improving the health of infertile women. The interviews were conducted by the first author through face to face invitations. The first author wrote memos, familiarized herself with the data by multiple readings and generated themes. Based on the initial findings, the second author supervised themes and

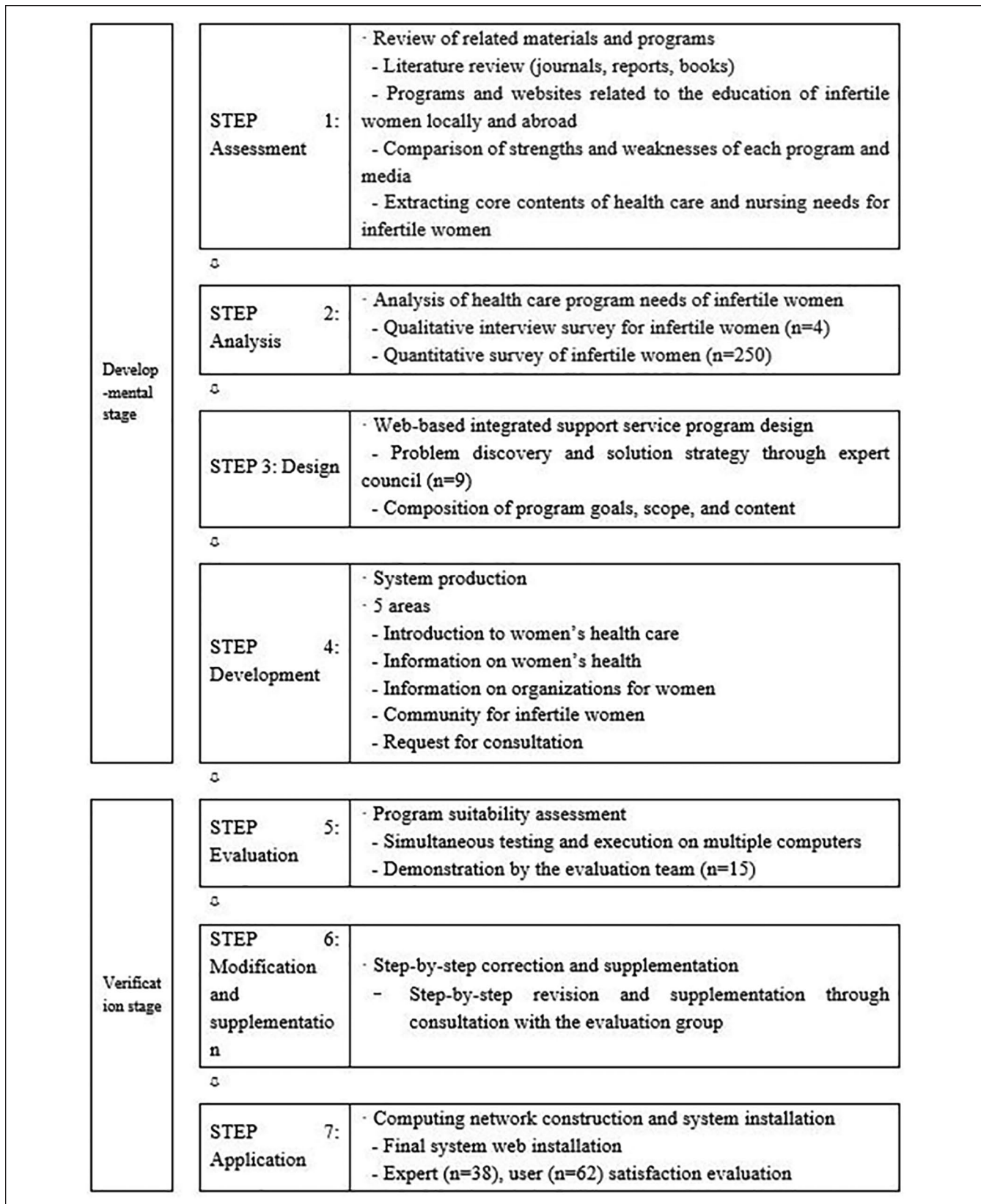


Figure 1. User-oriented web-based integrated support service program design process for infertile women.

Table 1. Web-Based Integrated Support Service Program Web Page Content for Infertile Women.

Menu	Content
Introduction to women's health care	Introduction to women's health care
Information on women's health	Greetings Information on infertility Information on miscarriage Pregnancy Childbirth Information on postpartum management
Information on organizations for women	Information on administrative infertility support Administrative support organizations Information on organizations for infertility treatment, pregnancy, and childbirth
Community for infertile women	Notice Q&A Video materials regarding fertility tests and treatment processes
Request for consultation	1:1 Online consultation Consultation with medical staff regarding infertility treatments and nursing (phone, face-to-face) Consultation with non-medical staff regarding infertility administrative support (phone, face-to-face)

double checked them. Each interview was recorded and then analyzed concurrently. Data saturation was determined when no new themes on health care and nursing needs of infertile women emerged.

Quantitative survey for health care and nursing needs of infertile women. To understand the health care and nursing needs of infertile women, a questionnaire survey was conducted on the needs of 250 infertile women who visited and received treatment at a fertility center in Korea for about 9 months from February to October 2019. The analysis revealed the average score for "physical and psychological health care" was the highest with 3.67 points, and that for "requiring infertility treatment information" was 3.62 points. The average score for "requiring education for infertility diseases" was 3.40 points, and that for the "support system for infertile women (community, counseling, medical institutions)" was 3.44 points. In addition, the "request for information on infertility treatment" is a factor that influences the health care and nursing needs of infertile women,⁹ and thus the contents of the program were organized to be an intervention plan to maintain good physical health of infertile women. Furthermore, as a result of the survey on the needs of the health care and nursing demand programs, it was found that infertile women desired face-to-face and non-face-to-face (online) counseling, which were also reflected in the developing of the program.

Design: Web-based integrated support service program design

Problem discovery and solution strategy search through expert council. An expert council consisting of 5 professors of women's health nursing, 3 nurses from infertility specialty hospitals, and 1 professor of information and communication engineering multimedia was formed. The expert council

reviewed data on health care and nursing needs of infertile women and prepared the basis for the program contents through problem discovery, prioritization, strategy selection, implementation, and evaluation through expert consultation process.

Organization of program goals, scope, and content. Based on the results of analysis of major infertile women's health problems and nursing needs derived through the above process, the basic direction, goals, and target range of the program were selected. The subjects are women diagnosed with infertility, and the content of the program is composed in consideration of the health management and nursing needs of these women based on the problems discovered through data collection. It was decided to actively utilize various multimedia materials to provide easy, specific, and practical interventions (Table 1).

Development: System creation. After discussing the confirmed health care and nursing needs of infertile women with a web programmer of a professional web manufacturer, we developed and implemented a web-based health care and nursing education program for infertile women through 7 revisions and modifications. The web-based health care and nursing program consists of 5 areas: "Introduction to women's health care," "Information on women's health," "Information on organizations for women," "Community for infertile women," and "Request for consultation." Through each area, information on infertility, miscarriage, pregnancy, childbirth, postpartum management, women's institutions (administrative support organizations, infertility treatment, and private pregnancy institutions), video archives, and online counseling can be obtained.

Assessment: Assessing the suitability of the program. The contents of the program built in the server system were tested and executed simultaneously on several computers to evaluate the function and performance of the system. In addition, to evaluate whether the program was developed appropriately for the subjects, a total of 15 people including 2 women's health nursing majors, 1 nurse specializing in infertility hospitals, 2 information and communication engineering and multimedia majors, and 10 infertile women were selected to try the program themselves.

Revision and modification: Step-by-step correction and supplementation by evaluation team. To implement a more desirable system, the research team continued to discuss and revise each step throughout the entire research process. Afterwards, the evaluation team composed of a total of 15 people tested it, and it was then evaluated and revised and modified again.

Application: Computing network construction and system installation. The final system developed through the above process was installed on the web and developed so that anyone can use it through a personal computer. A program satisfaction survey was conducted on 38 experts composed of nurses working in hospitals for infertile women and 62 infertile women, and the final evaluation was conducted.

Results

This education system consists of introduction to women's health care, information on women's health, information on organizations for women, community for infertile women, and request for consultation for health management and nursing education of infertile women (Table 1).

Web-based Integrated Support Service Program Development

Introduction to women's health care initial screen and program introduction. In the initial screen, the overall program is introduced, and greetings and system operation, health management, and nursing for infertile women are emphasized. At the top of the initial screen, icons that allow the user to grasp comprehensive details of each area are located. The icons are concise and organized so that the contents of the program can be seen visually. Representative icons were divided into "Information on women's health," "Information on organizations for women," "Community," and "Request for consultation." In addition, the lower area consists of icons for infertility, miscarriage, pregnancy, childbirth, postpartum management, administrative support organizations, organizations for infertility treatment, pregnancy and childbirth, Q&A, and video materials, all of which can be clicked for details. The content includes videos that the subjects can easily follow, and detailed information is provided through

corresponding explanations. In addition, there is an inquiry menu on the online consultation screen, so users can inquire through the bulletin board at any time and receive answers (Figure 2a).

Information on women's health. General information on infertility, treatment of infertility, and symptom management, and lifestyle was introduced based on the "physical and psychological health management," "infertility treatment information request," and "education request for infertility disease" derived from the survey on health care program needs of infertile women. In addition, the contents of the treatment regimen for miscarriage, symptom management, and lifestyle that can be experienced in case of pregnancy failure were also organized. The contents were organized in accordance with general information on pregnancy, childbirth, and postpartum management after successful pregnancy, comprehensive information on prenatal care, symptom management, childbirth preparation education, postpartum management, and comprehensive health management that can be carried out longitudinally from women's infertility treatment to postpartum management (Figure 2b).

Information on organizations for women. Information on support for infertility, miscarriage, pregnancy, and childbirth support, as well as administrative agencies (Ministry of Employment and Labor, Ministry of Health and Welfare, and Korea Employment Insurance Corporation) based on the "support system for infertile women (community, counseling, medical institutions)" derived from the survey on health care program needs were organized. In addition, by presenting the current status of treatment-related expenses according to the median income based on the number of family members, it is possible for infertile women to easily understand and receive information about applications and benefits for administrative support.

Community for infertile women. The community for infertile women consists of announcements, Q&A, and contents of the video archive. The notice page is designed to function as a question-and-answer bulletin board so that researchers and other subjects can interact with and share their experiences with the subjects' concerns or questions. In addition, a cyber field was prepared for Q&A and information exchange on infertility, pregnancy, and childbirth in the web space. The person who writes the post on the bulletin board can lock it with a password, and to prevent the generation of a large amount of data in the future, the ability for the writer to modify the post by entering the password was also added. The bulletin board is created so that researchers can easily manage and organize through the integrated manager module, and it is made to manage data efficiently by converting it into a database using a web hosting service. In the video archives, the researcher directly produces up-to-date health

information on prenatal care before pregnancy, such as self-diagnosis related to infertility, self-injection of infertility treatments and pain check, and listening to the child’s heart-beat, which are helpful for health management during infertility treatment (Figure 2c).

Request for consultation. Through the operation of the community for infertile women, the subjects applied for counseling on their concerns in the web space sought solutions to problems together and organized a counseling application menu through phone and face-to-face interactions to improve the health of infertile women. First, it was guided to serve as a support group by allowing medical staff counseling related to infertility treatment and nursing and general public counseling related to infertility administrative support (Figure 2d).

Web-based Integrated Support Service Program Evaluation

General characteristics of evaluators of web-based integrated support service program for infertile women. The general characteristics of the evaluators of this program are a group with 38 experts consisting of nurses working in hospitals for infertile women and a group of 62 infertile women. The average age of the subjects was 32.13 years old for the expert group and 32.85 years for the user group. A total of 97.4% of the expert group were single, whereas the members of the user group were all married. As for the final academic background, all of the expert groups were college graduates, and in the user group, 59.7% were college graduates and 21.0% were graduate school graduates. In terms of religion, in both groups, atheism was the highest, with 50.0% or higher, and in the case of user group, professional occupation accounted for the most with 56.5%. A total of 86.8% of the expert group and 74.2% of the user group had experience using online programs related to infertility (Table 2).

Satisfaction with web-based integrated support service program for infertile women. For the developed program, a program satisfaction survey was conducted on 38 experts consisting of nurses working in hospitals for infertile women and 62 infertile women to evaluate the web-based integrated support service program. As for the program satisfaction of experts, the usefulness of information was the highest with 3.53 points out of 5, the efficiency of information was 3.51 points, system suitability was 3.50 points, system convenience was 3.34 points, and design was 3.26 points. The users’ program satisfaction was highest at 3.19 points for the suitability of information, followed by 3.17 points for usefulness of information, 3.16 points for design, 3.13 points for information efficiency, and 3.20 points for convenience. In the case of experts, the sub-areas with the highest satisfaction score were in the order of “This is information needed by women” (3.65 ± 0.62), “The information provided is

reliable” (3.63 ± 0.63), “This is information related a lot to women’s health care,” and “The information provided is easy to understand” (3.55 ± 0.60). In the case of users, the

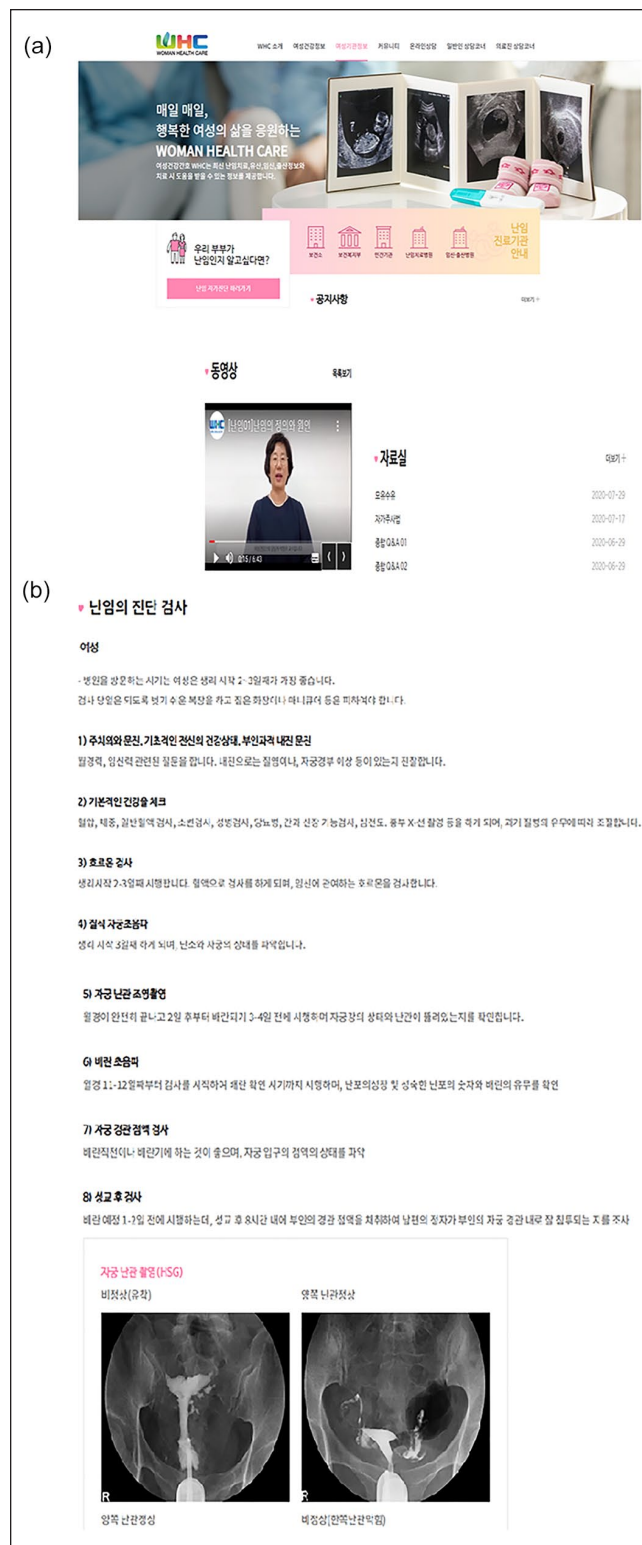


Figure 2. (continued)

(c)

영상 자료실



(d)

온라인상담

- ♥ 온라인 상담시간 평일 오전 10시 ~ 오후 5시
- ♥ 온라인 상담 게시판에 글을 남겨주시면 확인 후 상담해드립니다.

전체 | 난임 | 유산 | 임신-출산

총 11건

제목+내용

번호	카테고리	제목	작성자	작성일	조회수	상태
11	난임	온라인상담 활성화가 안되었는데..	홍길동	2020-07-31	17	답변완료
10	난임	난임자가진단	00	2020-07-23	3	답변완료
9	난임	온라인상담 테스트222	온라인상담 테스트	2020-07-23	27	답변완료
8	난임	궁금합니다	천사	2020-05-30	18	답변완료
7	난임	궁금합니다	천사	2020-05-30	5	답변완료
6	난임	asdfasdf	asdfasdf	2020-05-06	8	답변완료
5	유산	tesasdf	asdfasdf	2020-05-06	4	답변완료
4	난임	testasdf	test	2020-05-06	17	답변완료

Figure 2. (a) Introduction to women's health care, (b) women's health information, (c) video archive, and (d) online consultation.

Table 2. General Characteristics of Program Evaluators.

Variable	Category	Experts (n=38)	Users (n=62)
		M ± SD or n (%)	
Age		32.13 ± 2.15	32.85 ± 8.72
Marital status	Single	1 (2.6)	62 (100.0)
	Married	37 (97.4)	–
Final education	High school graduate	–	6 (9.7)
	Junior college graduate	–	6 (9.7)
	University graduate	38 (100.0)	37 (59.7)
	Graduate school graduate	–	13 (21.0)
Religion	Atheist	20 (52.6)	36 (58.1)
	Christian	12 (31.6)	9 (14.5)
	Buddhist	2 (5.3)	7 (11.3)
	Catholic	4 (10.5)	10 (16.1)
Occupation	Specialist	38 (100.0)	35 (56.5)
	Salaried worker	–	14 (22.6)
	Unemployed	–	11 (17.7)
	Others	–	2 (3.2)
Experience of using online infertility-related programs	Have experience	33 (86.8)	46 (74.2)
	No experience	5 (13.2)	16 (25.8)

sub-regions with the highest satisfaction score were in the order of “The information provided is clear and not ambiguous” (3.24 ± 0.59), “This information is usefully used in women’s health management” (3.24 ± 0.43), and “The content of the information is detailed” (3.22 ± 0.55), followed by “This is information needed by women” (3.22 ± 0.45) (Table 3).

Discussion

A web-based integrated support service program was developed for health management of infertile women using user-centered design. To this end, the processes went through health-related data and program studies of infertile women, collection of quantitative and qualitative data to understand the nursing needs of infertile women, discovery of problems and exploring strategies for solutions through expert councils, composition of the program contents, program design, and production, evaluation, revision and modification, building computer network, and loading the program. As a result of surveying web-based health care and nursing needs of infertile women, most of the opinions were on physical and psychological health management, information on infertility treatment, understanding of infertility diseases, and support systems. This is consistent with previous studies that have high information requirements and a burden to consult with medical staff.¹⁰ For infertile patients, the topic of infertility treatment is not a topic for comfortable communication with the general public. Infertility is directly related to the success rate of pregnancy, and discussions of integrated services may be given less priority in situations where a focus on testing and treatment is required. However, when patients want to

obtain information related to infertility and want to obtain accurate information in a way such that they do not have to interact with the medical staff in person, web-based programs are shown to be appropriate.

In the health management area, the provision of health services through correct information and intervention using the Internet can be utilized as a very efficient medium as not only text but also multimedia videos can be used. In the field of nursing, studies showing the effect of computer-based nursing interventions¹⁶ are increasing. However, research on web-based support related to health management of infertile women is insufficient. Infertile women have a need for education on physical and psychological health management, information on infertility treatment, understanding of infertility diseases, and relevant support systems,²¹ but due to the nature of infertility diseases, patients are reluctant to disclose them publicly. It is not easy to provide direct help.⁴ Therefore, by developing an integrated support service program system for the health management of infertile women that best reflects the characteristics and needs of infertile women, who are end users of the program, using user-centered design, this study is meaningful in that it is supporting health promotion. Due to the spread of Covid-19, face-to-face treatment or counseling has become difficult, so it is not easy to receive help. This program provides a sense of psychological stability by ensuring anonymity as well as high accessibility using the Internet. This program is expected to be useful for integrated support including health management and information provision for infertile women through a non-contact method. In fact, infertile women are likely to obtain infertility-related information through people around them rather than through medical staff.²² Thus, there is a need for a program that can

Table 3. Satisfaction with Web-Based Integrated Support Service Program for Infertile Women.

Variable	Category	Experts (n=38)	Users (n=62)
		M ± SD	
System efficiency	Easy to connect	3.51 ± 0.57	3.13 ± 0.52
	Information search is fast	3.50 ± 0.60	3.14 ± 0.56
System convenience		3.52 ± 0.60	3.12 ± 0.55
	Operator's contact information is specified.	3.34 ± 0.58	3.02 ± 0.45
	Composition of the program is convenient to use.	3.26 ± 0.64	3.04 ± 0.45
Design	Program is friendly.	3.47 ± 0.64	2.95 ± 0.61
	I like the design.	3.28 ± 0.76	3.06 ± 0.64
Suitability of information		3.26 ± 0.64	3.16 ± 0.54
	Content of the information is correct.	3.50 ± 0.48	3.19 ± 0.37
	Content of the information is sufficient.	3.47 ± 0.60	3.19 ± 0.47
	Information provided is clear and not ambiguous.	3.42 ± 0.55	3.16 ± 0.48
	This is information needed by women.	3.36 ± 0.63	3.24 ± 0.59
	Information provided is reliable.	3.65 ± 0.62	3.22 ± 0.45
	Information provided is up to date.	3.63 ± 0.63	3.19 ± 0.50
	Content of the information is detailed.	3.50 ± 0.68	3.12 ± 0.52
Usefulness of the information	Content of the information is clear.	3.52 ± 0.60	3.22 ± 0.55
		3.44 ± 0.60	3.19 ± 0.50
	This is information related a lot to women's health care.	3.53 ± 0.53	3.17 ± 0.42
	This information is usefully used in women's health management.	3.55 ± 0.60	3.09 ± 0.53
		3.50 ± 0.60	3.24 ± 0.43
	Information provided is easy to understand.	3.55 ± 0.60	3.19 ± 0.50

provide specific, highly reliable, and accurate information to infertile women. It is believed that this program has satisfied the demand for infertility health management. In addition, the validity of the contents of the program was established through expert verification. Infertility health care websites provided for promotion by medical institutions have a limitation in that most of them are text-oriented with unidirectional information delivery, despite the surmountable technical abilities and costs, and to overcome this, simple flash animations have recently begun to be used. However, programs capable of immediate interaction according to the characteristics and level of each subject are insufficient. To solve this problem, counseling through e-mail or bulletin board has been recently attempted, but there is a limitation that targets have to find and read it by themselves in the case of bulletin board counseling, and the development of new strategies is urgently required.²³ Although the user-centered design of this program has been developed as 1 field of artificial intelligence, researchers, who have come to the conclusion that artificial intelligence alone does not solve all problems, provide expert knowledge and experience that mimics the situation where a non-expert asks for advice from an expert. Due to its high accessibility, availability, and demand, it is expected to become the next generation of infertility health management strategy.²⁴ As a result of the program satisfaction measured for the feasibility study of the developed program, both experts and users gave 3 or more out of 5 points. This is believed to be because the accurate and practical

web-based integrated support program related to infertility has relatively fewer programs accessible to the subject than those in other areas and was developed by reflecting the subject's needs and including actual content. In particular, the experts gave the highest score for the usefulness of the information and the users gave the highest score for the suitability of the information, which shows that the necessary information is accurately presented to the subjects. In addition, as a result of the satisfaction measurement, it was found that the satisfaction of not only users but also experts was high. In the case of medical staff who are required to provide infertility-related information to subjects, Park et al¹⁰ found that insufficient knowledge related to infertility was one of the factors why people avoided infertility-related counseling. Thus, this program is believed to be helpful not only for users to learn about infertility information, but also for professionals to acquire information on infertility.

Conclusions

This study introduced and applied a user-centered design that maximizes the value of use by first understanding the user's convenience and needs when developing a program. In addition, in the analysis stage, accurate content was reflected through analysis of the needs of infertile women and existing data. To provide an integrated support service suitable for infertile women, a web-based integrated service program

was developed according to the program development process and the validity was confirmed. The clinical significance can be found in that it can contribute to the improvement of infertility health when it is applied to infertile women in the future and the effect is confirmed. During the coronavirus pandemic, inadequate face-to-face treatment and lack of counseling make it difficult for infertile women to visit medical institutions and administrative agencies to promote infertility health and receive help. In such a situation, this program is highly accessible because users can receive service through the Internet anywhere, regardless of time and place, and it is expected to be effective with high satisfaction of experts and users in this regard.

Author Contributions

Criteria for first authorship include contribution to study conception, design Acquisition, analysis and interpretation of the data. Criteria for corresponding authorship include contribution to study drafting revision of the manuscript for important intellectual content. IRB number and institute: NSU

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