

Method of App Selection for Healthcare Providers Based on Consumer Needs

Jisan Lee, MSc, RN, Jeongeun Kim, PhD, RN, INS

Mobile device applications can be used to manage health. However, healthcare providers hesitate to use them because selection methods that consider the needs of health consumers and identify the most appropriate application are rare. This study aimed to create an effective method of identifying applications that address user needs. Women experiencing dysmenorrhea and premenstrual syndrome were the targeted users. First, we searched for related applications from two major sources of mobile applications. Brainstorming, mind mapping, and persona and scenario techniques were used to create a checklist of relevant criteria, which was used to rate the applications. Of the 2784 applications found, 369 were analyzed quantitatively. Of those, five of the top candidates were evaluated by three groups: application experts, clinical experts, and potential users. All three groups ranked one application the highest; however, the remaining rankings differed. The results of this study suggest that the method created is useful because it considers not only the needs of various users but also the knowledge of application and clinical experts. This study proposes a method for finding and using the best among existing applications and highlights the need for nurses who can understand and combine opinions of users and application and clinical experts.

KEY WORDS: Dysmenorrhea, Methods, Mobile applications, Needs, Premenstrual syndrome

Mobile health (mHealth) has become an important paradigm in healthcare. In 2015, there were more than 2.6 billion smartphone users worldwide, and concurrently, a large number of applications (apps) for mHealth were available.¹ Although one-third of US healthcare providers reported recommending apps to patients, most were hesitant

to do so because evidence is lacking regarding the effectiveness of apps for improved health outcomes, cost efficacy, and security.² This suggests that, if healthcare providers were confident in healthcare apps, their use would be recommended more often. Nurses (including nurse educators, researchers, and school nurses) are in positions to recommend these apps to patients, research participants, and students to help them effectively manage health and control symptoms of chronic disease on a daily basis. Therefore, healthcare providers require knowledge on how to select and identify the best apps for their patients. To investigate this topic, this study examined a specific target consumer: women experiencing dysmenorrhea and premenstrual syndrome (PMS).

In 2015, the Institute for Healthcare Informatics evaluated the top 26 864 mHealth apps out of the 165 000 available. Of these, approximately 7% were related to women's health and pregnancy. It is known that 45% to 97% of women of childbearing age in the world experience dysmenorrhea and more than 12% of them experience severe pain limiting daily activities.³ Dysmenorrhea is associated with stress, depression, family history, and PMS, which refers to physical or mood changes experienced in the days before menstruation begins.⁴⁻⁶ Studies found that women were more likely to use online methods of health management to identify a possible diagnosis and modify their health behaviors (eg, how to take care of their own health).⁷⁻⁹

Consumers generally choose mHealth apps without any advice or guidance from their healthcare providers and typically either opt for the highest-rated app offered by a vendor or try several.¹⁰ A study revealed that 63% of female users would use menstruation tracking apps for merely observing their menstrual cycle and not for medical reasons.¹¹ This implies that female users might fail to find appropriate apps that can achieve more than simple tracking and that better reflect their medical needs. Thus, users need effective ways to improve their app selection.

Nurses or researchers may be trained in such activities so that they can recommend the most appropriate app to each consumer. However, in 2016, a MEDLINE literature search using Medical Subject Headings (MeSH) terms such as "menstruation disturbances," "fertility," and "mobile app" identified no publications on menstruation app use in clinical settings,¹² although numerous apps related to menstruation

Author Affiliations: Interdisciplinary Program of Medical Informatics and College of Nursing (Mrs Lee and Dr Kim) and Research Institute of Nursing Science (Dr Kim), Seoul National University, Korea.

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Corresponding author: Jeongeun Kim, PhD, RN, College of Nursing, Seoul National University, 103 Daehak-ro, Jongno-gu, Seoul, Korea 110-799 (jeongeunkim0424@gmail.com).

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exist. The potential clinical value of these apps is therefore yet to be exploited and remains a fruitful area for further research. It is necessary to develop an exhaustive selection method for healthcare providers that takes into consideration clinical efficacy, cost efficacy, security, and user needs. Thus, the aim of this study was to develop the Method of App Selection based on User Needs (MASUN).

MATERIALS AND METHODS

To develop the MASUN, this study adopted the intervention mapping approach, which provides a systematic method to develop and implement an evidence-based health promotion intervention through the assessment and prioritization of needs.¹³ The intervention mapping approach has been used to derive user needs to develop design strategies.¹⁴ Figure 1 shows the process followed in this study.

- App searching and screening: After searching for apps using related keywords, we excluded apps that were not related to the research topic and those not fulfilling the inclusion criteria.
- App checklist based on virtual users' needs (design MASUN): In this study, a virtual user is defined as a user imagined by a researcher as a virtual character and expressed as a persona and a scenario. Virtual users were used because we could not find an appropriate tool for evaluating the retrieved dysmenorrhea- and PMS-related apps in terms of users' needs. To do this, persona and scenario techniques were used, and the needs of virtual users were converted into a checklist to evaluate the apps. The checklist was modified based on the evaluation by nursing informatics experts to improve its validity.

- App analysis considering real users' needs (intensify MASUN): A real user is defined as a user who actually downloads and uses the app and leaves a review and rating in the two dominant marketplaces for apps. By considering these users in the MASUN process, we included another informational source for user needs.¹⁵ Based on these and the checklist scores, five candidate apps were selected.
- App evaluation based on potential users' needs (verify MASUN): Potential users are defined as those who use apps and participate in focus group interviews (FGIs). They were defined as potential users because they could continue to use the app after the interview. By adding them to the MASUN process, a detailed and focused source of information on user needs was also considered. In addition, the perspectives of app and clinical experts were used to evaluate security and effectiveness, respectively.

App Searching and Screening

In this step, healthcare providers who want to select the best app for their clients can adjust the inclusion and exclusion criteria depending on their target consumer population and symptoms. In this study, apps were included if they (1) provided dysmenorrhea or PMS information or a menu for management (eg, a recording function) and (2) were user-centered apps in English or Korean. Apps were excluded if they were specifically focused on advertising or clinical products.

The search terms consisted of general and MeSH terms in English and Korean: “period,” “menstrual,” “menstruation,” “menstrual pain,” “dysmenorrhea,” “PMS,” and “premenstrual syndrome.” Each term was searched in Apple iTunes

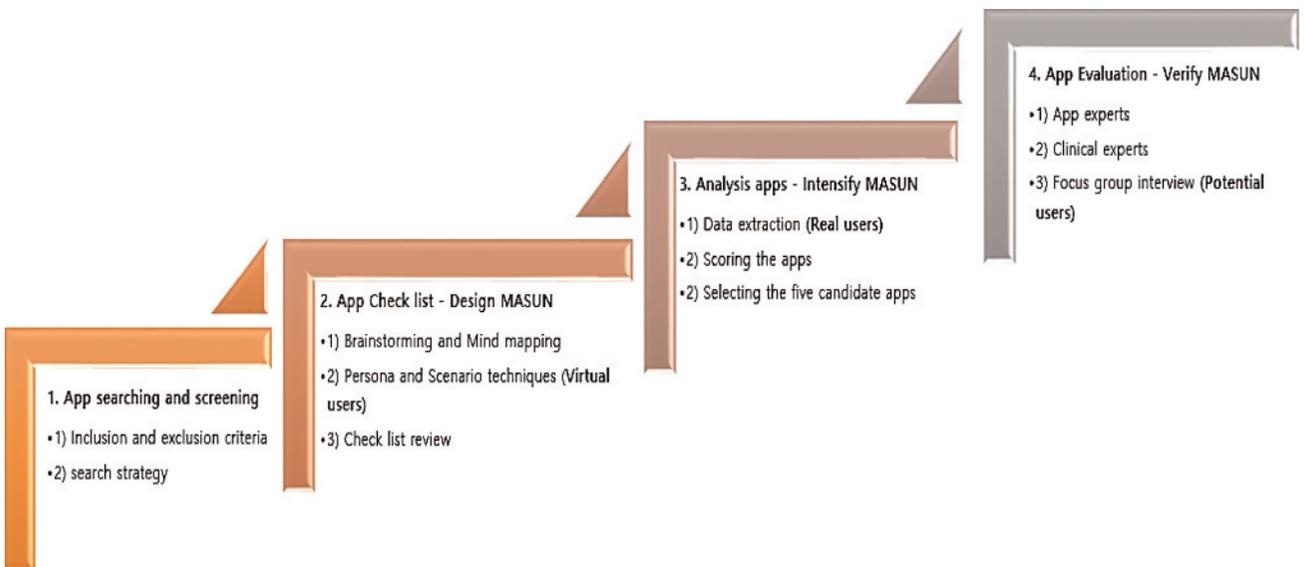


FIGURE 1. Process of the current study.

(Apple, Cupertino, CA) and Google Play (Google, Mountain View, CA) stores using a Korean account and a US account. Between August and September 2016, the app search was conducted twice to ensure that updated apps were screened.

Application Checklist: Design Method of App Selection Based on User Needs

To understand dysmenorrhea and PMS in depth, it was necessary to obtain researchers' understanding of women's health and hormonal changes. Six researchers of both sexes, from 20 to 39 years old, majoring in nursing or medical informatics, with direct or indirect experience with dysmenorrhea and PMS, performed this step. First, they thought about the task individually and were then grouped by sex to answer a broad question. The female researchers used their own experiences and drew a mind map. Two male researchers did the same by relying on their girlfriends' experiences. These mind maps helped the researchers to better understand women's health and develop the core idea of the study.¹⁶

Persona and scenario techniques were used to obtain a checklist for mobile apps to manage dysmenorrhea and PMS. Personas are described in Johns' book as "detailed descriptions of imaginary people constructed out of well-understood, highly specified data about real people"^{17(p3)} and can guide decisions about user-centered features.¹⁸ We designed a persona following guidelines in *A Project Guide to UX Design*.¹⁹ Scenario is a method for systematic planning and prediction of users' needs.²⁰ In particular, a scenario describes the service features and interactions with users. Using these techniques, the virtual users' needs checklist for scoring the apps was composed.

Five experts, including a professor and four doctoral and master's degree students in nursing informatics, checked the content validity of all items in the checklist against the content validity index. When necessary, items were partially revised and updated. The final checklist was used for scoring the apps. The Cronbach's α of the checklist was .70.

Application Analysis: Intensify Method of App Selection Based on User Needs

Names of apps, app developers, and app stores; price; language; rating; and number of app reviews were collected. Three independent raters performed a full review and app scoring based on the checklist. On September 2016, two researchers, who had been educated about this study, were fluent in Korean and English, and had majored in nursing, scored the apps independently. The results were then compared. Finally, one researcher scored and analyzed the apps.

The criteria for selecting the candidate apps included (1) checklist score (from virtual users), (2) app rating (from real users), and (3) number of reviews (from real users) in the two app stores. To select the five candidate apps, the top five scores according to the checklist (from virtual users) were

selected. One app was chosen for each of the scores. When multiple apps received the same score, the app with the highest app rating (from real users) was selected. Multilayered criteria were used instead of simply selecting the five highest-scored apps because the latter method reflects only the virtual users' needs. By choosing multilayered criteria, it is possible to reflect both the needs of virtual and real users together. Real users' ratings were chosen as the second criterion instead of the number of reviews because, for newer apps, users might not have enough time to upload their reviews.

Application Evaluation: Verify Method of App Selection Based on User Needs

In this step, healthcare providers who want to evaluate the candidate app can adjust the evaluation tool depending on the targeted mHealth needs. In the current study, the apps were evaluated using the Mobile Application Rating Scale (MARS),²¹ which provides a multidimensional and reliable app-quality rating tool for developers. It consists of 29 items divided into three parts: app quality rating, app subjective quality, and app specific. The app quality rating consists of four sections: engagement (five items), functionality (four items), aesthetics (three items), and information (seven items). The app subjective quality has four items. The app-specific section has six items for assessing the perceived impact of the app on users' knowledge of, attitudes toward, and intention to change the target behavior. In addition, a simpler version of the MARS, the "MARS-app user" (uMARS), was also used in this study.²² This version was designed for obtaining user feedback on app quality and satisfaction and consists of the same four sections used in the app quality rating of MARS except that there are only four items in the information section. Responses are marked on a 5-point Likert scale, with higher scores indicating greater quality. Permission was obtained to use the tools.

Experts with experience in the development and/or design of health-related apps were recruited through the developer community to evaluate the candidate apps in terms of technical aspects and the user interface (UI). Five experts (four app developers and one app designer) evaluated the candidate apps using the MARS after using each app for at least 10 minutes.

Clinical experts with experience in the treatment of or research on dysmenorrhea or PMS patients were recruited through the related community to evaluate the candidate apps in health provider terms, especially in content and clinical aspects. Five experts (four physicians and one nurse) evaluated the candidate apps after using each of them for at least 10 minutes. They used the uMARS as an evaluation tool, as clinical experts evaluated the apps in terms of the user aspects, as well as their own point of view on recommending the app to their patients.

Eleven participants who experienced dysmenorrhea and/or PMS were recruited as potential users to evaluate the candidate apps and participate in an FGI through social networking services. They were divided into three groups according to occupation and age: four professional workers in their 20s and 30s, four students in their 20s, and three researchers in their 20s. Focus group interviews were conducted to clarify the results of the quantitative evaluation by both app and clinical experts.²³ The potential users assessed each of the candidate apps for at least 10 minutes before the interview. The questions posed during the FGI were structured around the uMARS. Finally, the potential users' perspectives as regards advantages and disadvantages of each app, and needs when using apps for managing dysmenorrhea and/or PMS, were used to determine actual users' needs. The interview duration varied from approximately 60 to 120 minutes depending on the size of the focus group.

This study was preapproved by the institutional review board (1702/001-011). We collected only a minimal amount of personal information and stored the collected data safely in a separate area. The data will be destroyed 5 years after the completion of the study.

RESULTS

App Searching and Screening

Initially, 402 apps were found in the US Apple iTunes store, 1427 were found in the US Google Play store, 299 were found in the Korean Apple iTunes store, and 656 were found in the Korean Google Play store. Figure 2 shows a flowchart of this process. After screening, 369 apps were finally included in the quantitative analysis.

Application Checklist: Design Method of App Selection Based on User Needs

Figure 3 displays the two mind maps drawn during the groups' brainstorming sessions. They contain comprehensive content on women's hormones and life cycle, including not only dysmenorrhea and PMS but also pregnancy, menarche, and menopause. This information was used to develop the virtual users (personas).

Two personas and scenarios were created. Persona A was a woman in her 20s experiencing severe dysmenorrhea. The scenario for persona A is the first day of her period and dysmenorrhea experience. She searches for ways to relieve the pain by using a mobile app. Persona B is a man in his 20s who is in a relationship with a woman who has severe PMS. The scenario for persona B revolves around his girlfriend's behavior and mood changes due to PMS. He searches for solutions to the problem by using a mobile app. The needs of the personas included information on and management of period cycle, dysmenorrhea, PMS, women's health checkups, women's health problems, medications, and contraception. Furthermore,

visualization of symptoms, information sources, information sharing, community for users, password setting/privacy policy, and login features were included in the checklist. Each component of the checklist was assigned a score of 3 points. Partial scoring and relevant components were determined through discussions with nursing informatics experts, as described in the Methods section.

Application Analysis: Intensify Method of App Selection Based on User Needs

Table 1 shows the characteristics and checklist features of the 369 apps. Nearly half of them (185) had a score of less than 10 points, and 13 apps had a score of 0. The data extraction and scoring features of the apps are also shown in Table 1.

The highest checklist score that an app received (from virtual users) was 35, followed by 33, 32, 30, and 29. No apps received either 34 or 31 points. A total of 14 apps had one of these top five checklist scores (35, 33, 32, 30, or 29). Five candidate apps were then selected according to the multilayered criteria described in the Methods section. Of the three apps with 35 points, the app with the highest rating (5 points) was selected as app A, and the only app with 33 points was selected as app B. In addition, of the three apps with 32 points, the one with the highest rating was selected as app C. Of the three apps with 30 points, the one with the highest rating was selected as app D. Finally, of the four apps with 29 points, two apps (one free and one paid) had the highest rating; thus, we chose the free app as app E. The detailed scores of the five candidate apps are shown in Figure 4A.

Application Evaluation: Verify Method of App Selection Based on User Needs

The evaluation of the five candidate apps was performed by app experts, clinical experts, and potential users, as described in the Methods section (see Figure 4B). App A, which had the highest score on the checklist, was rated as the best app by app and clinical experts; in addition, potential users chose it as their preferred app.

In the evaluation by app experts, the following ranking was observed: app A (first place); apps B, D, and C (joint second place); and app E (last place). Similarly, app A was also ranked first by the clinical experts. The remaining apps were ranked as follows: apps B and E (joint second place) and apps C and D (joint third place).

Table 2 shows the characteristics of the interviewees and their responses. The interview data revealed that both UI and language were very important. The participants usually chose apps because of the app design and ease of use. In addition, they avoided certain apps because of the kind of language used and the presence of translated words. This led to them choosing app A, C, or E. Almost all participants in the FGI wanted to use these apps after the interview.

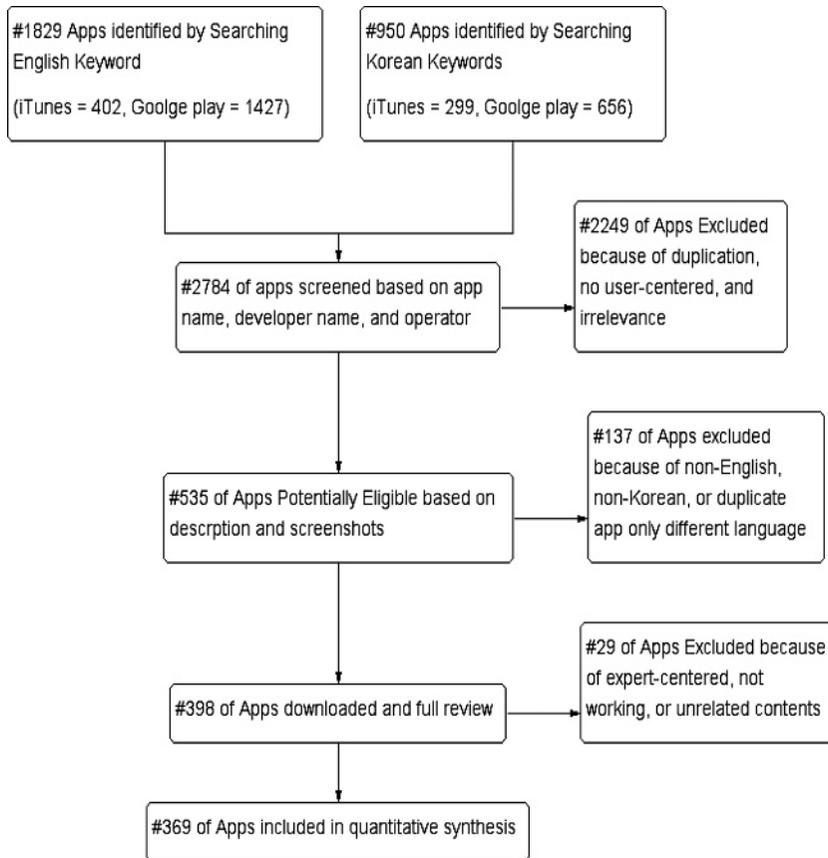


FIGURE 2. Overview of app selection and screening process and number of applications remaining after each step.

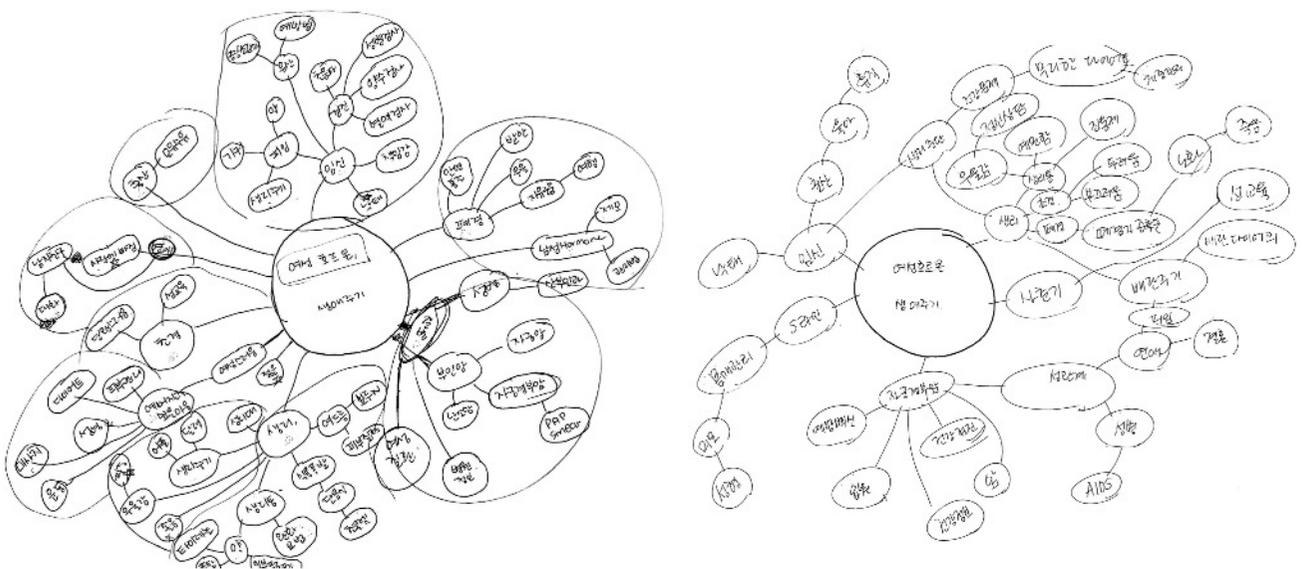


FIGURE 3. Mind map after brainstorming of the two groups.

Table 1. Characteristics and Features of the 369 Apps

Characteristics	
Operating system, n	
iOS	186
Android	244
Both	61
Rating, mean (SD)	3.90 (0.82)
No. reviews, mean (SD)	15584.5 (203119)
Cost of apps, mean (SD)	2.57 (1.66)
No. free apps, mean	220
Language, n	
English	315
Korean	97
Both	43
Features	
Period tracking	0, absent 100 3, present 269
Dysmenorrhea management	0, absent 175 1, information provided 42 2, record available (symptom) 86 3, record available (level of symptom) 66
PMS management	0, absent 193 1, information provided 28 2, record available (symptom) 86 3, record available (level of symptom) 62
Visualization (graphical chart)	0, absent 237 3, present 132
Birth control pill	0, absent 239 1, record available 12 2, information 113 3, both 5
Medication	0, absent 287 1, record available 15 2, information 66 3, both 1
Women's health information	0, absent 248 3, present 121
Women's health checklist	0, absent 308 1, information 36 2, support check 21 3, both 4
Information sharing	0, absent 281 3, present 88
User community menu	0, absent 316 2, categorized by symptom or disease 41 3, present 12
Information sources	0, no reference 318 3, reference used 51

(continues)

Table 1. Characteristics and Features of the 369 Apps (Continued)

Characteristics		
Login feature	0, absent	278
	3, present	91
Password setting	0, absent	179
	3, present	190
Private policy	0, absent	295
	3, present	74

I did not even know about these five candidate apps. I just searched for “period” in the app store, downloaded what appeared at the top of the screen, and used it.

I think I will use these apps even after this interview. It is good to be able to record symptoms in various ways, and in particular, I think it will help to record my PMS. I like information sharing features in the apps.

DISCUSSION

App Searching

During the search for apps on August and September 2016, 1933 English-language apps were identified; however, only 369 apps were usable in clinical settings or everyday life. A previous study also showed that, of 1816 unique apps, only 242 (13.3%) were considered potentially useful for women's healthcare providers.²⁴ Therefore, this suggests that healthcare providers, such as nurses, should intervene in the selection of health-related apps for patients or consumers who are exposed to a large number of unrelated apps.

Application Checklist: Design Method of App Selection Based on User Needs

All the researchers who performed brainstorming and mind mapping had some understanding of women's health and mobile apps. However, their experience with menstrual pain and PMS differed. Brainstorming and mind mapping were used to freely share and materialize their experiences. Therefore, through this process, differences in their perceptions were identified, which stimulated their engagement to contribute more ideas in the next stage. This was in close agreement with the process found in other studies.^{25,26} The two personas and their scenarios helped to compile virtual users' needs for the checklist. Through this process, the researchers, who did not have experience with apps for managing dysmenorrhea or PMS, could create items for the checklist. The results were consistent with the assertion that personas can help predict potential users' needs and focus on their goals.^{27(pp15)}

Application Analysis: Intensify Method of App Selection Based on User Needs

Three raters independently performed a full review. Although it took approximately 1 month, this was essential to

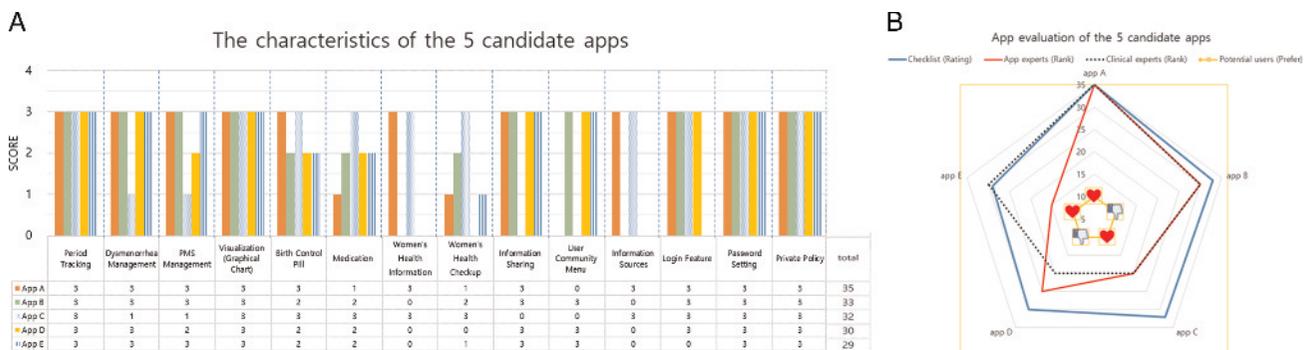


FIGURE 4. The characteristics (A) and app evaluation (B) of the five candidate apps.

find the best apps. For example, when a search for the term “dysmenorrhea” was performed in the Google Play store, the five candidate apps were not found. Using the term “period pain,” two of them were found, but they were in the 20th and 80th places, making them less accessible. Interestingly, these findings agree with those from the evaluation step. Even app experts, clinical experts, and FGI interviewees experiencing dysmenorrhea and/or PMS and using related apps were scarcely aware of the candidate apps.

The results for data extraction and scoring features revealed the present state of menstrual apps from the two dominant marketplaces for mobile device apps. In a previous study, many menstrual app users reported that tracking symptoms, such as skin problems and mood changes, was an important feature and daily self-monitoring that recorded symptoms on a calendar or chart helped women detect the pattern and severity of their symptoms.^{10,28} However, unexpectedly, 27.1% of the apps identified in our study did not have a menstrual cycle tracking feature. Furthermore, prospective ratings have been found to increase the precision of diagnosis and help to categorize symptoms that occur periodically.²⁹ Fortunately, dysmenorrhea and PMS management features such as rating of symptoms were provided in approximately half of the apps. However, only 35.8% of the apps identified in this study produced graphical charts to visualize those records. We recommend adding a visualizing dashboard in apps that can show changes in pain and emotions at a glance.

Although 121 apps were found to provide women's health information, only 36 provided health screening information. There were 22 apps supporting women's health screening, of which only four (1.08%) were able to direct users to nearby hospitals, whereas the others had only a feature to record medical checkup reminders. If a menstrual app is intended to support practical help for users, it will be necessary to include details on hospitals and medical insurance so that users can undergo a health checkup.

Furthermore, 53 apps were found to provide a user community menu, of which only 12 apps provided personalized

menus according to the specific disease. Although 23.8% of the apps provided an information-sharing feature, only 13.8% showed the sources of the information provided. It has been pointed out that the information presented in women's health apps requires verification by clinical experts, who reported that it would be preferable to specify the source and verify accuracy or not to provide information at all than to provide misleading, inaccurate, or dangerous information.

Application Evaluation: Verify Method of App Selection Based on User Needs

All five candidate apps provided a period tracking calendar, graphic chart, password setting, and privacy policy. Both app and clinical experts ranked app A as first. This app met all criteria and provided the features of community, support for women's health screening, and recording medication details, among others. Regarding second place, the app experts chose app B (based only on its checklist score) because it provided the features of community and information sharing through an intuitive interface, despite the lack of information about women's health and medication. App E was also ranked second by the clinical experts because it possessed a clear dysmenorrhea and PMS management feature and had community menu and information-sharing features, although there was no login feature. App E is one of the most downloaded mHealth apps in the world.¹¹ Its login function was intended to allow users to write posts to online communities rather than to the app community itself. In the current study, only 24.7% and 20.1% of the identified apps provided a login feature and personal information protection policy, respectively.

The potential users also selected app A as their most preferred app, similar to the other groups, and they also gave high rankings to apps C and E. There were several reasons for their choice of app A: simple design, information-sharing feature, and many menus to record PMS symptoms. Users were surprised by app A, which displayed information based on published research. However, some interviewees said that app A would be even better if it had a community

Table 2. Characteristics and Key Responses of the Interviewees

Characteristics of the 11 interviewees		
Age, mean (SD), y		25.82 (5.19)
Job	Student	4
	Researcher	3
	Professional	4
Menstrual app use experience	Yes	7
	App D	1
	Other (not the five candidate apps)	6
	No	4
Name of the App	Evaluating the Five Candidate Apps	
App A	Like	"I like it because I can share information with other users," "I can see the cycle at a glance," "It's convenient," "The design is pretty," "It would be good for PMS management," "It works well with iPhone health apps," "It has a lot of alarms. So I can set it up for myself," and "It has a lot of information on drugs and symptoms and is reliable."
	Dislike	"It has a lot of questions initially," "It does not seem to have a wide choice of symptoms," and "I feel it's similar to studying."
	Want to use	Almost all the interviewees said yes.
App B	Like	"I like the app design theme selection," "I think it is suitable for viewing only the menstrual cycle," and "Graphs such as those for body temperature seem to be good."
	Dislike	"It's difficult," "It's more suitable for pregnant persons," "It's difficult because it is in English," and "It's hard to understand the structure of the app and inconvenient to find the menu with the content I want."
	Want to use	Almost all the interviewees said no.
App C	Like	"There are informative videos on various topics," "It's easy to use the menus," "I like that icons appear on the calendar when recording," "Because an oriental medicine doctor appears on the video, it's trustworthy," and "The webtoon about women's health is fun."
	Dislike	"Because there are a lot of ads, it's not reliable," "It's inconvenient to login," "There is no calendar on the home screen," and "The interface is slow."
	Want to use	Two of the interviewees said yes.
App D	Like	"I can see it at a glance," "The theme setting is pretty," "I like that icons appear on the calendar when recording," and "It's fun to read community posts and it's good because the community is active."
	Dislike	"The app has a mixture of English," "It's hard to know when the next menstrual period is," and "It's inconvenient to find a menu with the content I want."
	Want to use	Almost all the interviewees said no.
App E	Like	"It's good for maintaining a diary because there are notes," "I like the theme settings," "The design is intuitive," "It's good to be able to ask questions about pregnancy to the community," "It's fun to read community posts," and "It's easy to back up my information."
	Dislike	"Ads show up," "It's hard to see UI at a glance," and "The graphs are not good."
	Want to use	Four of the interviewees said yes.

menu to share their symptoms and solutions with other users with the same symptoms. App C, in which the dysmenorrhea and PMS management feature was simplified and there was no community menu or information-sharing feature, was developed by an Asian traditional medicine clinic. Its contents were primarily videos. The interviewees who selected app C stated that their interest in dysmenorrhea and PMS was likely to continue because the app was interesting and they could trust the information provided, as physicians appeared on the videos on women's health. This finding about videos is

in close agreement with results from earlier experimental studies.^{30,31} App C, which is based on traditional Asian medicine, may have been chosen as the preferred app because of the cultural background of the potential users. Furthermore, the clinical experts in this study were concerned about the scientific accuracy of the traditional Asian medicine information. In recent years, however, Western medicine has begun using traditional Asian medicine methods to treat various health problems, including women's health issues, and its effectiveness has been demonstrated in the

literature.^{32,33} The barriers for apps based on traditional Asian medicine are likely to decline gradually. In addition, some interviewees responded that they wanted information about the management of medications. However, only 35.2% of the 369 apps examined had a menu related to contraceptive pills. Moreover, only 22.2% of the 369 apps provided information about other medications.

Strength of the Method of App Selection Based on User Needs and Nurses' Role

To implement the MASUN and ensure the effectiveness of the apps in a clinical environment, it is necessary to increase compliance by reflecting users' needs, address the technical and UI issues with the relevant app developer, and verify the clinical effectiveness of apps by clinical experts. Using mixed methods is very helpful to understand not only potential users' needs and preferences but also the perspective of app and clinical experts. Our findings were in close agreement with those from an earlier study on diabetes management via mHealth.³⁴ If only users' needs are considered, there is a risk that users may select apps that look interesting although their menus for managing health problems are weak, as with app C. Similarly, it is not enough to consider only the clinical experts' opinions because they may judge an app based on its contents and the convenience of use, while missing security issues such as login features, as with app E. Therefore, there was also a need to get advice from app experts on technical issues. Thus, it is essential to integrate the judgments of users, app experts, and clinical experts by using MASUN so that target consumers are provided with the best app. Moreover, nurses specializing in women's health should be familiar with women's health apps, which can increase the quality of nursing care in the long term.^{35,36} Indeed, when nurses recommended a health management app to patients, the duration of app use was longer.¹¹ Taken together, the findings from this study suggest that nurses could be a bridge to connect and coordinate the needs of users, app experts, and other healthcare providers. In addition, they can use the MASUN for patients to manage other health problems in daily life, such as obesity and diabetes mellitus. Although the results of this study were verified by means of the FGIs, randomized clinical trials (RCTs) are needed to apply results to clinical settings. Our research team is conducting an RCT based on the results of this study.

CONCLUSION

This study is significant in that it investigated the needs of users who experience dysmenorrhea and PMS and suggested a method, the MASUN, whereby health providers can select the best app for them. This method was evaluated by various users and app and clinical experts using mixed methods. All three groups ranked app A the highest;

however, the remaining rankings differed. App A met many criteria; in particular, it has a simple design, information-sharing features, information sources, and numerous menus to record symptoms. However, it did not provide the features of user community, support for women's health screening, and recording medication details. In conclusion, this study suggests how to find and use the best among existing apps and demonstrates the need for nurses who can understand and combine the opinions of users with those of app and clinical experts. Furthermore, the MASUN can be used by consumers who want to find apps to manage many other health problems.

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Corrigendum to: A Comparison of Two Nursing Program Exit Exams That Predict First-Time NCLEX-RN Outcome

In the August 2014 (vol. 32, issue 8) Online issue of *CIN: Computers, Informatics, Nursing*, the last 2 paragraphs of the “RESULTS” section on page 407 should read: “Chi-square statistics revealed no significant differences ($P > .05$) in success related to gender, race, RNCP form, and NCLEX-RN blueprint. However, independent t tests showed that students who failed had significantly lower cumulative GPAs, RNCP scores, and E2 scores.”

This is noted in the online article available at <http://www.cinjournals.com>.

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