Methodological Issues in Nursing Research using IT Technology: A Discussion Paper

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Purpose: Recent advances in computer and mobile technologies have brought increasing usages of IT technology in nursing research across nursing fields. Despite the increasing usages, there has been little discussion on methodological issues involved in nursing research using IT technology. This is a discussion paper to identify methodological issues in IT technology-based nursing research. **Methods:** An analysis was done using content analysis on research team meeting minutes and research team members' research diaries in a clinical trial that tested the efficacy of a technology-based intervention. First, several major categories of IT technology-based nursing research are concisely summarized. Then, the method that was used for this analysis is presented. **Results:** The findings are presented as themes reflecting methodological issues in IT technology-based research: (a) difficulties in recruitment due to necessary technology literacy; (b) facilitating recruitment through allowing the use of multiple languages; (c) participants' preferences for specific IT technology; (d) efforts needed to ensure technological security; (e) participants' preferences for design; and (f) necessary considerations on timing. **Conclusion:** Finally, future directions for nursing research using IT technology are proposed based on the identified issues.

Key Words: Information technology; Nursing methodology research; Methods; Nursing

INTRODUCTION

Recent advances in computer and mobile technologies have brought increasing usages of IT technology in nursing research across nursing fields [1-6]. Mainly due to easy access (e.g., 24 hour, 7 day access), IT technology has been widely used in health care fields including nursing [1-6]. Furthermore, IT technology using computers and mobile devices (mobile phones and tablets) provides a more effective medium for nursing research compared with traditional media of research (e.g., pen-and-pencil questionnaire, printed pamphlets, face-to-face meetings, phone calls, etc.) [7-10]. For instance, an Internet education program provided an efficient way to deliver knowledge and information to metabolic syndrome patients in promoting their physical activity [11]. An Internet-based smoking cessation program was also effective in reducing smoking among adolescents through providing information and coaching through the Internet [12].

Despite the increasing usages, there has been little discussion on methodological issues involved in nursing research using IT technology [2]. When multiple databases were searched during the past decade to identify articles on methodological issues involved in nursing research using IT technology, only few articles were identified [13-15]. Except the papers by the authors of this paper, most issues that have been discussed are related to descriptive studies that used the Internet as a plain data collection method or a data source [4,5]. Subsequently, these papers rarely provide directions on what need to be considered in the use of IT technology in nursing research in general because they tended to focus on issues in simple usages of the Internet as a quantitative or qualitative data collection medium or method [4,5].

In this paper, to identify methodological issues in using IT technology in nursing research in general, research team meeting minutes and research team members' research diaries from a clinical trial that tested the efficacy of a technology-based intervention were analyzed using a content analysis. In this paper, IT technology refers to

technology using computers and mobile devices to save, search, transmit, and manage data or information. Here, IT technology-based research in nursing mean nursing studies using computers and mobile devices as data collection and/or intervention medium. First, several major categories of IT technology-based research are concisely summarized. Then, the method that was used for this discussion paper is presented. The findings are presented next as the themes reflecting methodological issues in nursing research using IT technology. Finally, future directions for nursing research using IT technology are proposed.

1. IT Technology-based Research in Nursing

Based on the previous categories of Web-based interventions by Im and Chang [2] and new evolving IT technology using mobile devices (e.g., smartphone, tablets), IT technology-based research in nursing could be roughly categorized into: (a) IT technology-based descriptive studies; (b) IT technology-based education/information programs; (c) IT technology-based coaching/consultation programs; (d) IT technology-based decision support systems; (e) IT technology-based support groups; (f) IT technology-based games; and (g) combinations of multiple categories (e.g., IT technology-based education/information programs + IT technology-based support groups).

IT technology-based descriptive studies often use simple online questionnaires/surveys, online forum discussions, or social media for data collection and/or data sources. The purpose of these studies is usually to gather the descriptive data through an online medium to explore a specific nursing phenomenon with various specific aims (e.g., to describe characteristics of a specific study population, to examine the associations among different variables, etc.). For instance, Im and her colleagues [16] conducted a national scope Internet survey on menopausal symptoms among four racial/ethnic groups of midlife women using IT technology (through computers and mobile devices). They used the Internet survey to overcome geographical constraints; it was difficult to recruit an adequate number of racial/ethnic minority women in a local area where racial/ethnic diversities did not exist.

IT technology-based education/information programs usually include educational/informational content from conventional education programs through IT technology-based media. The goal of these programs is to provide their users with access to educational/informational materials through multiple media. For example, Reynolds et al. [17] tested the acceptance of a technology-based education/in-

formational program for sexual health risk-reduction in Ecuadorean adolescents. Thobias and Kiwanuka [18] developed a mHealth data model (educational/informational) to improve the knowledge on reproductive and child health services in rural areas (low resource areas) among mothers.

IT technology-based coaching/counselling programs aim to provide coaching and/or counselling in health-related topics (e.g., self management of diabetes, counselling for depressive symptoms). For instance, Wootton et al.[19] tested a telehealth counselling program for youth and young adults living with HIV. Hecht et al. [20] examined the efficacy of a motivational counseling intervention using automated interactive voice response (IVR) telephone and text messaging for those with serious mental illness.

IT technology-based decision support systems provide their users with assistance in making decisions associated with health-related choices. For instance, Saver et al. [21] developed an online decision support system to assist midlife women to make right decisions on management of menopausal symptoms, hormone replacement therapy, and preventive health behaviors. Also, in the study by Im and Chee [22], a decision support system was developed and tested to assist nurses to make culturally appropriate decisions on cancer pain management for racial/ethnic minority patients with cancer.

IT technology-based support groups provide peer or professional support as in traditional support groups, but through different channels such as Web-based media (e.g., chat room, smart phone app, etc.). The users could usually share their opinions and experience with their peers or health care providers in order to provide support and advice. For instance, Herman and colleagues [10] utilized an online discussion platform to give peer support for African American women who were low-income, first-time pregnant. Also, in the study by Cantrell and Conte [9], they utilized a chat room using audio, video, and text chats for increasing hope among young women cancer survivors.

IT technology-based games aim to be educational aids in enhancing cognitive and/or social skills among younger populations (e.g., adolescents). For example, Horvath et al. [23] tested a technology-based intervention using gamification components to increase antiretroviral therapy adherence of men who had sex with men. Also, in the study of Sward et al. [13], they utilized an online game in order to test the knowledge on pediatrics among medical students.

Finally, because these categories are not mutually exclusive, many researchers have combined these different types of IT technology-based research methods in their studies. Indeed, in a number of studies, different types of

IT technology-based interventions are combined. For example, Penn and Kuperberg [24] adopted multiple components of technology-based interventions including peer support interventions, personalized psychoeducational counseling, and skill-enhancing interventions in order to assist adolescents and young adults with cancer. In the study of Weinert et al. [25], they combined an online education program and a virtual support group to provide coaching/support for self-management among midlife women with chronic diseases in rural areas.

2. The Original Study

The original study that was the basis for this discussion paper aimed to test a culturally tailored technology-based intervention in its efficacy to improve Asian American breast cancer survivors' survivorship experience. The study was approved by the Institutional Review Board of the institute where the authors worked. The participants came from only three sub-ethnic groups including Chinese, Koreans, and Japanese. These sub-ethnic groups were chosen because Chinese are the largest group within Asian Americans [15,16], Koreans are the most rapidly increasing group within Asian Americans [15,16], and Japanese have the highest risk of getting breast cancer among Asian Americans [17-20].

The original study adopted a randomized control group design (repeated measures pretest/posttest). The study aimed to recruit 330 Asian American breast cancer survivors through online and offline support groups and communities/groups that targeted Asian Americans. The intervention group used the intervention and an online site by the American Cancer Society (ACS) during the period of 3 months. The control group used only the online site during the period of 3 months.

The intervention itself was consisted of three culturally tailored components including sub-ethnic specific social networking sites, sub-ethnic specific education sessions, and sub-ethnic specific online resources. The intervention was provided in four languages (Mandarin Chinese, Korean, Japanese, and English), and the participants were allowed to choose their preferred languages to use the intervention. The social networking sites were managed and moderated by culturally matched bilingual interventionists, and culture-specific examples from former studies of the research team were used to guide the discussions in the sites. The education sessions included general and sub-ethnic specific information on breast cancer survivorship. The online resources also included links to general and sub-ethnic specific resources in the U.S. and in the participants' countries of origin.

The questionnaires included 14 items on background characteristics (e.g., gender, education, religion, family income), 8 items on health/disease characteristics (e.g., perceived health, breast cancer diagnosis, length of time after diagnosis, and cancer stage), the Functional Assessment of Cancer Therapy Scale-Breast Cancer [26], the Memorial Symptom Assessment Scale-Short Form [24], and the Support Care Needs Survey-34 Short Form [23]. All the measurement scales were reliable and valid in Asian Americans (Cronbach's $\alpha = .76\sim.96$). An intent-to-treat linear mixed-model growth curve analysis [27] was done to analyze the data. More details on the study could be found elsewhere [14].

METHODS

Themes reflecting methodological issues in nursing research using IT technology were extracted using a content analysis. The minutes from regular team meetings and weekly diaries on issues/concerns by team members were the data sources. Team members were asked to write and keep research diaries throughout the research process, and research team meetings were recorded as minutes. The minutes of research team meetings were about 1-2 pages (single-spaced) per meeting (3 to 4 meeting per month); over 80 pages (single-spaced) were included in the analysis. About 300 pages of memos (26 to 80 pages per team member) were written as narratives or bullet points. Then, all the data were analyzed using the content analysis by Weber [28]. First, the data were reviewed at multiple times, and line-by-line codes were developed. Then, the codes were reviewed and finalized through team meetings. The unit of analysis was individual words. Then, the codes were re-reviewed for categorization, and the extracted categories were combined to reflect methodological issues in nursing research using IT technology. Through the process, six themes were extracted from the categories. This thematic analysis aimed to provide the bases for this discussion paper rather than aiming at a full qualitative research study.

RESULTS

1. The Methodological Issues (See Table 1)

1) Difficulties in Recruitment Due to Necessary Technology Literacy and Cultural Attitudes

From 1990s when researchers began to use IT technology, technology illiteracy of research staff members and/

Table 1. Methodological Issues and Suggestions for Future IT Technology-based Research

Issues	Suggestions
Difficulties in recruitment due to necessary technology literacy and cultural attitudes	· Development of step-by-step guidelines for the participants
Facilitating recruitment through allowing the use of multiple languages	· Consideration on potential participants' preferences for the methods (e.g., language, app, communication medium, email, etc.)
Participants' preferences for specific IT technology	
Efforts to ensure technological security	· Development and adoption of strategies to protect human subjects in advance. · Getting advice from computer system administrators and/or network administrators of researchers' institutions first, and developing guidelines for research team members. · Being aware of regular and time sensitive updates on computer and smart phone technologies adopted in their research. · Updating their knowledge and skills through conferences, seminars/workshops, other education sessions (e.g., Webinars, panel discussions)
Participants' preferences for intervention design	· Regular training of research team members and/or interventionists and development of study protocols for standardized data collection process and/or intervention process
Necessary considerations on timing	· Consideration on timing and geographical constraints in study design

or research participants has been reported as a major methodological issue in IT technology-based research [26]. Although there have been drastic advances in computer and mobile technologies and the use of computers and mobile devices became ubiquitous, technology illiteracy is still a methodological issue in IT technology-based research, especially IT technology-based intervention studies. Indeed, in the original study, some groups of potential participants would not be able to participate in the study due to their technology illiteracy and/or lack of access to the technology, which limited the potential pool of participants. In the original study, a total of 222 participants were recruited for 3.5 years (63 to 64 participants per year) despite various recruitment strategies that we adopted for the study. Throughout the research process, those who were not able to use computers and/or mobile devices were automatically excluded because of the nature of the technology-based intervention (e.g., the participants needed to use their computers or mobile devices to use the intervention). All the participants had access to the project website through their computers and/or mobile devices (mostly smartphones).

With this requirement of technology literacy, Asian Americans' general attitudes toward research also negatively influenced the recruitment process of the participants for this technology-based study. It is well known

that it would be difficult to recruit Asian Americans into research studies in general [29]. A possible reason for their hesitance in participating in research would be their mistrust toward government and medical research due to their previous experience with the U.S. authorities. Historically, they experienced the Gentleman's Agreement between the U.S. and Japanese Governments that prohibited the immigration of Japanese men [30], the Naturalization laws that prohibited Asians from U.S. citizenship until 1952 [30], and the internment of Japanese Americans in the World War II [30]. Especially with a stigmatized condition such as breast cancer among Asian Americans [31,32], it would be much more difficult to recruit this specific group of participants into any types of research. This signifies that, even in nursing research using IT technology, this kind of potential participants' attitudes toward research participation could affect the research methodology in general and the recruitment and retention process in particular.

2) Facilitating Recruitment through Allowing the Use of Multiple Languages

IT technology enabled the use of multiple languages in the original study, which strongly supports the strengths of IT technology-based research in approaching marginalized populations who tend to be difficult to approach in real health care systems due to multiple reasons such as

language proficiency, power differentials, transportation difficulties, etc. Indeed, for the study, the use of multiple languages was essential because the participants included many non-native English speakers. The adoption of IT technology easily allowed the use of multiple language versions of the project website, informed consent, educational modules, and online resources. Then, the use of multiple language versions allowed the participants to choose their preferred languages in their participation in the study. It was obvious that the use of multiple languages facilitated the recruitment and retention of many participants who might have not joined the study only with the use of English. It is reported in the literature that those with limited language proficiency are less likely to ask questions [33]. In other words, with language difficulties, they would not participate in research studies that they would need to ask questions and get answers. Indeed, in this specific study, the research team members frequently recognized that the participants wanted to participate in the study because they could use their native languages to get help for their survivorship issues/concerns. Also, the research team members frequently found that the participants preferred the use of their native languages in answering the questions in the questionnaires even when they were able to read and write in English.

3) Participants' Preferences for Specific IT Technology

Participants' preferences for specific IT technology are an important factor to consider in IT technology-based research, which could affect the process of recruitment, retention, intervention, and data collection. In the original study, the intervention was provided through a project Website that the participants could access through both computers and mobile devices. Because Asians have been reported as the racial/ethnic group whose usages of computers and mobile devices are more prevalent than any other racial/ethnic groups' [27, 29-31], no issue/concern was expected at the beginning. However, the reality was a little bit different; the participants preferred utilizing their own apps such as Line, WeChat, and Kakaotalk in order to get coaching/support and communicate with the interventionists. They preferred the use of multiple functions included in their apps that they were usually using in their daily life (e.g., voice calls using the app, voice dictation functions, instant messaging). Furthermore, the original plan for using emails for communication (e.g., study updates, reminders, etc.) needed to be changed as well. In many cases, the participants did not know how to access their emails even when they had email accounts. In many cases, the participants needed the research team members'

assistance to go through the intervention and surveys; they wanted to get step-by-step instructions through their social media apps and/or phone calls. The use of the communication apps was helpful and essential in participant recruitment as well. For instance, when WeChat was used to announce the study just for New York areas, we had over 7K clicks during just one day.

The use of communication apps by the participants added another layer of human subject protection issue though because the apps usually involve risks related to privacy and confidentiality. Thus, in the original study, the participants were allowed to use their apps only to contact the interventionists, and the research team members were allowed to use the apps only to send reminders to the participants. Also, the participants were required to use only nick-names, and identity information was always blocked (not allowed to use) during communication.

4) Efforts to Ensure Technological Security

Human subject protection issues have been one of the major methodological concerns related to IT technology-based research [26,27,29,30]. The concerns include those related to protection of privacy, copyright, and confidentiality, lack of ethical guidelines and/or policies related to IT technology-based research, and unanticipated consequences due to the use of IT technology [26,27,29,30]. Despite continuous efforts to establish national and/or international standardized guidelines for IT technology-based research, virtually none is clearly established [24]. Conventionally, the SANS/FBI recommendations, the Health Insurance Portability and Accountability Act (HIPAA), and the Ubuntu Linux security updates are frequently used to guide IT technology-based research in recent years. However, the lack of standardized guidelines/policies could be a major issue in IT technology-based research.

In the original study, the project website was developed and maintained in the central servers of the institute where the study was conducted. Subsequently, it was assumed that the servers and website were regularly updated/upgraded and carefully monitored by the IT office However, the research team was contacted by the participants at multiple times because they had a warning security message from the project website when they tried to log in, which actually made some of them to decline to participate in the study. The participants were seriously concerned that their privacy might not be ensured, and they declined to participate or withdrew their participation during the research process. Subsequently, this greatly affected the process of recruitment, retention, intervention, and data collection.

The use of emails also brought up some human subject protection issues at multiple times in the original study. One of the cases was: an interventionist sent out an email from her gmail account because her institutional email account was not working in a specific time period and she did not want her participant to wait until her institutional email account was back to normal. Due to strict regulations related to email communication at the institute where the original study was conducted, it raised a red flag, and the interventionist needed to go through multiple layers of training related to email communication, which significantly delayed the research process.

5) Participants' Preferences for Intervention Design

Participants' preferences for intervention design were another important factor to consider in IT technology-based research. In the original study, there were several intervention design issues, which were mainly related to the project website design. One of them was the font size used in the project website. The participants of the original study tended to be older, and many of them had vision problems in reading the content in small fonts. Also, the project website needed to be developed in multiple languages as in the components of the intervention itself. When the first home page of the project website was designed only in English, some participants could not create their accounts in the website to participate in the study. Step-by-step instructions in their original languages were essential to make them to register for the website.

Another intervention design issue was how to design the intervention to retain the participants. In the original study, having a symptom log through which the participants could monitor their progress (to meet the goals that they set with the interventionists) was helpful in retaining the participants in the intervention. Weekly reminders through texting was also helpful in retaining the participants in the intervention for three months. Also, providing educational sessions that were directly related to recent concerns/issues of the participants was also helpful in retaining the participants in the intervention. Finally, regular updates of the resources provided in the intervention were also essential to keep the participants' interests and retain the participants in the intervention.

6) Necessary Considerations on Timing

Timing is another important factor to consider in the design of any IT technology-based research studies, especially in the data collection and/or intervention process. In the original study, a national sampling/recruitment was done because the number of Asian Americans living in one local area would not be enough to test the efficacy of the intervention. With the national recruitment process, methodological issues related to time and geographical constraints were raised. For instance, some participants did not trust the study because the original study was conducted in a different state from theirs. Furthermore, as other researchers have raised [3,32,34-36], timing issues were one of the methodological concerns in the original study as well. Indeed, the differences in time zones between the participants and interventionists decreased the efficiency of the intervention implementation. Many participants wanted to schedule individual coaching sessions at their convenience, which was usually not during the interventionists' working hours. Furthermore, it was difficult to maintain the participants' adherence during holidays such as Christmas and summer vacations.

DISCUSSION

1. Suggestions for Future IT Technology-based Research

These methodological issues provide some directions for future IT technology-based research. First of all, for future IT technology-based research, step-by-step guidelines for the participants need to be developed and provided for the participants. As discussed, although the participants were required to use computers and/or mobile devices for their participation in the study, many participants were not technology savvy (although they had access to computers and/or mobile devices). Thus, step-by-step instructions by the research team members were essential to make them even to sign up for the study and go through the research process successfully.

Second, researchers need to be aware of potential participants' preferences for the methods that will be used in their IT technology-based research (e.g., language, app, communication medium, emails, etc.). As discussed, the use of communication apps was not originally planned in the original study. However, due to the preferences on the use of apps by the participants, the apps were adopted for the study implementation. Without incorporating the participants' preferences into the study design and implementation plans, it would have been difficult to recruit the participants and conduct the intervention as planned in the research design.

Third, as in traditional research, researchers need to carefully develop and adopt strategies to protect human subjects in advance. Checking with IRB policies related to the use of IT technology would be essential to meet the requirements. Also, regular training on human subject

protection among research team members would be also essential to ensure adequate protection of human subjects. Furthermore, research records need to be regularly monitored to double-check any potential breaches in security and confidentiality of the study. In this way, studies could be successfully and ethically conducted as planned in the study design.

Fourth, it would be essential to get advice from computer system administrators and/or network administrators of researchers' institutions first, and develop guidelines for research team members as well. Especially, the research team members need to be on the same page about technical aspects of the study (e.g., the use of email accounts, etc.), which would ensure the rigor in data collection and/or the fidelity of the intervention. Furthermore, researchers need to be aware of regular and time sensitive updates on computer and smart phone technologies adopted in their research to ensure the security and confidentiality of their studies. They could easily update their knowledge and skills through conferences, seminars/ workshops, and other education sessions (e.g., Webinars, panel discussions).

Fifth, as in traditional research, the research team members of IT technology-based research need to be regularly trained. Surely, development of study protocols for standardized data collection process and/or intervention process would be essential to ensure the quality, rigor, and/or fidelity of the studies and/or interventions. Regular support group meetings for research team members and/or interventionists could also help ensure the quality, rigor, and/of fidelity of the studies and/or interventions.

Finally, researchers need to consider potential study and/or intervention implementation issues in IT technology-based research (e.g., timing, geographical constraints). As in traditional research, issues related to time and geographical limitations could also complicate the implementation of the study and/or intervention using IT technologies, which subsequently threatens the rigor of the studies.

CONCLUSION

In this paper, methodological issues in IT technology-based research were discussed based on the issues raised in an IT technology-based interventions study among Asian American breast cancer survivors. Based on the discussions, implications for future IT technology-based research were suggested. Despite high potential of IT technology-based research in many aspects of research process, researchers need to consider several methodological

issues in conducting IT technology-based studies. Maybe, with further advances in computer and mobile technologies, these issues could disappear in the near future. Or, further investigations on these issues could help develop more detailed and rigorous IT technology-based research methodologies for future nursing research.

REFERENCES

1. Jander A, Crutzen R, Mercken L, De Vries H. Web-based interventions to decrease alcohol use in adolescents: A Delphi study about increasing effectiveness and reducing drop-out. BMC Public Health. 2015;15:340.
https://doi.org/10.1186/s12889-015-1639-z

2. Im E-O, Chang S. Web-based interventions in nursing. Computers, Informatics, Nursing. 2013;31(2):94-102.
https://doi.org/10.1097/NXN.0b013e3182771868

3. Im E-O, Lee Y, Chee E, Chee W. Web-based interventions for menopause: A systematic integrated literature review. Maturitas. 2017;95:24-30.
https://doi.org/10.1016/j.maturitas.2016.10.009

4. Christensen H, Griffiths KM, Korten A. Web-based cognitive behavior therapy: Analysis of site usage and changes in depression and anxiety scores. Journal of Medical Internet Research. 2002;4(1):e3. https://doi.org/10.2196/jmir.4.1.e3

5. Kim C-J, Kang D-H. Utility of a web-based intervention for individuals with type 2 diabetes: The impact on physical activity levels and glycemic control. Computers, Informatics, Nursing. 2006;24(6):337-345.
https://doi.org/10.1097/00024665-200611000-00008

6. Sward KA, Richardson S, Kendrick J, Maloney C. Use of a web-based game to teach pediatric content to medical students. Ambulatory Pediatrics. 2008;8(6):354-359.
https://doi.org/10.1016/j.ambp.2008.07.007

7. Ye J. Acculturative stress and use of the internet among East Asian international students in the United States. Cyberpsychology & Behavior. 2005;8(2):154-161.
https://doi.org/10.1089/cpb.2005.8.154

8. Im E-O, Chee W. A descriptive Internet survey on menopausal symptoms: Five ethnic groups of Asian American university faculty and staff. Journal of Transcultural Nursing. 2005;16(2):126-135. https://doi.org/10.1177/1043659604273550

9. Paxton RJ, Nayak P, Taylor WC, Chang S, Courneya KS, Schover L, et al. African-American breast cancer survivors' preferences for various types of physical activity interventions: A Sisters Network Inc. web-based survey. Journal of Cancer Survivorship. 2014;8(1):31-38.
https://doi.org/10.1007/s11764-013-0307-5

10. Hobbs BB, Farr LA. Assessing internet survey data collection methods with ethnic nurse shift workers. Chronobiology Inter-

national. 2004;21(6):1003-1013.
https://doi.org/10.1081/cbi-200038529

11. Bosak KA, Yates B, Pozehl B. Effects of an Internet physical activity intervention in adults with metabolic syndrome. Western Journal of Nursing Research. 2010;32(1):5-22.
https://doi.org/10.1177/0193945909333889

12. Chen H-H, Yeh M-L. Developing and evaluating a smoking cessation program combined with an Internet-assisted instruction program for adolescents with smoking. Patient Education and Counseling. 2006;61(3):411-418.
https://doi.org/10.1016/j.pec.2005.05.007

13. Im E-O, Kim S, Xu S, Lee C, Hamajima Y, Inohara A, et al. Issues in recruiting and retaining Asian American breast cancer survivors in a technology-based intervention study. Cancer Nursing. 2018.
https://doi.org/10.1097/NCC.0000000000000657

14. Im E-O, Lee SJ, Hu Y, Cheng C-Y, Iikura A, Inohara A, et al. The use of multiple languages in a technology-based intervention study: A discussion paper. Applied Nursing Research. 2017; 38:147-152. https://doi.org/10.1016/j.apnr.2017.10.011

15. Im E-O, Chee W, Hu Y, Kim S, Choi H, Hamajima Y, et al. What to consider in a culturally tailored technology-based intervention? Computers, Informatics, Nursing. 2018;36(9):424-429.
https://doi.org/10.1097/CIN.0000000000000450

16. Im E-O, Lee B, Chee W, Brown A, Dormire S. Menopausal symptoms among four major ethnic groups in the U.S. Western Journal of Nursing Research. 2010;32(4):540-565.
https://doi.org/10.1177/0193945909354343

17. Reynolds C, Sutherland MA, Palacios I. Exploring the use of technology for sexual health risk-reduction among ecuadorean adolescents. Annals of Global Health. 2019;85(1):57.
https://doi.org/10.5334/aogh.35

18. Thobias J, Kiwanuka A. Design and implementation of an m-health data model for improving health information access for reproductive and child health services in low resource settings using a participatory action research approach. BMC Medical Informatics and Decision Making. 2018;18(1):45.
https://doi.org/10.1186/s12911-018-0622-x

19. Wootton AR, Legnitto DA, Gruber VA, Dawson-Rose C, Neilands TB, Johnson MO, et al. Telehealth and texting intervention to improve HIV care engagement, mental health and substance use outcomes in youth living with HIV: A pilot feasibility and acceptability study protocol. BMJ Open. 2019;9(7): e028522. https://doi.org/10.1136/bmjopen-2018-028522

20. Hecht J, Rigotti NA, Minami H, Kjome KL, Bloom EL, Kahler CW, et al. Adaptation of a sustained care cessation intervention for smokers hospitalized for psychiatric disorders: Study protocol for a randomized controlled trial. Contemporary Clinical Trials. 2019;83:18-26.
https://doi.org/10.1016/j.cct.2019.06.001

21. Saver BG, Gustafson D, Taylor TR, Hawkins RP, Woods NF, Dinauer S, et al. A tale of two studies: The importance of setting, subjects and context in two randomized, controlled trials of a web-based decision support for perimenopausal and postmenopausal health decisions. Patient Education and Counseling 66. 2007;66(2):211-222.
https://doi.org/10.1016/j.pec.2006.12.004

22. Im E-O, Chee W. The DSCP-CA: A decision support computer rogram--cancer pain management. Computers, Informatics, Nursing. 2011;29(5):289-296.
https://doi.org/10.1097/NCN.0b013e3181f9dd23

23. Horvath KJ, Amico KR, Erickson D, Ecklund AM, Martinka A, DeWitt J, et al. Thrive with me: Protocol for a randomized controlled trial to test a peer support intervention to improve antiretroviral therapy adherence among men who have sex with men. JMIR Research Protocols. 2018;7(5):e10182.
https://doi.org/10.2196/10182

24. Penn A, Kuperberg A. Psychosocial support in adolescents and young adults with cancer. The Cancer Journal. 2018;24(6): 321-327. https://doi.org/10.1097/PPO.0000000000000339

25. Weinert C. "Measuring Social Support: PRQ2000." In Measurement of Nursing Outcomes: Vol. 3. Self Care and Coping, 161-172. New York: Springer, 2003.

26. Bush NE, Wooldridge J, Foster V, Shaw K, Brown P. Web site design and development issues: The Washington State Breast and Cervical Health Program Web Site Demonstration Project. Oncology nursing forum. 1999;26(5):857-865.

27. Pew Internet and American Life Project. Demographics, degrees of Internet access, and health. February 2010.
http://www.pewinternet.org/~/media/Files/Presentations/2006/Fox_UNC_June_2006[1].pdf. Accessed December 31, 2013.

28. Weber RP. Basic content analysis. Thousands Oaks, CA: Sage; 1990.

29. Pew Internet and American Life Project. 17% of cell phone owners do most of their online browsing on their phone, rather than a computer or other device. 2012.
http://pewinternet.org/Reports/2012/Cell-Internet-Use-2012.aspx. Accessed May 20, 2014.

30. López G, Ruiz NG, Patten E. Key facts about Asian Americans, a diverse and growing population. Pew Res Cent. September 2017.
http://www.pewresearch.org/fact-tank/2017/09/08/key-facts-about-asian-americans/. Accessed February 19, 2018.

31. Fallows D. Pew Internet & American life report. How women and men use the Internet. 2005.
http://www.pewinternet.org/. Accessed May 20, 2014.

32. Shaw BR, Hawkins R, Arora N, McTavish F, Pingree S, Gustafson DH. An exploratory study of predictors of participation in a computer support group for women with breast cancer.

Computers, Informatics, Nursing. 2006;24(1):18-27.
https://doi.org/10.1097/00024665-200601000-00007

33. Green AR, Ngo-Metzger Q, Legedza ATR, Massagli MP, Phillips RS, Iezzoni LI. Interpreter services, language concordance, and health care quality. Experiences of Asian Americans with limited English proficiency. Journal of General Internal Medicine. 2005;20(11):1050-1056.
https://doi.org/10.1111/j.1525-1497.2005.0223.x

34. Massoudi BL, Olmsted MG, Zhang Y, Carpenter RA, Barlow CE, Huber R. A web-based intervention to support increased physical activity among at-risk adults. Journal of Biomedical Informatics. 2010;43(5):S41-S45.
https://doi.org/10.1016/j.jbi.2010.07.012

35. Neve MJ, Collins CE, Morgan PJ. Dropout, nonusage attrition, and pretreatment predictors of nonusage attrition in a commercial Web-based weight loss program. Journal of Medical Internet Research. 2010;12(4):e69.
https://doi.org/10.2196/jmir.1640

36. Hine C. Virtual Methods: Issues in Social Research on the Internet. Oxford, UK: Berg; 2005.