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A qualitative study of older adults and computer use for health education: 'It opens people's eyes'

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Abstract

Adults over the age of 60 struggle with achieving target blood pressure readings due to difficulties seeing, hearing, and understanding medical information, which can result in poor adherence and drug interactions that can be fatal. According to the Institute of Medicine (2000) approximately 10% of adverse drug events may be attributed to communication failure between the provider and patient. Informing patients of potential drug interactions with over-the-counter medications, supplements, and alcohol use can contribute to better blood pressure control. The Next Generation Personal Education Program (PEP-NG) was designed to improve patient care by educating both older adults and their providers about the dangers of adverse drug interactions arising from self-medication. This web-based programme analyses information entered by the patient user (with a stylus on a tablet computer) and delivers tailored interactive educational content applicable to the user's reported medication behaviours. This qualitative study demonstrated that even among participants who may not feel computer literate (older-age generation) it can be a useful tool for information dissemination and also a successful way to improve communication between provider and patient.

Keywords: Qualitative, Older adults, Hypertension, Communication, Nurse practitioners

Introduction

Hypertension (HTN) is a chronic disease that affects nearly 72 million people in the USA and approximately 1 billion people globally.[1] Older adults comprise a growing segment of this population and also utilize a significant amount of healthcare services. The estimated direct and indirect costs of high blood pressure (BP) in 2007 was $66.4 billion.[2] If complications including preventable adverse drug events and hospitalizations are included, the estimated annual cost of HTN in the USA exceeds $100 billion.[1] Contributing to these rising costs are issues of poor adherence to antihypertensive regimes and adverse self-medication behaviours.[3–6]

Background

Adults over the age of 60 have difficulty achieving target BP readings.[7] Within this ageing population, difficulties seeing, hearing, and understanding medical information can result in poor adherence and drug interactions that can be fatal. Failure to take medications properly is a growing problem and estimated to cost over $25 billion annually.[1] Providers often do not account for patients' self-medication behaviours, poor diet, and lack of knowledge and focus solely on alterations made to medication regimes in order to improve BP control.[8,9] Since high BP results in more doctor visits than any other condition, just a 10% decline in the number of visits would save $450 million each year.[1]

In today's world of sub-specialities and polypharmacy, the slightest miscommunication can also lead to adverse drug interactions. Time constraints prevent most physicians from being able to appropriately discuss all the necessary elements of a medication review during routine office visits.[10] Approximately 10% of adverse drug events may be attributed to communication failure between the provider and patient.[11] Informing patients of potential drug interactions with over-the-counter (OTC) medications, supplements, and alcohol use can also contribute to better HTN control.[3,4] Older adults have demonstrated large knowledge deficits related to these areas as well as decreased confidence in their ability to sidestep potential

problems.[12] Educational interventions aimed at increasing older (aged 60 and over) patients' knowledge and self-efficacy for avoiding adverse self-medication behaviours demonstrated positive clinical outcomes.[13,14]

The Next Generation Personal Education Program (PEP-NG) was designed to improve patient care by educating both older adults and their providers about the dangers of adverse drug interactions arising from self-medication. This web-based programme analyses information entered by the patient user (with a stylus on a tablet computer) and delivers tailored interactive educational content applicable to the user's reported medication behaviours. The PEP-NG computer interface was designed with user-friendly characteristics and ease of navigation with minimal user burden for both older adults and primary care advanced practice registered nurses (APRNs) (also identified as nurse practitioners). A detailed description of the PEP-NG development, results of formative evaluation during development, and formal usability testing with older adults and primary care providers (APRNs) have been published elsewhere.[13,15,16]

The design, methodology, and quantitative results of the PEP-NG clinical effectiveness trial have been reported previously.[17,18] The trial was approved by the University Institutional Review Board and met all Health Insurance Portability and Accountability Act (HIPAA) regulations prior to enrolling any provider or patient participants. The PEP-NG was tested with 160 older adults with HTN in 10 APRN primary care practices. Participants were self-referred. APRNs obtained consent and the PEP-NG randomly assigned participants to either control condition (data collection and four routine APRN visits) or intervention condition (data collection, tailored intervention, and four focused APRN visits). BP, self-medication behaviours, self-efficacy, and knowledge for avoiding adverse self-medication behaviours were assessed during four visits. Those in the intervention group received education tailored to the adverse patient-reported behaviours identified and included animations, corrective strategies, and interactive questions that allowed the patient to apply information learned. Patients in the intervention group also received a printout summarizing reported symptoms and medication use, identified adverse self-medication behaviours, and corrective strategies. The printout was reviewed by the APRN and patient, and was used as an educational guide during the primary care visit. The patient was also allowed to take it home for review. Those in the control group received a general education message and interactive animation and an explanation on how BP medicines work and why they should be taken every day. Patients in the control group were not provided with a printout. All patient participants completed an online satisfaction questionnaire at the end of the fourth visit. Participant's experiences with the PEP-NG will be addressed in this article.

Methods

Participants who completed all four visits were eligible to be interviewed. The APRNs in the study provided each of the participants with a card that included the necessary contact information. Participants that chose to be interviewed left a message on a dedicated telephone number. A member of the research team (a PhD nursing student) arranged a time for the interview, at the convenience of the participant. All interviews took place at the provider office where the patient was receiving care. A predetermined set of 15 open-ended questions was used to solicit information regarding what it was like to learn with the PEP-NG and their experience with the study (see

Table 1: Interview questions used for older adult participants in PEP-NG study.

1. How did you feel about using computers before you began using the PEP programme?
2. How has your use of the PEP programme changed your thinking about using computers?
3. What parts of the PEP were easy to use?
4. What parts of the PEP were difficult to use?
5. How well did you understand what your medicines were for before you began the PEP study?
6. Did the PEP study help you to learn about medicines?
7. How did what you know about your medicines change as a result of the PEP programme?
8. Did the PEP study change how sure you are about how to take your medicines?
9. How did your confidence (which is how sure you are) about medicines change as a result of the PEP programme?
10. Was there something about the PEP that was very helpful for you?
11. Do you think you will change the way you take your medicines after being in the PEP study?
12. How will you change the way you take your medicines after being in the PEP study?
13. What would you change about the PEP programme?
14. Is there anything else you would like to tell me about the PEP programme or about your meetings with the APRN who worked with you?
15. Is there anything else on your mind you would like to share as we complete the interview?

Table 1). Upon completion of the interview, the participant was provided with a $10 grocery gift card.

Since the intervention targeted older adults, the initial questions reviewed the participants' mindset about using computers and whether using the PEP-NG had changed their outlook. The logistics of using the PEP-NG (what was easy/what was difficult) was also examined. The questions then assessed how well participants understood their medication regimes prior to the study and whether participation improved their confidence and knowledge of their medications. Specific examples were requested. Finally, the interaction with the APRN was evaluated.

A total number of 23 participants left messages regarding an interest in being interviewed. Four participants declined a face-to-face interview, as they initially thought that the interviews could be done via telephone. A total of 19 participants (12 control/7 intervention) were interviewed from various sites. All interviews were conducted within 4 months of their last PEP-NG visit. Interviews were tape recorded and lasted between 20 minutes and 1 hour. The PhD nursing student interviewer transcribed all the interviews verbatim.

A content analysis[19] approach was used to guide data analysis. The use of this type of analysis emerged in the 1940s and 1950s and gained widespread acceptance across multiple disciplines. This process enabled many 'to embrace … the essence of human behaviour: talk, conversation, and mediated communication' (p. 12).[19] Qualitative approaches to content analysis emerged from literary theory, social sciences, and critical scholarship, and were sometimes labelled interpretive. Krippendorff[19] explained that analysts work 'within hermeneutic circles in which their own socially or culturally conditioned understandings constitutively participate' (p. 17). This qualitative research method involves the subjective interpretation of the text through systematically identifying, categorizing, and labelling the patterns and themes in the data. Although both qualitative and quantitative approaches for this research method exist, the qualitative approach has more recently been used with increased frequency in health studies.[20,21]

Data analysis began with reading all transcripts repeatedly to allow immersion. Transcriptions were reviewed and intensely examined as part of the coding process. Next, words from the text were highlighted that seemed to 'speak to something other than the given texts' (p. 23).[19] Notes were taken regarding the researcher's first impressions of the analysis, in order to identify meanings and draw specific inferences from the transcripts. As the process continued, thematic distinctions were identified through recurring patterns within the data. A total of four distinct themes were recognized as central to the participants' experience (see Table 2). Knowledge created from this analysis is based on the participants' individual perceptions and emergence of content/themes through the researcher analysing the text.[19] An expert in the field of qualitative methods was consulted throughout the process of data analysis.

Methodological rigour was attained by focusing throughout the process on credibility, confirmability, authenticity, dependability, and transferability as described by Polit and Beck (p. 539).[22] Credibility was fulfilled by the researcher tape recording and verbatim transcription of interviews, adhering to Krippendorff's method for content analysis, and providing tables reflecting the process. Confirmability or objectivity of the data was achieved by two reviewers verifying the coding process and interpretation of data with emerging themes. Authenticity or the representation of different realities was seen in the presentation of both positive and negative comments by participants from the intervention and control groups. The foundation for dependability and transferability is the rich descriptive data that will allow future researchers to replicate the study and apply the data from this study to other contexts.

Results

The opening questions during the interview were used to assess the participant's baseline computer usage prior to their exposure to the PEP-NG. A majority of participants expressed a level of comfort with computers prior to enrolling in this programme. Only 5 of the 19 talked about feeling uneasy about computer usage but expressed a positive opinion after using the PEP-NG. A few had used computers at previous jobs and, although familiar with general concepts, the interactive interface was a new experience. Realizing that technology is a part of everyday living today, these participants articulated a desire to learn more and communicated that they had less anxiety surrounding computers after participating in the study.

Of those interviewed, more than half found the entire programme user friendly and easy to navigate. In particular, the touch screen was reported as being 'a nice feature'. Some of the difficulties experienced were related to inputting their individual medications because they forgot the names (or spelling) or could not find it on the generated list provided within the tablet programme. The

Table 2: Process of theme development.

Question #	Participant quote	Category	Theme derived
9	'But more sure of it in that respect as far as looking into the type of medication and reading the precautions that actually go with it' (control participant 16)	Seeking other information	Climbing the mountain of awareness
6	'like week after week seeing the same questions come up … I started to ask some questions' (control participant 11)	Cued to ask for further info	
5	'I would like to know more …' (intervention participant 5)	Seeking other information	
8	'before I didn't, now I ask the pharmacist questions' (control participant 2)	Seeking other information	
7	'it helped me to understand better to be careful with OTC things and make sure I know what was in them before I take them' (intervention participant 17)	Heightened awareness	
6	'it brought some questions but I don't know the answers' (control participant 7)	Unanswered questions	In need of attention
7	'… no one explained to me which answers I got wrong' (control participant 3)	Unanswered questions	
8	'no it didn't affect that [confidence in taking meds] at all' (control participant 18)	No change/no effect	
8	'I thought I was sure but I learned that I wasn't.' (control participant 9)	Uncertainty	
13	'Answering the questions, I'm not sure I got them right … a little more explanation' (control participant 3)	Unanswered questions	
6	'… not to take Ibuprofen when I was taking some of my medications and that it was alright to take Tylenol' (intervention participant 17)	Know what to take	Adjustments made, as needed
7	'… I take calcium and I was taking it along with my regular pills and that's a no-no, it's either 2 hours after or half hour before …' (intervention participant 13)	Know when to take it	
10	'I was getting headaches when I had the wine and the medication and I didn't know [not to take them together] …' (control participant 15)	Know how to take it	
6	'I didn't know I was not supposed to take my calcium with my thyroid meds …' (intervention participant 10)	Know when to take it	
14	'… I found it very comforting to have her in the room with me …' (intervention participant 12)	Comforting	Provider matters
14	'If I had a problem she helped me … she'd just come in and check on me to make sure everything was going alright' (intervention participant 17)	Helpful	
14	'Not only was she professional, her personality is one in which you can't help but warm up to' (control participant 11)	Professional	
14	'She has been so good to me and for me' (control participant 6)	Comforting	
14	'Everything went well. I would show up and was very quickly escorted into a room and did my thing and went home' (control participant 7)	Efficient	

generic names of brand medications also confused some participants. A few found some of the questions challenging, especially when trying to answer questions that seemed irrelevant to their lifestyle. A number of participants talked about how they did not consume alcoholic beverages and would have liked to see an option to skip the questions related to medication and alcohol. One person noted, 'I am not a smoker or a drinker – so a lot of those things were not applicable'. Another

individual stated, '… the questions that asked about a glass of wine – I couldn't answer, because I don't drink so I didn't know …'. The starting point of the knowledge base was similar between groups. In both the control and the intervention groups, there were participants who reported understanding their medications very well. An equal percentage in both groups reported adequate or no comprehension of their medication before beginning the PEP-NG study.

Theme one – climbing the mountain of awareness

During the interview, participants were asked how well they understood the purpose of their medication prior to the PEP-NG study. The answers ranged from not very well, fairly well, to very well. All in the intervention group reported an increase in awareness and subsequent knowledge. The majority (9/12) of participants in the control group also verbalized that the study helped them learn about their medications, but this was based more on a heightened awareness to seek out more information. Since the sessions included repetition of various concepts, some participants associated recurrence as a prompt to further enquire about the medication: 'like week after week seeing the same questions come up like ibuprofen … I really didn't know much about it and I started to ask some questions'.

Although an increase in knowledge was not reported by those in the control group, 10 of these participants did comment on how the programme made them more aware of potential interactions. Some of the comments were, 'Now I read what comes with the medication more.'; 'Educate yourself. I never used to – When I would get my prescriptions, the pamphlets that go with it, I just dumped it. Now I don't. Now I read it- I study it.'; and '[I am] more aware of the medication that I take and looking into it and what to mix and what not to mix; to read those precautions, to do more investigation into the drugs that I will be taking in the future'.

Confidence in their ability to take their medication was influenced by the *control participants'* feeling empowered to ask questions. While the control participants did not express any changes in self-efficacy or knowledge – they all described either being more likely to ask questions following participation or more likely to seek out additional information: '… before I didn't, now I ask the pharmacists questions' and 'It certainly alerted me even more about being careful'.

Similar to the control group, the *intervention participants* were split fairly evenly as far as understanding their medications prior to the PEP-NG study. 'I was informed but not at the level that I really should've been or wanted to be until I finished'. All of the people in the intervention group (7/7) reported that the PEP-NG study helped them to learn about their medication and were able to give specific examples about what that knowledge meant for them and their medication regimes: 'I didn't know I was not supposed to take my calcium medication with my thyroid meds' and '[I learned] not to take ibuprofen when I was taking some of the medications but that it was all right to take Tylenol'. Another commented, 'I am more aware now of the Tylenol and Advil and Motrin and their interactions with my BP medicines'. The intervention participants comprehended the interactions of their medications and the need to possibly change their medication-taking behaviours to accommodate this new understanding.

Theme two – in need of attention

Because those in the control group did not receive a printout after each session or a review of their PEP-NG responses by the APRN, many were unsure of their answers to the questions. In fact, among those in the control group, one of the main issues was the lack of feedback after participation. One person stated, 'No one explained to me which answers I got wrong'. There was a level of uncertainty that was felt by many in this group, 'It made me less confident because it raised a lot of questions in my mind'. Another expressed it as, 'What it left me with is that I don't know what I can take anything with …'. One participant requested more explanations while inputting information such as having, 'A little word that would come up and say "WRONG." More feedback would be nice, so you know the answer you gave was wrong'. Others preferred a chance to discuss questions at a later time, 'even if it's the next time you come in and you have some questions that you're not sure about'.

For those in the intervention group this was not an issue. They received tailored online education and a printout after each visit, which the APRN reviewed with them. This immediate feedback to their questions provided an opportunity to review their responses and the educational information that was provided. While a few of the participants mentioned the repetitious nature of the sessions, one participant in particular described its helpfulness:

> […] I don't have the tendency to retain as much as I used to […] Most people would have been bored that you repeated a lot of stuff […] In a way I was glad that you did because not only

did it reinforce but it re-stimulated my grey matter […] so I was glad.

Theme three – adjustments made, as needed

Despite having an increase in awareness, half of the control participants stated that they would not change the way that they take their medication, primarily because they were not provided with the necessary feedback to make those changes. The majority were unsure about the correctness of their responses. Six did allude to small changes that they had made: two discussed not mixing alcohol with their medicine, three described adhering to a time schedule when they take their medication, and one reported that he stopped taking his ibuprofen at night. In response to the increased knowledge, the majority (6/7) of intervention participants felt more confident about how to take their medicine. Various examples were provided specifically detailing how they either avoided OTC pain medication or altered their current medication regimes to accommodate this new information that was provided by the PEP-NG. Mentioned by four of the seven in particular was the time spacing of calcium pills when taking other medication.

Theme four – provider matters

None of the participants had negative experiences with the nurse practitioners who assisted with the study. Their professionalism, patience, and efficiency made for very positive encounters. One participant stated, 'She has been so good to me and for me'. Specifically, their helpfulness was mentioned by almost all participants. The presence of the APRN reassured those involved that if needed, help would be available, '… I found it very comforting to have her in the room with me, not necessarily that I needed her but I liked that'. For this older-aged population the support was an important piece in their ability to overcome any computer-phobia obstacles. The ability of the nurse practitioners to make the participant feel comfortable and welcomed also contributed to the overall enthusiasm felt by patients.

Limitations and discussion

The participants taking part in the qualitative portion of the study were interviewed after their fourth visit. For some, the last visit had been only 3 weeks prior, while for others up to 4 months had elapsed. The variation in time between study conclusion and post-study interview could affect recall and have influenced answers to the interview questions – thus it should be considered a study limitation. The fact that participants self-referred for the qualitative interviews can also be considered a limitation. Those either extremely content with the programme or dissatisfied may have wanted to discuss their experience. It should be noted, however, that the researcher did not feel that she encountered extremes during the interviews.

Overall, the 12 participants interviewed from the control group did not find the PEP-NG to be very helpful, in stark contrast from those in the intervention group. Quantitative results reported previously indicated a high degree of satisfaction with the PEP-NG interface and programme in both control ($n = 64$) and intervention ($n = 71$) groups.[18] The previously reported quantitative results from the PEP-NG study also demonstrated that patients receiving the intervention significantly increased both their self-medication knowledge and self-efficacy and significantly reduced their adverse self-medication behaviours.[18] Of the seven intervention group participants in this qualitative study, 100% said that they would not change anything about the PEP-NG programme. If fact, nearly all expressed a desire to be recruited for similar future programmes. One person articulated, 'I had a good time. I am waiting for the next one because I enjoyed this learning process'. They verbalized an interest in programmes related to other chronic diseases and various groups of medication interactions (such as cholesterol medications or blood thinners). A handful also suggested that the programme be used in senior centres. One noted, 'It's too bad it is not open to more people'.

Future research may include a similar design with additional chronic diseases, as suggested by participants, and tested with a wider age-span. For example, both quantitative and qualitative results of a pilot study in the workplace (with adults aged 45–60 with HTN) also found a high degree of satisfaction with the PEP-NG and workers using the e-health intervention also increased their knowledge and self-efficacy while reducing their adverse self-medication behaviours.[23] A study of the PEP-NG intervention in older women with diastolic heart failure is underway and a study of the PEP-NG with caregivers of patients having both early dementia and HTN is being planned.

Older adults are a growing segment of the population that will continue to consume a large proportion of healthcare costs. This population is more inclined to chronic disease and therefore more likely to be on multiple medications. Coupled with a higher probability to self-medicate for pain and other common problems with OTC agents, including vitamins and supplements, there is a high risk for adverse medication interactions to

occur. The PEP-NG is an innovative and interactive way for older adults to not only learn, but also improve communication with their providers. By allowing participants to input their own information (medication, timing schedules, OTC use, etc.), it provides personalized and pertinent information that can then be reviewed by the provider. This can decrease the amount of visit time spent on irrelevant questions and increase the time spent on medication management and tailored patient education.

Computers can be very useful tools in assisting with patient education. In particular, the touch screen technology utilized in the PEP-NG allows for the creation of more user-friendly interfaces and options to facilitate the patient-provider encounter and teaching. This study demonstrated that even among participants who may not feel computer literate (older-age generation), it can be a useful tool for information dissemination. As one participant very poignantly expressed, 'I'll be very honest about this, I know nothing about computers … I know the typewriter keyboard. I would have to go slow, but I'd like to learn'.

Patient education is an integral part of primary care and important for any chronic disease management. Including interactive ways to learn (like the PEP-NG) as part of continuous efforts to enhance patient education can revolutionize patient visits. As summarized by one participant, 'I liked this program. I think everyone should take a shot at it. It opens people's eyes. A lot of people have their eyes closed'.

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Conflicts of interest

The University of Connecticut granted an exclusive license for the PEP-NG to AdhereTx Corporation on 25 August 2009. The University of Connecticut and Patricia J. Neafsey are shareholders of AdhereTx. Jessica Alicea-Planas and Elizabeth Anderson have no conflicts of interest.

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Patricia Neafsey, RD, PhD, is Professor, Center for Health Intervention and Prevention and School of Nursing at the University of Connecticut. She is a pharmacologist and registered dietician and an author on over 100 peer-reviewed publications and 25 computer-assisted instructional programmes in pharmacology. She was Principal Investigator on grants from the University of Connecticut Research Foundation, the Donaghue Medical Research Foundation, and the NIH National Heart Lung and Blood Institute that funded the development and testing of the Next-Generation Personal Education Program (PEP-NG), an e-health intervention to improve patient adherence to antihypertensive regimens and reduce adverse self-medication behaviours. The PEP-NG has undergone formal usability testing (focus group evaluations and think aloud usability tests), a beta trial, and a clinical efficacy trial. The University of Connecticut granted an exclusive license for the PEP-NG to AdhereTx Corporation, a provider of web-based solutions that facilitate patient data collection and automate coordination of care for medication management in patients with chronic diseases. Dr Neafsey serves as principal scientist for AdhereTx.

Elizabeth Anderson, PhD, ANP-BC, APRN, is Associate Professor, Center for Health Intervention and Prevention and School of Nursing at the University of Connecticut. She is Coordinator of the Adult Primary Care Nurse Practitioner Track and the Undergraduate Honors Program at the School of Nursing. She has worked clinically as an advanced practice nurse and conducted research with persons with HIV/AIDS and older adults with hypertension for more than 15 years. Her programme of research includes stress and coping with HIV, factors impacting quality of life including nausea, anxiety, healthcare relationships. Her current research focuses on medication adherence with older adults with HIV/AIDS. She also has extensive experience in phenomenological research with community-based persons living with HIV/AIDS.