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Beta Testing of a Network-Based Health Literacy Program Tailored for Older Adults With Hypertension

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Abstract

A touch screen–enabled "Personal Education Program" was modified to the "next generation" to capture self-medication behaviors of older adults with hypertension and assess related knowledge and self-efficacy. The program analyzes patient-entered information and delivers interactive educational content tailored to the reported behaviors. Summaries of self-reported symptoms, medication use (including frequency/time), drug interactions, and corrective strategies with an illustration of the drug interaction are printed to inform the provider before the primary care visit and for the patient to take home for self-study. After formative research during development and formal diagnostic and verification usability studies with advanced practice nurses and older adults, a beta test was conducted with older adults with hypertension over a 3-month period. Findings from the beta test suggest that older adult user satisfaction was high. Blood pressure declined over the four visits for 82% of the participants. The next generation of the Personal Education Program had a large effect size in increasing knowledge and self-efficacy for avoiding adverse self-medication behaviors. Behavior risk score did not change significantly but was significantly correlated with systolic blood pressure on the fourth visit. The positive results found in this small sample suggest that the next generation of the Personal Education Program could play a central role in facilitating patient-provider communication and medication adherence.

Keywords

Health literacy; Hypertension; Older adults; Self-medication; Tailored education

Achievement of target blood pressure (BP) readings is often inadequate in older adults despite frequent health-care visits.[1,2] Poor medication adherence frequently contributes to preventable adverse drug events and hospitalization.[3–5] Intensive and frequent (monthly) counseling can greatly improve medication adherence, but research indicates that adherence declines to baseline when the intervention is removed.[6] In a survey of 168 English-speaking older adults with hypertension, 86% reported two or more adverse self-medication practices.[7] Addressing these adverse self-medication practices is one step to reduce the risk of potential adverse drug interactions (PADI). Inadequate patient education about safe medication use also contributes to preventable adverse drug events.[3] Older adults with hypertension were found to have large knowledge deficits regarding interactions between prescription and over-the-counter (OTC) medicines and low confidence in their ability to

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avoid serious interactions.[8] The Personal Education Program (PEP), a computer-based educational intervention that addresses the most common adverse self-medication practices documented in English-speaking older adults, has been shown to be effective in improving knowledge and self-efficacy and reducing adverse self-medication practices in older adults with hypertension.[9,10]

PERSONAL EDUCATION PROGRAM–NEXT GENERATION DEVELOPMENT

The PEP has been modified to the "next generation" PEP (PEP-NG) to capture patient self-medication behaviors on a touch-sensitive tablet personal computer (PC) instead of using pencil and paper methods, as was done previously. The PEP-NG, which is written at a grade 6 reading level, analyzes information entered by the patient and delivers only that PEP interactive content applicable to the patient's medication behaviors. Summaries of the patient's self-reported symptoms, medication use (including frequency/time), specific drug interactions, and corrective strategies—with an illustration of the drug interaction—are separately printed for the patient and for the provider to enter into the medical record. The three adverse self-medication behaviors identified with the highest priority weights are addressed in the tailored education delivered on the tablet. The program includes animations, interactive questions, and a printout that lists the behavior and a suggested corrective strategy along with an illustration of the drug interaction. In the case of fewer than three reported adverse behaviors, the PEP-NG delivers a set of up to three defaults dealing with medication adherence, OTC pain relievers that can be safely taken with antihypertensives, and dangers of combining pain relievers.

The PEP-NG has undergone formative research study during development and formal usability testing. Focus groups with older adults and advanced practice nursing (APRN) students were conducted to gain feedback on the usability of the tablet, PEP-NG wireless, touch screen interface, and software system. Consistent with expectations, participants provided suggestions on how to make the navigation easier and more intuitive. Consensus was achieved for data entry boxes, progress bar, scroll bar, menus, clock, entry method (finger vs stylus), cart, privacy shield, and printout characteristics. The database and interface architecture and system programming were then designed accordingly.[11,12]

Macromedia's Flash ActionScript language (Adobe Systems, San Jose, CA) was used to program text, graphic elements, and animation materials to allow for user interface with a touch screen–enabled tablet PC equipped with a "View Anywhere" display to eliminate glare from overhead fluorescent lights.[a] A stylus was used to point at and then press (click) either a large graphic object (3 cm high), a large letter (20-point size Arial Black font), an entire phrase (or sentence), or an entire text block to communicate with the program. The color of the text and background, illumination level, and the graphic and animation style are all older adult friendly.[11] The speed of the display, object movements, and animation sequence are also slowed to adequately accommodate older adults' visual and cognitive processing capability. Extra-wide scroll bars and dropdown menus displayed in blocks of eight lines were designed to ease the maneuver for a user who may have stiff joints and/or fine tremor. An animated clock enables the accurate selection of time of medication and dosage (for a complete description of the database and interface, see Strickler et al[12]).

Previously validated knowledge, self-efficacy, satisfaction, and self-medication behavior surveys and self-medication behavior score calculation subroutines were embedded into the

[a]The tablet PC (Motion LE 1600 Centrino) was manufactured by the Motion Computing, Inc. in 2006. Technical specifications for this model include: Intel Pentium M Processor LV 778 (1.6 GHz), Integrated Intel PRO Wireless 2915ABG, 512MB RAM, 30GB HDD with View Anywhere Display, 12.1" wide view XGA TFT display, convertible keyboard, 3-M privacy filter, and Genuine Windows XP.

software, and a Microsoft Access database (Microsoft, Redmond, WA) receives the entered data. Participant information is recorded solely by a random identification (ID) number selected by the APRN from a computer-generated list of random numbers. The APRN and site are also coded by an APRN-selected random number. The researchers cannot trace a participant's ID to identify a specific patient or link private health information to study participants. Only the APRN has access to the participant's or patient's name and ID. The tablets are set up only for access to PEP-NG (ie, no other Internet connection is available).

A tracking program logs patient, site, and APRN ID code; health literacy score; previsit and postvisit BP (measured by the APRN); demographic data, medical conditions; patient-reported symptoms; knowledge; self-efficacy; and medication use (including frequency and time of administration).[b] The self-medication behaviors are scored according to a previously validated weighting scheme.[10] User action (both APRN and patient) is date/time stamped. Data collected are automatically transferred to a database via virtual private network, which meets or exceeds the HIPAA requirements[13] and the European Union Directive 95/46/EC.[14] The interface was developed in accordance with ISO 9100 international standards[15,16] to provide for refinement and efficient duplication of the system.

USABILITY TESTING

A participatory usability design was used to inform the development of three successive prototypes of the PEP-NG resulting in the fourth and final beta test version. Findings from formal iterative "think aloud" usability tests indicated that both nurses (APRNs and registered nurses in a graduate APRN program) and older adult users of the system had significantly fewer errors (both cognitive and motor) in their interaction with the final prototype compared with earlier tests of the previous prototypes. These results suggested that the final PEP-NG prototype permitted users to navigate the PEP-NG with minimal errors and "subject burden" (in relation to mental task load). In addition, older adult users rated the PEP-NG highly in terms of system usefulness and satisfaction with the program. The mean (SD) time for interface use by 10 verification usability study participants was 33.08 (7.65) minutes (Lin et al[17]). Minor changes to the final prototype were implemented to produce the beta test version of the PEP-NG.

Results of a 3-month (four visits) beta test of the PEP-NG are reported herein. The specific aims of the beta test were for older adult participants to (1) achieve target BP readings, (2) increase knowledge of potential drug interactions arising from self-medication practices, (3) increase self-efficacy for avoiding potential drug interactions stemming from self-medication practices, (4) reduce self-reported adverse behaviors associated with potential drug interactions, (5) improve medication adherence, (6) demonstrate satisfaction with the APRN provider relationship, and (7) demonstrate satisfaction using the PEP-NG.

METHODS

Participants

The University Human Subjects Review Board approved the study, and all members of the research team completed research ethics training. Participants were recruited from two congregate housing facilities for older adults and their associated senior centers by means of flyers, newsletters, and announcements at BP clinics, activities, and meals. One housing facility was in a rural community, and one was in an urban community near the university.

[b]"Did you take something for ___ in the last month?" is asked with respect to the following problems: blood pressure, blood thinning, pain, cold or sinus, allergies, sleep, stomach problems such as indigestion or gas, and low thyroid. "Did you take ___ in the last month?" was asked with respect to: calcium pills, vitamins, minerals, herbs or supplements, and alcohol, wine or liquor.

Individuals interested in participating in the study left their contact information on a telephone answering machine dedicated to the study. The project graduate assistant met with each potential participant to describe the study, obtain informed consent, and assess participants for inclusion criteria. The consent form was written in an Arial 14 font at a grade 6 reading level. Participants were requested not to participate in another research study related to their health while enrolled in this one.

Participant inclusion criteria were as follows: (1) not previously involved in a PEP study, (2) at least age 60 years old (by self-report), (3) a health literacy score of at least 44 (sixth grade) as measured by the Rapid Estimate of Adult Literacy in Medicine tool,[18,19] (4) taking prescribed antihypertensive medication, and (5) independent physical and cognitive functioning. Criteria developed and validated by the MacArthur Research Program in Successful Aging[20] typically used by APRNs in their practices were used to assess participants for independent physical and cognitive functioning. These criteria include the ability to (1) perform telephone, shopping, travel arrangements, medication taking, and manage finance activities independently on the Instrumental Activities of Daily Living Scale[21]; (2) answer six of 10 items on the Short Portable Mental Status Questionnaire[22]; and (3) be living independently. Participants also needed to demonstrate a visual acuity of at least 20/100 with corrective lenses as needed.

Seventeen participants (one man, 16 women) responded to the flyers to participate in the study. One man and one woman did not meet inclusion criteria (one did not take an antihypertensive, one did not meet cognition criteria.) Of the 15 respondents who did meet eligibility criteria, one participant did not begin the study because of illness. Two participants completed the first visit, but one dropped out due to admission to nursing home and another dropped out due to time constraints. One other participant completed two visits and then dropped out due to surgery. These participants were omitted from the analyses.

The final sample consisted of 11 female participants. Of these, 10 participants completed all four visits. One participant was unable to complete the second visit because of a greatly elevated BP prior to the start of the visit. The participant's primary care provider was immediately contacted, and the participant received an adjustment in the antihypertensive regimen. The participant was then able to complete the third and fourth visits. Nine of the participants reported that they were white. Two participants indicated that they were of more than one race, one of whom was Latino. The mean (SD) age was 80.36 (8.52) years (range, 65–98 years). The mean (SD) years of education was 12.8 (1.2). Two participants had less than a high school education, one was a high school graduate, seven had some college or post–high school training, and one was a college graduate. Rapid Estimate of Adult Literacy in Medicine scores ranged from 64 to 66 out of a possible score of 66, thus all were able to read at a high school level. Six of the participants (55%) were non–computer users. Of the five participants who reported using a computer, three patients reported using a computer without Internet access for 1 hour a week or less. Only two participants reported using a computer with Internet access, both of whom reported daily use.

At the beginning of the study, seven (64%) of the participants reported that they had three or more chronic health conditions (range, 1–7). The use of bifocals/trifocals, arthritis in the dominant hand, and hearing impairments were common physical characteristics of the participants (see Table 1). The average (SD) number of prescription medications taken daily was 5.73 (3.5) (range, 1–11), with seven (64%) participants taking five or more prescription medications a day. When OTC medications and vitamin/mineral/herbal supplements were included, the average (SD) number of medications taken daily was 10.7 (4.0) (range, 5–17), and all participants were taking five or more medications daily.

Measures

All instruments are written at a sixth grade Flesch-Kincaid reading level[23] and appear on the PEP in a 20-point size Arial black font.

OVER-THE-COUNTER/PRESCRIPTION MEDICATION KNOWLEDGE—The knowledge instrument is modified from a previously validated 17-item instrument[9,10] and based on the PEP content outline. Items test both knowledge and application levels in the cognitive domain.[24] Items include short scenarios presenting potential interactions in realistic, interesting settings and have one correct response and three distracters based upon common misconceptions about OTC medicines and alcohol. The Cronbach's α reliability coefficient was .68. The 1-month test-retest reliability estimate was .50, acceptable for an instrument with heterogeneous content administered to a naive group, as the members used random guessing to answer items.[25] The mean (SD) percent score in a convenience sample of 52 older adults meeting study criteria at a BP clinic was 43.1% (15.4%).[8] In this study, three items unrelated to hypertension (ie, related to warfarin) were omitted.

OVER-THE-COUNTER/PRESCRIPTION MEDICATION SELF-EFFICACY SCALE—The scale is based on a previously validated 13-item instrument consisting of behavioral, task-specific statements related to confidence in avoiding drug interactions arising from self-medication behaviors.[9,10] The five-point self-report response options range from 1, for "not sure" to 5, for "totally sure." Data from 134 older adults subjected to a principal factor analysis revealed that the structure of the measure was unidimensional, and the single internal consistency estimate (Cronbach's α) was .95. Item loadings on the single factor solution were all greater than 0.63. The test-retest reliability estimate was .81 ($P < .001$).[10] The mean (SD) score in a convenience sample of 52 older adults attending a BP clinic and who met study criteria was 2.0 (0.8), indicating a low level of self-efficacy.[8] In this study, one item related to warfarin was omitted.

MEDICATION USE—The instrument collects self-reported, patient-entered data on medication, supplement, and alcohol use. Frequency and longitudinal use are captured. Adherence to the prescribed drug regimen (in this study, antihypertensive medication) is assessed from questions related to what, when, and how patients take their antihypertensive medication. Concurrent validity of the self-report survey has been established.[9,10]

CALCULATION OF ADVERSE SELF-MEDICATION BEHAVIOR SCORE (BEHAVIOR RISK SCORE)—Data from the pilot test of the medication use survey were used to develop an Adverse Self-medication Behavior Score.[9,10] An expert panel following a modified Delphi method[26] rated a list of self-medication behaviors using a five-point scale from 1 for "very unlikely" to 5 for "very likely" to cause an adverse outcome. The importance weight for each behavior was the mean of the expert panel ratings. The total score is the weighted sum of the scores for the adverse behaviors identified. Because of nonnormality of the distribution of self-medication scores in the older adult population, the log of the total adverse self-medication behavior score is used in parametric statistical analyses.[9]

HEALTHCARE RELATIONSHIPS INSTRUMENT—The five-item instrument, based on two qualitative studies[27,28] addresses patient-provider communication (two questions), trust, decision making related to care, and satisfaction with care. The scale was modified for usability by older adults by changing the visual analog 10-cm response to five-point Likert-type responses with two extremes (eg, "not at all easy" to "very easy"). The Cronbach standardized α was .81 with 121 persons aged 60 years and older; test-retest with 19 persons aged 60 years and older was $r = 0.57$, $P = .014$. Factor analysis by principal component

extraction method revealed one component accounting for 57% of the variance. All components loaded above 0.78 except for the item "How easy is it for you to talk with your Primary Care Provider," which loaded as 0.47.

PATIENT SATISFACTION INSTRUMENT—The instrument is modified from a 14-item instrument previously validated[9] in which eight items address the ease of program use, program content, and suitability of program content, and six items address the perceived likelihood of making behavior change following program use. The five-point Likert-type scale ranges from 1 for "strongly disagree" to 5 for "strongly agree." Ratings are summed and divided by the number of items answered, so that the overall satisfaction scale is not affected by omitted items and is expressed in the original five-point metric. Data from 83 older adults using the PEP revealed a unidimensional measure with a single factor accounting for 70% of the covariance in items. The Cronbach α estimate for internal consistency[9] was .89. In this study, an additional item was added, "The advice in this program suited my special needs," to capture satisfaction with the tailored education delivered.

Procedure

The PEP-NG was piloted from May to August 2006 with older adults in a time series design with multiple institution of treatment. Three graduate APRN students were trained to follow the study protocol. They were paid $24 per hour for 25 hours of participation ($600) and were supervised by one of the authors who is a board-certified APRN and director of the graduate Adult Primary Care Program that prepares students for an APRN license in Connecticut. Each participant met with the APRN student to whom he/she was assigned once a month for 4 months in a private conference room in either his/her housing facility or senior center. Participants brought all of their medications (including supplements) to each visit. Blood pressure was recorded by the APRN student pre-PEP and post-PEP use at each visit. At the beginning of the first visit, participants completed the healthcare relationships questionnaire (paper and pencil) and then used the PEP to complete the demographic questionnaire and all of the remaining scales except the Patient Satisfaction Instrument. The demographic questionnaire was omitted on subsequent visits. At the beginning of the fourth visit, participants completed the healthcare relationships questionnaire again and then used the PEP to complete the Patient Satisfaction Instrument in addition to the other scales. After using the PEP, each participant met with the APRN student for approximately 10 minutes to go over the PEP printout that listed symptoms, reported adverse self-medication behaviors, and corrective strategies suggested by the PEP. Each participant was given a $10 grocery gift card at the end of each of the first three visits and a $25 grocery gift card at the end of the fourth visit.

DATA ANALYSIS—SPSS version 14.0 (SPSS, Chicago, IL) was used for data analysis. Descriptive statistics were derived by tabulating data recorded by the tracking software. Correlations between user age, education, health literacy score, knowledge, self-efficacy, adverse self-medication score, BP, and satisfaction scores were assessed. Because of the small scale of this pilot study, changes in dependent variables across time were analyzed using paired *t* tests between visit 1 and visit 4. Effect sizes were calculated using the standard deviations[29] comparing visit 1 with visit 4.

RESULTS

Blood Pressure

The experience of using the PEP did not affect BP immediately before use to immediately after use. The mean (SD) pre-PEP use systolic BP was 131.11 (14.07), and the mean (SD)

post-PEP systolic BP was 131.20 (15.32). The mean (SD) pre-PEP use diastolic BP was 74.53 (13.14), and the mean (SD) post-PEP diastolic BP was 75.81 (13.40).

Post-PEP use BP measurements at each visit were used in determining BP outcome (see Table 2). The BP goal[30,31] of less than 140/90 was met by five participants on the first visit and by nine participants on the fourth visit. Blood pressure declined over the four visits for nine of the 11 participants (82%). The mean (SD) decline in systolic BP (SBP) was −5.91 (11.09) mm Hg, and the mean (SD) decline in diastolic BP (DBP) was −5.64 (14.21) mm Hg from the first visit to the fourth visit (neither decline was statistically significant). This represents a small effect size for both SBP (Cohen's $d = -0.41$, $r = -0.20$) and DBP (Cohen's $d = -0.46$, $r = -0.22$). Two participants had an increase in BP, one with a BP of 100/60 at the first visit and a BP of 112/60 at the fourth visit. The other had a BP of 130/60 at the first visit and a BP of 132/68 at fourth visit. When these two participants were removed from the analyses, the mean (SD) decline in SBP was −9.22 (10.4) ($t = -2.67$, $df = 8$, $P < .05$) with a medium effect size (Cohen's $d = -0.70$, $r = -0.33$); the mean (SD) decline in DBP was −7.78 (14.8) from the first visit to the fourth visit (not statistically significant) also with a medium effect size (Cohen's $d = -0.70$, $r = -0.33$).

Knowledge

Complete knowledge data were available for only six participants due to hardware (tablet) malfunction on the first visit at one site. Results of a paired samples t test revealed that the mean (SD) knowledge increase from 35.71% (21.66%) at the first visit to 60.71% (20.57%) at the fourth visit just missed statistical significance ($t = 2.53$, $df = 5$, $P = .053$) but had a large effect size (Cohen's $d = 1.18$, $r = 0.51$).

Self-efficacy

Complete self-efficacy data were available for only five participants due to hardware malfunction on the first visit at one site. Mean (SD) self-efficacy increased from 2.00 (1.03) at the first visit to 2.74 (0.50) at the fourth visit on the five-point scale, and although not statistically significant in this small sample size ($t = 1.91$, $df = 4$, $P = .129$), the effect size from the first visit to the fourth visit was large (Cohen's $d = .91$, $r = 0.42$).

Behavior Risk Score

There was no significant change in behavior risk score from visit 1 to visit 4. This was due both to low power and to missing values due to hardware malfunction on visits 1 at one site. There were no missing values for visit 4. The risk score for visit 4 was significantly correlated with the postsystolic BP for visit 4 (one-tailed Pearson $r = 0.882$, $P < .01$).

When asked how often they took their antihyperten-sive medication, nine participants (81.2%) responded either "less than daily" or "when I remembered to take it" on at least one visit.

Healthcare Relationships

Scores for the healthcare relationships scale did not change from before visit 1 to before visit 4. See Table 3. The lowest score was for the item asking how involved participants were with their healthcare decisions. The mean (SD) scores of 3.57 (1.01) and 3.58 (0.79) for previsits 1 and 4, respectively, reflect being more or less involved. The highest item (SD) scores, 4.50 (0.76) and 4.67 (0.49), were for "How easy is it to talk with your Primary Care Provider" previsit 1 and previsit 4, respectively. These means fell into the "very easy" to "completely easy" range.

Satisfaction

Table 4 shows the mean satisfaction scores on the nine-item scale. The overall mean (SD) satisfaction score was 4.24 (0.51) on the five-point scale. Participants were also asked to indicate their degree of agreement with statements concerning their intent to change behaviors after using the PEP (see Table 5). The overall mean (SD) score was 3.72 (0.76) on five-point scale. Ten (91%) participants either agreed or strongly agreed with the following statements: “This program helped me want to change how I use medicines” and “This program helped me think of questions to ask my doctor.” Six (55%) participants either agreed or strongly agreed with the following statement: “After using this program I will make some changes in how I use medicines,” and seven (64%) participants agreed with the following statement: “After using this program I will change when I take some medicines.”

DISCUSSION

The risk of PADI is greatly increased in older adults having three or more chronic diseases, five or more medications per day, more than 12 medication doses taken per day, a history of nonadherence, or a drug requiring therapeutic monitoring.[32] All of the participants in this study were at increased risk of PADI. Seven (64%) had three or more chronic diseases. The average (SD) number of prescription medications taken daily was 5.73 (3.5) (range, 1–11), with seven (64%) participants taking five or more prescription medications a day. When OTC medications and vitamin/mineral/herbal supplements were included, the average (SD) number of medications taken daily in this study was 10.7 (4.0) (range, 5–17), and all participants were taking five or more medications daily. The participants in this study took more daily medications than the general population of older adults did, as indicated in the Sloane telephone study[33] conducted in 1988–1999. That random telephone survey of 2590 adults found that 23% of women and 19% of men aged 65 years and older reported taking five or more prescription medications per day and 57% taking five or more medications a day when OTC agents were included.[33] The differences are likely due to sampling error, given the small sample size in the present study. Also, the Sloane study included older adults not living in congregate housing.

Self-reported nonadherence was common throughout the study. Assessing medication adherence among older adults in the community remains problematic. The Medication Event Monitoring System (MEMS)[34] can provide an electronic record of pill removal from a container, but pills removed are not necessarily consumed, and the cost of MEMS is often prohibitive for large studies and monitoring adherence in private practices or clinics. The validity of the commonly used Morisky self-report scale[35] has been questioned.[36] The simple approach taken by the PEP-NG may also underestimate adherence, but it does document for the provider that the patient has not taken a medication as prescribed. The PEP-tailored education addresses non-adherence when it is reported; this may help foster a subsequent discussion between patient and provider about the reasons for nonadherence and the strategies for improved adherence to the medication regimen.

Participants had a high degree of satisfaction with PEP and its components. They also indicated that they were likely to make changes in their self-medication behaviors following PEP. Although based on a small sample, these results suggest that PEP may have utility in helping older adults with a high risk of PADI identify behaviors that they can change to improve adherence to their (often complicated) medication regimens.

A report prepared for the Agency for Healthcare Research and Quality[37] documented the mean reductions in SBP and DBP as 4.5 and 2.1 mm Hg, respectively, across all studies examined and a variety of strategies. The present study found mean BP reductions of more than 5 mm Hg for both SBP and DBP and a strong correlation between the risk score and

SBP. This indicates that the PEP-NG intervention may offer a beneficial adjunct to the usual care of older adults with hypertension. That BP measurements did not change immediately pre-PEP use and immediately post-PEP use indicates that the PEP experience neither induced anxiety nor fostered relaxation, while participants used the PEP. Thus, the PEP appeared to make good use of the older adult's waiting time for the provider.

Results of this pilot study suggest that the PEP-NG is an effective system to capture patient self-medication behaviors on a touch-sensitive tablet PC instead of using pencil and paper methods. The PEP-NG analyzes information entered by the patient and delivers only the PEP content applicable to the patient's behaviors. Summaries of the patient's self-reported symptoms, medication use (including frequency/time data), specific drug interactions, and corrective strategies, along with thumb-nail illustrations from PEP animations, are printed for the patient and for the APRN to enter into the medical record. This will ensure that important adverse behaviors are brought to the attention of the provider before beginning the one-on-one visit. In a primary care environment in which the median time of a visit is 14 minutes,[38] the PEP-NG could play a central role in facilitating patient-provider communication.

Limitations of this pilot study included a small, homogeneous sample, within-subjects design, self-reported medication use, missing data due to hardware malfunction on visit 1, and inadequate power to detect statistical significance. Also, the Healthcare Relationships scale was a paper and pencil survey administered before visit 1 and before visit 4 with a focus on the primary care provider relationship in general, without identifying whether the provider was a physician, APRN, or physician assistant. The instrument has now been revised, with five background questions added asking which provider is considered the primary care provider, whether he/she (MD, APRN, or PA) helped make healthcare decisions, and which provider is called first.

While the limitations of this beta test of the PEP-NG prevent generalization to the population of older adults, the large effect sizes attained are positive findings and suggest that a larger scale study will likely show beneficial effects of using the PEP-NG. Currently, the PEP-NG is being implemented in a randomized clinical efficacy trial that compares the PEP-NG versus usual care in 10 primary care practices with more than 240 participants. The trial will have sufficient statistical power to reassess all psychometric measures and evaluate the effectiveness of the PEP-NG on BP, medication adherence, patient-provider relationships, adverse self-medication behaviors, and the knowledge and self-efficacy to avoid adverse behaviors in men versus women and among various racial and ethnic groups.

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Table 1

Physical Characteristics of Participants Who Completed the Study

Characteristic Frequency	(%)
Bifocals	6 (55)
Trifocals	2 (18)
Existing cataracts	4 (36)
Previous cataract surgery	4 (36)
Macular degeneration	0 (0)
Hearing impairment	5 (45)
Right handed	10 (91)
Left handed	1 (9)
Arthritis in dominant hand	7 (64)
Tremor in dominant hand	1 (9)

Table 2

Post-PEP Use Mean BP Values

Visit	BP Systolic Mean (SD)	Diastolic Mean (SD)
1	136.09 (18.42)	78.45 (15.14)
2	127.45 (15.52)	77.09 (15.10)
3	131.50 (15.79)[a]	74.80 (14.94)[a]
4	129.81 (11.71)	72.81 (8.68)

[a]N = 10.

Table 3

Mean Scores on Healthcare Relationships Scale

Visit (N)	How Easy, Mean (SD)	Trust, Mean (SD)	Involved, Mean (SD)	Comfort Call, Mean (SD)	Satisfaction, Mean (SD)
1 (14)	4.50 (0.76)	4.23 (0.75)	3.57 (1.01)	4.57 (0.85)	4.43 (0.75)
4 (12)	4.67 (0.49)	4.67 (0.49)	3.58 (0.79)	4.17 (0.83)	4.36 (0.50)

Table 4

Degree of Satisfaction With PEP

Statement	Mean (SD)[a]
The movies were useful.	4.27 (0.49)
The questions were useful.	3.68 (0.76)
The program was easy to use.	4.36 (0.81)
The program was fun to use.	4.18 (0.87)
The program was easier to understand than medicine labels.	4.36 (0.67)
Much of the information in the program was new for me.	4.00 (0.63)
I will recommend this program to my friends.	4.45 (0.67)
I would choose to use another program like this one in the future.	4.36 (0.52)
The advice in the program suited my special needs.	4.45 (0.52)
Overall mean satisfaction score	4.24 (0.51)

[a]Mean degree of agreement with statement: 1 = strongly disagree to 5 = strongly agree.

Table 5

Degree of Intent to Make Behavior Changes Following PEP Use

Statement	Mean (SD)[a]
This program helped me want to change how I use medicines.	4.45 (0.69)[b]
After using this program, I will make some changes in how I use medicines.	3.60 (1.26)[c]
After using this program, I will change when I take some medicines.	3.27 (1.35)[d]
This program helped me think of questions to ask my doctor.	4.00 (0.77)
This program helped me think of questions to ask my pharmacist.	4.09 (0.83)
This program helped me think of questions to ask my APRN.	3.82 (0.60)
Overall mean change score	3.72 (0.76)

[a] Mean degree of agreement with statement: 1 = strongly disagree to 5 = strongly agree.

[b] Ten of the participants selected 4 or 5 to this question.

[c] Six of the participants selected 4 or 5 to this question.

[d] Seven of the participants selected 4 or 5 to this question.