

Participation, Retention, and Utilization of a Web-Based Chronic Disease Self-Management Intervention Among Older Adults

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Abstract

Background: Web-based self-management (web-based SM) interventions provide a potential resource for older adults to engage in their own chronic disease management. The purpose of this study is to investigate the effect of age on participation, retention, and utilization of a web-based SM intervention.

Materials and Methods: This study reports the results of a secondary data analysis of the effects of age in a randomized trial of a web-based diabetes SM intervention. Participation, reasons for nonenrollment, retention, reasons for disenrollment, and website utilization were examined by age using discriminant function, survival analysis, and multivariate analysis of variance as appropriate.

Results: Website utilization by all participants dropped after 6 months but did not vary significantly with age. Though older adults (>60 of age) were less likely to choose to participate ($F = 57.20$, $p < 0.001$), a slight majority of participants in the experiment (53%) were over 66 years of age. Enrolled older adults utilized website management tools at a rate equivalent to younger participants. At termination, they often reported the experiment as burdensome, but tended to stay in the study longer than younger participants.

Conclusions: Web-based SM offers a feasible approach for older adults with chronic disease to engage in their health management, but it needs to be improved. Those older adults who passed the rigorous screens for this experiment and chose to participate may have been more likely than younger participants to utilize web-based SM intervention tools. They were more persistent in their use of the web-based SM to try to improve health outcomes and formed definitive opinions about its utility before termination.

Keywords: behavioral health, e-health, technology, home health monitoring

Introduction

Currently healthcare systems are experiencing rapid growth in the development and testing of health information technologies (HITs) to promote chronic disease self-management (SM) among older adults¹⁻³

Older age is correlated with incidence of chronic illness and multimorbidity,^{4,5} and HITs provide innovative platforms for older adults to engage in their own chronic disease management. Web-based chronic disease self-management (web-based SM) is a HIT intervention that uses a website to deliver evidence-based SM programs.⁶ While website designs vary, SM websites typically offer features that allow participants to establish health goals, monitor these goals over time, and access health resources.⁷ Web-based SM is also increasingly incorporated into tethered electronic personal health records, that is, patient portal systems. Patient portals are websites that provide personal health information and are directly linked to patients' electronic medical records.⁸ With increased demand for online health information, nearly 90% of hospitals now provide a patient portal system⁹ offering logical access to SM tools. For example, a patient portal that provides information on lab results, clinical appointment, and/or provider email communication features may also include web-based SM tools (goal setting and monitoring) for specific chronic conditions.

Although older adults are progressively using the internet for health information,¹⁰ there is some debate regarding the feasibility and acceptability of web-based SM among older populations.¹¹ While barriers to web-based SM access among older adults have been identified,¹²⁻¹⁴ including nonavailability of computers and the internet, computer illiteracy, and anxiety, security concerns, and lack of interest, the effect of age among participants in web-based SM has not been explored. A major factor limiting exploration is that mixed levels of utilization and unacceptable attrition rates are commonly reported.¹⁵⁻¹⁷ As a consequence, even though increased retention and higher rates of web-based SM utilization are thought to lead to improved intervention outcomes,¹⁸⁻²⁰

little can be reported about the effects of participant age on these elements of implementation.

The purpose of this study is to assess the association between age, participation retention, and website utilization of a web-based SM intervention. The specific research questions are as follows: (1) does age predict enrollment in the web-based SM intervention, (2) does retention in the web-based SM intervention differ across age, and (3) is there an effect of age on intervention utilization as measured by time spent on the website and visits to website features.

Materials and Methods

This is a secondary analysis of data collected from the randomized control trial (RCT) of a web-based SM intervention for diabetes, *My Path to Healthy Life (My Path)*. Potential participants were first identified from a large health system's electronic medical record using the following initial screen: 25–75 years of age; diagnosed with type 2 diabetes for at least 1 year; body mass index of 25 kg/m² or greater; and at least one other risk factor for heart disease (the risk factors included in the screen were diagnosis of hypertension, low-density lipoprotein cholesterol >100 mg/dL, current prescription of a lipid-lowering agent, hemoglobin A1c >7%, or a current smoker). Those patients who passed the initial screen were contacted via phone. Secondary screening criteria included independent living, access to a telephone, greater than bi-weekly access to the internet, ability to read English or Spanish, and ability to perform mild to moderate physical activity. Two thousand six hundred and four persons met the requirements of both screens and were offered a chance to participate in the experiment. Those who agreed to participate were scheduled for a baseline visit in the clinic where they completed consent forms and were randomly assigned to one of the three groups. One group was given access to *My Path*, a 12-month self-administered computer-assisted SM intervention based on Glasgow's 5 A's SM model. The *My Path* intervention for this group included goal setting and monitoring, progress reports and feedback, *Ask the Expert* sections, and behavior change activities. A second group was assigned to *My Path* with additional, ongoing social support. The third group received enhanced usual care, where usual care was supplemented by comprehensive health assessments at baseline and during two follow-up visits (4 and 12 months). Primary outcomes of the intervention study are published elsewhere.²¹

SAMPLE

Of the 2,604 potential participants, 462 ultimately participated in the RCT. Three hundred and thirty enrolled partici-

pants were assigned to one of the two intervention groups that could access and use the web-based SM system. One hundred and thirty-two enrolled participants were assigned to enhanced usual care.

All potential participants were included in the *participation* analysis. Enrolled participants were included in the *retention* analysis, and only intervention participants were included in the *website utilization* analysis. Participant age ranged from 34 to 76 (M=59.43, standard deviation=9.24), 247 participants enrolled in the study (53%) were over the age of 60 at time of recruitment.

DATA COLLECTION AND MEASURES

Participation information, special enrollment, and retention data were collected by research staff at the time of recruitment and completion of the program. Website utilization data were gathered through the intervention website.

Age. Age was measured as a continuous variable, but for purposes of analysis comparing older participants to younger participants, age was also recoded into two categories: (1) participants 59 years and younger, and (2) participant at least 60 years of age. In diabetes studies, the age of 60 has commonly been used as a cutoff point that defines an older adult.²²

Participation. Participation in the study was captured nominally in four categories: (1) *enrolled*, those who completed informed consent and randomization; (2) *ineligible*, those who did not meet inclusion criteria at time of recruitment specifically lack of internet access, was not type 2 diabetic, was not a Kaiser member, was not accessible for 12 months, or was a participant in another study; (3) *declined*, those who chose not to participate in the study because they opted out via mail or indicated that they were not interested, too busy, had other health concerns, and other reason over the phone; and (4) *unable to contact*, those who study staff were unable to reach.

Retention. Retention was measured by the number of days calculated from the day of enrollment to the day of study completion or disenrollment, that is, the day they dropped out of the study. Reasons for disenrollment were placed in one of three categories: no longer interested in the program, the program was too burdensome, or other.

Website utilization. Total number of visits was measured by the sum of all website log-on for the participant. The amount of time spent on the site was measured by the sum of minutes spent on the site for all visits. Use of website features was measured by the number of times a participant visited particular sections of the site. These sections included the following:

(1) the “ABC” page, which displayed A1c, blood pressure, and cholesterol lab results; (2) the “Ask the Expert” section, which was a moderated forum where participants could ask questions and review responses from a dietician, diabetic nurse, or doctor; and (3) the “Resource” section, which was a library of resources related to eating exercise and diabetic medications. Due to dramatic decreases in website utilization in the later months of intervention participation, the number of site visits and time spent on the site was calculated for only the first 6 months of participation.

ANALYSIS

To determine whether age predicted enrollment in the web-based SM trial, a discriminant function analysis (DFA) was conducted using age as a continuous variable and participation group (enrolled, ineligible, declined, and unable to contact) as the outcome. The association between age and reason for not participating (no internet access, not type 2 diabetic, not a Kaiser member, not accessible for 12 months, participant in another study, mail opt out, not interested, too busy, had other health concerns, or other) was also examined using DFA. To test whether retention and reason for disenrollment in the web-based SM intervention differed across age, survival analysis was used. First, the mean and median survival times in the study were obtained. A Kaplan Meier comparison analysis was then used to model survival times by age group, where age group was collapsed into two categories, either ≤59 or 60+, for purposes of comparison. To examine the effects of age on website utilization over the course of the study, a two group between-subjects multivariate analysis of variance was conducted on the two dependent variables: time spent on the website and the number of total visits to the site.

Results

ENROLLED PARTICIPANTS

Older adult participants (*n* = 227) were on average 66 years of age. Approximately the same number of men and women participated, although there were more male participants than females in the older group. The older participants were primarily married, highly educated, Caucasian English speakers, with the majority reporting incomes of \$30,000–\$50,000 annually (*Table 1*).

PARTICIPATION

Overall, potential participants were on average 60 years old, while those who refused or were ineligible were slightly older. Significant mean differences in age were observed across potential participants when placed into one of four groups (*enrolled, ineligible, declined, and unable to contact*),

Table 1. Enrolled Participant Characteristics

CHARACTERISTICS	<60-YEAR-OLD (N= 235)	60+ YEARS (N= 227)	TOTAL (N= 462)
	%	%	%
Treatment group			
Usual Care Control	27.7	29.5	28.6
My Path Group	72.3	70.5	71.4
Age, mean (SD)	51.17 (6.5)	65.9 (4.3)	58.4 (9.2)
Gender			
Male	48.5	52.0	50.2
Female	51.5	48.0	49.8
Hispanic/Latino	31.0	12.6	21.8
Ethnicity			
Caucasian	67.1	76.4	71.8
African American	16.7	14.1	15.4
Asian	0.9	2.3	1.6
American/Alaskan Native	9.7	3.6	6.7
Hispanic/Latino	5.1	3.6	4.4
Unknown	0.5	–	0.20
Language ^a			
English	94.9	99.1	97.0
Spanish	5.1	0.9	3.0
Marital status			
Married	59.7	64.2	61.9
Divorced	13.7	15.0	14.4
Single no relationship	15.0	7.1	11.1
Single in relationship	8.1	4.4	6.3
Widowed	2.1	8.0	5.0
Separated	1.3	1.3	1.3
Income			
>9,999	1.3	1.0	1.1
10,000–29,999	11.1	21.9	16.3
30,000–49,999	28.0	31.9	29.9
50,000–69,999	24.4	21.4	23.0
70,000–89,999	11.6	12.9	12.2
90,000+	23.6	11.0	17.5
Education			
Less than ninth grade	1.7	0.4	1.1

continued →

Table 1. Enrolled Participant Characteristics *continued*

CHARACTERISTICS	<60-YEAR-OLD (N= 235)	60+ YEARS (N= 227)	TOTAL (N= 462)
	%	%	%
Some high school	1.7	1.8	1.7
High school degree	15.4	17.2	16.3
Some college	44.4	39.2	41.9
College degree	23.5	20.7	22.1
Graduate degree	13.3	20.7	16.9

SD, standard deviation.

$F(3, 2,600) = 57.20, p < 0.001$. The overall Wilks's lambda was statistically significant [$\Lambda = 0.94, \chi^2(3, N = 2,604) = 168.22, p < 0.001$] indicating that age differentiated among the four groups of possible participants. However, the canonical correlation was weak, showing that only 6.25% of the variance in the enrollment group was explained by age. Further, the classification showed that overall 26.40% were correctly classified if prior group probabilities were assumed to be equal.

On average those contacted were 60 years of age. Potential participants who actively opted out of the program (those who opted out of the study via mail or phone and specified no interest in participation), had other health concerns, or lacked internet access and were older (Table 2). Significant mean differences in age were observed across the reasons for not participating, $F(10, 2,131) = 30.60, p < 0.001$. The overall Wilks's lambda was significant [$\Lambda = 0.87, \chi^2(10, N = 2,142) = 285.50, p < 0.001$] indicating that age differentiated among the reasons patients did not participate in the trial. However, the canonical correlation was again weak, showing that only 12.53% of the variance in nonparticipation reason was explained by age; classification indicated that overall 17.70% were correctly classified.

RETENTION

The trial maintained a retention rate of 77.5%, and participants stayed in the trial for 387.36 (standard error [SE] = 7.29) days. The Kaplan–Meier comparison of age groups indicated that 81% of the older cohort completed the study, compared to 74% of the younger group. The older adult group's mean duration in the study ($M = 409.50, SE = 10.83$) was also longer than the younger adult cohort ($M = 377.67, SE = 8.90$).

Of the few older participants who did not complete the study ($n = 43$), 30 persons (69.8%) indicated that they were no longer interested, possibly due to their assessment of poor progress in

Table 2. Participation by Age

GROUP	AGE, MEAN (SD)	N
Total	60.1 (10.6)	2,604
Enrolled	58.4 (4.3)	462
Ineligible	62.1 (10.0)	438
No internet	64.1 (8.9)	304
Not type 2 diabetic	60.8 (11.2)	25
Not a Kaiser Permanente member	55.5 (10.9)	45
Not accessible for 12 months	61.0 (11.2)	31
Participant in another study	60.3 (9.6)	33
Declined	61.4 (9.7)	1,131
Not interested via phone	62.3 (9.5)	455
Too busy	58.8 (9.5)	281
Opt out via mail	64.1 (8.6)	229
Other health concerns	64.4 (9.5)	80
Other	59.7 (9.8)	86
Unable to contact	55.1 (10.1)	573

health outcome improvement; 5 persons (11.6%) felt the program was too burdensome, and the rest (18.6%) stated that they had other reasons for leaving the program. When examining the survival times of older participants who left the program before the 12-month trial ended, older participants who felt the program was too burdensome left the study within the first 6 months of the program. Older participants who left for other reasons stayed in the study longer. In general, it is important to note that SM intervention use dropped significantly for all participants after 6 months.

WEBSITE UTILIZATION

Time spent on the website and visits to the site was not significantly affected by age, Pillai's trace = 0.004, $F(2, 327) = 0.72, p = 0.486$, partial $\eta^2 = 0.004$. In addition, there were no differences in website feature use between younger and older participant groups. Frequencies of website feature use are described in Table 3.

Discussion

Results from this study indicated several age effects in terms of participation and retention, but not utilization. Although there were no age differences in website utilization, older adults who did not complete the study did so because they were no longer interested or felt that the program was too

Table 3. Visits to Website Features

SITE FEATURE	≤60-YEAR-OLD (N= 170)	60+ YEARS (N= 160)	TOTAL (N= 330)
	%	%	%
ABC visits			
No visits	14.7	21.9	18.2
One to two visits	28.2	30.6	29.4
Three to four visits	25.3	17.5	21.5
Five or more visits	31.8	30.0	30.9
Ask the expert posts			
No postings	85.9	86.3	86.1
Posted	14.1	13.8	13.9
Ask the expert visits			
No visits	18.2	23.8	20.9
One visit	44.1	43.1	43.6
Two or more visits	37.6	33.1	35.5
Resources			
No visits	23.4	26.4	24.8
One visit	16.6	12.0	14.4
Two or more visits	60.0	61.6	60.8

burdensome. Older participants who felt the study was too burdensome also were likely to leave within the first 6 months of the study.

Our results call into question a common finding elsewhere that older adults may not have the technology or have the interest in technology to participate in web-based SM. However, older adults are increasingly using the internet, smart phones, and other emerging technologies. Older adults may lag in technology adoption and broadband access but, as a population, they are rapidly catching up.²³ Our findings indicate that older adults who have some knowledge of and capacity to deal with their health condition may still need support to initially start using web-based SM. But in fact, all participants may need additional technological assistance the first few months of participation to understand the variety of tools available to improve their health outcomes. Others have recommended implementing training and technical assistance for older adults emphasizing the benefits of the technology early in the adoption process.^{24,25} This recommendation could not be investigated here and needs to be included in future studies of web-based SM systems. Older adults who needed fundamental assistance of that type were likely to be excluded

here. Those older adults deemed eligible had passed screening that indicated they had some knowledge of health intervention as well as technology application and use. Once enrolled in the trial, there were no differences in technology utilization between older and younger adults. Indeed, older adults who have adopted technology access and use may become vigorous participants in the ongoing assessment and utilization of disease SM systems. While not statistically significant, the average duration of participation among older participants was longer than the younger cohort. This may indicate that older adults, once involved, tend to remain committed to the time and effort required to use SM tools to improve their health outcomes.

There are several limitations to our study. First, this is a secondary analysis of a larger clinical trial, and therefore only represents individuals contacted and enrolled for the intervention study. Older participants were primarily white, middle class, well educated, English speakers with internet access, and raising concerns about the applicability of these findings to a web-based SM that included a diverse older population. Although reasons for nonenrollment and disenrollment were documented and categorized, these were not primary outcomes of the study, and specific participant decision-making rationales were not fully captured.

In conclusion, web-based SM offers a promising approach for older adults with chronic disease to engage in their health management. While older adults may experience barriers during participation, these barriers may be due to their exclusion during design and lack of involvement in website feature development. This study indicates that research is needed to develop effective approaches to better facilitate the participation of older adults in design and ongoing development of emerging HITs. Implementers need to pay attention to the reactions of older adults to their SM website tools. They need to anticipate the need for evolution and design changes. Those who do so may find that older adults are unusually motivated to utilize web-based SM interventions that lead to improved health outcomes and greater life satisfaction.^{21,26}

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Disclosure Statement

No competing financial interests exist.

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