Evaluating three methods to encourage mentally competent older adults to assess their driving behavior

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BACKGROUND: Fourteen percent (43.1 million) of the population in the United States was 65 years and older in 2012. This population is projected to reach 20% (88.5 million) by 2050. Older adults accounted for 17% of all traffic fatalities and 9% of all vehicle occupant injuries in 2012. We explored the effectiveness of three interventions to help older adults assess their current driving behaviors at a Level 1 trauma center.

METHODS: During 2010 to 2012, 1,216 inpatients 70 years and older admitted for surgical and medical services were screened for eligibility, and 120 were enrolled. Participants completed a driving assessment and preintervention questionnaires and were subsequently randomized to one of the following interventions: (1) brief negotiated interview plus an educational kit by the American Automobile Association about older driving plus an accompanying list of Web-based resources for older adult drivers; (2) American Automobile Association document and a list of Web-based resources; (3) online referral sheet of the list of Web-based resources only. A 3-month post-intervention follow-up questionnaire was administered over the telephone to measure changes in (1) driving-related knowledge, attitudes, and beliefs as well as (2) driving-related behaviors and intended behaviors.

RESULTS: A total of 113 randomized patients were included in the analysis. The mean (SD) age was 76.8 (5.23) years; majority of patients were white (64%), followed by black African American (33%); and 51% were males and 49% were females. Multivariate analysis showed that older adults' driving knowledge, attitudes, and beliefs ($p < 0.0001$, $R^2 = 0.37$) as well as behaviors and intentions ($p < 0.0001$, $R^2 = 0.27$) toward driving were positively correlated, controlling for other predictors in the model. Intervention assignment did not affect changes in outcomes, although outcomes improved across experimental conditions.

CONCLUSION: Our pilot study suggests that older adults are likely to make changes in their driving behavior on the basis of minimal hospital-based intervention. (*J Trauma Acute Care Surg*. 2015;79: 125–131.

KEY WORDS: Older adult driving; motivational interviewing; brief negotiated interview.

Older adult driver safety is a growing public health concern, as the proportion of the population older than 65 years increases. Fourteen percent (43.1 million) of the population in the United States was 65 years and older in 2012.[1] The number of people 65 years or older has increased more than 13 times (from 3.1 million to 43.1 million), from 1900 to 2012.[2] This population is projected to outnumber people younger than 18 years for the first time in 2056 and will reach 22% (92 million) by 2060.[3]

According to the US Department of Transportation, there were 35 million licensed older drivers in 2011, a 21% increase from 2002. This represents 16% of all licensed drivers in 2011. People 65 years and older accounted for 17% (5,560) of all traffic fatalities and 9% (214,000) of all people injured in traffic crashes in 2012. Although the proportion of licensed drivers who are older adults is similar to the proportion of all traffic fatalities who are older adults, older adults remain at higher risk for traffic-related morbidity and mortality on a per mileage basis because they tend to drive fewer miles per year than do younger drivers.

Normal aging processes are associated with declines in certain driving-related cognitive abilities, such as processing speed (e.g., reaction time and task switching), certain aspects of memory, visuospatial acuity, and executive function.[4] The relation between impairments in cognitive and physiologic functions and increased risk of motor vehicle crashes has been well documented in the literature.[5–7] The onset and extent of functional impairments, however, are highly variable, and age alone is not sufficient to determine when an individual should stop driving. Older adults have a higher motor vehicle–related injury and fatality rate per vehicle-mile traveled and are more susceptible to injury (greater incidence of head and chest trauma) and medical complications.[8,9] Fragility begins to increase at 60 years to 64 years and increases steadily with advancing age, accounting for approximately 60% to 95% of the excess death rates in older drivers.[9]

Older adult drivers, however, are not adverse to modifying their driving to reduce risk. They are, for example, less likely to engage in alcohol-impaired driving, less likely to speed, less likely to drive without a license, and more likely to wear a seat belt.[10] Research has shown that older drivers self-limit their driving by making fewer trips, traveling shorter distances, or avoiding night driving, heavy traffic, rush hour, driving on interstates, or driving on rain, ice, or snow because of medical

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impairments in vision, memory, and physical functioning.[11–14] However, some older drivers tend to be confident about their driving ability and do not feel it is necessary to regularly avoid difficult driving situations.[15] Horswill et al.[16] demonstrated that many older drivers are not able to accurately judge their own driving ability. Therefore, assessments and behavioral interventions are needed to assist older adults in determining their risk of traffic injury to themselves, pedestrians, and other drivers.

Brief Negotiated Interview

The brief negotiated interview (BNI) has foundations in motivational interviewing, a clinical method used to enhance personal motivation for change.[17] The BNI is a more effective alternative to advice giving and has been effectively applied to various public health problems, particularly substance abuse.[18–20] The BNI is normally provided in one to two sessions. It begins with assumption of personal autonomy—people make their own behavioral choices. The goal of the BNI is to elicit the patient's inherent readiness for change, resolve ambivalence, and affirm autonomy. The patient-centered method elicits intrinsic motivation and reasons for change in a goal-directed counseling style. In this model of mutual learning, the patient imparts knowledge about his or her own experiences and perspective and then receives feedback. Techniques to avoid resistance and support self-efficacy for change include open-ended questions, affirming the patient's emotions, listening reflectively, and summarizing. By ensuring greater parity between the patient and motivator, BNI minimizes resistance and improves the intervention effectiveness.

To our knowledge, BNIs have not been applied to changing driving-related behaviors among older adults. BNIs may be useful in this situation because it is nonconfrontational and does not pass judgment on the participant. Through the BNI, the participant has a chance to assess his or her driving skills and determine whether he or she wants to make changes to driving practices, and the participant receives assistance in devising a plan to make changes. Moreover, BNIs can be applied in a hospital setting, in a time-limited and patient-centered environment.[21] We reasoned that, compared with other education only, the BNI would be most effective in helping older adults assess their current driving behaviors at a Level 1 trauma center.

PATIENTS AND METHODS

Overview

We conducted randomized pilot study comparing three experimental interventions with respect to THE effects on older adults' knowledge, attitudes, beliefs, behaviors, and behavioral intentions relative to their driving practices. Interventions consisted of combinations of three components as follows: (1) BNI promoting driving self-assessment and ability-appropriate driving behavior change; (2) an older adult driving skills toolkit with associated change strategies developed by the American Automobile Association (AAA); and (3) a sheet listing AAA Web-based sources of information for older adult drivers. Participants were randomized to one of three interventions. Group 1 received all three intervention components. Group 2 received the AAA toolkit plus the sources information sheet. Group 3 received the information sources sheet only. Our hypotheses were as follows:

H1. Controlling for age, sex, and baseline assessments, experimental group predicts postintervention knowledge, attitudes, and beliefs (KAB).

H2. Controlling for age, sex, and baseline assessments, experimental group predicts postintervention driving behaviors and behavioral intentions.

PARTICIPANTS

Inclusion/exclusion criteria were as follows: (1) admitted to the surgical or medical services; (2) within 48 hours of scheduled discharge; (3) 70 years or older; (4) owns a telephone; (5) currently driving on average at least once a week, before hospitalization; (6) access to a car; (7) valid driver's license; (8) fluent in English; (9) literate; and (10) mentally competent (Mini–Mental State Examination [MMSE] score ≥ 20). Patients were also excluded from participating in the study if they were diagnosed with a medical condition that would preclude driving for more than 6 weeks after hospital discharge or had been advised by their physician to cease driving altogether.

SCREENING, RECRUITMENT, ENROLLMENT, AND RANDOMIZATION

A study coordinator monitored admission of patients into surgical and medical services to identify those who were 70 years or older. The study coordinator consulted with a nurse practitioner and/or attending physician to determine patients' scheduled discharge date. If the patient was within 48 hours of the scheduled discharge, the study coordinator, after receiving approval from medical staff, approached patients and gave a 5-minute explanation of the study. Patients interested in participating were then screened anonymously. Patients' name, telephone number, and address were recorded on a separate sheet that could be detached and destroyed if patient did not meet inclusion criteria or declined enrollment. If the patient did not meet screening criteria, he or she was given the list of Wed-based sources on older adult driving that was given to all study participants.

If the patient met the initial inclusion criteria and was interested in participating, consent procedures were initiated, and upon completion, patients were randomized.

INTERVENTIONS

Interventions were delivered by five study coordinators who received training from a licensed clinical social worker in BNI, code of ethics and professional conduct, cultural competence, and procedures for informed consent. This training used role playing and supervised bedside interviews.

Intervention component were as follows:

BNI

The BNI script took approximately 10 minutes to deliver. It is based on the principle that a patient's motivation to change can be enhanced by using a negotiation method in which the patient articulates the benefits and costs of the targeted behavior change.[21]

The *AAA Brochure*: *How to Help and Older Driver—A Guide for Planning Safe Transportation* covers general information on older adult driving, particular issues related to aging (sensing, deciding, and acting), medications that can affect driving, and a self-assessment of driving skills. The brochure includes Web links to AAA and other relevant sources, such as (1) computer-based screening tool to measure predictors of crash risk, (2) driving refresher course, and (3) quizzes, tips, and information for older drivers, including a searchable database of local transportation options. As well, additional links help older drivers connect with (1) state-by-state contacts for information on driving licensing, reporting unsafe drivers, and services for seniors; (2) other driver refresher courses; (3) information about driving with health conditions; (4) family support handbook; and (5) information on local supplemental transportation services (taxicabs, limousines and paratransits).

Online Information Referral Sheet

This intervention included only a sheet listing the AAA Web links to older drivers' information, described earlier.

Follow-up

Ten weeks after discharge, participants were sent a post card to remind them that they would receive a 3-month post-discharge follow-up telephone call. Three months after discharge, study staff contacted participants by telephone and administered the posttest questionnaire. Questions that had been asked during enrollment about driving were repeated. The posttest questionnaires required approximately 10 minutes to complete. The study staff made up to 15 contact calls within a week of scheduled follow-up at a maximum of three calls per day, leaving only one message per day before declaring a participant lost to follow-up.

Assessments

Individual Differences

Data were collected on participants' age and sex.

Screening

The MMSE is a brief 30-point questionnaire test that is used to screen for cognitive impairment, commonly used to screen for dementia syndromes.[22] A score of 23 or higher is considered normal, a score between 19 and 23 points was borderline, and a score lower than 19 points is impaired.

Driving Self-Assessment

The driving self-assessment questionnaire consisted of 21 statements as follows: (1) I get lost while driving. (2) My friends and family members say they are worried about my driving. (3) Other cars seem to appear out of nowhere. (4) I have trouble seeing signs in time to respond to them. (5) Other drivers drive too fast. (6) Other drivers honk at me. (7) Driving stresses me out. (8) After driving, I feel tired. (9) I have had more near misses lately. (10) Busy intersections bother me. (11) Left-hand turns make me nervous. (12) The glare from oncoming lights bothers me. (13) My medication makes me dizzy or drowsy. (14) I have trouble turning the steering wheel. (15) I have trouble pushing down on the gas pedal or brakes. (16) I have trouble looking over my shoulders when I back up. (17) I have been stopped by the police for my driving recently. (18) People will no longer accept rides from me. (19) I do not like to drive at night. (20) I have more trouble parking lately. (21) I think about giving up my driver's license (response options: never [0]; rarely [1]; sometimes [2]; often [3]; always [4]). The composite score, calculated by summing the numbers associated with the responses, ranged from 0 to 84.

Knowledge, Attitudes, and Beliefs

The KAB composite score was composed of the responses to the following questions. (1) In general, do you think that a person's driving skills decline as they get older? (response options: yes or no). (2) Do you think that your driving skills have declined in recent years? (response options: yes or no) (If no, skip to Question 4). (3) How much would you say your driving skills have declined, compared with 20 years ago? (response options: a little, somewhat, a lot). (4) Do you worry that you are not as safe a driver as you once were? (response option: yes or no) (If no, skip to Question 5). (5) How much would you say you worry about driving safety? (response options: a little, somewhat, a lot). The composite KAB score was constructed.

Behaviors and Behavioral Intentions

The behaviors composite score was composed of responses to the following questions. (1) In recent years, have you taken any steps to change your driving behaviors? For instance, do you … (response options [check all that apply]: Drive only when you have to? Use public transportation more? Get family or friends to drive you places? Take taxis more often? Drive less at night? Drive when traffic is less? Drive more slowly? Other changes [specify]; or have made no changes. (2) In recent years, have you spoken to your family members about your driving? (response options: yes or no). (3) Do you think you will talk to your family members about your driving within the next year? (response options: yes or no). (4) In recent years, have you spoken to your health care provider about your driving? (response options: yes or no). The composite behaviors score was constructed.

Sample Size

Because this was a pilot study intended to test feasibility of implementation and develop information on potential effect sizes, we did not conduct a formal power analysis. Nonetheless, to insure normality of distributions in each of the intervention groups, we aimed at enrolling 40 participants in each group to ensure 30 per group for analysis (assuming a 33% loss to follow-up).

DATA ANALYSIS

Test for Effectiveness of Randomization

We used analysis of variance and X^2 to determine whether the experimental groups were comparable on demographic characteristics and baseline scores.

Tests of Hypotheses

We created summary scores for each of our outcomes: (1) KAB and (2) behaviors and behavioral intentions. We

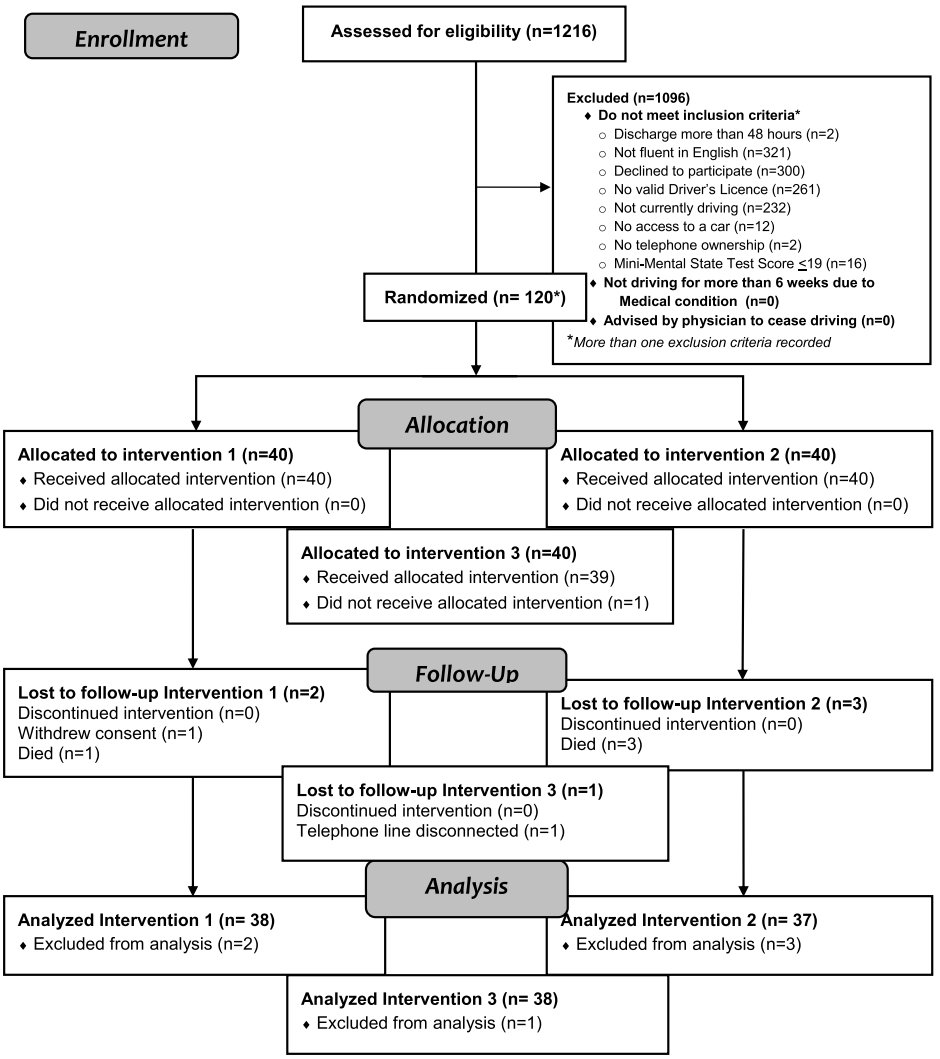

Figure 1. Participant flow diagram.

TABLE 1. Characteristics and Demographics of Enrolled Participants

	Total, n = 113	BNI, n = 38 (34%)	AAA, n = 36 (32%)	Online Referral, n = 39 (35%)	*p*
Age, mean (SD)	76.8 (5.2)	76.8 (5.4)	76.7 (4.9)	76.8 (5.5)	0.9899
Race					<0.0001
White	72 (63.7)	24 (63.2)	22 (61.1)	26 (66.7)	
Black	37 (32.7)	13 (34.2)	12 (33.3)	12 (30.8)	
Hispanic	3 (2.7)	1 (2.6)	1 (2.8)	1 (2.6)	
Asian	1 (0.9)	—	1 (2.8)	—	
					0.7778
Sex					
Male	58 (51.3)	14 (36.8)	24 (66.7)	20 (51.3)	
Female	55 (48.7)	24 (63.2)	12 (33.3)	19 (48.7)	
MMSE, mean (SD)	27.4 (2.6)	27.4 (2.5)	26.8 (3.0)	27.8 (2.4)	0.2514
Driving assessment, mean (SD)	13.7 (8.2)	14.5 (9.1)	13.2 (7.3)	13.5 (8.0)	0.7851
KAB, before intervention, mean (SD)	2.3 (2.1)	2.5 (2.1)	2.2 (2.0)	2.3 (2.2)	0.7705
Behaviors and intentions, before intervention, mean (SD)	4.0 (2.2)	4.1 (2.1)	4.5 (2.4)	3.4 (2.0)	0.0957

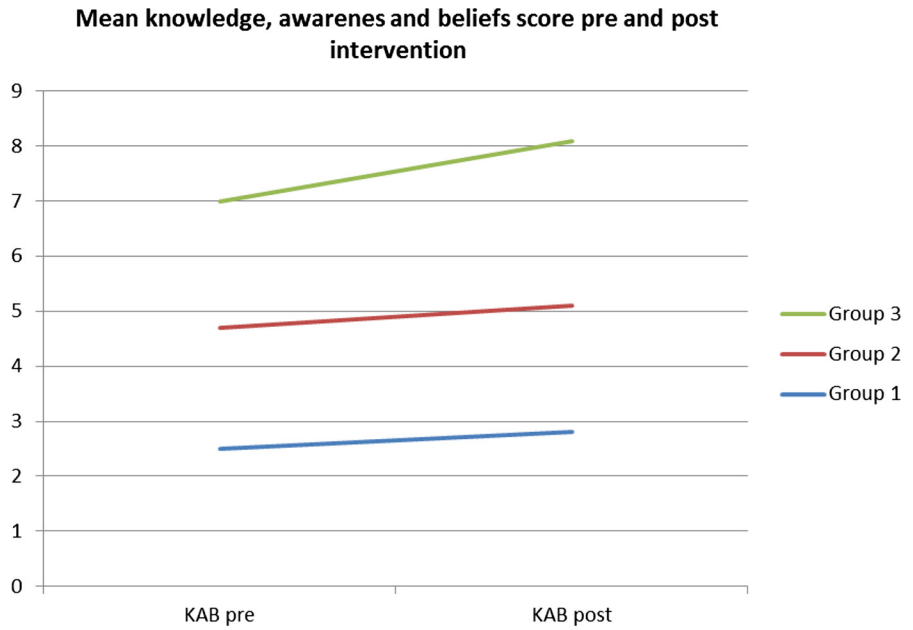

Figure 2. Mean knowledge, awareness, and beliefs score before and after intervention.

investigated, by experimental condition, pretest-posttest changes in these summary scores. We created a dummy variable for intervention (experimental condition) so that all the information concerning the three levels is accounted for. We used Group 1 as the intercept; therefore, the coefficient for Group 2 is the mean for Group 2 minus the mean from the omitted group (Group 1), and the coefficient for Group 3 is the mean of Group 3 minus the mean of Group 1. Each summary score then served as the dependent variable in a multiple regression analysis, in which the primary independent variable was experimental condition, controlling for pretest scores plus age and sex.

Data completion and collection were monitored through a data manager and computerized tracking system. We used SAS version 9.4 (SAS Institute, Cary NC) for all statistical analyses.

Human Subject's Protection

Boston University's Institutional Review Board approved the study.

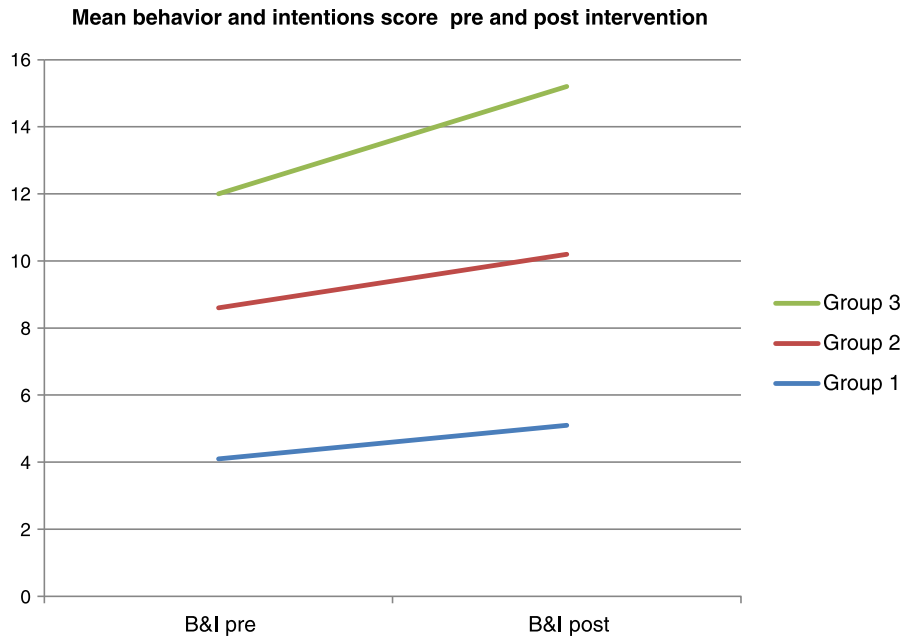

Figure 3. Mean behavior and intention score before and after intervention.

RESULTS

We assessed 1,216 patients for eligibility; 120 were randomized to one of three interventions. A detailed participant flow diagram, eligibility, exclusion, intervention allocation, follow-up, and final number of patients per intervention group are shown in Figure 1.

Characteristics of participants are shown in Table 1. By intervention status, participants were not significantly different by age, sex, MMSE score, baseline driving assessment, KAB, or driving behaviors or behavioral intentions. They were significantly different with respect to race/ethnicity, but differences were caused mainly by the distribution of Asian and Hispanic participants, of whom there were few.

Experimental condition pretest and posttest changes in the summary scores for KAB and behaviors and behavioral intentions are shown in Figures 2 and 3. Overall, across the three experimental groups, KAB and behavior scores increased in a positive direction between pretest and posttest.

Results of multivariate analysis predicting posttest driving KAB scores are shown in Table 2. This model R^2 was significantly greater than zero ($p < 0.001$, $R^2 = 0.37$). When the effects of other predictors were controlled, it was positively correlated with older adults' KAB toward driving. Sex pretest KAP and behavior scores were significant. Groups 2 and 3 are not significantly different from intervention Group 1.

Results of the multivariate analysis predicting posttest driving behavior scores are shown in Table 3. This model R^2 was significantly greater than zero ($p < 0.001$, $R^2 = 0.27$). When the effects of other predictors were controlled, it was positively correlated with older adults' driving behaviors and behavioral intentions toward driving. Pretest driving behavior score was significant. Groups 2 and 3 are not significantly different from intervention Group 1.

DISCUSSION

Thus far, older adult driving research has focused on understanding the cognitive, physiologic, and pharmacologic causes of declines in driving performance.[23,24] More recently, the impact of education programs on prevention of age-related declines in driving performance has been studied.[25] Thus, a shift is occurring from epidemiologic studies of older adult risk factors to behavioral intervention studies.[26,27] Our study contributes to this shift and suggests that minimal intervention can promote older adult drivers to consider changes to driving practices and that the hospital may be an important and underexploited venue for delivering behavioral intervention.

TABLE 2. Multivariate Analysis Predicting Driving KAB Scores

Variables	β (95% CL)	SE	*t* Value	*p*
Intercept (Group 1)	8.363 (2.85 to 13.88)	0.45	−0.72	0.0033
Group 2	−0.888 (−1.83 to 0.06)	0.48	−1.87	0.0648
Group 3	0.321 (−0.57 to 1.21)	0.45	0.72	0.4757
Age	−0.081 (−0.15 to −0.01)	0.04	−2.26	0.0260
Sex	−1.155 (−1.94 to −0.37)	0.40	−2.90	0.0045
Driving assessment	0.018 (−0.03 to 0.07)	0.03	0.69	0.4912
Pretest behaviors and behavioral intentions	0.330 (0.14 to 0.52)	0.10	3.46	0.0008
Pretest KAB	0.371 (0.17 to 0.57)	0.10	3.65	0.0004

$F_{7,105} = 8.71$, $R^2 = 0.37$, $p < 0.0001$.

TABLE 3. Multivariate Analysis Predicting Driving Behaviors and Behavioral Intentions

Variables	SE	β (95% CL)	*t* Value	*p*
Intercept (Group 1)	3.20	−1.041 (−7.4 to 5.3)	−0.32	0.7459
Group 2	0.54	−0.167 (−1.3 to 0.9)	−0.55	0.7614
Group 3	0.52	0.192 (−0.8 to 1.2)	0.37	0.7106
Age	0.04	0.045 (−0.04 to 0.1)	1.08	0.2826
Sex	0.46	0.025 (−0.88 to 0.9)	0.05	0.9572
Driving assessment	0.03	0.037 (−0.02 to 0.1)	1.24	0.2178
Pretest behaviors and behavioral intentions	0.11	0.456 (0.2 to 0.7)	4.15	<0.0001
Pretest KAB	0.12	0.124 (−0.1 to 0.4)	1.06	0.2896

$F_{7,105} = 5.44$, $R^2 = 0.27$, $p < 0.0001$.
CL, Confidence Limit.

For several reasons, the period 48 hours before hospital discharge may be a propitious time for behavioral intervention. First, because patients are soon to be discharged, they are likely recovering from the presenting health problem and thus feeling better; second, time in the hospital can be boring, and patients may welcome interaction; third, patients may be thinking about their postdischarge activities, possibly including behavioral changes to their lives. Our study illustrates these points. Most eligible patients were receptive to hearing about the study, and most enrolled. Although the intensity of intervention did not seem to affect our outcomes, all outcomes improved, suggesting that even minimal intervention can be effective.

Planning for driving cessation and alternative transportation has to be assessed at an individual level; there is no national guideline for physicians in counseling older drivers. The American Medical Association has adopted H-140.925 titled, "Impaired Drivers and Their Physicians." It articulates a physician's ethical responsibility to recognize impairments in patients' driving ability, which pose a strong threat to public safety. All states have established either mandatory or permissive reporting laws for identifying drivers with physical and mental impairments that might affect their driving safety. Moreover, because of the level of credibility and the increased frequency of their visits, doctors can be a key to discussing alternatives and help older drivers assess their skills and make safe driving decisions as they age with the support of family and friends.[25] Further research is needed to better understand the decision-making process that prompts planning for driving cessation and alternative transportation to help facilitate the aging population maintain their autonomy and increase their quality of life.

CONCLUSION

The hospital stay can provide a potentially important venue for behavioral intervention. Older adults seem receptive to considering changing driving practices in response to minimal intervention.

AUTHORSHIP

J.H., P.B., T.D., and L.A.B. developed the idea for the study. J.H., L.A.B., and T.U.-L. designed the analysis plan. A.P., V.L., C.D., E.L., and T.U.-L. acquired the data. T.U.-L., L.A.B., J.H., and V.L. analyzed and interpreted the data. T.U.-L., A.P., J.H., and L.A.B. drafted the manuscript, which was critically reviewed by all authors.

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DISCLOSURE

The authors declare no conflicts of interest.

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