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ORIGINAL RESEARCH

Geriatrics

Identification and characterization of older emergency department patients with high-risk alcohol use

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1. J. Griffeth, Y. Fatade, T. Platts-Mills, M. Weaver, K. Biese, G. D'Onofrio, J. Busby-Whitehead, C. Shenvi, "Comparing High-Risk and Low-Risk Drinking in Older Adults," presented by J. Griffeth at the American Geriatrics Society Annual Meeting, May 2017, San Antonio, TX

2. CL Shenvi, T Platts-Mills, Y Fatade, M Weaver, K Biese, J Busby-Whitehead, G D'Onofrio, "A Comparison of Older Adults with Low-Risk and High-Risk Alcohol Use in the Emergency Department," GEMSSTAR U13 Conference, September 2016, Washington, DC

3. CL Shenvi, T Platts-Mills, Y Fatade, M Weaver, K Biese, J Busby-Whitehead, G D'Onofrio, "A Comparison of Older Adults with Low-Risk and High-Risk Alcohol Use in the Emergency Department," Society for Academic Emergency Medicine Annual Meeting, May 2016, New Orleans, LA

Abstract

Background: High-risk alcohol use in the elderly is a common but underrecognized problem. We tested a brief screening instrument to identify high-risk individuals.

Methods: This was a prospective, cross-sectional study conducted at a single emergency department. High-risk alcohol use was defined by National Institute on Alcohol Abuse and Alcoholism (NIAAA) guidelines as >7 drinks/week or >3 drinks/occasion. We assessed alcohol use in patients aged ≥ 65 years using the timeline follow back (TLFB) method as a reference standard and a new, 2-question screener based on NIAAA guidelines. The Alcohol Use Disorders Identification Test (AUDIT) and Cut down, Annoyed, Guilty, Eye-opener (CAGE) screens were used for comparison. We collected demographic information from a convenience sample of high- and low-risk drinkers.

Results: We screened 2250 older adults and 180 (8%) met criteria for high-risk use. Ninety-eight high-risk and 124 low-risk individuals were enrolled. The 2-question screener had sensitivity of 98% (95% CI, 93%–100%) and specificity of 87% (95% CI, 80%–92%) using TLFB as the reference. It had higher sensitivity than the AUDIT or CAGE tools. The high-risk group was predominantly male (65% vs 35%, $P < 0.001$). They drank a median of 14 drinks per week across all ages from 65 to 92. They had higher rates of prior substance use treatment (17% vs 2%, $P < 0.001$) and current tobacco use (24% vs 9%, $P = 0.004$).

Conclusion: A rapid, 2-question screener can identify high-risk drinkers with higher sensitivity than AUDIT or CAGE screening. It could be used in concert with more specific questionnaires to guide treatment.

KEYWORDS
alcohol abuse, alcohol misuse, alcohol screening, geriatric emergency medicine

1 | INTRODUCTION

Globally, alcohol use is the seventh leading cause of death. Alcohol use contributes to problems as disparate as oropharyngeal cancer, ischemic heart diseases, breast cancer, tuberculosis, and motor vehicle collisions (MVCs).[1] Alcohol misuse is an umbrella term for a spectrum of high-risk alcohol use and alcohol use disorders. It is a complex social, personal, cultural, and medical problem that warrants focused study in every age group, as the best means of screening for and promoting reduction in use can vary with age and demographic group. In the United States from 2001 to 2013 the prevalence increased for high-risk alcohol use (9.7% to 13%) and alcohol use disorders (8.5% to 13%). The greatest increases were seen among women, older adults, racial/ethnic minorities, and lower sociodemographic groups.[2]

Alcohol use and misuse among older adults is an important, modifiable risk factor for injuries and illness.[3-6] The older adult population is at higher risk of complications because of underlying comorbidities, frailty, and polypharmacy. Alcohol misuse also leads to higher healthcare costs, emergency department (ED) visits, and hospitalizations for older adults.[7,8] Other studies have also shown high risks of dementia (78% vs 66%) and higher 18-month mortality (15% vs 12%) among patients with unhealthy alcohol use.[9] "Heavy alcohol use" is thought to contribute to 21%–24% of dementia cases.[10]

The demographics and risks of high-risk alcohol use defined here as drinking above the National Institute on Alcohol Abuse and Alcoholism (NIAAA) limits have not been fully defined in the elderly population. Prior work has estimated that the prevalence of alcohol misuse among older adults is 14% for patients in the ED, 18% for medical inpatients, and 23%–44% for psychiatric inpatients.[11] Sociodemographic factors associated with alcohol use disorders in the elderly community-dwelling population include being male,[12,13] socially isolated, single,[14,15] and separated or divorced.[16] Despite the prevalence of alcohol use and misuse among older adults, it is often not identified by clinicians.[17,18]

The NIAAA defines low-risk alcohol use among older adults as having 7 drinks per week or less, and no more than 3 drinks per occasion.[19,20] For this study, we have defined high-risk drinking as any individual consuming above the low-risk NIAAA limits. This may encompass individuals who drink above the low-risk limits but have not experienced any negative sequelae as well as patients with mild, moderate, or severe alcohol use disorders, which were previously termed alcohol abuse or dependence.[21] Prevalence comparisons are difficult to make across studies and years, as the definitions and nomenclature of alcohol use conditions have changed over time and different screening tools have been used by different studies.

Screening, brief intervention, and referral for treatment can lead to reduced alcohol consumption among low and moderate drinkers in the ED, inpatient, and outpatient settings.[22,23] One barrier to implementing alcohol interventions in healthcare settings is the need for more rapid and sensitive screening tools to efficiently identify high-risk alcohol use. Because the threshold for high-risk alcohol use is lower in older adults,[20] some of commonly used screening tools for alcohol misuse, such as the Alcohol Use Disorders Identification Test (AUDIT) and Cut down, Annoyed, Guilty, Eye-opener (CAGE) questionnaires using standard cutoffs[24] are not sensitive in the older adult population or the questions are not congruent with current NIAAA guidelines.

The purpose of this study was to develop and test a rapid screening tool for high-risk alcohol use. In addition, we sought to understand the drinking habits and characteristics of older adults who are high-risk drinkers. We used a 2-question screener for high-risk alcohol use as well as the AUDIT and CAGE tools, and compared them to consumption determined using the timeline follow back (TLFB) method as the

gold standard. The TLFB method is considered the most rigorous self-reported way to determine alcohol consumption. The alcohol screening questions used were: "During the last 3 months, on average, how many drinks containing alcohol have you had per week?" and "During the last 3 months, have you ever had 4 or more drinks on 1 occasion or over the course of 4 hours or less?" The goal of the work is to determine whether a 2-question screener that can serve as a rapid instrument to detect high-risk alcohol use above the NIAAA low-risk limits.

2 | METHODS

2.1 | Study design

This was a cross-sectional observational study of older adults, conducted among patients during their ED visit. The study was approved by the institutional review board of the University of North Carolina at Chapel Hill and was registered with ClinicalTrials.gov (NCT02236494) as part of a larger randomized controlled trial of an ED-based intervention to reduce high-risk alcohol use.

2.2 | Study setting and protocol

The setting was a single, academic, level 1 trauma center ED in the southeast United States serving a socioeconomically diverse population, with 16% of visits by individuals aged 65 or older. Patients were eligible if 65 years or older and English speaking. Patients were excluded if they were cognitively impaired, a prisoner, under psychiatric hold, receiving end-of-life or hospice care, deemed too ill by their emergency physician, or lived in a skilled nursing facility. Research assistants were trained in recruitment, enrollment, consent, and cognitive screening of older adults in the ED via training modules, videos, role-play exercises, and completion of two 90-minute sessions to ensure mastery of the interview process.[25] The research assistants monitored the ED census for enrollment, filtering by inclusion and exclusion criteria, from 7 am to 10 pm on weekdays.

Eligible patients were screened for high-risk alcohol consumption using the 2-question screening tool described previously based on the NIAAA guidelines for high-risk alcohol use. High-risk drinkers as defined by the NIAAA were those who had had >7 drinks per week or those who had had >3 drinks on 1 occasion. All others were considered low-risk drinkers. Following the alcohol screening questions, the Callahan 6-item screener was used to assess cognitive function,[26] and individuals who scored 3 or less on this were excluded due to concern for low cognitive ability that would limit accurate data measurement or reliable consent. All high-risk drinkers were offered enrollment in the trial. Screening and enrollment were performed over a period of 20 months ending June 2015. An enrollment flowchart is shown in Figure 1. Sensitivity and specificity calculations were performed using the combined dataset of individuals identified as low risk and high risk by the screener questions to capture both the false negatives and false positives.

> ### The Bottom Line
>
> High-risk alcohol use in the elderly is a common but under-recognized problem. In this study of 2250 older adults presenting to the ED, a simple 2-question screen ("During the last 3 months, on average, how many drinks containing alcohol have you had per week?" and "During the last 3 months, have you ever had 4 or more drinks on one occasion or over the course of 4 hours or less?") showed better accuracy than traditional screens such as AUDIT and CAGE.

2.3 | Measurements

After consent was obtained, the research assistants conducted a structured interview using the TLFB method to characterize drinking in the past 7 days and binge episodes in the 28 days prior to the interview.[27] Two commonly used alcohol screening tools were also administered: the AUDIT[28] and CAGE assessments.[29] In addition to standard sociodemographic characteristics, we also assessed the number of falls, MVCs, episodes of driving after drinking, and number of outpatient, ED, and inpatient healthcare encounters in the 6 months before the interview. We assessed patients' ability to perform activities of daily living (ADL) using the Katz Index of Independence in ADL[30] and depression using the Patient Health Questionnaire-2,[31] and inquired about patients' social support, past or current alcohol rehabilitation treatment, drug and substance use, mobility, and chronic pain. For all calculations, the consumption reported using the TLFB method was used as the reference standard.

2.4 | Data analysis

Data were collected and recorded using the Research Electronic Data Capture program. Characteristics were compared across risk groups using the χ^2 test for nominal categorical variables, the Mantel-Haenszel row mean score test for ordinal categorical variables, and the nonparametric Wilcoxon rank sum test for counts with multiple categories.

3 | RESULTS

3.1 | Enrollment

During the 20-month enrollment period, 2250 ED patient aged 65 years or older were screened using the 2-question screening tool. 183 (8%) met criteria for high-risk alcohol use, and 2067 (92%) were low-risk drinkers or non-drinkers. All high-risk individuals were offered enrollment, and 98 (53%) enrolled. Of the low-risk group, 199 were offered enrollment, and 124 (62%) were enrolled. The reasons and
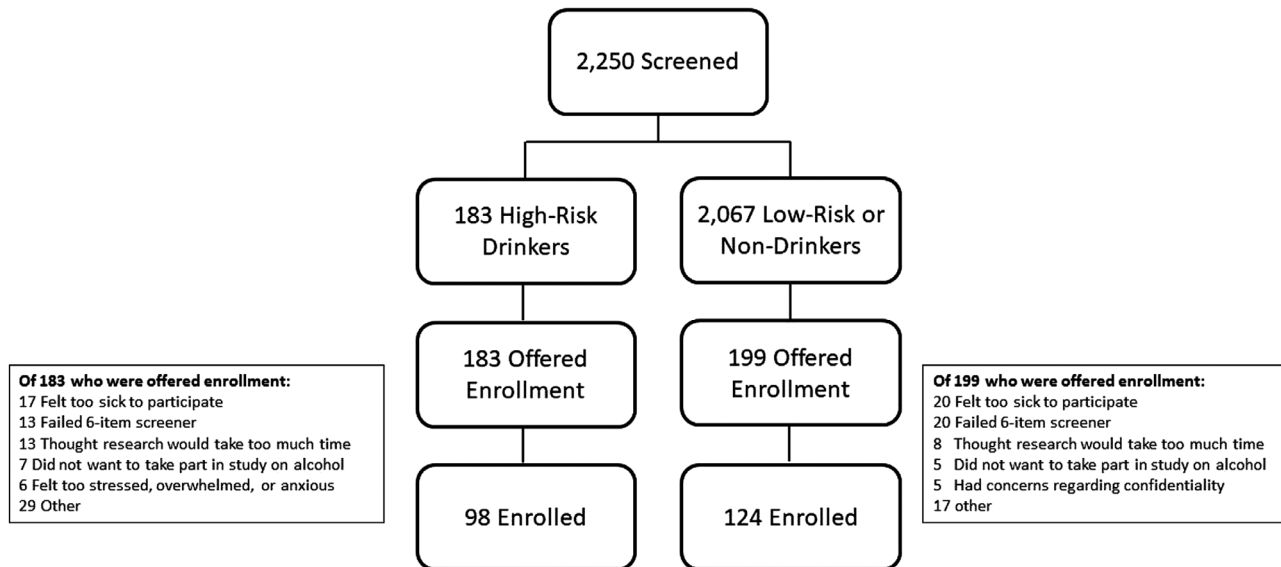
FIGURE 1 Flowchart showing screening and enrollment of high-risk and low-risk individuals. There are far more low-risk than high-risk individuals, so enrollment for low-risk individuals was closed earlier to enroll similar numbers of individuals in both groups

numbers of individuals who were offered enrollment but did not enroll are shown in Figure 1.

3.2 | Screening tools

Using the combined data of low-risk and high-risk individuals, the 2-question screener had a sensitivity and specificity of 98% (95% CI, 93%–100%) and 87% (95% CI, 80%–92%) using the TLFB method as a standard. By contrast, the AUDIT screen had sensitivity and specificity of 93% (95% CI, 85%–97%) and 78% (95% CI, 70%–84%) with a cut-off of 4 or more, and 52% (95% CI, 41%–63%) and 99% (95% CI, 95%–100%) with a cutoff of 8 or more, which is similar to prior reports.[24] Using CAGE questions with a score of 2 or more had sensitivity and specificity of 45% ((95% CI, 34%–56%) and 100% (95% CI, 97%–100%).

The mean AUDIT score for the group of high-risk drinkers was 9.1, whereas for the low-risk group it was 1.1 (Table 1). The mean CAGE score in the group of high-risk drinkers was 1.2, whereas that for low-risk drinkers was <0.1.

3.3 | Characteristics

The high-risk drinkers were predominantly male (67%) and had a mean age of 73 (range 65–94). They reported a median of 14 weekly drinks (mean = 19, range 1 to 170), and 57% reported 1 or more binge episodes per month. Although more of the enrollees were in the younger age range (65–75), the median number of drinks consumed per week was consistent across ages (Figure 2). The mean number of drinks per week based on the patient's estimate from the initial alcohol screening questions was similar to the amount calculated using the TLFB tool with a mean of 19 by average self-estimate and 17 by TLFB.

Among the high-risk drinkers, 57% reported binge episode on the initial alcohol screening questions and this was confirmed in 51% by 28-day TLFB.

The low-risk group were predominantly female (65%), had a mean age of 74 years (range 65 to 92), consumed a median of 0 weekly drinks (mean = 1.1, range 0 to 7), and by definition had no instances of binge episodes. The number of drinks per week based on the patient's average estimate was similar to the amount calculated using the TLFB tool with a mean 1.1 by self-estimate versus 1.0 by TLFB.

There was no significant difference between the ages of the 2 groups, and the racial distributions were also similar, with 17% African Americans in the high-risk group and 21% African Americans in the low-risk group. Marital status for each group was also similar with 59% of the high-risk group married or living with a partner, and 52% of the low risk group. The 2 groups had similar levels of social support and rates of feeling isolated or lonely, with 9% of the high-risk group feeling isolated most or all of the time, compared with 4% of the low-risk group. Statistically significantly more high-risk drinkers had education beyond high school (80% vs 62%) and lived independently (92% vs 77%) (Table 1).

3.4 | Health and healthcare utilization

The proportion of high-risk drinkers with poor or fair self-rated health was lower than the percentage of patients in the low-risk group (25% rated their health as poor or fair vs 39%). The high-risk group less often reported pain in the last month (51% vs 65%), had lower mean pain scores (2.6 vs 4.3), and used fewer prescription pain medications (16% vs 35%) (Table 2).

Individuals in the high-risk group reported the same number of out-patient visits but fewer hospitalizations (mean 0.41 vs 0.75) and ED

TABLE 1 Alcohol use and demographics of high- and low-risk drinkers enrolled

Characteristic	High-risk	Low risk	P value
Sociodemographic information			
Mean age	73	75	0.129
Male	67%	35.5%	<0.001
Living independently	92%	76.6%	0.003
Married or living with a partner	59%	51.6%	0.440
More than high school education	81%	62.1%	0.041
Alcohol screening and use			
CAGE score ≥ 1	64%	4.0%	
CAGE score ≥ 2	37%	0.8%	<0.001
Mean AUDIT score (possible 0–40)	9.1	1.1	
AUDIT ≥ 4	93%	14%	
AUDIT ≥ 8	44%	2%	<0.001
Median drinks/week by estimate	14	0	
Mean drinks/week by estimate	19	1	<0.001
Median drinks/week by TLFB	13	0	
Mean drinks/week by TLFB	17	1	<0.001
Patients with ≥1 binge episodes per month by patient estimate	57%	0%	<0.001
Patients with ≥ 1 binge episodes per month by TLFB	51%	1%	<0.001

AUDIT, Alcohol Use Disorders Identification Test; CAGE, Cut down, Annoyed, Guilty, Eye-opener; TLFB, timeline follow back
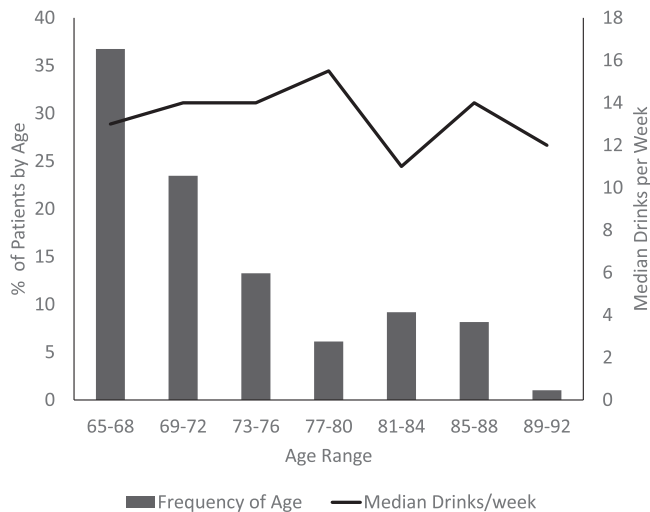
FIGURE 2 Age distribution among high-risk drinkers enrolled and median drinks consumed per week by age group

visits (1.3 vs 1.9) in the past 6 months. 14% of high-risk drinkers reported a perceived relationship between alcohol use and a prior ED visit, whereas none of the low-risk drinkers reported the same.

3.5 | Substance use history

Rates of illicit drug use and prescription misuse were similar for the high- and low-risk groups (5% vs 3%). Similar percentages of patients in the 2 groups reported a family history of alcohol (34% vs 32%) and (non-alcohol) substance use disorder (15% vs 15%). The high-risk group was, however, much more likely to have received prior treatment for (non-alcohol) substance use disorders (17% vs 1%). Tobacco use was also more prevalent in the high-risk drinkers (24% vs 9%) (Table 2).

3.6 | Mobility, falls, and function

High-risk drinkers were generally more mobile and more able to manage their ADLs. Compared with 57% of the low-risk group, 82% of the high-risk group reported they were able to walk a quarter mile with no or some difficulty. The percentage of patients who had experienced a fall in the 6 months prior to the interview was similar in the 2 groups: 47% of high-risk drinkers and 45% of low-risk drinkers. However, the high-risk alcohol group was more likely to report a fall that had involved alcohol (20% vs 2%).

The rates of MVCs in the 6 months prior to the interview were similar between high- and low-risk drinkers (2%). No one in either group reported a MVC involving alcohol. However, more high-risk drinkers reported driving after having two or more drinks (25% vs 2%) in the past 6 months.

4 | DISCUSSION

High-risk alcohol use among older adults is a rising and underrecognized public health concern for several reasons. First, changes in body

TABLE 2 Medical and functional status of high- and low-risk drinkers enrolled

Characteristic	High-risk	Low-risk	P value
Medical history and healthcare utilization			
Patient rated health as fair or poor	25%	39%	0.011
Mean number of prescription medications	5	6	0.005
Mean number of hospitalizations in the last 6 months	0.4	0.8	0.009
Patients who reported prior hospitalizations were related to alcohol	10%	0%	0.030; Fishers $P = 0.090$
Mean number of ED visits in the last 6 months	1.3	1.9	0.001
Patients who reported prior ED visits were related to alcohol	14%	0%	0.001; Fishers $P < 0.001$
Patient reports MD or RN talked to them about alcohol use	4%	4%	0.001; Fishers $P < 0.001$
Functional status and mobility			
MVC in the last 6 months	2%	2%	0.850; Fishers $P = 1.000$
Reported driving after 2 or more drinks in last 6 months	25%	2%	$P < 0.001$
Patients with falls	47%	45%	0.837
Falls that involved alcohol	20%	2.4%	<0.001; Fishers $P < 0.001$
Unable to walk a quarter mile	18%	43%	<0.001
Mean Katz ADL score (1-6)	0.1	0.4	0.003
Pain in the last month	51%	65%	0.043
Mean pain score (1-10)	2.6	4.3	0.001
Using OTC pain medications	59%	55%	0.516
Using prescription pain medications	16%	35%	0.002
Mental health and substance use disorders			
Mean PHQ-2 depression score (1-6)	1.3	0.9	0.075
Tobacco use	24%	9%	0.004
Use of illicit drugs or prescription misuse in the last 6 months	5%	3%	0.513
Prior (non-alcohol) substance use treatment	17%	1%	<0.001
Family history of unhealthy alcohol use	34%	32%	0.824; Fishers $P = 0.886$
Family history of substance use	15%	15%	0.869; Fishers $P = 1.000$

ADL, activities of daily living; MVC, motor vehicle collision; NIAAA, National Institute on Alcohol Abuse and Alcoholism; OTC, over the counter; PHQ-2, Patient Health Questionnaire-2

High-risk drinkers were defined as anyone drinking with a quantity or frequency above the NIAAA low-risk thresholds of >7 drinks per week or >3 drinks per occasion.

composition with aging result in higher blood alcohol concentrations for a given alcohol intake[3,32] Second, older adults tend to have more chronic medical conditions, take more prescription medications, and are at higher risk of falls, all of which can be complicated or worsened by high-risk alcohol use.[33] Third, rates of high-risk alcohol use may increase in the coming decades. National estimates of regular alcohol use and binge drinking have risen markedly over the past decade and the aging "Baby Boomer" generation has higher rates of substance use than earlier generations.[19,34] Finally, high-risk alcohol use and alcohol use disorders are often missed among older patients.[3,17] Symptoms of excess alcohol use, such as gait disturbances, falls, or confusion, may be interpreted as signs of aging or other conditions[35] and not all clinicians routinely screen older patients for high-risk alcohol use. Many older adults who engage in high-risk drinking are not aware of the recommended alcohol limits for their age group and have never tried to cut down.[32] In this study only 9 of the 98 high-risk drinkers enrolled were aware of the guidelines for hazardous alcohol use for their age.

All these factors contribute to the need for more widespread, rapid screening and intervention for alcohol use among older patients.

In this study we developed and tested a rapid, 2-question screener for high-risk alcohol use and found it functioned with a high sensitivity and specificity using the TLFB method as a reference. Many of the alcohol screening tools used in clinical settings are more specific for alcohol use disorders, as they focus on the negative social or personal consequences of drinking, rather on the quantity and frequency of consumption, and so they lack sensitivity for high-risk alcohol use. In addition, the screening tools were not designed specifically for older patients, and the screening tools no longer represent the current NIAAA guidelines. Our 2-question screener could easily be integrated into a triage screen in the ED to identify older patients with high-risk alcohol use efficiently and accurately. Screening and identification are the necessary first steps toward developing or deploying an intervention.

In our study, 8% of the screened individuals met criteria for high-risk alcohol use of which 67% were male, which is similar to prior studies.[3]

The prevalence of high-risk alcohol use in this study is lower than in some prior studies. The exact causes for this are not clear but could be related to varied definitions used or the demographics of individuals in this ED. The high-risk drinkers tended to be healthier, more mobile, and have lower rates of ED visits and hospitalization rates in the prior 6 months. High-risk drinkers also tended to have lower prevalence and severity of chronic pain. The rate of falls between the 2 groups was similar but the relationship between alcohol use and falls is complex. Prior studies have also found that healthier patients who are at a lower fall risk tend to drink more, making it difficult to isolate the effect of alcohol on falls, though other research has found a trend toward more falls in the very heavy drinkers. For example, Malmivaara et al found an increased relative risk of falls in individuals over 64 only when they consumed >1000 g of alcohol per month, which equates to ≈18 drinks per week.[36] Our study did find that significantly more of the high-risk drinkers reported a fall that had involved alcohol use, though the overall rate of falls was the same. The high-risk group also reported more instances of driving after drinking 2 or more drinks.

These findings support the conclusion that high-risk drinkers in this study tended to be healthier than low-risk drinkers, which is consistent with previous literature.[37,38] The known negative physiologic effects of alcohol in older adults[39] suggests that the better health in high-risk drinkers in comparison to low-risk drinkers is correlative and not causative. In a similar vein, the high-risk drinkers tended to use more tobacco products, which is also likely correlative with their overall better health and not in any way causative. It is possible that patients with worse health and mobility do not have as ready access to alcohol, have previously voluntarily cut down on their alcohol intake in order to prevent falls, have been counseled to reduce their alcohol use, or suffered side effects from interactions of alcohol with other medications. Also, more of the low-risk drinkers lived in assisted living facilities, where they may not have ready access to alcohol.

4.1 | Limitations

Although this study has helped describe the demographics and characteristics of high-risk and low-risk older adult drinkers and the sensitivity of a rapid, 2-question screener, there are several limitations. One is the need for a larger sample size and more geographic and socioeconomic diversity in order to generalize the results. Another possible limitation is that patient information was mostly self-reported, which can lead to recall bias as only some of the information could be verified via the medical records. A number of patients opted not to enroll, primarily because they felt too unwell, or were ineligible based on cognitive decline, which could also introduce some selection bias.

5 | CONCLUSION

High-risk alcohol use is prevalent among older adults in the ED and is more common among men. Many commonly used screening tools are not optimized for use among older adults and do not reflect current NIAAA guidelines. We developed and tested a rapid, high-sensitivity, 2-question screener to identify high-risk alcohol use among older adults in the ED. This tool could be used in concert with a more specific tool or questionnaire to better define the presence and severity of an alcohol use disorder and guide future intervention or treatment.

Patients who are high-risk drinkers tended to be healthier and more mobile and were more likely to be living independently. Patients who are institutionalized, immobile, or in worse health may have less access to alcohol or may limit their drinking because of their poorer health. Among the high-risk drinkers that we interviewed, there were more enrollees among younger patients (65–75-year age group), but the median number of drinks per week was stable at close to 14 across the age spectrum. Future work is needed to test the feasibility and effect of implementing this screening tool in the ED and on the effect of brief interventions in the ED on future drinking and health outcomes in this population.

CONFLICT OF INTEREST

None of the authors has any conflict of interest for this research.

AUTHOR CONTRIBUTIONS

Christina L. Shenvi, Timothy F. Platts-Mills, Kevin J. Biese, Jan Busby-Whitehead, and Gail D'Onofrio conceived of the study, designed the trial, and obtained funding. Mark A. Weaver assisted with study development and performed statistical analyses. Yushan Wang, Rishab Revankar, and Yetunde Fatade performed data collection. Aileen Aylward assisted with data analysis and manuscript preparation. Christina L. Shenvi led the study, supervised data acquisition and analysis, and led manuscript development. All authors contributed to manuscript preparation. Christina L. Shenvi takes responsibility for the paper as a whole.

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