Original Contributions

PREVALENCE OF PROBLEM DRINKING AND CHARACTERISTICS OF A SINGLE-QUESTION SCREEN

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Abstract—Hazardous drinking and alcohol use disorders (i.e., abuse and dependence) are common in Emergency Departments (EDs). This study examined 1) the prevalence of these conditions among ED patients and 2) characteristics of a single screening question (having consumed at least five drinks for males or four for females during a single day). Data from the National Epidemiologic Survey on Alcohol and Related Conditions were analyzed. Logistic regression for clustered data was used to estimate the relative risk for past-year ED use associated with hazardous drinking, abuse, and dependence. Contingency tables were analyzed to estimate the sensitivity and specificity of the single-question screen for detecting these conditions. Hazardous drinking was not associated with ED utilization. Alcohol abuse was associated with a relative risk of 1.3 (95% confidence interval [CI] 1.1–1.5) and alcohol dependence with a relative risk of 1.9 (95% CI 1.6–2.2). For current drinkers, the single question screen was 0.96, 0.85, and 0.90 sensitive for hazardous drinking, alcohol abuse, and alcohol dependence, respectively. Individuals with a positive screen in the past year were considered at least hazardous drinkers, and specificity was 0.96, 0.85, and 0.90 for hazardous drinking, alcohol abuse, and alcohol dependence, respectively. Specificity was modestly increased in women. Most problem drinkers were hazardous drinkers, but only severe alcohol use disorders were particularly prevalent in the ED. The single heavy-drinking-day item appears sensitive for problem drinking. Positive tests must be followed by additional assessment to differentiate hazardous drinking from alcohol use disorders. © 2008 Elsevier Inc.

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INTRODUCTION

Alcohol problems are common in emergency medical settings (1). Hazardous drinking indicates a pattern of consumption that is associated with health risks, but has not resulted in an alcohol use disorder (AUD) (i.e., abuse or dependence as defined by the American Psychiatric Association). AUDs are not defined by the amount of alcohol consumed, but rather are characterized by recurrent drinking despite adverse consequences resulting from alcohol use. Hazardous drinking patterns may improve with brief interventions that consist of 5 to 10 min of counseling and advice by medical personnel designed to motivate patients to reduce alcohol consumption, a mode of care that has been shown effective in Emergency Departments (EDs) (2). AUDs are unlikely to respond to brief intervention in acute medical settings, but effective pharmacological and psychosocial treatments are available and treatment linkages from EDs to further care are important (3,4). Due to this high prevalence and the availability of effective treatments, identification of cases in EDs is a priority, and various screening instruments such as the four-item CAGE and six-item RAPS-QF have been evaluated in the ED setting (5).
In primary care settings, an even briefer screen has been recommended by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) in their publication, “Helping Patients Who Drink Too Much – A Clinician’s Guide” (6). This involves asking non-abstinent persons a single question about heavy drinking days. Those reporting any heavy drinking day in the past year (five or more drinks for men, four or more drinks for women) are considered to have a positive screen, and additional assessment is then recommended. This approach is attractive due to its brevity and simplicity and because it does not immediately focus on alcohol-related problems (e.g., family problems, legal problems). As such, the screen is compatible with a typical history and physical conducted in the ED and other medical settings. Although there is increasing evidence that the use of one or several consumption questions is a reasonable screening approach in non-abstinent persons in primary care and EDs, the use of a heavy-drinking-day item alone has not been validated in a nationally representative ED sample using a strong diagnostic standard (7–11).

The purposes of this study were to 1) estimate the relative risk of ED utilization associated with hazardous drinking and alcohol use disorders among adults in the United States, and 2) explore the characteristics of the single-question heavy-drinking-day screen for hazardous drinking and alcohol use disorders among non-abstinent persons with past-year ED utilization.

**METHODS**

**Subjects**

Subjects included participants in the 2001–2002 National Epidemiologic Survey on Alcohol and Related Conditions (NESARC). This residential survey was conducted by NIAAA, and provided nationally representative estimates on alcohol use, alcohol use disorders, and mental health comorbidities for non-institutionalized adults in the United States. A complex probability sampling design and person-level weighting were utilized to generate estimates for the target population and to ensure adequate representation of all persons regardless of demographic characteristics, as described in detail elsewhere (12). The NESARC database was thoroughly de-identified before public release, and the study was exempt from Institutional Review Board review.

**Determination of Alcohol Abuse and Dependence**

The Alcohol Use Disorders and Associated Disabilities Interview Schedule (AUDADIS) was administered to all NESARC participants. The AUDADIS is a validated diagnostic interview for alcohol use disorders and associated comorbidities (13). Those persons currently meeting the American Psychiatric Association’s *Diagnostic and Statistical Manual – IV* (DSM-IV) criteria for alcohol abuse and alcohol dependence were considered as having these diagnoses for this analysis (past alcohol use disorders were not considered) (14).

**Determination of Heavy Drinking Days**

A standard drink (i.e., 12 oz of beer, 5 oz of wine, or 1.5 oz of distilled spirits) was defined for survey participants. Male NESARC participants were asked how often they drank five or more drinks of any alcohol in the last 12 months. Women were asked how often they drank four or more drinks. Several categorical responses for non-abstainers ranged from “never” to “every day.” Men with any five-plus drinking days and women with any four-plus drinking days were considered as having a heavy drinking day(s).

**Determination of Hazardous Drinking**

Hazardous drinking was defined as exceeding dietary guidelines for alcohol consumption (15). These guidelines attempt to prevent alcohol-related medical conditions (e.g., hypertension) while at the same time allowing for social drinking and possible cardiovascular benefits resulting from light to moderate drinking (16). For males this includes up to 14 drinks per week and no more than four on drinking days. For non-pregnant females and older males (> 65 years), this includes up to seven drinks per week and no more than three on drinking days. Based on this guideline, any person with a heavy drinking day in the past year was considered a hazardous drinker.

Because some persons may on average exceed weekly limits while avoiding heavy drinking days, two additional items were used to further define hazardous drinking. Survey participants were asked how often they drank alcohol. Several categorical responses for non-abstainers ranged from “1 or 2 times in the past year” to “daily.” Non-abstainers were then asked how many drinks they usually consumed on drinking days. For purposes of this analysis, men were considered hazardous drinkers if they drank at least three to four times per week and had four drinks on a typical drinking day, or drank on all or most days with three drinks on a typical drinking day. This definition results in an overestimation of hazardous drinking in males, because some men in this category might be consuming about 12 drinks per week without exceeding daily limits. For females,
hazardous drinking included those having three drinks on at least 3 or 4 days per week, or two drinks on all or most days of the week.

**Determination of ED Utilization**

Determination of ED utilization in NESARC was based on self-report. Participants were asked, “In the last 12 months, how many times did you receive medical care or treatment in a hospital emergency room?” Those responding “at least once” were considered to have utilized emergency medical services.

**Analysis**

Prevalence of each current problem-drinking condition was estimated for persons with and without recent ED utilization. Logistic regression models with ED utilization as the dependent variable were used to estimate relative risk for such utilization for each problem-drinking condition, with and without adjustment for age and gender. Dummy coding was used to provide relative risks for each problem-drinking condition relative to individuals with no problem-drinking condition. Finally, contingency tables were analyzed to estimate the sensitivity and specificity of the heavy-drinking-day question for detecting each problem-drinking condition in non-abstinent persons with recent ED utilization. This was done for the overall sample and by gender. Post-test probabilities were estimated using the resulting positive and negative likelihood ratios and the prevalence of each disorder in those with ED utilization as estimated from the NESARC data. All analyses accounted for the complex survey design, and were completed using standard procedures included in SAS v.9.1 (SAS Institute Inc., Cary, NC). Point estimates were generated using person-level weights, and standard errors accounted for the clustered sampling method. Standard error estimates using this method were compared to standard errors released by the funding agency that were generated with SUDAAN software (SUDAAN; Research Triangle Park, NC), and were identical (17).

**RESULTS**

The total NESARC sample included 43,093 participants. Of this total, 41,961 had data required for the current study and were included in these analyses, and 8525 reported past-year emergency medical utilization. The prevalence of each problem-drinking condition for those with and without such utilization, and the crude and age-and-sex-adjusted relative risk for utilization are shown in Table 1. Hazardous drinking was more prevalent (16.9%) than alcohol abuse (5.3%) or alcohol dependence (5.7%) in the ED population, but was not associated with increased risk for ED utilization. AUDs were more prevalent compared to those not using the ED, and were associated with increased risk for ED utilization. The estimated sensitivity and specificity of the heavy-drinking-day item for each problem-drinking condition in non-abstinent persons with recent ED utilization are listed in Table 2, along with the estimated probability for each condition associated with a positive or negative heavy-drinking-day item. The single question was sensitive for hazardous drinking (0.96), alcohol abuse (0.85), and alcohol dependence (0.90), whereas specificity was comparatively lower. Probabilities for any problem drinking were low with a negative heavy-drinking-day item. With a positive heavy-drinking-day item, 63% were hazardous drinkers, with the remainder meeting criteria for abuse or dependence. Women with any heavy drinking days were more likely to be hazardous drinkers, but 28% still met criteria for an AUD.

**DISCUSSION**

This work examined the risk for ED utilization associated with problem-drinking conditions, and the utility of a single-question heavy-drinking-day alcohol screen in non-abstinent persons utilizing emergency medical services. Results showed that approximately 60% of patients with problem drinking in the ED were hazardous drinkers, but that only those with more severe alcohol problems are particularly prevalent in the ED.
of at least 1 heavy drinking day in the past 12 months was sensitive for problem-drinking conditions, but additional assessment would be required to differentiate hazardous drinking from alcohol abuse and dependence.

The diagnosis of alcohol dependence is often clinically apparent in ED patients, obviating the need for formal screening. However, when screening and assessment across the entire spectrum of alcohol misuse is required, the results of this analysis support the use of a single heavy-drinking-day question among non-abstinent ED patients. Several other clinically validated alcohol screening instruments are also available, such as the RAPS4-QF and AUDIT, both of which include items about alcohol use and related problems (5,18). These could be used as an initial screen among current drinkers, or as a case-finding tool when an alcohol problem is clinically suspected. Such instruments have the advantage of enhanced specificity for alcohol dependence because they include items about adverse alcohol-related consequences. Due to this, they may help to discriminate hazardous drinkers from dependent drinkers, if quantity of consumption is high but no adverse consequences are endorsed.

Despite this, the single-question heavy-drinking-day item has some potential advantages. Firstly, it is extremely brief and can easily be included in a patient interview. Secondly, it does not immediately address alcohol-related consequences (e.g., arrests, interpersonal problems, symptoms of withdrawal), and may thus be less threatening to patients and more comfortable for health care providers. Thirdly, a positive response to a single-item screen indicates at least hazardous drinking. These are potential advantages upfront, but any positive screen, regardless of the instrument used, should ultimately be followed-up with a diagnostic assessment that covers criteria for abuse and dependence, such as the one provided in NIAAA’s guidelines for alcohol screening (6). Results of this study suggest that such assessment would have high yield, with 37% of persons with heavy drinking days having abuse or dependence. Nonetheless, the relatively lower specificity of the heavy-drinking-day item would result in a larger number of negative assessments for abuse and dependence. Because assessment requires familiarity with DSM-IV criteria and is more time consuming than screening, brief but accurate assessment methods would be helpful in determining who would benefit from referral to an addiction specialist and who is appropriate for brief intervention in the ED. There is a need for clinical research in this area.

Strengths of this study include the use of a nationally representative sample with detailed information on alcohol use and full diagnostic assessment for alcohol use disorders. Reliance on self-reports is a potential source of bias, but the detailed drinking assessments and the AUDADIS can be considered gold standards for determining alcohol use and diagnosing alcohol use disorders. Any under-reporting would likely cause a decrease in estimated risk of ED utilization associated with problem-drinking conditions, and diminish the characteristics of the heavy-drinking-day question. Self-reports of ED utilization were not independently confirmed, but it is unlikely that self-reports would be biased by alcohol status. A limitation of this work is the use of data that were not collected at the time of ED utilization by clinical personnel. However, reproducibility in clinical settings is supported by similar findings in a primary care sample and among injured patients (10,11). Due to its high sensitivity across the spectrum of problem-drinking conditions, and the ease with which it can be incorporated into a patient inter-

<table>
<thead>
<tr>
<th>Drinking Condition</th>
<th>Sensitivity</th>
<th>Specificity</th>
<th>Probability with Heavy-Drinking Day(s)†</th>
<th>Probability without Heavy-Drinking Day(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous drinking</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Overall</td>
<td>0.96 (0.95–0.98)</td>
<td>0.80 (0.78–0.82)</td>
<td>63% (61–66)</td>
<td>2% (1–2)</td>
</tr>
<tr>
<td>Males</td>
<td>0.97 (0.96–0.99)</td>
<td>0.72 (0.69–0.75)</td>
<td>57% (54–60)</td>
<td>2% (1–2)</td>
</tr>
<tr>
<td>Females</td>
<td>0.95 (0.94–0.97)</td>
<td>0.86 (0.86–0.90)</td>
<td>72% (69–76)</td>
<td>2% (1–2)</td>
</tr>
<tr>
<td>Alcohol abuse</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Overall</td>
<td>0.85 (0.80–0.89)</td>
<td>0.64 (0.62–0.66)</td>
<td>17% (16–19)</td>
<td>2% (1–3)</td>
</tr>
<tr>
<td>Males</td>
<td>0.86 (0.81–0.91)</td>
<td>0.58 (0.55–0.60)</td>
<td>20% (18–22)</td>
<td>3% (2–4)</td>
</tr>
<tr>
<td>Females</td>
<td>0.82 (0.74–0.89)</td>
<td>0.70 (0.67–0.72)</td>
<td>13% (11–14)</td>
<td>1% (1–2)</td>
</tr>
<tr>
<td>Alcohol dependence</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall</td>
<td>0.90 (0.86–0.94)</td>
<td>0.65 (0.63–0.67)</td>
<td>20% (18–22)</td>
<td>1% (1–2)</td>
</tr>
<tr>
<td>Males</td>
<td>0.91 (0.86–0.96)</td>
<td>0.59 (0.56–0.61)</td>
<td>23% (21–25)</td>
<td>2% (1–3)</td>
</tr>
<tr>
<td>Females</td>
<td>0.88 (0.80–0.96)</td>
<td>0.71 (0.68–0.73)</td>
<td>15% (13–18)</td>
<td>1% (0–2)</td>
</tr>
</tbody>
</table>

* For non-abstinent persons with past-year ED utilization; 95% confidence intervals are included in parentheses.
† Probabilities were calculated based on NESARC-estimated prevalences of 26.2%, 8.2%, and 8.8% for hazardous drinking, abuse, and dependence, respectively, among current drinkers with ED utilization. Corresponding figures for males were 27.6%, 11.1%, and 11.8%, respectively; for females 24.7%, 5.0%, and 5.7%, respectively.
view, use of the heavy-drinking-day item as an initial screen has potential. Importantly, a negative screen would strongly suggest the absence of problem drinking, but positive results would need to be followed by a valid assessment for alcohol use disorders.

CONCLUSIONS

Problem drinking is common in EDs, with severe alcohol problems being particularly prevalent relative to the general population. Patient outcomes might be improved with detection, diagnosis of hazardous drinking or an alcohol use disorder, and brief intervention or treatment linkage. All of these are areas in need of continued research and quality improvement initiatives (19). Regarding detection, several instruments exist that are helpful in screening for problem-drinking conditions, or for additional risk stratification when a clinical suspicion exists. The single-question heavy-drinking-day item provides a practical, rapid, and simple alcohol screen that would seem to be ideal in the hectic ED environment. Results of this study suggest that this screen may be highly useful in ruling out problem drinking, whereas a positive result indicates at least hazardous consumption. Future research in the ED should validate the screen at the point of care, and develop brief methods for differentiating hazardous drinkers from those with alcohol use disorders.

REFERENCES