Screening for Underage Drinking and *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* Alcohol Use Disorder in Rural Primary Care Practice

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Objective To examine the National Institute on Alcohol Abuse and Alcoholism Youth Guide alcohol frequency screening thresholds when applied to *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* (DSM-5) diagnostic criteria, and to describe alcohol use patterns and alcohol use disorder (AUD) characteristics in rural youth from primary care settings.

Study design Adolescents (n = 1193; ages 12 through 20 years) visiting their primary care practitioner for outpatient visits in six rural primary care clinics were assessed prior to their practitioner visit. A tablet computer collected youth self-report of past-year frequency and quantity of alcohol use and DSM-5 AUD symptoms. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were determined.

Results For early adolescents (ages 12 through 14 years), 1.9% met DSM-5 criteria for past-year AUD and ≥3 days with alcohol use in the past year yielded a screen for DSM-5 with optimal psychometric properties (sensitivity: 89%; specificity: 95%; PPV: 37%; NPV: 100%). For middle adolescents (ages 15 through 17 years), 9.5% met DSM-5 AUD criteria, and ≥3 past year drinking days showed optimal screening results (sensitivity: 91%; specificity: 89%; PPV: 50%; NPV: 99%). For late adolescents (ages 18 through 20 years), 10.0% met DSM-5 AUD criteria, and ≥12 past year drinking days showed optimal screening results (sensitivity: 92%; specificity: 75%; PPV: 31%; NPV: 99%). The age stratified National Institute on Alcohol Abuse and Alcoholism frequency thresholds also produced effective results.

Conclusion In rural primary care clinics, 10% of youth over age 14 years had a past-year DSM-5 AUD. These at-risk adolescents can be identified with a single question on alcohol use frequency. *(J Pediatr 2016;173:214-20)*.

Given the relatively high prevalence of alcohol-related harm among youth, medical organizations recommend routine screening for underage drinking in clinical practice.[1-5] However, most adolescents visiting primary care practitioners (PCPs) do not receive alcohol screening and related services, with PCPs citing barriers including time constraints and inadequate training.[6-8] Advances in computer-administered self-assessment methods and the availability of brief screening tools may combine to provide feasible and effective methods for PCPs to optimize their efforts to efficiently identify underage drinking in their adolescent patients.

Approaches to facilitate screening to identify adolescents with alcohol-related problems are particularly needed for PCPs in rural settings, given higher rates of alcohol use among rural youth.[1,9] Alcohol use patterns dramatically change across adolescent development. Average ages of onset for drinking milestones provide some guidelines regarding the development of alcohol use behavior, and suggest the potential utility of age-specific alcohol screening thresholds.

The purpose of a screening tool is to efficiently and effectively identify adolescents likely to have an alcohol use disorder (AUD). For adults, such screening has utilized items referencing alcohol related problems, eg, Cut down, Annoyed, Guilty, Eye opener (CAGE). With CAGE showing poor psychometric properties in teens, attempts have been made to devise other problem-based screens.[10] Car, Relax, Alone, Forget, Friends, Trouble (CRAFFT)[11] has been the most extensively studied, and is comprised of three substance use questions and six substance problem questions. Although found to have acceptable psychometric properties in some studies,[11] the specificity of the CRAFFT has been unacceptably low in some clinical settings[12] and inferior to screening based

AUD	Alcohol use disorder	FP	False positive
CRAFFT	Car, Relax, Alone, Forget, Friends, Trouble	NIAAA	National Institute on Alcohol Abuse and Alcoholism
DSM-5	*Diagnostic and Statistical Manual of Mental Disorders, 5th Edition*	NPV	Negative predictive value
		PCP	Primary care practitioner
DSM-IV	*Diagnostic and Statistical Manual of Mental Disorders, 4th Edition*	PPV	Positive predictive value
		TN	True negative
FN	False negative	TP	True positive

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on substance use frequency.[13] CRAFFT and similar approaches also require substantial administration time.

Among teens, alcohol use frequency has been observed to be highly correlated with AUD.[14] In a national sample of 12- to 18-year olds,[15] past year alcohol use frequency has been found to be a screen for AUD with excellent psychometric properties. The use of an alcohol frequency item to screen youth for problematic drinking was adopted for the National Institute on Alcohol Abuse and Alcoholism (NIAAA) Alcohol Screening and Brief Intervention for Youth: A Practitioner's Guide (NIAAA Youth Guide).[5]

When adolescents are asked to report their alcohol use in a primary care setting, computer-administered assessment may have several advantages.[13,16-18] This method could facilitate routine alcohol screening of adolescents seen in rural primary care settings.

This study used a computer-administered assessment to examine alcohol involvement in a large sample of adolescents seen in rural primary care settings, and examined the psychometric characteristics of alcohol use patterns as screening for *Diagnostic and Statistical Manual of Mental Disorders, 5th Edition* (DSM-5) AUD. We also tested the DSM-5 AUD performance of NIAAA-recommended age-stratified alcohol use frequency cut-offs,[5] which were developed for *Diagnostic and Statistical Manual of Mental Disorders, 4th Edition* (DSM-IV) AUD. The AUD diagnostic criteria in DSM-5 represent the current consensus AUD definition. Compared with DSM-IV AUD, DSM-5 AUD defines a single diagnosis (vs abuse and dependence in DSM-IV) and requires a minimum of two endorsed items to meet diagnostic criteria (vs one for abuse in DSM-IV).

Methods

The region served by the rural PCPs involved in this study has been designated "Pennsylvania Wilds" by the Pennsylvania Tourism Office. The Pennsylvania Wilds region was selected for this study because this area has the lowest population density in Pennsylvania and was the rural area most proximal to the academic centers conducting the study (ie, University of Pittsburgh, Pittsburgh and Bradford campuses). The study was conducted from September 1, 2008, through June 3, 2015.

The subjects were 1193 adolescents (ages 12 through 20 years) sequentially recruited from six practices described below. The subjects and methods reported here were distinct from those described in Gordon et al.[7]

Subjects were first seen by a practice staff member, who provided a brief description of the project, and asked the adolescent whether he or she was interested in receiving a more detailed description of the study by research staff. No information was collected about patients who declined participation. Informed consent was then conducted with the subject (18 years or older) or parental consent with subject assent (if under 18 years old). Subjects received $25 for research participation. Participating youth were provided with a tablet computer that collected data on past year alcohol use and alcohol-related symptoms. Survey completion time was 3 to 6 minutes. Participation in the study did not impede patient flow in the practices. The study was approved by the University of Pittsburgh Institutional Review Board.

Measures

Alcohol Use Patterns

Subjects were provided with a "standard drink" definition[5] as part of the computer administered assessment. With the exception of an initial question on any lifetime alcohol use, all questions were defined as referencing at least 1 standard drink. The alcohol use items were: age of first drink; alcohol use frequency for the past 30 days and past 12 months; typical number of drinks per occasion (ie, quantity); lifetime greatest number of drinks in 24 hours; age of first binge (traditional definition: ≥5 male/≥4 female or more drinks within 2 hours); age of first incident of intoxication ("drunk"); frequency of binge drinking in the past 30 days. Although the traditional definition of a drinking binge has typically been applied across development, binge definitions based on estimated blood alcohol concentrations have been developed that are more appropriate for younger teens.[19] Using the "lifetime greatest number of drinks" response, the estimated blood alcohol concentrations[19] binge thresholds were calculated as follows: ages 9 to 13 years: ≥3 drinks; 14 or 15 years: ≥4 for males, ≥3 for females; 16 or 17 years: ≥5 for males, ≥3 for females.

AUD Symptoms and Diagnoses

The National Survey on Drug Use and Health computer administered structured diagnostic assessment for determining DSM-IV AUD symptoms and diagnoses[20-22] for the past 12 months was expanded to cover the 11 DSM-5[23] AUD symptoms (ie, the DSM-5 "craving" symptom was added to the DSM-IV[24] AUD symptoms queried in the National Survey on Drug Use and Health). The DSM-IV "legal problems" item was assessed but was not used to determine DSM-5 AUD diagnosis.

Sensitivity, Specificity, Positive Predictive Value, Negative Predictive Value

Relative to disorder status (ie, DSM-5 AUD), screening test results may be true positive (TP): screen+, disorder+; false positive (FP): screen+, disorder−, true negative (TN): screen−, disorder−; and false negative (FN): screen−, disorder+. The psychometric characteristics of a screening test are indicated by four statistics: sensitivity (SE = TP/TP + FN); specificity = TN/TN + FP; positive predictive value (PPV: TP/TP + FP); negative predictive value (NPV: TN/TN + FN). The selection of threshold values involves optimizing these values while taking into consideration the consequences of inaccurate results. We examined the screening performance of past-year frequency, average quantity per