Addictive Behaviors 68 (2017) 14–17

Contents lists available at ScienceDirect

Addictive Behaviors

journal homepage: www.elsevier.com/locate/addictbeh

Short Communication

Sensitivity and specificity of the gain short-screener for predicting substance use disorders in a large national sample of emerging adults

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HIGHLIGHTS

- Uses a large (n = 9808) clinical sample of emerging adults (EAs)
- Uses the Substance Disorder Screener (SDScrY) subscale of the GAIN-Short Screener
- Demonstrates sensitivity and specificity in predicting EA substance use disorders
- Finds equivalent screening cutoffs for emerging adults and other age groups

ARTICLE INFO

Article history:
Received 25 October 2016
Received in revised form 20 December 2016
Accepted 4 January 2017
Available online 6 January 2017

Keywords:
Screening, brief intervention, and referral to treatment, SBIRT
Substance disorder screener
Emerging adults
Substance use disorders
Screening

ABSTRACT

Background and objectives: Emerging Adults (ages 18–25) have the highest prevalence of substance use disorders and rarely receive treatment from the specialty care system. Thus, it is important to have screening instruments specifically developed for emerging adults for use in Screening, Brief Intervention and Referral to Treatment (SBIRT) models. Optimal cutoffs for the widely-used GAIN Short-Screener's (GAIN-SS) Substance Disorder Screener (SDScrY) are not established specifically for emerging adults. Therefore, this study examined the sensitivity and specificity of the SDScrY in predicting emerging adult (ages 18–25) substance use disorders.
Methods: We analyzed data from emerging adults in a large clinical sample (n = 9,808) who completed both the five-item SDScrY (α = 0.85) and the full criteria set for DSM-IV Substance Use Disorders. We estimated the sensitivity, specificity and area under the curve to determine optimal cutoffs.
Results: Analyses revealed a high correlation between the SDScrY screener and its longer parent scale (r = 0.95, p < 0.001). Sensitivity (83%) and specificity (95%) were highest at a cutoff score of two (AUC = 94%) on the SDScrY for any past year substance use disorder. Sensitivity (85%) was also high at a cutoff score of two on the SDScrY for any past year alcohol disorder.
Conclusions: The five-item Substance Use Disorder Screener is a sensitive and specific screener for emerging adults, and could be used to identify emerging adults who may benefit from SBIRT interventions.

1. Introduction

Across all age brackets, emerging adults (EAs, ages 18–25) in the United States have the highest rates of past year substance use disorders (SUDs, 16.3%) (Center for Behavioral Health Statistics and Quality, 2015). Additionally, higher percentages of EAs report binging on alcohol in the past month (37.7%) relative to older adults (22.5%) or adolescents (6.1%) (2015). Despite the high prevalence of substance use among EAs, they have been traditionally underrepresented in the research literature, prompting a recent Institute of Medicine (IOM, 2014) report that advocated for more research on EAs. The IOM report (2014) also recommended reporting findings separately for emerging adults and other age groups to understand the unique needs of this population. The purpose of this study was to test the sensitivity and specificity of a brief screening instrument, the GAIN Short Screener (GAIN SS), in predicting the presence of SUDs among EAs. Sensitivity is the percentage of true positive cases, and specificity the percentage of true negative cases.

1.1. Screening and treating EAs for substance use

Emerging adulthood is conceptualized as a unique developmental stage nested between adolescence and adulthood during which significant changes occur in educational, occupational and relational realms (Arnett, 2000). EAs rarely come to treatment (8% in Tuithof, ten Have,

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http://dx.doi.org/10.1016/j.addbeh.2017.01.013
0306-4603/

van den Brink, Vollebergh, & de Graff, 2016) and when they do they have lower abstinence motivation and poorer outcomes compared to adolescents and older adults (Smith, Godley, Godley, & Dennis, 2011; Satre, Mertens, Areán, & Weisner, 2003, 2004). There has been substantial interest in delivering Screening, Brief Intervention and Referral to Treatment (SBIRT) interventions to EAs in opportunistic settings such as emergency rooms or in primary care (Monti et al., 1999; Babor et al., 2007). There is substantial controversy, however, surrounding whether screening and brief intervention works for EAs who meet criteria for SUDs (Saitz, 2007; Saitz, 2015). For such individuals, referral to treatment should be the goal of SBIRT.

Many screeners have not been adequately vetted for sensitivity and specificity in predicting substance use disorders among emerging adults specifically (Stucky, Edelen, & Ramchand, 2014), with most studies using primarily adolescent and/or adult samples (Bastiaens, Francis, & Lewis, 2000; Bastiaens, Riccardi, & Sakhrani, 2002; Dennis, Chan, & Funk, 2006; Titus, Dennis, Lennox, & Scott, 2008; Friedmann, 2013; Knight, Sherritt, Shrier, Harris, & Chang, 2002; Pilowsky & Wu, 2013). Screeners should be tested specifically with EAs for two main reasons. First, it is possible that cutoff points on screeners may be different for EAs than for individuals in other age groups. Few studies exist on this, but higher cutoffs were needed for EAs on the CRAFFT than previously found with adolescents to achieve good sensitivity (Bagley, Anderson, and Stein, 2017). Additionally, consumption-based screeners (i.e., frequency and quantity measures) do better at identifying problematic use among adolescents than for emerging adults (Kahler, Hoeppner, & Jackson, 2009). Thus, it is reasonable that cutoffs may be different for screeners based on SUD criteria for emerging adults. For example, some of the SUD criteria are interpreted by EAs in ways not originally conceptualized by the developers (Slade, Teesson, Mewton, Memedovic, & Krueger, 2013), and some single SUD criteria are associated with higher or lower latent severity for EAs (i.e., differential item functioning; Conrad, Dennis, Bezruczko, Funk, & Riley, 2007; Mewton, Teesson, & Slade, 2010). Thus, shorter scales could be more susceptible to age-related cutoff differences between emerging adults and other age groups (Conrad et al., 2007; Delforterie et al., 2015; Mewton et al., 2010). Second, screeners such as the AUDIT do well predicting risky drinking for EAs, but not as well in terms of predicting SUDs (DeMartini & Carey, 2012; Kokotailo et al., 2004; Zamboanga et al., 2007). Knowing an EA's potential for SUD diagnosis at the time of screening may better help practitioners to focus SBIRT on making referrals for treatment. Thus, screeners are needed to efficiently identify EAs with SUDs for SBIRT interventions that focus on referral to treatment for EAs, a noted gap in the literature (Glass et al., 2015).

1.2. The GAIN family of instruments

This study tests the specificity and sensitivity of the GAIN Short Screener's Substance Discorder Screener (SDScrY). It was derived from the full version of the Global Appraisal of Individual Needs (GAIN-I; two hour administration time), for which the core substance use scales ($\alpha = 0.90$) have consistently high levels of internal consistency and reliability across populations (Stevens, Schwebel, & Ruiz, 2007). The GAIN I is widely used in the United States in both practice and research, with approximately 150 scholarly publications using GAIN data through 2013 (Hunter, Griffin, Booth, Ramchand, & McCaffrey, 2014). The GAIN family of instruments have a well-established training protocol that is associated with high data quality (Titus et al., 2012), and the instruments are also practice-friendly in that web-administered versions generate clinical reports that can aid in clinical decision making and facilitate brief motivational interventions (Smith, Ureche, Davis, & Walters, 2015).

The GAIN Short Screener was developed in 2006 due to the need for brief screeners with shorter administration times (Dennis et al., 2006). Although analyses revealed that the SDScrY had good sensitivity and specificity, that study only included adolescents and adults, did not specifically examine emerging adults, and did not report age-related differences in cutoffs (Dennis et al., 2006). The current study uses a much larger sample of emerging adults (n = 9808) to give an EA-specific estimate of sensitivity and specificity, given that other studies reveal age related differences in optimal cutoffs for SUD screeners (Bagley et al., 2017).

1.3. Summary

Because of the high prevalence of substance use and SUDs among EAs, the relative lack of screeners with established cutoffs for EAs, and the national interest in broad dissemination of SBIRT, it is critical that screeners be validated for use with EAs. This study establishes the sensitivity and specificity of the Gain Short-Screener's SDScrY for EAs.

2. Material and methods

2.1. Data source and participants

Pooled data were available from Chestnut Health Systems' GAIN Coordinating Center, which manages what is perhaps the largest longitudinal dataset of adolescent and emerging adult treatment outcomes in the United States (Hunter et al., 2014). Sites contributing data were mainly funded by SAMHSA's Center for Substance Abuse Treatment (CSAT). Sites contributing data to the CSAT GAIN dataset came from all regions of the United States (4% North East, 53% Midwest, 13% West, 30% South), predominantly from urban centers (30% population > 2,000,000, 11% population 1–2 million, 32% population 250,000–999,000, 27% population < 250.000). Most participants contributing data in this study came from treatment sites providing outpatient treatment (73%). Prior research has shown that the sites are similar to other treatment agencies nationally, but do offer more ancillary services such as HIV testing, (Hunter et al., 2014). Participant characteristics are presented in Table 1.

2.2. Measures

The SDScrY consists of five items drawn from the 16-item Substance Problem Scale on the GAIN I. Dennis et al. (2006) found it to be internally consistent ($\alpha = 0.78$), as well as sensitive (>88%), and specific (>92%) in predicting past year SUDs at a recommended cutoff of 2 or higher. The SPS from which the SDScrY's items originate, contains questions consistent with the Diagnostic and Statistical Manual's (DSM- IV, American Psychiatric Association, 2000) criteria for substance abuse (4 items), substance dependence (7 items), as well as five additional items on risky substance use (e.g., hiding use). The SPS has been used in multiple emerging adult studies (Smith, Cleeland, & Dennis, 2010; Smith et al., 2011; Smith, Bahar, Cleeland, & Davis, 2014) and corroborated independently-made psychiatric diagnoses (Chan, Dennis, & Funk, 2008). On the full version of the GAIN I, the SPS is administered for any substance for which the participant reports using, generating substance-specific lifetime and past year diagnoses.

2.3. Analysis plan

Following procedures from Dennis et al. (2006), a study which included a smaller sample of 18–25 year olds (n = 804), we calculated the sensitivity and specificity for the SDScrY in predicting whether an EA had a past year SUD (i.e., abuse or dependence). Additionally we examined Receiver Operator Curves (ROC) at different cutoffs to determine which had the largest Area under the Curve (AUC). Such analyses aided identifying the optimal emerging adult-specific cutoffs for the screener with the best balance between sensitivity and specificity. We report sensitivity and specificity for three past year criterion variables including, any alcohol or other drug use disorder (AOD), any alcohol use disorder (AUD), or any drug use disorder (DUD). Data on the