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Translating transdermal alcohol monitoring procedures for contingency management among adults recently arrested for DWI

Charles W. Mathias[a,b,*], Nathalie Hill-Kapturczak[a], Tara E. Karns-Wright[a], Jillian Mullen[d], John D. Roache[a,c], James C. Fell[e], Donald M. Dougherty[a,c]

[a] Department of Psychiatry, The University of Texas Health Science Center at San Antonio, San Antonio, TX, USA
[b] Center for Research to Advance Community Health (ReACH), The University of Texas Health Science Center at San Antonio, San Antonio, TX, USA
[c] Institute for Integration of Medicine and Science, The University of Texas Health Science Center at San Antonio, San Antonio, TX, USA
[d] EASL International Liver Foundation, Geneva, Switzerland
[e] NORC at the University of Chicago, Bethesda, MD, USA

HIGHLIGHTS

- Describes four Plan-Do-Study-Act (PDSA) cycles of quality improvement.
- Adapting transdermal alcohol concentration monitoring for contingency management.
- Treatment retention was greatest under final round of contingency management conditions.
- The proportion of weeks with alcohol use remained stable across the four PDSA cycles.

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ABSTRACT

Recent developments in alcohol monitoring devices have made it more feasible to use contingency management (CM) procedures to reduce alcohol use. A growing body of literature is demonstrating the effectiveness of CM to reduce alcohol use among community recruited adults wearing transdermal alcohol concentration (TAC) monitoring devices. This article describes the quality improvement process aimed at adapting TAC-informed CM aimed at minimizing alcohol use and maximizing treatment completion. This extends literature to a high-risk population; adults arrested and awaiting trial (pretrial) for criminal charge of driving while intoxicated (DWI). Participants were enrolled during their orientation to pretrial supervision conditions of DWI bond release. At enrollment, participants completed a screening, brief intervention, and referral to treatment; those with high risk alcohol histories were enrolled in an 8-week CM procedure to avoid TAC readings. Four Plan-Do-Study-Act (PDSA) quality improvement cycles were conducted where the TAC cutoff for determining alcohol use, the quantity of reinforcer, and handling of tampers on the transdermal alcohol monitor were manipulated. Across four PDSA cycles, the retention for the full 8-weeks of treatment was increased. The proportion of weeks with alcohol use was not decreased across cycles, the peak TAC values observed during drinking weeks were significantly lower in Cycles 1 and 4 than 3. CM may be developed as a tool for pretrial supervision to be used to increase bond compliance of those arrested for DWI and for others as a method to identify the need for additional judicial services.

1. Introduction

Driving while intoxicated (DWI) offenses are prevalent and associated with severe consequences. DWI is among the most frequently committed offenses in the U.S. (FBI, 2015), yet it's estimated that only 0.1% of alcohol-impaired drivers are arrested (Zaloshnja, Miller, & Blincoe, 2013). Further, nearly 30% of those arrested for DWI will be re-arrested for alcohol impaired driving (NHTSA, 2014b). DWI recidivists are over-represented in fatal crashes by a factor of 1.62, as drinking drivers in fatal crashes by a factor of 2.38, and as a high blood alcohol concentration (BAC) driver in fatal crashes by a factor of 3.81 (Fell, 2014). National rates show 31% of motor vehicle fatalities involve

* Corresponding author at: Department of Psychiatry, The University of Texas Health Science Center at San Antonio, NRLC MC 7793; 7703 Floyd Curl Drive, San Antonio, TX 78229-3900, USA.
E-mail address: Mathias@uthscsa.edu (C.W. Mathias).

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a driver with a BAC ≥ 0.08 (legal intoxication) and cost $49.8 billion annually (NHTSA, 2014a).

The period after DWI arrest is a unique context for targeting reduction in alcohol use. The time between arrest and adjudication (pretrial) is typically lengthy and involves bond stipulation for alcohol abstinence and monitoring (Buner, 2015; Fell, 2006; Widgery, 2013). Despite inherent contingencies (fines, incarceration) within the pretrial supervision period, rates of alcohol use are alarmingly high. One large study (n = 7743) using ignition interlock data (car-installed breathalyzer) found that alcohol is detected in as many as 70% of cases (Vanlaar, Robertson, Schaap, & Vissers, 2010). In light of ongoing alcohol use in pretrial, we were interested in adapting a contingency management procedure to ultimately determine if it reduces alcohol use among DWI defendants under pretrial supervision.

Contingency management (CM) may be an effective intervention to reduce alcohol use during the pretrial supervision period. CM is a behavioral intervention involving the delivery of rewards or removal of punishment to achieve a specific behavior, like reductions in alcohol use. CM is effective in reducing the quantity and frequency of using drugs of abuse (Benishek et al., 2014; Lussier, Heil, Mongeon, Badger, & Higgins, 2006) and is well-tolerated by patients (Kirby, Benishek, & Tabit, 2016). Until recently, limitations in blood, breath, or urine alcohol use biomarkers (e.g., Javors & Johnson, 2003; Maenhout, De Buyzere, & Delanghe, 2013) hindered progress in applying CM for reducing alcohol use. However, continuous remote detection of alcohol use is now available through transdermal alcohol monitors that passively measure alcohol excreted in sweat (Marques & McKnight, 2009; McKnight, Fell, & Auld-Owens, 2012; Swift, 2000, 2003). One study has shown that DWI offenders mandated to transdermal alcohol monitoring during pretrial supervision have delayed recidivism to DWI compared to non-monitored offenders (360 days to rearrests versus 271; Tison, Nichols, Casanova-Powell, & Chaudhary, 2015).

Transdermal alcohol concentration (TAC)-informed CM procedures have been shown to reduce alcohol use among community samples and this article describes the quality improvement process of adapting these procedures for a new population and treatment context: adults recently arrested for a DWI and under bond-stipulation of alcohol abstinence. Previous studies examined manipulations of CM parameters (i.e., size of reinforcers and the TAC cut-offs) in studies of community volunteers (Barnett, Tidey, Murphy, Swift, & Colby, 2011; Barnett et al., 2017; Dougherty et al., 2014; Dougherty, Karns, et al., 2015; Dougherty, Lake, et al., 2015). The issue of limits of detection is important because the forensic criteria for TAC cut-offs to confirm a drinking event is deliberately conservative to avoid false positive readings. In contrast, clinical research has focused on the reliability of detection of lower TAC values (i.e., is higher sensitivity; Roache et al., 2015). Across various adaptations in TAC-informed CM procedures, studies have consistently found reductions in alcohol use among community-recruited heavy drinkers (Barnett et al., 2011; 2017; Dougherty et al., 2014; Dougherty, Karns, et al., 2015; Dougherty, Lake, et al., 2015). Because the DWI population tends to have more complex needs and more limited resources than general community samples (Mullen, Ryan, Mathias, & Dougherty, 2015b), we anticipated that the CM procedure would require adaptation for the high-risk pretrial DWI offender population. This project used quality improvement methodology as a mechanism to adapt TAC-informed CM procedures for this new target population with the goal of minimizing alcohol use and maximizing treatment completion among those recently arrested for DWI offenses.

2. Material and methods

2.1. Participants

Between May 2015 and June 2017, adults who had been recently arrested for a DWI were offered enrollment into an evaluation and intervention program. Enrollment occurred at pretrial orientation, where offenders are instructed on the conditions of their bond release supervision. In our local jurisdiction, this orientation typically occurs two weeks after arrest. As an adjunct to the typical orientation process, our staff advertised the availability of alcohol evaluation and intervention services. Participants were informed that these services are separate from the pretrial supervision, voluntary, and confidential. They specifically were informed that participation in the program was not intended to impact the outcome of their pending DWI case and that information gathered as part of participation in the intervention would not be shared with the pretrial supervision officers. Those who attended all 8-weekly CM visits received a program completion certificate. Of the 213 potential participants approached during this 2-year project, 86 were enrolled in CM, 88 were excluded for low AUDIT score, and 39 declined participation.

2.1.1. Screening, brief intervention, referral to treatment (SBIRT)

Interested participants first experienced an approximately 45 min computer-assisted alcohol screening, brief intervention, and referral to treatment (SBIRT) as previously described in Mullen, Ryan, Mathias, & Dougherty, 2015a. During the SBIRT session, data were collected about participant demographic and alcohol use characteristics including the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). Those who score risky, harmful, or in the dependent range (i.e. scores > 4) in the AUDIT were offered participation in the CM intervention. Participants were included if they were: adults (≥ 21 years); arrested for DWI; under pretrial supervision; and willing to undergo voluntary transdermal alcohol monitoring for the purpose of treatment. Participants were excluded if they: were court mandated to transdermal alcohol monitoring; had significant alcohol withdrawal symptoms. Clinical Institute Withdrawal Assessment for Alcohol (CIWA score ≥ 10; Sullivan, Sykora, Schneiderman, Naranjo, & Sellers, 1989); or had medical conditions that might contraindicate wearing the ankle monitor (e.g., pregnancy, diabetes). While not an entry criteria, the clinic from which this data was gathered serves a high proportion of low-income, uninsured clients.

2.2. Transdermal alcohol monitoring

Participants who qualified and agreed to volunteer were fitted with the Secure Continuous Remote Alcohol Monitors [SCRAM, Alcohol Monitoring Systems (AMS); Highlands Ranch, CO] for detecting transdermal alcohol concentrations (TAC). The monitors were worn on the ankle and detected ethanol emitted through the skin every 30 min, 24 h/day. Attempts to obfuscate alcohol use were measured by infrared reflectivity and body temperature sensors.

SCRAM data was uploaded to the AMS web interface ($SCRAM_{NET}$; Highlands Ranch, CO) during weekly visits. Then, data was downloaded and run through a program we developed for processing TAC data and producing a CM payment decision. The data processing removes TAC data points that are uninterpretable because they do not conform to characteristics of actual alcohol use events based on known absorption and elimination rates, or producing implausibly high or low, but long, TAC readings. After processing, the application then produces a CM payment decision (yes/no) and provides a summary of TAC, infrared, and temperature data.

2.3. Quality improvement cycles

This project describes four QI cycles following the Plan, Do, Study, Act (PDSA) model (described in Moran, Duffy, & Smith, 2012). Each cycle involved: Planning a CM intervention using a well-defined set of contingency criteria; Doing the intervention in a cohort of participants; Studying the outcomes of that cycle of intervention; and Acting to implement change in the subsequent round of intervention. The goal of the PDSA process was to improve the quality of the CM intervention to minimize alcohol use and maximize treatment completion. Cycles were