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A procedure that differentiates unintentional from intentional overdose in opioid abusers

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Abstract

Objective—The purpose of this study is to develop a procedure for assessing unintentional overdose (OD) in opiate abusers that differentiates it from intentional OD, and provides reliable information about the incident.

Methods—A sample of 121 patients in a methadone maintenance program at an urban university hospital completed a baseline assessment. A total of 70 participants completed an identical assessment at least 14 days later. The ability of an OD item to differentiate unintentional OD from intentional OD was tested, as was the test-retest reliability of questions assessing symptoms and treatment of OD.

Results—The procedure differentiated unintentional OD from intentional OD, and is reliable. Questions assessing symptoms of OD were endorsed in almost every unintentional OD incident, although reliability was affected by loss of consciousness. The reliability of questions assessing emergency treatment and Narcan administration was outstanding.

Conclusions—Our procedure for assessing OD differentiates unintentional OD from intentional OD. The use of follow-up questions assessing acute treatment for OD is recommended. Items concerning symptoms of OD are not needed to confirm the presence of an OD, but may be used to clarify whether an event was an OD.

Keywords

Opioid-Related Disorders; Analgesics; Methadone; Heroin Dependence; Overdose; Attempted Suicide; Reliability; Questionnaire

1. Introduction

Unintentional overdose (OD) is the leading cause of death among individuals in treatment for opioid dependence (Gossop, Stewart, Treacy, & Marsden, 2002; Hser, Hoffman, Grella, & Anglin, 2001). Suicide is also a leading cause of death among opiate abusers (Wilcox, Conner, & Caine, 2004). Postmortem attempts to distinguish opiate abusers who died by unintentional from intentional OD are prone to error (Cantor, McTaggart, & De Leo, 2001). It is easier to distinguish unintentional from intentional non-fatal OD because individuals are available to report their intentions. Information gained from non-fatal cases may generalize to fatal cases as non-fatal unintentional OD is associated with future OD (Britton, Wines, & Conner, 2010; Coffin et al., 2007), and suicide attempts are associated with suicide (Bukstein et al., 1996; Harris & Barraclough, 1997). Accordingly, the study and prevention of unintentional and intentional ODs among opioid abusers is a public health priority.

Studies comparing non-fatal unintentional ODs to suicide attempts by any method among substance users have produced conflicting results (Bohnert, Roeder, & Ilgen, 2010). Although many studies show that the events are related (Best et al., 2000; Bradvik, Frank, Hulenvik, Medvedeo, & Berglund, 2007; Darke, Ross, Lynskey, & Teesson, 2004; Hakansson, Schlyter, & Berglund, 2008; Maloney, Degenhardt, Darke, & Nelson, 2009; Rossow & Lauritzen, 1999; Vingoe, Welch, Farrell, & Strang, 1999), they often do not distinguish whether the unintentional OD and suicide attempt were the same event. Studies that make the distinction suggest that a suicide attempt history is not associated with a history of unintentional OD (Conner, Britton, Sworts, & Joiner, 2007; Darke & Ross, 2001; Wines, Saitz, Horton, Travaglini, & Samet, 2007). Moreover, studies that examine correlates of OD and suicide attempts by any method indicate the presence of unique correlates (Conner et al., 2007; Darke et al., 2004; Maloney et al., 2009; Ravndal & Vaglum, 1999; Rossow & Lauritzen, 1999), and are replicated by studies examining correlates of unintentional and intentional OD (Heale, Dietze, & Fry, 2003; Neale, 2000; Pfab, Eyer, Jetzinger, & Zilker, 2006).

Understanding the similarities and differences between unintentional and intentional ODs is essential to informing prevention strategies. Targeted interventions are likely to be required if unintentional and intentional ODs have unique predictors, but a more general strategy may be viable if they have common predictors. Previous findings have been confounded by the failure to consistently differentiate unintentional from intentional ODs (Bohnert et al., 2010). Although various methods have been used to differentiate them (Heale et al., 2003; Kosten & Rounsaville, 1988; Maloney et al., 2009; Neale, 2000; Pfab et al., 2006; Wines et al., 2007), to our knowledge, none of these methods has been psychometrically studied. To advance research, it is essential to develop reliable procedures for assessing and differentiating unintentional OD from suicide attempt, particularly attempts by OD which are prone to misclassification.

This study builds upon a previous study of unintentional OD and suicide attempts in methadone maintenance patients (Conner et al., 2007). Participants were asked about accidental OD and suicide attempt experiences. Test-retest reliability (percent agreement, Kappa) for the unintentional OD (86%, $\kappa = .72$), and suicide attempt (92%, $\kappa = .82$) items

was high. The report further showed that history of unintentional OD and history of attempted suicide by any method were not associated [$X^2(1) = 0.92$ ($p=.76$)], suggesting that the procedure successfully discriminated between these outcomes, acknowledging that the nonsignificant result is not proof of a nonassociation.

The purpose of this study is to further test the procedure by examining the ability of individual items to differentiate a history of unintentional from intentional OD, a qualification not addressed in the previous report (Conner et al., 2007). A secondary purpose is to examine the reliability of standard follow-up questions.

2. Method

2.1 Procedure

This study is a secondary analysis of data collected in a methadone maintenance program at a university medical center in upstate New York. English and Spanish advertisements informed patients that the study explored difficulties that may affect recovery and explained where they could sign up. Procedures were described, informed consent was obtained, and patients provided a treatment identification card to confirm their eligibility. Participants completed a battery of interviewer and self-report instruments with a trained research assistant. Data were recorded on paper and reviewed independently to check for missing items and invalid responses. Data were double entered into an electronic database and discrepant entries were identified and corrected. The number of Spanish speaking participants ($n=10$) was too small and excluded from the analyses. Participants were invited to return after 14 days to complete an identical interview with a different investigator who was masked to the first assessment. For each assessment, participants were paid a gift card to a local store. The university's Internal Review Board (IRB) approved the study.

2.2 Participants

One hundred twenty-one patients, including 61 (approximately 50%) women, completed at least one interview. Eighty-six (71%) were Caucasian, 29 (24%) African-American, and 6 (5%) reported other race. One hundred three (86%) identified themselves as non-Hispanic and 18 (15%) reported they were Hispanic. Mean (*SD*) age was 41.9 (9.7) years, ranging from 21 to 59, and mean education was 12.2 (1.9) years ranging from 7 to 16. The majority had used opiates intravenously (99, 82%), and mean daily methadone dose was 112.0 (48) mg, ranging from 30 to 280 mg.

Seventy participants (57%) completed follow-up interviews. Mean follow-up was 24 (8.0) days, ranging from 14 to 42 days. Participants who completed follow-ups, compared to those completing one interview, were less likely to have used drugs intravenously, $X^2(1) = 7.14$, $p < .01$.

2.3 Measures

Participants were asked a series of questions about OD and suicide attempt experiences (Conner et al., 2007). The OD section of the questionnaire was introduced as follows: "These questions refer to accidental overdose on drugs or alcohol. I am referring to

unintentional overdose, not to suicide attempts that involve taking an overdose on purpose.” Participants were then asked, “Have you ever overdosed?” All individuals who reported at least one OD were asked follow-up questions. Those with multiple ODs were asked the questions in regards to “the most serious incident”. The follow-up questions included those used by Darke and colleagues (e.g., Darke, Ross, & Hall, 1996a; Darke & Ross, 2001; McGregor, Darke, Ali, & Christie, 1998) to assess OD among opiate abusers: “Did you have difficulty breathing?” “Did you turn blue?” “Did you collapse?” “Were you unconscious so that nobody could arouse you or wake you up?” Participants were asked two additional questions: “Did you receive emergency treatment within 24 hours of the overdose?” and “Were you treated with Narcan?” Responses to these questions were “Yes” or “No.” Narcan, the brand name for Naloxone a drug used to reverse the effects of opiates, was used because of its familiarity to our patients.

Following the OD questions, the suicide section of the questionnaire was begun with the screening question “Have you ever tried to kill yourself or attempt suicide?” Participants were then asked “What method did you use to attempt suicide?” with potential answers being overdose, cutting wrist, cutting elsewhere, hanging, drowning, firearm, jumping, and “other.”

2.4 Analyses

Data were analyzed using SPSS (version 11). Chi squares were used to assess the association between unintentional and intentional OD. Test-retest reliability was evaluated using Cohen’s Kappa (Cohen, 1960). For interpreting Kappas, we used Landis and Koch’s recommendations which classify them into poor (.40), moderate (.40–.59), substantial (.60–.79), and outstanding (.80) categories (Landis & Koch, 1977). Percent agreement was also computed.

3. Results

Seventy-two participants (60%) endorsed a history of unintentional OD. Unintentional and intentional OD were not statistically associated at baseline [neither (36, 30%), unintentional OD (56, 46%), intentional OD (16, 13%), both (16, 13%); $X^2(1) = 0.30$ ($p=.59$)], or follow-up [neither (22, 31%), unintentional OD (32, 46%), intentional OD (7, 10%), both (9, 13%); $X^2(1) = 0.05$ ($p=.83$)]. Seventy-one of 72 (99%) participants reporting a history of unintentional OD endorsed one or more of the items used by Darke and colleagues to assess OD symptoms. Test-retest reliability of these items ranged from poor to moderate ($\kappa = 0.16$ – 0.53) (Table 1). Reliability of the emergency treatment ($\kappa = 0.88$) and Narcan ($\kappa = 0.93$) items was outstanding. Forty-four (61%) participants who reported an OD received emergency treatment within 24 hours, and 29 (40%) reported receiving Narcan.

We reasoned that individuals who lost consciousness would have difficulty remembering experiencing the other OD symptoms used by Darke and colleagues. Among the 56 participants who reported losing consciousness, test-retest reliability (kappa, percent agreement) was poor: difficulty breathing ($k=.38$, 78%), turning blue ($k=.09$, 71%), and collapsing ($k=-.06$, 86%). Among the seven who did not report losing consciousness, test

retest reliability was better: difficulty breathing ($k=.70$, 86%), turning blue ($k=1.00$, 100%), and collapsing ($k=.36$, 71%).

4. Discussion

The procedure we tested is reliable and differentiated unintentional from intentional OD. Our procedure instructed patients to reflect on unintentional (i.e., “accidental”) ODs and differentiate them from intentional ODs. The instructions probably contributed to the high reliability of the OD item and its ability to consistently distinguish unintentional from intentional ODs, and are consistent with recommendations to carefully distinguish these outcomes in research on opiate abusers (Bohnert et al., 2010). These findings also suggest that unintentional and intentional ODs are indeed distinct events with unique causes and correlates (Heale et al., 2003; Neale, 2000; Pfab et al., 2006), which may extend to fatal unintentional and intentional ODs (Darke, Duflou, & Torok, 2010; Schifano et al., 2006).

Standardized follow-up questions to characterize OD incidents described by Darke and colleagues showed a range of wide range of test-retest reliability, and post hoc tests suggest that reliability is unacceptably poor if there was loss of consciousness during the event. Interestingly, at least one of these symptoms was reported in very nearly every unintentional OD (99%), underscoring the validity of these items in the aggregate. As well, administering these questions may have clinical utility, for example in an effort to provide education to opiate dependent patients about OD.

Items pertaining to emergency treatment and Narcan administration showed outstanding reliability. These experiences are potentially reliable because individuals may overcome the acute effects of OD during these treatments and they involve other individuals (e.g., emergency treatment provider) and settings (e.g. emergency department), making them memorable. However, a large percentage of ODs did not involve emergency care or Narcan, consistent with a growing body of research suggesting that the use of questions about medical interventions to identify ODs underestimates their prevalence (Darke, Ross, & Hall, 1996b; Davidson, Ochoa, Hahn, Evans, & Moss, 2002; Powis et al., 1999). Accordingly, we recommend that questions about emergency interventions be administered as part of OD assessments because they provide important information about the treatment, but that such questions not provide the sole basis for determining that an OD occurred.

4.1 Limitations

These analyses were conducted with adult methadone maintenance patients who speak English and may not generalize to other populations. The study assessed lifetime OD incidents that may be vulnerable to memory loss and reinterpretation. Follow-up questions asked about the “most serious” OD, and the reliability of these questions with less severe incidents is unclear. A gold standard assessment of unintentional and intentional OD is not available for comparison with the measures used. The sample size is moderate overall and the test-retest sample is fairly small, warranting cautious interpretation.

4.2 Conclusion

Opiate dependent patients can be oriented to questions about unintentional OD versus intentional OD with brief, standard instructions. Follow-up question(s) about medical treatment for OD are highly reliable although such questions may not apply to many OD incidents. One or more questions about OD symptoms used in prior research are endorsed in virtually every unintentional OD incident although reliability is strongly affected by loss of consciousness.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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Table 1

Overdose (OD) Definitions, Percent Agreement and Test-Retest Reliability

Question	N (%) of ODs in Full Sample (N=72)	Test-Retest N	Test-Retest % Agreement	Test-Retest κ (N=70)
Have you ever overdosed?	--	70	87.1	0.74
Did you have difficulty breathing?	53 (73.6%)	35	80.0	0.47
Did you turn blue?	35 (48.6%)	33	66.7	0.33
Did you collapse?	61 (84.7%)	36	83.4	0.16
Were you unconscious so that nobody could arouse you or wake you up?	56 (77.8%)	36	86.1	0.53
Were you treated with Narcan?	29 (40.3%)	29	96.5	0.93
Received emergency treatment	44 (61.1%)	36	94.5	0.88