Drug and Alcohol Dependence 132 (2013) 521–527

Contents lists available at ScienceDirect

Drug and Alcohol Dependence

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

Postoperative risks associated with alcohol screening depend on documented drinking at the time of surgery

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ARTICLE INFO

Article history:
Received 3 December 2012
Received in revised form 27 March 2013
Accepted 29 March 2013
Available online 16 May 2013

Keywords:
Alcohol
Drinking
AUDIT-C
Postoperative complications
Postoperative health care utilization

ABSTRACT

Background: Both AUDIT-C alcohol screening scores up to a year before surgery and clinical documentation of drinking over 2 drinks per day immediately prior to surgery ("documented drinking >2 d/d") are associated with increased postoperative complications and health care utilization. The purpose of this study was to evaluate whether documented drinking >2 d/d contributed additional information about postoperative risk beyond past-year AUDIT-C screening results.
Method: Male Veterans Affairs (VA) patients who had a non-emergent, non-cardiac, major surgery assessed by the VA's Surgical Quality Improvement Program 10/2003-9/2006 and completed the AUDIT-C by mailed survey in the prior year were eligible for this study. Linear or logistic regression models compared 30-day postoperative complication(s), return to operating room (OR), hospital length of stay (LOS), and intensive care unit (ICU) days across eight groups defined by past-year AUDIT-C score and clinically documented drinking >2 d/d, with AUDIT-C scores 1–4 and no documented drinking >2 d/d as the referent, after adjusting for important covariates.
Results: Overall 8811 patients met inclusion criteria. Among patients with documented drinking >2 d/d immediately prior to surgery, postoperative risk varied widely depending on past-year AUDIT-C score; scores ≥5 were associated with increased risk of complication(s), and scores ≥9 with increased hospital LOS and ICU days. Among patients without documentation of drinking >2 d/d, increasing AUDIT-C scores were not associated with these outcomes.
Conclusions: Clinical documentation of drinking >2 d/d immediately prior to surgery contributed additional information about postoperative risk beyond past-year AUDIT-C score. However, among patients with documented drinking >2 d/d, postoperative risk varied widely depending on the AUDIT-C score.
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1. Introduction

Alcohol misuse, which includes a spectrum of severity ranging from drinking above recommended limits to diagnosis of alcohol dependence, is common among general surgical patients (13–29%; Agabio et al., 2012; Bradley et al., 2012; Neumann et al., 2012; Shourie et al., 2007) and a risk factor for postoperative

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0376-8716/$ – see front matter. Published by Elsevier Ireland Ltd.
http://dx.doi.org/10.1016/j.drugalcdep.2013.03.022

complications and increased postoperative health care utilization (Bradley et al., 2011; Delgado-Rodriguez et al., 2003; Harris et al., 2008, 2011; Nath et al., 2010; Rubinsky et al., 2012; Spies et al., 2001, 2004; Tonnesen, 1999; Tonnesen et al., 2009). A randomized controlled trial among patients scheduled for elective colorectal surgery who reported drinking ≥60 g ethanol (over 4 U.S. standard-sized drinks) daily demonstrated that four weeks of preoperative abstinence reduced postoperative complications by over 50% (Tonnesen et al., 1999). These findings suggest that if high risk patients can be identified prior to surgery, preoperative alcohol interventions could be implemented to improve postoperative outcomes. Although clinical documentation of drinking >2 drinks (over 28 g ethanol) daily immediately prior to surgery is associated with increased postoperative complications and health care utilization (Nath et al., 2010), surgical patients are not always assessed for alcohol use during routine preoperative care. Systematic alcohol screening with a validated instrument identifies more than twice as many patients with alcohol misuse compared to routine preoperative evaluation (Kip et al., 2008; Moore et al., 1989). Therefore, alcohol screening of all surgical patients using a validated questionnaire is recommended so that patients at high risk can be identified, counseled to reduce their drinking, and managed expectantly (Gordon et al., 2006; Kip et al., 2008; Kork et al., 2010; Shourie et al., 2007; Spies et al., 2001).

Scores from the 3-item Alcohol Use Disorders Identification Test – Consumption questionnaire (AUDIT-C) up to a year prior to surgery can identify surgical patients at risk of postoperative complications and increased postoperative inpatient health care utilization (Bradley et al., 2011; Harris et al., 2011; Rubinsky et al., 2012). However, the AUDIT-C asks about consumption in the previous year and assessment of drinking closer to the time of surgery may provide additional information about postoperative risk. The purpose of this study was to evaluate whether clinical documentation of drinking immediately prior to surgery modified estimates of postoperative risk associated with AUDIT-C screening results from up to a year before surgery. Specifically, the study evaluated whether postoperative complications and health care utilization differed across groups based on both past-year AUDIT-C score and clinical documentation of drinking >2 drinks per day in the two weeks prior to surgery ("documented >2 d/d") in a male U.S. surgical sample.

2. Methods

2.1. Sample and data sources

Veteran's Affairs (VA) patients who had a non-emergent, non-cardiac, major surgery monitored by the VA Surgical Quality Improvement Program (VASQIP) 10/2003-9/2006 were eligible for this study if they completed the AUDIT-C on the VA's mailed Survey of Healthcare Experiences of Patients (SHEP) in the year prior to surgery. The first eligible surgery after the first AUDIT-C was included. Surgeries that occurred within 90 days of an earlier surgery and inpatient surgeries that did not occur in the three days after admission were excluded because patients undergoing such surgeries may have recently stopped drinking. Women were excluded due to small numbers.

Surgical data were obtained from VASQIP, which collects preoperative, intraoperative and postoperative data for approximately 70% of VA surgical procedures performed under general, spinal or epidural anesthesia (Henderson and Daley, 2009; Henderson et al., 2007). VASQIP surgical nurses at each VA medical center review medical records and assess preoperative risk factors, operative variables, and postoperative complications during hospitalization and post-discharge up to 30 days following surgery using standard procedures and uniform data definitions. AUDIT-C alcohol screening scores and demographic data were obtained from confidential outpatient SHEP surveys mailed regularly by the VA Office of Analytics and Business Intelligence (OABI) to stratified random samples of patients with recent outpatient visits (Wright et al., 2006; response rate: 62% during the study period). The SHEP assesses patient satisfaction and quality of care for quality improvement purposes and survey data are not shared with providers or included in the medical record. Other measures were obtained from the VA's National Patient Care Database (NPCD).

The study received approval and waivers of informed consent and HIPAA authorization from the VA Puget Sound Health Care System institutional review board.

2.2. Measures

2.2.1. AUDIT-C alcohol screening in the year prior to surgery. The independent variable of interest was AUDIT-C screening completed on confidential mailed surveys up to a year before surgery. The AUDIT-C is a 3-question validated screen for alcohol misuse scored 0–12 points (Bush et al., 1998; Reinert and Allen, 2007). Scores of 0 indicate no past-year drinking and scores of 12 indicate the highest level of severity. AUDIT-C scores in the year prior to surgery have been associated with increased postoperative complications (AUDIT-C ≥5 points) and postoperative inpatient health care utilization (AUDIT-C ≥9 points; Bradley et al., 2011; Rubinsky et al., 2012). Similar to these studies, the present study evaluated four AUDIT-C score groups: 0 points (nondrinkers), 1–4 points (low-risk), 5–8 points (at-risk) and 9–12 points (high-risk).

2.2.2. Clinically documented drinking >2 drinks/day immediately prior to surgery. Drinking over 2 drinks (28 g ethanol) daily exceeds recommended drinking limits (National Institute on Alcohol Abuse and Alcoholism, 2007) and is associated with increased risk of alcohol-related problems (Corrao et al., 2004; Dawson et al., 2005; Rehm et al., 2010). Clinical documentation of drinking over 2 drinks per day in the two weeks immediately prior to surgery ("documented >2 d/d"), based on medical record review by VASQIP nurses (see Supplementary Material 1), was evaluated as a potential effect modifier of the association between past-year AUDIT-C scores and postoperative outcomes. This measure was not based on standardized alcohol assessment. The primary source for documented >2 d/d was the preoperative nursing assessment. However, when this documentation was lacking, VASQIP nurses generally reviewed the following additional sources in order: (1) history and physical, (2) anesthesia assessments, (3) records from other VAs where the patient received care, and (4) active alcohol abuse on the problem list. A "no" on the measure indicated either documented drinking ≤2 drinks per day during the two preoperative weeks or no documentation of alcohol use by the above criteria. This VASQIP measure has demonstrated reliability (kappa = 0.77; Davis et al., 2007) and was associated with increased postoperative complications and longer postoperative hospital stays in previous studies (Henderson et al., 2007; Nath et al., 2010).

2.2.3. Postoperative outcome measures. Any *postoperative complication(s)* in the 30 days following surgery was defined as the occurrence of at least 1 of 20 individual complications monitored by VASQIP during the study period (Supplementary Material 2). Any *return to operating room (OR)* within 30 postoperative days, from VASQIP, indicated the patient was taken to the surgical OR for any procedure. Postoperative *hospital length of stay (LOS)*, also from VASQIP, measured the number of days between the date of surgery and date of discharge. *ICU days*, from NPCD, assessed the total number of days in an ICU during the postoperative hospital stay. Hospital LOS and ICU days were truncated to the first 30 days of postoperative hospitalization to avoid undue influence by extreme values.

2.2.4. Covariates. Patient demographics included self-reported age, race, and marital status from the SHEP. VA service-connected disability rating was obtained from NPCD, and past-year smoking status and VA medical center from VASQIP. Quartiles of year-specific work relative value units (RVUs; Johnson and Newton, 2002) and five categories of surgical procedures based on Current Procedural Terminology (CPT) codes (i.e., thoracic, musculoskeletal, gastrointestinal, genitourinary, or other) were included to address variation in surgical complexity. RVU values are assigned for each procedure by the Centers for Medicare and Medicaid based on physician time and effort and serve as a proxy for increasing complexity of the surgical procedure (Henderson et al., 2007). Days from AUDIT-C screening to surgery was included in order to address differences in proximity of the assessment measure to surgery and associated opportunity to change drinking prior to surgery.

2.3. Analyses

Two outcomes were evaluated in the total study sample: postoperative complication(s) and return to OR. Hospital LOS was evaluated in the subset of patients who were hospitalized for at least one day following surgery (i.e., inpatients), and total ICU days was evaluated in the subset of inpatients admitted to the ICU during postoperative hospitalization. Postoperative admission to the hospital and ICU were not evaluated as outcomes because unplanned admissions could not be distinguished from planned admissions, and, therefore, differences across alcohol risk groups could be driven by differential surgical complexity rather than potentially preventable complications. Patients who died during their hospitalization [$n = 33$ (<1%)] were excluded from inpatient analyses.

Initial analyses evaluated differences in characteristics between patients with and without documented >2 d/d in each analytic sample. Differences in categorical variables were tested with chi-square tests and continuous variables with nonparametric Kruskal–Wallis tests.

All *main analyses* used multivariable ordinary least squares logistic (i.e., for any complication and return to OR) or linear (i.e., for hospital LOS and ICU days) regression models that adjusted for demographic variables, past-year smoking status, surgical CPT category, quartile of surgical RVUs, and days from AUDIT-C to surgery; and estimated clustered robust standard errors to account for correlated data from