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A systematic review of behavioural interventions to reduce preoperative alcohol use

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Abstract

Issues—Preoperative alcohol use is associated with an increase in postoperative morbidity and mortality. Short-term abstinence prior to elective surgery has been shown to reduce postoperative risks. Therefore, behavioural intervention (BI) targeting risky drinking may have significant utility in preventing surgical complications.

Approach—The literature was systematically reviewed to identify the scope and outcomes of BIs aiming to reduce alcohol use in risky drinkers before they underwent surgery. Five databases were searched using PRISMA criteria. Of 1243 studies identified, four met pre-established inclusion criteria: (i) implementation of a BI prior to an elective surgery; (ii) the BI-targeted alcohol use among risky drinkers; and (iii) printed in English.

Key Findings—Two studies indicated significant reductions in alcohol use at follow ups, and one study demonstrated reductions in postoperative risks. These findings are encouraging, but in light of methodological limitations, the efficacy of preoperative BIs for risky drinking could not be determined.

Implications—Future efforts to screen and implement BIs addressing alcohol use in preoperative patients should carefully define risky drinking, allow ample time for recruitment prior to surgery, implement empirically supported interventions, examine the impact of relevant covariates, and consider the statistical power needed to detect change in postoperative complications.

Conclusion—Given the strong link between preoperative alcohol use and postoperative risks, additional research on preoperative BIs is critically needed. Existing research suggests several promising directions for research that may enhance future intervention efforts with this high-risk population.

Keywords

alcohol drinking; preoperative period; elective surgical procedure; brief psychotherapy; behavioural medicine

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Background

Alcohol use is now the third most common cause of disease worldwide [1]. Alcohol use is implicated in 3.8% of global deaths, and accounts for 4.6% of global disability adjusted life years (i.e. the number of life years lost to ill health) [2]. In terms of economic costs, the consequences of alcohol use account for approximately 1% of the gross domestic product in high- and middle-income countries [1], and a large proportion of this spending is attributed to health-care costs [3]. In the USA, the estimated economic cost of excessive drinking is approximately $223.5 billion annually, or $1.90 per alcoholic drink, with 11% of this cost attributed to health-care expenditures [4]. On average, each high-income nation spends $23 billion on alcohol-related health-care annually.

Individuals interacting with the medical system are more likely to have alcohol use disorders (AUD) relative to the general population. AUDs are defined as ‘medical conditions’ diagnosed when a person’s drinking causes distress or harm, and include diagnoses of ‘alcohol abuse’ and ‘alcohol dependence’ [5]. Among medical patients, prevalence of AUDs is above 20% [6–8]. While there may be some health benefits to light drinking, the impact of alcohol on health and disease is largely detrimental [9,10]. AUDs contribute to many disease categories including diabetes mellitus, hypertension, cardiovascular disease, stroke, numerous cancers and pneumonia [10,11].

Alcohol use and postoperative morbidity and mortality

The detrimental impact of alcohol use on health extends to surgical risk and recovery. Risky drinking (defined as approximately two to three standard drinks per day or >24 g day for women; >36 g day for men [12]); is one of the 10 most common preoperative surgical risks in the USA, and is one of the few that is modifiable [13]. The pathophysiological effects of excessive alcohol consumption on the body that may impact surgery include increased susceptibility to bacterial infection [14], decreased immune functioning [15,16], organ dysfunction [17], bleeding complications [18,19] and nutrition deficiency [20]. These pathophysiological effects that impact the body’s ability to heal and recover from ill health have important implications for surgical recovery.

A growing body of research indicates that risky drinking prior to surgery can have a detrimental impact on postoperative recovery [19,21–27]. Rates of risky alcohol use prior to elective surgeries range from 30.0% to 88.5% among otolaryngology surgeries, from 29% to 33% among vascular and thoracic surgeries and from 7.7% to 28.0% among other types of surgery [28]. The research linking risky drinking and postoperative problems is robust. A recent meta-analysis of 55 studies (n = 1,234,923) linked risky alcohol use to an increase in overall morbidity, general infections, wound complications and pulmonary complications following surgery [12]. This meta-analysis also found ‘very risky’ drinking (defined as >60 g day) was associated with a two- to fourfold increase in postoperative complications [12,19] and increased rates of postoperative mortality [12].

As an individual’s alcohol consumption increases, so does postoperative risk; every additional point scored on the consumption questions of the Alcohol Use Disorder Identification Test (AUDIT-C [29]) is associated with a 29% increase in the expected

number of postsurgical complications [30]. In a study of 8811 surgical patients in the US Veterans Affairs Health Care System, patients drinking two or more drinks a day combined with an AUDIT-C score ≥5 were significantly more likely to experience postoperative complications and those with an AUDIT-C score ≥9 had a higher risk of complications, longer hospital length of stay and more days spent in the intensive care unit [31].

The timing of drinking may also be important with regards to postoperative risk and recovery. In one study, risky drinking in the 2 weeks immediately preceding surgery was associated with postoperative risks, while a more remote history of risky drinking did not predict postoperative complications [31]. A randomised controlled trial (RCT) demonstrated that 4 weeks of preoperative abstinence reduced postoperative complications by over 50% among colorectal surgery patients who reported daily drinking ≥60 g of ethanol at baseline [32].

Need for preoperative alcohol use interventions

Abstinence from alcohol for 4–8 weeks is recommended prior to surgery [33]. Therefore, there is a need to develop and implement effective interventions that reduce alcohol during this critical time period. However, the best method to identify and intervene in alcohol use among preoperative patients is yet to be determined. Behavioural interventions (BI), particularly brief interventions using motivational interviewing, are an accepted and recommended approach to reduce risky drinking in medical and non-medical settings [30,33,34] and may therefore be a viable approach to reduce preoperative risky drinking. In this review, a BI is defined as any therapeutic encounter designed to reduce alcohol use through psychological means (e.g. talk therapy, motivational interviewing). A number of empirically supported BIs exist, including brief motivational interventions (BMI) [35,36]; screening, brief intervention, and referral to treatment (SBIRT) [37]; cognitive behavioural therapies [38]; other individual and group therapies; and even telephone and computer-delivered interventions [39,40]. Brief interventions may be an appropriate approach for many patients, particularly those drinking at risky, but non-dependent levels [41]. Furthermore, brief interventions have demonstrated cost-effectiveness when compared with treatment as usual (TAU), and as such have been increasingly applied in medical settings to reduce alcohol use and alcohol-related consequences among at-risk patients [42–46].

Objective

In light of research indicating preoperative alcohol use can lead to significant complications following surgery, the primary aim of this review was to identify and provide a summary of the research literature on BIs for preoperative alcohol use. We chose to focus on BIs to expand on a past review that summarised research on pharmacotherapy for preoperative alcohol use [33]. In addition, given this nascent area of research, we aimed to provide a narrative summary of existing study designs, objectives, participants, interventions used and research outcomes. The secondary aim of this review was to use this burgeoning literature base to make recommendations for future research.

Method

Search strategy and selection of studies

We applied the PRISMA systematic review criteria [47] to search for and identify published studies that examined behavioural alcohol use interventions among preoperative populations. Literature searches were conducted within five databases including PsycINFO, PubMed, CINAHL, Medline, Web of Science and Cochrane databases. The search was conducted using combinations of the following terms to ascertain relevant papers: [(*surgery OR surgical OR preoperative OR perioperative) AND (alcohol OR alcoholic OR drinker OR drinking) AND (intervention OR psychosocial OR behavioural)*]. For Cochrane databases, search terms were confined to 'Title' and 'Abstract' fields.

Once identified through database searches, duplicates were deleted and all papers were screened at the abstract and title level to determine eligibility for full-text screening. Papers that explicitly mentioned a behavioural alcohol intervention for preoperative patients were obtained and their text reviewed. Papers were included if they met the following a priori criteria: (i) original research published in a peer-reviewed journal (thus excluding conference proceedings, dissertations and book chapters); (ii) the study sample included preoperative patients drinking alcohol at risky levels (risk was defined as drinking above recommended health guidelines in the nation the study was conducted); and (iii) the study included a BI that addressed alcohol use reduction prior to elective surgery. Study inclusion criteria were not limited solely to RCTs; pre-post experimental designs were also included. The experimental treatment had to include a behavioural alcohol use treatment component as a stand-alone intervention or within a broader intervention context. Studies were excluded if they were not available in the English language, targeted trauma or emergency surgeries only, or recruited transplant or bariatric surgery exclusively. Studies published up to October 2013 were eligible for inclusion. No date range parameters were included in the search terms.

Two researchers independently coded each included study. Operational definitions were provided in a code-book to ensure consistent and accurate categorisation throughout the coding process. Satisfactory intercoder reliability was established with an average percentage of agreement across all categories of 94%. Any disparities in judgment that emerged during the coding process were resolved through discussion.

Assessment of risk of bias in included studies—Three researchers independently assessed risk of bias. Risk of bias was assessed for RCTs using guidelines outlined by Higgins and colleagues [48], and for non-randomised trials using guidelines outlined by Barnaby and colleagues [49].

Results

Through searching online databases, 1476 papers were identified (see Figure 1). After removing duplicates (n = 233), 1243 unique papers were identified. After screening, 22 papers underwent full-text review to determine eligibility. Of these, four studies represented original research that implemented a BI that aimed to reduce preoperative alcohol use

among ‘risky drinking’ patients scheduled for elective surgeries. Unpublished data were requested from two authors, of whom one responded and agreed to share data for this review. Because of the small numbers of studies and heterogeneity in assessment and methodology, we elected to provide a narrative, descriptive summary of the research emphasising study design, participants, recruitment and retention issues, the interventions studied, and research outcomes.

Study design and participants

The study design and participant information for all four studies are presented in Table 1. All four studies [50–53] used a pre-/post-test experimental controlled design, but only two randomised participants to study condition [50,51]. TAU control groups were used for comparison in all studies. The included studies were conducted in either Australia or Europe. Participants were scheduled for a range of elective surgeries including general surgery, hip and knee arthroplasty, and coronary bypass surgery. Participants were typically recruited in hospitals, although one study used a mailed letter to recruit patients. The samples ranged from $n = 98$ to $n = 136$. All studies included women, but men were overrepresented at a rate of about 3:1. The average age of participants across studies ranged from 52 to 70 years old. None of the studies reported race or ethnicity of participants. Studies targeted a range of outcomes related to alcohol use and postoperative complications.

Recruitment and retention

Recruitment periods across the four studies ranged from 4 months to 3.5 years. Shourie and colleagues [52] spent 2 years and 10 months screening elective surgery patients in two hospitals. Of 3783 patients approached 3139 (83%) were successfully screened and 617 met initial alcohol screening criteria (≥5 on the AUDIT-C). After additional screening, 136 patients (4.3%) were recruited. At the 6 month follow up, 119 (88%) were retained. The authors also reported difficulty recruiting patients at least 7 days to surgery. As a result, they abandoned randomisation and allocated groups to the intervention and control conditions based on the interval from screening to surgery.

McHugh and colleagues [51] invited all patients on a coronary bypass surgery waitlist to participate in their study over the 15 month study period. Of the 147 invited, 125 (85%) agreed to participate and 98 (78%) completed baseline and final follow ups. Kummel and colleagues [50] screened 449 patients scheduled for cardio artery bypass at a single hospital over a 3.5 year period. Of those, 38% ($n = 173$) met inclusion criteria (≥65 years old and scheduled for elective surgery). More than half of the eligible patients ($n = 117$; 68%) completed baseline and 3 month follow up and were included in the study analysis. Hansen and colleagues [53] screened all patients scheduled for surgery during 2 month blocks in the winter and spring of the study year. A total of 140 patients were eligible and eight (6%) refused participation. In total, 132 patients were recruited. Medical data were obtained for all participants at the 3 month follow up.

Interventions

Interventions varied in terms of theoretical orientation, behavioural targets and frequency of sessions. Single-session [52,53] and multiple-session [50,51] treatments were utilised.

Interventions were delivered by nurses ($n = 3$), or a 'member of the research team' ($n = 1$). Three studies examined the efficacy of interventions targeting alcohol use in addition to other preoperative risk factors such as physical activity, nutrition, emotional stress and medication non-adherence [50,51,53].

In terms of intervention theory and framework, one study [52] used a protocol-based, empirically supported intervention based on the World Health Organization-based 'Drink-less' program [54,55]. In this study, all participants received 'Drink-less', and dependent drinkers were also offered a consult with a drug and alcohol specialist for management of withdrawal symptoms and pharmacotherapy. Two additional studies reported using a motivational 'conversation' or motivational interviewing as part of their intervention approach, but did not cite the use of specific intervention techniques or protocols, or fidelity monitoring [51,53].

Study outcomes

Alcohol use—All four studies assessed alcohol use at baseline and targeted alcohol use in an intervention. Only two studies reported alcohol use outcomes [50,52] and a third [51] provided de-identified alcohol use data for this review (see Table 2). Overall, findings were mixed. Shourie and colleagues [52] reported the entire sample (intervention and TAU) reduced alcohol use at the 6 month follow up. Average daily alcohol use fell from 70 g day^{-1} at baseline to 26 g day^{-1} in the entire sample, a 63% reduction (natural log transformed, t= 25.6; $P < 0.001$), but between-group comparisons were not significant. In contrast, Kummel and colleagues [50] reported a significant time by group interaction ($P < 0.001$), such that the intervention group was more likely to report 'no drinking' at the 3 month follow up relative to baseline, odds ratio (OR) = 2.2, 95% confidence interval (95% CI) [1.5, 3.3] than the control group OR= 1.3, 95% CI [1.1, 1.4].

The third study did not report alcohol use outcomes [51], but provided unpublished, de-identified alcohol use outcome data to the authors of this review ($n_{control} = 42$; $n_{intervention} = 43$). Using the data provided, we conducted a repeated-measures analysis of variance to analyse mean differences in weekly alcohol use across group and time. Alcohol quantity is presented in standard drinks, equivalent to 25 mL of 40% alcohol (8 g of pure alcohol). The main effect of time was not significant, $F(1, 83) = 0.045$, $P = 0.83$, but the time by group interaction was significant $F(1, 83) = 47.262$, $P = 0.002$, $\eta^2 = 0.11$. From baseline to follow up, the intervention group *decreased* their average quantity of weekly alcohol consumption from 6.93 drinks per week (SD = 10.49) to 5.77 drinks week (SD = 7.38). In contrast, the control group *increased* their quantity of alcohol consumption from 6.55 drinks week^{-1} [standard deviation (SD) = 8.51] at baseline to 7.88 drinks per week (SD = 10.11) at follow up.

Postoperative mortality—Two studies examined postoperative mortality, Hansen and colleagues [53] reported no group differences at 3 month follow up (no deaths in either group). Shourie and colleagues [52] reported no group differences in mortality at the 6 month follow up (one death in each group).

Postoperative morbidity—Two of the four studies reported outcomes related to postoperative complications. Shourie and colleagues [52] reported no significant differences in postoperative morbidity, length of hospital stay, number of doctor visits or hospital admissions. In contrast, Hansen and colleagues [53] reported significant differences in the number of 'unintended patient paths' defined as minor postoperative complications, major postoperative complications, readmissions or death within 3 months postoperatively. There were significantly fewer unintended paths in the intervention group ($n = 14$; 18%) relative to the control group ($n = 19$; 35%), $P = 0.025$, adjusted OR = 0.34, 95% CI [0.13, 0.84]. There were nine complications (e.g. pneumonia, infections, swelling) in the control group and seven in the intervention group in the 3 months postoperatively, and the median hospital length of stay was 1 day shorter in the intervention group, $P < 0.001$, 95% CI [0.3, 1.7].

Results of bias assessment

The risk of bias in RCTs was unclear because of limited reporting of trial details (see Table 3). However, some areas of risk were identified such as higher dropout rates among older and less healthy women in one study [50] and lack of blinding of participants and personnel in another study [51]. Non-randomised trials used appropriate prospective design, hypothesis generation and compared groups at baseline.

Discussion

This systematic literature review summarised the methods and results of four controlled trials of BIs for risky alcohol use in preoperative patients. The small number of studies attempting to reduce preoperative alcohol use is perhaps the most striking findings of this review, especially given the potential benefits of reducing alcohol use prior to surgery. The small literature base provides two important themes. First, BIs appear to be feasible and acceptable to preoperative patients. All four studies completed recruitment with relatively low rates of refusal and were able to retain study participants through intervention and follow-up periods. Second, BIs were linked to significant reductions in alcohol use in two studies, and significant reduction in postoperative complications was reported in one. One study reported null findings for between-group differences in alcohol use and postoperative morbidity. The small number of studies and methodological limitations of this research makes it premature to draw conclusions regarding the efficacy of preoperative behavioural alcohol use interventions. Therefore, more targeted and carefully designed trials of preoperative BIs are needed.

Recommendations and future directions for research and practice

The literature summarised in this review highlights many considerations and challenges that researchers may want to consider when implementing and studying BIs prior to surgery. The next section presents strategies to anticipate and ameliorate these challenges, as well as highlights promising directions for future research.

Recruitment and sample selection—Recruitment and sample selection were significant issues in all four reviewed studies. For example, Shourie and colleagues [52] took close to 3 years to recruit 136 patients from two hospitals. Although 9.7% of screened

patients met initial alcohol use inclusion criteria, only 4.3% of the original screened patients were recruited after excluding outpatient surgeries and refusals. Future researchers should be aware that the length of time needed to identify and recruit risky drinkers prior to surgery may be considerable. There are several potential reasons for such delays. There are a finite number of patients awaiting surgery at any one time, and many surgeries occur in an urgent/emergency-care setting where there is not time for intervention and behaviour change. In addition, patient alcohol use is often overlooked by healthcare providers [56], and alcohol use data are often inadequate or unavailable in patient medical charts. This makes identifying and recruiting eligible patients more difficult. Therefore, researchers may want to use broad recruitment strategies such as recruiting from large medical centres and/or multiple sites, allow ample time for study recruitment and implement universal alcohol screening rather than relying on medical charts or physician referral. In addition, in some subpopulations, rates of risky drinking may be low. For example, one study of surgical 'prehabilitation' was excluded from this review because none of the participants met risky drinking criteria at baseline [57].

Patient diversity—None of the studies in this review reported patient race or ethnicity, thus limiting the conclusions about intervention outcomes in diverse groups. In terms of age, the majority of participants in the reviewed literature were between 52 and 70 years old. Therefore, researchers and practitioners may want to consider the unique needs of older adults when designing interventions. Alcohol misuse among the ageing population is common [58,59] and contributes to harmful health outcomes as a result of physiological changes in alcohol metabolism and prevalence of comorbid diseases that may be exacerbated by alcohol use [60,61].

Researchers who want to recruit a more diverse population should consider whether alcohol screening is taking place among all groups. Physicians often overlook women and younger patients when screening for alcohol problems prior to surgery [56], and recent research among preoperative patients indicates that most patients drinking at risky levels appear relatively healthy and have health problems unrelated to alcohol use [19,23]. Without unbiased screening, most patients drinking at risky levels will not be detected. Researchers may also want to consider increasing recruitment of more diverse samples by accessing hospital/medical centre data on patient demographics to determine how and where to recruit underrepresented patients, collaborating with women's clinics and other specialty clinics, setting recruitment quotas based on demographic factors, and including diverse research and clinical staff to recruit patients and serve clinical roles.

Selecting and evaluating a preoperative BI—Research has yet to determine the best intervention for preoperative risky drinking and careful consideration of therapeutic approach is imperative for testing pre-existing approaches or developing new treatments. In this review, only one study used a protocol-based, empirically supported intervention approach, the 'Drink-less' intervention [52,55]. Two studies reported using motivational-based approaches, but did not provide details on treatment, training and fidelity of their techniques.

Moving forward, researchers and practitioners should carefully consider the type of intervention best suited to their clinical setting as well as the empirical research on such interventions. One option is to implement empirically supported treatments from other medical settings such as BMI or SBIRT. Brief interventions may be an appropriate behavioural approach for surgical settings given the narrow window for treatment and behaviour change prior to surgery. They are typically less than an hour in length, can be as brief as 5 min, and can be delivered by medical staff including nurses, doctors, social workers or psychologists. Brief interventions have been implemented widely in hospital and clinic settings to reduce alcohol use and alcohol-related consequences among at-risk patients [42–46] and have demonstrated efficacy among hospital inpatients [42] and emergency department and trauma patients following acute alcohol-related injury [35,36,62]. Several reviews of brief alcohol interventions in medical settings are available [42,46], and research supports their cost-effectiveness [63,64].

Intervention delivery and timing—The timing of preoperative alcohol interventions has important implications for intervention outcomes. Specifically, delivering an intervention 1–2 weeks prior to surgery may not provide a sufficient period of alcohol use reduction to impact postoperative outcomes, a methodological problem encountered by one study in this review [52]. Instead, at least 4 weeks of preoperative alcohol abstinence has been recommended to achieve reductions in postoperative complications [33,65–67]. Given the narrow window between surgery referral and completion, researchers and real-world practitioners may consider screening patients as soon as they are referred to surgery and deliver interventions in conjunction with medical appointments early in the referral process. Many patients receiving elective, non-emergency surgeries are monitored for months prior to surgery referral. These patients, if identified through preoperative clinics, could be screened and recruited prior to surgery referral, and receive an intervention when surgeries referral takes place. Likewise, researchers could examine treatments that can be disseminated quickly and easily such as brief in-person sessions, or telephone and computer-based interventions that will ease implementation challenges [39,40].

Data collection and analysis—Improved research methodology is vital to improving our understanding of the impact of alcohol use and alcohol use reduction on surgical outcomes. For example, assessing change in alcohol use following intervention, but preceding surgery is imperative for determining the temporal relationship between alcohol use reduction and postoperative complications. Researchers should also verify abstinence using toxicology screening prior to surgery, as biological verification of sobriety was not reported in any of the reviewed studies. In terms of statistical power, researchers should calculate sample size based on the expected effect size for the intervention and take into account the baseline rate of surgical complications. Only one study conducted power analysis [52], raising the possibility that studies in this review were not able to assess change in some complications because of low number of occurrences. As such, large samples may need to be recruited to detect effects for outcomes with low base rates (e.g. postoperative mortality). In addition, future research could carefully consider and assess covariates related to alcohol use and postoperative recovery, such as smoking, hypertension, diabetes, and other health and demographic variables.

Assessing cost-effectiveness—In this era of limited resources, institutional decision makers frequently demand that interventions and treatments have fiscal as well as clinical justification. Although no study has formally examined the economic impact of preoperative alcohol use, extant data suggest risky drinking results in longer hospital stays and increased utilisation of healthcare services [12,22]. This, combined with research estimating that each avoidable post-surgical complication costs an additional $12 000 to the health-care system [68], clearly indicates the potential cost savings of reducing preoperative alcohol use. Explicitly including cost-effectiveness analyses in future clinical trials will provide detailed estimates of how much can be saved through the implementation of preoperative BIs.

Alternative study designs—Alternatives to RCTs are another avenue for researchers to consider. Hybrid implementation-effectiveness studies may be useful for researchers interested in the concurrent assessment of clinical effectiveness and implementation outcomes of a preoperative BI [69]. In contrast, randomised encouragement designs may be appropriate in some settings where true randomisation is not possible or desirable [70]. Dog leg designs could also be used by researchers who want to compare interventions to ‘usual care’ and reduce the number of patients needed to test an intervention [71].

Limitations of this review

The findings of this review should be considered in the context of some limitations. First, the small number of studies meeting inclusion criteria and the limited reporting of alcohol use and postoperative outcomes made a qualitative review more appropriate than a quantitative review, such as a meta-analysis. Second, postoperative interventions or other hospital-based interventions were not reviewed despite their potential influence on postoperative alcohol use [72]. Third, formal analysis of within-study bias was limited because of lack of detail regarding randomisation (when used), blinding and outcome assessment in randomised trials. Identified bias, such as lack of blinding of participants and personnel is common and often unavoidable in psychosocial intervention literature.

Conclusion

Critical life-events, such as illness and surgery, can represent a ‘window of opportunity’ for health behaviour change [73–76]. At this time, the research on BIs for preoperative alcohol use is promising, but limited in breadth and depth. Several strategies could improve future development and testing of preoperative BIs such as implementing theory-based interventions, at appropriate times, in adequately powered trials. The findings of such well-designed research will greatly enhance the development of efficacious alcohol interventions among this at-risk population.

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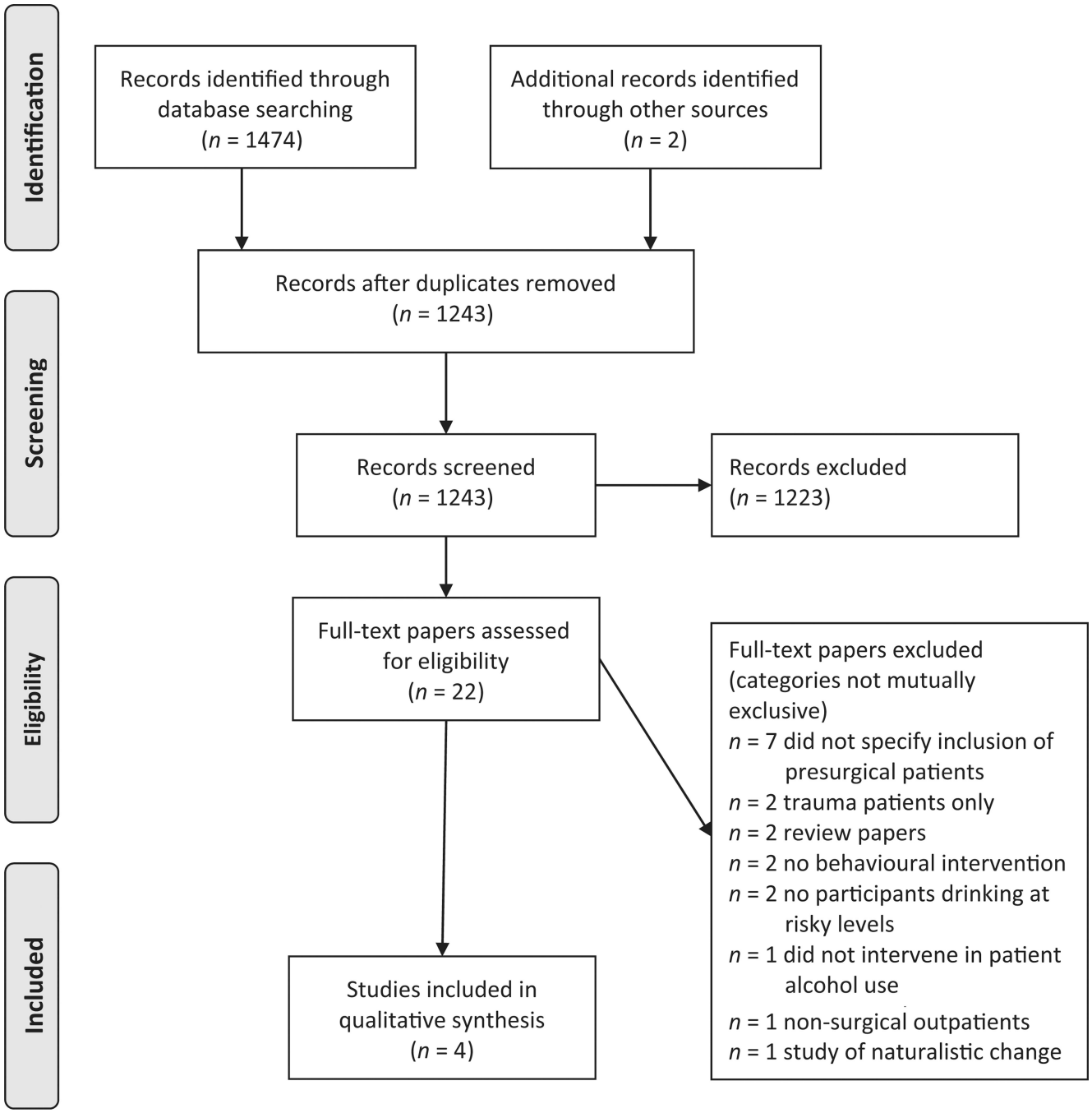

Figure 1.
Study flow diagram

Table 1

Study design, participants, and interventions for included studies

Paper	Design	Groups	*n*	Country	Surgery	Women	Age (M)	Alcohol risk definition	Intervention	Behavioural targets of intervention	Interventionist	Intervention timing
Kummel *et al.* [50]	RCT	IG vs. TAU	117	Finland	Coronary artery bypass	27.3%	IG=61 TAU = 63	Not specified	Group 'health counselling, guidance, and adjustment education' to	'Physical, mental-emotional, and social abilities' including alcohol use	Nurse	Not specified; 1 of 5 sessions took place prior to surgery
McHugh *et al.* [51]	RCT	IG vs. TAU	98	Scotland	Coronary artery bypass	24.5%	IG=70 TAU = 71	Not specified	Home-based health education and motivational interviewing	Tailored to patient risk (smoking, physical activity, diet, alcohol use and hypertension).	Nurse	Monthly for an average of 8 months
Shourie *et al.* [52]	CT	IG vs. TAU	136	Australia	Elective	19.8%	IG=55 TAU = 52	AUDIT-C > 4, > 60 g day^{-1} — men; > 40 g day^{-1} women; and CIDI	'Drink-less' Intervention. Dependent drinkers also receive treatment referral.	Alcohol use only	Member of research team	IG > 7 days prior to surgery; TAU < 7 days prior to surgery
Hansen *et al.* [53]	CT	IG vs. TAU	132	Denmark	Hip and knee	49.2%	IG=68 TAU = 69	Men > 21 g $week^{-1}$; Women > 14 g $week^{-1}$	'Motivational conversation' followed by information and recommendations.	Tailored to patient risks (nutrition, health/ medication, physical activity, smoking, and alcohol use)	Nurse	Average 4 weeks prior to surgery

BI, brief intervention; CIDI, composite international diagnostic interview; CT, clinical trial; IG, intervention group; RCT, randomised clinical trial; TAU, treatment as usual.

Table 2

Assessment-timing, outcomes and results of included studies

Paper	Follow-up assessments time points	Alcohol outcomes	Postoperative physical health outcomes	Other intervention Outcomes	Summary of significant results: alcohol use	Summary of significant results: physical health
Kummel *et al.* [50]	3, 6 and 12 months	Alcohol use frequency (none, one to two times a month or less, or weekly)	Angina pectoris Health and functioning (e.g. ability to climb stairs)	Exercise/PA Diet/nutrition 'Nervousness' Depression	Relative to baseline, the IG decreased alcohol use at 3 months while the CG increased alcohol use at 6 and 12 months	Relative to baseline, the IG was more likely to report 'no angina pectoris symptoms at 3 months; however, the CG was more likely to report 'no angina pectoris symptoms' at 6 and 12 months.
McHugh *et al.* [51]	15 months	Grams per week alcohol[a]	Body mass index Blood pressure Plasma cholesterol General health status	Smoking Exercise/PA	From baseline to follow up, average weekly alcohol consumption decreased in the IG and increased in the CG.	Relative to the CG, the IG had a significant decrease in body mass index, cholesterol and blood pressure at follow up. The IG also had significant increases in general health status and functioning.
Shourie *et al.* [52]	Hospital discharge and 6 months	AUDIT-C score Average daily alcohol consumption Alcohol dependence diagnosis (DSM-IV)	Major postoperative complications (e.g. repeat surgery, transfusion) Minor postoperative complications (e.g. wound infections) Mortality Physical functioning	Number of visits to GP Hospital admissions Days unable to work Smoking	The entire sample reduced alcohol use at follow up, but there were not significant between-group differences in AUDIT-C score, daily alcohol use or diagnosis of alcohol dependence.	No between-group differences in postoperative morbidity, mortality or health-care utilisation.
Hansen *et al.* [53]	3 months	Number of patients meeting alcohol risk criteria reported for baseline assessment only	Unintentional patient path[b] Sum of postoperative complications Mortality General health status 'Disease Specific Outcome Score' (e.g. walking distance)	Hospital length of stay Hospital readmission	Post-intervention alcohol use was not reported	There were significantly fewer unintentional patient paths[b] in the IG relative to the CG.

[a] Unpublished result. Data provided by author.

[b] An unintentional patient path was defined as 'a path by which the patient did not reach the discharge criteria within five days (minor complications), or had any postoperative complication within three months (major complications) leading to a non-planned inpatient visit, was readmitted within three months irrespective of cause, or died within three months postoperatively irrespective of cause.'

AUDIT-C, Alcohol Use Identification Test; CG, control group; DSM-IV, Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition; GP, general practitioner; IG, intervention group; PA, physical activity.

Table 3

Risk of bias summary for included trials

	Random sequence generation (selection bias)	Allocation concealment (selection bias)	Blinding of participants and personnel (performance bias)	Blinding of outcome assessment (detection bias)	Incomplete outcome data (attrition bias)	Selective reporting (reporting bias)
Randomised controlled trials						
Kummel *et al.* [50]	?	?	?	-	+	?
McHugh *et al.* [51]	?	?	+	?	-	?

	Was there a comparison?	How were the groups assigned?	Was the baseline and allocation prospective?	Was outcome assessment prospective?	Was hypothesis generation prospective?	Was comparability of groups assessed?
Non-randomised controlled trials						
Shourie *et al.* [52]	Yes	Time to surgery	Yes	Yes	Yes	Yes
Hansen *et al.* [53]	Yes	Time to surgery	Yes	Yes	Yes	Yes

+, indicates high risk of bias; −, indicates low risk of bias; ?, indicates unclear risk of bias.