Interventions for preventing injuries in problem drinkers (Review)

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This is a reprint of a Cochrane review, prepared and maintained by The Cochrane Collaboration and published in *The Cochrane Library* 2009, Issue 1

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[Intervention Review]

Interventions for preventing injuries in problem drinkers

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Editorial group: Cochrane Injuries Group.
Publication status and date: Edited (no change to conclusions), published in Issue 1, 2009.
Review content assessed as up-to-date: 31 March 2004.

Citation: Dinh-Zarr TB, Goss CW, Heitman E, Roberts IG, DiGuiseppi C. Interventions for preventing injuries in problem drinkers. *Cochrane Database of Systematic Reviews* 2004, Issue 3. Art. No.: CD001857. DOI: 10.1002/14651858.CD001857.pub2.

ABSTRACT

Background

Alcohol consumption has been linked with injuries through motor vehicle crashes, falls, drowning, fires and burns, and violence. In the US, half of the estimated 100,000 deaths attributed to alcohol each year are due to intentional and unintentional injuries. The identification of effective interventions for the reduction of unintentional and intentional injuries due to problem drinking is, therefore, an important public health goal.

Objectives

To assess the effect of interventions for problem drinking on subsequent injury risk.

Search strategy

We searched 12 twelve computerized databases: MEDLINE (1966 to 2002), EMBASE (1982 to 2002), CENTRAL (*The Cochrane Library* 2002, Issue 2), PsycINFO (1967 to 2002), CINAHL (1982 to10/96), ERIC (1966 to12/96), Dissertation Abstracts International (1861 to11/96), IBSS (1961 to 2002), ISTP (1982 to 2002) and three specialized transportation databases (Transport 1988 to 2002/03). Bibliographies of relevant trials were searched and authors were contacted. Government agencies were also contacted for further information and grey literature. Most of the electronic and bibliographic database searches were last run in May 2002.

Selection criteria

Randomized controlled trials of interventions among participants with problem drinking, which are intended to reduce alcohol consumption or to prevent injuries or their antecedents, and which measured injury-related outcomes.

Data collection and analysis

Two authors extracted data on participants, interventions, follow-up, allocation concealment, and outcomes, and independently rated allocation concealment quality.

Main results

Of 23 eligible trials identified, 22 had been completed and 17 provided results for relevant outcomes. Completed trials comparing interventions for problem drinking to no intervention reported reduced motor-vehicle crashes and related injuries, falls, suicide attempts, domestic violence, assaults and child abuse, alcohol-related injuries and injury emergency visits, hospitalizations and deaths. Reductions ranged from 27% to 65%. Because few trials were sufficiently large to assess effects on injuries, individual effect estimates were generally imprecise. We did not combine the results quantitatively because the interventions, patient populations, and outcomes were so diverse. The most commonly evaluated intervention was brief counseling in the clinical setting. This was studied in seven trials, in which injury-related deaths were reduced: relative risk (RR) 0.65; 95% confidence interval (CI) 0.21 to 2.00. However, this reduction may have been due to chance. The majority of trials of brief counseling also showed beneficial effects on diverse non-fatal injury outcomes.

Authors' conclusions

Interventions for problem drinking appear to reduce injuries and their antecedents (e.g. falls, motor vehicle crashes, suicide attempts). Because injuries account for much of the morbidity and mortality from problem drinking, larger studies are warranted to evaluate the effect of treating problem drinking on injuries.

PLAIN LANGUAGE SUMMARY

Action with problem drinkers can cut risk of injury

Drinking too much alcohol can be dangerous, and injuries (both intentional and unintentional) are one of the most important ways in which excess alcohol use can result in harm. Are there ways of working with people known to be "problem drinkers" that can reduce the number of these injuries? The reviewers found 17 studies of programs that reported whether working with problem drinkers reduced injuries. Several different approaches were evaluated, the most common being brief counseling by health workers. The evidence from these studies suggests that action with problem drinkers is effective in reducing both injuries and events that lead to injury (such as falls, motor vehicle crashes, and suicide attempts). However, more research is needed to calculate the level of effectiveness accurately and to determine which type of program works best.

BACKGROUND

Alcohol consumption has been linked with injuries and deaths incurred through motor vehicle crashes, falls, drowning, fires and burns, and violence (NCIPC 2001). In the United States, alcohol consumption contributes to 38% of motor vehicle crash fatalities, 40% of deaths in residential fires, and 25% to 50% of adolescent and adult deaths associated with water recreation (NCIPC 2001). A strong association has been found between alcoholism and domestic violence (O'Farrell 1995, Cunradi 2002). Even moderate alcohol consumption has been associated with increases in injuries and deaths from trauma (Andreasson 1988, Vinson 1995). Problem drinkers who do not meet definitions for alcohol dependence are responsible for the majority of alcohol-related morbidity and mortality in the general population (IOM 1990). In the United States, the burden of alcohol-related diseases and injuries on emergency department is now three times greater than previously reported, with alcohol-related visits to emergency departments from 1992-2001, averaging 7.6 million visits per year (McDonald 2004). Nearly half of the global burden of alcohol-related mortality is attributable to unintentional and intentional injury (Rehm 2003). Based on estimates of global injury mortality and its contributors (Rehm 2003), alcohol-related injuries worldwide may cause several million deaths each year.

Why it is important to do this review

Numerous randomized controlled trials have evaluated a diverse range of interventions to reduce alcohol dependence, abuse or consumption: pharmacotherapy; individual, couple, and group counseling; exercise; acupuncture; controlled drinking; brief educational interventions (alcohol intake assessment and provision of

information and advice); and other in- and out-patient therapies and combinations of treatments. Most such trials have measured effects of treatment on alcohol consumption and maintenance of abstinence. Many trials have also evaluated the effects of treatment on a wide variety of negative consequences linked directly or indirectly to drinking (e.g. hospitalizations, social or occupational maladjustment) (Babor 1994). Because of the increased risk of injuries associated with problem drinking, we undertook a systematic review to evaluate the effectiveness of interventions for problem drinking in preventing injuries.

OBJECTIVES

To assess by systematic review the effect of interventions for problem drinking on injuries and their antecedents.

METHODS

Criteria for considering studies for this review

Types of studies

Randomized controlled trials.

Types of participants

People diagnosed with alcohol dependence, alcohol abuse, or hazardous use of alcohol, all of which are considered to be 'problem drinking'.

Definitions

- *Alcohol dependence* (i.e. "alcoholism", "alcohol addiction") involves impaired control over drinking, manifested by physiological addiction to alcohol and/or serious disturbances of health, work, social or recreational activities, or other areas of functioning related to alcohol use (DSM-IV-TR 2000).
- *Alcohol abuse* (i.e. "harmful drinking") involves serious disturbances of health, work, or other areas of functioning related to alcohol use, without satisfying the criteria for alcohol dependence (DSM-IV-TR 2000).
- *Hazardous use of alcohol*, such as binge or chronic heavy drinking, places asymptomatic drinkers at risk for future health and other problems (USPSTF 1996).

For the purposes of this review, we refer to alcohol dependence, alcohol abuse, and hazardous use of alcohol as "problem drinking."

Types of interventions

Interventions designed to reduce or eliminate alcohol consumption, prevent hazardous use of alcohol, or prevent injuries or their antecedents (e.g. falls, motor vehicle crashes).

Types of outcome measures

Injuries and injury deaths, or their antecedents (e.g. falls, motor vehicle crashes, suicide attempts).

Search methods for identification of studies

Eligible trials were identified by searching relevant computerized medical databases (see below), reviewing reference lists of relevant trials, contacting national and international agencies for information about unpublished studies, and asking authors of relevant trials to identify additional published or unpublished trials.
These electronic searches were updated in May 2002. ITRD, TRANSDOC, and TRIS have been combined into a single database, TRANSPORT. This database was searched for the update. Bibliographies of eligible trials were reviewed to identify additional studies.

Electronic searches

Twelve electronic databases were searched:

- MEDLINE (1966 to March 2002)
- EMBASE (1982 to May 2002)
- CENTRAL (*The Cochrane Library* 2002, Issue 2)
- PsycINFO (1967 to Feb 2002)
- Cumulative Index to Nursing and Allied Health (CINAHL) (1982 to October 1996)
- Educational Resource Information Center (ERIC) (1966 to December 1996)
- Dissertation Abstracts International (1861 to November 1996)
- International Transport Research Documentation (ITRD) (1972 to January 1997)
- Transport 1988 to 2002/03 (which includes TRANSDOC; a publication of the European Conference of Ministers of Transport) and ((TRIS; Transportation Research Information Service)
- International Bibliography of the Social Sciences (IBSS) (1961 to January 1997)
- Index of Scientific & Technical Proceedings (ISTP) (1982 to January 1997)

The search strategy is described in Appendix 1.

Searching other resources

We handsearched abstracts from the Transport Research Laboratory Database of Worldwide Published Information and relevant conference proceedings at the Transport Research Laboratory Library (United Kingdom).
To find other eligible published or unpublished trials, we contacted and received responses from the:

- National Highway Traffic Safety Administration and the National Institute for Alcohol Abuse and Alcoholism (United States)
- Federal Office of Road Safety (Australia)
- Addiction Research Foundation (Canada)
- Transport Research Laboratory (United Kingdom)
- University of Auckland's Injury Prevention Research Centre (New Zealand)
- Väg-och Trafik-Institutet (Sweden)

Data collection and analysis

Selection of studies

One researcher first reviewed titles and abstracts to identify potentially relevant trials, using the selection criteria of study design, participants and interventions. Studies that clearly failed to meet these three inclusion criteria were excluded. Those that met these criteria or could not be definitely excluded were obtained in full text, to exclude those that did not meet at least these first three inclusion criteria. We contacted the corresponding authors of all remaining studies to identify additional potentially relevant trials and to request further details to determine eligibility (if required). If studies met the first three inclusion criteria but did not report collecting injury-related outcome measures (selection criterion four), we asked the authors to provide any unpublished data on such outcomes. We attempted to contact additional authors (by mail, telephone, and Internet search) when corresponding authors were deceased or could not be traced.

Data extraction and management

Two reviewers independently extracted data and rated the quality of allocation concealment for each eligible study. We extracted data on: the number and description of participants, type of intervention, duration of follow-up, method of allocation concealment, and outcomes evaluated. We assessed the quality of allocation concealment as follows: an 'A' rating signified adequate measures to conceal allocation (e.g. central randomization; serially numbered, opaque, sealed envelopes); a 'B' rating signified unclear adequacy of allocation concealment (e.g. no mention of allocation concealment, or insufficient description of allocation concealment, such as "sealed envelopes"); and a 'C' rating signified inadequately concealed allocation (e.g. alternation; open list of random numbers) (Schulz 1995). There was 100% agreement in the allocation concealment ratings. Studies that would have received a 'C' rating based on the use of quasi-random allocation were ineligible under our inclusion criteria.

RESULTS

Description of studies

See: Characteristics of included studies; Characteristics of excluded studies; Characteristics of ongoing studies.

Results of the search

Of the 7014 published and unpublished studies identified by our search strategies in the original review, 569 (8.1%) were potentially relevant, based on title or abstract. After full text review, nine trials met all four inclusion criteria (Brown 1980, Reis 1982a, Reis 1982b, Walsh 1991, Anderson 1992, Öjehagen 1993, Mann 1994, Barber 1995, Sitharthan 1996). An additional 314 met the first three inclusion criteria. For 23 of these 314 trials (7%), we could not determine whether injury-related outcomes had been measured, because all authors were either untraceable or deceased. The authors of 119 (41%) of the remaining 291 studies responded to our requests for further information. From these responses, we identified an additional nine eligible completed studies (Gallant 1968, Landrum 1981, McCrady et al 1982, Fitzgerald 1985, Potamianos 1986, Kuchipudi 1990, WHO BISG 1996, Toteva 1996, Sitharthan 1997). Two trials (McCrady et al 1982, Anderson 1992) were subsequently excluded because their 'injury' outcome measures were found to include other outcomes not specifically related to injury (i.e. criminal behavior and alcohol-related illness, respectively) that could not be separated from the injury data. The injury-related data for three studies were published in government reports (Reis 1982a, Reis 1982b, Landrum 1981) and we obtained unpublished injury data from the authors of four studies (Barber 1995, Gallant 1968, Fitzgerald 1985, Kuchipudi 1990).
The updated database searches identified 52 potentially eligible studies for full-text review; five eligible trials were found, one of which had been in progress at the time of the original review. Review of bibliographies identified one additional trial. Thus, six trials met all inclusion criteria (Gentilello 1999, Monti 1999, Fleming 1997, Fleming 1999, Kristenson 2002, and Longabaugh 2001). We also identified two published follow-up reports to Fleming 1997 (Manwell 2000, Fleming 2002). Long-term follow-up from the trial by Öjehagen et al (Ojehagen 1993) has been presented at an international conference in Sweden (Öjehagen 1997).

We identified one eligible study in progress (written communication: Bohn M, University of Wisconsin Medical School, Madison, Wisconsin, May 5, 2004). A trial previously identified as in progress did not collect injury-related outcomes as planned because the available motor vehicle crash records were insufficient; this trial was therefore excluded as ineligible (Wells-Parker 2002). A total of 23 eligible trials have therefore been identified (See Table of included studies and List of on-going studies), of which 22 have been completed, 17 have reported results for injury-related outcomes, and 16 have reported numerical data for the relevant outcomes.

Risk of bias in included studies

Allocation

Four completed trials received an 'A' rating for allocation concealment (Reis 1982a, Reis 1982b, Fitzgerald 1985, Potamianos 1986). The remaining completed trials received a 'B' rating, in most cases because the method of randomization was unspecified and the information was not obtainable from the authors.
In the trial by Fitzgerald and Mulford (Fitzgerald 1985), the number of subjects differed markedly between the two study groups at Center A. The author notes that originally the study had two experimental groups at Center A, 'hospital-initiated telephone aftercare' and 'patient-initiated telephone aftercare', in addition to a 'no aftercare' control group. Because 42 of 43 subjects randomly assigned to 'patient-initiated aftercare' did not in fact initiate any contacts, all 43 patients were combined with the control group in the analysis. Random allocation to the first experimental group was maintained. The author states that there was little impact on their effect estimates regardless of whether these subjects were included or excluded from the control group (personal communication, HA Mulford, September 1997).

Effects of interventions

The 23 completed trials evaluated a diverse group of interventions, patient populations, and injury outcomes. The most common intervention studied was brief counseling for problem drinking, which was evaluated in nine trials. The data from these trials, when available, have been combined quantitatively where appropriate. Due to the diversity of interventions, populations, and outcomes studied in the other trials, no attempt was made to combine their results. Effects of intervention on abstinence, alcohol consumption, and alcohol-impaired driving are shown in the notes section of the Table of included studies.

Mortality

Eight completed trials collected injury mortality outcomes. Twenty-seven total deaths were reported in the seven trials for which data were available (Fleming 2002, Gallant 1968, Kristenson 2002, Kuchipudi 1990, Mann 1994, Öjehagen 1997, Walsh 1991).
Four trials compared intervention to no intervention. Three of these reported a reduced risk of death in the intervention group compared to the control group, although all effect estimates were imprecise due to small numbers. At 48-month follow-up, Fleming 2002 reported one suicide per 392 subjects in the intervention group and two motor vehicle crash deaths per 382 subjects in the control group (RR=0.49; 95% CI 0.04 to 5.35). Mann 1994 reported 3/220 accidental and violent deaths in the experimental group and 5/127 in the control group: relative risk (RR) 0.35; 95% confidence interval (CI) 0.08 to 1.43). Kuchipudi 1990 reported 3/59 suicides and violent deaths in the intervention group and 5/55 in the control group (RR=0.56; 95% CI 0.08 to 1.43). The fourth trial reported more deaths in the intervention than the control group. Kristenson 2002 reported one suicide per 365 persons in the intervention group and no injury deaths per 382 persons in the control group (p=0.55, Fisher's exact test). Combining data from the three trials of brief counseling that reported effects on injury-related deaths (Fleming 2002, Kristenson 2002, Kuchipudi 1990), the relative risk of death among 1555 total subjects was reduced with intervention (RR=0.65; 95% CI 0.21 to 2.00).
The other three completed trials reporting injury mortality data compared different treatment modalities, without any 'no intervention' control group. There were too few events in each of these three trials (none in Gallant 1968, two in Walsh 1991, five in Öjehagen 1997) to identify differences in the effects of specific treatment modalities on injury deaths. At 9 years follow-up, Öjehagen 1997 reported three suicides among 36 participants who received one year of multi-modal behavioural therapy versus two suicides among 36 participants who received a year of psychiatric therapy (RR=1.50; 95% CI 0.27 to 8.45), although the effect estimate was imprecise due to small numbers.

Data were not available for Toteva and Milanov (Toteva 1996), which reported collecting data on suicides.

Non-fatal injuries

Eighteen completed trials collected data on non-fatal injuries and their antecedents. The results from trials collecting non-fatal injury outcomes due to specifically identified causes (violence, falls, motor vehicle crashes) are summarized separately below.
Eleven trials collected data on non-fatal injuries due to all causes. Results, however, were available from only six of these trials: Kuchipudi 1990, Fitzgerald 1985, Monti 1999, Longabaugh 2001, Gentilello 1999, Fleming 1999. Three of the six trials specif-

ically assessed alcohol-related injuries (Longabaugh 2001, Monti 1999, Fitzgerald 1985); the remainder looked at injuries regardless of relationship to alcohol use.

In five of the six trials, the intervention for problem drinking reduced the risk of injuries or accidents compared to no intervention. In four of the trials, a reduction in injury risk occurred, despite the fact that there were no beneficial effects of treatment on abstinence (Kuchipudi 1990, Fitzgerald 1985) or on alcohol consumption (Monti 1999, Longabaugh 2001) (see Notes in Table of Included Studies). Three of these reported specifically on alcohol-related injuries. Fitzgerald 1985 reported a reduction in drinking-related injuries and accidents with telephone aftercare contacts (RR=0.73; 95% CI 0.34 to 1.58). Monti 1999 found a significantly reduced risk of self-reported alcohol-related injury at 6-month follow-up among adolescents who received a brief intervention in the emergency department (21% versus 50%, adjusted OR=0.25; 95% CI 0.09 to 0.69). Longabaugh 2001 compared a motivational interview with a booster session to standard care and reported fewer mean total injuries (0.67 versus 0.72; p=0.17, one-tailed) and alcohol-related injuries (0.165 v. 0.240 mean injuries, p = 0.04, one-tailed). However, mean alcohol-related injuries after a motivational interview alone (without a booster session) were not different from mean alcohol-related injuries after standard care (data not provided, p > 0.40, one-tailed). Total injuries and injuries treated by a doctor did not differ among any of the three groups (data not shown, p>0.05). Kuchipudi 1990 reported the beneficial effect of a motivational intervention on injury-related hospitalizations (2/59 vs 3/55; RR=0.62; 95% CI: 0.11, 3.58). In the fifth trial (Gentilello 1999), both injury risk and alcohol consumption were reduced with intervention. At one-year follow-up, Gentilello 1999 found that a brief motivational intervention reduced the risk of injury requiring emergency treatment or hospital admission (adjusted hazard ratio 0.53, 95% CI 0.26 to 1.07). At three year follow-up, the risk of injury resulting in hospital readmission was also reduced (adjusted hazard ratio 0.52, 95% CI 0.21 to 1.29). Alcohol consumption was substantially reduced at 12-month follow-up (-21.8 (3.7) versus -6.7 (5.8) drinks/week, p=0.03).

In the sixth trial, Fleming 1999 implemented a brief motivational interview among adults aged $\geq$ 65 years and reported that there were "no significant changes" in accidents or injuries (data were not reported), although alcohol consumption was significantly reduced with intervention.

Other trials also measured the effect of the experimental intervention on accidents (Brown 1980, Walsh 1991, Potamianos 1986) or injuries (WHO BISG 1996; Toteva 1996), but we were unable to obtain these data.

Non-fatal violence

Seven completed trials collected data on non-fatal violence, but data were available for only four of the trials.

All three trials evaluating intervention versus no intervention suggested a reduction in non-fatal violence with intervention (Barber 1995, Fitzgerald 1985, Fleming 2002). Barber and Crisp, using the "Pressure to Change" approach for partners of heavy drinkers, reported a reduction in 'domestic violence' (4/16 vs 3/7; RR=0.58; 95% CI 0.17 to 1.95). Fitzgerald and Mulford reported a reduction in suicide attempts with telephone aftercare contacts (4/125 vs 11/167; RR=0.48; 95% CI 0.15, 1.51). A motivational interview administered to injured problem drinkers resulted in fewer instances of arrest for assault, battery, and/or child abuse than did standard care (Fleming 2002; 8 events/1568 person-years v 11/1528 person-years; RR=0.71; 95% CI 0.29, 1.76). Two of the three trials (Fleming 2002, Barber 1995) showed a beneficial effect on drinking-related outcomes as well as on injuries. The reduction in mean drinks per week did not persist to 48 month follow-up in Fleming et al (2002), although the reduction in binge drinking episodes did. Fitzgerald 1985 found little difference in abstinence rates between the two groups (21% versus 22%).

The fourth trial (Sitharthan 1997) reported a reduced risk of committing assault after cognitive behavioral therapy compared to cue exposure therapy (0/25 vs 5/27; RR=infinity; 95% CI: 0.91, infinity) (CI shown is based on the odds ratio approximation), p=0.06. Sitharthan, however, found a greater reduction in alcohol consumption with cue exposure therapy.

Other completed trials measured the effect of intervention on aggressive behavior (Potamianos 1986), assaults (Sitharthan 1996), and criminal and domestic violence (Toteva 1996), but data were not available.

Falls

Kuchipudi 1990 reported the beneficial effect of a motivational intervention on falls (3/59 vs 4/55; RR=0.70; 95% CI 0.16, 2.98). No other trials specifically assessed effects of interventions for problem drinking on falls.

Motor vehicle crashes

Five completed trials assessed the effect of intervention on motor vehicle crashes and on injuries following motor vehicle crashes. Data were available from four of these trials.

Landrum 1981 assessed three different interventions for persons convicted of DUI (driving under the influence), compared to no intervention. Monthly probation alone, structured rehabilitation alone, and these two interventions combined were each associated with a reduced risk of motor vehicle crashes: RR=0.76 (95% CI 0.51 to 1.13), RR=0.85 (0.57 to 1.26), and RR=0.90 (0.60 to 1.35), respectively. Monthly probation and structured rehabilitation had stronger effects on motor vehicle crash injuries (RR=0.47; 95% CI 0.20 to 1.11 and RR=0.58; 95% CI 0.26 to 1.32, respectively), while the combination of probation and rehabilitation appeared to have no effect on crash-related injuries (RR=1.06; 95%

CI 0.52 to 2.17). However, all effect estimates were imprecise. (Proportions with crashes and injuries in each group are shown in the Table of included studies.) Despite apparently differential effects on crashes and injuries, all four groups had similar rates of DUI repeat arrests (32%, 33%, 31%, and 33%, respectively), with the lowest repeat arrest rate in the intervention group that showed the smallest effect on crashes and related injuries (i.e. probation plus rehabilitation).

In a study of DUI first offenders (Reis 1982a), in-class education about drink driving reduced the cumulative accident rate (0.084 compared to 0.101 in controls), but there appeared to be little effect from home study (cumulative accident rate=0.098); the overall p value for the three groups was 0.58. In-class education also had a stronger effect on alcohol consumption and on DUI arrest recidivism than did home study (see Table of included studies).

In a study of DUI multiple offenders (Reis 1982b), only educational counseling combined with disulfiram therapy appeared to reduce the cumulative incidence of alcohol-related crashes and injuries (0.055) compared to no intervention (0.076). The cumulative incidence of alcohol-related crashes and injuries was higher in the groups receiving bi-weekly contacts (Cumulative incidence=0.086) and educational counseling alone (0.087) than in controls, despite the fact that counseling alone was as effective as counseling with disulfiram in reducing DUI arrest recidivism.

Fleming 2002 measured motor vehicle crashes for 48 months after administering a brief intervention to injured problem drinkers. Compared to a no-intervention group, the intervention group had fewer motor vehicles crashes resulting in fatal or non-fatal injuries or property damage (87/1568 person-years v. 105/1528 person-years, RR=0.81; 95% CI 0.61 to 1.06). Effects were greater on motor vehicle crashes with injuries (20/1568 person-years v. 33/1528, RR=0 .59; 95% CI 0.34 to 1.02) than on motor vehicle crashes with property damage only (67/1568 person-years v. 72/1528 person-years, RR=0.91; 95% CI 0.66 to 1.26). However, all effect estimates were imprecise.

Potamianos 1986 also measured the effect of community-based day center treatment on motor vehicle crashes, but these data were unavailable.

DISCUSSION

Summary of main results

Injury is a major public health problem worldwide, and alcohol is a significant contributor. The reduction of unintentional and intentional injuries due to problem drinking is, therefore, an important public health goal. Although these data are not conclusive, they do indicate that interventions for problem drinking may be effective in reducing injuries and injury deaths. In the thirteen trials that compared interventions for problem drinking to control interventions and provided outcome data, nearly all interventions showed a beneficial effect on injury-related outcomes. The estimated effect sizes were typically large, with reductions in alcohol- or drinking-related injuries ranging from 27% to 65%. Because the trial sample sizes were generally small, however (few of the trials having been designed to measure effects on injuries), the precision of most estimates was low. However, two recent studies were large enough to demonstrate statistically significant reductions in alcohol-related injuries (Longabaugh 2001, Monti 1999). The results indicate that interventions to reduce problem drinking have beneficial effects on the incidence of injuries, particularly alcohol-related injuries, and interventions could have an important effect on injury deaths.

Although reduced alcohol consumption would seem a likely mechanism for any beneficial effects of treatment on injuries, this review does not provide strong support for this mechanism. Among trials reporting beneficial effects on injuries or injury antecedents, five trials reported reduced alcohol consumption or increased abstinence (Reis 1982a, Reis 1982b, Barber 1995, Gentilello 1999, Fleming 2002), but four showed no effect on these outcomes (Fitzgerald 1985, Kuchipudi 1990, Monti 1999, Longabaugh 2001). In two of four completed trials that compared different treatment modalities and provided data on injury outcomes, there were significantly greater declines in alcohol consumption with one therapeutic modality compared to the other(s) (Sitharthan 1997, Walsh 1991). In both trials, however, the treatments that were associated with reduced injury risk were not the treatments associated with reductions in alcohol consumption. It is possible that these paradoxical results can be explained by chance, reflecting the nearly universally imprecise effect estimates, or by measurement error in the assessment of the drink- or injury-related outcomes. It is also possible that beneficial effects on injuries are mediated by other aspects of treatment for problem drinking (e.g. receipt of medical attention and social support).

Similarly, the evidence does not establish that reported reductions in unintentional injuries are due to decreases in driving while impaired by alcohol. Reis (Reis 1982a; Reis 1982b) found significant reductions in DUI recidivism rates in both of his trials, Gentilello 1999 et al reported reduced DUI violations, and Monti 1999 et al reported reductions in self-reported drinking and driving. On the other hand, Landrum 1981 and Fleming 2002 reported minimal or no effects on DUI incidence with intervention, and Kuchipudi 1990 found an increase in DUI rates with intervention.

The availability of research examining brief clinical interventions for problem drinkers is increasing. In fact, all six trials identified during the May 2002 update evaluated such interventions. Five of the seven trials that evaluated brief interventions for problem drinking, and provided results, reported reductions in injury outcomes, but akin to trials identified for the original review, the mechanisms for these reductions are unclear. Gentilello 1999, Fleming 2002, and Fleming 1999 found significant decreases in alcohol consumption; however, Fleming 1999 found no reduction

in injury outcomes. Furthermore, the two trials that reported significant reductions in alcohol-related injury outcomes did not find reductions in alcohol consumption (Monti 1999, Longabaugh 2001), nor did Kuchipudi 1990 et al find any effect on abstinence despite finding reductions in injury hospitalizations and deaths. Brief interventions also had mixed effects on hazardous drinking behavior associated with injury risk: Gentilello 1999 reported reduced DUI violations and Monti reported reductions in drinking and driving, but Fleming 2002 and Kuchipudi 1990 found no or adverse effects on DUI incidence with intervention. Recently a need for medical interventions for people with alcohol problems, particularly in emergency department settings, has been emphasized (Hungerford 2003, McDonald 2004). Increased research on emergency department interventions for problem drinkers should help to identify characteristics of effective interventions for different age, sex, and other populations, as well as the mechanisms for the beneficial effects of such treatment on injury outcomes.

Quality of the evidence

We limited our critique of the quality of the included studies to an assessment of the quality of allocation concealment because this appears to be the most important criterion for assessing the validity of a randomized trial (Schulz 1995). Unfortunately, we were able to determine this criterion accurately in only a small proportion of the trials reviewed. Few trials reported allocation concealment in detail, and among the others, very few researchers provided us with sufficient information to assess this criterion adequately. We cannot, therefore, draw firm conclusions about quality for most of the trials.

The aim of our systematic review was to make explicit the randomized evidence on what appears to be a promising approach to tackling the problem of alcohol-related injuries. A key finding of the review is that the trials that we found reported imprecise effect estimates, and often had methodological weaknesses, indicating that this promising approach requires further research. We considered the possibility of combining the available data from these trials in a meta-analysis to increase the precision of the effect estimates. However, for the most part, this would have involved combining markedly heterogeneous groups of participants, interventions, and outcomes. In such circumstances, a meta-analysis can produce inappropriate, and even misleading, conclusions (Bailar 1997, Lancet 1997). We did attempt to quantitatively combine results from the seven trials of brief interventions. However, this was possible only for deaths, because the diversity of non-fatal injury outcomes measured (i.e. falls, motor vehicle crashes with injuries, self-reported injuries, accidents and injuries, injury-related visits to the ED, injuries treated by a doctor, injury-related hospitalizations) precluded meaningful combination.

Potential biases in the review process

Publication bias is an important threat to the validity of systematic reviews. Such bias may arise if outcome data are selectively omitted from published reports because the results fail to reach significance. To avoid the effects of this type of bias we wrote to the authors of all identified trials that met our first three inclusion criteria, asking them whether they collected any data on injuries or their antecedents, and to provide such data if available. Nine additional completed trials, long-term follow-up of another completed trial, and one trial still in progress, were identified by this approach. However, we were able to obtain unpublished injury-related data from only four of the completed trials. The difficulties involved in extracting unpublished data and other information for systematic reviews have been reported previously (Roberts 1997). More than half of the authors of studies that met our first three inclusion criteria were deceased or untraceable or did not respond to our requests for information. While it is likely that some did not respond because they did not measure injury outcomes, the inability to identify all unpublished data might have biased our results.

AUTHORS' CONCLUSIONS

Implications for practice

Interventions for problem drinking appear to have beneficial effects on injury risk, but this benefit does not necessarily correlate with the effect of the intervention on abstinence, alcohol consumption, or drinking-related hazardous behavior.

Implications for research

Previous reviews have shown that interventions for problem drinking can reduce alcohol consumption (Freemantle 1993) and driving under the influence of alcohol (Wells-Parker 1995). This review indicates that interventions for problem drinking are likely to reduce the incidence of injuries and their antecedents, but current data are insufficient to draw firm conclusions, particularly in terms of effects on violent injuries. Because injuries account for a large proportion of the morbidity and mortality due to problem drinking, further studies are warranted to evaluate the effect that treating problem drinking may have on injuries and to investigate how any beneficial effects on injuries are mediated.

ACKNOWLEDGEMENTS

An earlier version of this review was published as 'Dinh-Zarr T, DiGuiseppi C, Heitman E, Roberts I. Preventing injuries through

interventions for problem drinking: a systematic review of randomized controlled trials. Alcohol & Alcoholism 1999; 34: 609-21.' It is reprinted here by permission of the Medical Council on Alcoholism.

We gratefully acknowledge the assistance of Drs Ralph Bloch and Ellen Ingham (translations), Dr Robert Zarr, Darmendra Ramcharran and Adam Howard (data collection), and all the researchers who sent us information and unpublished data.

This research was supported in part by Grant Number R49/CCR811509 from the Centers for Disease Control and Prevention (CDC), US Department of Health and Human Services. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the CDC.

REFERENCES

References to studies included in this review

Barber 1995 *{published and unpublished data}*
Barber J, Crisp BR. The 'pressures to change' approach to working with the partners of heavy drinkers. *Addiction* 1995;**90**:269–76.

Brown 1980 *{published and unpublished data}*
Brown RA. Conventional education and controlled drinking education courses with convicted drunk drivers. *Behavior Therapy* 1980;**11**:632–42.

Fitzgerald 1985 *{published and unpublished data}*
Fitzgerald JL, Mulford HA. An experimental test of telephone aftercare contacts with alcoholics. *Journal of Studies on Alcohol* 1985;**46**(5):418–24.

Fleming 1999 *{published data only}*
Fleming MF, Manwell LB, Barry KL, et al.Brief physician advice for alcohol problems in older adults: A randomized community-based trial. *Journal of Family Practice* 1999;**48**:378–84.

Fleming 2002 *{published data only}*
Fleming MF, Barry KL, Manwell LB, et al.Brief physician advice for problem alcohol drinkers: A randomized controlled trial in community-based primary care practices. *JAMA* 1997;**277**: 1039–45.
* Fleming MF, Mundt MP, French MT, Manwell LB, Stauffacher EA, Barry KL. Brief Physician advice for problem drinkers: Long-term efficacy and benefit-cost analysis. *Alcoholism: Clinical and Experimental Research* 2002;**26**:36–43.
Manwell LB, Fleming MF, Mundt MP, Stauffacher EA, Barry KL. Treatment of problem alcohol use in women of childbearing age: Results of a brief intervention trial. *Alcoholism: Clinical and Experimental Research* 2000;**24**:1517–24.

Gallant 1968 *{published and unpublished data}*
Gallant DM, Bishop MP, Camp E, Tisdale C. A six-month controlled evaluation of metronidazole (Flagyl) in chronic alcoholic patients. *Current Therapeutic Research* 1968;**10**(2):82–7.

Gentilello 1999 *{published data only}*
Gentilello LM, Rivara FP, Donovan DM, et al.Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Annals of Surgery* 1999;**230**:473–83.

Kristenson 2002 *{published data only}*
Kristenson H, Osterling A, Nilsson J-A, Lindgarde F. Prevention of alcohol-related deaths in middle-aged heavy drinkers. *Alcoholism: Clinical and Experimental Research* 2002;**26**:478–84.

Kuchipudi 1990 *{published and unpublished data}*
Kuchipudi V, Hobein K, Flickinger A, Iber FL. Failure of a 2-hour motivational intervention to alter recurrent drinking behaviour in alcoholics with gastrointestinal disease. *Journal of Studies on Alcohol* 1991;**51**:356–60.

Landrum 1981 *{published data only}*
Landrum J, Miles S, Neff R, et al.Mississippi DUI Follow-up Project. National Highway Traffic Safety Administration. Washington, DC, 1981; Vol. Final report. [: DOT–HS–806 274]

Longabaugh 2001 *{published data only}*
Longabaugh R, Woolard RF, Nirenberg TD, et al.Evaluating the effects of a brief motivational intervention for injured drinkers in the emergency department. *Journal of Studies on Alcohol* 2001;**62**: 806–16.

Mann 1994 *{published data only}*
Mann RE, Anglin L, Wilkins K, et al.Rehabilitation for convicted drinking drivers (second offenders): effects on mortality. *Journal of Studies on Alcohol* 1994;**55**:372–4.

Monti 1999 *{published data only}*
Monti PM, Colby SM, Barnett NP, et al.Brief interventions for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *Journal of Consulting and Clinical Psychology* 1999;**67**:989–94.

Potamianos 1986 *{published data only}*
Potamianos G. *A randomised controlled trial of a community-based centre in the treatment of alcoholism [PhD dissertation]*. 1986.
Potamianos G, North WRS, Meade TW, Townsend J, Peters TJ. Randomised trial of community-based centre versus conventional

hospital management in treatment of alcoholism. *Lancet* 1986; **October 4**:797–9.

Reis 1982a *{published and unpublished data}*
Reis RE, Davis LA. *First interim analysis of first offender treatment effectiveness*. National Highway Traffic Safety Administration, 1981. [: Report Number: CDUI–IE–80–1Intrm Rpt.; Report Number: HS–805 577]

Reis 1982b *{published and unpublished data}*
Reis RE. *Analysis of traffic safety impact of educational counseling programs for multiple offense drunk drivers*. Vol. **1980 annual report: volume V**, National Highway Traffic Safety Administration, 1982. [: Report Number : CDUI–AN–5–80 Intrm Rpt.; Report Number: HS–806 555]

Sitharthan 1996 *{published and unpublished data}*
Sitharthan T, Kavanaugh DJ, Sayer G. Moderating drinking by correspondence - an evaluation of a new method of intervention. *Addiction* 1996;**91**:345–55.

Sitharthan 1997 *{published data only}*
Sitharthan T, Sitharthan G, Hough M, Kavanaugh DJ. Cue exposure in moderation drinking: a comparison with cognitive-behavior therapy a comparison with cognitive-behavior therapy. *Journal of Consulting and Clinical Psychology* 1997;**65**:878–82.

Toteva 1996 *{published and unpublished data}*
Toteva S, Milanov I. The use of body acupuncture for treatment of alcohol dependence withdrawal syndrome: a controlled study. *American Journal of Acupuncture* 1996;**24**:19–25.

Walsh 1991 *{published data only}*
Walsh DC, Hingson RW, Merrigan DM, et al.A randomized trial of treatment options for alcohol-abusing workers. *New England Journal of Medicine* 1991;**325**:775–82.

WHO BISG 1996 *{published data only}*
WHO Brief Intervention Study Group. A cross-national trial of brief interventions with heavy drinkers. *American Journal of Public Health* 1996;**86**:948–55.

Öjehagen 1997 *{published and unpublished data}*
Öjehagen A, Berglund M, Appel CP. Long-term outpatient treatment in alcoholics with previous suicidal behavior. *Suicide & Life Threatening Behavior* 1993;**23**:320–8.
Öjehagen A, Schaar I, Berglund M. Nine-year follow-up of outpatient psychiatric- versus multimodal behavioural therapy in alcoholics, a randomised study. (Poster Presentation). 6th Congress European Society for Biomedical Research on Alcoholism. Stockholm.. 1997.

References to studies excluded from this review

Anderson 1992 *{published data only}*
Anderson P, Scott E. The effect of general practitioners' advice to heavy drinking men. *British Journal of Addiction* 1993;**87**:891–900.

McCrady et al 1982 *{published and unpublished data}*
McCardy BS, Moreau J, Paolino TJ, Longabaugh R. Joint hospitalization and couples therapy for alcoholism: a four-year follow-up. *Journal of Studies on Alcohol* 1982;**43**:1244–50.

Wells-Parker 2002 *{published and unpublished data}*
Wells-Parker E, Williams M. Enhancing the effectiveness of traditional interventions with drinking drivers by adding brief individual intervention components.. *Journal of Studies on Alcohol* 2002;**63**:655–64.

References to ongoing studies

Bohn, in prog *{published data only}*

Additional references

Andreasson 1988
Andreasson S, Allbeck P, Romelsjo A. Alcohol and mortality among young men: longitudinal study of Swedish conscripts. *BMJ* 1988; **296**:1021–5.

Babor 1994
Babor TF, Longabaugh R, Zweben A, et al.Issues in the definition and measurement of drinking outcomes in alcoholism treatment research. *Journal of Studies on Alcohol Supplements* 1994;**12**:101–11.

Bailar 1997
Bailar JC III. The promise and problems of meta-analysis [editorial]. *New England Journal of Medicine* 1997;**337**:559–61.

Cunradi 2002
Cunradi CB, Caetano R, Schafer J. Alcohol-related problems, drug use, and male intimate partner violence severity among US couples. *Alcoholism: Clinical and Experimental Research* 2002;**26**:493–500.

Dickersin 1994
Dickersin K, Scherer R, Lefebvre C. Identifying relevant studies for systematic reviews. *BMJ* 1994;**309**:1286–91.

DSM-IV-TR 2000
American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, Text Revision*. IV. Washington, DC: American Psychiatric Association, 2000.

Freemantle 1993
Freemantle N, Gill P, Godfrey C, et al.Brief interventions and alcohol use. *Effective Health Care* 1993;**Bulletin Number 7. University of Leeds, Leeds, United Kingdom**.

Hungerford 2003
Hungerford DW, Pollock DA. Emergency department services for patients with alcohol problems: Research directions. *Academic Emergency Medicine* 2003;**10**:79–84.

IOM 1990
Institute of Medicine, Division of Mental Health and Behavioural Medicine. *Broadening the base of treatment for alcohol problems*. Washington, DC: National Academy Press, 1990.

Lancet 1997
The Lancet. Meta-analysis under scrutiny [editorial]. *Lancet* 1997; **350**:675.

McDonald 2004
McDonald AJ III, Wang N, Camargo C Jr. US emergency department visits for alcohol-related diseases and injuries between 1992 and 2000. *Archives of Internal Medicine* 2004;**164**:531–7.

NCIPC 2001
National Committee for Injury Prevention and Control. *Injury fact book: 2001-2002*. Atlanta: Centers for Disease Control and Prevention, 2001.

O'Farrell 1995

O'Farrell J, Murphy CM. Marital violence before and after alcoholism treatment. *Journal of Consulting and Clinical Psychology* 1995;**63**:256–62.

Rehm 2003

Rehm J, Room R, Monteiro M, et al.Alcohol as a risk factor for global burden of disease. *European Addiction Research* 2003;**9**: 157–64.

Roberts 1997

Roberts I. and Schierhout G. The private life of systematic reviews. *BMJ* 1997;**315**:686–7.

Schulz 1995

Schulz KF, Chalmers I, Hayes RJ, Altman DG. Empirical evidence of bias: dimensions of methodological quality associated with the estimates of treatment effects in controlled trials. *Journal of the American Medical Association* 1995;**273**:408–12.

USPSTF 1996

US Preventive Services Task Force. Screening for problem drinking. In: DiGuiseppi C, Atkins D, Woolf S, Kamerow D editor(s). *Guide to Clinical Preventive Services*. 2nd Edition. Washington, DC: US General Printing Office, 1996:567–82.

Vinson 1995

Vinson DC, Mabe N, Leonard LL, et al.Alcohol and injury. A case-crossover study. *Archives of Family Medicine* 1995;**4**:505–11.

Wells-Parker 1995

Wells-Parker E, Bangert-Drowns R, McMillen R, Williams M. Final results from a meta-analysis for remedial interventions with drink/drive offenders. *Addiction* 1995;**90**:907–26.

References to other published versions of this review

Dinh-Zarr 1999

Dinh-Zarr T, DiGuiseppi C, Heitman E, Roberts I. Preventing injuries through interventions for problem drinking: a systematic review of randomized controlled trials. *Alcohol & Alcoholism* 1999; **34**:609–21.

* *Indicates the major publication for the study*

CHARACTERISTICS OF STUDIES

Characteristics of included studies *[ordered by study ID]*

Barber 1995

Methods	Randomized controlled trial
Participants	23 partners of heavy drinkers (22 women, 1 man).
Interventions	1) Training partners to pressure heavy drinkers to change. 2) No intervention.
Outcomes	Domestic violence: 1) 4/16 (25%) 2) 3/7 (43%) RR=0.58 (95% CI 0.17, 1.95); p=0.63.
Notes	Australia. 3-month follow-up. N and % fully abstinent: 1) 1/16 (6%) 2) 0/7 (0%) % subjects taking <4 drinks (10 g etoh) per day: 1) 3/16 (19%) 2) 0/7 (0%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Brown 1980

Methods	Randomized controlled trial
Participants	60 males convicted of DUI.
Interventions	1) Conventional education. 2) Controlled drinking. 3) No intervention.
Outcomes	Accidents. Data unavailable.
Notes	New Zealand. 12-month follow-up Mean days abstinent/90 days: 1) 48.0 2) 58.4 3) 53.6

Brown 1980 (*Continued*)

	Average DUI incidence/year: 1) 32.40 2) 7.25 3) 23.95

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Fitzgerald 1985

Methods	Randomized controlled trial
Participants	288 alcoholics (from 2 centers, A & B).
Interventions	1) Telephone aftercare contacts. 2) No or minimal aftercare intervention.
Outcomes	Drinking-related injuries and accidents. 1) A: 7/86, B: 2/39 (7%) 2) A: 14/127, B: 3/40 (10%) RR*=0.73 (95% CI 0.34, 1.58); p=0.55 Suicide attempts: 1) A; 2/86; B: 2/39 (3%) 2) A: 9/127; B: 2/40 (7%) RR*=0.48 (95% CI 0.15, 1.51); p=0.31 *Mantel-Haenzel weighted relative risk, stratified by Center.
Notes	USA. 12-month follow-up. N and % fully abstinent 1) 26/123 (21%) 2) 37/165 (22%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Fleming 1999

Methods	Randomized controlled trial
Participants	158 patients >= 65 years, identified as problem drinkers (105 men, 53 women).

Fleming 1999 (*Continued*)

Interventions	1) Scheduled for brief intervention by personal physician, follow-up call, and general health booklet. 2) General health booklet.
Outcomes	No significant changes in incidence of accidents or injuries for either group. (Data not reported).
Notes	USA. 12-month follow-up. Drinks/week M(SD): 1)9.92 (6.97) 2)16.27 (12.17) p < 0.001 % change in drinks/week: 1) -36.14% 2) 1.89% Number of binge drinking episodes in past 30 days: 1) 1.83 2) 5.36 p < .005 N and % reporting binge drinking in past 30 days: 1) 24/78 (30.8%) 2) 33/67 (49.3%) p < .025

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Fleming 2002

Methods	Randomized controlled trial
Participants	774 patients identified as problem drinkers, ages 18-65 (482 men, 292 women).
Interventions	1) Two brief intervention visits one month apart by personal physician, two follow-up calls by nurse, and general health booklet. 2) General health booklet.
Outcomes	Injury-related deaths: 1) 1/392 (suicide). 2) 2/382 (motor vehicle crashes) RR (95% CI) = 0.49 (0.04, 5.35), p = .56 Motor vehicle crashes with fatalities: 1) 0/1568 2) 2/382 p = .24, Fisher's Exact Test, two-tailed Motor vehicle crashes with non-fatal injuries: 1) 20/1568 person-years

Fleming 2002 (*Continued*)

	2) 31/1528 person-years RR=0.63 (0.36, 1.10) Motor vehicle crashes with property damage only: 1) 67/1568 p-y 2) 72/1528 p-y RR=0.91 (0.66, 1.26) Motor vehicle crashes: 1) 87/1568 p-y 2) 105/1528 p-y RR=0.81 (0.61, 1.06) Assault/battery/child abuse: 1) 8/1568 p-y 2) 11/1528 p-y RR=0.71 (0.29, 1.76).
Notes	USA. 48-month follow-up. 48 months Mean drinks/week: No differences between groups, although there was an overall reduction in the intervention group across all time points up to 48 months, p =.0018 % reporting binge drinking in past 30 days: 1) 63.8% 2) 70.4% Mean number of binge drinking episodes/30 days (est from graph): 1) 4.2 2) 5.1 Arrests for operating while intoxicated: 1) 25/1568 person-years 2) 25/1528 person-years RR=0.97 (0.56, 1.69) 12 months Number of drinks/7days M(SD): 1) 11.48(11.31) 2) 15.46 (12.93) p < .001 Number of binge episodes/30 days M(SD): 1) 3.07(5.23) 2) 4.21 (5.52) p < .005 N and % reporting binge drinking in past 30 days: 1) 188 (55.8%) 2) 261 (71.3%) p < .001

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Gallant 1968

Methods	Randomized controlled trial
Participants	78 male alcoholics.
Interventions	1) Metronidazole (125 mg qid) 2) chlordiazepoxide (10 mg qid).
Outcomes	Suicides. 1) 0/39 2) 0/39 Relative risk undefined.
Notes	USA. 6-month follow-up N and % fully abstinent 1) 6/39 (15%) 2) 8/39 (21%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Gentilello 1999

Methods	Randomized controlled trial
Participants	762 adult patients admitted to hospital for trauma and identified as problem drinkers (82% male).
Interventions	1) One-hour motivational interview with psychologist 2) Standard care.
Outcomes	Hospitalization for an injury up to 3 years post-intervention: Adjusted Hazard ratio (95% CI) = .52 (0.21, 1.29), p = .16 Visit to emergency department or hospital for a new injury up to 12 months post intervention: Adj. Hazard ratio (95% CI) = 0.53 (0.26, 1.07), p = .07
Notes	USA. Up to 3 years follow-up. Mean change in drinks/wk M(SE): 1) -21.8(3.7) 2) -6.7(5.8) p = .03 DUI violations: OR (95% CI est from graph) = 0.77(0.25, 1.55) Alcohol-related arrest OR (95% CI est from graph): 0.50 (0.1, 1.4)

Risk of bias

Gentilello 1999 (*Continued*)

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kristenson 2002

Methods	Randomized controlled trial
Participants	667 men born 1927-1937, ages 46-49 at screening, identified as heavy drinkers (based on GGT).
Interventions	1) Test results, invited for further assessment (liver tests, physical examination) and brief intervention by physician 2) Test results and invited for laboratory checkups in 2 years.
Outcomes	Unintentional injury deaths while intoxicated: 1) 0/365 2) 0/302 RR undefined Suicides among known alcoholics: 1) 1/365 2) 0/302 RR cannot be calculated, p = 0.55, one-tailed Fisher's Exact Test.
Notes	Sweden. Follow-up 10-16 years (median 13 years).

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Kuchipudi 1990

Methods	Randomized controlled trial
Participants	114 alcoholics hospitalised for medical illness.
Interventions	1) Motivational intervention and medical care 2) Medical care only.
Outcomes	Suicides and violent deaths: 1) 3/59 (5%) 2) 5/55 (9%) RR=0.56 (95% CI 0.08, 1.43); p=0.48 Injury hospitalisations: 1) 2/59 (3%) 2) 3/55 (5%) RR=0.62 (95% CI 0.11, 3.58); p=0.67

Kuchipudi 1990 (*Continued*)

	Falls: 1) 3/59 (5%) 2) 4/55 (7%) RR=0.70 (95% CI 0.16, 2.98); p=0.71.
Notes	USA. 10 to 16-wk follow-up. N and % fully abstinent: 1) 21/59 (36%) 2) 20/55 (36%) N and % Driving Under The Influence: 1) 8/59 (14%) 2) 5/55 (9%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Landrum 1981

Methods	Randomized controlled trial
Participants	3425 persons convicted of DUI
Interventions	1) Monthly probation. 2) Rehabilitation (group therapy/ structured intervention). 3) Probation & rehabilitation 4) No intervention.
Outcomes	Motor vehicle crashes 1) 41/552 (7%) 2) 42/504 (8%) 3) 38/431 (9%) 4) 48/490 (10%) RR (95% CI); p-value 1) 0.76 (0.51, 1.13); p=0.21 2) 0.85 (0.57, 1.26); p=0.49 3) 0.90 (0.60, 1.35); p=0.69 4) 1.0 Motor vehicle crash injuries 1) 8/552 (1%) 2) 9/504 (2%) 3) 14/431 (3%) 4) 15/490 (3%) RR (95% CI); p-value 1) 0.47 (0.20, 1.11); p=0.12 2) 0.58 (0.26, 1.32); p=0.27

Landrum 1981 (*Continued*)

	3) 1.06 (0.52, 2.17); p=0.98 4) 1.0.
Notes	USA. 24-month follow-up DUI repeat arrestees 1) 179/552 (32%) 2) 168/504 (33%) 3) 132/431 (31%) 4) 162/490 (33%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Longabaugh 2001

Methods	Randomized controlled trial
Participants	539 adult injury patients seen in emergency department and identified as hazardous drinkers (78% male)
Interventions	1) Brief motivational interview by interventionist plus booster session 7-10 days later. 2) brief motivational interview by interventionist 3) standard care.
Outcomes	Alcohol-related injuries (after reciprocal transformation) M(SE): 1) 0.863 (.026) 2) 0.807 (.025) 3) 0.800 (.024) 1 v 3, one-tailed p = .04; 2 v 3, one-tailed p > .4 Actual injuries in past year estimated from transformations (change from baseline): 1) 0.165 (-36%) 2) not stated 3) 0.240 (-6%) All injuries Mean(change from baseline): 1) 0.67 (-64%) 2) Not stated 3) 0.72 (-53%) 1 v 3, one-tailed p = .17 Injuries requiring medical treatment: No group differences, p > .05 (group data not reported)
Notes	USA. 12-month follow-up. Number of heavy drinking days in past year M(SE): 1) 1.68 (1.15) 2) 1.72 (1.23) 3) 1.70 (1.09) 1 v. 3, one-tailed p = .41 2 v. 3, one-tailed p = .43 Negative consequences from drinking, logged total score M(SE): 1) 2.24(.082)

Longabaugh 2001 (*Continued*)

	2) 2.40(.078) 3) 2.52(.076) 1 v 3, one-tailed p <= .005 2 v 3, one-tailed p = 0.133

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Mann 1994

Methods	Randomized controlled trial
Participants	347 men twice convicted of DUI
Interventions	1) Rehabilitation program. 2) No program.
Outcomes	Accidental and violent deaths: 1) 3/220 (1%) 2) 5/127 (4%) RR=0.35 (95% CI 0.08, 1.43); p=0.15
Notes	Canada. 8 to 13-year follow-up.

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Monti 1999

Methods	Randomized controlled trial
Participants	94 patients ages 18-19 y, seen in emergency department for alcohol-related event (64% male)
Interventions	1) Brief motivational interview by interventionist and drunk-driving handout 2) drunk driving handout.
Outcomes	Alcohol-related injuries: 1) 21% 2) 50% Adj OR (95% CI) = 0.25 (0.09, 0.69), p < 0.01

Monti 1999 (*Continued*)

Notes	USA. 6-month follow-up. Alcohol consumption scores: No group differences (data not shown) Self-reported drinking and driving: 1) 62% 2) 85% OR (95% CI) = 0.26(0.08, 0.83) Alcohol-related problems, adjusted M(SD): 1) 0.89 (1.18) 2) 1.44 (1.43) Effect size=0.23, p < .05

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Potamianos 1986

Methods	Randomized controlled trial
Participants	151 problem drinkers aged 18-60
Interventions	1) Community- based day center treatment 2) conventional in- and out-patient management.
Outcomes	Accidents. Aggressive behavior. Motor vehicle crashes (Data Unavailable)
Notes	UK. 12-months follow-up Mean alcohol consumption: 1) 89 g/d (55% reduction) 2) 106 g/d (37% reduction)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Reis 1982a

Methods	Randomized controlled trial
Participants	4639 persons once convicted of DUI
Interventions	1) in-class education 2) Home study education 3) no intervention.
Outcomes	Alcohol-related crashes & injuries ('Cumulative accident rate') 1) 0.084 2) 0.098 3) 0.101 Overall: p=0.58.
Notes	USA. 3-year follow-up Mean change in drinking score: 1) -12.40 2) -18.53 3) -16.36 DUI recidivism rate 1) 0.24 2) 0.25 3) 0.28

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Yes	A - Adequate

Reis 1982b

Methods	Randomized controlled trial
Participants	1103 persons convicted more than once of DUI
Interventions	1) Biweekly contacts (BWC) 2) educational counselling 3) educational counselling with disulfiram 3) no intervention
Outcomes	Alcohol-related crashes & injuries ('Cumulative accident rate') 1) 0.086 2) 0.087 3) 0.055 4) 0.076 Overall: p=0.49

Reis 1982b (*Continued*)

Notes	USA. 2-year follow-up Mean change in drinking score: 1) -49.53 2) -40.91 3) -72.87 4) -16.73 DUI recidivism rate 1) 0.25 2) 0.23 3) 0.21 4) 0.29

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Yes	A - Adequate

Sitharthan 1996

Methods	Randomized controlled trial
Participants	121 'low-dependent' problem drinkers compliant with therapy
Interventions	1) Cognitive behavioural therapy by correspondence. 2) Minimum intervention by correspondence.
Outcomes	Assaults Data unavailable
Notes	Australia. 4-month follow-up Mean alcohol consumption: Men 1) 24.7 ±16.8 g/wk 2) 37.2 ± 24.4 g/wk Women: 1) 16.4 ±10.5 g/wk 2) 23.7 ±10.3 g/wk

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Sitharthan 1997

Methods	Randomized controlled trial
Participants	52 problem drinkers
Interventions	1) Cue exposure therapy. 2) Cognitive behavioural therapy.
Outcomes	Assaults 1) 5/27 (19%) 2) 0/25 (0%) RR=infinity (95% CI 0.91, infinity); p=0.06 (Confidence interval based on odds ratio approximation.)
Notes	Australia. 12-month follow-up Days/month when any drink taken: 1) 6.23 d/mo 2) 11.93 d/mo

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Toteva 1996

Methods	Randomized controlled trial
Participants	118 alcoholics
Interventions	1) Acupuncture. 2) Medical detoxification.
Outcomes	Suicides. Data unavailable.
Notes	Bulgaria. 6-month follow-up N and % fully abstinent ('Total remission rate') 1) 11/15 (73%) 2) 10/21 (48%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Walsh 1991

Methods	Randomized controlled trial
Participants	227 alcohol-abusing workers.
Interventions	1) Compulsory inpatient treatment. 2) Compulsory Alcoholics Anonymous attendance. 3) choice of optional treatment
Outcomes	Suicides and homicides: 1) 2/73 (3%) 2) 0/83 (0%) 3) 0/71 (0%) RR (95% CI); p-value 1) infinity (0.18, infinity)*; p=0.51 2) undefined 3) 1.0 *confidence interval based on odds ratio approximation. Accidents: Data unavailable.
Notes	USA. 2-year follow-up N and % Fully Abstinent 1) 27/73 (37%) 2) 13/83 (16%) 3) 12/71 (17%)

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

WHO BISG 1996

Methods	Randomized controlled trial
Participants	1559 heavy drinkers in 10 countries.
Interventions	1) Simple advice. 2) Brief counselling. 3) No intervention.
Outcomes	Injuries. Data unavailable.
Notes	10 countries. 9-month follow-up N and % fully abstinent: Men 1) 19/387 (5%) 2) 38/471 (8%)

WHO BISG 1996 (*Continued*)

	3) 8/403 (2%) Women 1) 8/109 (7%) 2) 13/105 (12%) 3) 3/83 (4%) Mean alcohol consumption: Men 1) 5.18 cl ETOH/d 2) 5.29 cl ETOH/d 3) 6.29 cl ETOH/d Women 1) 3.39 cl ETOH/d 2) 2.99 cl ETOH/d 3) 3.80 cl ETOH/d

Risk of bias

Item	**Authors' judgement**	**Description**
Allocation concealment?	Unclear	B - Unclear

Öjehagen 1997

Methods	Randomized controlled trial.
Participants	72 alcoholics
Interventions	1) Psychiatric outpatient treatment - 1 yr 2) Psychiatric outpatient treatment - 2 yr 3) Multi-modal behavioural outpatient treatment -1 yr 4) Multi-modal behavioural outpatient treatment - 2 year.
Outcomes	9 years. Suicides. 1+2) 2/36 3+4) 3/36 RR (95% CI) = 1.50 (.27, 8.45), p = .65 36 months Suicides: 1+2) 2/36 (6%) 3+4) 1/36 (3%) RR=2.0 (95% CI 0.19, 21.09); p=1.00
Notes	Sweden. 9-year follow-up. 36 months % subjects taking >4 drinks (3.8 cl 40% etoh) per day on 14 or fewer days/yr: 1) 44%

Öjehagen 1997 (*Continued*)

	2) 40% 3) 41% 4) 42%

Risk of bias

Item	Authors' judgement	Description
Allocation concealment?	Unclear	B - Unclear

Characteristics of excluded studies *[ordered by study ID]*

Anderson 1992	The 'injury' outcome measure was found to include alcohol-related illness; the data on injuries could not be separated from the illness data.
McCrady et al 1982	The 'injury' outcome measures were found to include criminal behaviour. These data did not differentiate between criminal behaviour related to injury (e.g., assault) and other types of criminal behaviour (e.g., shop lifting), nor could the injury-specific data be extracted.
Wells-Parker 2002	At the time of the original review, this study was in progress. Motor vehicle crashes were the intended 'injury' outcome measure, but the researchers did not report this measurement because motor vehicle crash records were found to be incomplete. DUI arrests were measured instead.

Characteristics of ongoing studies *[ordered by study ID]*

Bohn, in prog

Trial name or title	
Methods	
Participants	140 heavy drinkers
Interventions	1) naltrexone and extended brief counseling 2) naltrexone and simple advice 3) placebo and extended brief counseling 4) placebo and simple advice
Outcomes	All injuries, including falls, burns, violence, fractures, sprains, other injuries, and motor crashes
Starting date	

Bohn, in prog (*Continued*)

Contact information	
Notes	USA. Drinking outcomes: drinks/drinking day, total drinks, heavy drinking days, days abstinent, drinking frequency, alcohol craving.

DATA AND ANALYSES

Comparison 1. Brief intervention for problem drinking vs control

Outcome or subgroup title	No. of studies	No. of participants	Statistical method	Effect size
1 Injury-Related Deaths	3	1555	Risk Ratio (M-H, Random, 95% CI)	0.65 [0.21, 2.00]

Analysis 1.1. Comparison 1 Brief intervention for problem drinking vs control, Outcome 1 Injury-Related Deaths.

Review: Interventions for preventing injuries in problem drinkers

Comparison: 1 Brief intervention for problem drinking vs control

Outcome: 1 Injury-Related Deaths

Study or subgroup	Intervention n/N	Control n/N	Risk Ratio M-H,Random,95% CI	Weight	Risk Ratio M-H,Random,95% CI
Fleming 2002	1/392	2/382		21.9 %	0.49 [0.04, 5.35]
Kristenson 2002	1/365	0/302		12.3 %	2.48 [0.10, 60.75]
Kuchipudi 1990	3/59	5/55		65.8 %	0.56 [0.14, 2.23]
Total (95% CI)	**816**	**739**		**100.0 %**	**0.65 [0.21, 2.00]**

Total events: 5 (Intervention), 7 (Control)

Heterogeneity: $Tau^2 = 0.0$; $Chi^2 = 0.78$, df = 2 (P = 0.68); $I^2 = 0.0\%$

Test for overall effect: Z = 0.75 (P = 0.45)

APPENDICES

Appendix 1. Search strategy

MEDLINE (1966 to March 2002)
1. (ALCOHOLIC-INTOXICATION OR ALCOHOL-DRINKING OR ALCOHOLISM OR TEMPERANCE) in MJME
2. (dr?nk* NEAR3 excess*) or (dr?nk* NEAR3 binge*) or (dr?nk* NEAR3 heavy*) or (dr?nk* NEAR3 hazard*) or (dr?nk* NEAR3 problem*) or (dr?nk* NEAR3 abuse*) or (dr?nk* NEAR3 influence*)
3. (alcohol* NEAR3 excess*) or (alcohol* NEAR3 binge*) or (alcohol* NEAR3 heavy*) or (alcohol* NEAR3 hazard*) or (alcohol* NEAR3 problem*) or (alcohol* NEAR3 abuse*) or (alcohol* NEAR3 influence*)
4. 1 OR 2 OR 3
5. (WOUNDS-AND-INJURIES/prevention and control OR ACCIDENT-PREVENTION) in MJME
6. (injur* OR accident* OR prevent*)
7. (6 in TI) or (6 in AB)
8. 5 OR 7
9. 4 and 8
Aboved combined with the optimally sensitive MEDLINE strategy for RCTs (Dickersin 1994)

EMBASE (1982 to May 2002)
1. ALCOHOL ABUSE OR ALCOHOL INTOXICATION OR ALCOHOL ABSTINENCE
2. (dr#nk$ NEAR3 excess$) or (dr#nk$ NEAR3 binge$) or (dr#nk$ NEAR3 heavy$) or (dr#nk$ NEAR3 hazard$) or (dr#nk$ NEAR3 problem$) or (dr#nk$ NEAR3 abuse$) or (dr#nk$ NEAR3 influence$)
3. (alcohol$ NEAR3 excess$) or (alcohol$ NEAR3 binge$) or (alcohol$ NEAR3 heavy$) or (alcohol$ NEAR3 hazard$) or (alcohol$ NEAR3 problem$) or (alcohol$ NEAR3 abuse$) or (alcohol$ NEAR3 influence$)
4. 1 OR 2 OR 3
5. INJURY/prevention OR ACCIDENT PREVENTION
6. (injur* OR accident* OR prevent*).ti,ab.
7. 5 OR 6
8. RANDOMIZED CONTROLLED TRIAL OR RANDOMIZATION
9. randomi#ed or double blind or single blind
10. 8 or 9
11. 4 and 7 and 10
CENTRAL (*The Cochrane Library 2002, Issue 2)*
#1 (drink*) near (excess* or binge* or heavy* or hazard* or problem* or abuse* or influence*)
#2 (alcohol*) near (excess* or binge* or heavy* or hazard* or problem* or abuse* or influence*)
#3 (drunk*) near (excess* or binge* or heavy* or hazard* or problem* or abuse* or influence*)
#4 #1 or #2 or #3
#5 injur* or accident* or prevent*
#6 #4 and #5

Transport 1988 to 2002/03
#1. drink*
#2. excess*
#3. binge*
#4. heavy*
#5. hazard*
#6. problem*
#7. abuse*
#8. influence*
#9. (drink*) near (excess* or binge* or heavy* or hazard* or problem* or abuse* or influence*)
#10. alcohol*
#11. alcohol* near (#2 or #3 or #4 or #5 or #6 or #7 or #8)
#12. drunk*

#13. drunk* near (#2 or #3 or #4 or #5 or #6 or #7 or #8)
#14. #9 or #11 or #13
#15. injur*
#16. accident*
#17. prevent*
#18. injur* or accident* or prevent*
#19. (#18 in ti) or (#18 in ab)
#20. trial*
#21. randomi*
#22. controlled
#23. double
#24. blind*
#25. single*
#26. blind*
#27. trial* or randomi* or controlled or double blind* or single blind*
#28 #14 and #19 and #27

PsycINFO (1967 to Feb 2002)

1. ALCOHOL ABUSE OR ALCOHOL INTOXICATION OR ALCOHOLISM OR SOBRIETY
2. (dr?nk* NEAR3 excess*) or (dr?nk* NEAR3 binge*) or (dr?nk* NEAR3 heavy*) or (dr?nk* NEAR3 hazard*) or (dr?nk* NEAR3 problem*) or (dr?nk* NEAR3 abuse*) or (dr?nk* NEAR3 influence*)
3. (alcohol* NEAR3 excess*) or (alcohol* NEAR3 binge*) or (alcohol* NEAR3 heavy*) or (alcohol* NEAR3 hazard*) or (alcohol* NEAR3 problem*) or (alcohol* NEAR3 abuse*) or (alcohol* NEAR3 influence*)
4. 1 OR 2 OR 3
5. INJURIES or ACCIDENT PREVENTION
6. (injur* OR accident* OR prevent*)
7. (6 in TI) or (6 in AB)
8. 5 OR 7
9. (clinical-trial in pt)
10. (randomi* or double blind or single blind)
11. 9 OR 10
12. 4 AND 8 AND 11

ERIC (1966 to12/1996)

1. ALCOHOL ABUSE
2. ALCOHOLISM
3. 1 or 2
4. INJURIES
5. ACCIDENT PREVENTION
6. 4 or 5
7. 3 and 6

WHAT'S NEW

Last assessed as up-to-date: 31 March 2004.

9 June 2008	Amended	Converted to new review format.

HISTORY

Protocol first published: Issue 4, 1999

Review first published: Issue 4, 1999

1 April 2004	New search has been performed	Substantive amendment. An electronic search for new trials was performed in May 2002. In May 2004 progress was updated for trials which had been ongoing during the original review. Search strategies identified six eligible completed trials, and reviewers amended all applicable sections to incorporate results from these six trials. New data from Ojehagen et al 1997 have been added.
1 May 2002	New search has been performed	New studies found but not yet included or excluded.

DECLARATIONS OF INTEREST

None known.

SOURCES OF SUPPORT

Internal sources

- No sources of support supplied

External sources

- Camden and Islington Health Authority (DiGuiseppi), UK.
- University of Texas-Houston Health Science Center Summer Internship (Dinh-Zarr), USA.
- Centers for Disease Control and Prevention (Grant #R49/CCR811509), USA.
- AAA National Office, Washington, DC, USA.

INDEX TERMS

Medical Subject Headings (MeSH)

*Accident Prevention; Alcoholism [epidemiology; *prevention & control]; Risk; Wounds and Injuries [epidemiology; *prevention & control]

MeSH check words

Humans