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A systematic review of emergency care brief alcohol interventions for injury patients

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Abstract

This article examines 14 studies that assessed the effectiveness of brief interventions (BIs) delivered to injury patients in emergency care settings. The aims were to review findings concerning the effectiveness of providing BI in these settings and to explore factors contributing to its effectiveness. Of the 12 studies that compared pre- and post-BI results, 11 observed a significant effect of BI on at least some of the outcomes: alcohol intake, risky drinking practices, alcohol-related negative consequences, and injury frequency. Two studies assessed only post-BI results. More intensive interventions tended to yield more favorable results. BI patients achieved greater reductions than control group patients, although there was a tendency for the control group(s) to also show improvements. Five studies failed to show significant differences between the compared treatment conditions. Variations in the study protocol, alcohol-related recruitment criteria, screening and assessment methods, and injury severity limit the specific conclusions that can be drawn.

Keywords: Emergency care; Injury patients; Randomized, brief intervention; Results

1. Introduction

Injury is a major public health problem worldwide, and alcohol consumption is an important contributing factor for virtually all categories of injury among patients seeking emergency care (Barss, Smith, Baker, & Mohan, 1998; Dinh-Zarr, DiGuiseppi, Heitman, & Roberts, 2000; Roche, Watt, McClure, Purdie, & Green, 2001). About 40% of visits in the emergency department in the United States are attributable to injuries, and between 40% and 50% of injured patients admitted to trauma centers have an alcohol-related injury (Cherpitel, 1995; Cornwall et al., 1998; Maio, Waller, Blow, Hill, & Singer, 1997). Patients presenting to the emergency department, as compared with those presenting to the primary health care, are more likely to report heavy drinking, negative consequences of drinking, and alcohol dependence (Cherpitel, 1999). Emergency care settings thus offer a unique opportunity to intervene with injury patients to reduce future alcohol intake and alcohol-related injury (Babor & Kadden, 2005; Cryer, 2005).

There is a growing interest in brief intervention (BI) for alcohol-related problems in emergency departments and trauma centers (Cherpitel, 1994; Dyehouse & Sommers, 1995; Lockhart, 1997). Relatively, BIs have been shown to reduce alcohol intake in a variety of settings (Dunn &

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Ostafin, 2005; Saunders, Kypri, Walters, Laforge, & Larimer, 2004; Wilk, Jensen, & Havighurst, 1997), although few emergency care studies have been conducted (D'Onofrio & Degutis, 2002; D'Onofrio et al., 2002; Dill, Wells-Parker, & Soderstrom, 2004; Hungerford & Pollock, 2003; Roche, Freeman, & Skinner, 2006). BI is a clinical strategy that requires modest time and resource investment (Hodgson, Alwyn, John, Thom, & Smith, 2002) and thus is suitable for use in busy, fast-paced emergency care settings (Spirito et al., 2004).

BIs have aimed to moderate alcohol intake and to reduce or eliminate risky drinking practices, such as drinking and driving, rather than to target complete abstinence from drinking (Moyer & Finney, 2004). A BI typically consists of one to four short, 5- to 20-minute counseling sessions with a trained interventionist, for example, a physician, nurse, psychologist, or social worker (Moyer, Finney, Swearingen, & Vergun, 2002). Emphasis is often placed on self-help techniques and relatively limited involvement by professionals (Maio, 1995; Sommers et al., 2006). BI can be based on a number of different therapeutic approaches, although motivational interviewing techniques have become increasingly popular (Dunn & Ostafin, 2005).

For several reasons, it may be particularly advantageous to focus BIs on injured patients. These patients tend to be younger than the general population, which could make it possible to detect risky drinking practices in the early stages (Antti-Poika & Karaharju, 1988). In addition, an injury is believed to increase receptivity of patients toward alcohol counseling, thus providing a "teachable moment" in which the aversive experience naturally produces a period where the individual is contemplating behavior change (Longabaugh, Wirtz, Beattie, Noel, & Stout, 1995; Gentilello et al., 1999). However, it has also been suggested that the traumatic experience of the injury and the subsequent emergency department visit and/or hospitalization could themselves yield a decrease in drinking independent of any interventions (Bombardier, Dawn, & Kilmer, 1997; Bombardier & Rimmele, 1998). Factors affecting alcohol intake after an alcohol-related injury and the role BI may have not been fully understood, and more research is called for (Smith, Hodgson, Bridgeman, & Shepherd, 2003).

BIs are well supported in terms of their efficacy and effectiveness in primary health care and hospital settings (Babor & Kadden, 2005; Bien, Miller, & Tonigan, 1993; Fleming, Barry, Manwell, Johnson, & London, 1997; Welte, Perry, Longabaugh, & Clifford, 1998; Wilk et al., 1997). However, no review has specifically examined the results of interventions targeting injured patients in emergency care settings. This review addresses this knowledge gap by systematically reviewing the available literature on hospital emergency department and trauma center studies of BIs for alcohol use with injured patients. The aims are to review findings concerning the results of providing BI in emergency care settings and to contribute to improved understanding of the mechanisms involved in achieving effects.

2. Method

2.1. Inclusion criteria

This systematic review considered studies that assessed the results of BI counseling with injury patients in emergency care settings. The following inclusion criteria were used:

- The intervention study population included only injured patients (i.e., other patient categories were not part of the studies);
- The patients were treated, and BIs were performed in emergency care settings (inpatient or outpatient) and/or in follow-up outpatient care following emergency care;
- A flexible definition of BI was accepted, using the term as defined in the individual studies;
- Injury patients who were eligible for intervention study inclusion were assigned to different groups, of which at least one group received a BI in association with the emergency care visit;
- A BI condition (or conditions) was compared with conditions of different intensity to allow for comparison of results;
- Random assignment to different conditions was used;
- The intervention goal was any of the following: reduced alcohol intake (including heavy episodic drinking); reduced risky drinking practices (e.g., driving under influence of alcohol citations); reduced alcohol-related negative consequences (e.g., getting into a physical fight); and reduced injury frequency (whether or not alcohol-related);
- One or more alcohol-related variables were assessed as baseline measures (other measures may also have been assessed);
- Changes in baseline measures and/or results concerning alcohol-related and/or injury-related measures were assessed at one or more follow-ups;
- The study was published in English.

2.2. Data collection

The studies for this review were obtained through literature searches up to January 2007. Searches were made in the databases at Medline, PsychLIT, CINAHL, and the Cochrane Library using the following terms or relevant combinations thereof: "injury," "trauma," "alcohol," "brief intervention," "early intervention," "emergency care," "emergency room," "emergency department," "trauma center." Hand searches of specialist alcohol, injury prevention, and emergency care journals were also conducted.

Abstracts were retrieved and inspected for contents pertaining to studies that assessed the results of BI for injury patients in emergency care settings. The full texts of potential studies were then carefully examined and systematically reviewed against the inclusion criteria of this study.

Fourteen studies satisfied the inclusion criteria and were included in this review: Antti-Poika and Karaharju (1988); Blow et al. (2006); Daeppen et al. (2007); Dauer, Rubio, Coris, and Valls (2006); Gentilello et al. (1999); Longabaugh et al. (2001); Maio et al. (2005); Mello et al. (2005); Neumann et al. (2006); Runge (2002); Schermer, Moyers, Miller, and Bloomfield (2006); Smith, Hodgson, Bridgeman, and Shepherd (2003); Soderstrom et al. (2007); Sommers et al. (2006). The studies are referred to by the name of the first author in the text as well as in Tables 1 and 2. The study by Mello was a secondary analysis of motor and nonmotor vehicle crash-injured patients in the Longabaugh study. In total, there were 13 unique data collections. Table 1 briefly includes details about the Mello study because all study characteristics and intervention details were the same as those pertaining to the Longabaugh study.

2.3. Review methodology

The following aspects of the published studies were examined:

- Study characteristics: target population, treatment setting, location of the study
- Inclusion details: age and gender criteria, main alcohol criteria
- Patient recruitment: number of patients, treatment conditions, recruitment process
- Intervention details: intervention goals, interventionist's qualifications, intervention duration, number of counseling sessions, settings for the sessions, and contents of and/or theoretical basis for counseling
- Measurement: baseline and follow-up measurement, measurement times, completion rates
- Main results
- Factors that influenced the results: authors' analysis or discussion of factors that may have influenced the results aside from the intervention itself.

The methods sections of the studies were examined to obtain information about the study characteristics and intervention details, whereas the results sections were studied to search for information about the results of the interventions. The discussion sections of the studies provided further information regarding the study findings and the conclusions of the authors. The studies were initially analyzed by the first author of this study and were then discussed with all the authors to reach agreement.

3. Results

3.1. Settings and populations

The 14 intervention studies were published between 1988 and 2007. Nine studies were conducted in the United States, and five studies in Europe (Finland, Wales, Spain, Germany, and Switzerland).

Eight of the studies involved injury patients treated in emergency departments (Longabaugh, Runge, Smith, Dauer, Blow, Maio, Neumann, and Daeppen), and five studies involved patients admitted to the hospital inpatient service: three in Level 1 trauma centers (Gentilello, Sommers, Soderstrom), and two in hospitals (Antti-Poika, Schermer).

The studies by Runge, Dauer, Schermer, Sommers, and Mello focused on motor vehicle injury patients, whereas the Smith study targeted patients with a facial injury who attended an outpatient clinic after the emergency department visit. The other eight studies reported on all types of injury.

3.2. Inclusion criteria

The age and gender inclusion criteria that were applied differed among the studies. All but two studies included both genders. Antti-Poika and Smith restricted their study populations to males with the age span being 20 to 64 years and 16 to 35 years, respectively. The population in the studies by Gentilello, Longabaugh, Runge, Dauer, Neumann, and Soderstrom consisted of all patients who were 18 years or older, whereas Blow included patients 19 years or older. Maio included patients aged 14 to 18 years; Sommers, 18 to 45 years; Schermer, 16 to 80 years; and Daeppen, 18 to 65 years.

The specific alcohol inclusion criteria and measurement tools differed substantially among the studies. The studies by Gentilello, Longabaugh, Runge, Schermer, and Sommers all combined blood alcohol content (BAC) measures with self-report questionnaires on different aspects of drinking. Dauer and Blow used only a BAC measure, whereas Antti-Poika, Smith, Maio, Neumann, Daeppen, and Soderstrom relied exclusively on self-report measures of drinking.

The targeting of the interventions varied, although most of the studies focused on nondependent "at-risk" or "hazardous" drinkers. Some of the studies applied the same terms, but the use was inconsistent across studies, and precise definitions tended to vary. For example, Blow, Neumann, and Soderstrom all targeted at-risk drinkers but applied different measures or definitions. The Runge study specifically targeted drinkers "who abuse alcohol or who are alcohol-dependent." The study by Maio was "universal" in that it did not apply any alcohol inclusion criteria. The wide range of screening tools and cutoff levels applied in the studies make it difficult to determine the extent to which the studies focused on similar categories of drinkers.

3.3. Patient recruitment

Three basic strategies for patient enrolment were used. Most of the studies used routine screening or screening instigated for study purposes to identify screen positives that were asked to participate. Longabaugh, Runge, Smith, and Sommers instead identified eligible patients from emergency

Table 1
Study characteristics

Author (year)	Target population, treatment setting, and study location	Study inclusion details: age and gender criteria; main alcohol inclusion criteria	Patient recruitment: no. of patients and treatment conditions (no. of patients); recruitment process	Main intervention goal(s)	Intervention details: interventionist, number and duration of sessions, site, timing, and intervention components
Antti-Poika (1988)	Injury patients treated in hospital ED, Finland.	20–64 years, male; MAST score positive (7+).	120: BI (60), CG (60); patients who attended the hospital were screened (MAST), and screen positives were asked to participate.	Reduced alcohol intake.	BI: nurse delivered one session at inpatient hospital, then nurse delivered one more session during checkup visit in the outpatient department along with physician who delivered 1–3 (mostly 2) sessions (duration NR). BI involved verbal counseling and provision of a booklet.
Gentilello (1999)	Injury patients treated in Level 1 TC, USA.	18+ years, both genders; one of five criteria: BAC 100+ mg/dl, SMAST score 3+, BAC 1–99 mg/dl and SMAST score 1–2, BAC 1–99 mg/dl and GGT above normal, SMAST score 1–2 and GGT above normal.	762: BI (366), CG (396); routine screening in TC, screen positives were asked to participate.	Reduced alcohol intake and injury frequency.	BI: psychologist delivered one × 30-minute session in inpatient hospital at or near discharge, handwritten follow-up letter summarizing the session sent 1 month later. BI was an MI based on personalized feedback of health issues, injury risk, and level of alcohol dependence based on BAC level at admission, SMAST, AUDIT, and laboratory results.
Longabaugh (2001)	Injury patients treated in ED, USA.	18+ years, both genders; one of three criteria: breath BAC 0.003+ mg/dl, reported ingestion of alcohol 6 hours prior to injury, AUDIT score 8+.	539: BI (182), BI+B (169), CG (188); patients identified from ED logs were asked to screen (breath BAC, AUDIT), screen positives were asked to participate.	Reduced alcohol intake, alcohol-related negative consequences, and alcohol-related injury frequency.	BI: trained counselor delivered 1 × 40–60-minute session in the ED during time that did not interfere with medical treatment (for patients discharged before BI was completed, a research room adjacent to the ED was used). BI consisted of manual-guided counseling based on MI principles; BI+B: intervention same as BI plus 1 × 40-minute booster session 7–10 days later when patient returned to hospital. The intervention was the same as BI but added a booster session based on MI principles.
Runge (2002)	Motor vehicle injury patients treated in ED, USA.	18+ years, both genders; one of two criteria: TWEAK score 2+, breath BAC 0.12+ mg/dl.	287: BI (130), CG (157); patients identified from ED logs were asked to screen (breath BAC and TWEAK), screen positives were asked to participate.	Increased patient compliance with and completion of referral for alcohol treatment.	BI: trained research assistant delivered 1 session lasting only a few minutes in ED. BI used FRAMES approach. Referral to specialist to see if the alcohol problem required treatment.

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Table 1 (*continued*)

Author (year)	Target population, treatment setting, and study location	Study inclusion details: age and gender criteria; main alcohol inclusion criteria	Patient recruitment: no. of patients and treatment conditions (no. of patients); recruitment process	Main intervention goal(s)	Intervention details: interventionist, number and duration of sessions, site, timing, and intervention components
Smith (2003)	Facial injury patients treated in outpatient clinic following ED care, Wales.	16–35 years, male; alcohol intake 8+ units prior to injury.	151: BI (75), CG (76); patients screened at outpatient clinic, screen positives were asked to participate.	Reduced alcohol intake.	BI: nurse delivered one session in outpatient clinic during follow-up care at outpatient clinic (duration NR). BI consisted of manual-guided counseling based on MI principles.
Maio (2005)	Injury patients treated in TC ED, USA.	14–18 years, both genders; no alcohol use criteria.	655: BI (329), CG (326); patients identified from ED logs and by checking with ED staff, then asked to use a desktop computer in the ED.	Reduced alcohol intake, alcohol-related negative consequences, and alcohol-related injury frequency.	BI: following a computer-based survey of alcohol intake, the patients used an interactive computer program, which "took place in the setting of a virtual house party." Participants selected a cartoon character with whom to attend the party. The characters were intended to represent "somewhat older teens of various personalities, both sexes, and a range of ethnicities." The characters provided feedback to the participants. At the close of the intervention, a tailored message was delivered to participants based on their responses to baseline alcohol intake items.
Dauer (2006)	Motor vehicle (drivers, passengers, pedestrians) injury patients treated in ED of TC, Spain.	18+ years, both genders; BAC 0.2+ g/L.	85: BI (40), BI-SA (45); routine screening in ED, screen positives were asked to participate.	Reduced alcohol intake and injury frequency.	BI: nurses and social work staff delivered 1 × 15- to 20-minute session in ED (73% of the patients) before discharge or at surgical ward in cases of admission (27% of the patients). BI was based on Stages of Change model and the FRAMES methodology; BI-SA: nurses and social work staff delivered 1 × 5-minute "minimal intervention" consisting of empathic advice.
Schermer (2006)	Motor vehicle patients (drivers, passengers) treated in hospital, USA.	16–80 years, both genders; BAC 80+ mg/dl or AUDIT score 8+.	128: BI (62), CG (64); patients who attended the hospital were screened (AUDIT, BAC), screen positives were asked to participate.	Reduced risky drinking practices.	BI: patients underwent 45-minute assessment of their alcohol and driving history (CG also received assessment). Social worker or trauma surgeon then delivered 1 × 30-minute session in the patient's hospital room immediately after the assessment or the day after. FRAMES-style approach was used.

Sommers (2006)	Motor vehicle injury patients treated in Level 1 TC, USA.	18–45 years, both genders; BAC 10+ mg/dl on admission or AUDIT score 2+.	187: BI-BC (63), BI-SA (68), CG (56); patients identified from ED/TC logs were asked to screen, screen positives were asked to participate.	Reduced alcohol intake, risky drinking practices, and alcohol-related injury frequency.	BI-BC: nurse clinician delivered 2 × 20-minute counseling sessions, the first in inpatient hospital and the second by telephone a month after discharge. The intervention was the same as BI plus manual-guided counseling based on components from the TrEAT protocol and the FRAMES approach; BI-SA: nurse clinician delivered 1 × 5-minute manual-guided simple advice session in inpatient hospital usually during the week after the injury, followed by a booster (repeat) session delivered by telephone.
Blow (2006)	Injury patients treated in TC ED, USA	19+ years, both genders; BAC 100–200 mg/dl.	494: BI-TA (129), BI-TNA (121), BI-GA (124), BI-GNA (120); BAC level was assessed during ED visit, if BAC >100 mg/dl, patients were asked to use a computerized "health survey" on a desktop computer in ED.	Reduced alcohol intake and alcohol-related negative consequences.	BI-TA: computer-generated tailored feedback and advice; BI-TNA: computer-generated tailored feedback but no advice; BI-GA: computer-generated generic feedback and advice; BI-GNA: computer-generated generic feedback but no advice; The feedback consisted of a booklet printed by the computer for each participant. The tailored and generic booklets were identical in length (12 pages), content, and graphics, but the generic version included standard text and graphics rather than content tailored to the individual responses. For the advice conditions (BI-TA and BI-GA), a research social worker conducted a BI session (duration NR) before the patient left the ED, focusing on reviewing the booklet (tailored or generic) using the FRAMES approach. For the no advice conditions (BI-TNA and BI-GNA), the appropriate booklet was given to the participant by the research social worker, who asked them to review the booklet.

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Table 1 (*continued*)

Author (year)	Target population, treatment setting, and study location	Study inclusion details: age and gender criteria; main alcohol inclusion criteria	Patient recruitment: no. of patients and treatment conditions (no. of patients); recruitment process	Main intervention goal(s)	Intervention details: interventionist, number and duration of sessions, site, timing, and intervention components
Neumann (2006)	Injury patients treated in ED, Germany.	18+ years, both genders; AUDIT score 5+.	1,139: BI (563), CG (576); routine screening in ED, screen positives received computer-generated feedback.	Reduced alcohol intake and use of alcohol treatment services.	BI: computer-generated feedback about drinking status based on AUDIT and RCQ, displayed on the computer. A letter summarizing the results were then printed and provided to the patient before discharge from the ED. The feedback was tailored to the individual responses, with the FRAMES approach as a guiding principle.
Daeppen (2007)	Injury patients treated in ED, Switzerland.	18–65 years, both genders; hazardous drinkers, defined as >14 drinks per week or 5+ drinks on one occasion for men in the past month and >7 drinks per week or 4+ on one occasion for women.	987: BI (310), CG-SA (342), CG-SO (335); patients were asked to complete a 2-minute lifestyle survey, screen positives were then asked to participate.	Reduced alcohol intake.	BI: research assistant (master's level psychologist or experienced ED nurse) conducted 1 × 30-minute assessment immediately after screening. Research assistant then delivered 1 × 15-minute MI; CG-SA: same assessment as BI condition; CG-SO: screening only.
Soderstrom (2007)	Injury patients treated in Level 1 TC, USA.	18+ years, both genders; at-risk drinkers, defined as positive response to one of these: an item of CAGE, drinking 2+ times per week, 15+ drinks per week for men and 8+ drinks per week for women, typical daily intake of 5+ drinks for men and 4+ drinks for women.	497: BI-PMI (250), BI-IA (247); patients were queried by a nurse about alcohol intake during the previous 24 hours, typical drinking of 3+ drinks, and 4+ days of drinking in the past week. If any of these criteria was met, a second screen was conducted. Screen positives (second screen) were asked to participate.	Reduced alcohol intake, risky drinking practices, and alcohol-related negative consequences.	BI-PMI: "Intervention specialist" (PhD-level psychology students) delivered 1 × 15- to 20-minute MI as soon as feasible after assessment interview, followed by a personalized letter with feedback on questionnaire responses a week later, and two telephone calls from the interventionist, the first a few days after feedback later and the second 4 weeks after TC discharge; BI-IA: the intervention specialist informed the participants that their alcohol intake put them at risk for future injury and provided advice to reduce their drinking and they were given generic written information.

Note. Main terms: BI-GA = BI: generic feedback and brief advice; BI-GNA = BI: generic feedback but no advice; BI-TA = BI: tailored feedback and brief advice; BI-TNA = BI: tailored feedback but no advice; ED = emergency department; GGT = gammaglutamyl transpeptidase; MI = motivational interview; NR = not reported; TC = trauma center. *Measurement tools*: AUDIT = Alcohol Use Disorders Identification Test, self-report measure of alcohol intake, symptoms of dependence, tolerance, and alcohol-related negative consequences; CAGE = self-report measure of alcohol use (CAGE is an acronym formed by taking the first letter of key words in four questions: cutting down, being annoyed by criticisms of one's drinking, feeling guilty about one's drinking, and having an "eye-opener" drink in the morning); MAST = Michigan Alcoholism Screening Test, self-report measure of alcohol problems; Project TrEAT = Trial for Early Alcohol Treatment, a large 1997 U.S. primary care BI trial that applied a questionnaire on drinking habits and other health behaviors; RCQ = Readiness to Change Questionnaire, self-report measure of readiness to change health-related behaviors; SMAST = short MAST, shorter version of MAST; TWEAK = Tolerance, Worried, Eye-opener, Amnesia, K/Cut down, self-report measure of alcohol problems.

Table 2
Measurement and key findings

Author (year)	Baseline measures	Follow-up measures; times (completion rates)	Main results	Authors' analysis or discussion of factors that may have influenced the results aside from the BI
Antti-Poika (1988)	MAST and blood samples (S-ASAT, S-ALAT, S-GGT).	Same as baseline; 6 months (75% total; 82% BI, and 67% CG).	6-month follow-up alcohol intake, measured as blood sample results, significantly decreased for BI compared to CG. 45% in BI group and 20% in CG were improved, i.e., decrease in alcohol intake by at least one third and decrease of S-GGT by at least 20%.	Blood sample values decrease first month after leaving the hospital for both BI and CG, an effect which "at least in part may be caused by the motivating effect of the injury itself."
Gentilello (1999)	AUDIT, alcohol section of DIS form-III, SADD, selected fields from the Addiction Severity Index.	Alcohol intake (instrument NR), injury frequency (registry data), adverse driving events (registry data); 6 months (73% BI; 76% CG), 12 months (53% BI; 54% CG), 3 years for injury frequency and adverse driving events (NR).	6-month follow-up alcohol intake decreased for BI and CG, but difference maintained only for BI at 12-month follow-up. Reduction most apparent in patients with mild to moderate alcohol problems. Female BI and CG patients did not display a significant difference in alcohol intake at 12 months. 47% reduction in new injuries requiring outpatient treatment in the BI group compared to the CG and a 48% reduction in inpatient hospital admissions for treatment of a new injury in the BI group compared to the CG at 3-year follow-up.	For many patients, a severe injury alone can be a motivating factor for change that results in a decrease in alcohol use. Both BI and CG conditions demonstrated a reduction in drinking, but over time, the level of drinking in CG patients increased, suggesting that the injury caused a "temporary intervention effect."
Longabaugh (2001)	AUDIT, DrInC, revised IBC.	Same as baseline; 3 months (92%), 12 months (83%).	12-month follow-up alcohol-related negative consequences and alcohol-related injuries reduced more among BI+B patients, but not BI patients, than CG patients. All three conditions reduced the number of days of HED.	The authors explicitly stated that they had not determined how the results were achieved, calling for more research to "build a causal model that accounts for how this happens."

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Table 2 (*continued*)

Author (year)	Baseline measures	Follow-up measures; times (completion rates)	Main results	Authors' analysis or discussion of factors that may have influenced the results aside from the BI
Runge (2002)	Screening only: TWEAK and breath BAC.	Receipt of recommended alcohol evaluation and whether the patients kept their appointments; 3 months (68%), 6 months (63%).	19.2% of BI group received alcohol evaluation compared with 4.5% of the CG (unclear if this was at 3 or 6 months). For those persons who agreed to an evaluation, 48.8% actually showed up.	Authors did not address this issue.
Smith (2003)	AUDIT, APQ, RCQ, SADD, SSQ, 90I Drink Diary section.	AUDIT, BAPQ, SSQ, 90I Drink Diary section; 3 months (92%), 12 months (81%).	3-month follow-up across sample slight reduction in proportion drinking above recommended drinking levels reduced slightly. At 12 months, decrease from 60% at baseline to 27% for BI group, compared to from 54% to 51% for CG. 70% of BI group reported no alcohol problems at 12 months compared to 58% of CG. The proportion of hazardous drinkers (according to AUDIT cutoff) dropped from 95% at baseline to 58% at 12 months for BI group, compared to from 96% to 81% for CG.	Authors did not address this issue.
Maio (2005)	Amidx, HED.	Same as baseline; 3 months (>88%), 12 months (88%).	No significant effects of BI. Alcohol-related negative consequences decreased at 3 months but returned to baseline results at 12 months for BI and CG conditions. Frequency of HED decrease for BI patients at 3 months returned to baseline at 12 months, whereas CG HED frequency did not change from baseline at 3 or 12 months.	Authors did not address this issue.

Mello (2005)	Same as Longabaugh (2003).	Same as baseline; 12 months (81%).	At 12 months, for patients with an injury sustained in a motor vehicle crash, the BI+B group had a third of the alcohol-related injuries compared with the CG patients. No significant difference between motor vehicle crash and nonmotor vehicle crash groups BI+B group in reduction of alcohol-related negative consequences.	BIs may be particularly effective for certain injury types. A motor vehicle crash is an event that has implications for an individual on many levels, allowing a motor vehicle crash to be a more potent teachable moment than other injury types.
Dauer (2006)	AUDIT, AUDIT-C, AIS, The Readiness Ruler, ad hoc inventory exploring behaviors.	AUDIT-C; 3 months (67%), 6 months (60%), 12 months (67%), 1 year preinjury and 1 year postinjury for traffic injury frequency.	No significant difference between the two treatment groups for alcohol intake, but both groups substantially reduced hazardous drinking and frequency of HED from baseline. At 12 months, 67% had reduced their alcohol intake and 62% had ceased drinking at hazardous levels. 60% drop in traffic injury frequency from the year prior to the study entrance to the year following this.	Authors noted the difficulty of "disaggregating effects" and speculated that several factors other than the BI could have influenced the results: chance, regression-to-mean, deterrence effect of the crash, and assessment after the injury.
Schermer (2006)	AUDIT, BAC, prior driving under influence arrests.	Driving under influence arrests within 3 years of hospital discharge (registry data); 3 years (NR).	11% of BI group and 22% of CG had driving under influence arrests within 3 years of discharge, but this difference was not significant. BI was the strongest predictor for driving under influence arrest. AUDIT score was not associated with driving under influence arrest.	Authors did not address this issue.
Sommers (2006)	Interview protocol adapted from Project TrEAT (including alcohol intake questions).	Alcohol intake and risky drinking practices (instrument NR, but timeline follow-back was used), adverse driving events (registry data), health status (interview); 12 months (73%), 1 year pre and 1 year post TC admission for adverse driving events (96%).	No difference between the three conditions in alcohol intake, adverse driving events, or health status. However, all conditions demonstrated significant and dramatic decrease in alcohol intake during the 12 months after the injury. The participants' monthly alcohol intake declined by 57% (from 56.80 to 32.10) and monthly HED episodes by 55% (from 5.79 to 3.21) at 12 months.	Intensity of screening may account for decease in drinking across all groups. Patients may have curtailed their drinking because they felt it was being monitored. Injury may have an effect on patients if they can relate injuries to their alcohol use.

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Table 2 (*continued*)

Author (year)	Baseline measures	Follow-up measures; times (completion rates)	Main results	Authors' analysis or discussion of factors that may have influenced the results aside from the BI
Blow (2006)	Alcohol-related questions embedded in lifestyle survey: quantity-frequency of drinking (weekly intake), frequency of HED, S-DrInC (with two additional items from the longer DrInC).	Same as baseline; 3 months (>85%), 12 months (>85%).	At 6 months, all four groups had significantly reduced the weekly intake (average reduction 37%) compared to CG (20% reduction). BI-TA condition achieved greatest reduction. At 12 months maintained significant difference in decrease from baseline (average reduction 30%). Women in BI-TA most likely to reduce frequency of HED. Significant decrease in alcohol-related negative consequences across all four groups.	Authors did not address this issue.
Neumann (2006)	Alcohol-related questions embedded in lifestyle survey, AUDIT, RCQ.	Same as baseline, use of alcohol treatment services 1 year post injury; 6 months (63%), 12 months (58%).	6-month decrease in weekly alcohol intake by 36% in BI group and by 20% in CG and 12-month decrease 23% in BI group and 11% in CG from baseline. Significant reduction in the proportion of high-risk drinkers in BI group, with 22% of BI patients considered high-risk drinkers at 6 months, compared with 30% of CG. Difference not statistically significant at 12 months, 37% for BI versus 42% for CG. At 12 months, more BI patients (9%) than CG (6%) reported using alcohol treatment services.	Reduction of alcohol intake of all patients suggests "transient reduction in alcohol intake" due to assessment rather than BI.

Daeppen (2007)	Alcohol-related questions embedded in lifestyle survey (frequency, typical quantity, frequency of HED). Assessment included AUDIT, alcohol intake in the past 7 days, SF-12.	Same as baseline; 12 months (78%).	Minimal differences between the three groups at 12 months: 34%–37% changed to low-risk drinking. All groups also showed similar reductions in frequency and typical quantity of drinking, frequency of HED, and AUDIT scores at 12 months.	Numerous potential explanations for the lack of difference across the treatment groups were offered: injury alone, intervention (too short; interruptions reduced effectiveness), interventionist (inexperienced), patient selection (minor injury; younger men with low readiness to change), regression-to-mean, screening as effective as assessment and/or BI.
Soderstrom (2007)	CAGE, AUDIT-C, SIP, questions on drinking history questions, readiness to change, and risk-taking.	AUDIT-C, adverse driving events (registry data); 6 and 12 months (42%), 6 or 12 months (71%).	At 6 months, both groups had statistically significant reductions in alcohol intake (number of drinks within the last 90 days), frequency of HED, and alcohol-related negative consequences. Reductions persisted to 12 months. More pronounced effects for medium and higher-level drinkers (similar effects for both groups). Twice as many alcohol-related driving convictions for BI-IA as for BI-PMI, although this was not statistically significant.	Authors did not speculate on reasons for the lack of difference between the two treatment groups.

Note. 90I Drink Diary section = self-report measure of alcohol intake across 90 days; AIS = Attribution of Injury Scale, self-report measure of the attribution of injury to alcohol; Amidx = Alcohol Misuse Index, self-report measure of alcohol-related negative consequences; APQ = Alcohol Problems Questionnaire, self-report measure of alcohol problems; AUDIT-C = short three-item version of AUDIT; BAPQ = Brief APQ, shorter version of APQ; DIS form III = Diagnostic Interview Schedule, a psychiatric epidemiologic research interview protocol including questions about alcohol dependence; DrInC = The Drinker Inventory of Consequences, self-report measure of negative consequences experienced from drinking; HED = heavy episodic drinking (often referred to as binge drinking); The Readiness Rule = self-report measure of readiness to change health behaviors; Revised IBC = Revised Injury Behavior Checklist, self-report measure of incidence and treatment of different types of injuries, revised to measure alcohol involvement in the injuries; SADD = Short Alcohol Dependence Data, self-report measure of alcohol dependence; S-ASAT = serum aspartate amino transferase; S-ALAT = serum alanine transferase; S-DrInC = Short DrInC, shorter version of DrInC; S-GGT = serum gammaglutamyl transpeptidase; SF-12 = Short-form health-related quality of life measure; SIP = Short Inventory of Problems, a 15-item version of DrInC (difference from S-DrInC not known); SSQ = Social Satisfaction Questionnaire, self-report measure of satisfaction in relationships.

department logs, then screened these patients and approached them about participation if they screened positive. Maio also identified the patients from emergency department logs but did not use a screening procedure before enrolling them.

The number of participants in the studies ranged from 85 patients in Dauer's study to 1,139 patients in Neumann's. The median number of patients was 494, and the average number was 464 (not counting Mello's study involving secondary analyses of the Longabaugh study).

All the studies used random assignment to one or more BI conditions. However, three of the studies did not use traditional control group (CG) conditions and instead compared BI groups of varying intensity: Blow compared four BI conditions, Dauer compared a regular BI group with a shorter intervention of "simple advice" (BI-SA), and Soderstrom compared a personalized motivational interview (BI-PMI) condition with an information and advice (BI-IA) intervention. Longabaugh and Sommers compared a CG with two BI conditions: a regular BI group and a group that received a BI plus a booster session (BI+B) in Longabaugh's study, and a brief counseling (BI-BC) condition and a BI-SA condition in Sommers' study. Daeppen instead used a regular BI condition and two CG conditions, one that was screened and assessed (CG-SA) and one that was screened only (CG-SO).

3.4. Intervention details

The intervention goals were similar in all studies because most aimed to achieve reductions in alcohol intake. Reduced risky drinking practices (including citations for driving under the influence of alcohol) was a goal in the studies by Schermer, Sommers, and Soderstrom. In addition, the studies by Gentilello, Dauer, Sommers, Longabaugh, and Maio explicitly sought to reduce injury frequency. The Longabaugh, Maio, and Soderstrom studies also aimed at reducing alcohol-related negative consequences, although this may have been an implicit goal in other studies as well. The Runge study was quite different because the intervention goal was increased patient compliance to complete referral for alcohol abuse or dependence (i.e., reduced alcohol intake and/or reduced risky drinking practices was an implicit goal).

The BIs were delivered by nurses in the studies by Antti-Poika (in the inpatient hospital and outpatient department), Smith, Dauer, and Sommers; by physicians in Antti-Poika's study (in the outpatient department); by psychologists in Gentilello's study; by research assistants (education not specified) in the study by Runge; by a social worker or trauma surgeon in Schermer's study; and by trained masters and/or PhD-level counselors or psychology students in the studies by Longabaugh, Daeppen, and Soderstrom. Dauer's study involved social workers in addition to nurses. Entirely different are the studies by Maio, Blow, and Neumann, which applied computer-based BIs with provision of computer-generated feedback, although Blow's study also included two conditions that involved a BI provided by a research social worker.

The duration of the BI counseling sessions varied considerably, from meetings lasting a few minutes to 1 hour. The shortest sessions were the BIs delivered in Runge's study, which lasted "only a few minutes." Daeppen's BI session lasted 15 minutes, and Schermer's 30 minutes. The BI-BC in Sommers' study consisted of a 20-minute session in the hospital and a follow-up booster session of similar duration by telephone, whereas the BI-SA group in the same study received 5 minutes of counseling and a repeat session of similar duration by telephone. In the Dauer study, the BI lasted 15 to 20 minutes, whereas the BI-SA counseling lasted about 5 minutes. Gentilello's BI counseling took 30 minutes and was followed up by a summarizing letter. Similarly, the more intensive BI condition (BI-PMI) in Soderstrom's study involved a 15- to 20-minute motivational interview session, followed by a summarizing letter and two telephone calls (a week after the letter and 4 weeks after trauma center discharge). The duration of the shorter BI-IA intervention in Soderstrom's study was not specified. The BI condition in Longabaugh's study involved 40 to 60 minutes of counseling, whereas the BI+B received an additional session of similar length in addition to the BI session. The studies by Antti-Poika, Smith, and Blow did not provide details of the duration of the interventions. Maio and Neumann's studies, meanwhile, relied on computer-generated feedback.

Most studies involved one BI counseling session. The exceptions were Sommers' BI-BC condition and Longabaugh's BI+B condition, both of which involved two sessions, and Antti-Poika's study in which the patients received between three and five sessions.

BI counseling in the studies by Gentilello, Longabaugh (both BI and BI+B conditions), Smith, Dauer (the regular BI condition), Schermer, Sommers (BI-BC condition), Daeppen, and Soderstrom (BI-PMI condition) was based on motivational interviewing principles and was guided by the FRAMES methodology, that is, Feedback, Responsibility, Advice to change, Menu of alternative choices, Empathy, and Self-efficacy (Miller & Rollnick, 1991). The computer-generated feedback in the studies by Blow and Neumann was also based on the FRAMES methodology. Furthermore, the BI-SA condition in Sommers' study was likely similar because it was described as being manual-guided and based on the World Health Organization's model for initial BI work. The shorter session described in Runge's study also relied on the FRAMES methodology. The less intensive BI conditions in the studies by Dauer (BI-SA) and Soderstrom (BI-IA) may also have incorporated elements of FRAMES. Antti-Poika did not expound on the content of or the theoretical basis for the BI but instead described the intervention as consisting of "verbal counseling" and provision of a booklet. Maio's computer-based intervention was based on a "school-based curriculum that used social learning theory." This was an interactive computer program allowing participants to select a cartoon character with which

they attended a virtual party during which the characters provided feedback to the participants. At the close of the intervention, a tailored message was delivered to participants based on their responses to baseline alcohol intake items.

Three types of medical settings for the delivery of BI were used: outpatient emergency departments, inpatient hospitals or trauma centers, and outpatient clinics or departments for patient follow-up after inpatient treatment. Initial BIs took place in an outpatient emergency departments in the studies by Longabaugh, Runge, Maio, Dauer (73% of the patients), Blow, Neumann, and Daeppen; in an outpatient clinic in Smith's study; and in an inpatient trauma center or hospital setting in the studies by Antti-Poika, Gentilello, Dauer (27% of the patients), Schermer, Sommers, and Soderstrom. The BI+B condition in Longabaugh's study involved a second hospital session delivered 7 to 10 days after discharge when the patient returned to the hospital. In Antti-Poika's study, the initial hospital intervention was continued in the hospital's outpatient department.

3.5. Measurement

Although many different measurement instruments were used, most studies measured baseline and follow-up alcohol intake, risky drinking practices, and alcohol-related negative consequences. Other measured variables included injury frequency, readiness-to-change drinking behaviors, and health status.

Most studies repeated measurement of baseline variables at follow-up, which was conducted at 3, 6, and 12 months postintervention. The follow-up rates generally declined with increasing time elapsed since the intervention took place, a 67% to 92% completion rate at 3 months, 60% to 82% at 6 months, and 58% to 88% at 12 months following the intervention. Soderstrom reported that 42% of the participants could be followed up at both 6 and 12 months and 71% at either 6 or 12 months.

A few studies also assessed variables not measured at baseline. Gentilello followed up on adverse driving events and injury occurrence 3 years after the injury. Similarly, Schermer investigated driving under influence arrests within 3 years of hospital discharge. Runge examined agreement to seek treatment for alcohol problems and whether the patients kept their appointments, whereas Neumann's study involved an assessment of the use of alcohol treatment services during the 12 months after the injury.

3.6. Main results

There was a general trend of reduced alcohol intake at follow-up assessments. Alcohol intake reduced more among BI patients than CG patients in most studies. Antti-Poika reported that more than twice as many BI patients as CG patients had "improved" at 6 months after the intervention, with improvement defined as a decrease in alcohol intake by at least one third and a decrease of serum gammaglutamyl transpeptidase by at least 20%. Gentilello found that alcohol intake had decreased for both the BI and CG conditions at 6 months, but at 12 months follow-up, the difference was maintained only in the BI group. Smith noted larger improvements at 12 months among BI patients than CG patients in terms of alcohol problems, proportion drinking above recommended levels, and proportion of hazardous drinkers. Longabaugh reported that the most intensive condition (BI+B), but not the regular BI condition, reduced alcohol-related negative consequences more than the CG at 12 months. Five studies (Dauer, Schermer, Sommers, Daeppen, and Soderstrom) did not find significant differences in alcohol intake variables across the conditions that were compared.

Maio was the only study that did not report favorable intervention results for either the BI or CG conditions. The two other computer-based studies (Blow and Neumann) reported favorable intervention results. Neumann documented considerable reductions in alcohol intake and proportion drinking above recommended levels for the BI patients receiving computer-generated feedback compared with the CG patients. Likewise, Blow noted substantial reductions in alcohol intake, frequency of heavy episodic drinking, and alcohol-related negative consequences for the four BI conditions that were compared, observing that computer-generated feedback combined with brief advice achieved the most beneficial results, but tailored compared with generic feedback did not add to the effects.

Outcomes other than alcohol intake, risky drinking practices, and alcohol-related negative consequences were generally more favorable for BI patients than CG patients. Blow reported that 9% of the BI patients compared with 6% of the CG patients used alcohol treatment services during the 12 months after the intervention. Runge found that 19% of the BI group received a formal evaluation for alcohol problems as compared with 4% of the CG patients. The BI patients in the Gentilello study showed a trend toward reducing new injuries requiring outpatient treatment and hospital admission compared with the CG patients at the 3-year follow-up. Longabaugh reported that the BI+B group, but not the regular BI group, reduced frequency of alcohol-related injury and negative consequences more than the CG patients at 12 months. The studies by Sommers and Dauer did not find differential treatment effects. Changes between Sommers' two BI conditions and the CG pertaining to adverse driving events or health status at 12 months were small (and improvements over time were small). Dauer observed a 60% drop in frequency of traffic injury for both conditions.

A few of the studies conducted secondary analyses to investigate the effect of the interventions on different patient subgroups. Mello compared motor vehicle crash patients with nonmotor vehicle crash patients, noting more favorable results for the BI+B condition concerning alcohol-related injury frequency for the motor vehicle crash patients. However, alcohol-related negative consequences between

the two injury categories were not significantly different in the Mello study. Similarly, in a secondary analysis of patients aged 19 to 22 years, Blow found that women were most likely to reduce frequency of heavy episodic drinking. In contrast, Gentiello observed that female BI and CG patients did not display a significant difference in alcohol intake at the 12-month follow-up. Maio observed more of an intervention effect for patients who had previous drinking and driving experiences.

3.7. Factors that influenced the results

The authors of several studies discussed factors that potentially influenced the results aside from the BI itself. Antti-Poika, Gentilello, Dauer, Sommers, Neumann, and Daeppen believed that an alcohol-related injury can provide a salient experience that may result in self-initiated behavior change irrespective of any structured interventions. Mello suggested that the differential effects of BI on those patients whose injury was the result of a motor vehicle crash may have been due to the long-term potential social and legal consequences of a motor vehicle crash (e.g., loss of license, insurance claims, and legal issues). He referred to a "global nuisance" factor. In contrast, Daeppen speculated that an overrepresentation of younger men with mostly minor injuries might have impacted negatively on intervention results.

Although several studies observed small differences between the different treatment conditions, few authors discussed potential explanations for this. Sommers and Daeppen argued that the reason for the lack of difference in alcohol intake variables between the different conditions may have been that the screening and/or assessment procedure was too intensive to differentiate between the conditions, essentially functioning as an intervention for all patients. Dauer also believed that the two conditions in their study might have been too alike to yield significantly different results. In addition, Sommers suggested that some of the positive results could be due to patients being under observation, that is, a Hawthorne-like effect, whereas Dauer and Daeppen mentioned the possibility of regression-to-mean effects and/or chance when attempting to explain the results.

4. Discussion

This systematic review was conducted to synthesize findings concerning the results of BI in emergency care settings and to improve understanding of the mechanisms involved in achieving these results. It was not our intention to quantify these results as one may do in a meta-analysis. Such an analysis would be informative, but a meaningful meta-analysis would require more uniformity in the use of BI, increased similarity in both operationalizing and measuring outcomes, and a common approach to identifying patients who would receive the BI.

Although all of the 14 selected studies were conducted on injured patients, there were considerable differences across the studies in terms of important characteristics such as age of the patients, screening methods, recruitment eligibility criteria, severity of injury, alcohol intake levels, frequency of risky drinking practices, and degree of alcohol dependence. This heterogeneity makes it difficult to draw simple conclusions as to the general effectiveness of conducting BIs in emergency care settings.

There was also considerable variation in study protocol. Although the label of BI was applied to all of the treatments, there was a limited description of the theoretical approaches to BI used, beyond some reference to the FRAMES approach. Exactly what constitutes a BI has been a source of some debate, and the BI term has been used flexibly in the scientific literature. Thus, the umbrella of BI covers a multitude of interventions, which can differ in duration, approach, and content and be delivered to disparate client groups such as treatment seekers or nontreatment seekers and dependent or nondependent drinkers (Smith et al., 2003). This lack of transparency in many studies makes it difficult to decide if we are really evaluating the same treatment approach or a range of treatment approaches that share some common components but also have differences. We are also unable to determine the length of training of the BI providers and the monitoring of the fidelity to the BI approach. The computerized approach to BI does promise an intervention that can be consistently conducted.

Expectedly, more intensive interventions tended to yield overall more favorable results. However, we are unable to draw any dose–response conclusions about BI because it is unclear whether more BI (either in number, length, or intensity of sessions) results in a greater treatment effect. Indeed, no study suggests a simple stepwise increase in effect with higher dosage of the initial BI, although Longabaugh did find a booster session to be needed.

Of the 12 studies that compared pre- and post-BI results, 11 observed a significant effect of BI on at least some of the outcomes: alcohol intake, risky drinking practices, alcohol-related negative consequences, and injury frequency. Maio was the only study that did not report a significant effect of BI on at least some of the study outcomes. Maio argued that the baseline levels of alcohol intake and alcohol-related negative consequences might have been too low for reductions to occur at 3 and 12 months. Two studies (Runge, Schermer) assessed only post-BI results.

Most of the patients in both the BI and CG conditions in most studies improved in the study outcomes. Thus, the CG patients also improved alcohol- or injury-related outcomes, although usually not at the same level as the more intensive treatment groups. It is noteworthy, however, that five of the studies (Dauer, Schermer, Sommers, Daeppen, and Soderstrom) failed to show significant differences between the compared conditions concerning the decrease of one ore more outcomes.

Some of the studies offered explanatory mechanisms for intervention effects. A few study authors implied that an intensive screening and/or pre-BI assessment may in fact constitute a sort of intervention because it makes people reflect upon their drinking. This interpretation is supported by Blow's observation that tailored feedback relative to generic feedback did not add to the effects, suggesting that the "reactivity" to the drinking questions could be as important as the precise content of the feedback. Other studies have also suggested that screening may actually work as a BI in that the patient is made aware of his or her alcohol intake in a way that might not occur otherwise (Dill et al., 2004). Research in different behavioral domains does indeed suggest that responding to a questionnaire may create cognitions (i.e., not merely accessing them) and change a participant's subsequent behavior (Ogden, 2004). Hence, the cognitive process of answering alcohol-related screening questions could yield an increased awareness, which is a critical antecedent to behavioral change. Awareness may be a prerequisite to concern and action, but by itself does not trigger action (Fishbein & Ajzen, 1975). More research on how the reactivity to being asked about drinking may promote behavior change is needed.

A few of the studies speculated that the injury itself and/or the experience of being in the emergency department can motivate patients to reduce their alcohol intake in the absence of any interventions. This is consistent with research that demonstrated that injury patients who causally attribute their injury to alcohol are more motivated and likely to change their drinking behavior (Field, Hungerford, & Dunn, 2005; Longabaugh et al., 1995; Nilsen, Holmqvist, Nordqvist, & Bendtsen, 2007). However, Gentilello stated that this "intervention effect" is merely temporary unless the underlying alcohol problem is addressed. Other emergency care studies not focusing exclusively on injury patients have also shown that patients tend to reduce their level of alcohol intake after visits to the emergency department regardless of whether they receive a BI (Dunn et al., 2003; Forsberg, Ekman, Halldin, & Ronnberg, 2000; Monti et al., 1999). An emergency department visit for illness or an alcohol-related injury may yield decreased alcohol intake because the patient is made aware of negative consequences of drinking. In addition, the patient may be hindered or unable to drink as much as previously if the injury is severe (Dunn & Ostafin, 2005).

The role of participant and injury characteristics that may moderate responsiveness to BI was addressed by a few of the study authors. Mello discussed the possibility of stronger intervention effects for alcohol-related injuries that more profoundly impact an individual's life, implying that the magnitude of consequences of alcohol-related injury influences the outcome. Mello hypothesized that such a "nuisance" factor could serve as a more consistent reminder of the negative aspects of drinking and the need to change alcohol use. In contrast, Daeppen noted that their study included mostly younger males with lighter injuries who might have had a lower readiness to change drinking behaviors.

There clearly is a need for more studies that do not only exclusively focus on changes in alcohol intake and other alcohol-related outcomes but also attempt to open the "black box" of emergency care interventions to explore how and why these changes occur. Researchers such as Moos and Finney (1985) in the early 1980s proposed the need to theorize and test possible casual chains of treatment mechanisms. However, after nearly 20 years of research into the efficacy and effectiveness of addressing some of those alcohol-related issues at emergency care settings with injured patients, we are still faced with many unknowns and questions.

The emergency department has often been described as "an ideal setting in which to identify and initiate interventions for alcohol abuse" (Maio, 1995), and trauma centers have been depicted as "ideally situated for alcohol screening, interventions, and referrals" (Daeppen, 2003). However, there has been speculation as to whether an emergency department visit really is an ideal opportunity for a BI because it can be a chaotic and confusing time for the patient (Dill et al., 2004; Hungerford & Pollock, 2003; Rhodes et al., 2001). We also have to consider whether patients really are "more receptive to education in the moment of crisis" (Huntley, Blain, Hood, & Touquet, 2001) or if the emergency care setting is more appropriate for motivating patients to return for a later visit with more time to discuss their drinking? Does a phase after the emergency department or trauma center visit provide a better opportunity for addressing alcohol issues, as suggested by the Longabaugh study? This is another area where research is called for.

Computerized screening and BI may overcome the logistic problems associated with delivery of interventions in hectic, crowded emergency care settings where patient flow and management of acute medical conditions typically assume greater priority than preventive care. Computer-based solutions could offer a relatively inexpensive means of utilizing time for injury patients who have nonurgent medical conditions and are observed, treated, and released from the emergency department. Support is emerging for computer-generated feedback in place of personalized, individual feedback (Bendtsen, Holmqvist, & Johansson, 2007; Charalambous, 2002; Glasgow, Bull, Piette, & Steiner, 2004; Karlsson & Bendtsen, 2005; Rhodes et al., 2001). However, more research into computer-based concepts is needed because the three computer-based studies included in our review showed inconsistent results.

5. Conclusions

The heterogeneity of the studies included in this review makes it difficult to provide solid evidence on the results and factors contributing to the results of BI. Still, we can

conclude that 11 of the 12 studies that compared pre- and post-BI results observed a significant effect of BI on at least some of the outcomes: alcohol intake, risky drinking practices, alcohol-related negative consequences, and injury frequency. Two studies assessed only post-BI results. More intensive interventions tended to yield more favorable results, although no simple dose–response conclusions can be drawn. CG patients who did not receive a BI also showed improvement, although usually not at the same level as the treatment groups. However, five studies failed to show significant differences between the compared conditions.

Several studies discussed factors that potentially influenced the results aside from the BI. It was speculated that the injury itself and/or the experience of being in an emergency care can motivate patients to reduce their alcohol intake irrespective of interventions. It was also suggested that the screening and/or assessment procedure might function as a sort of intervention or that regression-to-mean and Hawthorne-like effects could explain favorable results. There is a need for a more systematic approach to studying BI to determine the range of results of this approach in emergency care settings. More studies are also needed to investigate how and why these effects are achieved.

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