

Screening and Brief Intervention for Substance Misuse Among Patients With Traumatic Brain Injury

John D. Corrigan, PhD, Jennifer Bogner, PhD, Daniel W. Hungerford, DrPH, and Katherine Schomer, MA

Background: Research on screening and brief interventions (SBI) for substance misuse has demonstrated efficacy in a variety of medical settings including emergency departments and trauma centers. However, SBI has not yet been evaluated for persons who incur traumatic brain injury (TBI)—a substantial patient subpopulation for whom substance-related problems are frequent. To examine whether research on SBI efficacy and effectiveness can be generalized to persons with TBI, a systematic review of the literature was conducted to analyze how TBI populations were included in previous studies and whether there was evidence of differential outcomes.

Methods: Peer-reviewed studies that investigated SBI for misuse of alcohol or other drugs, that were implemented in emergency departments or trauma centers, and that were published in English since 1985 were examined. From 174 articles initially identified, 28 studies were determined to meet inclusion criteria.

Results: The review revealed that research conducted on SBI for injury populations systematically neglected patients with more severe TBI and those who presented with sufficient confusion that they could not provide informed consent.

Conclusions: Future effectiveness studies should examine barriers to routine clinical use of SBI and evaluate the generalizability of expected benefits to the full spectrum of injured patients. Researchers should also develop and evaluate systematic accommodations for persons with neurobehavioral impairments who would benefit from brief interventions for substance misuse.

Key Words: Craniocerebral trauma, Substance-related disorder, Brief intervention.

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From the Department of Physical Medicine and Rehabilitation (J.D.C., J.B.), The Ohio State University, Columbus, Ohio; Division of Injury Research (D.W.H.), National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, Georgia; and Department of Rehabilitation Medicine (K.S.), Model Systems Knowledge Translation Center, Center for Technology and Disability Studies, University of Washington, Seattle, Washington.

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Address for reprints: John D. Corrigan, PhD, Department of Physical Medicine and Rehabilitation, The Ohio State University, 480 Medical Center Drive, Columbus, OH 43210; email: corrigan.1@osu.edu.

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By the late 1970s, randomized trials had demonstrated that relatively brief interventions for alcohol misuse produced positive outcomes equivalent to more intensive interventions consisting of many counseling sessions.^{1,2} By 1990, accumulating positive research results had influenced the Institute of Medicine to recommend that general medical settings incorporate screening for alcohol misuse as part of routine medical care and that screen-positive patients receive a brief, onsite counseling intervention.³ Since that time, research on screening and brief interventions (SBI) for alcohol misuse has matured and evidence of its efficacy in a variety of medical settings continues to grow.^{4–6} Further, cost-benefit studies have demonstrated that SBI is associated with reductions in alcohol use, health care utilization, and motor vehicle events and makes economic sense, with cost savings of as much as \$4 for every dollar invested.^{7,8} Because of SBI's efficacy and cost advantages, attempts to integrate it into routine clinical practice proceed in a variety of medical settings.⁹ As of 2006 standards promulgated by the American College of Surgeons requires Level I and Level II trauma centers (TC) to have a mechanism to identify patients who are problem drinkers; with Level I centers additionally required to have the capability to provide an intervention for patients so identified.¹⁰ However, SBI has not yet been evaluated for some patient subpopulations in which alcohol-related problems are prevalent. One such population—persons who incur traumatic brain injury (TBI)—is especially important because of the high association with prior misuse of substances.

The Centers for Disease Control and Prevention estimates that each year 1.56 million Americans sustain a TBI for which they receive medical attention. Among these injured, 1.22 million are treated in emergency departments (EDs), 290,000 are hospitalized, and 50,000 die.¹¹ Hospitalizations with TBI comprise 15% of all injury-related hospitalizations; ED visits for TBI comprise 5% (Hungerford, September 24, 2009, personal communication). Although there is no research on substance use after treatment for TBI in an ED or TC, 30% of hospitalized TBI survivors consume moderate or heavy levels of alcohol 1-year postinjury and 48% report at least one incidence of binge drinking per month.¹² This binge rate is 50% higher than in the age- and gender-matched general population.¹² Among adults who experienced moderate or severe TBI and received rehabilitation, 18% are misusing substances 1 year after injury and 11% report at least one incident of binge drinking per month.¹³

Substance use often causes TBI, and those patients who misuse substances before injury are at high risk for resuming

misuse despite the greater consequences that can accrue. Multiple studies have found from one third to one half of persons incurring a TBI are intoxicated at the time of injury.^{14–16} Among those treated for injuries in EDs and TCs, the likelihood of a concurrent TBI increases significantly as blood alcohol content increases.¹⁷ As with injuries in general, substance misuse initially declines after experiencing TBI but then begins to increase, at least during the first two years postinjury.¹⁸ Individuals with a history of substance use disorder before injury may be as much as 10 times more likely to exhibit problematic substance use postinjury, when compared with those without such history.¹⁹ Thus, previous TBI increases the likelihood of intoxication, which increases the likelihood a TBI will be incurred. TBI increases the likelihood of postinjury substance misuse, particularly for those with a previous history of substance misuse.

The effectiveness of SBI may be moderated by the consequences of TBI. Although the magnitude, type, and point of impact of the external force to the head affect the location and extent of damage, the frontal areas of the brain are always the most vulnerable to injury. As a result, the “fingerprint” of TBI is contusions in the frontal lobes and the anterior tips of the temporal lobes, as well as shearing and tearing of axon sheaths and neuron bundles connecting to the frontal lobes.²⁰ The frontal lobes of the human brain control functions essential to complex social behavior, particularly the ability to inhibit emotion, plan goal-directed behavior, and manage thinking skills.^{21,22} These abilities allow us to regulate our actions, including modifying our consumption of alcohol. Furthermore, impaired frontal lobe functioning may not only exacerbate a comorbid behavioral problem but also interfere with interventions targeting the comorbidity.²³ Given that SBI presumes some insight into one’s own behavior and sufficient self-regulation to change a behavior on deciding it is excessive, it would appear prudent to inquire whether the efficacy of SBI found for persons incurring injuries is equally generalizable to patients for whom their injury has included a TBI.

SBI has proven to be a valuable intervention for alcohol misuse among persons treated in EDs and TCs. Those whose injuries include TBI are a significant segment of patients requiring intervention for alcohol misuse. Although persons with TBI need SBI, damage incurred to brain functioning may diminish the efficacy of SBI. To analyze whether the existing research on SBI efficacy can be confidently generalized to persons with TBI, we systematically reviewed the SBI research on injury populations to analyze how TBI was treated in these studies and whether there was evidence of differential efficacy from clinical trials or effectiveness from evaluations of its utility in actual clinical practice.

MATERIALS AND METHODS

A systematic review of the literature was conducted (see Figure, Supplemental Digital Content 1, <http://links.lww.com/TA/A39>) and summarized below.

Search Criteria

The criteria used to search for published studies for this systematic review included peer-reviewed studies (1) that

investigated screening and brief intervention techniques for use of alcohol and drugs, (2) in an ED or TC, and (3) that were published in English since 1985. For the initial database search, all study types such as review articles and meta-analyses were included. All study design types were also included. A complete list of the search terms for each database is shown in Table 1 (see Table, Supplemental Digital Content 2, <http://links.lww.com/TA/A40>). Searches conducted in PubMed, CINAHL, PsycINFO, ProQuest, Web of Science, and Google Scholar located 174 articles.

Criteria and Methods for Inclusion

Once the search for published articles was complete, more specific inclusion criteria were created to find the most relevant of the 174 articles. The initial inclusion criteria were created to identify randomized controlled trials (RCTs) of SBI for drugs or alcohol in EDs and TCs. Identifying studies that included a TBI population was not a criterion. The specific criteria included (1) experimental RCTs in which SBI was clearly used for substance misuse in an ED or a TC, (2) experimental RCTs in which the use of SBI is unclear, or unclear if used for substance misuse but in an ED or TC, and (3) experimental RCTs in which the use of SBI is clear, but unclear if used in an ED or a TC.

Using these criteria, abstracts from the 174 articles found in the database search were reviewed by two trained reviewers at the University of Washington Model Systems Knowledge Translation Center (MSKTC). Discrepancies were resolved by consensus of the reviewers. Author and journal names were not masked from the reviewers. If reviewers were unable to analyze whether the article met the criteria from the abstract, the full article was reviewed. If a study did not meet the criteria, it was excluded from further review. After reviewing the abstracts, 31 of the 174 articles appeared to meet the inclusion criteria.

Similar criteria were used to find nonexperimental SBI studies in EDs and TCs that evaluated outcomes. Of the 174 articles, 26 articles met these criteria and were reviewed again to exclude those that were not effectiveness studies. The remaining 10 studies, combined with the 31 RCTs, yielded a total of 41 articles included in this review.

Data Extraction and Outcome Results

Two MSKTC reviewers independently extracted data from each of the 41 articles including the research design, sample information, details of the interventions, outcome measures, and main outcomes. Data on inclusion and exclusion criteria were also specifically extracted to show if those with TBI were being included or excluded in the SBI trials. For example, subjects were included or excluded because (1) they showed a loss of consciousness, (2) they showed a sense of confusion, (3) they were unable to consent, or (4) the medical record mentioned the patient’s cognitive function or mental status.

Data were compiled in a Microsoft ACCESS database specifically developed for systematic reviews. Differences between the two reviewers’ data extraction were reconciled by consensus. For each article, the total number of data extraction changes between the two reviewers was recorded.

These changes included correcting data in a field, filling in missing data, or moving misplaced data into the correct field. The mean number of changes per article between two reviewers was 0.85 (less than one change per article), with a range of 0 to 4, indicating strong reviewer consistency.

During the data extraction process, articles were again excluded if the subsequent in-depth review revealed that they did not meet the initial criteria. At the end of this full review, 26 of the 41 articles met the criteria. Of these 28 articles, 20 examined efficacy and 6 were effectiveness studies.

RESULTS

Efficacy Studies

Twenty efficacy studies were reviewed (see Table, Supplemental Digital Content 3, <http://links.lww.com/TA/A41>),^{5,24–42} with all but one being an RCT. The exception used a quasi-experimental design.⁵ One study tested a Screening, Brief Intervention and Referral to Treatment (SBIRT) intervention,⁴¹ whereas the remaining used SBI. (SBIRT incorporates SBI but places additional emphasis on treatment referral options for those identified as being at greater risk or suspected of having a substance use disorder.⁴³) Sixteen of the studies were conducted in EDs,^{5,24–29,32–36,40–42} one on an emergency surgery ward,³⁰ and the remaining four were conducted on trauma units.^{31,37–39} The majority limited their sample to adults aged ≥ 18 years (12 studies^{5,24–29,31,32,36,38,39}), whereas the remaining studies either included both adults and adolescents (2 studies^{30,37}) or focused exclusively on adolescents or young adults (6 studies^{33–35,40–42}). With the exception of one of the adolescent studies,³³ a history of some level of at-risk alcohol use was required to be eligible for randomization, although the criteria for extent of use varied across studies.

The vast majority of the studies did not directly exclude persons who had sustained a TBI, with the exception of two trauma unit studies. Gentilello et al.³¹ excluded individuals whose TBI did not “resolve” before discharge from the trauma unit, and required individuals to pass a mental status examination before participation. Another trauma unit study (Schermer et al.³⁷) excluded persons who had sustained a TBI requiring rehabilitation. Thus, for these two studies, it is highly likely that some persons with moderate-severe TBI were systematically excluded, but it is possible that persons with less severe TBIs were included as long as any mental status changes had cleared before discharge. One ED study²⁶ did not exclude persons with TBI from enrollment but found that “head injury” was a significant predictor of refusing advice⁴⁴ and not showing for the appointment to conduct the intervention.⁴⁵

Of those studies not specifically mentioning TBI (18 studies), 13 studies mentioned cognitive impairment as an exclusion criterion,^{5,24,26,29,32–36,38–40,42} usually in direct association with the ability to provide consent or participate in the intervention. The remaining five studies did not explicitly refer to cognitive capacity,^{25,27,28,30,41} but did specify that informed consent was required, implying that capacity was intact. Although studies conducted on trauma units required informed consent, as noted above, there may have been time for cognitive deficits to resolve before discharge, allowing for participation of

persons with less severe TBIs. Six studies tested cognitive capacity with a mini-mental examination.^{32,34,35,38,40,42}

Studies conducted in the ED had limitations inherent to the environment that likely precluded the inclusion of persons with moderate-severe TBI. Persons with serious injuries who are admitted to the hospital were not likely to have reached sufficient medical stability before transfer out of the ED. Ten of the ED studies excluded patients because of the severity of their medical condition or the need for an advanced level of medical treatment (hospitalization, trauma consult, life-saving procedures).^{5,25,28,29,30,32,33,35,36,40} Blow et al.²⁵ used “unconsciousness” as an example of an injury characteristic that precluded participation. Dauer et al.^{28(p77)} indicated that persons were excluded if they were unable to participate in the interview because of “severe medical, psychiatric, or social conditions,” which presumably would include conditions associated with cognitive impairment such as TBI. Two studies excluded subjects whose medical condition or treatment did not allow for participation in an interview.^{24,27} However, the severity of the medical condition could not be analyzed from the information provided.

Effectiveness Studies

Six effectiveness studies were reviewed. Two of the effectiveness studies used an SBIRT approach rather than SBI; i.e., individuals at higher levels of risk were referred for treatment beyond the brief intervention.^{46,47} Five of the six studies occurred in EDs, with the remaining one in a trauma unit.⁴⁸ All the studies required at-risk use for receipt of the intervention. One of the samples was limited to 18- to 39-year-old college students.⁴⁹ Of the remaining five studies, three were conducted with adults only^{46,48,50} and two studies included adolescents as well as adults.^{47,51}

None of the effectiveness studies specifically mentioned the presence of TBI in relationship to their sample characteristics or selection criteria. All but one study (Wright et al.⁵¹) explicitly excluded persons with cognitive impairment but, in comparison to the efficacy studies, some studies used descriptors suggesting that a moderate to severe level of impairment led to exclusion (e.g., mentally incompetent,^{49,50} moderate-severe impairment⁴⁸). All studies required consent, although one only obtained consent for follow-up⁵¹ and one asked for verbal consent only.⁴⁷ The effectiveness studies did not require that a mental status examination be passed, but it was apparent that the cognitive capacity to provide consent was required. The presence of a life threatening condition or medical instability was specifically mentioned as an exclusion criterion in five studies.^{46–50}

DISCUSSION

This review reveals that research on both the efficacy and effectiveness of SBI for injured patients may have systematically neglected (1) patients with more severe TBI and (2) patients confused enough to preclude informed consent. The former omission is understandable because it is not possible to engage the more seriously injured patients in the intervention. The latter omission is also understandable in efficacy studies on human subjects, which require informed

consent. However, the SBI effectiveness studies had the same bias because they too required informed consent. Clearly, effectiveness studies are needed that can examine possible limits on generalizability to patients excluded by the inability to consent. Depending on the setting, this may include patients with more life threatening injuries, those with pre-morbid cognitive impairment, those intoxicated, or those for whom cognitive impairment may have been a consequence of their injury. This latter group includes persons who incurred TBI, the group of greatest interest in this review.

The study setting—particularly ED versus TC—affected the extent to which patients were unable to be consented. For instance, the seriously injured patient may not have been held long enough, or be sufficiently medically stable, to be studied in the ED, however, may very well have been included in a TC study as the longer length of stay would have allowed exclusionary circumstances to resolve. Intoxication or more severe TBI might present similar circumstances; although the most severe TBIs may have been excluded from TC studies because of not having sufficient cognitive function before transfer for rehabilitation services. Mild TBI may be more difficult to judge with regard to systematic exclusion. Minor TBI in which altered consciousness resolved quickly may very well have allowed consent to participate even in ED studies. However, more serious but still mild TBIs may have been excluded from both ED and TC studies—the former because they remained confused, and the latter because their injuries were not sufficient to require hospital admission. One final group that was likely excluded from both ED and TC studies were those individuals whose preexisting cognitive impairments precluded consent being obtained. Although in theory proxy consent may have been possible, we found no mention in any study of the use of proxies for persons with cognitive impairments.

In considering the applicability of SBI for persons with TBI, we were also interested in whether any accommodations were made to standard protocols to address potentially diminished learning capacity. The studies reviewed made no mention of accommodations, which may be quite consistent with the proper execution of a standardized intervention. Informal discussions with clinicians experienced in the use of SBI suggest a paucity of attention to accommodation. Although some clinicians allow that a delayed intervention or a booster session could maximize the inclusion of patients with impaired cognition because of TBI, standard procedures for this purpose apparently are not commonplace. Indeed in routine clinical practice, the interviewer is expected to analyze whether a patient can carry on a conversation—if so, SBI proceeds; if not, it is not attempted. This practice may systematically exclude some patients who are in need of SBI or some other type of intervention and could conceivably benefit from an adapted approach. However, this practice also may include individuals who appear to be conversant and able to learn but indeed have subclinical impairments making it unlikely that the standard approach will be effective.

CONCLUSIONS

Based on this review, we recommend first that future effectiveness studies examine barriers to routine clinical use of SBI and evaluate the generalizability of expected benefits to the full spectrum of injured patients. Second, we encourage researchers to develop systematic accommodations for persons with cognitive impairments to evaluate how diminished attention or impaired memory affects SBI outcomes, and, more important, how such deficits might be accommodated. An alternative to relying solely on verbal exchange might be multi-methods or mixed media for conducting the initial intervention. The timing and frequency of boosters might also be evaluated. Even though the injury visit to the ED or TC may be the “opportunity” that leverages motivation for change in most patients, patients with more serious TBI might need intervention later in the continuum of recovery, e.g., on discharge to home, or when entering community-based rehabilitation programs.

The high prevalence of substance misuse among persons who incur TBI^{12–16} underscores the need to provide interventions for alcohol misuse and other drug use among these patients. SBI has been a monumental development in the techniques available for addressing substance misuse among persons receiving medical attention for an injury. A recent commentary on efficacy research for SBI in EDs concluded that more study is needed on the optimal elements of the intervention, confounding factors and, of significance for this article, those target populations most likely to benefit.⁵² It is imperative that effective interventions be available for persons with TBI. If SBI as currently practiced is not effective for persons with impaired cognition, then it is incumbent on the field to identify and validate accommodations that will allow effective and efficient interventions to be extended to patients with TBI.

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