Published in final edited form as:

Oral Maxillofac Surg Clin North Am. 2010 May ; 22(2): 231–238. doi:10.1016/j.coms.2010.01.005.

Substance Use and Facial Injury

Debra A. Murphy, PhD^a

^aResearch Psychologist, Health Risk Reduction Projects, Integrated Substance Abuse Programs, Department of Psychiatry, University of California Los Angeles

Summary

Substance use is a major contributing factor to the interpersonal violence that accounts for a significant proportion of facial injuries among adults and adolescents; thus, violence is the main “pathway” through which substance use and injuries are linked. Beyond causality, substance use continues to influence recovery from the injury through its impact on the healing process (e.g., patient non-compliance, suppression of T-cell counts, susceptibility to bacterial colonization, and protein production). Further exacerbating this issue are significant rates of injury recidivism and the lack of motivation to seek treatment for underlying substance use problems. As a front-line care provider, the oral and maxillofacial surgeon has a responsibility to screen for and refer patients for any needed specialty treatment (including substance use treatment, violence reduction, post-traumatic stress reduction). Recognizing and addressing these issues requires a paradigm shift that involves integration of multidisciplinary expertise.

Keywords

Substance Use; Facial Injury; Trauma Centers

Introduction

The use of alcohol and illicit drugs is a common theme in patients presenting with traumatic injury to trauma centers. In addition to associated patient care issues, these common precipitants of clinician contact and costly hospitalizations presents a particular fiscal challenge to our trauma care systems and compromises their ability to provide conventional medical services. Estimates compiled by the Institute of Medicine's Committee on Injury Prevention and Control indicate that the costs of injury are higher than those of any other health problem, and roughly equal to the costs associated with heart disease (second most costly) and cancer (third most costly) combined.[1] Similar injury trends are increasingly manifest in children and adolescents [2,3]; between 2002 and 2004, over 13 million emergency department visits in the U.S involved adolescents 10 to 19 years of age, with injury constituting 42% of these visits.[4] Given that alcohol and substance use are common antecedent risk factors for traumatic injury, a significant portion of facial injury injuries should be considered as preventable. The focus of this chapter is to: (1) detail the connection between substance use and orofacial injuries among adults and adolescents; (2) discuss the

^aCorresponding author for proof and reprints: Debra A. Murphy, Ph.D., Health Risk Reduction Projects, Department of Psychiatry, UCLA, 11075 Santa Monica Blvd., Suite 200, Los Angeles, CA 90025-7539, Phone: (310) 794-8127 FAX: (310) 312-0552, dmurphy@mednet.ucla.edu.

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

sequelae of substance use related orofacial injuries (i.e., complications and re-injury); and (3) discuss the need for collaborative care across disciplines.

Substance Use and Injury among Adults

A sizable proportion of adults receiving treatment at trauma centers exhibit a pattern of harmful substance-using behaviors. For example, pooled data on 4,063 patients treated at 6 regional trauma centers indicated that 40.2% of patients had a positive blood alcohol concentration at admission[5]; when polydrug use (alcohol, illicit drugs) was included, over 60% of the patients tested positive for intoxicants.[6] These findings reflect the results of Cromwell et al. [7] who investigated the prevalence of substance use among victims of major trauma presenting to a Level I trauma center. Of the 516 patients who had urine toxicology and blood alcohol screens, 71% screened positive for alcohol or drugs or both: 52% had positive alcohol screens; and 42% had positive drug screens with cocaine and opiates representing 91% of positive drug screens.

As with general trauma, there are substantive linkages between substance use and facial injury. Mathog et al.[8] found that over 82% of the 1,432 mandible fractures in 906 patients were the result of aggravated assault, and related largely to substance use and risky behaviors. Their findings are echoed by Ogundare et al.[9], who reported interpersonal violence as the proximate cause of injury in 79% of all patients with mandible fractures, with 55% of the patients reporting the use of an illicit substance within two hours of the injury. Murphy et al.[10] found that 58% of patients presenting with intentional facial injury at an urban trauma center met criteria for problem drinking, and over half reported illicit substance use in the previous month, with 25% meeting criteria for problem drug use. Similarly, the association alcohol use with interpersonal violence was 72% in an audit of emergency referrals to a maxillofacial trauma unit over a period of two years [11].

The majority of studies conducted on the association of substance use and facial injuries have been among males.[12] One study of subjects with mandible fractures found the ratio of males to females was 5:1; other reported ratios have ranged from 3:1 to 5.4:1.[13-17] Drinking alcohol is not only a risk factor for violent behavior, but may increase the risk of assault, especially for females.[18] In a study of females seen at a busy regional maxillofacial unit between 2000 and 2004, the most common mode of injury in alcohol-related incidents was interpersonal violence.[19]

Collectively, these studies implicate interpersonal violence as the “pathway” that links substance use and orofacial injuries. Research on substance use and violent crime has shown consistently that intoxicated individuals commit a high proportion of violent crime, including assault,[20-22] and that a majority of assault patients consume alcohol prior to assault, and sustain facial injuries ranging from minor cuts to severe fractures.[23-25] In a five-year follow-up of 501 survivors of violent trauma seen at one hospital, Sims et al.[26] found that 62% abused alcohol or drugs. Utilizing a case-control analysis, Vinson et al.[27] calculated the increased risk of intentional injury related to alcohol use and reported that drinking in the six hours prior to injury was positively associated with injury, with an odds ratio of 9.5 after 5 drinks.

The face is a common target for assault and most injuries involve the mandible.[28] Haug, Prather, and Indresano[29] found a 6:2:1 ratio among mandibular, zygomatic, and maxillary fractures. Specific to intentional injuries, Lee[30] reported that interpersonal violence accounted for 49% of mandible fractures treated over an 11-year period at one hospital's oral and maxillofacial surgery service, and that alcohol was a major contributing factor. Specifically, alcohol was involved in 56% of all patients with mandible fractures and with 50% of all patients with maxillofacial fractures. In another study of maxillofacial trauma, of

246 patients treated for mandible fractures, most were caused by violent assault (53.5%), and alcohol was a contributing factor at the time of injury in 20.6% of the fractures. In general, facial injuries associated with substance use frequently involve multiple fractures, and a high proportion of the patients end up requiring hospitalization and intensive surgical intervention.

Substance Use and Injury among Adolescents

As with adults, the use of alcohol and drugs has been closely linked with injury in adolescents. Of all 13 to 19 year olds admitted to a Level I Pediatric Trauma Center, 34% screened positive for alcohol or drugs on admission.[31] Another study of adolescents admitted for trauma found that 48% had positive blood alcohol levels.[32] Rivara et al.[33] found that 41% of 18 – 20 year olds admitted for trauma had positive blood alcohol screens. The youth admitted for assault-related injuries were most likely to be positive for substance use, with a surprising 49% of the youth having behavioral evidence of chronic alcohol abuse. Similarly, Loiselle et al.[31] found that recent use of alcohol was more common among adolescents treated for intentional injury than those treated for unintentional injury. Finally, Murphy et al.[34] found that more than half (55%) of adolescents presenting at inner-city trauma centers with facial injuries had problem levels of substance use.

The strong linkages of substance use and injury found in the adult literature, is also apparent in the trauma literature focusing on adolescents and young adults. In a comprehensive study of injury prevalence among adolescents in 35 countries, Pickett et al.[3] determined that poverty was positively associated with intentional injuries, and that alcohol use was positively and consistently associated with interpersonal violence, but not with school and sports related injuries. As noted earlier, in their study of adolescents presenting to inner-city trauma centers with facial injuries, Murphy et al.[34] found that more than half (55%) had problem levels of substance use. The orofacial injuries were predominantly intentional in nature, caused either through violent actions (i.e., being in a physical fight with someone) or victimization (i.e., being physically attacked). Moreover, a significant proportion of these youth (56%) had been previously arrested. Lee and Snape[35] reviewed trends in maxillofacial injuries over an 11-year period and found that males accounted for 88% of alcohol-related fractures, with 59% in the 15 – 29 year age group and 76% of alcohol-related fractures resulting from interpersonal violence.[35]

Recognizing that some of these markers can be used to identify at-risk adolescents and serve as the basis for secondary prevention efforts, organizations including the American Academy of Pediatrics now advocate that health professionals involved in trauma care be involved proactively in the identification of these youth. The fact that these adolescents are high risk in a number of areas including substance abuse, re-injury, and arrest argues for multi-targeted interventions as part of trauma care.

Sequelae to Injury Related to Substance Use: Complications and Re-Injury

There are a number of complications related to substance use that can affect the healing process. Serena-Gomez and Passeri[28] found that patients consuming significant rates of alcohol per day had compromised recovery because: (1) this level of alcohol use suppresses T-cell counts and affects the body's responses in terms of cell migration, adhesion, and signal transduction; (2) the production of T cells is also affected, making the body more susceptible to bacterial colonization and subsequent infection; and (3) alcohol consumption negatively affected protein production—particularly collagen— and ultimately, wound healing. Of note, Passeri et al. [36] reported that patients using intravenous or non-intravenous drugs presented with postsurgical mandibular-fracture complications (ranging from 30 – 37.5% and 14.2 to 19%, respectively). Insufficient nutrition may also play a part

in the recovery process of patients reporting alcohol abuse,[37] impacting both soft tissue and osseous healing.

Substance use can also affect the outcomes of fracture treatment strategies, such as maxillomandibular fixation, that rely on the patient's ability to follow postoperative instructions and maintain adequate oral care. Shetty et al. reported a significantly higher nonattendance rate among patients with facial injuries who had reported regular alcohol use at the time of hospital admission.[12] Equally important, the behavioral precursors of alcohol and drug use that lead to violence and intentional injury also predispose vulnerable patients to recurrent injury. In the context of general trauma, hospitalized patients with alcoholism have been found to have a 16-fold greater prevalence of prior fractures than hospitalized control patients without alcoholism.[38] A five-year follow-up of substance-abusing patients who were admitted to a level I trauma center in the Midwest evidenced an injury recurrence rate of 44%.[26] In the case of maxillofacial fractures, patients who return to a particular lifestyle are more likely to return with a similar injury in the future.[39] Of those trauma victims who survive their injuries, significant subsets (23% - 52% of urban trauma patients) resume risk-taking behaviors leading to recurrent injury or recidivism.[40,41] In their investigation of risk factors for re-injury in a sample of orofacial injury patients, Shetty et al. determined that recidivist trauma patients, compared to sociodemographically matched cohorts, are more likely to report habitual use of alcohol and drugs. Also, alcohol screening indicated that many of the patients were at-risk drinkers or to be problem/alcohol dependent drinkers. [12]

All of these sequelae, both immediate and delayed, indicate the need for integrated care that extends beyond the management of the physical injury. However, implementing a collaborative care model is subject to several challenges.

Lack of Patient Motivation for Substance Use Treatment

Most individuals who have an alcohol or drug use problem do not seek help or receive treatment. National surveys suggest that less than half of those individuals who have a psychiatric disorder (including substance use disorder) in the past year receive any treatment.[42,43] Estimated ratios of untreated to treated individuals have ranged from 3:1 to 13:1.[44,45] Simply put, only a fraction of individuals with substance abuse related difficulties seek or are offered professional help.[46] Reported reasons for affected patients not seeking treatment include not thinking the problem is serious enough, thinking they can handle it on their own, believing the problem may get better by itself, and not wanting to admit they need assistance.[47-49] Some patients think that the substance abuse treatments may not be effective. Many of these reasons can be considered differential expressions of denial, which has been described as endemic to substance use disorders.[50]

Specific to orofacial injury, Murphy et al. [51] found that 60% of patients treated for a facial injury screened for problem alcohol use and slightly more than 25% screened for problem drug use. Yet, only one-third of patients recognized they had a substance use problem and of those, only 20% had actually sought treatment.

Even among those who do seek treatment, the substance use patterns may be more established before they decide to seek help. Hingson et al.[48] determined that two third of their respondents recognized they had a drinking problem before age 30, but considerable time (1 – 2 years) elapsed between recognizing the problem and deciding to seek help. Most medically hospitalized patients with clinically recognized alcohol dependence are aware of their drinking problem, worry about the consequences of their drinking, and may even have thoughts that they need to change their behavior.[52] Patients hospitalized after a substance-related injury have been found to be motivated to change their drinking,[53] with

aversiveness of the injury and perception of degree of substance involvement predictive of their level of motivation.[54] This ambivalence presents an opportunity for moving some patients towards behavior change.

Lack of Trauma Care Provider involvement in Substance Use Treatment

Although a high proportion of patients treated for facial injuries have at-risk or problem substance use, screening by care providers is limited and very few receive referrals for interventions to cut-back or stop substance use. It is not that care-providers do not recognize a problem: in one trauma center there was an overall intoxication rate of 33% of 242 consecutive adult trauma admissions, and documentation revealed that staff had recognized it in 77% of cases, but only approximately 7% were referred to a treatment program.[55] There are several reasons why clinicians do not address substance use issues. Multiple demands on their time is one common reason, a lack of training in screening and referral is another. In a random sample of members of the American Association for the Surgery of Trauma, only 54% of respondents screened 25% or fewer trauma patients for substance use, while only 29% screened most patients.[56] Those who did not screen were twice as likely to state that screening was not what they were trained to do, and more often believed that screening offends patients. Therefore, a lack of training in screening, discussing, and referring patients for specialty treatment of substance use problems is a significant barrier to comprehensive care of the injured patient with substance use problems.

Substance Use Screening in the Trauma Setting

Screening is a preliminary assessment used to determine when an individual needs intervention or referral. There are reliable and valid brief screening measures to detect alcohol and drug use.[57,58] The World Health Organization (WHO) has developed screenings to identify a continuum of substance use and brief interventions,[59-61] and the Committee of the American College of Surgeons has supported routine alcohol screening and brief interventions in Level I Trauma Centers.[62] This support is due to the strong research documentation: the growing field of screening, brief intervention, and referral to treatment (SBIRT) indicates that this method can reduce alcohol use.

There are three brief screens for alcohol or substance use that have strong reliability and validity. For adolescent (youth 14 and up) the CRAFFT screen for substance use is recommended.[63] For adults, the World Health Organization's Alcohol Substance Involvement Screening Test (ASSIST) is recommended,[64] as it has been found to be a valid screening for psychoactive substance use in individuals who use a variety of substances, and also who have varying degrees of substance use. In addition, the Alcohol Use Disorders Identification Test (AUDIT) has been found to be comparable—and often better—than other self-report screening measures for early stage alcohol problems. In fact, for males, an even briefer version exists (the AUDIT-C) and appears equal to the full screen.[65]

Recent research indicates that short, brief treatment of substance use in emergency departments can be efficacious.[66] The largest SBIRT service program of its kind was implemented by the Substance Abuse and Mental Health Administration in 2003. Of 459,999 patients screened, 22.7% were positive for a spectrum of use, and the majority was recommended for a brief intervention. Results strongly indicate that SBIRT is feasible to implement and there are significant improvements at 6 months for illicit drug use and heavy alcohol use.[67]

Most surgeons involved in trauma care agree that the trauma setting is an important venue for addressing harmful substance use consumption,[68] and over two thirds frequently check

blood alcohol concentrations. However, the use of formal screening questionnaires are much less frequent (25%). Nonetheless, trauma surgeons are screening for at least alcohol disorders more frequently than they were 5 years ago. More effort is needed to get existing screening tests implemented through trauma centers for both alcohol and drug use.

Integrating the Surgeon into Collaborative Care

As stressed in the preceding chapters, current trauma care is oriented toward tending to the visible manifestations of the injury, and only very rarely are the underlying risk factors considered. The traumatic experience of the facial injury may cause the patients to feel vulnerable and open to advice - the so-called “teachable moment”.[69,70] The injured patient may experience a number of concerns and fears, including permanent disfigurement, sustained recuperation with an effect on normal behaviors such as eating (e.g., wired jaw), and shame. In such a vulnerable state, patients may be more likely to admit, discuss, and accept that they have a problem with substance use. This awareness renders them more receptive to reviewing their substance use relative to normative use, and to immediate feedback and/or referral to treatment for associated substance use behaviors.

The patient's receptiveness to considering the consequences of their substance use, and the potential benefits of changing these behaviors presents the oral and maxillofacial surgeon with an opportunity to treat the patient more comprehensively. Longabaugh et al.[54] showed that the patient's injury and the perceived level of its association with substance use are predictive of readiness to change behavior. Warburton et al.[70] have suggested that oral and maxillofacial surgeons are in a prime position to identify alcohol-related assault victims and ensure a coordinated multi-agency response to enhance the victims' chances of receiving comprehensive care and empathetic and informed assistance. Recognizing both the need and the opportunity, the American College of Surgeons have mandated alcohol screening among admitted trauma patients, for level 1 and 2 trauma centers. Since there is increasing evidence of the effectiveness of relatively brief substance use interventions—some of which may be feasible even within the time, staffing, and financial constraints typical of busy trauma centers[71-75]—it is critical to change surgeon and surgical nurses' attitudes and behavior toward screening and brief intervention. However several issues need to be answered so that substance use screening, intervention and referrals can become part of the care of patients with facial injuries. For example, how can oral and maxillofacial surgeons incorporate substance use management practices into their workflow? Specifically, how they can: (1) set about discussing treatment options with substance-using patients and determine which treatment options they prefer?; (2) offer referral to substance use treatment programs or other substance use services to patients with active substance use/abuse problems? (3) obtain training in the skills required for screening for substance use problems?; and (4) integrate substance use interview techniques into core surgical training?

Summary

Facial injuries are quite common, frequently result from substance use related behaviors typically involve the mandible [76]. Most facial trauma patients tend to be young, adult males in the 20 – 29 year old age group. There is a strong need for service enhancement and service system collaboration and integration. The trauma care setting is an important entry portal into the substance use care system, especially for uninsured patients who may have decreased access to other sources of medical care. Given the epidemiology of substance use among facial injury patients and the costs of providing care for recurrent injury and other attendant health consequences, the delivery of efficacious brief interventions and referrals for substance use by the oral and maxillofacial surgeon has the potential to have a large public health impact. Brief interventions have been shown to be successful in reducing substance

use, and the best time for approaching patients about such treatment may be at the time of injury, when they are aware of the consequences of their substance using behaviors. Most surgeons endorse psychosocial aftercare programs to reduce the risk of re-injury and promote patient compliance.[77] Thus, the care of facial injury patients appears ripe for the use of brief screening instruments and the integration of multidisciplinary expertise to address attendant substance use problems.

Acknowledgments

This work was supported by Grants No. 5R21DE016490 and 5R01DA016850 from the National Institutes of Health.

References

1. Injury Fact Book 2001-2002. Atlanta, GA: Centers for Disease Control and Prevention; 2001. National Center for Injury Prevention and Control.
2. Danesco ER, Miller TR, Spicer RS. Incidence and costs of 1987-1994 childhood injuries: Demographic breakdowns. *Pediatrics* 2000;105(2):E27. [PubMed: 10654987]
3. Pickett W, Molcho M, Simpson K, et al. Cross national study of injury and social determinants in adolescents. *Inj Prev* 2005;11(4):213-8. [PubMed: 16081749]
4. MacKay, AP.; Duran, C. Adolescent Health in the United States, 2007. Hyattsville, MD: Centers for Disease Control and Prevention; 2007.
5. Soderstrom CA, Dischinger PC, Smith GS, et al. Psychoactive substance dependence among trauma center patients. *JAMA* 1992;267(20):2756-9. [PubMed: 1578594]
6. Madan AK, Yu K, Beech DJ. Alcohol and drug use in victims of life-threatening trauma. *J Trauma* 1999;47(3):568-71. [PubMed: 10498317]
7. Cornwell EE, Belzberg H, Velmahos G, et al. The prevalence and effect of alcohol and drug abuse on cohort-matched critically injured patients. *Am Surg* 1998;64(5):461-5. [PubMed: 9585786]
8. Mathog RH, Toma V, Clayman L, et al. Nonunion of the mandible: An analysis of contributing factors. *J Oral Maxillofac Surg* 2000;58(7):746-53. [PubMed: 10883689]
9. Ogundare BO, Bonnick A, Bayley N. Pattern of mandibular fractures in an urban major trauma center. *J Oral Maxillofac Surg* 2003;61(6):713-8. [PubMed: 12796884]
10. Murphy DA, Shetty V, Resell J, Zigler C, Yamashita DD. Substance use in vulnerable patients with orofacial injury: Prevalence, correlates, and unmet service needs. *J Trauma* 2009;66(2):477-84. [PubMed: 19204524]
11. Laverick S, Patel N, Jones DC. Maxillofacial trauma and the role of alcohol. *Br J Oral Maxillofac Surg* 2008;46(7):542-6. [PubMed: 18687507]
12. Shetty V, Dent DM, Glynn S, et al. Psychosocial sequelae and correlates of orofacial injury. *Dent Clin North Am* 2003;47(1):141-57. [PubMed: 12519011]
13. Bataineh AB. Etiology and incidence of maxillofacial fractures in the north of Jordan. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 1998;86(1):31-5. [PubMed: 9690242]
14. Ellis E, Moos KF, el-Attar A. Ten years of mandibular fractures: an analysis of 2,137 cases. *Oral Surg Oral Med Oral Pathol* 1985;59(2):120-9. [PubMed: 3856795]
15. van Hoof RF, Merckx CA, Stekelenburg EC. The different patterns of fractures of the facial skeleton in four European countries. *Int J Oral Surg* 1977;6(1):3-11. [PubMed: 402321]
16. Marker P, Nielsen A, Bastian HL. Fractures of the mandibular condyle. Part 1: Patterns of distribution of types and causes of fractures in 348 patients. *Br J Oral Maxillofac Surg* 2000;38(5):417-21. [PubMed: 11010766]
17. Sojat AJ, Meisami T, Sándor GKB, et al. The epidemiology of mandibular fractures treated at the Toronto General Hospital: A review of 246 cases. *J Can Dent Assoc* 2001;67(11):640-4. [PubMed: 11841744]
18. Thornton DJA, Timmons MJ, Majumder S, et al. The impact of violent injuries on an NHS plastic surgery unit. *Ann R Coll Surg Engl* 2003;85(5):355-7. [PubMed: 14594543]

19. Gerber B, Ahmad N, Parmar S. Trends in maxillofacial injuries in women, 2000-2004. *Br J Oral Maxillofac Surg* 2009;47(5):374-7. [PubMed: 19019508]
20. Fothergill NJ, Hashemi K. A prospective study of assault victims attending a suburban A&E department. *Arch Emerg Med* 1990;7(3):172-7. [PubMed: 2152457]
21. Koorey AJ, Marshall SW, Treasure ET, et al. Incidence of facial fractures resulting in hospitalisation in New Zealand from 1979 to 1988. *Int J Oral Maxillofac Surg* 1992;21(2):77-9. [PubMed: 1602163]
22. Rix L, Stevenson AR, Punnia-Moorthy A. An analysis of 80 cases of mandibular fractures treated with miniplate osteosynthesis. *Int J Oral Maxillofac Surg* 1991;20(6):337-41. [PubMed: 1770237]
23. Allan B, Daly C. Fractures of the mandible. A 35-year retrospective study. *Int J Oral Maxillofac Surg* 1990;19(5):268-71. [PubMed: 2124596]
24. Shepherd JP, Robinson L, Levers BG. Roots of urban violence. *Injury* 1990;21(3):139-41. [PubMed: 2401543]
25. Wright J, Kariya A. Aetiology of assault with respect to alcohol, unemployment and social deprivation: A Scottish accident and emergency department case-control study. *Injury* 1997;28(5-6):369-72. [PubMed: 9764235]
26. Sims DW, Bivins BA, Obeid FN, et al. Urban trauma: a chronic recurrent disease. *J Trauma* 1989;29(7):940-7. [PubMed: 2746704]
27. Vinson DC, Borges G, Cherpitel CJ. The risk of intentional injury with acute and chronic alcohol exposures: A case-control and case-crossover study. *J Stud Alcohol* 2003;64(3):350-7. [PubMed: 12817823]
28. Serena-Gómez E, Passeri LA. Complications of mandible fractures related to substance abuse. *J Oral Maxillofac Surg* 2008;66(10):2028-34. [PubMed: 18848098]
29. Haug RH, Prather J, Indresano AT. An epidemiologic survey of facial fractures and concomitant injuries. *J Oral Maxillofac Surg* 1990;48(9):926-32. [PubMed: 2395044]
30. Lee KH. Epidemiology of mandibular fractures in a tertiary trauma centre. *Emerg Med J* 2008;25(9):565-8. [PubMed: 18723703]
31. Loiselle JM, Baker MD, Templeton JM, et al. Substance abuse in adolescent trauma. *Ann Emerg Med* 1993;22(10):1530-4. [PubMed: 8214830]
32. Hicks BA, Morris JA, Bass SM, et al. Alcohol and the adolescent trauma population. *J Pediatr Surg* 1990;25(9):944-9. [PubMed: 2213445]
33. Rivara FP, Gurney JG, Ries RK, et al. A descriptive study of trauma, alcohol, and alcoholism in young adults. *J Adolesc Health* 1992;13(8):663-7. [PubMed: 1290765]
34. Murphy DA, Shetty V, Der-Martirosian C, et al. Factors associated with orofacial injury and willingness to participate in interventions among adolescents treated in trauma centers. *J Oral Maxillofac Surg*. In press.
35. Lee KH, Snape L. Role of alcohol in maxillofacial fractures. *N Z Med J* 2008;121(1271):15-23. [PubMed: 18392058]
36. Passeri LA, Ellis E, Sinn DP. Relationship of substance abuse to complications with mandibular fractures. *J Oral Maxillofac Surg* 1993;51(1):22-5. [PubMed: 8419570]
37. Sandler NA. Patients who abuse drugs. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod* 2001;91(1):12-4. [PubMed: 11174564]
38. National Institute on Alcoholism and Alcohol Abuse. Screening for alcoholism in primary care settings. Rockville, MD: Alcohol, Drug Abuse, and Mental Health Administration; 1987.
39. Layton S, Dickenson AJ, Norris S. Maxillofacial fractures: A study of recurrent victims. *Injury* 1994;25(8):523-5. [PubMed: 7960070]
40. Redeker NS, Smeltzer SC, Kirkpatrick J, et al. Risk factors of adolescent and young adult trauma victims. *Am J Crit Care* 1995;4(5):370-8. [PubMed: 7489041]
41. Smith RS, Fry WR, Morabito DJ, et al. Recidivism in an urban trauma center. *Arch Surg* 1992;127(6):668-70. [PubMed: 1596166]
42. Kessler RC, Nelson CB, McGonagle KA, et al. The epidemiology of co-occurring addictive and mental disorders: Implications for prevention and service utilization. *Am J Orthopsychiatry* 1996;66(1):17-31. [PubMed: 8720638]

43. Wang PS, Lane M, Olfson M, et al. Twelve-Month Use of Mental Health Services in the United States: Results From the National Comorbidity Survey Replication. *Arch Gen Psychiatry* 2005;62(6):629–40. [PubMed: 15939840]
44. Cunningham JA, Sobell LC, Sobell MB, et al. Barriers to treatment: Why alcohol and drug abusers delay or never seek treatment. *Addict Behav* 1993;18(3):347–53. [PubMed: 8393611]
45. Sobell, LC.; Sobell, MB.; Toneatto, T. Recovery from alcohol problems without treatment. In: Heather, N.; Miller, WR.; Greeley, J., editors. *Self-control and the addictive behaviours*. New York: MacMillan; 1992. p. 198-242.
46. Tucker, JA.; King, MP. Resolving alcohol and drug problems: Influences on addictive behavior change and help-seeking processes. In: Tucker, JA.; Donovan, DM.; Marlatt, GA., editors. *Changing addictive behavior: Bridging clinical and public health strategies*. New York: Guilford Press; 1999. p. 97-126.
47. Grant BF. Toward an alcohol treatment model: A comparison of treated and untreated respondents with DSM-IV alcohol use disorders in the general population. *Alcohol Clin Exp Res* 1996;20(2): 372–8. [PubMed: 8730232]
48. Hingson R, Mangione T, Meyers A, et al. Seeking help for drinking problems; A study in the Boston Metropolitan Area. *J Stud Alcohol* 1982;43(3):273–88. [PubMed: 7120998]
49. Miller WR, Sovereign RG, Kreege B. Motivational interviewing with problem drinkers: II. The Drinker's Check-up as a preventive intervention. *Behavioural Psychotherapy* 1988;16(4):251–68.
50. Baekeland, F.; Lundwall, L. Engaging the alcoholic in treatment and keeping him there. In: Kissin, B.; Begleiter, H., editors. *The Biology of Alcoholism*. Vol. 5. New York: Plenum Press; 1977. p. 161-95.
51. Murphy DA, Shetty V, Zigler C, et al. Willingness of facial injury patients to change causal substance using behaviors. *Subst Abus*. In press.
52. Stewart SH, Connors GJ. Perceived health status, alcohol-related problems, and readiness to change among medically hospitalized, alcohol-dependent patients. *J Hosp Med* 2007;2(6):372–7. [PubMed: 18080338]
53. Apodaca TR, Schermer CR. Readiness to change alcohol use after trauma. *J Trauma* 2003;54(5): 990–4. [PubMed: 12777915]
54. Longabaugh R, Minugh PA, Nirenberg TD, et al. Injury as a motivator to reduce drinking. *Acad Emerg Med* 1995;2(9):817–25. [PubMed: 7584769]
55. Silver BA, Sporty LD. Behavioral correlates and staff recognition of alcohol use in a university hospital trauma service. *Psychosomatics* 1990;31(4):420–5. [PubMed: 2247571]
56. Danielsson PE, Rivara FP, Gentilello LM, et al. Reasons why trauma surgeons fail to screen for alcohol problems. *Arch Surg* 1999;134(5):564–8. [PubMed: 10323432]
57. Hungerford DW, Pollock DA, Todd KH. Acceptability of emergency department-based screening and brief intervention for alcohol problems. *Acad Emerg Med* 2000;7(12):1383–92. [PubMed: 11099429]
58. Kelly TM, Donovan JE, Chung T, et al. Alcohol use disorders among emergency department-treated older adolescents: A new brief screen (RUFT-Cut) using the AUDIT, CAGE, CRAFFT, and RAPS-QF. *Alcohol Clin Exp Res* 2004;28(5):746–53. [PubMed: 15166649]
59. Babor, TF.; Higgins-Biddle, JC.; Saunders, JB., et al. *The Alcohol Use Disorders Identification Test (AUDIT): Guidelines for Use in Primary Care*. Geneva, Switzerland: World Health Organization; 2001.
60. Humeniuk, R.; Dennington, V.; Ali, R. The effectiveness of a brief intervention for illicit drugs linked to the alcohol, smoking and substance involvement screening test (ASSIST) in primary health care settings: A technical report of phase III findings of the WHO ASSIST randomized controlled trial. Geneva, Switzerland: World Health Organization; 2008.
61. Knight JR, Sherritt L, Shrier LA, et al. Validity of the CRAFFT substance abuse screening test among adolescent clinic patients. *Arch Pediatr Adolesc Med* 2002;156(6):607–14. [PubMed: 12038895]
62. American College of Surgeons, Committee on Trauma. *Alcohol screening and brief intervention (SBI) for trauma patients*. Washington, DC: U.S. Department of Health and Human Services; 2007.

63. Knight JR, Sherritt L, Harris SK, et al. Validity of brief alcohol screening tests among adolescents: A comparison of the AUDIT, POSIT, CAGE, and CRAFFT. *Alcohol Clin Exp Res* 2003;27:67–73. [PubMed: 12544008]
64. Newcombe DAL, Humeniuk RE, Ali R. Validation of the World Health Organization Alcohol, Smoking and Substance Involvement Screening Test (ASSIST): Report of results from the Australian site. *Drug Alcohol Rev* 2005;24:217–26. [PubMed: 16096125]
65. Reinert DF, Allen JP. The Alcohol Use Disorders Identification Test (AUDIT): A review of recent research. *Alcohol Clin Exp Res* 2002;26:272–9. [PubMed: 11964568]
66. Gentilello LM, Rivara FP, Donovan DM, et al. Alcohol interventions in a trauma center as a means of reducing the risk of injury recurrence. *Ann Surg* 1999;230(4):473–83. [PubMed: 10522717]
67. Madras BK, Compton WM, Avula D, et al. Screening, brief interventions, referral to treatment (SBIRT) for illicit drug and alcohol use at multiple healthcare sites: Comparison at intake and 6 months later. *Drug Alcohol Depend* 2009;99(1-3):280–95. [PubMed: 18929451]
68. Schermer CR, Gentilello LM, Hoyt DB, et al. National survey of trauma surgeons' use of alcohol screening and brief intervention. *J Trauma* 2003;55(5):849–56. [PubMed: 14608155]
69. Smith AJ, Shepherd JP, Hodgson RJ. Brief interventions for patients with alcohol-related trauma. *Br J Oral Maxillofac Surg* 1998;36(6):408–15. [PubMed: 9881781]
70. Warburton AL, Shepherd JP. Alcohol-related violence and the role of oral and maxillofacial surgeons in multi-agency prevention. *Int J Oral Maxillofac Surg* 2002;31(6):657–63. [PubMed: 12521325]
71. Bien TH, Miller WR, Tonigan JS. Brief interventions for alcohol problems: A review. *Addiction* 1993;88(3):315–35. [PubMed: 8461850]
72. 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(13):1039–45. [PubMed: 9091691]
73. Fuller MG, Diamond DL, Jordan ML, et al. The role of a substance abuse consultation team in a trauma center. *J Stud Alcohol* 1995;56(3):267–71. [PubMed: 7623463]
74. Greber RA, Allen KM, Soeken KL, et al. Outcome of trauma patients after brief intervention by a substance abuse consultation service. *Am J Addict* 1997;6(1):38–47. [PubMed: 9097870]
75. Wilk AI, Jensen NM, Havighurst TC. Meta-analysis of randomized control trials addressing brief interventions in heavy alcohol drinkers. *J Gen Intern Med* 1997;12(5):274–83. [PubMed: 9159696]
76. Laski R, Ziccardi VB, Broder HL, et al. Facial trauma: a recurrent disease? The potential role of disease prevention. *J Oral Maxillofac Surg* 2004;62(6):685–8. [PubMed: 15170278]
77. Zazzali JL, Marshall GN, Shetty V, et al. Provider perceptions of patient psychosocial needs after orofacial injury. *J Oral Maxillofac Surg* 2007;65(8):1584–9. [PubMed: 17656287]