

# Are we missing the mark? Relationships of psychosocial issues to outcomes after injury

## A review of OTA annual meeting presentations

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### Abstract

**Objectives:** To observe the availability of information about social, emotional, and psychological factors in abstracts presented at the Orthopaedic Trauma Association (OTA) annual meeting.

**Data source:** OTA website (<https://ota.org/education/meetings-and-courses/meeting-archive/>)

**Study Selection:** All abstracts selected for paper or poster presentation at the 2016 through 2018 OTA annual meetings, as published in the final program. Studies were included if they sought to measure mental illness, substance use or abuse, pain, or other psychosocial issues. If studies utilized 1 or more patient-reported outcome measures (PROMs), they were also included.

**Data extraction:** For each abstract meeting inclusion criterion, studies were assessed for interventions intended to improve outcomes in any of the listed psychosocial domains.

**Data synthesis/Results:** Nine hundred forty-two abstracts were evaluated over a 3-year period. Of these, 294 (31.2%) met inclusion criteria. Twenty-five abstracts (8.5% of 294) reported mental illness, with depression (n=14), anxiety (n=9), and posttraumatic stress disorder (n=5) being the most common. Eighty-eight abstracts (29.9% of 294) reported substance-use of tobacco, alcohol, narcotics, and/or recreational drugs. Tobacco-use was most prevalent (n=59), followed by opioid-use (n=31). Ten abstracts reported substance abuse. Pain was measured in 95 abstracts, and 203 abstracts utilized PROMs. Thirty-five abstracts found that these psychosocial elements significantly impacted outcomes or complications. Many abstracts did not assess the influence of these factors on clinical outcomes (n=99). Sixteen studies described an intervention aimed at mitigating these features.

**Conclusions:** This study illustrates limited attention to the impact of psychological, social, and environmental factors on outcomes after orthopaedic trauma. Substance-abuse problems and mental health concerns are not only predictors of poor clinical and PROMs of pain and quality of life after injury, but have also been implicated in subsequent recidivism. Only 3% of 942 abstracts observed mental health and 1% reported substance-abuse. Moving forward, greater understanding of psychosocial issues may enhance interventions to impact long-term outcomes.

**Keywords:** injury, mental illness, outcomes, pain, PROM, substance abuse, trauma

### 1. Introduction

The effects of traumatic injury often persist following hospital discharge. As a result, clinicians have become increasingly aware of the importance of addressing psychosocial concerns including

mental illness, substance-use, pain, social support, and self-efficacy after injury. Psychiatric illness and substance-use disorders are a leading cause of disability in the United States and worldwide.<sup>[1,2]</sup> In trauma patient populations, rates of psychiatric illnesses have reportedly reached as high as 45%.<sup>[3-10]</sup> Substance use is likewise more prominent in trauma populations.<sup>[11,12]</sup> Not only have mental health disorders been linked to higher rates of complications, worse outcomes, and poor adherence, but such patients are also at higher risk for subsequent recidivism.<sup>[4,6,9,10,13-19]</sup>

Postoperative pain, narcotic use, and opioid prescription practices following orthopaedic injury have been well explored. Since opioid use has been linked with a number of adverse side effects and places patients at risk for overuse and addiction, some studies have sought to evaluate innovative means of reducing opioid use after traumatic injury.<sup>[20-24]</sup> Evidence indicates that psychiatric illness, particularly depression and anxiety, can alter pain perception and therefore may play an essential role in this relationship<sup>[3,7,9,25]</sup>

Interventions to address psychosocial issues in this population have been limited, despite contributions made by large, collaborative research groups including the Lower Extremity Assessment Project and the Major Extremity Trauma Research Consortium, through the Trauma Collaborative Care Study.<sup>[26-29]</sup> Counseling, education, and other interventions

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**Table 1**

**Report of abstracts that included some form of analysis or observation of psychosocial factors (n=294 of 942, 31%).**

	2016 accepted abstracts (%)	2017 accepted abstracts (%)	2018 accepted abstracts (%)	P value*
Total number of abstracts	287	337	318	–
Mental illness	7 (2.4%)	8 (2.4%)	12 (3.8%)	.49
Substance use	32 (11.2%)	25 (7.4%)	31 (9.8%)	.27
Substance abuse	3 (1.1%)	1 (0.3%)	6 (1.9%)	.14
Pain	34 (11.8%)	29 (8.6%)	32 (10.1%)	.41
Other psychosocial issues	6 (2.1%)	7 (2.1%)	9 (2.8%)	.77
Functional outcome scores	59 (20.6%)	82 (24.3%)	62 (19.5%)	.29

\* P values represent chi-squared tests between the 3 years of analyzed abstracts (2016–2018).

have proven beneficial in limiting opioid use<sup>[30]</sup> and in bolstering access to mental health resources.<sup>[31,27,32]</sup> The purposes of this study were to describe the frequency of information about social history and psychiatric health in abstracts presented at the OTA annual meeting and to identify opportunities for future study and intervention.

**2. Patients and methods**

Abstracts included in the final program at OTA annual meetings from 2016 through 2018 were retrospectively reviewed using the publicly assessable meeting archives: <https://ota.org/education/meetings-and-courses/meeting-archive/>. Both paper and poster presentation abstracts were included. A researcher not involved in clinical care read each of the 942 applicable abstracts for inclusion. The inclusion criterion was utilization or analysis of a psychosocial factor, namely mental illness, substance use or abuse, pain, or other concerns (e.g., satisfaction, self-efficacy, or social support). Abstracts were also included if they incorporated scores from patient-reported outcome measures (PROMs) in their methodology or results.

Each abstract was also analyzed to determine if the psychosocial variable (e.g., depression) was associated with clinical or functional outcomes (e.g., depression correlated with more revision surgeries). Abstracts that only reported functional outcomes through use of 1 or more PROMs were excluded from this analysis, as it was deemed not applicable. Presence of an

intervention to address 1 or more of these issues was also recorded.

Descriptive, univariate analyses were used to describe mental illnesses, substance use, and functional outcome questionnaires. To assess for any potential changes made over time, categorical variables in abstracts from 2016, 2017, and 2018 were compared using Chi-squared tests. In all cases,  $P < .05$  indicated a statistically significant difference between groups.

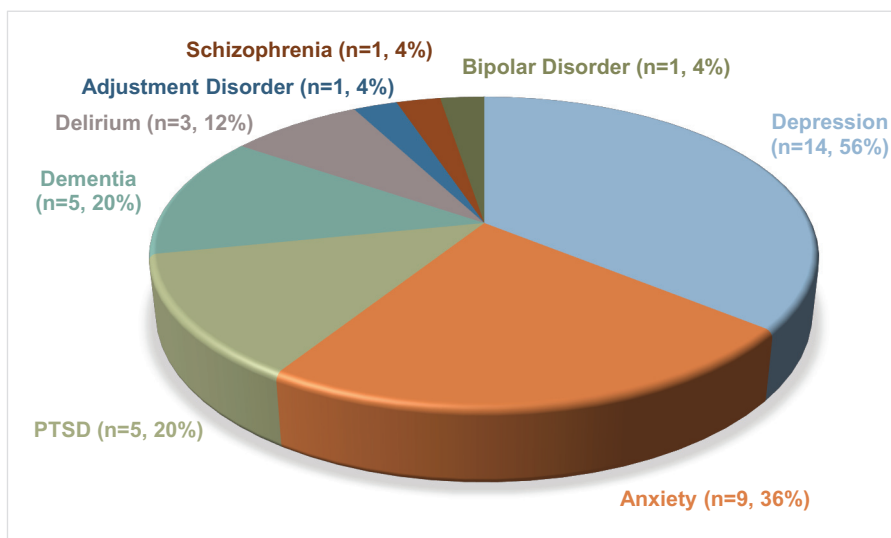
**3. Results**

**3.1. Mental illness**

Nine-hundred forty-two abstracts were assessed from 3 OTA annual meetings. Of these, 294 abstracts (31.2%) met inclusion criteria. Three percent of abstracts assessed mental illness (27 of 942). The 2018 meeting had the most abstracts that assessed or were inclusive to psychiatric illness (4% vs 2% in both 2016 and 2017) (Table 1). In these applicable abstracts, depression was the most common (n=14), followed by anxiety (n=9) and post-traumatic stress disorder (n=9) (Fig. 1).

**3.2. Substance-use and other psychosocial factors**

Reporting substance-use was more common, with 88 of 942 abstracts (9.3%), while only 10 abstracts (1.1%) measured substance abuse (Table 1). Tobacco use or smoking history was



\*Some abstracts assessed >1 mental illness. PTSD: post-traumatic stress disorder

**Figure 1.** Distribution of psychiatric disorders among abstracts reporting mental illness (n=27)\*.

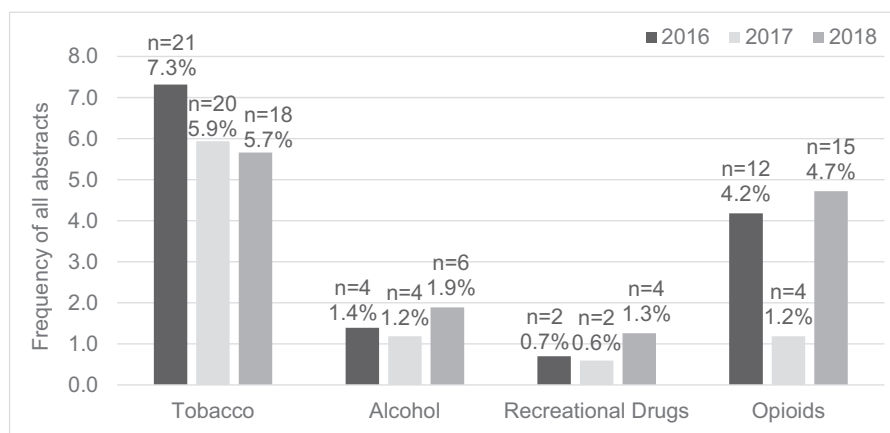


Figure 2. Breakdown of reported substances among all abstracts (n=942).

most frequently reported, with 5% to 7% of abstracts including this variable in analyses from 2016 to 2018 (Fig. 2). Opioid use was also common (31 abstracts, 3.2%). Alcohol use and recreational drug use, including marijuana, were not as common. Pain was evaluated in 95 abstracts (9.8%), typically using a visual analog scale. Other psychosocial issues were measured in 21 of the 942 abstracts (2.2%). These included resilience, social support, self-efficacy, coping, catastrophizing, and satisfaction, among other factors.

### 3.3. Functional outcomes

Functional outcome scores were used in 203 of the 942 abstracts (21.5%) and 340 surveys were used (average: 1.7 per abstract) (Table 2). Disabilities of the Arm, Shoulder, and Hand were most common (n = 51, 25% of the 203), followed by the Short form-12 or 36 (n=44, 22%), and the Musculoskeletal Function Assessment (MFA; n=42, 21%). Fifty-five distinct measures were used, with the majority looking at limb or joint-specific outcomes. See Table 2 for greater detail.

### 3.4. Effect on outcomes and use of interventions

Thirty-seven abstracts (12.6% of 294) found that these psychosocial factors had a significant (negative) impact on results or outcomes, such as complication rates or functional outcome scores (Table 3). Contrary to this, 32 abstracts (10.9%) did not identify a meaningful impact of psychosocial factors on outcomes. However, many studies did not assess the relationship between such factors and outcomes (n = 103, 35.0%). Over the 3-year period, 16 studies (5.4% of 294) described an intervention aimed at mitigating the impact of these factors. Ten of 16 interventions (62.5%) pertained to pain following injury, 4 (25%) regarded opioid use and the others addressed tobacco use, mental health or satisfaction. Two of these interventions pertained to both pain levels and opioid use.

## 4. Discussion

This study illustrates limited prior study of psychological, social, and environmental features on recovery following traumatic orthopaedic injury. A limited number of abstracts (31%) met inclusion criteria and 41% of these abstracts only used 1 or more

patient-reported functional outcome scores. Very few abstracts reported psychiatric illness (3%) or substance abuse (1%). This analysis indicates potentially unmet needs or potential outcome effects among this population and an opportune area of broad study and impact.

Approximately 10% of all abstracts (95 of 942) evaluated pain following injury. Out of all psychosocial variables assessed, pain was the most prevalent. Pain and associated medication use and prescription practices are well assessed in more recent orthopaedic literature. Ongoing investigation is still crucial to determine patients at risk for chronic pain and to mitigate associated poor outcomes and potential overuse of pain medication. Pain following orthopaedic trauma is linked with multiple psychosocial phenomenon, including but not limited to long-term disability, failure to return to work or major daily activities, and decreased satisfaction.<sup>[28,33,34]</sup> Studies have sought to understand opioid prescription and usage practices, as well as factors predicting overuse or noncompliance with prescribed pain medication, some of which are modifiable, social factors.<sup>[35,36]</sup> Ten of 16 interventions over the 3-year period sought to improve pain after orthopaedic injury, indicating that we are accurately addressing these issues.

Substance use was assessed frequently, with 9% of abstracts observing patient use of tobacco, alcohol, recreational drugs, or opioids. Substance use is more common in trauma populations and has long been identified as a major risk factor for traumatic injury and more severe injuries.<sup>[11,12,37,38]</sup> Despite some abstracts reporting substance use (9%), very few abstracts described interventions to mitigate tobacco use (2 abstracts) or opioid use (4 abstracts). No studies attempted to curtail alcohol or recreational drug use. In a large survey of over 800 orthopaedic trauma patients, McCrabb et al<sup>[39]</sup> found that despite > 75% of current smokers being somewhat or very interested in quitting smoking, less than half received advice from their surgeon to quit smoking during their hospital stay. This points to a paucity of smoking cessation interventions that are welcomed by a majority of tobacco-using orthopaedic patients.

Only 3% of the 942 total abstracts reported on or measured psychiatric illness, despite high rates (up to 45%) of psychiatric illness in trauma populations.<sup>[3-9]</sup> Depression and anxiety were mentioned most often, consistent with the reported occurrence of these disorders in trauma populations.<sup>[9]</sup> Thirteen of 27 abstracts assessed whether mental illness significantly influenced outcomes.

**Table 2****Description of patient-reported outcome measures (PROMs) used in the N=203 applicable abstracts.**

Outcome measure	Definition of acronym/outcome measure	Frequency of use	Categorization of outcome measure
DASH	Disabilities of the Arm, Shoulder and Hand	51 (25.1%)	Limb or joint specific outcomes
SF-12 or SF-36	Short Form-12 and 36	44 (21.7%)	Health-related quality of life <sup>†</sup>
MFA or SMFA	(Short) Musculoskeletal Function Assessment	42 (20.7%)	Generalized functional outcomes <sup>†</sup>
EQ-5D	EuroQol (includes EQ-5D-5L and EQ-5D-3L)	34 (16.7%)	Health-related quality of life
PROMIS	Patient-Reported Outcomes Measurement Information System	25 (12.3%)	Generalized functional outcomes <sup>†</sup>
MEPS	Mayo Elbow Performance Score	11 (5.4%)	Limb or joint specific outcomes
OMAS	Olerud-Molander Ankle Score	10 (4.9%)	Limb or joint specific outcomes
PRWE	Patient-Related Wrist Evaluation	8 (3.9%)	Limb or joint specific outcomes
HSS	Harris Hip Score	8 (3.9%)	Limb or joint specific outcomes
AOFAS	American Orthopedic Foot and Ankle Score	7 (3.4%)	Limb or joint specific outcomes
FFI	Foot Function Index	7 (3.4%)	Limb or joint specific outcomes
WOMAC	Western Ontario McMaster OA Index	6 (3%)	Limb or joint specific outcomes
FAOS	Foot and Ankle Outcome Score	6 (3%)	Limb or joint specific outcomes
PCS	Pain Catastrophizing Scale	5 (2.5%)	Psychosocial outcomes
Constant	Constant Shoulder Score or Constant Murley Score	5 (2.5%)	Limb or joint specific outcomes
OHS	Oxford Hip Score	5 (2.5%)	Limb or joint specific outcomes
UCLA	UCLA Shoulder Score	5 (2.5%)	Limb or joint specific outcomes
MPS	Majeed Pelvic Score	4 (2%)	Limb or joint specific outcomes
KOOS	Knee Injury Osteoarthritis Outcome Score	4 (2%)	Limb or joint specific outcomes
PHQ9	Patient Health Questionnaire	4 (2%)	Psychosocial outcomes
PODCI	Pediatric Outcomes Data Collection Instrument	3 (1.5%)	Generalized functional outcomes
PedsQL	Pediatric Quality of Life Inventory	2 (1%)	Health-related quality of life
Q-TFA	Questionnaire for persons with a Trans-Femoral Amputation	2 (1%)	Limb or joint specific outcomes
OES	Oxford elbow score	2 (1%)	Limb or joint specific outcomes
TSK-11	Tampa Scale for Kinesiophobia	2 (1%)	Limb or joint specific outcomes
PSEQ	Pain self-efficacy questionnaire	2 (1%)	Psychosocial outcomes
FADI	Foot and Ankle Disability Index	2 (1%)	Limb or joint specific outcomes
LEFS	Lower Extremity Functional Scale	2 (1%)	Limb or joint specific outcomes
iHOT	International Hip Outcome Tool	2 (1%)	Limb or joint specific outcomes
ASES	American Shoulder and Elbow Surgeons Shoulder Score	2 (1%)	Limb or joint specific outcomes
BDI	Beck Depression Inventory	2 (1%)	Psychosocial outcomes
PCL	PTSD Checklist	2 (1%)	Psychosocial outcomes
MOXFQ	Manchester-Oxford Foot Questionnaire	2 (1%)	Limb or joint specific outcomes
Other	Includes 22 questionnaires/scores that were only used once*	22 (10.8%)	

\* Other surveys include: ASAMI=Study and Application of Methods of Ilizarov, AUDIT=Alcohol Use Disorders Identification Test, CAS=Clinical Anxiety Scale, DAST-10=Drug Abuse Screening Test, ECS=Effective Consumer Scale, FAAM=Foot and Ankle Ability Measure, FAST=Functional Assessment Screening Tool, HADS=Hospital Depression and Anxiety Scale, HOOS=Hip Disability and Osteoarthritis Outcome Score, MAH=Merle d'Aubigne Hip Score, MFS=Maryland Foot Score, OSS=Oxford Shoulder Score, PAM=Patient Activation Measure, PEM=Patient Evaluation Measure, PS-18=Patient Satisfaction, SANE=Single Assessment Numerical Evaluation, SPOC=Somatic Pre-Occupation and Coping Questionnaire, SS-KDC=International Knee Documentation Committee Score, STAI=State Trait Anxiety Inventory, UEFI=Upper Extremity Functional Index, VR-12=Veterans Rand 12 Item Health Survey.

<sup>†</sup> Generalized outcome surveys that include a mental health component.

**Table 3****Assessment of impact of psychosocial variables on outcomes and use of interventions in applicable abstracts (n=294 of 942).**

	2016 accepted abstracts (%)	2017 accepted abstracts (%)	2018 Accepted Abstracts (%)	P value <sup>*</sup>
Number of applicable abstracts	90 (31%)	108 (32%)	96 (30%)	.87
Psychosocial element had a significant impact on clinical or functional outcomes:				
Yes	9 (10%)	15 (14%)	13 (14%)	.68
No	8 (9%)	12 (11%)	12 (13%)	.73
Not assessed	38 (42%)	30 (28%)	35 (36%)	.10
Not applicable <sup>†</sup>	35 (39%)	51 (47%)	36 (38%)	.32
Was there an intervention?				.09
Yes	7 (8%)	2 (2%)	7 (7%)	
No	83 (92%)	106 (98%)	89 (93%)	
Type of intervention				
Tobacco use	1 (14%)	0 (0%)	1 (14%)	.54
Pain	6 (86%)	0 (0%)	4 (57%)	.02
Opioid use	0 (0%)	1 (50%)	3 (43%)	.22
Mental health	0 (0%)	1 (50%)	0 (0%)	1.00
Other	0 (0%)	0 (0%)	1 (14%)	.65

\* P values represent Chi-squared tests between the 3 years of analyzed abstracts (2016–2018).

<sup>†</sup> "Not applicable" was used to describe abstracts that only included functional outcome scores and no other assessment of psychosocial variables.

Of these, 7 of 13 (54%) observed substantial negative effects, including more complications, worse physical function, and greater resource utilization. These results are in keeping with existing evidence indicating that psychiatric illness is both associated with and a predictor of complications, lower satisfaction, and worse functional outcomes following orthopaedic injury.<sup>[6,8,9,17–19,28]</sup>

Some studies have highlighted the complex relationship between chronic pain and mental illness. Pain is common after orthopaedic injury and operative treatment, can foster anxiety, catastrophizing, and new or worsening mental illness.<sup>[40,41]</sup> In turn, psychiatric illness predominates in populations with chronic pain, though the causal relationship between the two is not necessarily clear.<sup>[42,43]</sup> Comorbidity of chronic pain and depression is associated with worse outcomes, such as reduced function and poor treatment response, compared with situations where only 1 condition is present.<sup>[44,45]</sup> Ten abstracts (1% of 942) measured some form of psychiatric illness and pain. Future in-depth investigation of these frequently intertwined psychosocial hurdles is pertinent.

The strength of this paper is the attention to a topic that has been minimally addressed in prior trauma literature, and one that appears to play a critical role in recovery. However, due to the retrospective nature of this analysis, the authors cannot be sure that these psychosocial phenomena were not touched upon in the full presentation format (whether paper or poster). The authors posit, however, that if these variables or factors were a prominent component of the study, they should be mentioned in the abstract. This study is limited by the subjective nature of analysis as well. Only 1 researcher assessed the abstracts for inclusion and therefore interobserver reliability cannot be determined. Finally, only accepted abstracts were assessed, and therefore the authors cannot speak to the submitted studies that may have touched upon these topics but were not selected for poster or paper presentation.

Topics at the OTA annual meeting covers a wide range of basic and clinical topics, many of which would not be expected to include measurements of social, psychological, and functional aspects of recovery. Nevertheless, according to major research collaborations, investigation of psychological, social, and environmental subject matter remains limited in orthopaedic trauma literature. This is despite recent association of self-efficacy, social support, pain, substance abuse, and other mental illness with outcomes after trauma.<sup>[26–29]</sup> This trend is accurately portrayed by the low representation of these topics at the OTA annual meeting over the past 3 years. Of a variety of psychosocial features assessed including mental illness, substance use and pain, the latter 2 were substantially more common (included in 9% and 10% of abstracts, respectively). Psychiatric illness and “other” psychosocial elements such as self-efficacy, social support, coping, and resilience were far less common. Given the subsequent publication rate for 66% of OTA presentations, there exists great potential for future high-quality studies to incorporate psychosocial data to promote extensive impact in these domains that broadly affect patients after traumatic injury.<sup>[46]</sup>

## References

- Wainberg ML, Scorza P, Shultz JM, et al. Challenges and opportunities in global mental health: a research-to-practice perspective. *Curr Psychiatry Rep.* 2017;19:28.
- Whiteford HA, Degenhardt L, Rehm J, et al. Global burden of disease attributable to mental and substance use disorders: findings from the global burden of disease study 2010. *Lancet.* 2013;382:1575.
- Becher S, Smith M, Ziran B. Orthopaedic trauma patients and depression: a prospective cohort. *J Orthop Trauma.* 2014;28:e242–e246.
- Wan JJ, Morabito DJ, Khaw L, et al. Mental illness as an independent risk factor for unintentional injury and injury recidivism. *J Trauma.* 2006;61:1299–1304.
- Vranceanu AM, Bachoura A, Weening A, et al. Psychological factors predict disability and pain intensity after skeletal trauma. *J Bone Joint Surg Am.* 2014;96:e20.
- Muscattelli S, Spurr H, O'Hara NN, et al. Prevalence of depression and posttraumatic stress disorder after acute orthopaedic trauma: a systematic review and meta-analysis. *J Orthop Trauma.* 2017;31:47–55.
- Crichlow RJ, Andres PL, Morrison SM, et al. Depression in orthopaedic trauma patients. Prevalence and severity. *J Bone Joint Surg Am.* 2006;88:1927–1933.
- Kugelmann D, Qatu A, Haglin J, et al. Impact of psychiatric illness on outcomes after operatively managed tibial plateau fractures (OTA-41). *J Orthop Trauma.* 2018;32:e221–e225.
- Weinberg DS, Narayanan AS, Boden KA, et al. Psychiatric illness is common among patients with orthopaedic polytrauma and is linked with poor outcomes. *J Bone Joint Surg Am.* 2016;98:341–348.
- Koleszar JC, Childs BR, Vallier HA. The prevalence of recidivism in trauma patients. *Orthopaedics.* 2016;39:300–306.
- Vitesnikova J, Dinh M, Leonard E, et al. Use of AUDIT-C as a tool to identify hazardous alcohol consumption in admitted trauma patients. *Injury.* 2014;45:1440–1444.
- Levy RS, Hebert CK, Munn BG, et al. Drug and alcohol use in orthopedic trauma patients: a prospective study. *J Orthop Trauma.* 1996;10:21–27.
- Aaron DL, Fadale PD, Harrington CJ, et al. Posttraumatic stress disorders in civilian orthopaedics. *J Am Acad Orthop Surg.* 2011;19:245–250.
- Brooke BS, Efron DT, Chang DC, et al. Patterns and outcomes among penetrating trauma recidivists: it only gets worse. *J Trauma.* 2006;61:16–19.
- Caufield J, Singhal A, Moulton R, et al. Trauma recidivism in a large urban Canadian population. *J Trauma.* 2004;57:872–876.
- Kronenberg C, Doran T, Goddard M, et al. Identifying primary care quality indicators for people with serious mental illness: a systematic review. *Br J Gen Pract.* 2017;67:e519–e530.
- Rosenberger PH, Jokl P, Ickovics J. Psychosocial factors and surgical outcomes: an evidence-based literature review. *J Am Acad Orthop Surg.* 2006;14:397–405.
- Yeoh JC, Pike JM, Slobogean GP, et al. Role of depression in outcomes of low-energy distal radius fractures in patients older than 55 years. *J Orthop Trauma.* 2016;30:228–324.
- Simske NM, Audet MA, Kim CY, et al. Mental illness is associated with more pain and worse functional outcomes after ankle fracture. *OTA International.* 2019:e037, in print.
- Benyamin R, Trescot AM, Datta S, et al. Opioid complications and side effects. *Pain Physician.* 2008;11 (2 suppl):S105–S120.
- Manchikanti L, Cash KA, Damron KS, et al. Controlled substance abuse and illicit drug use in chronic pain patients: an evaluation of multiple variables. *Pain Physician.* 2006;9:215–225.
- Gangavalli A, Malige A, Terres G, et al. Misuse of opioids in orthopaedic postoperative patients. *J Orthop Trauma.* 2017;31:e103–e109.
- Castillo RC, Raja SN, Frey KP, et al. Improving pain management and long-term outcomes following high-energy orthopaedic trauma (Pain study). *J Orthop Trauma.* 2017;31:S71–S77.
- Seymour RB, Ring D, Higgins T, et al. Leading the way to solutions to the opioid epidemic: AOA critical issues. *J Bone Joint Surg Am.* 2017;99:e113.
- Beleckas CM, Prather H, Guattery J, et al. Anxiety in the orthopedic patient: using PROMIS to assess mental health. *Qual Life Res.* 2018;27:2275–2282.
- Wegener ST, Pollak AN, Frey KP, et al. METRCThe Trauma Collaborative Care Study (TCCS). *J Orthop Trauma.* 2017;31 (suppl 1):S78–S87.
- Wegener ST, Carroll EA, Gary JL, et al. Major Extremity Trauma Research Consortium (METRC). Trauma collaborative care intervention: effect on surgeon confidence in managing psychosocial complications after orthopaedic trauma. *J Orthop Trauma.* 2017;31:427–433.
- O'Toole RV, Castillo RC, Pollak AN, et al. LEAP Study Group. Determinants of patient satisfaction after severe lower-extremity injuries. *J Bone Joint Surg Am.* 2008;90:1206–1211.

29. Castillo RC, Huang Y, Scharfstein D, et al. METRC Association between 6-week postdischarge risk classification and 12-month outcomes after orthopedic trauma. *JAMA Surg.* 2018;19:e184824.
30. Holman JE, Stoddard GJ, Horwitz DS, et al. The effect of preoperative counseling on duration of postoperative opiate use in orthopaedic trauma surgery: a surgeon-based comparative cohort study. *J Orthop Trauma.* 2014;28:502–506.
31. Castillo RC, Wegener ST, Newell MZ, et al. Improving outcomes at Level 1 trauma centers: an early evaluation of the trauma survivors network. *J Trauma Acute Care Surg.* 2013;74:1534–1540.
32. Greden JF, Valenstein M, Spinner J, et al. Buddy-to-buddy, a citizen soldier peer support program to counteract stigma, PTSD, depression, and suicide. *Ann N Y Acad Sci.* 2010;1208:90–97.
33. Bosse MJ, MacKenzie EJ, Kellam JF, et al. An analysis of outcomes of reconstruction or amputation after leg-threatening injuries. *N Engl J Med.* 2002;347:1924–1931.
34. Castillo RC, MacKenzie EJ, Webb LX, et al. Use and perceived need of physical therapy following severe lower-extremity trauma. *Arch Phys Med Rehabil.* 2005;86:1722–1728.
35. Gangavalli AK, Malige A, Rehman S, et al. Patient comprehension and compliance survey to assess postoperative pain regimens in the orthopaedic trauma population. *J Orthop Trauma.* 2017;31:e190–e194.
36. Flanagan CD, Wysong EF, Ramey JS, et al. Understanding the opioid epidemic: factors predictive of inpatient and postdischarge prescription opioid use after orthopaedic trauma. *J Orthop Trauma.* 2018;32:e408–e414.
37. Lindenbaum GA, Carroll SF, Daskal I, et al. Patterns of alcohol and drug abuse in an urban trauma center: the increasing role of cocaine abuse. *J Trauma.* 1989;29:1654–1658.
38. Ward RE, Flynn TL, Miller PW, et al. Effects of ethanol ingestion on the severity and outcome of trauma. *Am J Surg.* 1982;144:153–157.
39. McCrabb S, Baker AL, Attia J, et al. Smoking, quitting and the provision of smoking cessation support: a survey of orthopaedic trauma patients. *J Orthop Trauma.* 2017;31:e255–e262.
40. Castillo RC, Wegener ST, Heins SE, et al. Longitudinal relationships between anxiety, depression, and pain: Results from a two-year cohort study of lower extremity trauma patients. *Pain.* 2013;154:2860–2866.
41. Lee CH, Choi CH, Yoon SY, et al. Posttraumatic stress disorder associated with orthopaedic trauma: a study in patients with extremity fractures. *J Orthop Trauma.* 2015;29:e198–e202.
42. Bennun IS, Bell P. Psychological consequences of road traffic accidents. *Med Sci Law.* 1999;39:167–172.
43. Connaughton J, Patman S, Pardoe C. Are there associations among physical activity, fatigue, sleep quality and pain in people with mental illness? A pilot study. *J Psychiatr Ment Health Nurs.* 2014;21:738–745.
44. Bair MJ, Robinson RL, Katon W, et al. Depression and pain comorbidity: a literature review. *Arch Intern Med.* 2003;163:2433–2445.
45. Holmes A, Christelis N, Arnold C. Depression and chronic pain. *Med J Aust.* 2013;199:S17–S20.
46. Lee R, Mamidi GA, Cohen JS, et al. Current publication rates of abstracts presented at the Orthopaedic Trauma Association Annual Meetings 2005-2010. *J Orthop Trauma.* 2018;32:e171–e175.