


# Implementation of a novel daily performance improvement checklist (PIC) improves alcohol screening and intervention compliance in trauma

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## ABSTRACT

**Introduction** Screening, brief intervention, and referral to treatment (SBIRT) has demonstrated up to 50% reduction in alcohol-related traumatic injury and is mandated by the American College of Surgeons for trauma center accreditation. While SBIRT effectiveness has been previously investigated, optimal implementation in the trauma setting has not. We sought to improve SBIRT compliance through integration of screening into a performance improvement checklist (PIC) deployed during morning report. We hypothesized that PIC would establish a self-sustaining model for improved alcohol screening/intervention.

**Methods** This was a retrospective study comparing trauma patients pre-PIC (January–May 2022) to post-PIC (January–May 2023) after PIC implementation in January 2023. The primary outcome was SBIRT performance. The PIC prompted alcohol intervention specialist consultation if blood alcohol content >80 mg/dL, <21 years old, or Alcohol Use Disorders Identification Test ≥8. Significance was determined if  $p < 0.05$ .

**Results** There were 705 pre-PIC and 840 post-PIC patients. Pre-PIC unscreened patients were more often uninsured (13% vs. 25%,  $p < 0.01$ ) and black (8% vs. 14%,  $p = 0.02$ ) compared with screened pre-PIC patients. There were no significant differences among screened versus unscreened patients after PIC with respect to age, sex, race, or ethnicity ( $p > 0.05$ ). Overall, screening improved pre-PIC to post-PIC (52% vs. 88%,  $p < 0.01$ ) and the percentage of patients who screened positively also increased after PIC (8% vs. 23%,  $p < 0.01$ ). Brief intervention was unchanged (83% vs. 81%,  $p = 1$ ).

**Conclusion** The PIC is a novel tool that demonstrated improved alcohol screening and referral. It improved compliance with SBIRT and reduced implicit bias in the population screened. Utilization of a PIC is easily translatable to other centers and could become a national standard to advance performance improvement.

**Level of evidence** IV.

## INTRODUCTION

Nearly one-third of trauma patients have an elevated blood alcohol level at the time of admission.<sup>1</sup> Recent literature suggests an association between recurrent incidents of traumatic injury and alcohol, with evidence that nearly 40% of trauma *reinjury* is related to alcohol use.<sup>2</sup> Hospital admission may serve as a potential avenue to initiate ethanol abuse

## WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Screening, brief intervention, and referral to treatment has demonstrated improvements in alcohol-related traumatic injuries and is therefore mandated for American College of Surgeons trauma center accreditation. Consistent compliance is challenging and there is no standard implementation protocol across centers. It is therefore critical to identify strategies which can be easily translatable across centers to achieve this metric.

## WHAT THIS STUDY ADDS

⇒ A performance improvement checklist (PIC) was implemented during trauma morning report. The PIC ensured Peer Recovery consultation for any patient with blood alcohol level above the legal limit, significantly improving compliance with alcohol misuse screening.

## HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The PIC used in this study is easily adaptable to other centers and other quality improvement initiatives. It is low cost and straightforward to implement. It also reduces the potential for implicit bias by universalizing screening.

treatment, thereby reducing future alcohol-related injuries.<sup>3</sup> Interventions delivered during hospitalization have been shown to decrease overall alcohol use, as well as the likelihood of alcohol-related injury for several months after discharge.<sup>4–6</sup>

Screening, brief intervention, and referral to treatment (SBIRT) is a comprehensive, evidence-based approach to identify and deliver care to individuals with substance use disorders.<sup>7</sup> It has been well documented that providing SBIRT for alcohol use in the emergency setting reduces rates of alcohol intake, and reduces issues such as trauma *reinjury* and driving under the influence offenses. SBIRT has also been shown to minimize healthcare costs.<sup>8,9</sup> Given its impact on alcohol-related traumatic injury, SBIRT is mandated by the American College of Surgeons (ACS) for level 1 trauma center accreditation. Compliance is required in at least 80% of trauma patients.<sup>4,10</sup> The effectiveness of SBIRT in emergency departments and primary care settings has been thoroughly examined; however,

optimal implementation in the trauma setting has not been established.<sup>4,5</sup>

Our institution, like many others, struggled with consistent screening for alcohol use disorder. Inspired by the success of checklist utilization in aviation and other medical and surgical fields,<sup>11</sup> we sought to tackle this challenge by instituting a performance improvement checklist (PIC). The PIC was incorporated into our morning service handoff, which included initial screening of patients for blood alcohol content (BAC). We hypothesized that the creation of a PIC standardizing SBIRT into the daily team sign-out would result in improved screening and intervention for alcohol misuse in the setting of traumatic injury.

## METHODS

A PIC was created to ensure compliance with several trauma performance improvement (PI) initiatives, including alcohol abuse screening, intimate partner violence screening/intervention, tertiary survey compliance, geriatric consultation, and others (online supplemental appendix A). The PIC was incorporated into the daily trauma morning report in January 2023. Morning report is a daily conference, attended by attending surgeons, surgical critical care fellows, surgical residents, advanced practice nurses and medical students on the surgical critical care, trauma surgery and emergency general surgery services, in which new patients and other service-related concerns are discussed. As each patient is presented, every item on the PIC is addressed, orders are placed in real time as appropriate by the trauma surgery team. SBIRT compliance is specifically targeted during morning report. The PIC tackles alcohol abuse by identifying new trauma patients with a BAC above the legal limit (80 mg/dL) or those under the age of 21

with a positive BAC and referring them to the Peer Recovery Service. Peer Recovery is available 7 days/week and is a team of alcohol and substance abuse intervention specialists who provide resources for patients with alcohol or substance misuse disorders.

Prior to PIC, referral to Peer Recovery was dependent only on Alcohol Use Disorders Identification Test (AUDIT-C) screening (table 1).<sup>12</sup> At our hospital, this tool is administered by nursing at admission along with other general intake questions. The questionnaire is a two-part screening algorithm in which patients scoring 8 or higher are referred to Peer Recovery.<sup>12</sup> Those with negative BAC screening but positive AUDIT-C were also referred to Peer Recovery after PIC implementation.

We performed a retrospective review of the impact of this PI initiative at an urban academic level 1 trauma center. BAC was obtained as part of the admission labs for trauma patients. All trauma patients admitted between January and May 2022 were included in the pre-PIC group. After PIC implementation, patients admitted between January and May 2023 were included in the post-PIC group for analysis. Patients were excluded if there were insufficient data available for sufficient chart review.

Patient demographic and injury data including age, sex, self-identified race and ethnicity, mechanism of injury, and Injury Severity Score (ISS) were collected. Additionally, hospital-related data including length of stay (LOS), intensive care unit (ICU) LOS, admission BAC, AUDIT-C screening results, and discharge disposition were gathered for analysis. Univariate analysis of data was performed using Fisher's exact test and Mann-Whitney U test. Significance was determined if  $p < 0.05$ .

**Table 1** AUDIT scoring<sup>12</sup>

AUDIT-C					
	0	1	2	3	4
How often do you have a drink containing alcohol?	Never	Monthly or less	2–4 times per month	2–3 times per week	4+ times per week
How many units of alcohol do you drink on a day when you drink?	1–2	3–4	5–6	7–9	10+
How often in the last year have you had $\geq 6$ (F)/ $\geq 8$ (M) units?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
<i>If total is 5 or more, proceed to AUDIT questions below.</i>					
AUDIT questions					
	0	1	2	3	4
How often during the last year have you found you were not able to stop drinking once you started?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you failed to do what was normally expected because of drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you needed an alcoholic drink in the morning to get yourself going after a heavy drinking session?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you have a feeling of guilt/remorse after drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
How often during the last year have you been unable to remember what happened that night before you were drinking?	Never	Less than monthly	Monthly	Weekly	Daily or almost daily
Have you or somebody else been injured as a result of your drinking?	No		Yes, but not in the last year		Yes, in the last year
Has a relative or friend, doctor, or other health worker been concerned about your drinking or suggested you cut down?	No		Yes, but not in the last year		Yes, in the last year
<i>Add AUDIT-C+AUDIT scores.</i>					
0–7: Low risk					
8–15: Increasing risk					
16–19: Higher risk					
20+: Possible dependence					
AUDIT-C, Alcohol Use Disorders Identification Test.					

**Table 2** Patient data pre-PIC vs. post-PIC

	Pre-PIC (n=705)	Post-PIC (n=840)	P value
Age, median (IQR)	54 (32, 74)	55 (33, 74)	0.634
Uninsured	134 (19%)	256 (30%)	<b>&lt;0.001</b>
Sex			
Female	243 (35%)	308 (37%)	0.394
Male	462 (66%)	532 (63%)	
Race			
African American	77 (11%)	104 (12%)	0.383
Asian	53 (7%)	59 (7%)	0.768
Caucasian	311 (44%)	275 (33%)	<b>&lt;0.001</b>
Native Hawaiian/Pacific Islander	6 (0.8%)	1 (0.1%)	0.052
Other	258 (37%)	383 (46%)	<b>&lt;0.001</b>
Ethnicity			
Hispanic	81 (11%)	209 (25%)	<b>&lt;0.001</b>
Non-Hispanic	624 (89%)	587 (70%)	<b>&lt;0.001</b>
ISS, median (IQR)	9 (4, 14)	9 (4, 13)	0.085
LOS, median (IQR)	2 (1, 5)	2 (1, 5)	0.161
ICU LOS, median (IQR)	3 (2, 5)	3 (0, 1)	0.381
Mechanism of injury			
Fall	300 (43%)	384 (46%)	0.218
Motor vehicle collision	201 (29%)	240 (29%)	1
Pedestrian struck	80 (11%)	72 (9%)	0.072
Motorcycle collision	29 (4%)	35 (4%)	1
Stabbing	29 (4%)	26 (3%)	0.335
Assault	20 (3%)	38 (4%)	0.106
Gunshot wound	15 (2%)	14 (2%)	0.574
Other	27 (4%)	31 (4%)	0.894
Discharge disposition			
Home	472 (67%)	588 (70%)	0.206
Rehabilitation facility	113 (16%)	125 (15%)	0.571
Skilled nursing facility	48 (7%)	59 (7%)	0.920
Morgue	43 (6%)	35 (4%)	0.102
Hospice	7 (1%)	8 (1%)	1
Psychiatric facility	6 (0.8%)	8 (1%)	1
Left against medical advice	12 (2%)	14 (2%)	1
Other	4 (0.6%)	3 (0.4%)	0.709

Bolded values denote statistically significant results  
 ICU, intensive care unit; ISS, Injury Severity Score; LOS, length of stay; PIC, performance improvement checklist.

**Table 3** Patient data pre-PIC

	Screened (n=364)	Unscreened (n=341)	P value
Age, median (IQR)	58 (39, 74)	48 (26, 72)	<b>&lt;0.001</b>
Uninsured	49 (13%)	85 (25%)	<b>&lt;0.001</b>
Sex			
Female	119 (33%)	124 (36%)	0.341
Male	245 (67%)	217 (64%)	
Race			
African American	30 (8%)	47 (14%)	<b>0.021</b>
Asian	29 (8%)	24 (7%)	0.670
Caucasian	169 (46%)	142 (42%)	0.225
Native Hawaiian/Pacific Islander	4 (1%)	2 (0.6%)	0.687
Other	132 (36%)	126 (37%)	0.876
Ethnicity			
Hispanic	38 (10%)	43 (13%)	0.409
Non-Hispanic	326 (89%)	298 (87%)	0.409
ISS, median (IQR)	10 (5, 14)	5 (1, 13)	<b>&lt;0.001</b>
LOS, median (IQR)	3 (1, 6)	1 (1, 4)	<b>&lt;0.001</b>
ICU LOS, median (IQR)	3 (2, 5)	3 (2, 6)	0.051
Mechanism of injury			
Fall	163 (45%)	137 (40%)	0.223
Motor vehicle collision	106 (29%)	95 (28%)	0.739
Pedestrian struck	37 (10%)	43 (13%)	0.342
Motorcycle collision	14 (4%)	15 (4%)	0.650
Stabbing	15 (4%)	14 (4%)	1
Assault	9 (2%)	11 (3%)	0.652
Gunshot wound	7 (2%)	8 (2%)	0.797
Other	10 (3%)	17 (5%)	0.169
Discharge disposition			
Home	235 (65%)	237 (69%)	0.174
Rehabilitation facility	88 (24%)	25 (7%)	<b>&lt;0.001</b>
Skilled nursing facility	22 (6%)	26 (8%)	0.456
Morgue	8 (2%)	35 (10%)	<b>&lt;0.001</b>
Hospice	4 (1%)	3 (0.9%)	1
Psychiatric facility	2 (0.6%)	4 (1%)	0.437
Left against medical advice	3 (0.8%)	9 (3%)	0.081
Other	2 (0.6%)	2 (0.6%)	1

Bolded values denote statistically significant results  
 ICU, intensive care unit; ISS, Injury Severity Score; LOS, length of stay; PIC, performance improvement checklist.

**RESULTS**

Before PIC, January–May 2022, there were 705 patients admitted to the trauma service, and after PIC, January–May 2023, there were 840 patients. The median age was similar between groups (pre-PIC: 54 years (IQR 32, 74) vs. post-PIC: 55 years (IQR 33, 74),  $p=0.634$ ). Most patients were male in both pre-PIC (66%) and post-PIC (63%) cohorts ( $p=0.394$ ). There was no difference in mechanism of injury, ISS, LOS, ICU LOS, nor discharge disposition before or after PIC implementation (all,  $p>0.05$ ). There were significantly more Caucasian patients in the pre-PIC compared with post-PIC groups (44% vs. 33%,  $p<0.01$ ). There were significantly more patients who identified as ‘other’ race (46% vs. 37%,  $p<0.01$ ) in the post-PIC cohort. More patients in the pre-PIC cohort were insured (82% vs. 69%,  $p<0.01$ ) (table 2).

Before PIC, 364 patients (52%) were screened for alcohol misuse using AUDIT-C and brief intervention was performed in 83% of those who screened positively. When comparing

screened versus unscreened pre-PIC patients, fewer uninsured (13% vs. 25%,  $p<0.01$ ) and African American patients (8% vs. 14%,  $p=0.02$ ) were screened for alcohol use disorder. There was no difference in screening rates by sex or ethnicity ( $p>0.05$ ). ISS was higher (10 (IQR 5, 14) vs. 5 (IQR 1, 13),  $p<0.01$ ) and LOS longer (3 days (IQR 2, 5) vs. 1 day (IQR 1, 4),  $p<0.01$ ) in the screened versus unscreened pre-PIC groups. Mechanism of injury was comparable between screened and unscreened patients in this cohort ( $p>0.05$ ) (table 3).

After PIC, 742 patients (88%) were screened for using BAC and/or AUDIT-C. There were no significant differences among screened versus unscreened patients after PIC with respect to age, sex, race, or ethnicity ( $p>0.05$ ). Rates of screening were also comparable regardless of injury severity and mechanism of injury ( $p>0.05$ ). Hospital and ICU LOS were similar across the post-PIC cohort ( $p>0.05$ ) (table 4).

When comparing pre-PIC and post-PIC groups, screening improved from 52% to 88% ( $p<0.01$ ). The percentage of

**Table 4** Patient data post-PIC

	Screened (n=742)	Unscreened (n=98)	P value
Age, median (IQR)	54 (34, 73)	60.5 (28, 81)	0.599
Uninsured	234 (31%)	22 (22%)	0.079
Sex			
Female	266 (36%)	42 (43%)	0.182
Male	476 (64%)	56 (57%)	
Race			
African American	91 (12%)	13 (13%)	0.745
Asian	51 (7%)	8 (8%)	0.673
Caucasian	245 (33%)	30 (31%)	0.731
Native Hawaiian/Pacific Islander	1 (0.1%)	0 (0%)	1
Other	340 (46%)	43 (44%)	0.747
Ethnicity			
Hispanic	189 (25%)	20 (20%)	0.320
Non-Hispanic	518 (70%)	69 (70%)	1
ISS, median (IQR)	9 (4, 13)	9 (4, 14)	0.395
LOS, median (IQR)	2 (1, 4.75)	2 (1, 5)	0.279
ICU LOS, median (IQR)	3 (2, 4)	3 (2, 4)	0.873
Mechanism of injury			
Fall	333 (45%)	51 (52%)	0.196
Motor vehicle collision	217 (29%)	23 (23%)	0.284
Pedestrian struck	60 (8%)	12 (12%)	0.178
Motorcycle collision	31 (4%)	4 (4%)	1
Stabbing	25 (3%)	1 (1%)	0.348
Assault	36 (5%)	2 (2%)	0.300
Gunshot wound	13 (2%)	1 (1%)	1
Other	27 (4%)	4 (4%)	0.776
Discharge disposition			
Home	534 (72%)	54 (55%)	<b>0.001</b>
Rehabilitation facility	104 (14%)	21 (21%)	0.068
Skilled nursing facility	47 (6%)	12 (12%)	0.054
Morgue	29 (4%)	6 (6%)	0.284
Hospice	5 (0.7%)	3 (3%)	0.056
Psychiatric facility	7 (0.9%)	1 (1%)	1
Left against medical advice	13 (2%)	1 (1%)	1
Other	3 (0.4%)	0 (0%)	1

Bolded values denote statistically significant results  
ICU, intensive care unit; ISS, Injury Severity Score; LOS, length of stay; PIC, performance improvement checklist.

patients who screened positively also increased after PIC (8% vs. 23%,  $p < 0.01$ ). Brief intervention by Peer Recovery occurred at similar rates in both the pre-PIC and post-PIC cohorts (83% vs. 81%,  $p = 1$ ) (figure 1).

## DISCUSSION

This study found that implementing a daily PIC resulted in the significant improvement of a targeted trauma PI metric, SBIRT utilization, and alcohol screening. We also found that unrealized disparities in care were improved after PIC deployment, as uninsured and African American patients were being screened less frequently before PIC than after PIC.

SBIRT is an important and effective strategy for reducing risky alcohol use and trauma *reinjury*.<sup>3 13</sup> Hospitalization after trauma offers a unique opportunity to implement SBIRT as it capitalizes on the ‘teachable moment’, especially if the injury is alcohol related. There is no standard method for SBIRT employment; however, many institutions, including our own, employ

the AUDIT-C tool. We also use a Peer Recovery Service to deliver brief intervention and treatment referral after positive AUDIT-C and/or BAC screening. This team is composed of alcohol and substance abuse intervention specialists who are qualified to support patients and often have their own history of substance use and recovery. This Peer Recovery model has been shown to reduce substance use and relapse rates, as well as improve treatment retention and satisfaction.<sup>14 15</sup>

Prior to PIC implementation, screening rates with AUDIT-C alone were 52%, far below the 80% ACS benchmark. There are a host of potential explanations for the screening inconsistency; for example, patients’ inability to answer questions (intoxication, low Glasgow Coma Scale, etc), discharge from the emergency department (ie, not admission intake performed), or general provider discomfort around alcohol-related screening. When BAC assessment was incorporated into the morning report routine as a mechanism for screening via standardized PIC, alcohol screening rates improved significantly. Additionally, rates of alcohol misuse were also found to be higher, highlighting the potential for missed intervention opportunities if these patients are not identified.

Furthermore, highlighting SBIRT in the daily PIC has created increased awareness resulting in residents consulting the Peer Recovery specialists even before morning report, making it an integral part of their routine. The PIC has seamlessly integrated into the trauma workflow and provides a flexible tool to address ongoing or new PI matters as they arise.

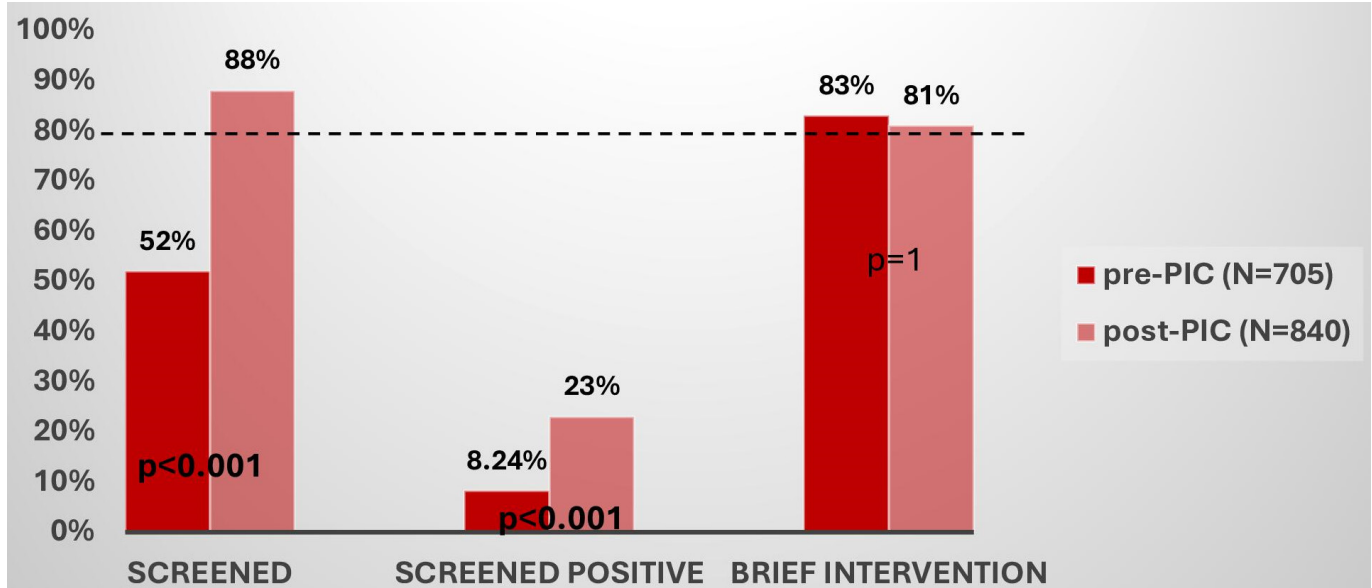
Our study is in line with the growing evidence supporting checklists to prevent adverse events. Benefits include reduced errors, improved outcomes and performance, and maximized patient care delivery.<sup>16 17</sup> For example, a study by Wolff *et al* demonstrated 21–48% improvements in different areas of the ST-elevation myocardial infarction treatment pathway and up to 55% in the stroke care pathway.<sup>18</sup> Another study used a quality control checklist in the ICU to significantly improve LOS, the incidence of hospital-acquired infections, and mortality.<sup>16</sup>

To our knowledge, this is the first study assessing the use of a checklist for trauma PI, and specifically alcohol misuse screening and intervention. Similar to previous studies in this area, we found that the PIC successfully helped improve screening for alcohol to well above the ACS benchmark of 80%. We attribute this to the additional layer of preliminary screening and Peer Recovery referral using a data point that is collected for most trauma patients. This highlights another role for checklist use in healthcare and is highly reproducible for other quality improvement initiatives and trauma centers.

While the utility of SBIRT is clear, equitable alcohol screening and intervention across racial-ethnic minorities and low-income individuals is deficient. There is a large body of evidence demonstrating that minority groups and those of lower socioeconomic status are more susceptible to alcohol-associated trauma.<sup>19–21</sup> In one study by Mulia *et al*, members of minority groups were less than 50% likely to receive alcohol misuse intervention.<sup>19</sup>

Alcohol abuse screening is not the only area with notable healthcare disparities. Maternal mortality, identification and management of pain, and venous thromboembolism (VTE) prevention practices are significantly worse in black patients. Quality improvement initiatives addressing disparities in healthcare have shown promising results.<sup>22–25</sup> Bingham *et al* described quality and safety strategies for policy makers and hospitals to improve perinatal morbidity and mortality.<sup>23</sup> Systematic quality initiatives such as the National Surgical Quality Improvement Program and clinical decision support tools have shown promise for improving cancer surgical





**Figure 1** Alcohol screening pre-PIC versus post-PIC cohorts. PIC, performance improvement checklist.

outcomes and VTE prevention practices in minorities, respectively.<sup>22 24</sup>

Among our own cohort, fewer uninsured and African American individuals received alcohol screening before PIC, highlighting significant disparities and missed opportunities for intervention. Like other published quality improvement initiatives, after PIC implementation, there were no differences among screened versus unscreened patients with respect to age, sex, race, or ethnicity across our diverse patient population. Implementation of a PIC could be a tangible intervention to minimize implicit bias in healthcare delivery and better ensure equitable access to care.

This study is not without limitations. These data suggest that the PIC was associated with reduced racial and socioeconomic disparities in alcohol screening practices; however, statistical assessment of reasons for this finding is limited by the retrospective observational nature of the study. Future prospective studies should focus on assessing bias and possible reasons underlying it. While BAC is collected on all patients admitted to the trauma service, there are occasionally injured patients admitted to non-trauma services, or patients admitted to the trauma service who present as consults or transfers from other hospitals, that may not be screened. As a result, these patients potentially do not receive needed Peer Recovery services, representing a population who would benefit from more targeted screening. Additionally, although we improved identification of individuals with alcohol misuse disorder, our data do not assess ethanol-associated trauma *reinjury* or outcomes after referral to treatment. More research is needed to solidify the utility of checklists for trauma PI initiatives, alcohol-related outcomes once referral services are provided, and to further characterize the potential benefit of quality improvement checklists for reducing healthcare disparities.

## CONCLUSION

Implementation of a daily PIC at trauma morning report facilitated improvement of the targeted trauma PI metric, SBIRT. This study revealed a significant improvement in screening for alcohol misuse pre-PIC when compared with post-PIC. We also found disparities in alcohol screening among our

uninsured and African American populations improved after PIC, indicating PIC utilization may improve implicit bias and better ensure equitable care. Utilization of a daily PIC is easily translatable to other trauma centers and could become a national standard to advance PI.

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**Contributors** MJ, AT, RLC: data interpretation, writing, critical revisions. ZPE: writing, critical revisions. CP, TM: data interpretation, critical revisions. LAF, MN: critical revisions. ALT: study design, data collection, data interpretation, writing, critical revisions. ALT is the guarantor.

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