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Perceptions of tech-based mental health screening

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ABSTRACT

Background An estimated one-third of patients experience post-traumatic stress disorder (PTSD) or depression in the year following a traumatic injury. The American College of Surgeons requires postinjury PTSD and depression screening in trauma centers, although implementation has been limited. Tech-based solutions have been proposed to improve uptake of postinjury mental health screening. The goals of this pilot study were to assess the usability and acceptability of Blueprint, a tech-based mental health screening platform, and explore attitudes toward tech-based screening and intervention.

Methods This pilot study included trauma patients (n=10) admitted to the trauma service. Participants completed the PTSD Checklist-5 and Patient Health Questionnaire-9 using Blueprint to test usability and acceptability of the platform. Participants completed the System Usability Scale (SUS) and a semi-structured interview to assess several domains including attitudes toward tech-based screening, potential barriers to implementation, and its usefulness in a postinjury context. Summative Template Analysis, a data abstraction procedure, was used to analyze qualitative data.

Results Blueprint received an average SUS score of 93.25/100 suggesting participants found the interface to be an 'excellent' means to assess postinjury mental health concerns. Participants were supportive of universal screening and identified several benefits to engaging in tech-based routine monitoring of postinjury PTSD and depressive symptoms including convenience, personalization, and trauma-informed care. Regarding intervention, patients valued web-based psychoeducation on topics related to their overall care and local resources.

Conclusions Tech-based mental health screening was highly usable and valuable to trauma patients at risk for postinjury PTSD and depression. Participants valued web-based psychoeducation and resources, but overall preferred Blueprint be used to facilitate access to in-person mental health services. Further evaluation of Blueprint as a means of assessment, intervention, and referral is needed.

BACKGROUND

An estimated 20%–40% of trauma patients will experience post-traumatic stress disorder (PTSD) and/or depression within the first year postinjury.[1 2] Postinjury mental health concerns can negatively impact quality of life and physical health[2] while increasing healthcare utilization and costs.[3] To address this problem, the American College of Surgeons (ACS) now requires postinjury mental health screening and referral[4]; however, the majority of centers have yet to implement screening[5] due to a variety of barriers. Organizational factors like disruptions to work flow, increased work burden, and limited resources to address positive screens have been noted,[6] while trauma patients report significant knowledge barriers and difficulty accessing care even when motivated to do so.[7]

Feasibility studies of tech-based screening among trauma patients have demonstrated promising results[8–10] and measurement-based care has been demonstrated to improve monitoring and treatment of mental health symptoms, yet is underused.[11] Utilization of tech-based screening tools has been found to minimize disruption to workflow while requiring less human resources,[10] and it has also been found to be feasible for rural communities.[12] Furthermore, literature suggests trauma patients find tech-based screening acceptable[10] and may even prefer to receive mental health-related information by phone or by text.[13]

This qualitative pilot study aimed to (1) assess the feasibility, acceptability, and usability of Blueprint (Chicago, Illinois, USA), an online measurement-based mental healthcare platform, to screen for postinjury PTSD and depression symptoms and (2) conduct a formative evaluation to inform the development of tech-based interventions.

METHODS

Adult trauma patients were identified using the state trauma registry and recruited through telephone contact postdischarge or approached during hospital admission. Eligible patients were those who were admitted to the inpatient trauma service within 1 year of study participation. This was to ensure adequate recovery time for patients while also prioritizing recency of the memory regading their experiences of hospitalization and discharge. One goal of the study was to reduce engagement barriers for injured patients living in rural areas. Therefore, we offered participation via videoconference as needed. Those who consented to participate were offered their choice to complete an in-person or videoconference appointment (n=1) to complete usability testing and the semi-structured interview. Usability testing was conducted with trauma patients (n=10) to explore perceptions of Blueprint as a postinjury mental health screening platform. Of those who successfully completed the study, a total of seven participants were recruited by telephone contact postdischarge. Recruitment for the study began in August 2020 leading to slow enrollment and a pivot to recruitment of participants during their hospitalization resulting in enrollment of an additional three participants. Recruitment was concluded at the end of the 1-year pilot period

when appropriate theme saturation was reached,[14] a widely used methodological practice in qualitative research.[15] The study also demonstrated good 'information power'[16] given the specificity of the individuals in the sample and the established theoretical background regarding screening among trauma patients.[9 12 13]

Blueprint platform

Blueprint is a commercial online service that enables remote measurement-based care practices. The Blueprint platform consists of two components, a patient-facing mobile application and a provider-facing data portal. The mobile application allows patients to complete digital screeners and assessments, engage with therapeutic worksheets, and track trends in daily health and lifestyle behaviors over time. Patients are sent reminders through the mobile application to complete their assigned activities at fixed intervals (eg, daily, weekly, monthly) and can access crisis resources and web interventions as configured by their provider. To accommodate patients with limited or no access to a smartphone, providers can send screeners and assessments via SMS and/or email for completion through a secure online webpage. The data portal allows providers to access and review patient health data in real-time as it is completed through the patient mobile application. All screening and assessment results are automatically scored and plotted on the dashboard for review, and providers can receive alerts triggered by patient endorsement and/or significant changes in patient functioning. Both the data dashboard and patient mobile application are user password-protected and compliant with Health Insurance Portability and Accountability Act (HIPAA) guidelines.

At the time of scheduled appointment, participants received a text message or an email containing a link to complete the assessments through the Blueprint platform. Participants were then asked to complete a list of tasks (ie, access the link, enter demographic information, complete the assigned screening measures). Participants completed the PTSD Checklist-5 (PCL-5)[17] and the Patient Health Questionnaire-9 (PHQ-9)[18] self-report measures of PTSD and depression symptoms that are routinely used by the trauma center to assess postinjury mental health symptoms. The usability testing included the 'Talk-aloud' protocol,[19] a semantic differential scale to evaluate the difficulty of the assigned tasks (easy-to-difficult), and administration of the System Usability Scale (SUS)[20 21] for measuring users' satisfaction and subjective usability. Confidence of SUS scores has been reported with small and large sample sizes alike,[22] making it an effective tool to combine with exploratory qualitative data in smaller samples. The 'Talk-aloud' protocol was audio-recorded and transcribed verbatim to assess the ease, challenges, or comprehension of the tasks being performed by participants, along with the potential usefulness of the Blueprint platform.

Participants then completed semi-structured qualitative interviews to explore opinions and attitudes toward tech-based screening and intervention for postinjury PTSD and depression symptoms. The interview guide was informed by the Consolidated Framework for Implementation Research (CFIR)'s interview guide tool. The CFIR interview guide tool supports empirically validated exploration of barriers and facilitators to implementation effectiveness.[23] A secondary goal of the formative evaluation was to gather trauma patients' perspectives on the potential development of future tech-based intervention tools tailored to the needs of trauma patients (online supplemental appendix A). All components of the interviews were conducted by the first author who is a clinical psychologist with extensive training in qualitative methodologies and clinical expertise in postinjury mental health. All participants were provided a referral list for outpatient mental health services following participation in the study. Summative Template Analysis, a qualitative data abstraction method, was used for the formative evaluation to assess participants' opinions and attitudes toward tech-based screening and intervention for postinjury PTSD and depression symptoms.[24] The first and second author double coded the transcripts, routinely discussed emerging themes and subthemes, and maintained an audit trail and code rubric.

RESULTS

Participants were cisgender men (n=5) and women (n=5). Participants identified as non-Hispanic white (n=5) and black (n=5). Most participants lived in urban areas (n=7) with the remaining in rural areas at least 1 hour drive from the trauma center (n=3). The average age was 34.4 (range 21–58). Mechanism of injury included motor vehicle collision (n=3), firearm injury (n=3), penetrating assault (n=1), plane crash (n=1), physical assault (n=1), and postpartum hemorrhage resulting in a trauma consult (n=1). The average time since injury was 82 days (range 8–249). A total of three (30%) participants demonstrated clinically significant symptoms of PTSD and six (60%) demonstrated mild symptoms of depression and two (20%) had clinically significant symptoms of depression. The mean PCL-5 score was 22.6 (range 2–56; PTSD cut-off score of 31) and the mean PHQ-9 score was 8.1 (range 3–20; clinically significant depressive symptoms cut-off score of 10).

Participants rated Blueprint highly in terms of acceptability and usability. Most participants (n=9) rated Blueprint as 'very easy' to access and use with one participant rating Blueprint as 'easy' to use. All participants reported that Blueprint was 'just about right' in terms of time needed to complete the assessments using the platform. The average score on the SUS was 93.25/100 (range 67.5–100) and the median score was 97.5 suggesting 'excellent' usability (table 1).

Tech-based mental health screening

All participants (100%) reported overall positive attitudes toward using technology for postinjury mental health screening and appreciated the ease of access and clear, straightforward format. Participants (100%) found the screening questions helpful and reported experiencing validation and increased insight into their behaviors and postinjury mental health. Participants also felt a sense of normalization after engaging with the screening and recognized its benefits for themselves and others who may not have a strong support system. While all participants experienced benefits from completing the screeners, some (40%) preferred other modes of delivery such as in-person clinical interviews or clinician-assisted approaches. Acknowledgment of differing abilities and generational differences in technology exposure were noted as reasons why others may prefer alternative modalities. See table 2 for exemplary participant quotes.

Tech-based intervention

Participants had mixed views about the possible use of asynchronous self-guided tech-based interventions, with 40% expressing a preference for in-person delivery of resources or intervention. All participants expressed interest in foundational trauma-focused education (eg, identifying symptoms, strategies to promote relaxation) and resources on topics not typically included in traditional PTSD psychoeducation including injury prevention and violence prevention among participants who experienced violent mechanisms, as well as pain management,

Table 1 Usability and acceptability of Blueprint for postinjury mental health screening

Question	Average score	Participant	Total SUS score
Q1: I think that I would like to use this system frequently	4.3	1	100
Q2: I found the system unnecessarily complex	1.0	2	100
Q3: I thought the system was easy to use	4.7	3	92.5
Q4: I think that I would need the support of a technical person to be able to use this system	1.0	4	100
Q5: I found the various functions in this system were well integrated	4.8	5	100
Q6: I thought there was too much inconsistency in this system	1.1	6	90
Q7: I would imagine that most people would learn to use this system very quickly	4.6	7	87.5
Q8: I found the system very cumbersome to use	1.1	8	100
Q9: I felt very confident using the system	4.8	9	95
Q10: I needed to learn a lot of things before I could get going with this system	1.7	10	67.5

Likert scale from 1 (strongly disagree) to 5 (strongly agree) where even questions are negatively framed and odd questions are positively framed. A total score from 0 to 100 is calculated for each participant. A score >68 is considered above average and a score >80 is considered top 10% on perceived usability of a platform.

the impact of injuries on relationships and communication, and adjustment to injury and expectation management regarding recovery. Most participants (70%) expressed preference for both hospital-based intervention and postdischarge follow-up, with interest in tech-based intervention serving as a tool to retain information shared during hospitalization. See table 3 for exemplary participant quotes.

DISCUSSION

Research is ongoing regarding how to best implement ACS postinjury PTSD and depression screening guidelines and how to best meet the psychosocial needs of trauma patients, especially in low-resourced trauma centers. Some trauma centers have demonstrated the promise of tech-based screening and intervention.[9] However, more information is needed about the acceptability and feasibility of tech-based screening as well as factors that influence implementation and sustainability of these tools.[25] The results of this study are consistent with existing literature regarding the acceptability of postinjury mental health screening among trauma patients.[8–10 12] As trauma centers increase their implementation of postinjury mental health screening and referral, adoption of innovative implementation strategies will be needed to address organizational and patient-related barriers. Results of this project may serve to inform implementation of tech-based postinjury PTSD or depression screening and the future development of tech-based interventions that are tailored to the unique needs of trauma patients. Automatic and universal tech-based screening during admission

Table 2 Exemplary participant quotes: tech-based screening

Participants rated Blueprint highly in terms of acceptability and usability	
Quick, easy and helpful	"You told me where the link was, I clicked it, and it opened. It was really easy. It was just as easy as opening Facebook". "It's set up great. It's short, it's quick, and it's easy to answer, easy to understand, very clear, very beneficial".
Participants reported overall positive attitudes toward tech-based screening following traumatic injury	
Helps to monitor health and facilitate referrals	"I would suggest it to people because it's easy, even if you don't have PTSD and you're not afraid to get out of the house. Just being able to video chat someone is so easy". "I think you can look for red flags in the answers, but I feel that importantly, very importantly, if you see red flags that they're brought back to the patient first. Then ask and say, 'Hey, this sort of may concern us. What did you mean by this?' Get clarification before it goes anywhere else. I think that's super huge. 'If you're not mentally aware, it's almost like it does have to be done for you'. You have to be told, 'Hey, I think we should do this. This is a good idea'".
Increases insight	"Then [the screeners] might help because people may think they're just angry and irritable because they're having a bad day when in reality they're angry, irritable, and having outbursts because the brain's wired differently now". "It kind of helped me realize, like I said, some things that I didn't even notice were signs of trauma. So, yes, eye-opening questions".
Validates and normalizes experiences	"It did help seeing the questions about PTSD and seeing the symptoms and being like, 'Hmmm, I experienced that. I didn't think about that as possibly being the PTSD'. It did really help, to be honest". "When it was like, 'Are things hard for you to do?' or 'Do you still enjoy doing things?' It's like, you know, some. But in those moments you think, 'God, I just don't enjoy doing anything anymore'….And really it's not that at all. It helped me get a different perspective of it".
Benefit to others	"A lot of people probably never get asked those questions or, everybody don't got family or people to talk to like this. It actually makes sense if you're coming out of some type of trauma". "And people that even don't know that they may need that help, they may realize, oh my gosh, they're offering this to me. Yeah, I'll take it".
Some participants expressed preferences for other modes of delivery	
Preferences for in-person	"Other people might want to do it on paper, you know what I mean? Myself, I like to do it face to face".
Preferences for integrating technology and in-person services	"Well, it wouldn't hurt for it to actually happen in the hospital, like, somebody come ask them or if somebody brought them a tablet while they were in the room".
Consideration for differing abilities and ages	"It was super easy. All I did was just click the answers. I think it may be hard for people who have never answered questions like that to understand the wording". "I think this is perfect for my age group or a little older, like in their 20s. Maybe the older people may not find it as handy, but I'm sure y'all have, like, pencil and paper, too. That works. I think how y'all question it is not—I think it's all very good".

PTSD, post-traumatic stress disorder.

Table 3 Exemplary participant quotes: tech-based intervention

Patients reported specific ways in which they would like these data to be used	
To tailor intervention	"If [patients] answer them honestly, you could take it and attempt to seek them some help. I guess if they're having problems sleeping or just give them some solutions to some of their problems or some alternative things to do that might help it. Not only medicine and all these other things you do".
To provide trauma-informed care	"If I was on the trauma team, I'd read over it and try to see how he was hurt or how she was hurt, if she's mentally stable or if she's not—he's not. Just seeing where a person's brain is at before I try to talk to them physically face to face so I know how to better approach them and won't say anything offhand".
To tailor appropriate treatment referrals	"I think it would help, once you gather that information, to navigate a care plan based on the type of trauma to achieve different results. Because I was in a car crash, I shouldn't be receiving treatment like I was sexually assaulted or vice versa. I think it would be very beneficial for y'all to use that to navigate different care plans for different kinds of trauma". "Establish a little council of some sort and then come up with a decision between the three of you and say, 'What do we think about this?' And, you know, if it's an addiction thing, I don't know what kind of addiction people y'all have on board. If it's PTSD, do you have a PTSD counselor somewhere to be able to use, and then go to them with that and say, 'What do you think?' See what they think".

PTSD, post-traumatic stress disorder.

may facilitate implementation of the ACS screening requirement; however, this would not eliminate barriers related to appropriate referral or long-term follow-up without additional programmatic support. Despite these limitations, universal tech-based screening continues to offer a promising approach to facilitate greater uptake of ACS screening guidelines across low-resourced and high-resourced trauma centers.

For implementation of tech-based screening and intervention to be most successful, trauma centers will need to consider why tech-based solutions are acceptable to and sometimes even preferred by patients. In this study, most participants perceived tech-based screening as a way to facilitate access to synchronous in-person or telehealth services. Trauma centers, therefore, may consider how to use technology to promote access and engagement in mental health services rather than as a substitute for interactions with providers. Additionally, when developing post-injury educational resources and psychosocial programming, understanding what information is most important to trauma patients is critical in order to facilitate engagement. Broadly, participants highlighted a desire for psychoeducational tools and interventions that support both physical and psychological recovery postinjury and empower patients with knowledge to prevent future injury and/or violence. Participants also valued resources tailored to their specific trauma event and subsequent injuries in addition to general trauma-informed care. Tech-based platforms, such as Blueprint, offer the functionality to provide targeted educational material and resources based on patients' responses to screening questions. Based on our findings, targeted materials may increase patient engagement and offer a more tailored experience without increasing staffing demands. Connecting a tech-based screening tool to an automated, but targeted, intervention and referrals may help to mitigate barriers to care and potentially serve as a link to in-person services if needed.[9 12]

This pilot study is limited by its small sample size impacting its generalizability to the broader trauma population. However, our preliminary results are encouraging and consistent with existing literature.[8 9 12 25] Our approach and results may be used to inform large-scale exploration of patients' engagement in tech-based screening and intervention to improve mental health outcomes and facilitate trauma center adherence to ACS mental health screening and referral guidelines. Future studies should assess the impact of tech-based screening and brief intervention on long-term service outcomes such as patients' and organizations' adoption of repeated assessment of post-injury mental health symptoms, and patients' engagement in mental healthcare after receiving positive screening results.

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