

## Implementation of programming for survivors of violence-related trauma at a level 1 trauma center

Natasha M Simske, Trenton Rivera, Bryan O Ren, Alex Benedick, Megen Simpson, Mark Kalina, Sarah B Hendrickson, Heather A Vallier Orthopedic Surgery,  
MetroHealth System, Cleveland,  
Ohio, USA**Correspondence to**Dr Heather A Vallier; hvallier@  
metrohealth.org

Received 19 March 2021

Accepted 29 August 2021

**ABSTRACT****Background** Prior investigation of violence intervention programs has been limited. This study will describe resources offered by Victims of Crime Advocacy and Recovery Program (VOCARP), their utilization, and effect on recidivism.**Methods** VOCARP was established in 2017 at our center, and all patients who engaged with programming (n=1019) were prospectively recorded. Patients are offered services in the emergency department, on inpatient floors and at outpatient clinic visits. Two control groups (patients sustaining violent injuries without VOCARP use (n=212) and patients with non-violent trauma (n=201)) were similarly aggregated.**Results** During 22 months, 96% of patients accepted education materials, 31% received financial compensation, 27% requested referrals, and 22% had crisis interventions. All other resources were used by <20% of patients. Patients who used VOCARP resources were substantially different from those who declined services; they were less often male (56% vs. 71%), more often single (79% vs. 51%), had greater unemployment (63% vs. 51%) and were less frequently shot (gunshot wound: 26% vs. 37%), all p<0.05. Overall recidivism rate was 9.4%, with no difference between groups. Use of mental health services was linked to lower recidivism rates (4.4% vs. 11.7%, p=0.016). While sexual assault survivors who used VOCARP resources had lower associated recidivism (2.4% vs. 12%, p=0.14), this was not statistically significant.**Discussion** This represents the largest violence intervention cohort reported to date to our knowledge. Despite substantial engagement, efficacy in terms of lower recidivism appears limited to specific subgroups or resource utilization.**Level of evidence** Level II. Therapeutic.**INTRODUCTION**Unintentional injury represents the leading cause of death among persons aged 1–44, with nearly one-third of such deaths resulting from violence.<sup>1</sup> Reported risk factors for sustaining a violent injury include an unstable family structure, low socioeconomic or educational attainment, unemployment, male sex, and substance abuse.<sup>2–4</sup> Furthermore, recidivism for violence-related trauma is high, ranging from 8.8% to 58%, with reported 5-year mortality rates as high as 20%.<sup>5–11</sup> Trauma recidivists incur more costs to the healthcare system, subsequent to presenting with greater frequency, higher likelihood of being uninsured, and more associated postoperative complications.<sup>12–14</sup>To ameliorate such issues, several trauma centers around the country have established violence intervention programs to reduce recidivism and violent crime after violent trauma.<sup>15–27</sup> Although more than 30 programs are touted across the USA and Canada, greater evidence is necessary to guide practice standards.<sup>28–30</sup> Reviews of various violence intervention programs have shown circumscribed benefit secondary to limited generalizability, small sample sizes, use of self-reported data and selection bias.<sup>31,32</sup> Accordingly, the American College of Surgeons Committee on Trauma has specifically called on trauma centers to present their evaluations of similar programming for the purposes of instituting evidence-based practices and for vital self-improvement.<sup>29</sup>The Victims of Crime Advocacy and Recovery Program (VOCARP) was instituted at our urban level 1 trauma center in March 2017.<sup>33</sup> This program includes a variety of resources such as financial compensation, educational resources, internal and external referrals, mental health services, and victim advocacy. The goal of the present study is to report the results of this novel program, which is not limited by targeting specific age groups, mechanisms of injuries (MOI) or at-risk cohorts. This article will report the demographics and injury characteristics of the population we serve, the resources offered and used, and recidivism rates. According to our knowledge, this is the largest study to document such findings in violently injured populations.**METHODS****Funding and program overview**

VOCARP began through funding from the Ohio Attorney General's Office, which used federal funding received from the US Department of Justice to support the State of Ohio Office of Victims of Crime. VOCARP seeks to identify patients with violence-related trauma within the hospital system and recommend resources and education to patients and their families. Educational materials are distributed by trained counselors and other providers who provide hard copies, and/or electronic links. Resources offered include, but are not limited to, financial compensation, education about victim rights and the criminal justice system, referral to internal or external resources, assistance with relocation or transportation, emergency interventions, advocacy, and mental health services. Financial compensation must be for immediate needs, as defined by the granting agency and has a \$50 maximum.

© Author(s) (or their employer(s)) 2021. Re-use permitted under CC BY-NC. No commercial re-use. See rights and permissions. Published by BMJ.

**To cite:** Simske NM, Rivera T, Ren BO, *et al.* *Trauma Surg Acute Care Open* 2021;**6**:e000739.

### Patient identification

All services are provided by dedicated social workers who are available any time of day, any day of the week to meet with patients. Each day, patients are screened using the emergency department (ED) intake list and patient lists from the trauma inpatient units. The hospital likewise runs a consult request system that allows providers to request a consult through the electronic medical record. Therefore, patients are identified in a variety of locations: the ED, on inpatient floors, or at outpatient clinic visits. If eligible patients are unavailable or missed during these times, the dedicated social work team will contact patients via telephone. Providers may also request a referral. All patients are eligible to receive services regardless of age, MOI (domestic violence, child abuse, and sexual assault victims are likewise encompassed by the program), or risk of recidivism. Subsequently, this program does not use any algorithm to determine patients most at risk for poor outcomes and/or recidivism, to specifically direct resources to them. From March 2017 until December 2018, a total of 4456 patients presented to the ED with injuries resulting from violence and 2717 (61%) were determined to be victims of crime. One thousand and nineteen patients (23% of 4456) used offered resources; the types of resources and frequency of each resource use were measured. Some patients choose not to use resources, though they are offered. Some patients are discharged from the ED before resources can be provided, and they are not able to be located subsequently. Notably, patients are referred to

as ‘survivors’ of trauma, rather than victims. A random selection of 212 patients who did not use VOCARP resources was aggregated and constituted the first control group. Additionally, 201 patients who were admitted for traumatic injuries not resulting from violence or crime were likewise gathered and constituted a second control group. In total, 1432 patients were included during the study window.

### Variables of interest

Data points collected prospectively included basic demographics (age, sex, and race), types of victimization, hospital length of stay, insurance information, and resources used. Retrospectively, electronic medical records were queried for additional information such as marital status and employment at time of injury. MOI was similarly acquired and grouped accordingly: gunshot wounds (GSWs), stab wounds (included all other penetrating injuries aside from GSWs), physical assault (including child abuse of a non-sexual nature), sexual assault (including child abuse of a sexual nature), domestic violence (defined as violent injuries resulting from a previous or current intimate partner), human or animal bite wounds, motor vehicle collisions (MVC) and motorcycle collisions (MCC) related to criminal activity (eg, as a result of evading the police) and vehicular assault (including pedestrians struck by motor vehicles and individuals thrown from moving vehicles). Those MOIs (n=21) which could not be

**Table 1** Demographics and baseline characteristics stratified by non-violent traumatic injury vs. violent or intentional traumatic injury (with and without service use)

	All patients (n=1432)	VOCARP service use?		Non-violent traumatic injury control group (n=201)	P value*
		Yes (n=1019)	No (n=212)		
Age (years)±SD	36.6±15.5	34.4±13.7	36.2±14.4	48.4±19.5	0.085
Male	838 (58.5%)	567 (55.6%)	150 (70.8%)	121 (60.2%)	<b>&lt;0.001</b>
Race					
Caucasian	606 (42.4%)	378 (37.1%)	78 (37.0%)	150 (74.6%)	1.00
Black American	714 (49.9%)	553 (54.3%)	119 (56.4%)	42 (20.9%)	0.65
Other	111 (7.8%)	88 (8.6%)	14 (6.6%)	9 (4.5%)	0.41
Ethnicity					
Non-Hispanic	1313 (91.7%)	926 (90.9%)	193 (91.0%)	194 (96.5%)	1.00
Hispanic	119 (8.3%)	93 (9.1%)	19 (9.0%)	7 (3.5%)	1.00
Marital status					
Single	1013 (70.7%)	800 (78.5%)	107 (50.5%)	106 (52.7%)	<b>&lt;0.001</b>
Married or significant other	267 (18.7%)	119 (11.7%)	86 (40.6%)	62 (30.9%)	<b>&lt;0.001</b>
Divorced	125 (8.7%)	86 (8.4%)	15 (7.1%)	24 (11.9%)	0.58
Widowed	27 (1.9%)	14 (1.4%)	4 (1.9%)	9 (4.5%)	0.53
Employment					
Employed	506 (35.4%)	356 (35.0%)	75 (35.4%)	75 (37.3%)	0.94
Unemployed	820 (57.4%)	638 (62.8%)	107 (50.5%)	75 (37.3%)	<b>0.0012</b>
Retired	62 (4.3%)	8 (0.8%)	8 (3.8%)	46 (22.9%)	<b>0.0025</b>
Student	41 (2.9%)	14 (1.4%)	22 (10.4%)	5 (2.5%)	<b>&lt;0.001</b>
Insurance					
Medicaid	913 (64.1%)	687 (67.4%)	152 (74.2%)	74 (36.8%)	0.26
Medicare	98 (6.9%)	48 (4.7%)	9 (4.4%)	41 (20.4%)	0.86
BWC	39 (2.7%)	25 (2.5%)	0 (0%)	14 (7.0%)	<b>0.014</b>
Uninsured	187 (13.1%)	158 (15.5%)	17 (8.3%)	12 (6.0%)	<b>0.0034</b>
Commercial	63 (4.4%)	36 (3.5%)	9 (4.4%)	18 (9.0%)	0.55
Managed care	125 (8.8%)	65 (6.4%)	18 (8.8%)	42 (20.9%)	0.29

Bold denotes statistical significance.

\*P values represent univariate statistical comparisons between VOCARP service users and non-users. BWC, Bureau of Workers' Compensation; VOCARP, Victims of Crime Advocacy and Recovery Program.

**Table 2** Injury and hospitalization characteristics stratified by non-violent traumatic injury vs. violent traumatic injury (with and without service use). Intentional and non-intentional vehicular assaults (MVC and MCC) are shown

	All patients* (n=1231)	VOCARP service use?		P value†
		Yes (n=1019)	No (n=212)	
<b>Mechanism of injury</b>				
GSW	343 (27.9%)	265 (26.0%)	78 (36.8%)	<b>0.002</b>
Stabbing	78 (6.3%)	63 (6.2%)	15 (7.1%)	0.64
Physical assault	544 (44.2%)	460 (45.1%)	84 (39.6%)	0.15
Sexual assault	59 (4.8%)	42 (4.1%)	17 (8.0%)	<b>0.021</b>
Domestic violence	91 (7.4%)	79 (7.8%)	12 (5.7%)	0.39
Human/animal bite	20 (1.6%)	20 (2.0%)	0 (0%)	<b>0.035</b>
MVC/MCC	27 (2.2%)	27 (2.7%)	0 (0%)	<b>0.009</b>
Other intentional vehicular assault	48 (3.9%)	44 (4.3%)	4 (1.9%)	0.12
Other	21 (1.7%)	19 (1.9%)	2 (0.9%)	0.56
<b>Hospital LOS (days)</b>	<b>3.6±9.4</b>	<b>3.7±10.1</b>	<b>3.4±6.2</b>	<b>0.68</b>

Bold denotes statistical significance.

\*Here, all patients do not include the additional control group who sustained non-intentional/non-violent trauma due to different mechanisms of injury.

†P values represent univariate statistical comparisons between VOCARP service users and non-users.

GSW, gunshot wound; LOS, length of stay; MCC, motorcycle collision; MVC, motor vehicle collision; VOCARP, Victims of Crime Advocacy and Recovery Program.

**Table 3** Description of resources used by patients with service use (n=1019) and their associated recidivism rates

Description of resource	Number of patients who used the resource n (%)	Recidivism rate* n (%)
Financial compensation	314 (30.8)	30 (9.6)
Education		106 (10.9)
Criminal justice	974 (95.6)	
Victim rights	973 (95.5)	
Referrals		34 (11.3)
Victim service programs	273 (26.8)	
Legal, medical or faith-based resources	46 (4.5)	
Interventions		40 (12.3)
Employers/creditors/landlords/other institutions	42 (4.1)	
Crisis (safety planning)	228 (22.4)	
Emergency financial assistance	17 (1.7)	
Emergency shelter or safe house	107 (10.5)	
Advocacy	59 (5.8)	9 (15.3)
Assistance		16 (16.2)
Transportation	91 (8.9)	
Relocation	5 (0.5)	
Child/dependent care	4 (0.4)	
Mental health		5 (4.4)
Individual counseling	12 (1.2)	
Support groups	18 (1.8)	
Peer visitors	90 (8.8)	
Other therapy (eg, cultural, art, writing, etc)	12 (1.2)	
Legal		0 (0)
Assistance obtaining protection/restraining orders	5 (0.5)	
Legal advice/counsel	6 (0.6)	

\*Frequency of recidivism was calculated based on the number of discrete patients who used the associated resource category.

classified into any of these categories were classified as ‘other’. Recidivism was defined as a return to the ED or outpatient clinics for a new violence-related injury. Overlap of medical record reporting in the area allowed for greater identification of recidivism for patients who presented to other institutions for these new injuries. Time to final follow-up was calculated based on the number of days that passed between the injury date and last clinic, ED, or hospital visit related to sequelae of the initial injury, including psychiatric sequelae. The average time to follow-up was 254 days.

### Statistical analysis

Univariate analyses were performed between patients with violence-related traumatic injuries who used VOCARP services and those who did not. All data were evaluated using independent samples t-tests,  $\chi^2$  tests or Fisher’s exact tests where appropriate given variable of interest and sample size. Multiple logistic regression analysis was performed to identify independent predictors for recidivism for new violence-related injuries. Variables included in regression analysis included those with  $p < 0.1$  on univariate analysis: age, sex, race, ethnicity, marital status, employment, insurance, MOI, hospital length of stay, mental illness, prior traumatic injuries (violent or non-violent) and use of VOCARP services. Results were expressed with use of OR and in all cases,  $p < 0.05$  represented statistical significance. Analysis was performed using SPSS V.25 software (SPSS).

### RESULTS

From March 2017 until December 2018, a total of 1109 discrete patients used VOCARP resources. Their mean age was 34.4 years, and 56% were male, which was significantly fewer than non-users (71%,  $p < 0.001$ ). Fifty-four percent of users were Black American, and 91% of patients who used services were non-Hispanic. Service users tended to be more often single (79% vs. 51%) and were more often unemployed (63% vs. 51%), both  $p < 0.01$ . Patients who used VOCARP resources were also more often uninsured (16% vs. 8%,  $p = 0.003$ ). See table 1 for additional demographics.

The most common MOI was physical assault (44%), followed by GSWs (28%) and domestic violence (7%). Among resource users, GSWs (26% vs. 37%) and sexual assaults (4% vs. 8%) were both less common than those patients who did not use offered services, both  $p < 0.05$ . The average hospital length of stay was 3.6 days (SD: 9.4), and this was no different among groups (table 2).

The most frequently used resources included education; 96% of patients received information regarding the criminal justice system and victim rights. Subsequently, 31% of patients received financial compensation, and 27% of patients requested referrals to victim service programs. Less popular resources included crisis interventions (22%), emergency shelter procurement (11%) and transportation assistance (9%). The least used resources included relocation assistance (0.5%), childcare assistance (0.4%), legal advice (0.6%) and assistance with obtaining restraining orders (0.5%). See table 3 for more details regarding VOCARP resources used.

The overall recidivism rate was 9.4% for patients with violence-related injuries, with no statistically significant differences between those who used VOCARP resources (10.9%) and those who did not (8.5%,  $p = 0.33$ ) (table 4). Recidivism rates varied greatly by services used. The lowest recidivism rates were lowest for those using legal services (0%) and mental health services (4.4%) and were highest for those who received

**Table 4** Recidivism for new injury resulting from violence, crime or victimization, stratified by non-violent traumatic injury vs. violent traumatic injury (with and without service use)

	All patients (n=1231)	VOCARP service use?		Non-violent traumatic injury control group (n=201)	P value*
		Yes (n=1019)	No (n=212)		
Recidivism for trauma from crime/victimization					
Yes	135 (9.4%)	111 (10.9%)	18 (8.5%)	6 (3%)	0.33
Time to recidivism (days)	264.4±249.7	236.7±227.5	300.4±249.5	669.8±318.3	<0.001
Recidivism rates by mechanism of injury					
GSW		12 (4.5%)	4 (5.1%)	–	0.83
Stabbing		7 (11.1%)	1 (6.7%)	–	0.61
Physical assault		65 (14.1%)	9 (10.7%)	–	0.40
Sexual assault		1 (2.4%)	2 (11.8%)	–	0.14
Domestic violence		17 (21.5%)	2 (16.7%)	–	0.70
Human/animal bite		1 (5%)	–	–	–
MVC/MCC		0 (0%)	–	–	–
Other intentional vehicular assault		3 (6.8%)	0 (0%)	–	0.59
Other		5 (26.3%)	0 (0%)	–	0.41

\*P values represent univariate statistical comparisons between VOCARP service users and non-users.

GSW, gunshot wound; MCC, motorcycle collision; MVC, motor vehicle collision; VOCARP, Victims of Crime Advocacy and Recovery Program.

**Table 5** Multiple logistic regression analysis to identify independent predictors for recidivism for new victimization

	Recidivism* (n=125, 10.6%)	
	OR	P value
Age	0.97	0.004
Male	0.84	0.45
Race		
Caucasian (ref)	–	–
African American	0.91	0.68
Other	0.41	0.13
Hispanic	2.03	0.17
Mechanism of injury		
Physical assault (ref)	–	–
Domestic violence	1.25	0.50
GSW	0.35	0.003
Human/animal bite	0.46	0.46
MVC/MCC	–†	–†
Sexual assault	0.26	0.035
Stab	0.79	0.58
Vehicular assault	0.85	0.80
Other	2.10	0.20
Hospital length of stay	0.96	0.22
Mental illness		
Positive history	2.02	0.003
New/worsening after injury	1.64	0.06
Prior traumatic injury		
Resulting from violence/crime	1.21	0.40
Non-violent trauma	1.03	0.90
Use of VOCARP services	1.12	0.71

\*Variables not shown above, including race, marital status, and employment, were included in the regression analysis but did not reach statistical significance.

†n too small for analysis.

GSW, gunshot wound; MCC, motorcycle collision; MVC, motor vehicle collision; VOCARP, Victims of Crime Advocacy and Recovery Program.

individual or victim advocacy (15%) or assistance with transportation, relocation or childcare (16%) (table 3).

Recidivism rates likewise varied greatly by MOI. Among VOCARP resource users, the highest recidivism rates were associated with ‘other’ MOI (26%) and domestic violence (22%) and the lowest with MVC/MCC (0%) and sexual assault (2.4%). Although VOCARP users had lower recidivism rates among sexual assault survivors (2.4% vs. 12%), this did not reach statistical significance ( $p=0.14$ ).

On multiple logistic regression analysis, independent predictors for decreased risk of recidivism included GSW (OR: 0.35,  $p=0.003$ ) and sexual assault (OR: 0.26,  $p=0.035$ ). While age was likewise significant on regression analysis (OR: 0.97,  $p=0.004$ ), no other baseline demographics including sex, race, ethnicity, marital status, employment, and insurance were significant. Positive history of psychiatric illness was likewise predictive of later recidivism for violent injury (OR: 2.02,  $p=0.003$ ). Use of VOCARP resources was not associated with a significant risk of recidivism (OR: 1.12,  $p=0.71$ ). See table 5 for additional information.

## DISCUSSION

Violent injury represents a substantial public health problem in the USA. Violent injury predisposes patients for subsequent recidivism, and it is likewise linked to poor outcomes and high rates of mental illness. Hospital-based violence intervention programs have sought to address these issues by intervening with patients in the window of opportunity that follows their trauma. At our institution, 1019 patients used VOCARP resources during the 22-month study period, representing the largest violence intervention cohort reported to date.

Although the concept of violence intervention programs is not novel, the inclusivity that our programming offers does depart from what has been instituted at several other trauma centers around the country. For example, most programs have age requirements. The Wraparound Program that began at San Francisco General Hospital is only offered to patients 10–35 years of age.<sup>15–18</sup> Within Our Reach, based at Mount Sinai in Chicago, restricts age to 10–24 years, and Caught in the Crossfire, an

Oakland-based program, similarly offers programming only to youth aged 12–20 years.<sup>24 26</sup> Only two other programs offered services more equitably to patients 18 years or older but had other constraints such as requiring the injury to be secondary to a GSW or stab wound.<sup>25 34</sup> Secondary to such restrictions, most violence-based program efficacy studies have had fewer than 100 participants in their intervention groups.<sup>19 20 25 26 34</sup> In a review of violence intervention programs, Mikhail and Nemeth noted that such explicit parameters limited generalizability and that most of the studies were underpowered for the conclusions they were attempting to draw.<sup>31</sup>

One benefit of the current study is the detailed reporting of services used by patients. We found that education was most readily used, with 96% of patients receiving information regarding their victim rights and the criminal justice system. Financial compensation (31%), victim service programs (27%), and crisis interventions (22%) were the following most readily used resources. Although many other programs have detailed their interventions or the services they provide to patients, few have sought to report the relative popularity of such resources. For patients enrolled in the Wraparound Program, Juillard *et al* found that 51% required mental health services, 48% received financial compensation, 36% needed employment assistance, 30% requested housing assistance, and 22% used court advocacy.<sup>15</sup> This departs from our experience, as we observed that only 11% of patients used mental health services and 6% requested advocacy. Such differences could be attributed to how resources are allocated or presented to patients. Patients may experience fear of retribution; they may also have transportation or communication barriers which curtail ability and willingness to engage with programming. The issue could also be related to patient perceptions. For example, patients from specific populations including those with cancer, autoimmune disease, or HIV are often disinclined to exploit mental health resources, such as support groups, with the major obstacle to attending being a lack of perceived need.<sup>35–38</sup>

An important consequence of violent injury is later recidivism, with rates varying from 9% to as high as 58% in a variety of studies.<sup>5–11</sup> Kao *et al* performed a large database study, citing that of 6484 traumatically injured patients, 19% were a result of violence and later recidivism for these patients was 25%.<sup>8</sup> Risk factors for recidivism include younger age,<sup>13 39 40</sup> African American race,<sup>11 13 39 40</sup> substance abuse,<sup>7</sup> previous violence or history of incarceration,<sup>7</sup> low socioeconomic status,<sup>11</sup> homelessness,<sup>11</sup> and being uninsured.<sup>11</sup> Kaufman *et al* cited the additional finding that patients with healthcare utilization related to both mental illness and unintentional injury were significantly more likely to recidivate.<sup>11</sup> Subsequently, recidivists are a burden to the healthcare system, both in terms of costs and secondary to poor outcomes such as more postoperative complications.<sup>12–14</sup> Given both the risk and disruption associated with violent injury recidivism, most hospital-based violence intervention programs have made it their foremost goal to reduce such recidivism. One of our future goals is to improve engagement of survivors of gunshot trauma and other assault with our programming. Specific demographic groups who have been less likely to engage have been identified for focused iterative efforts.

The overall recidivism rate for patients with violence-related trauma was 9.4% and was no different between those who used services and those who did not (10.9% vs. 8.5%,  $p=0.33$ ). However, the recidivism rate was significantly higher than that of patients who presented with non-violent traumatic injury (9.4% vs. 3%,  $p<0.001$ ). These findings represented a meaningful departure from other studies of violence intervention

programs, which did observe significant reductions in recidivism. For instance, the Wraparound Program saw recidivism drop to 4.9%, a substantial reduction from their 16% historic recidivism rate.<sup>15–18</sup> Similarly, Prescription for Hope saw a reduction of 1-year recidivism from 8.7% to 2.9%, although this was observed among a very small sample size ( $n=34$ ).<sup>23</sup> On the other hand, other investigations including that of Caught in the Crossfire have observed no differences in recidivism between enrolled and control patients (8% vs. 9%), a similar finding to our own.<sup>20 24</sup> Other studies have instead considered different outcome measures, reporting intervention groups to have reduced involvement with the criminal justice system (less likely to be arrested or convicted of violent crimes), and/or significant reductions in aggression.<sup>24 25 34</sup> Accordingly, while several review articles of violence intervention programs have demonstrated some advantages, there has been no generalizable, statistically significant benefit to be reported as it pertains to recidivism or other outcome measures.<sup>31 32</sup>

Although our study cannot support the argument that general engagement with survivor resources reduces later recidivism, our large study population has allowed for additional subanalysis that could help with program development moving forward. In particular, for patients who used mental health services, such as individual counseling or support groups, the recidivism rate was considerably lower (4.4%). This represented a significant deviation from patients who chose not to engage with such resources (4.4% vs. 11.7%,  $p=0.016$ ). Although use of legal services was associated with a 0% recidivism, this did not reach significance on statistical analysis likely a result of the small sample size. Certain resource use, such as advocacy and transportation, relocation or childcare assistance were associated with higher recidivism rates of 15% and 16.2%, respectively. It is likely that these connections are the result of population characteristics such as MOI, rather than properties of the services themselves.

This study has several limitations, the foremost being the lack of a randomized design, as seen in other violence intervention programs established at other institutions. This may have allowed for some selection bias, whereby certain patients elected to use services. Some subgroups of patients were very small in number, limiting the power to detect associations, especially for independent variables. We also are not able to remark about specific effects of some of our individual services. Additionally, seeing as our victims of crime program was institution-wide, patients who did not use services but were injured during the timeframe may have received some benefit as a result of a culture change within the hospital. Finally, given that patients could have recidivated at other institutions, we could have missed some cases of new violent injury. This was likely not a substantial number of patients, because other hospitals in the vicinity have linked hospital record systems, allowing for documentation of ED presentations or admissions at other institutions.

## CONCLUSION

In conclusion, VOCARP resources have been widely used, with higher utilization among those women, and more often by single and unemployed persons. Although almost 10% of patients were subsequent recidivists, patients who engaged with mental health services were less likely to experience trauma recidivism. Future work in a larger sample with efforts to assess for impact of specific program elements, including possible improvement of patient satisfaction, appears worthwhile.

**Contributors** NMS participated in literature search, data collection, data analysis, data interpretation, writing and critical revision. TR participated in data

collection, data interpretation, and critical revision. BOR participated in data collection and critical revision. AB participated in data analysis and writing. SBH participated in study design, program leadership and critical revision. MK participated in critical revision. MS participated in programming and critical revision. HAV participated in study design, data collection, data interpretation, writing and critical revision.

**Funding** The Victims of Crime Advocacy and Recovery Program is funded by the Ohio Attorney General's Office through federal funding received from the US Department of Justice to support the State of Ohio Office of Victims of Crime programming.

**Competing interests** None declared.

**Patient consent for publication** Not required.

**Ethics approval** Institutional Review Board approval was obtained from the MetroHealth IRB (IRB21-00038), which waived informed consent.

**Provenance and peer review** Not commissioned; internally peer reviewed.

**Data availability statement** Data are available upon reasonable request.

**Open access** This is an open access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited, appropriate credit is given, any changes made indicated, and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>.

#### ORCID iD

Heather A Vallier <http://orcid.org/0000-0003-3881-6518>

#### REFERENCES

- Heron M. Deaths: leading causes for 2017. *Natl Vital Stat Rep* 2019;68:1–77.
- Griffin RL, Davis GG, Levitan EB, MacLennan PA, Redden DT, McGwin G. The effect of previous traumatic injury on homicide risk. *J Forensic Sci* 2014;59:986–90.
- Caputo ND, Shields CP, Ochoa C, Matarlo J, Leber M, Madlinger R, Waseem M. Violent and fatal youth trauma: is there a missed opportunity? *West J Emerg Med* 2012;13:146–50.
- Haider AH, Young JH, Kisat M, Villegas CV, Scott VK, Ladha KS, Haut ER, Cornwell EE, MacKenzie EJ, Efron DT. Association between intentional injury and long-term survival after trauma. *Ann Surg* 2014;259:985–92.
- Goins WA, Thompson J, Simpkins C. Recurrent intentional injury. *J Natl Med Assoc* 1992;84:431–5.
- Rich JA. Wrong place, wrong time: trauma and violence in the lives of young black men. Baltimore, MD: The Johns Hopkins University Press, 2009.
- Richardson JB, St Vil C, Sharpe T, Wagner M, Cooper C. Risk factors for recurrent violent injury among black men. *J Surg Res* 2016;204:261–6.
- Kao AM, Schlosser KA, Arnold MR, Kasten KR, Colavita PD, Davis BR, Sing RF, Heniford BT. Trauma recidivism and mortality following violent injuries in young adults. *J Surg Res* 2019;237:140–7.
- Sims DW, Bivins BA, Obeid FN, Horst HM, Sorensen VJ, Fath JJ. Urban trauma: a chronic recurrent disease. *J Trauma* 1989;29:940–7.
- Gibson PD, Ippolito JA, Shaath MK, Campbell CL, Fox AD, Ahmed I. Pediatric gunshot wound recidivism: identification of at-risk youth. *J Trauma Acute Care Surg* 2016;80:877–83.
- Kaufman E, Rising K, Wiebe DJ, Ebler DJ, Crandall ML, Delgado MK. Recurrent violent injury: magnitude, risk factors, and opportunities for intervention from a statewide analysis. *Am J Emerg Med* 2016;34:1823–30.
- Buss TF, Abdu R. Repeat victims of violence in an urban trauma center. *Violence Vict* 1995;10:183–94.
- Rich JA, Grey CM. Pathways to recurrent trauma among young Black men: traumatic stress, substance use, and the "code of the street". *Am J Public Health* 2005;95:816–24.
- Hemmila MR, Jakubus JL, Maggio PM, Wahl WL, Dimick JB, Campbell DA, Taheri PA. Real money: complications and hospital costs in trauma patients. *Surgery* 2008;144:307–16.
- Juillard C, Cooperman L, Allen I, Pirracchio R, Henderson T, Marquez R, Orellana J, Texada M, Dicker RA. A decade of hospital-based violence intervention: benefits and shortcomings. *J Trauma Acute Care Surg* 2016;81:1156–61.
- Smith R, Dobbins S, Evans A, Balhotra K, Dicker RA. Hospital-Based violence intervention: risk reduction resources that are essential for success. *J Trauma Acute Care Surg* 2013;74:976–80.
- Dicker RA, Jaeger S, Knudson MM, Mackersie RC, Morabito DJ, Antezana J, Texada M. Where do we go from here? interim analysis to forge ahead in violence prevention. *J Trauma* 2009;67:1169–75.
- Juillard C, Smith R, Anaya N, Garcia A, Kahn JG, Dicker RA. Saving lives and saving money: hospital-based violence intervention is cost-effective. *J Trauma Acute Care Surg* 2015;78:252–7.
- Aboutanos MB, Jordan A, Cohen R, Foster RL, Goodman K, Halfond RW, Poindexter R, Charles R, Smith SC, Wolfe LG, et al. Brief violence interventions with community case management services are effective for high-risk trauma patients. *J Trauma* 2011;71:228–37.
- Shibru D, Zahnd E, Becker M, Bekaert N, Calhoun D, Victorino GP. Benefits of a hospital-based peer intervention program for violently injured youth. *J Am Coll Surg* 2007;205:684–9.
- Butler B, Agubuzu O, Hansen L, Crandall M. Illinois trauma centers and community violence resources. *J Emerg Trauma Shock* 2014;7:14–19.
- Bell TM, Gilyan D, Moore BA, Martin J, Ogbemudia B, McLaughlin BE, Moore R, Simons CJ, Zarzaur BL. Long-Term evaluation of a hospital-based violence intervention program using a regional health information exchange. *J Trauma Acute Care Surg* 2018;84:175–82.
- Gomez G, Simons C, St John W, Creasser D, Hackworth J, Gupta P, Joy T, Kemp H. Project prescription for hope (RxH): trauma surgeons and community aligned to reduce injury recidivism caused by violence. *Am Surg* 2012;78:1000–4.
- Becker MG, Hall JS, Ursic CM, Jain S, Calhoun D. Caught in the crossfire: the effects of a peer-based intervention program for violently injured youth. *J Adolesc Health* 2004;34:177–83.
- Cooper C, Eslinger DM, Stolley PD. Hospital-Based violence intervention programs work. *J Trauma* 2006;61:534–40.
- Zun LS, Downey L, Rosen J. The effectiveness of an ED-based violence prevention program. *Am J Emerg Med* 2006;24:8–13.
- Cheng TL, Haynie D, Brenner R, Wright JL, Chung S-en, Simons-Morton B. Effectiveness of a mentor-implemented, violence prevention intervention for assault-injured youths presenting to the emergency department: results of a randomized trial. *Pediatrics* 2008;122:938–46.
- HAVI. National Network of hospital-based violence prevention programs. <https://www.thehavi.org/>.
- Rosenblatt MS, Joseph KT, Dechert T, Duncan TK, Joseph D'Andrea K, Stewart RM, Cooper ZR. American association for the surgery of trauma prevention Committee topical update: impact of community violence exposure, intimate partner violence, hospital-based violence intervention, building community coalitions and injury prevention program evaluation. *J Trauma Acute Care Surg* 2019;87:456–62.
- Purtle J, Dicker R, Cooper C, Corbin T, Greene MB, Marks A, Creaser D, Topp D, Moreland D. Hospital-based violence intervention programs save lives and money. *J Trauma Acute Care Surg* 2013;75:331–3.
- Mikhail JN, Nemeth LS. Trauma center based youth violence prevention programs: an integrative review. *Trauma Violence Abuse* 2016;17:500–19.
- Affinati S, Patton D, Hansen L, Ranney M, Christas AB, Violano P, Sodhi A, Robinson B, Crandall M. Hospital-Based violence intervention programs targeting adult populations: an eastern association for the surgery of trauma evidence-based review. *Trauma Surg Acute Care Open* 2016;1:e000024.
- Simske NM, Rivera T, Breslin MA, Hendrickson SB, Simpson M, Kalina M, Ho VP, Vallier HA. Implementing psychosocial programming at a level 1 trauma center: results from a 5-year period. *Trauma Surg Acute Care Open* 2020;5:e000363.
- Loveland-Jones C, Ferrer L, Charles S, Ramsey F, van Zandt A, Volgraf J, Santora T, Pathak A, Dujon J, Sjöholm L, et al. A prospective randomized study of the efficacy of "Turning Point," an inpatient violence intervention program. *J Trauma Acute Care Surg* 2016;81:834–42.
- Kupprat SA, Dayton A, Guschlbauer A, Halkitis PN. Case manager-reported utilization of support group, substance use and mental health services among HIV-positive women in New York City. *AIDS Care* 2009;21:874–80.
- Holmes JM, Ford E, Yuill F, Drummond AER, Lincoln NB. Attendance at a psychological support group for people with multiple sclerosis and low mood. *Disabil Rehabil* 2012;34:1323–7.
- Delisle VC, Gumuchian ST, Pelaez S, Malcarne VL, El-Baalbaki G, Körner A, Hudson M, Baron M, Thombs BD. Reasons for non-participation in scleroderma support groups. *Clin Exp Rheumatol* 2016;34 Suppl 100:56–62.
- Bui LL, Last L, Bradley H, Law CHL, Maier B-A, Smith AJ. Interest and participation in support group programs among patients with colorectal cancer. *Cancer Nurs* 2002;25:150–7.
- Buss TF, Abdu R, Walker JR. Alcohol, drugs, and urban violence in a small City trauma center. *J Subst Abuse Treat* 1995;12:75–83.
- Cooper C, Eslinger D, Nash D, al-Zawahri J, Stolley P. Repeat victims of violence: report of a large concurrent case-control study. *Arch Surg* 2000;135:837–43.