

Before and After the Trauma Bay: The Prevention of Violent Injury Among Youth

Rebecca Cunningham, MD
Lynda Knox, PhD
Joel Fein, MD, MPH
Stephanie Harrison, MPH, PhD
Keri Frisch, MS
Maureen Walton, MPH, PhD
Rochelle Dicker, MD
Deane Calhoun, MA
Marla Becker, MPH
Stephen W. Hargarten, MD,
MPH

From the Departments of Emergency Medicine and the UM Injury Research Center (Cunningham, Harrison), School of Public Health (Cunningham), and Psychiatry (Walton), University of Michigan Medical Center, Ann Arbor, MI; the Department of Family Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA (Knox); the Department of Pediatrics and Emergency Medicine, University of Pennsylvania School of Medicine and Emergency Department at The Children's Hospital of Philadelphia, Philadelphia, PA (Fein); Department of Emergency Medicine and the Injury Research Center, Injury Research Center, Medical College of Wisconsin, Milwaukee, WI (Frisch, Hargarten); the Department of Surgery, University of California and San Francisco General Hospital, San Francisco, CA (Dicker); and Youth ALIVE!, Oakland, CA (Calhoun, Becker).

Despite a decline in the incidence of homicide in recent years, the United States retains the highest youth homicide rate among the 26 wealthiest nations. Homicide is the second leading cause of death overall and the leading cause of death for male blacks aged 15 to 24 years. High rates of health care recidivism for violent injury, along with increasing research that demonstrates the effectiveness of violence prevention strategies in other arenas, dictate that physicians recognize violence as a complex preventable health problem and implement violence prevention activities into current practice rather than relegating violence prevention to the criminal justice arena. The emergency department (ED) and trauma center settings in many ways are uniquely positioned for this role. Exposure to firearm violence doubles the probability that a youth will commit violence within 2 years, and research shows that retaliatory injury risk among violent youth victims is 88 times higher than among those who were never exposed to violence. This article reviews the potential role of the ED in the prevention of youth violence, as well as the growing number of ED- and hospital-based violence prevention programs already in place. [Ann Emerg Med. 2009;53:490-500.]

0196-0644/\$-see front matter
Copyright © 2008 by the American College of Emergency Physicians.
doi:10.1016/j.annemergmed.2008.11.014

In the United States, violence is the leading cause of death for male blacks aged 15 to 25 years and the second leading cause of death for all youths aged 15 to 25 years regardless of race or ethnicity. In 2006, almost a million youths ages 15 to 24 years received medical care for nonfatal violent injuries. As many as 40% of violently injured youths return to the emergency department (ED) in the future with violence-related injuries, and as many as 20% are victims of homicide within 5 years of admission. As with other forms of violence, including elder abuse, child abuse, and domestic violence, the ED is uniquely positioned to intervene to reduce rates of violent reinjury and death in these vulnerable youths. ED clinicians can identify and assess violently injured youths for risk of violent reinjury and perpetration of retaliatory violence; provide counseling and linked referrals to resources that may help reduce risk of future violence; and advocate for policies and programs that reduce risk for violence and violent reinjury. This article reviews recent

research on youth violence and its prevention, discusses 3 actions ED providers can take to aid in reducing violent reinjury and homicide among young patients, and identifies areas for future research. A list of resources for providers interested in integrating clinical preventive services in their patient care plans is also provided.

Youth violence, which includes acts such as aggravated assault, robbery, rape, and homicide, is a significant public health problem in the United States. In 2006, more than 766,000 youths ages 15 to 24 years received medical care for nonfatal violent injuries, of which 9% required hospitalization.¹ Repeated visits among this injured cohort are common: studies indicate that readmission rates for youths treated in the ED for violent injuries are as high as 44% for injury caused by another assault, and some studies find a subsequent homicide rate of 20% among the subset whose index visit required admission to trauma service.²⁻⁷ In 2005, more than 5,000 youths ages 15 to

Table 1. Leading causes of death among youths aged 15 to 24 years in the United States, by sex and race, 2005.¹

Rank	Aged 15–24 Years			
	Males		Females	
	African American	White	African American	White
1	Homicide	Unintentional injury	Unintentional injury	Unintentional injury
2	Unintentional injury	Suicide	Homicide	Suicide
3	Suicide	Homicide	Malignant neoplasms	Malignant neoplasms
4	Heart disease	Malignant neoplasms	Heart disease	Homicide
5	Malignant neoplasms	Heart disease	Complicated pregnancy	Heart disease

Source: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS). (2005). Available at: <http://www.cdc.gov/ncipc/wisqars>. Accessed April 8, 2008.

24 years were victims of homicide, making it the second leading cause of death of all youths in this age group, regardless of race, and the leading cause of death for male blacks in this age group (Table 1).¹ Violently injured urban adolescents treated after a gunshot injury are more likely to die from a subsequent and similar injury than from any other illness or condition for which they seek care.^{8,9}

Violent behaviors often show a developmental progression; offenders tend to add more serious offenses to their behavioral repertoire over time. Being a victim of violence during adolescence increases the odds of being an adult perpetrator or victim of domestic or community violence or of committing felony assault.¹⁰ Exposure to firearm violence, measured as being shot or shot at or as witnessing a shooting, doubles the probability that a youth will commit violence within 2 years.¹¹ Dowd¹² demonstrated that retaliatory injury risk among youth victims of violence was 88 times higher than among those who were never exposed to violence. Youths presenting to the ED with violence-related injuries need to be considered at high risk for retaliation and subsequently assessed with a comprehensive history.

The health care and productivity costs associated with the treatment of violent injuries are substantial. Fatal injuries caused by assault among youths ages 15 to 24 years costs \$4 billion annually for medical care alone, with an additional cost of \$32 billion in lost productivity.¹³ For nonfatal injuries caused by assault, the per-person cost for an injury requiring hospitalization is \$24,353 for medical care and \$57,029 for lost productivity; injuries for patients treated and released from the ED cost on average per person \$1,002 in medical care and \$2,822 in lost productivity. Gun violence injuries are the most expensive to treat; the cost of acute care treatment for gun violence injuries conservatively ranges from \$15,000 to \$32,000 per victim.¹⁴

A substantial body of literature now exists in violence prevention that disproves the myth that violence is “inevitable.” Youth violence can be viewed through the same lens as medical professionals view other diseases, implicating and treating a wide range of risk and protective factors and setting aside common myths (Tables 2 and 3). The surgeon general’s report on youth violence applied effectiveness criteria to several model community-based violence prevention/intervention programs and produced compelling results.¹⁵ Interventions based on strategies such as scare tactics, boot camps, gun buy-backs, and isolated self-esteem enhancement programs that provide information without skills were ineffective or even harmful.^{16–19} Although well-meaning hospitals and medical providers would like teens to understand “what might happen,” research shows that programs for youths who tour trauma bays and morgues are not effective prevention strategies and may actually cause more harm than good. The most successful programs evaluated were based on strategies such as social skills training, positive youth development, mentoring, parent and family training, and home visitation. Effective violence prevention approaches, short of massive social and economic reform, build resilience and enhance protective factors to overcome social and environmental stressors.^{20–23} These approaches include encouraging participation in peer groups, schools, and communities that emphasize positive social norms, facilitating concomitant involvement in safe activities, providing supportive relationships with adults, and enhancing competence in cognitive, social, and emotional skills.

According to this and other evidence, national medical organizations have urged physicians to incorporate violence prevention into adolescent medical practice.^{24–28} The high rates of health care recidivism for violent injury, along with increasing research demonstrating the effectiveness of violence prevention strategies in other arenas, mandate that physicians recognize violence as a complex preventable health problem rather than a criminal justice issue.^{19,29} The science of violence prevention research disproves the fact that clinicians should do nothing because there is “nothing that can be done.” The most important message ED clinicians can take from these programs is that preventing future violent injury is possible among high-risk youths.

THE TRAUMA BAY AS AN OPPORTUNITY FOR ASSESSMENT, INTERVENTION, AND REFERRAL

Complex public health issues, such as alcohol misuse, have been addressed successfully in the ED; the American College of Surgeons recently recognized the importance and cost-effectiveness of brief alcohol screening and intervention in trauma centers.³⁰ Studies show that health care encounters in the ED and hospital after events such as assault represent unique “teachable moments” that can be used for brief interventions, but this susceptibility may decrease over time.^{31–36} Taking advantage of this opportunity immediately after a violent injury is especially important in the prevention of reinjury caused by assault and revenge- or retaliation-related homicide.^{37,38} Until

Table 2. Myths and facts about youth violence, adapted from a report by the US surgeon general.¹⁹

Myth	Fact
Nothing works with respect to treating or preventing violent behavior.	A number of prevention and intervention programs that meet high scientific standards of effectiveness have been identified.
Black and Hispanic youths are more likely to become involved in violence than other racial or ethnic groups.	Data consistently indicate that race and ethnicity have little bearing on the overall proportion of racial and ethnic groups that engage in nonfatal violent behavior. However, there are racial and ethnic differences in homicide rates. It is likely the relationship between race and violence is confounded by socioeconomic and neighborhood factors.
Getting tough with juvenile offenders by trying them in adult criminal courts reduces the likelihood that they will commit more crimes.	Youths transferred to adult criminal court have significantly higher rates of reoffending and a greater likelihood of committing subsequent felonies than youths who remain in the juvenile justice system. They are also more likely to be victimized physically and sexually.
Youth violence is always a result of a behavior problem, and the only way to remedy this is to alter teenagers' individual behaviors.	Youth violence is best viewed in the context of the sociocultural and physical environment; successful interventions address both individual and environmental characteristics that culminate in violent events.

Adapted from: Youth violence: report of the surgeon general. Available at: http://mentalhealth.samhsa.gov/youthviolence/surgeongeneral/SG_Site/toc.asp. Accessed April 8, 2008.

recently, discharge planning for patients who are victims of violence focused on the rehabilitation from their physical wounds and trauma and did not capitalize on the opportunity to address the psychosocial challenges that these patients face in returning to the same conditions in which they were injured in the first place.³⁹

Table 3. Levels of risk and protective factors for youth violence.^{19,81,82}

Risk Factors	Protective Factors
Individual	
Attention deficits/hyperactivity	Intolerant attitude toward deviance
Antisocial beliefs and attitudes	High intelligence quotient
History of early aggressive behavior	Religiosity
Involvement with drugs, alcohol, or tobacco	Anger control skills
Early involvement in general offenses	
Poor behavioral control	
Family	
Poor parent/child relations	Parental presence
Low parental involvement	Parent-family connectedness
Antisocial parents	Parental monitoring of youths
Low family socioeconomic status	
Harsh, lax, or inconsistent disciplinary practices	
Family conflict	
School	
Gang presence in school	Absence of gang presence in school
	Positive school affiliation
Peer	
Association with delinquent peers	Involvement in positive social activities
Involvement in gangs that focus on criminal behavior	Involvement with nondelinquent peers
Social rejection by peers; weak social ties	
Community	
High rate of neighborhood crime	Low neighborhood crime rates
Neighborhood disorganization	Organized neighborhoods
Diminished economic opportunity	Economic opportunity
High concentrations of poor residents	
High levels of transiency	
High levels of family disruption	
Low community participation	

Although the primary care office may be a logical place for this type of education, injury prevention messages are often not delivered in the primary care setting; even if teens have a primary care provider, they may not receive injury prevention messages during their visits.^{40,41} Many of the patients at highest risk for youth violence utilize the ED as their primary or sole access point to the health care system. For example, 97% of injured patients presenting to EDs are treated and released after receiving care,⁴² and even after a firearm-related injury a large proportion of youths are treated and released from the ED (Figure 1).¹ Older adolescents are overrepresented in ED visits relative to their population

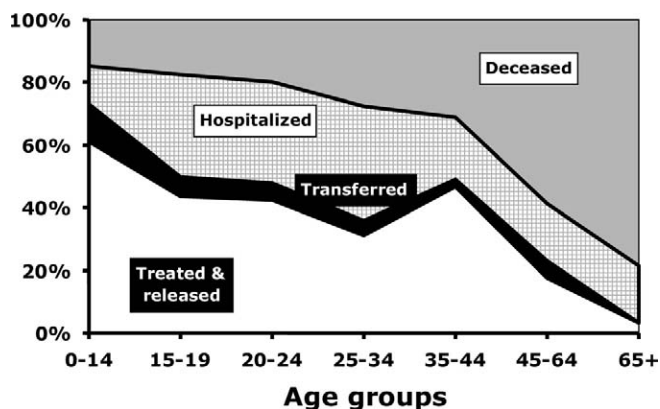


Figure 1. Distribution of ED dispositions for firearm-related injuries, by age, 2001.

proportion,⁴³ perhaps reflecting significant decreases in visits to pediatricians in late adolescence.⁴⁴ These discharged youths will not interface with resources on the inpatient trauma unit, and although some EDs attempt violence prevention, many still provide no evaluation of risk for future violent injury.

For many reasons, a “treat them and street them” attitude has prevailed in the care of assault victims in the ED. Barriers to incorporating violence prevention messages into routine ED care include lack of time and resources, lack of proper training in violence prevention, and concerns about one’s own safety.^{45,46} ED volumes are increasing nationally, and physicians struggle to care for injured patients in an increasingly overburdened system. To many, it may seem impossible to add an accurate violence assessment or brief intervention and referral to routine ED and trauma care. However, the ED is already the site of considerable violence prevention. ED and trauma providers are trained to carefully consider safety after discharge when treating a young woman with a black eye caused by a partner, to file with child protective services for a suspicious burn in a young child, or to refer a patient with a self-inflicted wound to psychiatric care. Domestic violence screening and referral are now required by The Joint Commission.⁴⁷ With appropriate training and protocols, these same models can be applied to youth violence prevention.

As with other types of violence, the ED provider is uniquely positioned to intervene with violently injured youths to reduce the risk of reinjury. Specifically, the ED provider can

- 1) identify and assess violently injured youths for risk for retaliatory violence and potential reinjury or violence-related death;
- 2) provide youths and their families with counseling and linkages to resources to help prevent future violence; and
- 3) advocate for policies and programs that promote positive youth development and reduce risk for violent injury and death.^{48,49}

Do you know the person who hurt you?

Do you think that the conflict that caused this incident is over?

Do you plan to hurt anyone because of what happened today?

Do you think that any of your friends or family members will hurt anyone because of what happened today?

Have you reported the incident to the police or other authority?

Figure 2. Children’s Hospital of Philadelphia Safety Screening Tool.*

*Patients identified as being at risk for future violence are referred to a lengthier assessment.

IDENTIFY AND ASSESS VIOLENTLY INJURED YOUTHS FOR RETALIATORY VIOLENCE AND POTENTIAL REINJURY

Identifying youths at risk for violence is the first step in ED-based violence prevention programs. When surveyed, ED physicians and nurses cite lack of time, energy, and skills; concern for personal safety; and upsetting family members as barriers to conducting a risk assessment among violently injured youths.⁴⁵ Clinicians are hampered by a paucity of empirically based screening tools that have been validated in a medical setting and can accomplish this assessment in a standardized and efficient manner. However, despite deficits in literature in the ED setting, there is substantial evidence from other disciplines that suggests that youths at especially high risk can be accurately identified.

A fundamental component of preventing reinjury is assessing youths (and possibly their families) for risk of retaliatory violence and reinjury. Similar to practices around intimate partner violence, respondents need to feel safe and confident that their answers will not “come back” to hurt them, and the questions need to be direct and straightforward and asked in a nonjudgmental manner. Risk for retaliation is presumably the highest in the several weeks after a violence-related injury, highlighting the potential effect of an ED intervention, as well as the futility in relegating screening and intervention to a later time or setting.

An example of a screening tool to assess retaliation is outlined in Figure 2, which may serve as a template for further research. The FiGHTS screen, derived from a national school-based sample (Table 4), effectively classifies the majority of school students at low risk for firearms carrying⁵⁰ and may also be appropriate for adaptation and validation in an ED sample. Other resources include brief violence-risk screening tools developed for use in primary care settings that may be appropriate to be adapted for use in the ED.^{51,52} One found that 3 short questions about performance in school, drug use, and involvement in physical fights predicted violence-related injury in the follow-up period.⁵¹ In addition to assessing risk for violent reinjury, ED providers should also consider assessing the

Table 4. FIGHTS screening tool for adolescent firearms carrying.⁵⁰

Fighting	During the last 12 mo, have you been in a physical fight?
Gender	Male
Hurt	During the last 12 mo, have you been in a fight in which you were injured and had to be treated by a physician or nurse?
Threatened	During the last 12 mo, have you been threatened with a weapon (knife/gun) on school property?
Smoker	Have you ever smoked cigarettes regularly (1 cigarette/day for 30 days)?

youth's risk of development of posttraumatic stress disorder.⁵³ Symptoms detected in the ED at evaluation may help predict the development of longer-term posttraumatic stress disorder and can be used to guide referrals.⁵⁴

PROVIDE YOUTHS WITH COUNSELING AND LINKAGES TO RESOURCES TO PREVENT FUTURE VIOLENCE

ED and trauma programs based on best practices have demonstrated a reduction in reinstitutionalization and service utilization for many high-risk populations.^{55,56} Successful models use a collaborative process that requires input and support from many groups, including patients, families, medical staff, and community services.

Four key components have been identified as "best practices" for promoting the successful transition from an institution to the community for youths at high risk for violence⁵⁷: (1) assessment of the patient's psychosocial needs and the risks they pose to public health and safety (see screening above); (2) planning for the treatment and services required to address these needs; (3) identifying institutional or local programs responsible for postdischarge services; and (4) coordinating the plan to ensure appropriate service delivery and mitigate gaps in care. In the simplest form, ED "discharge planning" would address youths' immediate risk of retaliatory violence and immediate safety. Table 5 provides an overview of recent ED/hospital-based violence interventions. For example, Zun et al⁵⁸ described a program that successfully referred victims of violence from the ED to a case manager at a social service agency. This study addressed the common question, is it possible to refer youths successfully? Most of the individuals made contacts with their case manager and used services such as education (21.6%), job readiness (19.1%), and mental health (11.9%). Cheng et al⁵⁹ recently evaluated an intervention that originated with the ED visit and used a case management approach to link those youths with violent injury to needed services. On a larger scale, several Philadelphia EDs have collaborated in the development of the Pennsylvania Injury Reporting and Intervention System, which provides an intervention for gunshot victims (aged 15 to 24 years). This program, supported by state funding and operated through city agencies and nonprofit organizations, assigns a counselor to victims and their families to aid in recognition of conditions that may have contributed to their exposure to

violence. Together, they develop individual plans for victims and their families to prevent further violence. Program evaluation of the effectiveness of the Pennsylvania Injury Reporting and Intervention System on youth outcome is ongoing.

Previous studies evaluating a similar case management approach with an inpatient trauma population found the intervention group was 3 times less likely to be arrested for a violent crime, 2 times less likely to be convicted of any crime, and 4 times less likely to be convicted of a violent crime.⁶¹ In addition, the projected time of incarceration was significantly longer for the control group.^{60,61} Other hospital programs have undergone evaluation, demonstrating a decrease in arrest rates and intentional reinjuries by program participants.^{62,63} Specifically, youths who had participated in the intervention were 70% less likely to be arrested and 60% less likely to have any criminal involvement.⁶² As with all promising interventions, these projects require replication and further evaluation with validated measures, standardized sampling procedures, larger sample size, multiple sites, concurrent comparison control groups, and long-term follow-up.

ED-based studies have demonstrated the effectiveness of brief counseling at ED care for prevention of other injury-related risk behaviors, such as alcohol use, in older adolescents.^{32,64-68} Similar brief motivational techniques may be applicable to ED violence prevention initiatives at ED care, especially in combination with active referral to community resources. One preliminary study found that universal computerized screening for violence and brief intervention during an ED visit is feasible, well received, and effective at changing violence and alcohol attitudes posttest.⁶⁹ Given the intrinsic difficulty in contacting high-risk mobile youths for follow-up evaluations, initiating the intervention during the ED visit may be a critical component in this endeavor. Strategies that can promote and enhance this evaluation and linkage include the use of trained peer volunteers (as is done for support of many victims of domestic violence), less resource-intensive interventions that use computer- or Web-based technology for youths earlier in the spectrum of problem behavior, and using existing or additional funded social workers to provide linkages with community-based programs.^{68,70,71}

Finally, although initiation of violence intervention and prevention protocols is often viewed as cost prohibitive, several studies have demonstrated significant long-term savings. In a criminal justice-based analysis of the potential lifetime costs and benefits derived from "saving" a high-risk youth, Cohen⁷² estimated that if a 2-year intensive youth program for 100 youths cost \$500,000 (\$5,000 per youth) and this program "saved" 1 youth from a life of drug abuse or crime or dropping out of high school, the program would generate total benefits of \$1.7 to \$2.3 million. A review of 34 recent analyses in the field of violence prevention approaches found that 19 yielded beneficial net societal cost ratios and cost per quality-adjusted life-year.⁷³ Although these analyses did not include ED-based

Table 5. Overview of ED- and hospital-based violence intervention programs.

Project Title and Study Design	Intervention Type	Population	Demonstrated Outcomes and Cost Analysis
Caught in Crossfire Youth ALIVE! (Case-control study)	Peer-based case management and mentoring beginning at the hospital bedside.	Oakland, CA Aged 12–20 y Hospitalized for violent injury (ie, trauma admissions)	N=112 Reduction in criminal justice involvement during a 6-mo postinjury period ⁶² Deemed cost-effective. Program cost: \$3,500 per patient/per year. Total cost reduction derived annually ≈\$750,000 to \$1.5 million. ⁷⁵
Cheng et al, 2008 (RCT)	Case management and family intervention: case management services by a counselor who discussed sequelae of assault injury and assessed family needs and facilitated service use.	Baltimore, MD Aged 12–17 y Presenting to ED or were hospitalized at a large urban children's hospital with peer assault injury (any level of severity)	N=88 Youths and parents were receptive to violence prevention intervention after ED visit for assault injury. ⁵⁹ The case management program did not increase service utilization or reduce risk factors for injury. ⁵⁹ Intervention parents reported high levels of satisfaction with case manager services at follow-up assessment. ⁵⁹
Violence Intervention Project (RCT)	Case management: intensive psychosocial follow-up services, family or group therapy and assistance with substance abuse treatment.	Baltimore, MD Age >18 y Admitted to trauma service with violent assault, and who had been previously hospitalized for violent injury and have previous involvement in criminal justice system	N=100 Control group was 3 times more likely to be arrested for violent crime and 2 times as likely to be convicted of any crime as the intervention group. Compared with the intervention group, projected time of incarceration was longer for control group and repeated violent activity was more evident. ⁸³
Pennsylvania Injury Reporting and Intervention System ⁸⁴ Pilot Surveillance and Intervention System N=256	Community-based, trauma-informed case management to link families to services and support healthy (physical, emotional, and social) transitions to adulthood.	Philadelphia, PA Aged 15–24 y Treated and discharged from trauma center for gunshot injuries	Study and recruitment ongoing. Two thirds of eligible cases identified, 60% achieved successful referrals. ⁸⁵ 70% Of participants remained in case management 90+ days. Increased medical follow-up compared with nonparticipants. 97% Of participants found case manager to be helpful. ⁸⁶
SaferFlint Teens (RCT)	Brief intervention (1 ED session) based on motivational interviewing+skills training delivered by computer or research therapist.	Flint, MI Ages 14–18 y Seeking ED care (medical or injury) who endorse past year violence, including weapon carriage, and alcohol use	N=64 Study and recruitment ongoing. Results to date show screening high-risk youths during ED visit is feasible, well received, and effective at changing violence and alcohol attitudes at 3 months ⁶⁹
Project UJIMA (Observational study)	Youth intervention services and referral based on needs assessment. Parent services addressing assault-related concerns or mental health concerns exacerbated by the assault.	Milwaukee, WI Aged 10–18 y Treated in ED for violent injury	N=218 1% Of repeated injury rate ⁶³ Using base cost-effectiveness analysis model, the program was cost-effective ⁸⁴
Within Our Reach	Case management: anger management and conflict resolution counseling from a case manager and referral to appropriate resources (Boys & Girls Clubs of Chicago).	Chicago, IL Aged 10–24 y Victims of violence with life- or limb-threatening injuries	N=218 Linkage between the ED and a social service agency increased the number of resources used by young victims of violence. ⁵⁸ Reduction in reinjury rate in the intervention group. ⁸⁷ Cost ≈\$45,000/year to enroll and follow an estimated 20 youths for 6 mo in the program. ⁸⁷
Wraparound Project	Culturally competent case management (6–18 mo), depending on the person.	San Francisco, CA Aged 12–30 y Treated in the ED or inpatient unit by trauma service, with violent injury.	N=210 Study and recruitment ongoing. Intermediate evaluations found successful in individual resource placement (jobs, General Educational Development, vocational training, court advocacy, mental health) more than 60% of the time. ⁸⁸

RCT, Randomized control trial.

Table 6. Patient- versus policy-level advocacy efforts.

Case	Patient Level	Policy Level
A child presents to the ED as a victim of abuse and neglect	ED/trauma personnel treat child and contact child protective services	ED/trauma staff join with child welfare advocates in support of increased funding for child protective service caseworkers
A young man presents to the ED with a gunshot wound	ED personnel treat young man and discharge him with wound follow-up information and referral for posttraumatic stress disorder counseling	ED staff organize a coalition of medical providers interested in limiting access to handguns in the state
A married mother presents to the ED, a victim of domestic violence	ED personnel treat woman and make referrals to domestic violence programs and shelters	ED staff join with other organizations interested in stronger enforcement of laws governing restraining orders

violence interventions, other studies among inpatient populations suggest that comprehensive discharge planning and aftercare for violently injured patients costs an average of \$2,000 to \$3,500 per patient—significantly less than the cost of hospitalization for gunshot injury.⁷⁴ Specifically, a trauma-based intervention, “Caught in the Crossfire,” was found to be cost-effective when compared with juvenile detention center costs; the total cost reduction derived from the intervention program annually was \$750,000 to \$1.5 million.⁷⁵

ADVOCATE FOR POLICIES AND PROGRAMS THAT PROMOTE POSITIVE YOUTH DEVELOPMENT AND REDUCE RISK FOR VIOLENT INJURY AND DEATH

Health professionals working on the front lines of health care can serve as powerful advocates for policies that support positive youth development and reduce violence risk factors. Providers are accustomed to being advocates for their patients, but few recognize that they have the professional obligation and ability to become community policy level advocates as well (Table 6). Violent injuries treated in ED settings offer the opportunity for ED physicians to interact with the media and reframe the media message. Unfortunately, episodic and sensationalist reports of crime and violence within a specific community can cause the lay public to be fearful and reactive and may distract from prevention efforts and promote more punitive, criminal justice responses to violence prevention.^{76,77} Through advocacy, emergency medicine, surgery, and nursing leaders and other

partners can reframe gun violence as a public health issue and advocate for the development, implementation, and evaluation of evidence-based programs and policies to reduce and eliminate violence in communities. Advocating for evidence-based policy change complements the importance of advocating for individual patients. It enables us to work upstream to prevent or minimize the high-risk environments that placed patients in our care in the first place.

RESOURCES FOR IMPLEMENTING VIOLENCE PREVENTION EFFORTS AND RESEARCH IN THE ED

A growing number of resources are available to assist providers in incorporating youth violence prevention assessment and interventions into medical settings. Although none of the following resources are specific to the violent reinjury of youths, the comprehensive Centers for Disease Control and Prevention publication titled “Measuring Violence-Related Attitudes, Behaviors, and Influences Among Youths: A Compendium of Assessment Tools” is a useful resource for future ED research on identifying screening and assessment tools.⁷⁸ The American Medical Association’s *Connecting the Dots to Prevent Youth Violence* training guide⁷⁹ provides a useful introduction to the topic of youth violence and a variety of online resources for clinicians. Other resources (Table 7) include a recently completed curriculum on violent injury prevention for emergency medicine and trauma providers.⁸⁰

FUTURE DIRECTIONS FOR RESEARCH

Although the evidence base for youth violence prevention in other sectors is considerable and compelling, the evidence base for youth violence clinical preventive services is still in a nascent stage. Existing evidence suggests the potential value of prevention efforts provided through the health care setting. Continuing research to identify effective components of current programs, cost-effectiveness, and reproducibility in other systems is needed to better understand the best approaches to risk assessment and intervention within the ED setting and to evaluate the effect of these actions on the long-term outcomes of violently injured youths.

Specific areas in need of study include:

- 1) Development and validation of brief practical screening instruments that can quantify the youth’s future level of risk for violent reinjury, retaliatory violence, or posttraumatic stress disorder after the inciting event.
- 2) Investigation of the optimal process for implementation of this evaluation in the ED. This includes the most appropriate timing during the ED stay, the type of personnel responsible for the evaluation and escalated care, and the role of technology in screening youths to ensure validity of response while working within the time constraints of the ED setting.
- 3) Development and longitudinal evaluation of safety protocols to identify and intervene for youths who are

Table 7. Resources for more information.

Resource	Description
Youth violence prevention: A curriculum and resources for Emergency and Trauma Providers	http://www.stopyouthviolence.ucr.edu
Connected Kids ⁸⁹	Tools and training curricula for youth violence prevention
PREVENT Preventing Violence through Education, Networking and Technical Assistance ⁹⁰	Face-to-face and distance learning to build capacity in health professionals working in local, state, and national government to develop comprehensive violence prevention plans and strategies for their communities.
Teach VIP ⁹¹	Training curricula aims at building public health and governmental infrastructure for reducing injury, including violent injury
National Youth Violence Prevention Resource Center	http://www.safeyouth.org/scripts/index.asp
Center for the Study and Prevention of Violence's Blueprints for Violence Prevention series	http://www.colorado.edu/cspv/blueprints/index.html

deemed high risk for retaliatory violence. Such protocols could include arrangements for safe housing, community- or police-based de-escalation of the event, and ED-based counseling similar to our efforts in managing domestic violence victims.

- 4) Adaptation and evaluation of brief intervention techniques successful for other high-risk behaviors, such as substance use, to enhance conflict resolution or decrease illicit weapon carriage among teens.
- 5) Rigorous evaluation and replication of case management strategies that have been shown to reduce future injury or incarceration among high-risk youths in other ED or inpatient settings.
- 6) Translation to clinical practice of potentially effective case management or brief intervention programs, and training of ED physicians, residents, and support staff in these techniques.
- 7) Cost analysis of promising programs.

CONCLUSIONS

At present, the ED is an underutilized resource in our national efforts to reduce violent injury among our nations' youths, and the ED visit is a missed opportunity for detection and intervention with those youths at highest risk for future violent injury and death. Although research on the effectiveness of ED-based interventions is still in an early stage of development, research on violence prevention in other settings is compelling.

Assessment and intervention with violently injured youths to prevent reinjury is a logical extension of violence interventions already occurring in the ED and can build on protocols that are already in place. Introducing or expanding violence prevention efforts and research in hospital EDs will require building a foundation with many different domains, including (1) interest and support of physicians and other health care professionals working in the setting; (2) development of clinical guidelines and tools that can guide clinicians in providing care to violently injured youths in the ED; (3) support from hospitals through their injury prevention coordinators, registries, and community outreach services; (4) leadership from professional associations

who educate their members about youth violence and the threat it poses to the health of their patients, especially poor and minority youths; and (5) continued research into what works to prevent or reduce the most severe forms of youth violence.

The authors thank Pat Bergeron and Sonia Kamat, MS, for administrative assistance.

Supervising editor: Kathy J. Rinnert, MD, MPH

Funding and support: By *Annals* policy, all authors are required to disclose any and all commercial, financial, and other relationships in any way related to the subject of this article that might create any potential conflict of interest. The authors have stated that no such relationships exist. See the Manuscript Submission Agreement in this issue for examples of specific conflicts covered by this statement.

Publication dates: Received for publication May 14, 2008. Revision received November 3, 2008. Accepted for publication November 19, 2008. Available online January 22, 2009.

Address for reprints: Rebecca Cunningham, MD, University of Michigan, Injury Research Center, 300 North Ingalls Building, Room 2C40, Ann Arbor, MI 48109-5437; 734-615-3704, fax 734-936-2706; E-mail stroh@umich.edu.

REFERENCES

1. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. Web-based Injury Statistics Query and Reporting System (WISQARS) [online]. 2005. Available at: <http://www.cdc.gov/ncipc/wisqars>. Accessed April 8, 2008.
2. Sims DW, Bivins BA, Obeid FN, et al. Urban trauma: a chronic recurrent disease. *J Trauma*. 1989;29:940-946.
3. Reiner DS, Pastena JA, Swan KG, et al. Trauma recidivism. *Am Surg*. 1990;56:556-560.
4. Morrissey TB, Byrd CR, Deitch EA. The incidence of recurrent penetrating trauma in an urban trauma center. *J Trauma*. 1991;31:1536-1538.
5. Goins WA, Thompson J, Simpkins C. Recurrent intentional injury. *J Natl Med Assoc*. 1992;84:431-435.
6. Poole GV, Griswold JA, Thaggard VK, et al. Trauma is a recurrent disease. *Surgery*. 1993;113:608-611.
7. Pennsylvania Health Care Cost Containment Council. Hospital performance report 2002—news release. Pennsylvania Health

- Care Cost Containment Council Web site. Available at: <http://www.phc4.org/reports/hpr/02/nr102903.htm>. Accessed April 8, 2008.
8. Centers for Disease Control and Prevention, National Center for Injury Prevention and Control. *National Summary of Injury Mortality Data, 1987-1994*. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 1996.
 9. Prothrow-Stith DB. The epidemic of youth violence in America: using public health prevention strategies to prevent violence. *J Health Care Poor Underserved*. 1995;6:95-101.
 10. Menard S. *Short- and Long-term Consequences of Adolescent Victimization*. Washington, DC: US Department of Justice, Office of Juvenile Justice and Delinquency Prevention; 2002.
 11. Bingenheimer JB, Brennan RT, Earls FJ. Firearm violence exposure and serious violent behavior. *Science*. 2005;308:1323-1326.
 12. Dowd MD. Consequences of violence. Premature death, violence recidivism, and violent criminality. *Pediatr Clin North Am*. 1998;45:333-340.
 13. Corso PS, Mercy JA, Simon TR, et al. Medical costs and productivity losses due to interpersonal and self-directed violence in the United States. *Am J Prev Med*. 2007;32:474-482.
 14. Cook PJ, Lawrence BA, Ludwig J, et al. The medical costs of gunshot injuries in the United States. *JAMA*. 1999;282:447-454.
 15. Center for the Study and Prevention of Violence. Blueprints for violence prevention. University of Colorado at Boulder Web site. Available at: <http://www.colorado.edu/cspv/blueprints/index.html>. Accessed July 8, 2005.
 16. Commission for the Prevention of Youth Violence. Youth and violence. Medicine, nursing, and public health: connecting the dots to prevent violence. American Medical Association Web site. Available at: <http://www.ama-assn.org/ama/upload/mm/386/fullreport.pdf>. Accessed April 8, 2008.
 17. Dearing B, Caston RJ, Babin J. The impact of a hospital based educational program on adolescent attitudes toward drinking and driving. *J Drug Educ*. 1991;21:349-359.
 18. Tucker JB, Barone JE, Stewart J, et al. Violence prevention: reaching adolescents with the message. *Pediatr Emerg Care*. 1999;15:436-439.
 19. US Department of Health and Human Services. *Youth Violence: A Report of the Surgeon General*. Rockville, MD: US Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2001.
 20. Catalano RF, Loeber R, McKinney KC. *School and Community Interventions to Prevent Serious and Violent Offending*. Washington, DC: Office of Juvenile Justice and Delinquency Prevention; 1999.
 21. Catalano RF, Arthur MW, Hawkins JD, et al. Comprehensive community- and school-based interventions to prevent antisocial behavior. In: Loeber R, Farrington DP, eds. *Serious and Violent Juvenile Offenders: Risk Factors and Successful Interventions*. Thousand Oaks, CA: Sage Publications; 1998:248-283.
 22. Masten AS, Coatsworth JD. The development of competence in favorable and unfavorable environments. Lessons from research on successful children. *Am Psychol*. 1998;53:205-220.
 23. Catalano RF, Hawkins JD. *Communities That Care: Risk-Focused Prevention Using the Social Development Strategy*. Seattle, WA: Developmental Research and Programs, Inc; 1995.
 24. American Medical Association. *Guidelines for Adolescent Preventive Services (GAPS)*. Chicago, IL: American Medical Association; 1997.
 25. American Academy of Pediatrics Task Force on Violence. The role of the pediatrician in youth violence prevention in clinical practice and at the community level. *Pediatrics*. 1999;103:173-181.
 26. American Academy of Pediatrics. Firearm-related injuries affecting the pediatric population. Committee on Injury and Poison Prevention. American Academy of Pediatrics. *Pediatrics*. 2000;105(4 pt 1):888-895.
 27. American Academy of Family Physicians. Violence [position paper]. American Academy of Family Physicians Web site. Available at: <http://www.aafp.org/online/en/home/policy/policies/v/violencepositionpaper.html>. Accessed April 8, 2008.
 28. American College of Emergency Physicians. Practice resources—violence. American College of Emergency Physicians Web site. Available at: <http://www.acep.org/practres.aspx?id=29848>. Accessed April 8, 2008.
 29. National Research Council and Institute of Medicine. *Injury in America: A Continuing Health Problem*. Washington, DC: National Academy Press; 1985.
 30. Committee on Trauma. Alcohol Screening and Brief Intervention (SBI) for trauma patients: COT quick guide. American College of Surgeons Web site. Available at: <http://www.facs.org/trauma/publications/sbirtguide.pdf>. Accessed April 8, 2008.
 31. Johnson SB, Bradshaw CP, Wright JL, et al. Characterizing the teachable moment: is an emergency department visit a teachable moment for intervention among assault-injured youth and their parents? *Pediatr Emerg Care*. 2007;23:553-559.
 32. Monti PM, Colby SM, Barnett NP, et al. Brief intervention for harm reduction with alcohol-positive older adolescents in a hospital emergency department. *J Consult Clin Psychol*. 1999;67:989-994.
 33. Williams S, Brown A, Patton R, et al. The half-life of the “teachable moment” for alcohol misusing patients in the emergency department. *Drug Alcohol Depend*. 2005;77:205-208.
 34. Becker B, Woolard RE, Nirenberg TD, et al. Alcohol use among sub-critically injured emergency department patients. *Acad Emerg Med*. 1995;2:784-790.
 35. Dikmen SS, Machamer JE, Donovan DM, et al. Alcohol use before and after traumatic head injury. *Ann Emerg Med*. 1995;26:167-176.
 36. Longabough R, Minugh PA, Nirenberg TD, et al. Injury as a motivator to reduce drinking. *Acad Emerg Med*. 1995;2:817-825.
 37. Widom CS. The cycle of violence. *Science*. 1989;244:160-166.
 38. Spivak HR, Prothrow-Stith D. Addressing violence in the emergency department. *Clin Pediatr Emerg Med*. 2003;4:135-140.
 39. Belcher JR, DeForge BR, Jani JS. Inner-city victims of violence and trauma care: the importance of trauma-center discharge and aftercare planning and violence prevention programs. *J Health Soc Pol*. 2005;21:17-34.
 40. Morrongiello BA, Hillier L, Bass M. “What I said” versus “what you heard”: a comparison of physicians’ and parents’ reporting of anticipatory guidance on child safety issues. *Inj Prev*. 1995;1:223-227.
 41. Quinlan KP, Sacks JJ, Kresnow M. Exposure to and compliance with pediatric injury prevention counseling—United States, 1994. *Pediatrics*. 1998;102:e55.
 42. McCaig LF, Burt CW. National Hospital Ambulatory Medical Care Survey: 1999 emergency department summary. *Adv Data*. 2001;(320):1-34.
 43. Ziv A, Boulet JR, Slap GB. Emergency department utilization by adolescents in the United States. *Pediatrics*. 1998;101:987-994.
 44. Marcell AV, Klein JD, Fischer I, et al. Male adolescent use of health care services: where are the boys? *J Adolesc Health*. 2002;30:35-43.

45. Fein JA, Ginsburg KR, McGrath ME, et al. Violence prevention in the emergency department: clinician attitudes and limitations. *Arch Pediatr Adolesc Med.* 2000;154:495-498.
46. Raden AS. *Youth Violence Prevention: How Does the Health Care Sector Respond?* Washington, DC: George Washington University; 2001.
47. Centers for Disease Control and Prevention. Emergency department response to domestic violence—California, 1992. *MMWR Morb Mortal Wkly Rep.* 1993;42:617-619.
48. Knox L. *Youth Violence and the Health Professions: Core Competencies for Effective Practice.* Riverside, CA: Southern California Academic Center of Excellence on Youth Violence Prevention; 2001.
49. Denninghoff KR, Knox L, Cunningham R, et al. Emergency medicine: competencies for youth violence prevention and control. *Acad Emerg Med.* 2002;9:947-956.
50. Hayes DN, Sege R. FIGHTS: a preliminary screening tool for adolescent firearms-carrying. *Ann Emerg Med.* 2003;42:798-807.
51. Sege R, Stringham P, Short S, et al. Ten years after: examination of adolescent screening questions that predict future violence-related injury. *J Adolesc Health.* 1999;24:395-402.
52. Borowsky IW, Ireland M. Predictors of future fight-related injury among adolescents. *Pediatrics.* 2004;113(3 pt 1):530-536.
53. Fein JA, Kassam-Adams N, Gavin M, et al. Persistence of posttraumatic stress in violently injured youth seen in the emergency department. *Arch Pediatr Adolesc Med.* 2002;156:836-840.
54. Fein JA, Kassam-Adams N, Vu T, et al. Emergency department evaluation of acute stress disorder symptoms in violently injured youths. *Ann Emerg Med.* 2001;38:391-396.
55. Wood C, Lui J. The evolution of disability care and case management: identifying core competencies. *Case Manager.* 1999;10:41-45.
56. Isham GJ, Kraemer KK. Identifying and managing high-risk members. Targeted outpatient management improves outcome. *Group Practice J.* 2003;52:1-5.
57. Travis J, Solomon AJ, Waul M. *From Prison to Home: The Dimensions and Consequences of Prisoner Reentry.* Washington, DC: Urban Institute; 2001.
58. Zun LS, Downey LV, Rosen J. Violence prevention in the ED: linkage of the ED to a social service agency. *Am J Emerg Med.* 2003;21:454-457.
59. Cheng TL, Wright JL, Markakis D, et al. Randomized trial of a case management program for assault-injured youth. *Pediatr Emerg Care.* 2008;24:130-136.
60. Cooper C, Eslinger D, Nash D, et al. Repeat victims of violence: report of a large concurrent case-control study. *Arch Surg.* 2000;135:837-843.
61. Dicker R. Violence prevention for trauma centers: a feasible start [poster 2901]. Paper presented at: Injury and Violence in America; May 11, 2005; Denver, CO.
62. Becker MG, Hall JS, Ursic CM, et al. Caught in the crossfire: the effects of a peer-based intervention program for violently injured youth. *J Adolesc Health.* 2004;34:177-183.
63. Marcelle DR, Melzer-Lange MD. Project UJIMA: working together to make things right. *WMJ.* 2001;100:22-25.
64. Gregor MA, Shope JT, Blow FC, et al. Feasibility of using an interactive laptop program in the emergency department to prevent alcohol misuse among adolescents. *Ann Emerg Med.* 2003;42:276-284.
65. Johnston BD, Rivara FP, Drosch RM, et al. Behavior change counseling in the emergency department to reduce injury risk: a randomized, controlled trial. *Pediatrics.* 2002;110(2 pt 1):267-274.
66. Maio RF. Alcohol and injury in the emergency department: opportunities for intervention. *Ann Emerg Med.* 1995;26:221-223.
67. Monti PM, Barnett NP, Colby SM, et al. Motivational enhancement of alcohol-involved adolescents. In: Monti PM, Colby SM, O'Leary TA, eds. *Adolescents, Alcohol and Substance Abuse: Reaching Teens Through Brief Interventions.* New York, NY: Guilford Press; 2001:145-182.
68. Strecher V, Wang C, Derry H, et al. Tailored interventions for multiple risk behaviors. *Health Educ Res.* 2002;17:619-626.
69. Cunningham R, Walton MA, Zimmerman MA. SafERTeens: computerized screening and brief intervention for teens at-risk for youth violence [abstract #264]. Paper presented at: 2007 Annual Meeting of the Society for Academic Emergency Medicine; Chicago, IL; May 18, 2007.
70. Strecher VJ, Kreuter M, Den Boer DJ, et al. The effects of computer-tailored smoking cessation messages in family practice settings. *J Fam Pract.* 1994;39:262-270.
71. Skinner HA. *Promoting Health through Organizational Change.* San Francisco, CA: Benjamin Cummings; 2001.
72. Cohen MA. The monetary value of saving a high-risk youth. *J Quantitative Criminol.* 1998;14:5-33.
73. Miller TR, Levy DT. Cost-outcome analysis in injury prevention and control: eighty-four recent estimates for the United States. *Med Care.* 2000;38:562-582.
74. Bonderman J. *Working with Victims of Gun Violence.* Washington, DC: US Department of Justice, Office for Victims of Crime; 2001.
75. Shibr D, Zahnd E, Becker M, et al. Benefits of a hospital-based peer intervention program for violently injured youth. *J Am Coll Surg.* 2007;205:684-689.
76. Wallack L, Dorfman L, Jernigan D, et al. *Media Advocacy and Public Health: Power for Prevention.* Newbury Park, CA: Sage Publications; 1993.
77. Wallack L, Woodruff K, Dorfman L, et al. *News for a Change: An Advocate's Guide to Working With the Media.* Thousand Oaks, CA: Sage Publications; 1999.
78. Dahlberg LL, Toal SB, Swahn M, et al. *Measuring Violence-Related Attitudes, Behaviors, and Influences Among Youths: A Compendium of Assessment Tools.* 2nd ed. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control; 2005.
79. Knox L. *Connecting the Dots to Prevent Youth Violence: A Training and Outreach Guide for Physicians and Other Health Professionals.* Chicago, IL: American Medical Association; 2002.
80. Cunningham R, Knox L, Fein J, et al. Youth violence prevention: a curriculum and resources for emergency and trauma providers. Southern California Academic Center of Excellence on Youth Violence Prevention. Available at: <http://www.stopyouthviolence.ucr.edu/>. Accessed October 24, 2008.
81. Huesmann L, Eron L, Lefkowitz M, et al. Stability of aggression over time and generations. *Dev Psychol.* 1984;20:1120-1134.
82. National Youth Violence Prevention Resource Center. Risk and protective factors for youth violence fact sheet. National Youth Violence Prevention Resource Center Web site. Available at: <http://www.safeyouth.org/scripts/facts/risk.asp>. Accessed April 8, 2008.
83. Cooper C, Eslinger DM, Stolley PD. Hospital-based violence intervention programs work. *J Trauma.* 2006;61:534-540.
84. Ketterlinus RD. *Youth Violence. Interventions for Health Care Providers.* Washington, DC: APHA; 2008.
85. Thornton CK, Ketterlinus R, Spears D, et al. Quality improvement assessment of a state-funded reporting and intervention system for youth firearm injury: Pennsylvania Injury Reporting and Intervention System. Paper presented at: 136th American Public Health Association annual meeting; October 27, 2008; San Diego, CA.

86. Thornton C, Liao A, Cheney R, et al. Pilot test and preliminary findings of an intervention system for youth firearm injury: Pennsylvania Injury Reporting and Intervention System (PIRIS). Paper presented at: National Injury and Violence Prevention research conference; October 10-11, 2007; Columbus, OH.
87. Zun LS, Downey L, Rosen J. The effectiveness of an ED-based violence prevention program. *Am J Emerg Med.* 2006;24:8-13.
88. Dicker RA, Jaeger S, Knudson MM, et al. Where do we go from here? utilizing interim analysis to forge ahead in violence prevention. Paper presented at: 38th Annual Scientific Meeting of the Western Trauma Association; February 24-29, 2008; Squaw Creek, CA.
89. Sege RD, Flanigan E, Levin-Goodman R, et al. American Academy of Pediatrics' connected kids program: case study. *Am J Prev Med.* 2005;29(5 suppl 2):215-219.
90. University of North Carolina, Injury Prevention Research Center. PREVENT: The new national violence prevention leader and practitioner training program. The University of North Carolina, Injury Prevention Research Center Web site. Available at: <http://www.prevent.unc.edu>. Accessed March 28, 2008.
91. Meddings DR, Knox LM, Maddaleno M, et al. World Health Organization's TEACH-VIP: contributing to capacity building for youth violence prevention. *Am J Prev Med.* 2005;29(5 suppl 2):259-265.