

**Investigating Gun Violence and Hospital-Based Violence Intervention Programs in
the Youth Population at Lurie Children's Hospital**

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1 **Abstract**

2 Gun violence is a public health problem that primarily impacts adolescents and
3 People of Color. Hospital Based Violence Intervention Programs (HVIPs) are formalized
4 interventions with patients who have experienced violence with the goal to prevent future
5 violence. For this project, I will focus on patients affected by firearm violence.

6 There is currently no HVIP in place at Ann & Robert H. Lurie Children's
7 Hospital of Chicago (Lurie Children's). The purpose of this project is to summarize
8 current literature recommendations for youth HVIP structure and initiation, summarize
9 current Lurie Children's firearm trauma patient demographics and current practices at
10 Lurie Children's in treatment of these patients, and to provide recommendations for Lurie
11 Children's to begin implementing a HVIP. This was accomplished through a literature
12 search, chart review of Lurie Children's firearm trauma patients via the electronic
13 medical record, and through interviews with Lurie Children's emergency department
14 (ED) staff members.

15 From 2013 to 2018, a total of 34 patients were seen in the Lurie Children's ED for
16 an initial encounter due to injury from a firearm, and the majority was hospitalized
17 (average hospital length of stay was 4.3 days); half of the incidents were intentional in
18 nature. Firearm-injured patients' ages ranged from less than 1 year of age to 16 years old.
19 The mean age was 12.5 years with a standard deviation of 3.7 years. 64.7% of patients
20 were non-Hispanic Black, and 29.4% of patients were Hispanic/Latino. Only one patient
21 was white. The majority (82.4%) of firearm-injured patients were male. 100% of firearm-
22 injured patients were seen by a social worker either in the ED or during their

1 hospitalization. Other services provided included case management, spiritual care, child
2 life services, and other mental health care.

3 From staff interviews, I learned that social workers perform risk assessments of
4 firearm-injured patients and provide resources to these patients, and that social workers
5 felt overworked. Additionally, staff members were open to the possibility implementing a
6 HVIP. As such, my initial recommendations to Lurie Children's for HVIP preparation
7 include identifying a high-risk target population, investing in additional social work and
8 case management resources, and forming partnerships with community organizations.
9 These findings will be presented to the relevant stakeholders (Lurie Children's staff or
10 administration) via email.

1 **Project Introduction**

2 **Gun Violence is a Public Health Issue**

3 The American Medical Association recognizes gun violence as an “epidemic” and
4 a “public health issue.” (1) They, along with numerous other organizations of public
5 health officials and healthcare providers, have long advocated for taking a public health
6 approach to the gun violence problem.

7 A public health approach to violence prevention is an evidence-based practice that
8 approaches violence prevention on a population level to maximize benefits to the greatest
9 number of people. The public health approach is multi-tiered and interdisciplinary,
10 involving coordinating with stakeholders from diverse sectors to prevent violence on all
11 levels (primary, secondary, and tertiary prevention). A public health approach takes four
12 concrete steps. First, define the problem. Second, identify risk factors and protective
13 factors for violence in the population. Third, develop, implement, and evaluate
14 interventions to reduce risk factors and maximize protective factors. Finally, after
15 evaluation, data collection, and analysis, institutionalize and disseminate successful
16 strategies. (2)

17 **Gun Violence in Chicago**

18 In Chicago, 573 people were killed in 2018. (3) See Figure 1. The majority of
19 Chicago homicides are due to gun violence.

20 The victims of gun violence are predominantly young, black men. Incidence
21 peaks in the mid-20s, but minors and children are also affected by gun violence. We also
22 know that violence tends to cluster in certain communities of Chicago, particularly the

1 South and West sides. The homicide map of the City of Chicago from June 2017 to June
2 2018 is displayed in Figure 2.

3 **Ann & Robert H. Lurie Children's Hospital of Chicago**

4 Ann & Robert H. Lurie Children's Hospital of Chicago has made significant
5 strides in violence prevention in the past 10 years, including establishing one of
6 Chicago's largest violence prevention coalitions, Strengthening Chicago's Youth (SCY).
7 Lurie Children's is heavily involved in policy and advocacy for gun violence prevention.

8 Lurie Children's is located in the Streeterville neighborhood of Chicago and is
9 one of only three Level 1 pediatric trauma centers in the city, the others being John H.
10 Stroger Jr. Hospital of Cook County and Comer Children's Hospital. (4) Of note, patients
11 age 16 to 18 years with gunshot trauma who are brought to Streeterville are seen and
12 treated at the neighboring and partnering hospital Northwestern Memorial Hospital
13 (NMH) as they do not fall under the definition of pediatric trauma for the state of Illinois
14 (less than 16 years of age). Lurie Children's is a leader in the identification and
15 prevention of child abuse and domestic violence. However, Lurie Children's does not
16 have an established, point-of-care intervention for firearm violence prevention.

17 Although the volume of firearm injury treated at Lurie Children's is low, Lurie
18 Children's is a leader in the field of violence and injury prevention and should therefore
19 have a strong Hospital-Based Violence Intervention Program (HVIP) in place. This
20 project seeks to understand the demographics of firearm-injured patient's at Lurie
21 Children's, evaluate the institution's current practices, and make recommendations for
22 next steps to establish a HVIP at Lurie Children's.

1 **Deliverables and Final Project**

2 The final project deliverables will include:

3 1. Summary of current literature recommendations for youth HVIP structure and
4 initiation

5 2. Summary of current Lurie Children's trauma patient (18 and younger)
6 demographics and neighborhoods, summary of current practices at Lurie
7 Children's in treatment of these patients based on chart review and staff
8 interviews

9 3. Recommendations for Lurie Children's to begin implementing a HVIP using
10 current evidence and guidelines from the literature

1 **Background**

2 **Scope and Epidemiology of Gun Violence in Pediatrics**

3 Firearm violence is an urgent public health problem among American youth. In
4 the United States, homicide from firearms is “the fourth leading cause of injury death in
5 5- to 9-year-olds and 10- to 14-year-olds and the second leading cause in 15- to 19-year-
6 olds.” (5) Firearm suicides are similarly prevalent and are the third most common cause
7 of death in children 10-19 years of age. (5)

8 Injuries accounted for over 60% of childhood and adolescent deaths in 2016. (6)
9 While the leading cause was motor vehicle accidents, “firearm-related injuries were the
10 second leading cause of death, responsible for 15% of deaths” in 2016. (6) Pediatric
11 firearm death rates in prior years were consistently high, at an annual crude rate of 1.8 per
12 100,000 from 2012 to 2014. (7) The United States has a high rate of pediatric death from
13 firearms compared to other countries; “9 out of 10 children <15 years of age killed by
14 firearms [worldwide] reside in the United States.” (5)

15 The annual rate of emergency department use for the treatment of “firearm-related
16 assault, an act of self-harm, or from an unintentional firearm injury, [was] 7.9 per
17 100,000 [from 2012 to 2014].” (7) More children are seriously injured by firearms than
18 are killed. (5) In addition, the majority of pediatric firearm injuries that present to the
19 emergency department are unintentional (5), though unintentional injuries are not the
20 leading causes of firearm-related death.

21 The categories of death by firearm violence include intentional injury such as
22 homicide and suicide, or unintentional injury such as accidental discharge. The categories
23 of firearm deaths in 2016 are summarized in Figure 3. (6)

1 **Why Study Firearm Violence Specifically?**

2 Violence is a broad topic that accounts for a large percentage of injuries and
3 death. The focus of this investigation is specifically the prevention of violence from
4 firearms in youth populations. Firearm violence is a particularly important area of study
5 because of it has high morbidity and mortality, imparts high risk of additional violence,
6 and is particularly costly to the medical system.

7 Injuries from firearms are some of the “most lethal of health events.” (8) The case
8 fatality for firearm injury varies by cause of injury and is highest for self-harm, reaching
9 85%. (8) The overall case fatality for firearm injury was estimated to be 22% in 2012. (9)
10 In addition, in the youth population (age 10-24) in 2017, 88.9% of homicide deaths were
11 due to firearms. (10) 94% of homicide deaths among African American youth in the same
12 year were due to firearms. (10) Firearm injuries of any cause that do not result in death
13 are also highly morbid, and about “50% of children hospitalized for a firearm-related
14 injury are discharged from the hospital with a disability.” (5)

15 Firearm injury is a risk factor for repeat injuries and death from firearms. In fact,
16 “violently injured urban adolescents treated after a gunshot injury are more likely to die
17 from a subsequent and similar injury than from any other illness or condition for which
18 they seek care.” (11) Being a victim or witness of firearm violence “doubles the
19 probability that a youth will commit violence within 2 years.” (11)

20 Firearm injuries are common and costly. In 2009, an average of “20 US children
21 and adolescents were hospitalized each day for firearm-related injuries.” (5) Each of
22 these injuries incurs significant costs. Gunshot injuries “are the most expensive [violent
23 injuries] to treat; the cost of acute care treatment for gun violence injuries conservatively

1 ranges from \$15,000 to \$32,000 per victim.” (11) In 2010, the total “medical cost of
2 treating firearm-related injuries in children and young adults <21 years old was >\$330
3 million.” (5) When accounting for both medical treatment and lost work, “violent injuries
4 among young people result in more than US \$16 billion in annual losses.” (12)

5 Overall, firearm injuries are among the most lethal, morbid, and costly of all
6 violent injuries. Gun violence increases the risk that victims are re-injured or killed by
7 guns, or become perpetrators of violence in the future. Stopping the cycle of gun violence
8 has the potential to decrease pediatric death and disability, and to reduce a large cost
9 burden on the medical system.

10 **Disparities in Experiencing Violence**

11 Violence, including firearm violence, disproportionately affects male and Black
12 youth. “Violence is the leading cause of death for male blacks aged 15 to 25” (11) and
13 “boys...[account] for 82% of all child firearm deaths.” (7) In African American youth, a
14 higher percentage of homicide deaths are attributable to firearms than in the general
15 adolescent population. (10) As such, programs that reduce firearm injury and violence are
16 opportunities to improve health equity. Both fatal and nonfatal firearm injuries also
17 disproportionately affect adolescents. The rate of “fatal firearm injury [in children aged
18 13-17]...was more than 12 times higher than the rate for younger children.” (7) In
19 addition, “Older children (aged 13–17) accounted for 88% of all nonfatal firearm injuries
20 treated in an ED” from 2012-2014. (7)

21 **Long-Term Effects of Violence**

22 Short-term effects of violence include immediate physical injury or bodily harm;
23 violence has several other long-term impacts on individuals and communities. There is a

1 growing body of research surrounding the biological mechanism of long-term health
2 effects of exposure to violence.

3 Exposure to violence has been categorized as one of many Adverse Childhood
4 Experiences (ACEs) that confer a greater risk of chronic disease later in life, including
5 heart disease, depression, and mental and behavioral health issues. (13) ACEs and other
6 “toxic chronic stress” are thought to impact health throughout one’s life course and cause
7 negative outcomes via neurotransmitter disruption, neuroendocrine dysfunction, and
8 chronic inflammatory pathways. (10) In addition, youth violence (including dating, gang-
9 related, and school-based violence) confers a greater risk of posttraumatic stress disorder
10 (PTSD), engaging in sexual intercourse prior to high school age, substance use and
11 dependence, violent victimization as an adult, and being involved in domestic violence
12 both as a victim and as a perpetrator. (10)

13

1 **Hospital Based Violence Intervention Programs**

2 **Introduction to Hospital Based Violence Intervention Programs**

3 Hospital-Based Violence Intervention Programs (HVIPs) are based on the
4 principle that in addition to treating injuries sustained from violence, hospitals may serve
5 as an important meeting and intervention point in the cycle of violence. They seek to
6 prevent future violence by establishing “(1) violent injury serving as a teachable moment,
7 (2) culturally competent case management and (3) addressing risks associated with
8 violent injury.” (14)

9 **Evidence for Youth HVIPs**

10 There are evidence-based interventions for community violence prevention in a
11 youth population, and there are a number of published toolkits and best practice
12 recommendations for building HVIPs. In addition, there are several randomized control
13 trials (RCTs) that demonstrate effectiveness of HVIPs in youth and adolescents.
14 Retrospective studies have also demonstrated effectiveness of some HVIPs.

15 Some RCTs demonstrate promising effects of HVIPs. A RCT evaluating a case-
16 management based HVIP that randomized patients seen in the “ED of an inner-city,
17 teaching, level I pediatrics and adult trauma center” that treated patients 10-24 years old,
18 demonstrated a statistically significant reduction in “self-reported reinjury rate...over
19 time in the treatment group (χ^2 3.87, P = .05).” (15)

20 Another RCT evaluating a HVIP established at the R Adams Cowley Shock
21 Trauma Center at the University of Maryland School of Medicine demonstrated, “The
22 control group was three times more likely to be arrested for a violent crime, two times
23 more likely to be convicted of any crime, and four times more likely to be convicted of a

1 violent crime [compared to the intervention group].” (16) In addition, control patients had
2 a significantly longer projected time of incarceration and significantly more evident
3 repeat violent criminal activity. (16) Although none of the patients in this trial were
4 children, the majority (52%) were under the age of 30. (16)

5 Another inpatient HVIP at Temple University Hospital in Philadelphia
6 demonstrated a change in attitudes towards violence, including “a 50% reduction in
7 aggressive response to shame, a 29% reduction in comfort with aggression, and a 19%
8 reduction in overall proclivity toward violence.” (17)

9 Despite the promising results of these RCTs, the “evidence base for youth
10 violence clinical preventive services is still in a nascent stage.” (11) There is limited
11 evidence for long-term effects of HVIPs, though some programs demonstrate sustainable
12 success. (12) The field would benefit from additional research into which components of
13 HVIPs are most effective, the effects of HVIPs on different patient demographics or age
14 groups, and the effects of HVIPs on different injury types.

15 **Challenges in Pediatric HVIPs**

16 While HVIPs are opportunities to reduce youth violence, there are some barriers
17 to the implementation of HVIPs in all age levels. Some published barriers to ED-based
18 violence prevention “include lack of time and resources, lack of proper training in
19 violence prevention, and concerns about one’s own safety.” (11) Other challenges in
20 pediatric populations include ensuring developmental appropriateness of the intervention
21 for each patient, as pediatric patients encompass a wide range of developmental stages.

22 Different age groups sustain different firearm injuries. For non-fatal injuries,
23 “children are more likely to be victims of unintentional injuries, the majority of which

1 occur in the home, and adolescents are more likely to suffer from intentional injuries due
2 to either assault or suicide attempts.” (5) For fatal firearm events in all pediatric age
3 groups, the annual rates of homicide are higher than the rates of unintentional deaths; in
4 older children, the firearm homicide and suicide rates are “roughly equivalent...and were
5 15 to 17 times higher than the unintentional firearm death rate for this group,” whereas
6 younger children have a firearm homicide rate “over 3 times higher than the rate of
7 unintentional firearm deaths.” (7)

8 **Suggested Models**

9 *Emergency Department as an Effective Location for Intervention*

10 Current publications indicate that the ED is an appropriate place to perform youth
11 screening for violence and initiate violence intervention. The ED sees a high volume of
12 firearm injuries, as “approximately 20,000 children present for care to the ED for
13 firearm-related injuries every year.” (5) Additionally, ED physicians and staff are likely
14 to encounter high-risk youth as “many of the patients at highest risk for youth violence
15 utilize the ED as their primary or sole access point to the health care system.” (11)
16 Because “assault-injured youth are more likely to have had prior ED use,” (18) and they
17 frequently access the ED for health services, the ED would be an appropriate location for
18 violence prevention interventions.

19 Not every patient seen and evaluated for a firearm injury is hospitalized. ED-
20 based interventions will capture a “large proportion of youths [who] are treated and
21 released from the ED.” (11) The ED also a place where other types of violence
22 interventions already occur, such as domestic violence and child abuse prevention. As
23 such, gun violence prevention is a “logical extension of violence interventions already

1 occurring in the ED and can build on protocols that are already in place.” (11) Therefore,
2 not utilizing the ED as a potential location for violence prevention is a “missed
3 opportunity for detection and intervention with those youths at highest risk for future
4 violent injury and death.” (11)

5 *Components of Successful HVIPs*

6 While HVIPs often vary in structure from institution to institution, there are some
7 elements that are implemented broadly. In addition, some of these components have been
8 found to be successful in studies of efficacious HVIPs. These components will be
9 discussed below. The overall timeline and flow of implementing and structuring a HVIP
10 can be seen in flow-chart format in Appendix 1. (19)

11 *Prior to Patient Recruitment*

12 According to best-practices guides published by experts in the field of HVIPs,
13 initial steps need to be taken prior to the implementation of HVIPs. (19) First, the target
14 population and their needs must be defined and identified through careful assessment and
15 data collection. In this paper, I characterize the population served at Lurie Children’s
16 through careful demographic analysis via a chart review. In addition the program must
17 determine screening criteria for entrance into the program.

18 The next step is to define the goals and objectives of the program. According to
19 Karraker, et al, many programs use the “SMART” (Specific, Measurable, Achievable,
20 Relevant, and Time-framed) framework to define their program’s goals and objectives.

21 Next, the program must secure hospital buy-in to ensure support and adoption of
22 the program. In addition, they recommend assessing the readiness and capacity of the
23 hospital to adopt such a program. In this paper, I conduct interviews with hospital staff

1 and administration to provide an initial assessment of current practices and potential
2 barriers and opportunities for program implementation.

3 Next, implementers must identify and establish community partnerships. All
4 current HVIPs involve “partnerships between a hospital that treats violently injured youth
5 and one or more community-based agencies.” (19) Community-based organizations offer
6 vital expertise and often implement their own evidence-based violence prevention
7 programs that patients can be referred to. (19)

8 *Patient Recruitment and Risk Assessment*

9 Designated individuals or teams should identify eligible patients once they arrive
10 at the hospital. Some programs use existing hospital staff such as chaplains, nurses, or
11 social workers, while others utilize program-specific staff members. However, employing
12 program-specific members can present an added barrier with HIPAA and chart-
13 accessibility for staff members who are not healthcare providers. (19)

14 Once patients are identified, programs must perform a risk assessment to identify
15 patients at high risk for retaliation and re-injury. (19) The risk assessment can serve both
16 to manage the initial crisis by identifying need for further immediate action or safety
17 precautions, and to determine appropriateness or establish consent for program entry.

18 *Models of Care and Intervention Services Provided*

19 Individual programs provide varying intervention services depending on the
20 service population’s needs, the goals and objectives of the program, and the resources
21 available. To determine specific interventions, programs may draw on a “four steps best
22 practices” framework (19), which includes the following steps:

23 1. *Assessment of the patient’s psychosocial needs and the risks they pose to public*

- 1 *health and safety, using screening tools;* [SEP]
- 2 2. *Planning for the treatment and services required to address these needs;*
- 3 3. *Identifying institutional or local programs responsible for post-discharge*
- 4 *services; and* [SEP]
- 5 4. *Coordinating the plan to ensure appropriate service delivery and mitigate gaps in*
- 6 *care. (19)*

7 Individual programs use different models to achieve these steps, including brief
8 intervention, mentor implemented violence prevention, trauma informed treatment, case
9 management, and faith-based approaches. (19)

10 Currently, “all National Network programs internally provide...crisis
11 intervention, needs/strengths assessment, case management, [and] referral to other
12 providers.” (19) In addition to the crisis intervention and initial risk assessment described
13 above, programs should assess the needs and strengths of the patient in a formalized way
14 to insure that they will reach the four best practices for HVIPs.

15 Commonly provided referrals include “job training and placement, mental health
16 and substance abuse counseling, ...academic [services], legal advocacy, tattoo removal,
17 housing assistance, and victim of crime compensation.” (19) Though the services
18 provided will depend on the patient, pediatric patients additionally require thoughtful
19 referrals that are developmentally appropriate. In addition, in situations of suspected or
20 potential abuse or neglect, referrals to or involvement of the Department of Child and
21 Family Services (DCFS) or Child Protective Services (CPS) may be necessary. Broadly,
22 the categories of referral are generally mental health and substance abuse treatment; and
23 vocational, educational, and legal services. (19)

1 *Staff and Support for Program*

2 Once goals and practice guidelines or protocols are defined, it may be necessary
3 to hire additional staff or support to sustain the HVIP. This discussion is beyond the
4 scope of this paper, though hiring and training guidelines are discussed in detail in the
5 best practices guide produced by Karraker, et al. (19) Similarly, discussions of funding
6 and revenue streams are beyond the scope of this project.

7 *Program Evaluations*

8 Like any public health intervention, HVIPs must be evaluated and studied.
9 Studied outcomes may vary depending on the patient population and the goals and
10 objectives of each individual program.

11 *Case Examples*

12 I have selected two case studies of programs that embody many of the
13 characteristics described above. Both of the programs are located in urban areas at large
14 academic medical centers. The populations seen at these centers may therefore be similar
15 to the target population at Lurie Children’s; by extrapolating from their care models, it
16 may be possible to craft an effective HVIP for Lurie Children’s.

17 *The University of Chicago Medicine (UCM) Recovery and*
18 *Empowerment After Community Trauma (REACT) Program*

19 The REACT program is a HVIP based at the University of Chicago’s Comer
20 Children’s Hospital. This program was launched in 2016 as an affiliate of the Healing
21 Hurt People Chicago (HHPC) program. HHPC is “embedded at UCM, Comer and
22 Stroger’s [John H. Stroger, Jr. Hospital of Cook County] Level 1 Trauma Centers.” (20)
23 The HHPC program strives to meet with every violently injured patient under the age of

1 19, and involves “a) trauma-focused support and psychoeducation as early as possible
2 following violent injury; b) assessment of safety and other needs; and c) information
3 about HHPC services.” (20) In addition, Trauma Intervention Specialists provide case
4 management to interested patients.

5 The REACT program provides an expansion of the resources, including
6 “screening, psychoeducation, and support for trauma patients...who are affected by
7 community violence, whether or not they have been injured.” Their program also
8 includes a weekly clinic providing a “trauma-informed psychological and psychiatric
9 needs assessment and linkage to care” for each of their patients. (21) They utilize a
10 method known as brief interventions, including the Child and Family Traumatic Stress
11 Intervention, and refer to therapy partners who “provide long-term treatment and have
12 expertise or receive training in trauma-focused psychotherapy models.” (21)

13 *The University of California San Francisco (UCSF): The Wraparound*
14 *Project*

15 The Wraparound Project is a youth violence intervention program at UCSF. (22)
16 The program aims to reduce “injury and criminal recidivism in the most vulnerable
17 citizens of the city of San Francisco.” (23) The program serves individuals aged 10 to 35
18 and utilizes a case management approach to violence prevention. Case managers evaluate
19 patients who are “victims of interpersonal or youth violence while they are recovering
20 from physical injury,” and then enroll patients at high risk for repeat injury or
21 incarceration in the program. (24) Patients enrolled in the program have access to crisis
22 response services, vocational training and employment opportunities, mental health

1 services, educational services, and more. (25) The program partners with community
2 organizations to provide these services and to “address the root causes of violence.” (22)

3 According to an evaluation of the Wraparound Project published in 2016, the
4 patients enrolled in the program demonstrated a lower rate of violent reinjury compared
5 to historical controls. (12) Of note, Black patients had the lowest re-injury rate at 2%,
6 while Hispanic/Latino patients had a higher reinjury rate of 11%; while White patients
7 represented a minority (5%) of patients, 100% were reinjured. (12) In addition, it is
8 notable that “mental health services (51%), victim-of-crime compensation (48%),
9 employment (36%), and housing (30%) were the most frequently identified needs.” (12)

1 **Firearm Trauma at Lurie Children’s Hospital**

2 **Methods**

3 Data was obtained from patient charts in Epic, the Lurie Children’s Electronic
4 Health Record (EHR). For a patient to be included, they must have an ED visit note for a
5 firearm injury from Jan 1, 2013 to Dec 31, 2018. Relevant ICD-10 codes with previously
6 equivalent ICD-9 codes were obtained from GunPolicy.org’s literature library and are
7 listed in Appendix 2. (26, 27). Patients who were transferred from other hospitals were
8 included if they had an ED visit note for the admission. Patients without an ED note
9 during the specified time frame were not included. Visits to the ED for follow up on a
10 previous firearm injury were not included.

11 Information was collected from the ED visit and hospital admission
12 documentation on the following: patient demographics (date of birth, sex, race/ethnicity,
13 and zip code of patient’s residence), injury type, hospital length of stay, services referred
14 to, and resources provided to the patient. Of note, the addresses listed in the EHR are the
15 patient’s most recent address and may not reflect the patient’s address at the time of the
16 injury or where the injury took place.

17 **Results**

18 ***Summary***

19 From January 1, 2013, to December 31, 2018, a total of 41 patients were seen in
20 the ED at Lurie Children’s Hospital for an initial encounter due to injury from firearms.
21 Follow-up appointments and direct-to-hospital floor or intensive care unit (ICU)
22 admissions were excluded. This study is focused on initial ED visits for patients with

1 firearm trauma. 7 of the 41 patients had an injury from a pellet or BB gun; the remaining
2 34 patients were injured by another firearm such as a pistol, handgun, or other
3 unspecified firearm. The numbers of total injuries per year from firearms (not including
4 BB or pellet guns) are summarized in Figure 4.

5 *Injury Outcomes and Type*

6 Injuries were classified as intentional or unintentional, and the perpetrator was
7 classified as self or other. Most patients were injured by another party. Injury outcomes
8 and types are summarized in Table 1. Among injuries by a firearm (excluding pellet or
9 BB guns), half of injuries were intentional, unintentional injuries comprise 20.6% of all
10 injuries, and the remainder were unknown.

11 Patient injury outcomes were classified as “Home” (patient was discharged home
12 from the emergency department in stable condition), “Hospital” (patient was transferred
13 from the emergency department to the hospital floor or ICU), or “Death” (patient expired
14 in the emergency department).

15 The majority of the 34 patients injured by firearms (not including BB or pellet
16 guns) were hospitalized. Of these hospitalized patients, the hospital length of stay ranged
17 from 0 to 18 days, with an average length of stay of 4.3 days, with a standard deviation of
18 4.7 days. Only two patients were discharged home from the emergency department and
19 there were no deaths.

20 BB and pellet guns, while potentially deadly depending on the power of the
21 weapon and proximity to the victim when fired, are less powerful than traditional
22 firearms, which shoot more injurious projectiles with greater speed. Consistent with this,
23 in contrast to firearm-injured patients, a higher percentage of patients injured by BB or

1 pellet guns were sent home from the emergency department (57.1%), although the sample
2 size is small for the BB and pellet gun injuries (n=7).

3 ***Patient Demographics***

4 Firearm-injured patients' ages ranged from less than 1 year of age to 16 years old.
5 The mean age was 12.5 years with a standard deviation of 3.7 years. The mode was 15
6 years of age, and over half of the patients were 14 and over. This is consistent with
7 national statistics on firearm injury, which show that pediatric firearm violence primarily
8 affects adolescents. (7) The majority of firearm-injured patients were male. The majority
9 were minority groups. Most patients were non-Hispanic Black, with the second most
10 common race or ethnicity being Hispanic/Latino. Only one patient was white. This is
11 reflective of the racial disparities in firearm injuries in the general population. In
12 comparison, in fiscal year 2017 Lurie Children's patients (including ED, observation, and
13 inpatient admissions) were 29% white, 45% Hispanic/Latinx, and 15% African
14 American. (28) Compared to all patients seen at Lurie Children's, the firearm-injured
15 population seen in the Lurie Children's emergency department had a higher percentage of
16 minority patients. Patient demographics are summarized in Table 2.

17 Four of the firearm trauma patients originated from zip codes outside of the city
18 of Chicago (Berwyn, IL; Evanston, IL; Forest Park, IL; Hammond, IN). The remainder
19 originated within the city of Chicago. A heat map of these zip codes can be referenced in
20 Figure 5.

21 ***Services Provided***

22 Patients received a number of services in the emergency room and throughout
23 their hospitalization. Of patients injured by firearms (not including BB guns or pellet

1 guns), the majority (32 of 34 patients) was hospitalized. Services included social work,
2 case management, spiritual care, child life, mental health services, and more. Some
3 patients were referred to other resources or services at the time of discharge from the
4 hospital.

5 All firearm-injured patients were seen by a social worker, either in the ED or
6 during their hospitalization. 18 of the 34 firearm-injured patients were seen by a social
7 worker in the ED, including the two patients who were not admitted. The majority
8 firearm-injured patients were evaluated for case management needs or managed by a case
9 manager. The majority of hospitalized patients met with a spiritual care professional
10 during their hospitalization. Most hospitalized patients were seen by Child Life services
11 during their hospitalization. Neither of the firearm-injured children who were discharged
12 home from the ED were seen by Child Life, but both met with a spiritual care
13 professional such as a chaplain prior to being sent home. Some hospitalized patients
14 received additional specialized mental health care such as psychiatric treatment or
15 meeting with a psychologist. Services accessed by patients are summarized in Table 3.

16 The patients received a number of other medical and surgical treatments
17 throughout their hospitalization. There were also additional resources provided to patients
18 during their hospitalization including music therapy and referrals to DCFS. In addition to
19 medical and surgical follow-up, discharge notes included several additional resources and
20 services that patients were referred to at discharge. These included safety plans per
21 DCFS, educational resources, and psychiatric follow up. One patient was discharged to
22 jail.

1 **Interviews with Lurie Children’s Emergency Room Staff**

2 **Methods**

3 Prior to interviews, I developed a semi-structured interview guide using the
4 following a priori goals:

- 5 1. To gather information regarding Lurie Children’s staff familiarity with HVIPs and
6 their opinions about implementing such a program at Lurie Children’s
- 7 2. To understand which services are routinely provided to firearm-injured patients at
8 Lurie Children’s.

9 The guide (Appendix 3) consisted of several general and open-ended questions
10 and an informal discussion of the project and violent injury seen at Lurie Children’s. The
11 first questions in the interview guide were designed to identify whether the staff members
12 had interacted with firearm-injured patients. These questions are open-ended, to gather
13 staff members’ opinions on the viability of implement a HVIP at Lurie Children’s. The
14 second half of the interview was dedicated to determining the services provided to
15 firearm-injured patients at Lurie Children’s. The services included in these questions
16 were frequently identified in HVIP best practice guides or are provided through other
17 studied HVIPs.

18 Invitations to participate were sent non-randomly to three individuals. The
19 recruitment email included a brief description of the project. To diversify the perspectives
20 gleaned from the interviews, I interviewed one physician, one nurse, and one social
21 worker. Each of the interviews lasted between 10 and 20 minutes. Prior to interviews, I
22 provided each participant with a consent form describing the risks and benefits of
23 participation and each respondent provided me with verbal consent to participate in the

1 study. For confidentiality, the names and specific roles of the interviewees were not
2 reported and no identifying information was included. Interviews were recorded if the
3 respondent consented to audio recording. I then transcribed them and deleted the audio
4 recording. For those who did not consent to recording, I took detailed notes during the
5 time of the interview.

6 While reviewing the transcripts and audio-recordings, I compared the answers of
7 each respondent for each question asked. I identified where there was consensus around
8 protocols or procedures. I also identified conflicting information, or areas of confusion
9 for staff. In collecting staff members' opinions on program viability and potential
10 barriers, I looked for thematic similarities between responses. Using a pre-formulated and
11 standardized question list was helpful in comparing and contrasting responses from
12 participants.

13 **Results**

14 *Current Protocol for Caring for Firearm-Injured Patients*

15 The social worker identified that there is a current social work protocol for caring
16 firearm-injured patients. They identified that this protocol is carried out every time a
17 child comes to the emergency department with a violent injury. This includes a
18 psychosocial assessment, visitor restriction, and coordinating communication with law
19 enforcement. The psychosocial evaluation includes risk indicators, social information,
20 and information about the developmental status of the child as well as exposure to other
21 types of violence. They also have discussions with the patient and/or family about the
22 immediate safety of the child including risk for re-injury or re-victimization.

1 The social worker noted that social workers see 100% of violently-injured
2 children at Lurie Children’s. They are part of the team alerted to traumas via the paging
3 system when trauma patients come to the ED. Referrals are made to other resources or
4 medical services as appropriate for each patient. This includes mental health services,
5 school services as they relate to bullying, and substance abuse resources if the patient
6 discloses substance use. The social worker also noted that Lurie Children’s has a
7 partnership with a legal clinic that can provide legal assistance if this applies to the
8 patient. In addition, social workers provide firearm-injured patients with a number of
9 other specific resources such as information from community partners such as
10 CureViolence (29), community organizations in their neighborhood; social workers also
11 encourage extracurricular activity via park district information and local university
12 programming and after school programs, and provide youth courts info for nonviolent
13 offenders.

14 The physician who was interviewed identified that there are social work and
15 security protocols including police involvement that are applied to firearm-injured
16 patients, as well as standardized protocols for the medical care. They noted that they
17 believe the majority of firearm-injured patients do receive care per these protocols. The
18 physician identified that social work does interview the patient and/or the family but was
19 unsure about whether risk assessments for future violence were performed, and was
20 unsure if these risk assessments are performed outside of social work services. They
21 stated that some providers discuss the risk of future violence or violence prevention with
22 patients, but “most [providers] probably don’t [discuss this].” The physician noted
23 “outside of any services our social workers might offer the family,” referrals for

1 psychiatry are not routinely made from the ED. In addition, they noted that other
2 resources such as education-related, substance abuse-related, and legal resources also fall
3 under the purview of the social worker. The physician notes that the Lurie Children's
4 adolescent medicine department has started a new substance-abuse treatment program in
5 the past year that the ED may refer patients to; however, only patients requesting
6 substance abuse treatment would be referred to this program and firearm injury alone
7 would not trigger a referral to this program. The physician notes that patients likely do
8 not see case managers in the emergency department because there are no case managers
9 in the ED at Lurie Children's.

10 The nurse noted that there are safety plans for violently injured patients and the
11 staff members and implementing visitor restrictions. The nurse stated that there is a
12 standardized protocol for when a patient comes to the emergency department with a
13 firearm injury that is carried out every time a patient presents with a firearm injury. The
14 protocol is that the social worker sees violently injured patients and put visitor
15 restrictions in place. The nurse notes that there was a "WeLearn" (online module) to train
16 staff on how to handle dangerous situations or escalating patients/family members in the
17 ED; however, the nurse notes that they do not have any specific experience with HVIPs.
18 The nurse states that nurses do not perform risk assessments for violence in the ED, but
19 they believe that the social workers always perform these. They note that they do not
20 think there are formalized conversations with patients about violence prevention from
21 anyone other than social workers in the ED. They believe that referrals such as to
22 substance abuse-related resources are often placed by the admitting inpatient service
23 rather than from the ED.

1 *Perceived Opportunities and Barriers from Lurie Children's Staff*

2 The staff members all identified opportunities for successful HVIP
3 implementation at Lurie Children's. Both the nurse and social worker noted that they
4 believe that providers at Lurie Children's would be open to such a program. In addition,
5 the physician stated that Lurie Children's has, "Very good social work coverage, so as
6 long as our social workers were aware of all the resources and the program, it would
7 not...be difficult to institute."

8 However, all staff members also identified potential barriers to HVIP
9 implementation within the institution. These include staffing and resource-allocation,
10 concerns about program-appropriateness for the ED specifically, and dissemination of
11 information about the program. The social worker said that any program of this nature
12 would need a social worker, but that there has been a recent increase in violent injury.
13 The social worker states that the social workers in the ED are generally understaffed and
14 overwhelmed. In fact, while the complete psychosocial evaluation is mandated in every
15 child with a violent injury, social workers are not always able to complete the full
16 assessment due to time and staffing constraints. The nurse stated that the largest barriers
17 would be "resources and money," as well as how to sustain the program and ensure that
18 all patients have equal access to the services provided, how to implement it and sustain it
19 and making sure that all patients have access to the same things. The physician said, "The
20 biggest challenge would be making everyone aware." The physician and nurse also both
21 expressed that many of the referrals and services referenced in the interview are usually
22 provided by the accepting inpatient providers. The physician endorsed that this is due to
23 the time constraints of working in the ED. They stated the following:

1 *“[A] challenge for us... [is that] a lot of what you’re describing, patients who*
2 *have a firearm injury and are hospitalized, there’s more social work involvement*
3 *and more of that gets done. The challenge is the patients who are stable... are*
4 *assessed, and can be discharged from the ED and don’t need to be hospitalized. I*
5 *don’t know if [they get] any of the things you just described.”*

6 These statements argue that if the ED is to be an appropriate location for HVIP
7 implementation at Lurie Children’s, additional resources may need to be provided. They
8 identify that patients discharged home from the ED are a vulnerable population that does
9 not often receive the same services as patients who are hospitalized following their
10 firearm injury.

1 **Recommendations to Lurie Children’s Hospital**

2 Lurie Children’s does not currently have a HVIP in place. As such, the first steps
3 for Lurie Children’s should be preparatory in nature. A HVIP should be designed for a
4 defined target population, should have specific goals, and should involve partnerships
5 with community organizations. In addition, the perspectives shared in the staff provide
6 insight into the institution-specific challenges and opportunities for HVIP
7 implementation. These findings will be presented to the relevant stakeholders (Lurie
8 Children’s staff or administration) via email.

9 **Target Population**

10 From case studies and the literature, many programs identify patients at highest
11 risk of recidivism or reinjury in order to target the intervention to the most vulnerable
12 populations. My recommendation to a new HVIP at Lurie Children’s would be to identify
13 such patients at high risk. To achieve this, the Lurie Children’s HVIP will need to work
14 in conjunction with social workers as they conduct a psychosocial evaluation with
15 patients and families that identifies risk indicators, social information, and information
16 about the developmental status of the child as well as exposure to other types of violence.
17 Social workers at Lurie Children’s are already assessing the immediate safety of the child
18 including risk for re-injury or re-victimization. A HVIP may be able to capitalize on this
19 existing relationship to identify a high-risk target population.

20 **Social Work Resources**

21 During staff interviews, the social worker identified that the social workers are
22 overwhelmed by need. In order to establish a robust and sustainable HVIP, program

1 leaders may need to involve and engage hospital leadership to invest in additional social
2 work support. Financial buy-in from hospital administration will likely be necessary.

3 **Case Management**

4 Many successful HVIPs utilize case management to connect eligible patients with
5 community resources. As demonstrated by the chart review, the majority of firearm-
6 injured patients at Lurie Children's are evaluated or seen by a case manager. However,
7 the extent of their involvement in each patient case varies and was not evaluated in this
8 project. To evaluate the viability of case management involvement in a future HVIP at
9 Lurie Children's, interviews with case managers to identify opportunities and barriers to
10 implementation would be beneficial.

11 **Community Partnership**

12 Finally, Lurie Children's should establish and formalize relationships with
13 community partners. These community partners should be resources or services to which
14 Lurie Children's providers may refer at-risk youth. The services should be appropriate for
15 the patient population seen at Lurie Children's hospital for firearm injury, which is
16 predominantly adolescent and male. These partners should also be culturally competent
17 and both financially and physically accessible to patients. Such partners may be identified
18 via Strengthening Chicago's Youth and the Juvenile Justice Collaborative, which are
19 housed within Lurie Children's Hospital and have many established community
20 relationships. These organizations may act as a vital link between Lurie Children's and
21 community organizations.

1 **Conclusion and Discussion**

2 Overall, establishing a HVIP is a viable opportunity at Lurie Children's based on
3 the current services provided to firearm-injured patients and the feedback from staff
4 members. The first steps for establishing a HVIP at Lurie Children's should be
5 preparatory in nature and may require additional investigation. However, existing social
6 work services and partnerships with organizations such as SCY can be leveraged to
7 connect internal clinical services with community resources.

8 The paper summarized the demographic characteristics of the firearm-injured
9 patients at Lurie Children's from 2013 to 2018, data that were not previously available.
10 The analysis revealed that the victims of violence treated at Lurie Children's are
11 primarily male, adolescent People of Color. All patients received social work services
12 and the majority met with a case manager. In addition, many patients received services
13 from mental health providers, Child Life services, and spiritual care. The paper captures
14 the current standard of care for firearm-injured patients that are provided at Lurie
15 Children's.

16 There are several limitations in this study. For example, the content of services
17 and the extent of their involvement, available in progress notes from social workers and
18 case managers, were not evaluated. A more detailed understanding of the services
19 provided from each of these team members could be an area for further investigation and
20 may be beneficial when designing a HVIP for Lurie Children's. Although the sample size
21 of firearm-injured patients for this study was relatively small, the data collected are
22 consistent with national trends in firearm violence. Finally, only three staff members
23 were interviewed and thus thematic saturation was likely not reached; further interviews

1 and qualitative data analysis to investigate staff perceptions on a new HVIP would be
2 worthwhile prior to HVIP implementation.

3 There are other avenues of future research for HVIPs. Further RCTs and meta-
4 analyses of interventions across different pediatric developmental stages and age groups
5 may help programs to focus on more effective interventions. At Lurie Children's, it will
6 also be important to study the cost analysis of a HVIP prior to its implementation.

Tables and Figures

Table 1: Injury Outcomes and Types

		n (%)
Outcomes	<i>Home</i>	2 (5.88)
	<i>Hospital</i>	32 (94.1)
	<i>Death</i>	0 (0)
Type	<i>Intentional</i>	17 (50)
	<i>Unintentional</i>	7 (20.6)
	<i>Unspecified</i>	10 (29.4)
Perpetrator	<i>Self</i>	0 (0)
	<i>Other</i>	33 (97.1)
	<i>Unspecified</i>	1 (2.94)

Table 2: Patient Demographics

Age	Mean (SD)
Years	12.5 (3.7)
Sex	n (%)
Male	28 (82.4)
Female	6 (17.6)
Race/Ethnicity	n (%)
Non-Hispanic Black	22 (64.7)
Hispanic/Latino	10 (29.4)
White	1 (2.94)
Asian/Pacific Islander	0 (0)
Other/Unknown	1 (2.94)

Table 3: Services Accessed by Firearm-Injured Patients at Lurie Children's

Service	Accessed [n (%)]	Not Accessed [n (%)]
Social Work	34 (100)	0 (0)
<i>Social Work in ED</i>	<i>18 (52.9)</i>	<i>16 (47.1)</i>
Case Management	30 (88.2)	4 (11.8)
Spiritual Care	23 (71.9)	9 (28.1)
Child Life	24 (75)	8 (25)
Mental Health Services	4 (12.5)	28 (87.5)

Figure 1: "About the Victims" (June 19, 2017 through June 19, 2018) (3)

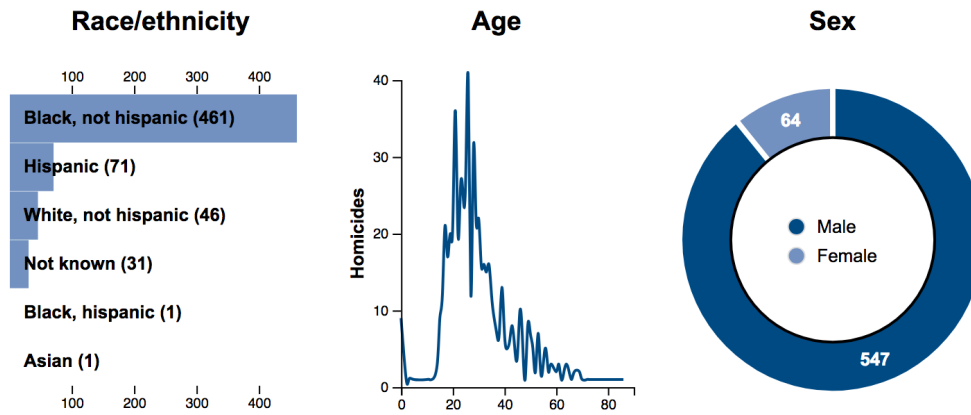


Figure 2: "Where homicides happen" in Chicago (June 19, 2017 through June 19, 2018) (3)

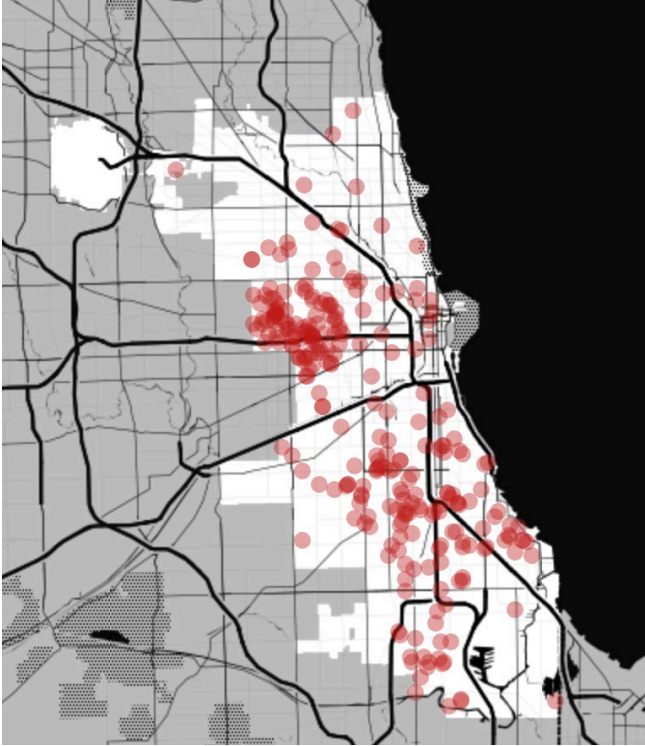


Figure 3: Firearm Death Causes in 2016 (6)

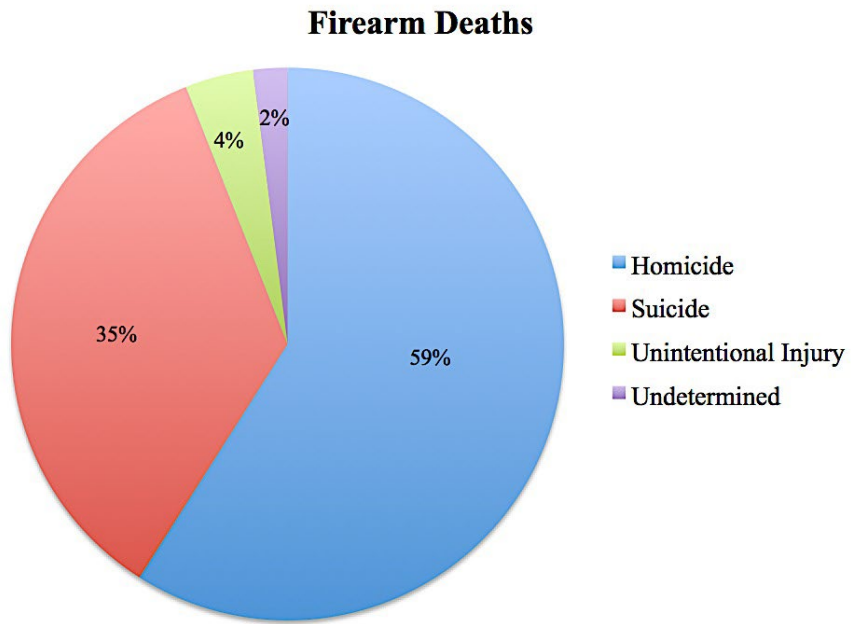
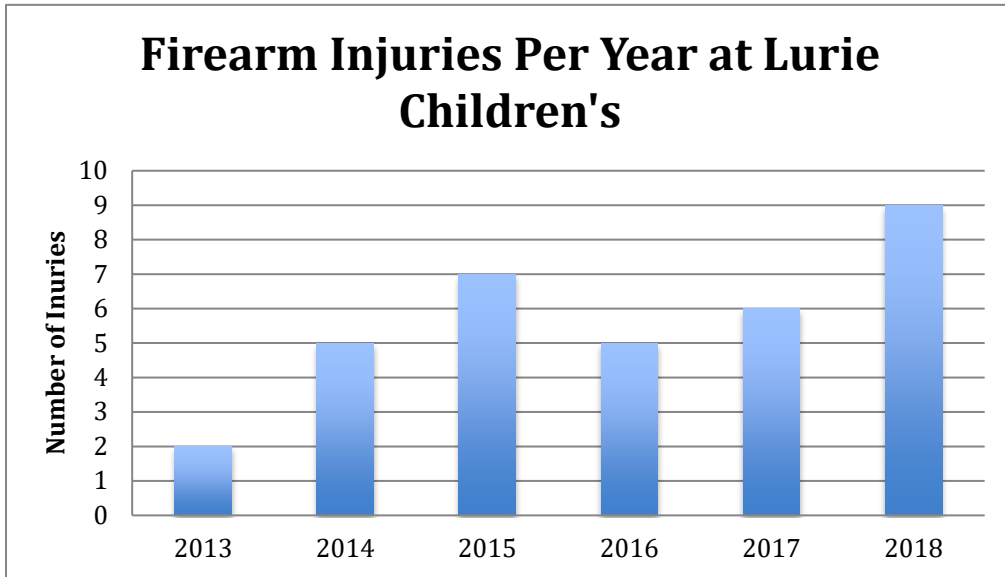
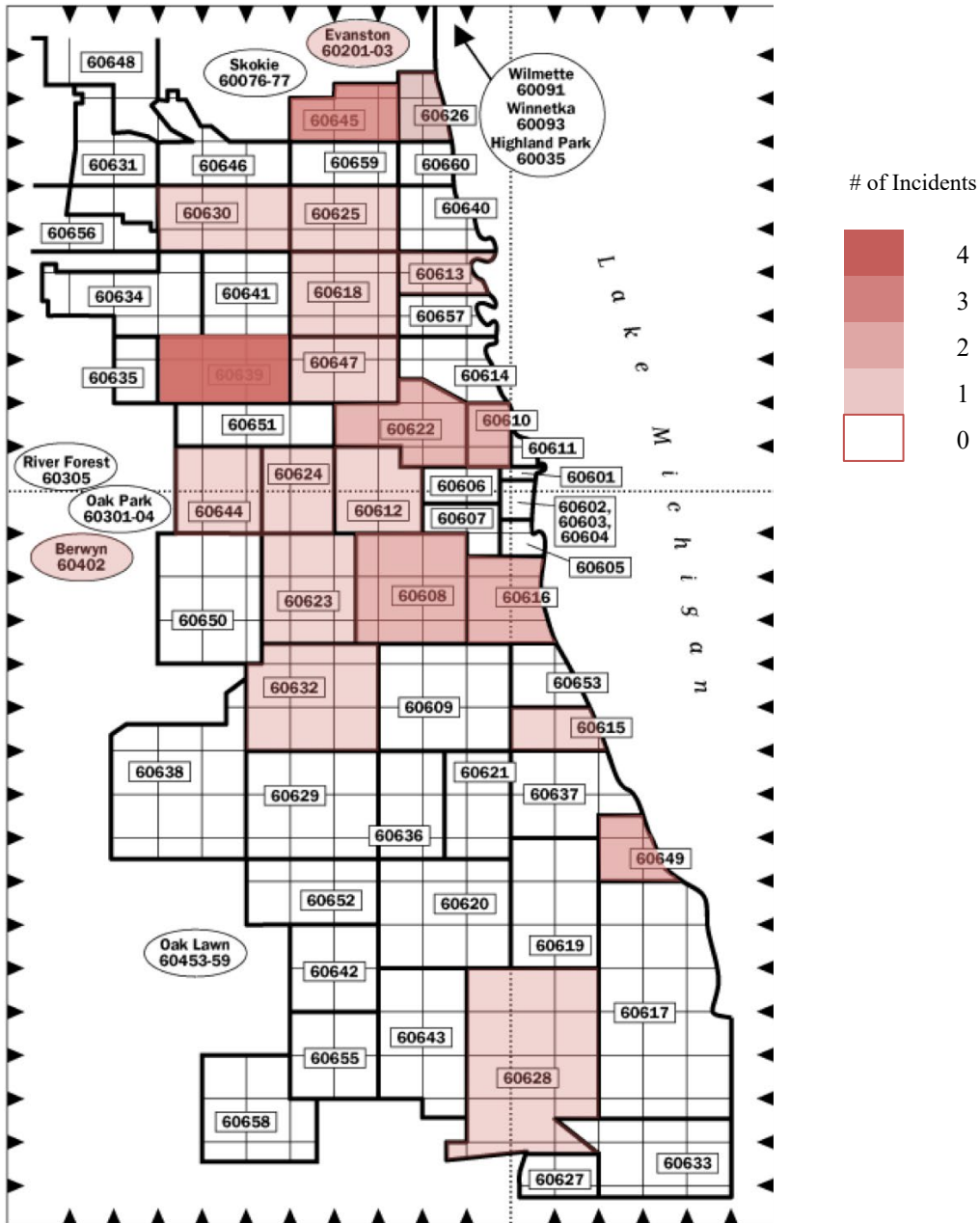


Figure 4: Firearm Injuries Per Year at Lurie Children's



**Figure 5: Firearm Trauma Patient Zip Code of Origin, Lurie Children's Hospital,
Jan 2013 to Dec 2018**

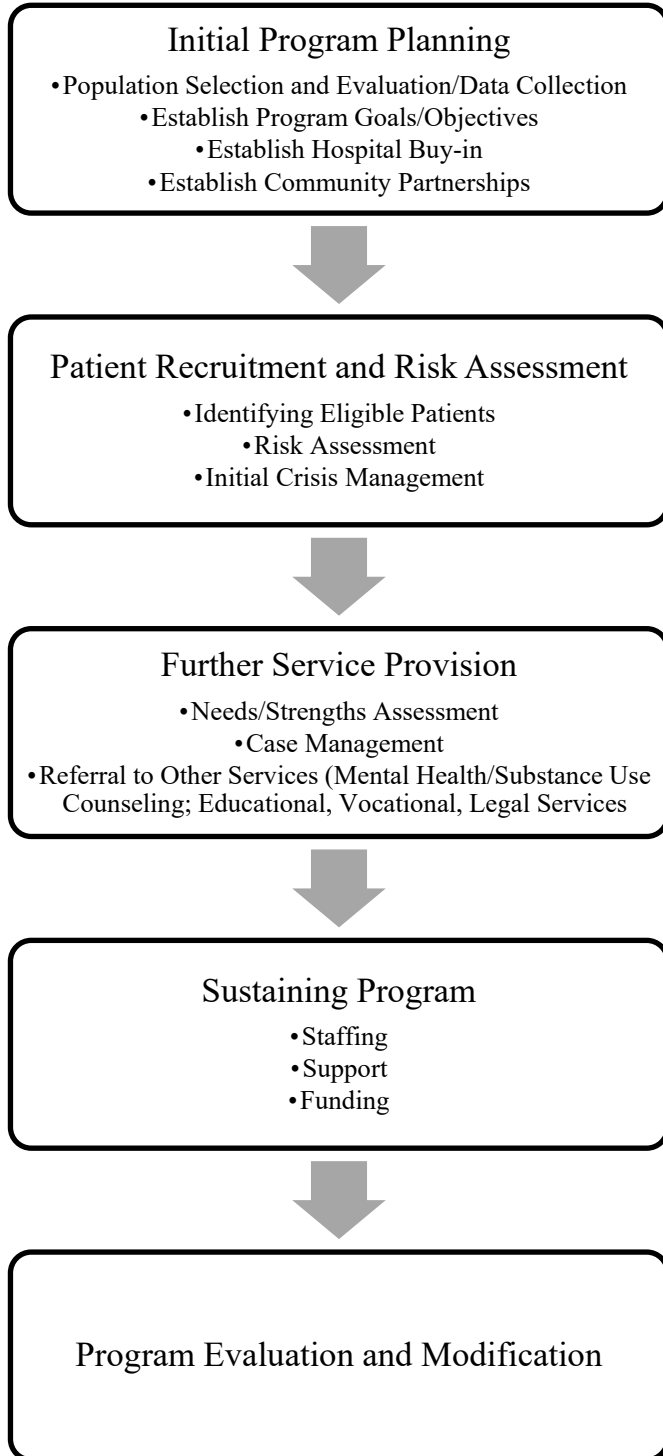


Please note that Hammond, IN, and Forest Park, IL, are not included in this map. Original

Map Copyright 1996 by Chicago Reader Inc. (30)

Appendices

Appendix 1: Flow Chart for Implementation of HVIPs (19)



Appendix 2: ICD Codes Included in Electronic Health Record Query

When querying the Lurie Children’s EHR to identify appropriate patients for the chart review, the statistician used the following ICD-10 <or equivalent ICD-9> codes. The following codes are cited from GunPolicy.org’s compilation of firearm-related ICD-10 injury and death codes (26, 27):

“Firearm Injury: Assault (Gun Homicide, attempted or completed)

X93: Assault by handgun discharge (firearm only) <965>

X94: Assault by rifle, shotgun & larger firearm discharge (firearm only) <965>

X95: Assault by other & unspecified firearm discharge (includes airguns, BB guns and flare guns) <965>

Firearm Injury: Self-harm (Gun Suicide, attempted or completed)

X72: Intentional self-harm by handgun discharge (firearm only) <955>

X73: Intentional self-harm by rifle, shotgun & larger firearm discharge (firearm only) <955>

X74: Intentional self-harm by other & unspecified firearm discharge (includes airguns, BB guns and flare guns) <955>

Firearm Injury: Unintentional (Unintentional Shooting, fatal or non-fatal)

W32: Handgun discharge (firearm only) <922>

W33: Rifle, shotgun and larger firearm discharge (firearm only) <922>

W34: Discharge from other and unspecified firearms (includes airguns, BB guns and flare guns) <922>

Firearm Injury: Undetermined Intent (Unknown Cause, fatal or non-fatal)

Y22: Handgun discharge undetermined intent (firearm only)

Y23: Rifle shotgun & larger firearm discharge undetermined intent (firearm only)

Y24: Other & unspecified firearm discharge undetermined intent (includes airguns, BB guns and flare guns)

Firearm Injury: Justifiable Shooting (Legal Intervention, fatal or non-fatal)

Y35.0 - Legal intervention involving firearm discharge

Firearm Injury: War Operations (War Shooting, fatal or non-fatal)

Y36.4: War operations involving firearm discharge and other forms of conventional warfare Includes bullet wounds, shotgun wounds, bayonet injuries, battle wounds and battle drownings; Excludes explosives, downed aircraft, fires, nuclear weapons, landmines, biological and chemical weapons, and unspecified war operations

Firearm Injury: Terrorism (Gun Terrorism, fatal or non-fatal)

U01.4: Terrorism involving firearms (homicide, completed or attempted). A rarely used, provisional category.

All-Methods Codes

Overall totals for calculating the proportion of firearm homicide or suicide:

X85 to Y09: Assault (Homicide - all methods, attempted or completed; i.e. fatal or non-fatal)

X60 to X84: Intentional Self-harm (Suicide - all methods, attempted or completed).”

(26, 27)

Appendix 3: Sample Interview Form

General/Open Ended questions

- Within the past 5 years, have you been involved in the care of a child (age 18 or younger) who was the victim of firearm violence (“patients”)?
 - o If yes, about how many of these patients have you cared for in the past 5 years?
- In what capacity did you care for these patients/were involved in their care? What has your experience been working with patients like this?
- To your knowledge, is there an established standardized protocol for care when a child comes to the emergency department with a firearm injury?
 - o If yes, what does that protocol entail?
 - o If yes, how often is this protocol carried out?
- Have you heard of hospital-based violence intervention programs?
 - o If not, interviewer will provide an explanation:
“Hospital based violence intervention programs program implemented within hospitals that are formalized interventions with patients who have experienced firearm violence with the goal to prevent future violence. The format of HVIPs varies from institution to institution, but usually include components such as initial crisis management, assessing a patient’s risk for future violence, performing needs and strengths assessments, case management, and referral to other services and community partnerships.”
 - o What is your experience, if any, with programs like this?

- Are there any community organizations that your institution regularly works with or refers patients to that you believe may be a promising partnership in a HVIP?
- What are your thoughts about establishing a hospital-based violence intervention program at your institution?
 - o Do you think that healthcare providers at your institution would be open to such a program?
 - o What are some barriers that you could anticipate to establishing a program like this at your institution?

Specific Questions about Protocols Currently in Place

When the question “how often” is asked, respondents will be given the following options:

1. Always, 2. More than half the time, 3. About half the time, 4. Less than half the time, or 5. Never

- Are risk assessments for further violence/victimization ever conducted in the emergency room?
 - o If yes, what does this risk assessment entail?
 - o If yes, how often?
- Are victims of firearm violence assigned a case manager or social worker?
 - o If yes, how often?
- Do healthcare providers discuss risk of future violence with patients or their families in the emergency department? Do they discuss violence prevention with patients or their families?

- If so, how is this discussion usually structured? Who is usually present during this discussion?
- If yes, how often?
- How often are referrals made to any of the following services:
 - Mental health?
 - Education-related resources/school assistance?
 - Substance abuse-related resources?
 - Legal assistance or advocacy resources?
- Are there any other services to which patients are regularly referred following a firearm injury?

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