Predicting a Patient’s Future Firearm Violence Risk in the Emergency Department

Michigan Medicine researchers developed a new tool to gauge a young adult patient’s gun violence risk, in hopes of more efficiently using prevention resources.

Homicide is the third-leading cause of death among young people ages 15 to 24. More than 87 percent of those homicides are due to firearms, according to the Centers for Disease Control and Prevention.

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“Firearm violence is a public health problem,” says Jason Goldstick, Ph.D., assistant professor of research in emergency medicine at Michigan Medicine. “At-
risk youth may not have many ways to connect to violence-prevention services. This means the emergency department is a critical access point for identifying youth that are most at risk and intervening to hopefully decrease their risk of future firearm violence.”

Goldstick is the lead author of a new study based on a secondary analysis of data from a study funded by the National Institute on Drug Abuse. It’s published in *Annals of Internal Medicine*, and it sought to provide emergency department physicians with a new clinical risk index tool to gauge firearm violence risk among urban youth.

“If we have some indication of which of these young people are at high risk, then perhaps this could guide emergency physicians on what to do next in terms of referring them to prevention resources,” Goldstick says.

"Before this tool, there was no clear way to gauge risk of future firearm violence."

Jason Goldstick, Ph.D.

**Collecting data through questionnaires**

Goldstick and team reviewed previous screening tools for youth violence but noted they were primarily focused on primary care settings, lacked a specific focus on firearm violence and were too lengthy for practical use in the hectic emergency department setting.

The researchers examined data collected during the Flint Youth Injury study, led by Rebecca Cunningham, M.D., professor of emergency medicine at Michigan Medicine and senior author on the new study with Goldstick. The Flint Youth Injury study was a two-year cohort of patients ages 14 to 24 who reported drug use in the past six months and sought care at a Level 1 trauma center in Flint,
Michigan. The study compared patients who were injured in assaults versus those seen for other emergency care. Although the study took place at a single site, the research team noted that Flint has rates of violence similar to other midsize urban centers, such as Youngstown, Ohio; Camden, New Jersey; and Oakland, California.

In total, 599 youth took a self-reported survey of 115 items with questions on such topics as violence involving partners and peers, community violence exposure, alcohol and drug use and peer influences. Participants were compensated for follow-up assessments at six, 12, 18 and 24 months.

Of the group, 483 youth (80.6 percent) could be definitively classified in terms of their involvement in firearm violence during the follow-up period. The remaining 19.4 percent were unable to be classified because of missing data.

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Of the 80.6 percent, 52.2 percent indicated they had been involved in firearm violence.

“We randomly split the data into a training set and a validation set with prevalence of firearm violence equivalent in each,” Goldstick says. “Using only training data, we used a machine-learning classification approach to identify the most predictive factors for future firearm violence.”

He adds, “Those factors fell predominantly into four domains: peer and partner violence victimization, community violence exposure, peer/family influences and fighting. Choosing one item from each domain — serious fighting frequency, number of friends that carry weapons, frequency of hearing gunshots in your neighborhood and frequency of received firearm threats — we created a 10-point score and demonstrated its predictive power on the validation data.”

The created score is named SaFETy, a mnemonic for remembering the four items: **Serious fighting, Friend weapon-carrying, community Environment and firearm Threats**.
Goldstick says this new tool could be useful for emergency physicians.

“Before this tool, there was no clear way to gauge risk of future firearm violence,” he says. “We know that someone presenting to the emergency department with a violent injury is at elevated risk, but the SaFETy score shows superior predictive power than just knowing they were treated for a violent injury.”

Goldstick and team realize this new index was developed using a high-risk sample and may not apply to every patient population.

Goldstick hopes emergency physicians practicing in urban centers find the SaFETy score useful.

“Predicting gun violence isn’t easy to do,” he says. “But we hope the index could help emergency physicians prospectively determine the highest-risk individuals and use that to tailor preventative services. Resources are scarce for prevention, and the more we can tailor services depending on level of risk, the more efficiently they can be allocated.”

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