

# Weapon Carrying Among Victims of Bullying

Tammy B. Pham, BA,<sup>a</sup> Lana E. Schapiro, MD,<sup>a,b</sup> Majnu John, PhD,<sup>c</sup> Andrew Adesman, MD<sup>a</sup>

abstract

**OBJECTIVES:** To examine, in a large, nationally representative sample of high school students, the association between bullying victimization and carrying weapons to school and to determine to what extent past experience of 1, 2, or 3 additional indicators of peer aggression increases the likelihood of weapon carrying by victims of bullying (VoBs).

**METHODS:** National data from the 2015 Youth Risk Behavior Survey were analyzed for grades 9 to 12 ( $N = 15\,624$ ). VoB groups were determined by self-report of being bullied at school and additional adverse experiences: fighting at school, being threatened or injured at school, and skipping school out of fear for one's safety. Weapon carrying was measured by a dichotomized (ie,  $\geq 1$  vs 0) report of carrying a gun, knife, or club on school property. VoB groups were compared with nonvictims with respect to weapon carrying by logistic regression adjusting for sex, grade, and race/ethnicity.

**RESULTS:** When surveyed, 20.2% of students reported being a VoB in the past year, and 4.1% reported carrying a weapon to school in the past month. VoBs experiencing 1, 2, or 3 additional risk factors were successively more likely to carry weapons to school. The subset of VoBs who experienced all 3 additional adverse experiences were more likely to carry weapons to school compared with nonvictims (46.4% vs 2.5%,  $P < .001$ ).

**CONCLUSIONS:** Pediatricians should recognize that VoBs, especially those who have experienced 1 or more indicators of peer aggression in conjunction, are at substantially increased risk of weapon carrying.

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<sup>a</sup>Division of Developmental and Behavioral Pediatrics, Steven and Alexandra Cohen Children's Medical Center of New York, Lake Success, New York; <sup>b</sup>Division of Developmental and Behavioral Pediatrics, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; and <sup>c</sup>Center for Psychiatric Neuroscience, Feinstein Institute for Medical Research, Manhasset, New York

Ms Pham drafted the initial manuscript, reviewed and revised the manuscript, and performed the statistical analyses; Dr Schapiro conceptualized and designed the study and reviewed and revised the manuscript; Dr John collaborated in the design of the study and reviewed and revised the manuscript; Dr Adesman collaborated in the design of the study and critically reviewed and revised the manuscript; and all authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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Address correspondence to Andrew Adesman, MD, Division of Developmental and Behavioral Pediatrics, Steven and Alexandra Cohen Children's Medical Center of New York, 1983 Marcus Ave, Suite 130, Lake Success, NY 11042. E-mail: [aadesman@northwell.edu](mailto:aadesman@northwell.edu)

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**WHAT'S KNOWN ON THIS SUBJECT:** The issues of school violence and peer bullying continue to pose serious threats to the well-being of children and adolescents. Past researchers have shown that victims of bullying are at increased risk of weapon carrying.

**WHAT THIS STUDY ADDS:** Victims of bullying who experienced 1, 2, or 3 additional risk factors (fighting at school, being threatened or injured at school, and/or skipping school out of fear for their safety) were successively more likely to carry weapons at school.

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The issue of school violence continues to pose a serious threat to the well-being of children and adolescents. In 2015 alone, there were 45 reported school shootings in the United States.<sup>1</sup> In the wake of Columbine and other cases of targeted school violence, there has been increased recognition of the risk of retaliatory violence by students who have been victims of bullying (VoBs).

Bullying is characterized by the Centers for Disease Control and Prevention (CDC) as “any unwanted aggressive behavior(s) by another youth or group of youths who are not siblings or current dating partners that involves an observed or perceived power imbalance and is repeated multiple times or is highly likely to be repeated.”<sup>2</sup> It has been well established that VoBs are at increased risk of experiencing negative physical, mental health, and academic issues that may persist for years after the bullying incident(s).<sup>3–7</sup> VoBs also exhibit higher levels of violent behaviors compared with nonvictims.<sup>8,9</sup> Previously, researchers have documented that bullying victimization is associated with greater odds of weapon carrying,<sup>9–11</sup> and in a robust meta-analysis of 22 studies, researchers recently found that VoBs were approximately twice as likely to carry weapons compared with uninvolved peers.<sup>12</sup>

Although it has been well established that VoBs are more likely to carry weapons, not all victims carry weapons to school. Our purpose with this study is to identify factors that predict which VoBs are more likely to carry weapons compared with other victims. In addition to bullying victimization, several risk factors associated with being a VoB (such as feeling unsafe at school or on the way to and from school,<sup>13,14</sup> being threatened with a weapon,<sup>13,15–17</sup> and being in a physical fight<sup>18</sup>) have also been associated with weapon carrying. Thus, we hypothesize that

the prevalence of weapon carrying increases among VoBs who have experienced successively greater numbers of risk factors. If so, then these additional indicators of peer aggression may serve as red flags for VoBs who may be most likely to carry weapons to school. Given that many perpetrators of targeted school violence had previously been bullied,<sup>19</sup> it is important to investigate behavioral indicators that may amplify the risk of weapon carrying at school by a VoB and thus serve as useful markers for the most at-risk victims.

To date, there is no study in which researchers have assessed the degree to which multiple compounded risk factors (specifically, fighting at school, being threatened or injured at school, and skipping school out of fear for one’s safety) increase the likelihood that a VoB will carry a weapon to school. Although these correlates of weapon carrying have been studied separately, their associations with weapon carrying (alone or in combination) specifically among VoBs have not been examined. By using a large, nationally representative sample of high school students and applying adjustments for relevant demographic factors, in the present investigation, we aim (1) to examine the association between being a VoB and carrying weapons to school and (2) to determine to what extent 1, 2, or 3 additional indicators of peer aggression increase the likelihood of weapon carrying by a VoB.

## METHODS

The national Youth Risk Behavior Survey (YRBS) uses a 3-stage cluster sample design to obtain a nationally representative sample of US high school students. Responses were weighted for nonresponses and for oversampling of African American and Hispanic students. The detailed methodology and national data sets

are available at the CDC Web site.<sup>20</sup> In this study, data from the 2015 National YRBS were analyzed for grades 9 to 12.

## Exposures

Victimization groups were based on responses to 4 self-report questions. Designation of “victims of bullying” and “nonvictims” was measured by responses to the question, “Bullying is when 1 or more students tease, threaten, spread rumors about, hit, shove, or hurt another student over and over again. It is not bullying when 2 students of approximately the same strength or power argue or fight or tease each other in a friendly way. During the past 12 months, have you ever been bullied on school property?” Three additional risk factors that have been shown in the literature to be associated with bullying victimization were analyzed: “During the past 30 days, on how many days did you not go to school because you felt you would be unsafe at school or on your way to or from school?”, “During the past 12 months, how many times were you in a physical fight on school property?”, and “During the past 12 months, how many times has someone threatened or injured you with a weapon such as a gun, knife, or club on school property?” These responses were dichotomized (0 vs  $\geq 1$  instances) and designated as “felt unsafe, skipped school,” “involved in fights at school,” and “threatened or injured at school.”

By using responses to these 4 variables, 8 subsets of the VoBs were created: students who were bullied and experienced none (1 group), exactly 1 (3 groups), exactly 2 (3 groups), and all 3 additional risk factors (1 group). Thus, these victimization groups successively hone in on the students hypothesized to be at greatest risk for weapon carrying.

The 8 victimization groups were compared with the nonvictims

**TABLE 1** Prevalence, CIs, and Test Statistics for VoBs and Students With Selected Risk Factors (*N* = 15 624)

Demographic Groups	VoB <sup>a</sup>	Involved in Fights at School <sup>a</sup>	Felt Unsafe, Skipped School <sup>a</sup>	Threatened or Injured at School <sup>a</sup>
Overall prevalence	20.2% (18.8–21.6)	7.8% (6.7–8.9)	5.6% (4.8–6.5)	6.0% (5.2–6.8)
Sex	<i>P</i> < .001	<i>P</i> < .001	<i>P</i> = .02	<i>P</i> < .001
Boys	15.8% (14.5–17.2)	10.3% (8.8–11.9)	5.0% (4.2–5.9)	7.0% (6.1–8.1)
Girls	24.8% (22.8–26.9)	5.0% (4.1–5.9)	6.0% (5.1–7.1)	4.6% (3.8–5.5)
Grade	<i>P</i> < .001	<i>P</i> < .001	<i>P</i> = .3	<i>P</i> = .02
Ninth	23.4% (20.6–26.3)	11.6% (10.1–13.4)	6.4% (5.1–7.8)	7.2% (6.2–8.3)
10th	20.8% (18.3–23.4)	7.3% (5.9–9.0)	5.4% (4.1–6.9)	6.2% (5.1–7.4)
11th	20.3% (18.6–22.1)	6.5% (5.0–8.3)	4.6% (3.6–5.8)	5.5% (4.2–7.0)
12th	15.9% (14.0–17.8)	4.5% (3.5–5.6)	5.7% (4.0–7.7)	4.4% (3.2–6.0)
Race	<i>P</i> < .001	<i>P</i> < .001	<i>P</i> < .001	<i>P</i> = .03
White	23.5% (21.7–25.3)	5.6% (5.0–6.4)	4.2% (3.2–5.3)	4.9% (3.9–6.0)
Hispanic or Latino	16.5% (14.1–19.1)	8.9% (7.3–10.8)	7.6% (6.3–9.0)	6.6% (5.3–8.0)
African American	13.2% (10.6–16.2)	12.6% (9.0–16.9)	6.8% (5.4–8.5)	7.9% (5.8–10.5)
Other race	20.7% (17.1–24.7)	9.1% (6.8–11.8)	6.5% (5.0–8.3)	7.1% (4.7–10.2)

Some of the top-level results presented in this table were originally presented in the CDC's Morbidity and Mortality Weekly Report.<sup>21</sup>

<sup>a</sup> *P* values calculated by using Rao-Scott  $\chi^2$  test.

reference group: students who did not report being bullied in the past year and did not experience additional risk factors.

## Outcomes

Weapon carrying at school was measured by the self-report question, "During the past 30 days, on how many days did you carry a weapon such as a gun, knife, or club on school property?" Because of small cell sizes, frequency responses were dichotomized (0 vs  $\geq 1$  instances) and designated as "carried weapon to school" and "did not carry weapon to school."

## Statistical Analysis

Analyses were performed by using the "survey" package in R 3.2.2 with procedures specifically suited for survey data. Categorical comparisons across groups yielded *P* values based on the second-order Rao-Scott  $\chi^2$  test, a modified version of the Pearson  $\chi^2$  test that accounts for complex sampling design. Logistic regression comparing prevalence of weapon carrying across victim groups yielded adjusted odds ratios (aORs) and 95% confidence intervals (CIs) with adjustment for sex, grade, and the 8 YRBS race/ethnicity groups: white, African American, Hispanic or Latino, multiracial and Hispanic, multiracial

and non-Hispanic, Asian American, Native Hawaiian or other Pacific Islander, and American Indian or Alaska Native. Although adjustments to our analyses used the 8 YRBS race/ethnicity groups, top-level prevalence data were presented with respect to 4 consolidated categories: white, Hispanic or Latino (includes multiracial and Hispanic), African American, and other race.

To explore whether missing data could be a confounding factor, Rao-Scott  $\chi^2$  tests were conducted to determine if there was an association between missing data and being a VoB or weapon carrying. The 972 (weighted) instances of missing data were not significantly associated with either of these variables. Thus, the main associations examined in this study are not likely to be confounded by these missing responses, and only nonmissing responses were included in calculations of prevalence and logistic analyses. All results presented are based on analyses of weighted data. Results were considered significant at the *P* < .05 level.

## RESULTS

The 2015 National YRBS achieved a school response rate of 69% and a student response rate of 86%

(after data editing), yielding a final sample size of 15 624 and an overall response rate of 60%. By sex, 48.7% were girls and 51.3% were boys. By grade level, 27.2% were in ninth grade, 25.7% were in 10th grade, 24.0% were in 11th grade, and 23.1% were in 12th grade. By race/ethnicity, the sample was 54.5% white, 22.3% Hispanic or Latino, 13.6% African American, and 9.7% other race.

## Prevalence of Exposures and Outcomes

Table 1 shows the prevalence, 95% CIs, and test statistics for "victims of bullying," "physical fighting at school," "felt unsafe, skipped school," and "threatened or injured at school" across sex, grade, and race/ethnicity.

Approximately 4.1% of high school students reported carrying a weapon to school in the past month. The prevalence of weapon carrying was higher among boys than girls (5.9% vs 2.0%, *P* < .001).

(Note: some of the top-level results presented above and in Table 1 were originally presented in the CDC's Morbidity and Mortality Weekly Report<sup>21</sup>; they are reproduced here to lend context to our subsequent results.)

**TABLE 2** Adjusted Associations Between Victimization Groups and Past-Month Weapon Carrying in School (N = 15 624)

Victimization Groups	Total Sample			Boys		Girls	
	% Who Carried a Weapon <sup>a</sup>	aOR <sup>b</sup> (95% CI)	% Who Carried a Weapon <sup>a</sup>	% Who Carried a Weapon <sup>a</sup>	aOR <sup>c</sup> (95% CI)	% Who Carried a Weapon <sup>a</sup>	aOR <sup>c</sup> (95% CI)
Nonvictim and no additional threats (n = 10 526) <sup>a</sup>	2.5	1.00 (Reference)	3.6	1.00 (Reference)	1.4	1.00 (Reference)	1.00 (Reference)
VoB in past year and no additional threats (n = 1857)	2.8	1.39 (0.85–2.28)	5.6	1.74 (1.05–2.88)	1.1	0.85 (0.45–1.60)	0.85 (0.45–1.60)
VoB and 1 additional risk factor							
VoB and skipped school because they felt unsafe in past month (“skipped”) (n = 211)	5.3	3.09 (1.12–8.54)	17.1	5.71 (1.59–20.48)	1.3	0.97 (0.28–3.36)	0.97 (0.28–3.36)
VoB and involved in fights at school in past year (“fought”) (n = 223)	10.8	5.02 (1.97–12.82)	15.9	5.92 (2.11–16.62)	2.3	1.91 (0.48–7.51)	1.91 (0.48–7.51)
VoB and threatened or injured at school in past year (“threatened or injured”) (n = 215)	11.9	5.94 (3.44–10.26)	17.5	7.19 (3.35–15.40)	6.7	3.72 (1.34–10.32)	3.72 (1.34–10.32)
VoB and 2 additional risk factors							
VoB, skipped, and threatened or injured (n = 89)	9.7	5.86 (2.52–13.62)	15.0	5.73 (1.88–17.44)	7.5	5.87 (1.85–18.62)	5.87 (1.85–18.62)
VoB, skipped, and fought (n = 47)	11.4	6.90 (2.32–20.50)	14.3	4.79 (0.64–35.69)	10.3	9.00 (2.42–33.50)	9.00 (2.42–33.50)
VoB, threatened or injured, and fought (n = 73)	25.9	14.45 (6.05–34.49)	28.9	11.59 (5.08–26.42)	25.4	27.99 (4.74–165.47)	27.99 (4.74–165.47)
VoB and 3 additional risk factors							
VoB, skipped, threatened or injured, and fought (n = 78)	46.4	35.56 (14.84–85.23)	44.8	23.92 (8.97–63.76)	39.9	49.97 (12.80–195.05)	49.97 (12.80–195.05)

<sup>a</sup> Unweighted frequencies; weighted percentages.

<sup>b</sup> Odds ratio adjusted for sex, grade, and race/ethnicity compared with “nonvictim and no additional threats.”

<sup>c</sup> Odds ratio adjusted for grade and race/ethnicity compared with “nonvictim and no additional threats.”

### Associations Between VoBs and Additional Risk Factors

VoBs were more likely to skip school (aOR: 4.55; 95% CI: 3.77–5.48), to have been threatened or injured at school (aOR: 5.27; 95% CI: 4.34–6.39), and to have been in a fight at school (aOR: 2.56; 95% CI: 1.98–3.31).

### Associations Between Weapon Carrying and Additional Risk Factors

Students who reported skipping school because they felt unsafe at school or on the way to school were more likely to carry weapons to school than those who didn’t (aOR: 4.51; 95% CI: 3.25–6.25). Students who were involved in school fights were more likely to carry weapons than uninvolved students (aOR: 6.50; 95% CI: 4.46–9.46). Finally, students who had been threatened or injured at school were more likely to carry weapons compared with those who had not been threatened or injured (aOR: 8.72; 95% CI: 6.22–12.22).

### Associations Between Weapon Carrying and Victimization Groups

Table 2 shows the percentage of students within each victimization group subset who carried a weapon to school as well as the aORs and 95% CIs of each victimization group compared with the reference group of nonvictims who did not experience additional risk factors.

Overall, VoBs were more likely to carry weapons to school compared with nonvictims (aOR: 2.25; 95% CI: 1.72–2.96). However, as shown in Table 2, VoBs who did not report any of the 3 additional risk factors were not more likely to carry weapons than nonvictims. When the impacts of additional risk factors were analyzed individually, the odds of weapon carrying by VoBs who reported skipping school out of fear for their safety, physical fighting at school, or being threatened or injured at school were, respectively, 3.09, 5.02, and 5.94 times greater compared

with nonvictims. Among victims who reported skipping school out of fear for their safety, the aORs were 5.86 and 6.90, respectively, if they also reported being threatened or injured at school or reported fighting at school. Among victims who reported being threatened or injured at school, the aOR was 14.45 if they also reported fighting at school. Students in the subset of victims who reported all 3 risk factors were much more likely to carry weapons to school compared with nonvictims (aOR: 35.56). Prevalence figures and 95% CIs are detailed in Table 2.

Table 2 also presents the results for male and female students separately, with adjustment for grade and race/ethnicity.

## DISCUSSION

Although previous researchers have established an association between bullying victimization and risk of weapon carrying,<sup>10–12</sup> with this study, we are the first to examine the compounded risk of weapon carrying among VoBs who have also experienced other risk factors. In this large, nationally representative sample of US high school students, 1 in 5 teenagers reported that they had been bullied in the past year. VoBs were over twice as likely to carry weapons to school compared with nonvictims. With over 16 million high school students in the United States,<sup>22</sup> in our analyses of CDC data, we suggest that >200 000 VoBs had carried a weapon to school in the 30 days before taking the survey.

By successively honing in on the students hypothesized to be at greatest risk for weapon carrying, we showed a clear pattern of increased prevalence of weapon carrying among the subsets of victims who experienced additional risk factors, such as fighting at school, being threatened or injured at school, and skipping school out of fear for their safety. Although VoBs with none of

the 3 additional risk factors were not more likely to carry weapons to school compared with nonvictims (2.8% vs 2.5%,  $P = .2$ ), the prevalence of weapon carrying rose to 5.3% to 11.9% among victims with 1 additional risk factor, 9.7% to 25.9% among those with 2 additional risk factors, and a staggering 46.4% among victims who had skipped school, were threatened or injured at school, and had been in a fight at school. Students whose sense of safety had been violated or threatened in successively more ways had a greater propensity to carry weapons to school, with each additional risk factor further compounding this risk.

The current study adds to the robust body of research showing the respective impacts of feeling unsafe at school or on the way to and from school,<sup>13,14</sup> being threatened with a weapon,<sup>13,15–17</sup> and being in a physical fight.<sup>18</sup> By evaluating the impact of these adverse experiences singly and in combination, we demonstrate the additive risk of experiencing multiple risk factors. By focusing on these effects among VoBs, we draw attention to an especially complicated student population that has been shown to be at greater risk of weapon carrying.<sup>9–12</sup>

### Split-Sex Analysis

The odds ratio trends noted in the total sample were likewise present when boys and girls were analyzed separately. Although the percentage of girls who carried weapons was generally lower than the percentage of boys who carried weapons, the aORs were typically higher among girls compared with boys due in part to the low rate of weapon carrying among girls in the reference group and in part to the elevated rates of weapon carrying among girls experiencing multiple additional risk factors. Thus, despite generally higher rates of weapon carrying by boys, the sex discrepancy seemed

to narrow among the victimization groups exhibiting several additional risk factors; among these high-risk groups, girls who were bullied carried weapons at rates that approached those of boys who were bullied. Although researchers have repeatedly documented higher rates of violence<sup>19,23</sup> and weapon carrying<sup>13,24,25</sup> among boys, with our data we strongly suggest that the potential for weapon carrying by girls, especially those who have been victimized in 1 or more ways, should not be discounted.

### Study Limitations

Despite the advantages offered by large, nationally-representative data, analysis of cross-sectional data cannot establish causal relationships or ascertain the timing of events (whether bullying or weapon carrying came first). However, as bullying victimization was assessed by past-year figures and weapon carrying was assessed by past-month figures, it is much more likely than not that a bullying incident preceded weapon carrying.

The issue of self-report also poses several limitations. As students may be reluctant to admit to weapon carrying, our prevalence figures are likely underestimates. The survey methodology may also be susceptible to common method biases.

The scope and wording of questions asked in the YRBS limited the variables that we could include in our analyses and our ability to accurately interpret their results. First, given the different time frames of the YRBS questions (past month versus past year), these analyses cannot account for students who were bullied in the past year and indeed carried a weapon to school but not within the past-month time frame captured by the survey. Second, previous researchers have shown that some VoBs are themselves bullies to others (“bully-victims”).<sup>26,27</sup> Because the YRBS data set does not provide

information regarding each student's own bullying behaviors, our analyses could not distinguish between those who are victim-only and those who are bully-victims. Third, the exposure variable "involved in fights at school" did not allow for a more granular analysis distinguishing perpetrators of fights from victims of fighting. Although "fighting" is less clearly an indicator of victimization, our analyses show that it is nonetheless a risk factor for weapon carrying and would thus be a pertinent screening question. Thus, these results do not reveal whether weapons were brought to school for defensive, self-protection purposes or for offensive purposes relating to aggression, intimidation, or retribution.

Because of small cell sizes, the split-sex analyses, although interesting from a macro perspective, could not more robustly and directly compare high-risk male and high-risk female students. Similarly, small cell sizes did not allow for more granular analysis of weapon carrying type and frequency (ie, gun versus other weapons, number of times per month).

### Implications for Pediatricians, Parents, and School Personnel

Violence-prevention efforts should consider directing what limited resources are available toward students who are at greatest risk for weapon carrying. We highlight 3 risk factors that greatly amplify the odds of weapon carrying by VoBs. When caring for students

who have been bullied in school, pediatricians, parents, and school personnel should also be vigilant for risk factors such as fighting at school, being threatened or injured at school, and/or skipping school out of fear for their safety. Parents and school personnel should be watchful for red flags such as unexplained bruises or injuries, school avoidance, and/or frequent truancy.

In 2009, the American Academy of Pediatrics issued a policy statement urging pediatricians to familiarize themselves with the "Connected Kids: Safe, Strong, Secure" primary care violence prevention protocol<sup>28</sup> and to practice anticipatory guidance, screening, and counseling of children and families.<sup>29</sup> This policy statement emphasizes that youth exhibiting violence-related behaviors should be treated and/or referred to the appropriate medical and community-based resources in a timely manner. Given the widespread prevalence of self-reported bullying, additional screening questions may help to identify youth who are most likely to carry weapons among the 20.2% of youth who report being a VoB. Pediatricians may also play a role in violence prevention by participating in advocacy for community-based behavioral health services, educating themselves about resources for children and adolescents with violence-related problems, and contributing to research in the domain of youth violence prevention.<sup>29</sup>

## CONCLUSIONS

Bullying is widespread among high school students in the United States. Furthermore, the alarming percentage of students who carry weapons on school property signals that school campuses are still not the optimal, safe learning environments that we want for our youth. The risk of weapon carrying by VoBs progressively increases among students who have experienced 1 or more risk factors in conjunction with bullying. Pediatricians should familiarize themselves with youth violence protocols and screen for risk factors for weapon carrying during routine consults, paying particular attention to VoBs who report fighting at school, being threatened or injured at school, or skipping school out of fear for their safety.

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## ABBREVIATIONS

aOR: adjusted odds ratio  
CDC: Centers for Disease Control and Prevention  
CI: confidence interval  
VoB: victim of bullying  
YRBS: Youth Risk Behavior Survey

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