HHS Public Access

Author manuscript

J Interpers Violence. Author manuscript; available in PMC 2023 May 01.

Published in final edited form as:

J Interpers Violence. 2022 May ; 37(9-10): NP8226–NP8236. doi:10.1177/0886260520966673.

New perspectives on risk factors for non-fatal strangulation and post-assault imaging

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Abstract

Strangulation has long been associated with death in the context of sexual assault and IPV. Non-fatal strangulation (NFS) during sexual assault, which refers to strangulation or choking that does not result in death, is common and has been associated with IPV and with bodily injury; however, other factors associated with NFS are unknown. The current study examined demographic and sexual assault characteristics associated with NFS among women who received a sexual assault medical forensic exam (SAMFE). A second purpose of this study was to explore factors associated with receiving follow-up imaging orders after NFS was identified during a SAMFE. Participants (N = 882) ranged in age from 18 to 81 (M = 28.85), with the majority identifying as non-Hispanic White (70.4%) or Black/African American (23.4%). A total of 75 women (8.5%) experienced NFS during the sexual assault. Of these, only 13 (17.3%) received follow up imaging orders for relevant scans. Results from a logistic regression analysis demonstrated that NFS was positively associated with report of anal penetration, intimate partner perpetration, non-genital injury, and weapon use during the assault. Results from chi-square analysis showed that among sexual assaults involving women who experienced NFS, those whose assaults involved weapon use were over four times more likely to receive imaging orders compared to assaults without weapon use. These findings have implications for criminal justice, and if incorporated into danger assessments, could potentially reduce fatalities linked to sexual assault and/or IPV. Additional work is needed to ensure that all assaults with NFS trigger a referral for imaging regardless of other assault characteristics.

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Keywords

sexual assault; intimate partner violence (IPV); non-fatal strangulation; domestic violence; medical care

Sexual assault is common in the United States, affecting approximately one in three women (Smith et al., 2018). Non-fatal strangulation (NFS), which is strangulation that does not immediately result in death, occurs in approximately 5.1% to 12% of sexual assaults (Cannon et al., 2020; Mcquown et al., 2016). Identification of NFS in sexual assault medical forensic exams (SAMFE) following assault is critical for several reasons. Within the context of intimate partner violence (IPV), NFS is associated with an over seven-fold increase in the odds of completed homicide (Glass et al., 2008). Further, even when victims survive the initial assault, the serious potential for delayed lethality remains (see De Boos, 2019, for a review). Because visible external signs of injury are not always found in survivors of strangulation and even in some fatal strangulation cases (Gill et al., 2013; Zilkens et al., 2016), follow-up imaging (for example, CT scans of the head and neck) is needed in order to identify these potentially lethal injuries.

Despite clear need for research on NFS and associated risk factors, the body of literature is sparse. However, NFS does appear to occur more often in the context of IPV: individuals who received a forensic exam after reporting IPV (but not sexual assault) had higher rates of NFS than those receiving a SAMFE after sexual assault (Mcquown et al., 2016). Further, a large study of sexual assaults revealed that while 7.4% of all cases involved NFS, 58% of NFS cases were perpetrated by intimate partners (Zilkens et al., 2016). Non-genital bodily injury has also been associated with NFS in a large sample of women undergoing a SAMFE (Sugar et al., 2004). Other factors associated with NFS are unknown. It is possible that factors like alcohol or drug use during the assault, weapon use, and characteristics of the assault may be associated with NFS. Further, it may be that individuals in certain demographic groups are at higher risk for NFS. Although follow-up imaging is needed to identify potentially lethal injuries and medical sequelae of NFS, even less is known about which patients tend to receive follow-up imaging after NFS is reported. Thus, demographic and sexual assault characteristic predictors of medical orders for follow-up imaging after NFS is also an area needing further research.

The current study examined associations among demographic and sexual assault characteristics with NFS. Based on results from previous research (Mcquown et al., 2016; Zilkens et al., 2016), it was hypothesized that sexual assault perpetrated by an intimate partner would have higher odds of NFS during the assault. Consistent with previous research (Sugar et al., 2004), it was also hypothesized that injury during the assault would be associated with higher odds of NFS during the assault. Demographic (race/ethnicity, age, and marital status) and other sexual assault characteristics (penetration type, injury type, weapon use, alcohol and/or drug use, and intimate partner perpetration) were also explored as predictors of NFS; however, because of a dearth of previous research on these factors, we did not hypothesize direction of association. A second purpose of the current study was to examine demographic and assault history characteristics associated with receiving imaging

orders after NFS. This second aim was exploratory, with no specific a priori hypotheses made as to direction of association.

Method

Participants

This study utilized a retrospective cohort design and examined electronic medical records for women (N = 882) receiving a SAMFE between July 1, 2014 to May 15, 2019. Participants received a SAMFE within 120 hours of the assault at an academic medical center in the southeastern United States. Participants ranged in age from 18 to 81 (M = 28.85, SD = 10.69 years). Participants identified as non-Hispanic White (n = 621; 70.4%), Black or African American (n = 206; 23.4%), Hispanic or Latino (n = 30; 3.4%), Asian (n = 7; 0.8%), American Indian or Alaska Native (n = 2; 0.2%), and Other (n = 14; 1.6%). The majority of participants were single/unmarried (n = 705; 79.9%); others identified as married (n = 93; 10.5%), divorced (n = 43; 4.9%), separated (n = 19; 2.2%), widowed (n = 9; 1.0%), or having a significant other (n = 4; 0.5%). Most participants had one SAMFE during the timeframe evaluated (n = 850; 96.4%), whereas 3.1% received two (n = 27), and 0.6% received three or more (n = 7).

Measures

Demographic information (e.g., age at time of SAMFE, race/ethnicity and marital status) was obtained from each participant's electronic medical record.

Sexual Assault Characteristics—Characteristics of each sexual assault were recorded by the Sexual Assault Nurse Examiner conducting the SAMFE. These characteristics included type(s) of penetration, presence of injury (both genital and non-genital injury), weapon use, use of alcohol and/or drugs by either the victim or the perpetrator before, during, or after the assault, whether the perpetrator was an intimate partner, and experience of NFS.

Imaging Orders—Imaging orders (i.e., CT scan, MRI) were also obtained from the patient's electronic medical record. For the current study, imaging orders prescribed within one week of the SAMFE and containing language specific to head, neck or spine injuries were included in analyses.

Procedure

All study procedures were approved by the Institutional Review Board, and all participants consented to the use of their medical records for research. Demographic information was obtained directly from electronic medical records and paired with the Sexual Assault Nurse Examiner notes. After pairing, individual medical record numbers were replaced by randomly generated personal identification numbers.

Analysis Plan

Because the outcome variable of NFS was dichotomous (experienced/not experienced), the cases of data were independent, and linear relationships between the predictors and outcome

were assumed (Field, 2017), a logistic regression was used to evaluate the likelihood of NFS during the sexual assault. The model was estimated in Mplus using maximum likelihood and Monte Carlo integration. For women with more than one SAMFE, only data from the first exam were used. Race/ethnicity and marital status were dummy coded, with the least frequently endorsed groups combined into a single "other" category. Each predictor was simultaneously regressed on the dichotomous NFS variable (i.e., experienced/not experienced).

Second, chi-square tests were estimated in IBM SPSS Statistics 26 to evaluate differences in assault and demographic characteristics among women who had an imaging order within one week of the SAMFE following NFS during the sexual assault. Fisher's exact test was used to determine *p*-values (Field, 2017). A second logistic regression tested age (the single continuous variable) as a predictor. Only data from women who experienced NFS at the SAMFE ($n = 75$) were included. Race/ethnicity and marital status were again dummy coded as described above.

Results

A total of 75 women (8.5%) experienced NFS during the sexual assault. Of these, only 13 (17.3%) received follow-up imaging orders for relevant scans.

NFS was positively associated with anal penetration, intimate partner perpetration, non-genital injury, and weapon use during the assault (Table 1). Vaginal penetration and injury, anal injury, drug and/or alcohol use, race/ethnicity, marital status, and age at time of assault were not significantly associated with NFS. These results indicated that when the assault was perpetrated by an intimate partner, the odds of NFS increased by 438%. When women reported anal penetration, the odds of NFS increased by 288%. Women reporting non-genital injury were 373% more likely to experience NFS. Women reporting weapon use were 343% more likely to experience NFS. Among assault and demographic characteristics, only weapon use differed significantly among women who did or did not receive imaging orders within a week after their SAMFE following NFS, $\chi^2(1) = 6.89$, $p = 0.017$, OR = 4.45. No other assault or demographic characteristics were associated with imaging orders among women who experienced NFS.

Discussion

The aims of the current study were to examine demographic and sexual assault characteristics associated with NFS during sexual assault as well as with orders for follow-up imaging for women who experienced NFS. These were investigated using a retrospective cohort design in a large sample of 882 women undergoing a SAMFE exam. A total of 8.5% of the sample experienced NFS. In support of the two directional hypotheses, women who experienced perpetration by an intimate partner faced greater odds of NFS during the assault, as compared to other women in this sample. Further, experiencing injury was associated with increased odds of experiencing NFS during the assault; specifically, women who reported NFS were more likely to have non-genital injury. These findings replicate previous research that found positive associations between NFS and IPV (Mcquown et al.,

2016; Zilkens et al., 2016) and non-genital injury (Sugar et al., 2004), respectively. Based on these results, NFS does not appear to be related to any demographic characteristics, other types of penetration, genital injury, or alcohol and/or drug use by the victim or perpetrator.

Exploratory results also showed that women who reported anal penetration or weapon use were significantly more likely to experience NFS. Taken together with the results on IPV and non-genital injury, these findings could suggest that the presence of NFS may be an indicator of the severity of physical and psychological violence (e.g., Pritchard et al., 2016) in the context of sexual assault. However, follow-up and replication studies are needed in order to further test this.

Notably, only 17.3% of women experiencing NFS also received orders for follow-up imaging relating to the head, neck, or spine. When a weapon was used during the assault, women experiencing NFS were nearly four and a half times more likely to receive imaging orders than women who did not report weapon use. Although the results suggest that women do not receive imaging orders at differential rates based on demographic or other sexual assault characteristics, further exploration is needed to understand why women who experienced weapon use during the assault were more likely to receive imaging. It could be that weapon use is indicative of the severity of violence used during the assault; however, if that were the case, it might reasonably be expected that level of injury (genital or non-genital) would also predict imaging orders.

The findings from the current study should be interpreted in the context of several limitations. First, because the data are cross-sectional, causality cannot be inferred. Although the NFS may have resulted in contusions, abrasions, petechiae, as well as handprints or ligature marks to the neck, information about the nature of non-genital injury (i.e., injured body part) was unavailable, precluding sub-analyses. Men were excluded from the analyses because none in the current sample reported strangulation. Because the data were collected as part of routine clinical care, limited information about demographic and sexual characteristics was available (i.e., participant sexual orientation or perpetrator gender). The current study did not find racial/ethnic differences in NFS or follow-up imaging, though previous literature suggests that African American women experience violence and stalking by an intimate partner at higher rates than other races/ethnicities (except American Indian or Alaska Native; Smith et al., 2017), and future research would benefit from examining interactions among race and/or ethnicity and sexual assault characteristics in predicting NFS or follow-up medical care and imaging orders.

Implications for Criminal Justice

Our finding that NFS is linked to identifiable, crime-related risk factors such as anal penetration, non-genital injury, and weapon use has implications for criminal justice and the law. These risk factors reflect characteristics of crimes that can be incorporated into danger assessments and be used by criminal justice professionals to identify those victims at risk for strangulation, even if not present in the incident offense. These findings during lethality assessments should prompt a recommendation to seek immediate medical care. Because NFS is strongly linked to an increased risk of death in IPV incidents, knowing what factors in sexual assaults increase risk for strangulation and incorporating them into danger

assessments and medical care decisions could substantially reduce fatalities linked to sexual assault and IPV. Doing so may be particularly important because strangulation itself is often misunderstood or misidentified by the police (Douglas & Fitzgerald, 2014). Our findings also suggest overlap between sexual violence and IPV in terms of factors correlated with NFS. This overlap suggests the need for educating law enforcement and victim advocates on the similarities in patterns across offenses and the fact that sexual assault victims may need similar services as IPV victims.

NFS is also used repeatedly over time as a mechanism of coercive control (Pritchard et al., 2016). Identifying risk factors for NFS in sexual assaults may also be a way to identify people entrenched in a cycle of abuse or at risk for becoming involved in relational abuse. Further, states may wish to re-evaluate their classification of and punishments for NFS. For example, strangulation was recently classified in 2014 as felony aggravated assault in Georgia, while it was a misdemeanor beforehand (Title 16, 2014).

Acknowledgements:

Manuscript preparation was partially supported by a grant from the National Institute on Drug Abuse (K23DA042935; PI: Gilmore) and the Department of Veterans Affairs Office of Academic Affiliations Advanced Fellowship Program in Mental Illness Research and Treatment, the Medical Research Service of the Veterans Affairs Central Virginia Health Care System, and the Department of Veterans Affairs Mid-Atlantic Mental Illness Research, Education, and Clinical Center (MIRECC).

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Table 1:

Factors Predicting Strangulation and Follow-Up Imaging Orders

		Strangulation			Imaging orders		
	% endorsed*	**Estimate (*SE*)**	***p*-value**	**Odds ratio**	**Estimate**	***df***	***p*-value**
Vaginal penetration	92.9%	1.21 (.76)	.110	3.36	3.20	1	1.000
Vaginal injury	30.5%	−.07 (.30)	.810	.93	0.22	1	.741
Anal penetration	15.1%	1.06 (.37)	.004	2.88	3.91	1	.100
Anal injury	4.9%	−.98 (.71)	.169	.38	0.79	1	.397
Nongenital injury	48.8%	1.32 (.32)	< .001	3.73	2.01	1	.275
Weapon use	9.4%	1.23 (.37)	.001	3.43	6.89	1	.017
Alcohol and/or drug use	65.8%	.22 (.31)	.467	1.25	1.81	1	.307
Intimate partner perpetration	11.9%	1.47 (.34)	< .001	4.38	0.40	1	.526
Race/ethnicity							
Non-Hispanic White vs. Black	--	.35 (.35)	.312	1.42	4.27	1	.058
Non-Hispanic White vs. Hispanic or Latino	--	.26 (.79)	.744	1.29	1.53	1	.319
Non-Hispanic White vs. other race/ethnicity	--	.98 (.73)	.179	2.67	.66	1	1.000
Marital status							
Single vs. married	--	−.14 (.44)	.753	.87	.05	1	1.00
Single vs. divorced	--	.05 (.64)	.940	1.05	.16	1	.546
Single vs. other marital status	--	−.24 (.66)	.711	.78	.16	1	.546
Age	--	.02 (.01)	.285	1.02	0.03 (0.03)[a]	0.03[a]	.204[a]

[a] Logistic regression results for Age reflecting estimate, *SE*, and *p*-value, respectively.

* Missing data differed for each variable, therefore, percentages are provided based on non-missing data.

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