



Research paper

Non-fatal strangulation in sexual assault: A study of clinical and assault characteristics highlighting the role of intimate partner violence



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ABSTRACT

Objective: To describe the prevalence, risk factors, signs and symptoms of non-fatal strangulation (NFS) in women referred to a Sexual Assault Resource Centre (SARC) following recent sexual assault.

Methods: A cross-sectional study using data routinely collected at time of forensic examination of women (age ≥ 13 years) referred to the Western Australian SARC between Jan-2009 and Mar-2015 alleging a recent sexual assault. Data on demographics, assault characteristics and forensic findings were available.

Results: A total of 1064 women were included in the study; 79 (7.4%) alleged NFS during the sexual assault. The prevalence of NFS varied significantly by age-group and assailant type. Of women aged 30–39 years 15.1% gave a history of NFS compared to less than 8.2% in all other age groups. Of women assaulted by an intimate partner, 22.5% gave a history of NFS compared to less than 6% of women assaulted by other assailant types. Of all sexual assaults with NFS, intimate partners were the assailant in 58.2% of cases, whereas in sexual assault cases without NFS, intimate partners were the assailant in 15.9% of cases. Odds of NFS were 8.4 times higher in women sexually assaulted by an intimate partner compared to women assaulted by an acquaintance/friend and 4.9 times higher compared to women assaulted by a stranger. When considering both age and assailant type the highest proportion of NFS (33.9%) was in women aged 30–39 years sexually assaulted by an intimate partner. Other factors associated with NFS during sexual assault included deprivation of liberty, verbal threats, being assaulted in the woman's home and use of additional blunt force. External physical signs of NFS were absent in 49.4% of all NFS sexual assault cases.

Conclusions: This study identifies and quantifies NFS risk factors in female sexual assault and highlights the strong association with intimate partner sexual assault. Greater awareness of NFS in sexual assault should lead to improvement in medical screening, forensic management and safety risk assessment by sexual assault and domestic violence services, emergency departments and police.

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1. Introduction

Strangulation is a form of mechanical asphyxia caused by direct

pressure on the neck by one or two hands (manual strangulation), a constricting band (ligature strangulation) or arm (sleeperhold or chokehold).^{1,2} It may result in obstruction of the great veins and carotid arteries, stimulation of carotid sinus baroreceptors and airway obstruction.^{1,2} Injuries sustained depend on force, duration and method and death may result.^{3,4} Non-fatal strangulation (NFS) refers to those surviving an episode of strangulation.

The clinical and forensic importance of NFS has been under-recognised.^{5,6} European and North American lifetime prevalence for NFS by an intimate partner is estimated to range from 3.0% to

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9.7%⁷ with estimates reported as high as 27%⁸ and 68%⁹ in women with a history of intimate partner violence. No published Australian data exists on the prevalence of NFS. The prevalence of NFS in the context of sexual assault is not well established in any population.

Health sequelae of NFS range from mild and transient to severe and life-threatening. NFS may result in injury to any neck structures including dissection, thrombosis and embolism of carotid arteries and contusion or fracture of the larynx, hyoid bone,⁴ tracheal rings and thyroid cartilage.^{5,6,10} Published studies report differing frequencies of symptoms following NFS. Symptoms include neck pain, sore throat, dyspnoea, vocal changes, pain or difficulty swallowing or speaking, loss of consciousness, incontinence, memory loss, visual changes and tinnitus.^{3,5,9–13} Clinical signs include neck and chin bruises and abrasions; neck swelling; petechial bruising of the face, eyelids, conjunctivae, scalp and neck; subconjunctival haemorrhages; and signs of cerebral anoxia such as agitation and memory loss.^{3,5,9,11–14} Signs may not appear for 24–36 h and laryngeal oedema may develop up to 36 h later resulting in delayed airway obstruction and compromise.^{3,10,15} Both fatal and non-fatal strangulation can occur without any signs of visible external injury.^{3,16–21} Absence of external neck injuries does not exclude strangulation.²²

Identification of NFS is important medicolegally. Documentation of signs and symptoms and photography of injuries may corroborate the history and collection of forensic samples such as skin and fingernail swabs for DNA analysis, may lead to identification of an alleged offender. NFS is now a discrete offence within the criminal code (some specific to the domestic violence context) in 43 USA states,²³ with similar legislative responses likely in New Zealand and Queensland, Australia in the near future.²⁴ These legal reforms highlight the importance of identification, and clinical forensic and risk factor assessment of NFS in sexual assault.²⁵

NFS by an intimate partner is a recognised predictive risk factor for subsequent severe violence and is associated with a 7.5-fold increased risk of homicide.⁸ Other predictive risk factors for future violence or homicide by intimate partner include sexual assault,²⁶ abuse during pregnancy and threats to kill.^{27,28} When NFS occurs during sexual assault by an intimate partner multiple risk factors may co-exist making risk assessment and safety planning essential.

This study aimed to describe the prevalence, demographics, clinical and assault characteristics and risk factors for NFS in female sexual assault presentations.

2. Methods

2.1. Selection of study participants

Study participants included females aged 13 years and older referred to the Sexual Assault Resource Centre (SARC) in Perth, Western Australia between 1 January 2009 and 31 March 2015 following alleged recent sexual assault. Excluded from the study were patients who (i) declined consent for research, (ii) were indecently assaulted, (iii) did not know the date of sexual assault or could not estimate time since assault, (iv) presented to SARC >10 days after sexual assault, (v) did not know assailant type (no memory), (vi) declined consent for general physical examination, (vii) admitted that report was fallacious and/or determined to be false by police.

2.2. Physical examination of patients and data collection

Forensically trained doctors from SARC conducted physical examinations according to a standard sexual assault examination protocol, as outlined in the SARC Medical and Forensic Manual,

Western Australia. This includes physical examination of the entire body (head to toe, front and back), with measurement and documentation of any injuries and findings on standardized body diagrams in the SARC Forensic Record. Photographs of any injuries may also be taken by the SARC doctor. Patient and/or guardian informed consent was obtained for use of de-identified data for research. The attending clinician entered history and examination data into the SARC Medical Forensic Services Clinical Information System. Additional specific symptoms and signs related to NFS were extracted by clinician chart review.

2.3. Study definitions

NFS included manual, ligature and chokehold methods of neck pressure.

Sexual assault was completed or attempted penetration without consent, of the vagina or anus (with penis, finger, tongue or object) or of the mouth with penis.

Indecent assault was a sexual act or contact without consent but with no completed or attempted penetration.

Assailants were categorised as stranger, intimate partner, acquaintance/friend and “other”. Intimate partner included current and ex-partners (including husbands, de facto and boyfriends).

Acquaintance/friend included short-term, long-term and accidental acquaintances (known <24 h), internet acquaintances and work colleagues.

“Other” assailants included relatives, carers or other relationships.

Blunt force assault was the history of being punched, kicked, slapped, dragged, stomped, hit, pushed, knocked, beaten and/or pulled hair.

Deprivation of liberty was any action unlawfully depriving a person of their freedom for a period of time.

Verbal threat was threat to kill or harm the woman, her family, friends or pets.

2.4. Statistics

Descriptive statistics were used to describe characteristics of women with and without an allegation of NFS during the sexual assault and summarized as means \pm standard deviations for continuous data and as percentages for categorical data. The chi-square test or the Fisher exact test was performed to compare categorical variables between groups. Logistic regression was used to identify characteristics associated with the odds of NFS in univariate analyses. All statistical analyses were performed using Stata version 13.1 (College Station, TX, USA).

3. Results

A total of 1755 women alleging sexual assault were seen during the 75 month study period, of whom 1064 were included in the study. The exclusion rate was 39.4% (n = 691), 5.4% (n = 95) not consenting to research, 2.0% (n = 35) solely indecent assault, 0.0% (n = 0) could not estimate time since assault, 4.0% (n = 70) presenting >10 days after assault, 5.8% (n = 101) unknown assailant type, 21.3% (n = 373) not consenting to a general body physical examination and 1.0% (n = 17) report deemed fallacious (Fig. 1). Almost half of the women excluded because they did not consent for general body physical examination (49.9%, 186/373) gave consent to a genital examination. The remaining 187 women declined both general body and genital examinations. There was no significant difference in mean age between participants (26.5 \pm 11.0 years) and non-participants (26.0 \pm 11.3 years) (p-value = 0.37).

Seventy-nine (7.4%) of the participants reported NFS (75 manual

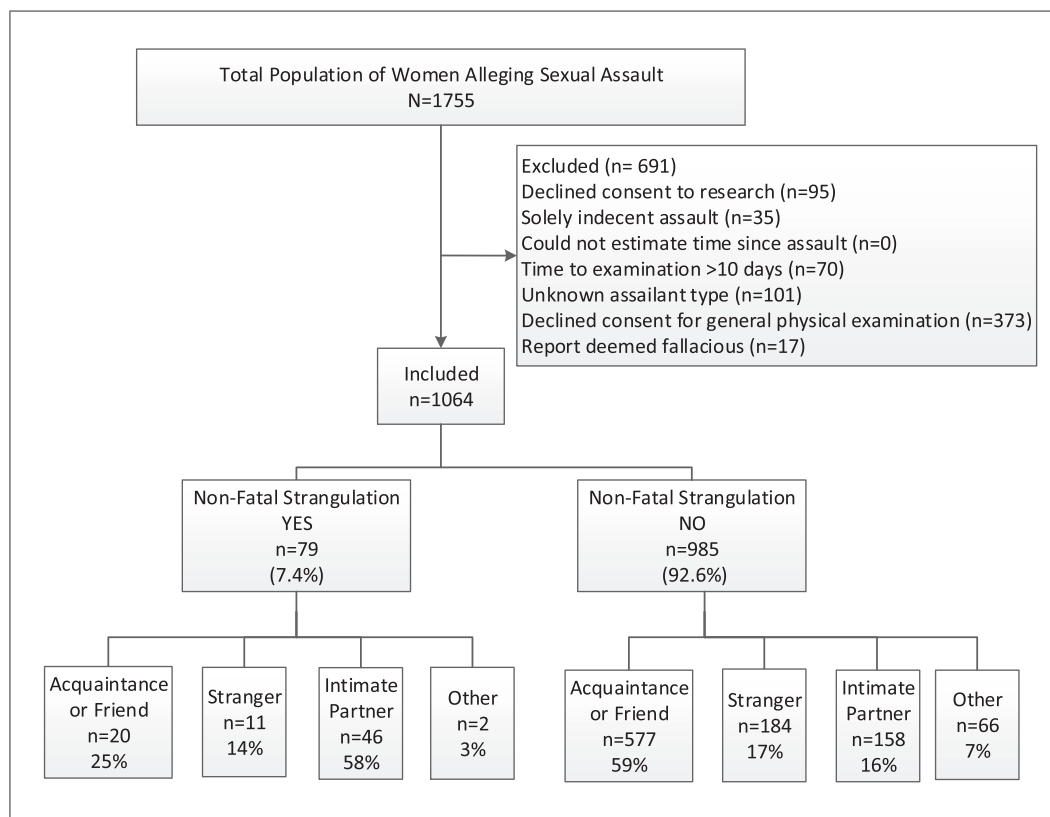


Fig. 1. Flow diagram of study population showing relationship to the assailant by non-fatal strangulation status.

or chokehold, 3 ligature and 1 both manual and ligature).

3.1. Comparison between those with and without an allegation of NFS during the sexual assault.

The 79 women with a history of NFS during the sexual assault (mean age: 29.1 ± 8.3 years) were significantly older by 2.8 years (95%CI 0.3, 5.4, p -value = 0.03) than the 985 women without a history of NFS during the sexual assault (26.3 ± 11.1). NFS cases were significantly more likely to present within 24 h of sexual assault when compared to women without NFS (53 of 79, 67.1% vs 525 of 985, 53.3%, $\chi^2_{(1)} = 5.60$ p -value = 0.02).

The proportion of NFS by patient and assault characteristics and estimates of unadjusted relative odds of reporting NFS are summarized in Table 1. There was a non-linear relationship between age and NFS with more women aged 30–39 years reporting NFS than any other age group. Women aged 30–39 years were almost six times more likely to report NFS compared to women aged 13–19 years of age.

The assailant type was more frequently reported to be an intimate partner in the women reporting NFS during the sexual assault when compared to those without NFS during the sexual assault (46 of 79, 58.2% vs 158 of 985, 16.0%, $\chi^2_{(1)} = 83.99$, p -value <0.001)(Fig. 1). Almost a quarter (23%) of the women who reported being sexually assaulted by an intimate partner also reported NFS (Table 1). The odds of NFS were 8.4 times higher for women sexually assaulted by an intimate partner compared to women reporting sexual assault by a friend/acquaintance and 4.9 times higher (95%CI 2.4, 9.7) compared to women assaulted by a stranger.

NFS was reported more frequently in sexual assaults that occurred in the woman's home compared to elsewhere, when additional blunt force was reported compared to reports that did

not and when deprivation of liberty and verbal threats were involved. (Table 1).

NFS prevalence stratified by assailant type and age are detailed in Table 2. The highest proportion of NFS was reported in women aged 30–39 years sexually assaulted by an intimate partner (33.9%) followed by women aged 20–29 years sexually assaulted by an intimate partner (25.0%) and women aged 30–39 year olds sexually assaulted by a stranger (17.4%).

Pregnancy data was collected in 437 women presenting to SARC after April 2012. Five (1%) of these women were pregnant including 2 (5%) of the 39 who reported NFS and 3 (0.8%) of the 398 who did not report NFS. Due to low numbers this was not investigated further.

3.2. Signs and symptoms of non-fatal strangulation

Table 3 details the frequency of 6 signs and 11 symptoms of NFS identified in the 79 women reporting NFS: 50.6% had at least one sign and 67.1% had at least one symptom. The most common symptoms were neck/throat pain, neck tenderness on palpation and pain and/or difficulty swallowing. Linear abrasions on the neck were the most common sign followed by petechial bruising of the upper neck/facial areas and non-petechial bruising of the neck. Of the 39 (49.4%) women without any signs of injury over half ($n = 20$, 51.3%) reported at least one symptom suggestive of strangulation: 13 (33.3%) had neck/throat pain and 11 (28.2%) reported tenderness on palpation. Nineteen (24.1%) women had neither signs nor symptoms.

4. Discussion

Using data from a large Western Australian cohort of 1064

Table 1
Summary demographic and sexual assault characteristics for the study cohort and prevalence of non-fatal strangulation.

	All		NFS				X ² p-value	Relative odds of NFS	
	(N = 1064)		No (n = 985)		Yes (n = 79)			OR	95% CI
	n	%	n	%	n	%			
Age (years)									
13–19	335		325	97.0	10	3.0	<0.001	1	ref
20–29	407		374	91.9	33	8.1		2.9	1.4–5.9
30–39	186		158	85.0	28	15.1		5.8	2.7–12.2
>39	136		128	94.1	8	5.9		2.0	0.8–5.3
Relationship to the assailant									
Acquaintance/friend	597		577	96.6	20	3.3	<0.001	1	ref
Stranger	195		184	94.4	11	5.6		1.7	0.8–3.7
Intimate partner	204		158	77.5	46	22.5		8.4	4.8–14.6
Other	68		66	97.1	2	2.9		0.9	0.2–3.8
Patient liberty deprived									
No	492		461	93.7	31	6.3	<0.001	1	ref
Yes	94		73	77.7	21	22.3		4.3	2.3–7.9
Location of assault									
Not Patient's residence	755		708	93.8	47	6.2	0.006	1	ref
Patient's residence	263		233	88.6	30	11.4		1.9	1.2–3.1
Blunt force									
No	659		642	97.4	17	2.6	<0.001	1	ref
Yes	405		343	84.7	62	15.3		6.8	3.9–11.9
Verbal threat									
No	561		539	96.1	22	3.9	<0.001	1	ref
Yes	197		155	78.7	42	21.3		6.6	3.9–11.5
Missing information	306		291	95.1	15	4.9		1.3	0.7–2.5

Deprivation of liberty data was collected from August 2011 onwards capturing data on 55% (586/1064) of the study cohort. Location of assault is missing for 2 (3%) of NFS and 44 (5%) of non-NFS women. CI denotes confidence interval; OR Odds ratio.

Table 2
Prevalence of non-fatal strangulation in a cohort of sexually assaulted women stratified by assailant type and age.

Assailant	Age	All		NFS				p-value ^a
				No		Yes		
		n	%	n	%	n	%	
Stranger	13–19	61	5.7	56	91.8	5	8.2	0.02
	20–29	87	8.2	85	97.7	2	2.3	
	30–39	23	2.2	19	82.6	4	17.4	
	>39	24	2.3	24	100.0	0	0.0	
Intimate partner	13–19	31	2.9	28	90.3	3	9.7	0.008
	20–29	76	7.1	57	75.0	19	25.0	
	30–39	62	5.8	41	66.1	21	33.9	
	>39	35	3.3	32	91.4	3	8.6	
Acquaintance/friend	13–19	227	21.3	225	99.1	2	0.9	0.01
	20–29	213	20.0	201	94.4	12	5.6	
	30–39	92	8.6	90	97.8	2	2.2	
	>39	65	6.1	61	93.8	4	6.2	
Other	13–19	16	1.5	16	100.0	0	0.0	0.09
	20–29	31	2.9	31	100.0	0	0.0	
	30–39	9	0.8	8	88.9	1	11.1	
	>39	12	1.1	11	91.7	1	8.3	

^a p-value for Fishers Exact test.

women referred to the Sexual Assault Resource Centre (SARC) in Perth, we estimated the overall prevalence of NFS during sexual assault to be around 7%.

A major finding of this study was that almost 60% of all alleged sexual assaults involving NFS were by an intimate partner. By comparison, a brief US report from California identified intimate partners as the alleged assailant in just over a third of NFS sexual assault cases.¹² It is not clear why the proportion of sexual assaults with NFS involving intimate partners in this study was almost double that reported in the US. However, it is likely that the population demographics were very different, that there are cultural differences between the two study populations and that the referral system for assessment differs between countries. The

Table 3
Signs and symptoms suggestive of strangulation in women alleging non-fatal strangulation during sexual assault (n = 79).

	Count	%
Symptoms		
Neck/throat pain	37	46.8
Neck tender on palpation	27	34.2
Pain and/or difficulty swallowing	15	19.0
Vocal changes	12	15.2
Shortness of breath	7	8.9
Loss of consciousness	7	8.9
Felt dizzy/faint	7	8.9
Blurred vision	2	2.5
Urinary incontinence	1	1.3
Pain on talking	1	1.3
At least one symptom	53	67.1
Signs of injury		
Linear abrasions - neck	25	31.7
Petechial bruising - upper neck/facial	17	21.5
Non-petechial bruising - neck	14	17.7
Subconjunctival haemorrhage	3	3.8
Petechiae in conjunctivae	2	2.5
Soft tissue swelling - neck	1	1.3
At least one sign	40	50.6

Symptoms occurred at time of and/or after the non-fatal strangulation.

Vocal changes included: hoarse voice, croaky voice, raspy voice, softer voice, deeper voice, lost voice, unable to talk and/or voice sounded "different".

study's definition of an intimate partner may have also been different. In studies of NFS not specifically in the context of sexual assault, intimate partners were involved in 68%–79% of cases.^{9,22}

The prevalence of NFS varied by age with women aged in their thirties sexually assaulted by intimate partners at greatest risk. This age group may be particularly vulnerable to this type of assault. A survey in the US proposed that strangulation is more likely to occur late in a domestic violence relationship and has been reported to be a predictor of attempted or completed homicides.⁹ This suggests that the subset of women referred to SARC with NFS by intimate partners may be at higher risk of further severe violence. Further

work linking the sexual assault data to hospital admissions and mortality records would help address this question.

In addition to age and assailant type, deprivation of liberty, verbal threats, being sexually assaulted in the woman's home and blunt force were all shown to be associated with reporting NFS in sexual assault. Almost two thirds (64%) of NFS sexual assaults included verbal threats, rates similar to the brief Californian report.¹² We found 40% of NFS sexual assaults took place in the woman's home and in 78% there was additional blunt force. Previous studies on NFS without a concurrent sexual assault reported 78% of NFS occurred in the woman's home⁹ and blunt force use in 97% of NFS cases.²² The higher rates may reflect differences in study populations, as these studies focused on cases of NFS rather than sexual assault.

Types of symptoms and external physical signs identified in NFS cases in our study are similar to those described in previous NFS studies. However, the frequency of findings vary significantly.^{5,9,12,14,17,21,22} In general we identified a lower frequency of individual symptoms and external physical signs than previous studies. Comparison of findings between studies is difficult due to differences in definitions, groupings of findings, examination protocols, use of checklists and differences in study populations with only the US report from California specifically examining NFS in sexual assault.¹² The greater frequency of physical findings in some studies may reflect greater degrees of violence in the assaults or greater awareness about the forensic aspects of NFS. Unless specifically asked, patients presenting following a sexual assault may minimise the significance of NFS or fail to disclose it^{3, 6, 23}. Identification of NFS is enhanced by specific NFS protocols and documentation tools such as that developed by the Training Institute on Strangulation Prevention, USA.¹³

Guidelines for NFS management and referral are used at SARC WA. Important considerations in the triaging and evaluation of NFS are outlined in Table 4. A specific NFS documentation chart, other than the routine forensic examination record, had not been

implemented at SARC at the time of the study. Almost a quarter of the women alleging sexual assault with NFS in our study had neither signs nor symptoms. This suggests that implementation of a NFS checklist of symptoms and signs, both present and absent, for use by sexual assault services, may increase the recording of physical findings. Such a checklist is likely to assist with medical management, forensic assessment and safety planning.

Screening for NFS in sexual assaults ensures forensic opportunities are not missed, safety risks are recognised and appropriate medical assessment is obtained. Nonetheless, assessing and prioritising symptoms and signs of NFS is complex, particularly in a patient with both medical and forensic requirements. Open-ended indirect questions are optimally used to obtain a forensic history. Use of a checklist with a series of direct leading questions needs to be balanced against the possible risk of suggestibility in some patients.

In our study two thirds of NFS sexual assault cases had at least one symptom and half had at least one sign attributed to NFS. Clinical findings described as markers of potential lethality include congestive petechiae around the eye, hematoma of the neck and loss of consciousness.¹¹ We identified subconjunctival haemorrhages and conjunctival petechiae in only two (2.5%) and three (3.8%) patients respectively and neck soft tissue swelling in a single patient (1.3%). The subjective clinical finding of loss of consciousness was reported by seven (8.9%) patients. Almost a quarter of the women alleging sexual assault with NFS in our study had neither signs nor symptoms. This is greater than the 5% reported by Plattner et al.¹⁴ however their study population was not confined to sexual assault presentations.

Medical assessment including all possible symptomatology is important as the absence of external neck injuries does not exclude strangulation.²² Both fatal and non-fatal strangulation have been well documented without any visible external injury.^{3,16–21} In our study, external physical signs of NFS were absent in half of the women reporting NFS.

Table 4
Important considerations in the evaluation of NFS.

History and symptoms	Examination
Dyspnoea	Vital signs
Voice changes (hoarseness, coughing, difficulty)	Tachypnoea
Swallowing (pain or difficulty)	Stridor
Neck pain	Voice changes (hoarseness, coughing, difficulty)
Loss of consciousness	Tender laryngeal/cricopharyngeal cartilages
Urinary or faecal incontinence	Tender larynx/trachea
Headache	Petechiae of face, palate, ear(external/canal)
Neurological symptoms	Subconjunctival haemorrhage
Drug or alcohol intoxication	Subcutaneous emphysema
Pregnancy status	Loss of laryngeal crepitus
	Cerebral hypoxia (agitation, confusion, combativeness)
	Neurological signs (unilateral weakness, facial droop)
	Neck swelling
	Bruises, linear abrasions to face or neck
<ul style="list-style-type: none"> Severely ill patients should be seen in the Emergency Department as a medical emergency. Patients should remain sitting upright as cervical spine injuries are rare in NFS and the airway may become compromised when supine. All NFS patients, even those with minimal symptoms should have a medical evaluation by healthcare provider experienced in evaluating and managing strangulation. A period of observation, specialty consultation such as ENT review and investigations such as X-ray, laryngoscopy, CT, CT angiogram, MRI may be required to assess the risk and extent of injury.¹³ A high index of suspicion is essential to avoid delayed morbidity and mortality. Many publications recommend observation for at least 24hrs in the Emergency Department following NFS^{5,13,19} due to risk of delayed oedema, neurological and pulmonary complications even if no urgent intervention is required. Clinical features requiring observation include history of loss of consciousness, dyspnoea, facial and/or conjunctival petechiae, odynophagia, voice changes, significant soft tissue neck injury, incontinence (urinary or faecal), intoxication, pregnancy and/or the potential for poor home observation.¹³ As NFS is a significant risk factor for escalating intimate partner violence, safety planning and alternative accommodation may be required prior to discharge. 	

Introduction of specific NFS offences in some jurisdictions highlights the importance of providing a clinical forensic service for NFS to assist both patient and the criminal justice system. Timely access to forensic assessment is important for documentation of symptoms and external physical findings and forensic evidence collection. Symptoms and external injuries of no or minimal medical relevance may be forensically important. They may provide corroboration of the history or may highlight sites for forensic evidence collection. Documentation by forensic clinicians may include use of standardized strangulation documentation charts and photography. Police in some US states also use voice recordings to document vocal changes.¹³

As NFS by an intimate partner is a predictive risk factor for future severe violence and homicide⁸ its accurate identification in sexual assault provides opportunity for safety risk assessment and interventions such as emergency accommodation, social work referral, community services and police assistance.

4.1. Strengths and limitations

The association between NFS and intimate partner violence has been well described previously but there has been little published research examining the characteristics and risk factors for NFS in sexual assault. This present study identifies risk factors of age, assailant type, deprivation of liberty, verbal threats, additional blunt force and assault location in the woman's home for NFS in sexual assault. This study quantifies symptoms and external physical signs following NFS. While external physical signs of NFS were absent in half of alleged NFS sexual assault cases, many of these women reported symptoms.

A number of study limitations exist. Firstly, the SARC study participants may not be representative of all women sexually assaulted in the community. The study may underestimate the true prevalence of NFS because women assaulted by an intimate partner who had the highest rates of NFS may be underrepresented in referrals to SARC. Secondly, reliance on patient recall may have led to an underestimate of NFS prevalence however we have tried to mitigate this by excluding women with no memory of assailant type. Thirdly, physical signs of NFS may be under reported in delayed presentations if injuries have healed and also under reported in early presentations where injuries such as bruising have not yet developed. Fourthly, symptoms and external physical signs were captured during routine medical forensic examination without use of strangulation documentation charts leading to individual examiner variation in assessment and documentation. Use of standardized strangulation documentation charts would likely improve documentation consistency.

5. Conclusions

Our findings support the recommendation to ask all sexual assault and intimate partner violence patients about NFS and to use a specific documentation tool or checklist for those who have experienced NFS. Those with ongoing safety risks from an intimate partner require adequate responses to secure their safety. In addition to medical management and safety assessment patients experiencing NFS in sexual assault should have access to timely clinical forensic services for assessment, documentation and evidence collection. Training for police, General Practitioner's, Emergency Service personnel and other health providers needs to include raising awareness about the prevalence and forensic aspects of NFS in sexual assault.

Further study to examine the effect of time to examination on rates of symptoms and signs in sexual assault cases with NFS would be worthwhile. Evaluation of the clinical forensic response to NFS

and analysis of the factors affecting criminal justice outcomes in cases of NFS in sexual assault would be of interest.

Ethics approval

Ethics approval was obtained from the Women and Newborn Health Services Human Research Ethics Committee and Curtin University Human Research Ethics Committee, Western Australia.

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Authors' contributions

This study was conceptualised and designed by RZ, MP, MK and DS. JS, SM, MP, MK and DS contributed substantially to the acquisition of data. RZ performed the analysis. RZ and DS drafted the manuscript. All authors were involved in the interpretation of results, editing for intellectual content. All authors approved the final manuscript.

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