



Nurse-led hospital violence intervention programmes improve emergency department identification of violence-related visits

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ABSTRACT

Objectives: Patients visiting an Emergency Department (ED) due to violence who are unable or unwilling to disclose that their injury is violence-related are unlikely to receive support for associated psychosocial vulnerabilities. Nurse-led hospital-based violence intervention programmes (HVIPs) are an additional resource in ED providing support to patients exposed to violence. Our objective was to determine whether HVIPs can overcome barriers to disclosure and what patient characteristics are associated with non-disclosure under usual care.

Study design: A natural longitudinal experiment, including routine health data from 2012 to 2024, comparing intervention EDs with HVIPs to control EDs.

Methods: Multi-level logistic difference-in-difference models with unplanned visits clustered by patient on the probability that a visit ($N = 6,724,446$) was recorded as violence-related in ED or subsequently in HVIP data from Wales, UK: nine control EDs without an HVIP were compared with two intervention sites with nurse-led HVIPs. Secondary analyses assessed the characteristics of patients disclosing to the HVIP, but not under usual care by age, gender, ethnicity, and residential deprivation.

Results: The probability that a visit was designated as assault-related increased in intervention EDs following HVIP implementation (Cardiff $\beta = 0.37$, 95 % CI 0.31 to 0.44; Swansea $\beta = 0.19$, 95 % CI 0.14 to 0.25). Male, younger, those residing in deprived neighbourhoods, and black or mixed ethnicity patients were more likely to be missed under usual care.

Conclusions: Non-disclosure is a significant barrier in provisioning support to those who are psychosocially vulnerable and likely to revisit ED. Nurse-led HVIPs can overcome inequalities in ED, reaching patient groups that are not otherwise able or willing to disclose their exposure to violence. HVIPs offer the prospect of reducing inequality in patients' visiting ED due to violence.

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1. Introduction

For those exposed to violence, the Emergency Department (ED) is often the first service where patients have both their injuries treated and broader psychosocial vulnerabilities addressed. Such vulnerabilities include alcohol and substance misuse, poor mental health, and/or residing in an area of deprivation. They predict both exposure to violence and

frequency of ED visits, suggesting that addressing these patients' vulnerabilities will reduce their frequency of ED visits [1–4].

In the United Kingdom (UK) all patient-facing staff are expected go beyond patients' immediate treatment needs and signpost support for underlying modifiable psychosocial vulnerabilities [5]. Usual care in ED is increasingly supplemented with Hospital-based Violence Intervention Programmes (HVIPs), both in the UK, US and worldwide. As an additional resource in ED, they provide support to patients visiting due to violence, overcoming ED workloads and performance targets limiting the extent that the clinical team can engage with patients [6–8]. In the UK, where it is estimated that 2.33 per 1000 residents

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visited EDs in Wales and 2.19 per 1000 residents in England for violence-related injuries in 2023, HVIP models include nurse-led Violence Prevention Teams (VPTs) [9,10]. VPT nurses not only receive referrals from ED clinical staff they also walk the floor and investigate clinical records to identify patients who have visited because of violence [11]. In the US, HVIPs have been shown to reduce violence-related injuries and patients have reported further positive outcomes such as, increased employment and engagement with education, however, health inequalities have not been considered [12].

There are several reasons why some patients may be reluctant to disclose the reasons for their ED visit. Those who have previously received a judgemental opinion from a clinician can be reluctant, as can patients who are accompanied by the perpetrator [13]. Non-disclosure may be associated with a distrust of authority, for example the avoidance of scrutiny by law enforcement that has generalised to include other services including clinicians and ED staff [14–16]. Those from ethnic minority groups may experience discrimination, further eroding trust in healthcare [17]. Conversely, disclosure can be enhanced through building trust [16,18], an objective of the VPTs of interest here [10,11]. As part of an effectiveness and cost-effectiveness evaluation of the VPTs, we were tasked to also assess the extent that introducing a nurse-led HVIP in two EDs increased the likelihood that violence-related visits were identified, and what characterised patients who were missed under usual care.

2. Methods

2.1. The intervention

The nurse-led VPTs (appendix 1), were implemented to address a perceived under-provision in support for those visiting the intervention EDs due to violence, first in Cardiff in November 2019 and then later in Swansea in January 2022 [10]. “The VPTs worked across paediatric (17 years and younger) and adult patients. Restricting VPTs to patients aged 11 years and older was due to commissioners also funding third sector organisations working with young people at risk of criminal exploitation. This organisation worked with young people aged 11 years and older.” VPT funding initially came from the UK Government, through grants to local police forces and affiliated agencies.

The VPTs support patients with modifiable psychosocial vulnerabilities who are then, according to need, referred into NHS, statutory or third sector services for support. The Cardiff VPT can also hold the case and provide ongoing support for up to 12 months [11]. Patients are referred into the VPTs by ED clinicians or are identified by the VPT nurses investigating clinical records and walking the floor. Both the Cardiff and Swansea teams were originally commissioned to support young people 11 to 25 years of age, with the upper limit dropped soon after implementation. Patients exposed to domestic or sexual violence were supported by Independent Domestic Violence Advocates (IDVAs) or Independent Sexual Violence Advocates (ISVAs) and were not eligible for the VPT intervention. For patients that were under 11 years of age, support would be given by paediatric clinicians.

2.2. Data

UK EDs routinely ask patients at check-in whether their injuries are related to violence, information that is recorded in the ED Patient Management System (PMS) [19]. These records are further supplemented by clinical staff at triage and as patients move through the department [20,21]. The two VPTs implemented in South Wales (University Hospital of Wales, Cardiff, a major trauma centre and Morriston Hospital, Swansea, a trauma unit) have access to the ED PMS, as well as hospital and community clinical records. The VPTs record eligible patient details in separate systems and do not update the PMS. For each patient we can therefore determine whether they disclosed that their visit was

violence-related under usual care using the PMS, and whether they subsequently disclosed to the VPT.

There are 13 Type I (consultant led 24-h service with full resus) EDs in Wales, since January 2012 there have been 11 EDs in continuous service: one ED became a Minor Injuries Unit, transferring its ED to a newly built hospital. This provides nine control EDs in continuous service and two intervention EDs. The control EDs do not have a service similar to the VPTs [22]. All Welsh hospitals return PMS data into the national Emergency Department Data Set (EDDS) [23], with data reliably available since January 2012. The EDDS includes dates and times of visits, discharge destination, patient characteristics and coding that identifies a violence-related visit (VRV), along with ethnicity, age, and sex.

The anonymised EDDS is available in the SAIL (Secure Anonymised Information Linkage) facility, with each record including an encrypted anonymised linkage field (ALF, a unique 10-digit number assigned to each individual in a dataset) derived from patients' name, date of birth, gender, address and, for healthcare records, NHS number [23,24]. SAIL does not handle any identifiable information, only pseudonymised data (e.g. week of birth instead of date of birth). Data, for example the Census, is split into two files by the Office for National Statistics, who are responsible for these data. File 1 contains personal information (name, date of birth, gender, address). File 2 contains anonymised responses to the census questions, such as respondents' ethnicity. A unique identifier is applied to each record in both File 1 and File 2. File 1 is sent to NHS digital services who uses the personal information to derive an ALF for each person. The ALFs and unique identifiers are then sent to SAIL. File 2 is sent directly to SAIL where the unique identifiers then allow ALFs to be attached to the anonymised Census records. ALFs were used to link the EDDS with other datasets within SAIL, including the Welsh Demographic Service (WDS) dataset that identifies residents of Wales, and from which the Index of Multiple Deprivation (IMD) by patients' resident Lower Layer Super Output Area (a small geographic area with typically an average population of 1500 people) can be derived. VPT data had ALFs appended and were also added to SAIL. We anticipated that a significant proportion of ethnicity codes would be missing in EDDS, and we therefore linked the EDDS to the 2021 Census and the 2011 Census, and if still missing then to hospital in-patient data and community general practitioner data, where ethnicity is also recorded (appendices 2 & 3). The result being that missingness on ethnicity was <1 % for all unique, eligible ALFs.

2.3. Eligibility

Only unplanned Type I ED visits (occasionally patients can be invited back to ED for a planned follow-up, typically out-of-area visitors with no local healthcare provision) with an ALF identified in the EDDS with >90 % certainty of a match were eligible for inclusion in the primary analysis. In secondary analyses only patients for whom protected characteristics (age, sex, ethnicity, deprivation) could also be additionally determined were eligible and had corresponding records in the VPT and EDDS data.

2.4. Analytic strategy

VRVs were identified in the PMS or linked VPT data. Due to differences in timing and catchment population across intervention sites, separate models were developed for each.

Multi-level logistic difference-in-difference (DiD) models with visits clustered in patient ALF, and using Stata v18 [25], derived the change in likelihood of visits being identified as an VRV associated with the implementation of each intervention. To explore the characteristics of patients identified by VPTs but not in ED usual care, we limited analysis to intervention sites only and patients with both a VPT and EDDS record. VRVs missed on the PMS but identified by the VPTs were coded as one, otherwise zero. We further derived a proxy to ED workload from all

patients identified in the EDDS. Each ED visit has recorded time and date of arrival and time and date of discharge. From these we estimated the number of patients present in the intervention hospitals as a proxy to each EDs workload. Furthermore, there has been a long-term decline in ED VRVs since 2012 [9,26] and therefore a linear time variable was included in the model assessing patient characteristics to account for any possible impact of declining violence-related visits, along with season and, as a proxy to acuity, whether the patient was admitted into hospital and if they were conveyed to ED by ambulance.

2.5. Public and patient involvement

The development and methodology of the overall study was informed through Public and Patient Involvement (PPI), facilitated by two lay members in the project team and further stakeholder engagement. PPI members were those with relevant lived or living experience [22]. Their experiences captured additional insights and personal perspectives, and this formative engagement identified patient disclosure in ED as a study objective.

2.6. Ethics

The approval to access and analyse data housed in the Secure Anonymised Information Linkage (SAIL) databank, an ISO 27001 certified and United Kingdom (UK) Statistics Authority accredited secure data environment, was granted by the SAIL Independent Information Governance Review Panel (Ref: 1421). The Emergency Department Violence Intervention Programme Evaluation (EDVIPE) was pre-registered (ISRCTN: 68945844, 12 August 2022) [22].

3. Results

Since implementation, the VPTs saw 4145 unique patients: 3072 in Cardiff and 1073 in Swansea. Since January 2012, patients in the EDDS ($N = 2,424,622$) visited ED 6,724,446 times (appendix 3). Although based on the same nurse-led model, the two VPTs operated in different contexts. According to the 2021 Census, Cardiff city has an estimated population of 348,535, whereas Swansea has 170,085 with 53.9 % and 48.8 % employment rate in those 16 years and older respectively. Furthermore, Cardiff has a more ethnically diverse population with 79.2 % white (English, Welsh, Scottish, Northern Irish or British) compared to Swansea 91.4 % [27]. Table 1 presents the results from the DiD and suggests the implementation of the VPT in Cardiff, and the model's subsequent implementation in Swansea increased the ascertainment of VRVs not otherwise captured under usual care: by 44 % in Cardiff and 21 % in Swansea.

Table 2 presents logistic regression results for the characteristics of patients identified as visiting due to violence by the VPTs, but not identified under usual care, together with the count of patients and the number of ED visits for those patients. The model yields robust effects of deprivation across both sites with those from more deprived neighbourhoods less likely to disclose under usual care. Similarly, male patients and younger patients were less likely to disclose. The coefficient on the black ethnic group suggests that these patients in Cardiff

were less likely to disclose, compared to white patients, whereas Asian patients were more likely than white patients to disclose under usual care. These results partially replicated in Swansea, with findings limited by the low number of black patients. The estimated number of patients in ED at one time did not influence detection, and there were no clear seasonality effects.

4. Discussion

Nurse-led HVIPs situated in ED, and with access to hospital and community clinical systems, can identify patients who do not disclose their exposure to violence under usual care. Patients who were identified by intervention nurses, but not under usual care, were more likely to be male, younger, reside in a deprived neighbourhood and of black or mixed ethnicity. It is feasible that this additional ascertainment addresses inequity in the support available to psychosocially vulnerable ED patients exposed to violence and who are likely to revisit ED.

The reasons why patients may not disclose under usual care likely varies across patient groups. Some patients might be unwilling to accept they are victims of violence [28]. Patients can have concerns that disclosure might have consequences to their safety, typical in victims of domestic and coercive violence [29,30]. Male patients may not want to be seen as a victim to preserve their masculine persona [31]. Studies also suggest violence can become normalised in deprived neighbourhoods and that repeat exposure to violence may cause desensitisation, further diminishing the likelihood of disclosure [32,33]. It is feasible that those previously involved with the criminal justice system might generalise distrust of law enforcement to ED staff, with younger patients particularly concerned they would be ostracised by peers and family if they report details of a crime [34,35].

The mixed results by ethnic group where black patients in Cardiff, a more diverse region, were less likely to disclose, emphasises the need to consider the local context when generalising interventions such as HVIPs into new EDs [36]. A culturally sensitive approach that adapts to local population needs may be warranted. In some regions in the US, for example, it is found that African American patients were more likely to distrust law enforcement, and this distrust may be extended to clinicians leading to these patients minimising symptoms to reduce the perceived likelihood of clinicians contacting the police [14].

4.1. Limitations

Common for all analyses using linked routine data, only those who can be linked across datasets can be considered. It is feasible that some patients might purposefully avoid identification. There are also barriers to accessing ED for some groups, which may overlap with some of the characteristics identified here [37]. This emphasises the need for ED prevention activities that can engage those exposed to violence before serious injury is sustained [38].

4.2. Future research

Patients exposed to violence will often present with one or more underlying vulnerability. Further data linkage that enables identification of a broader ascertainment of vulnerabilities and modifiable risks will provide detailed insights into not only how ED might respond to patients exposed to violence, but also opportunities for collaborations with other upstream services better placed to prevent violence, such as substance misuse treatment, mental health services and the criminal justice system. Sharing anonymised ED data on where patients were assaulted with partners, such as local government and law enforcement, can inform resource allocation and therefore significantly reduce ED visits due to violence [21]. It is feasible that the personal characteristics of patients could further inform services involved with supporting patients. Although this study was informed by PPI and stakeholder engagement, capturing the views of the most vulnerable and harder to reach patients

Table 1
Difference-in-Difference random effects logistic model on whether an ED visit was designated violence-related or not, pre- and post-intervention implementation.

	Cardiff		Swansea	
	β	95 % CI	β	95 % CI
Time: Pre- post-intervention	−0.48	−0.52 to −0.44	−0.50	−0.53 to −0.47
Site: Control, Intervention ED	0.59	0.56 to 0.61	0.39	0.36 to 0.42
Difference-in-Difference	0.37	0.31 to 0.44	0.19	0.14 to 0.25
EDDS Attendances	$n = 5,701,940$		$n = 5,341,365$	
EDDS Patients	$n = 1,763,801$		$n = 1,669,909$	

Table 2

Logistic regression with 95 % confidence interval (CI) for characteristics associated with a visit being missed as violence-related under usual care in ED. Counts for Swansea visits and patient numbers have been obfuscated to prevent unintended disclosure.

		Cardiff				Swansea			
		Attendances	Patients	β	95 % CI	Attendances	Patients	β	95 % CI
Ethnicity	White (reference)	677	343			197	> 100		
	Black	65	34	0.481***	0.217 to 0.744	< 10	< 10	0.005	−0.992 to 1.002
	Asian	25	15	−0.873***	−1.281 to −0.464	< 10	< 10	0.062	−0.649 to 0.774
	Other	40	17	0.130	−0.210 to 0.470	< 10	< 10	−0.328	−1.727 to 1.071
	Mixed	181	90	0.233*	0.056 to 0.410	47	> 30	0.494**	0.149 to 0.839
Deprivation	Most Deprived (reference)	433	208			127	79		
	2	222	119	−0.009	−0.172 to 0.154	53	37	−0.371*	−0.693 to −0.048
	3	109	56	−0.335**	−0.547 to −0.124	39	28	−0.281	−0.642 to 0.080
	Least Deprived	154	82	−0.628***	−0.815 to −0.442	27	22	−0.670**	−1.088 to −0.252
Arrival Time	Weekday, Day (reference)	451	221			112	78		
	Weekday, Evening	260	123	0.155	−0.005 to 0.316	84	55	0.265	−0.026 to 0.557
	Weekend, Day	151	81	−0.044	−0.236 to 0.148	32	19	−0.213	−0.615 to 0.188
	Weekend, Evening	126	74	0.434***	0.229 to 0.640	30	23	0.088	−0.339 to 0.514
Sex	Female (reference)	214	97			64	37		
	Male	774	402	1.312***	1.155 to 1.468	194	138	1.134***	0.844 to 1.423
Age, mean years (SD)		27.99 (13.71)		−0.052***	−0.056 to −0.047	27.20 (12.08)		−0.055***	−0.064 to −0.046
Conveyed to ED by Ambulance									
	No (reference)	795	386			228	152		
	Yes	193	113	0.804***	0.622 to 0.986	30	23	0.355	−0.056 to 0.767
Admitted into Hospital									
	No (reference)	857	421			236	158		
	Yes	131	78	−0.056	−0.268 to 0.156	22	17	−0.741**	−1.212 to −0.271
Season	Spring (reference)	253	134			70	48		
	Summer	307	149	0.144	−0.032 to 0.319	81	51	−0.289	−0.619 to 0.042
	Autumn	202	106	−0.078	−0.272 to 0.115	61	47	0.381	0.019 to 0.743
	Winter	226	110	0.004	−0.184 to 0.192	46	29	0.176	−0.212 to 0.565
Time				0.008**	0.003 to 0.013			0.097	0.066 to 0.127
Patients Attending (mean, SD)		94.27 (15.23)		−0.001	−0.006 to 0.003	55.47 (10.86)		−0.013	−0.025 to −0.001

qualitatively would enhance an understanding of how services are best aligned to their needs and able to further contribute to violence prevention initiatives.

5. Conclusion

The results presented here confirm that some ED patients are unwilling to disclose that the reason for their visit is due to violence. This unwillingness is associated with characteristics also implicated in health inequality generally [39]. The inclusion of nurse-led HVIPs in ED can overcome barriers to patient engagement that are associated with protected characteristics and violence and improve ascertainment by up to 44 %. They therefore enable ED clinical teams to provide more equitable support to patients. Furthermore ED data on violence, including where and when it takes place and who is injured, is key to effective prevention because so little is ascertained by law enforcement [21,40,41]. Without these ED data, most places and people at risk of serious harm cannot be identified by agencies responsible for prevention and their safety protected. This study shows how ED can boost violence ascertainment, especially by identifying a much wider spectrum of patients than have been identified previously. This discovery paves the way to more equitable prevention, especially through the collaborative Cardiff Model for Violence Prevention which is being implemented in the United States, the UK and other countries [42].

5.1. Data sharing

The sensitivity of the data used in this study prevents data sharing. However, researchers can apply for access to the data used in this study (<https://saildatabank.com/>).

5.2. Pre-registration

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CRediT authorship contribution statement

Megan Hamilton: Writing – review & editing, Writing – original draft. **Lara Snowdon:** Writing – review & editing, Writing – original draft, Funding acquisition, Conceptualization. **Jonathan Shepherd:** Writing – review & editing, Writing – original draft, Conceptualization. **Shainur Premji:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Adele Battaglia:** Writing – review & editing, Writing – original draft, Conceptualization. **Henry Yeomans:** Writing – review & editing, Writing – original draft, Conceptualization. **Daniel Todd:** Writing – review & editing, Writing – original draft, Methodology, Formal analysis. **Simon C. Moore:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Funding acquisition, Formal analysis, Conceptualization.

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Declaration of competing interest

None.

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Appendix A. Supplementary data

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