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Electronic Reporting of Workplace Violence Incidents: Improving the Usability, and Optimizing Healthcare Workers' Cognitive Workload, and Performance

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Abstract

A majority of healthcare workers (HCWs) experience workplace violence (WPV) but most WPV events go unreported. Underreporting of WPV is well documented in the literature as a barrier to identifying underlying causes and to evaluating the effectiveness of WPV interventions. Previous studies suggest that WPV reporting data is fragmentary, unreliable, and inconsistent. Also, WPV reporting systems are suboptimally designed making it difficult for healthcare workers to report WPV incidents. This study aims to assess the usability of an electronic WPV report in a large academic medical center and the perceived cognitive workload (CWL) and performance of HCWs associated with reporting WPV events. Findings from this study suggest that our institutional WPV report has suboptimal perceived usability and suboptimal perceived cognitive workload. Further, participants with training reported lower error rates in comparison to participants without training on performance.

Keywords:
Workplace Violence, Cognitive Ergonomics, Task Performance And Analysis

Introduction

Healthcare workers (HCWs) are four times more likely to experience workplace violence (WPV) than any other profession accounting for nearly one-half of fatal occupational injuries in United States hospitals [2]. A 2014 study reports that 71% of physicians in the United States experienced at least 1 incident of verbal assault in the past year and 28% experienced physical assault [6]. Further studies also report that 82% of nurses experienced WPV at least once during their career[8] [11]. Thus, WPV is associated with impairment to HCWs physical and mental well-being resulting in increased on-the-job errors, decreases in performance and productivity, low organizational commitment, staff shortages, and increased healthcare costs[11].

Data-driven process improvements are likely to effectively improve both employee work environments and patient-rated quality of care in nursing homes, primary care, and hospital settings [3]. The results of a randomized control study suggest a positive impact on the severity of WPV events in intervention units where supervisors were provided WPV reports to develop mitigation strategies [3]. Furthermore, an interventional study conducted in a single emergency department aimed to increase the reporting of WPV and but resulted in a decrease in overall reporting, thus, implying a positive relationship between WPV reporting and decreased WPV incidents [11].

HCWs are exposed to WPV so often that it is commonly considered "part-of-the-job"[9]. Large hospital systems employ systemic, multi-prong initiatives to address this issue. Usability barriers associated with WPV reporting must be addressed to ensure HCWs can report on WPV with ease and with optimal cognitive workload (CWL) through targeted usability-focused enhancements to reporting systems[4; 10]. Therefore, the primary aim of this study is to assess the perceived usability, perceived CWL, and performance of HCWs during WPV reporting in a large academic medical center. Secondary study aims include participants' ability to locate the correct WPV report and explore the influence of self-reported user characteristics on primary study aims.

Methods

Participants

Flyers and email announcements were used to recruit participants to this institutional review board-approved study. Usability testing was conducted with 10 HCWs at a large academic medical center.

Study settings

Testing sessions were conducted in a playground environment via Zoom/WebEx or in-person in a human factors laboratory conveniently located within the hospital premises.

Pre-screening questionnaire

Participants were administered an abbreviated version of the World Health Organization Workplace Violence Questionnaire that included age, professional group, and present position[12]. Participants were also asked to denote if they had experienced WPV or received training on WPV reporting. The results of this questionnaire were used to explore participant characteristics along with perceived usability, perceived cognitive workload, and human performance.

Think aloud and use case scenarios

Participants were asked to complete WPV reporting tasks by finding and submitting a WPV report using use case scenarios developed in consultation with subject matter experts and based on real-world reports of WPV. The eight use case scenarios were designed to omit gender-specific roles and to mitigate cognitive bias by using gender-ambiguous names for involved parties. Initial study participants were asked to think aloud

while completing the WPV report and provide feedback on features that work well for them, promote ease of use, identify suboptimal features, and suggest a new feature to enhance WPV reporting. Participants' verbal responses to the WPV report were assessed to extract trends and novel feedback on the WPV report.

Perceived usability assessment

After completing the WPV reporting tasks, participants were asked to assess the perceived usability of the WPV report using the post-study system usability questionnaire (PSSUQ) [1]. PSSUQ is the second most commonly used post-study questionnaire for measuring perceived usability and contains three sub-constructs: system quality, information quality, and interface quality [7]. Results of this assessment were compared to the Human-Computer Interaction (HCI) recommended standards as a baseline for evaluation.

Perceived cognitive workload assessment

The National Aeronautical and Space Administration's Task Load Index (NASA-TLX) was administered to quantify participants' perceived CWL associated with completing the WPV report. NASA-TLX is the most commonly used measure of perceived cognitive workload in HCWs [5]. NASA-TLX assesses six dimensions of workload including mental, physical, and temporal demand, frustration, effort, and performance [5]. Results of this assessment were compared to the Human Factors and Ergonomics (HFE) recommended standards as a baseline for evaluation.

Table 1 – Expected responses for each of the eight use case scenarios by key WPV report sections.

	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6	Scenario 7	Scenario 8
Act(s) of violence	Sexual assault/ harassment	Intimidation, harassment, verbal abuse	Threat, Intimidation	Verbal abuse, threats, phone call	Hate speech, bullying, and lateral violence	Assault, verbal abuse, hate speech	Verbal abuse, physical assault	Sexual assault
Event type	Patient-to-Staff Sexual Assault Patient-to-Staff Verbal Assault	Patient-to-Staff Verbal Assault Visitor-to-Staff Verbal Assault	Visitor-to-Staff Verbal Assault	Patient-to-Staff Verbal Assault	Staff-to-Staff Verbal Assault	Patient-to-Staff Verbal Assault	Visitor to Staff Verbal Assault, Visitor to Staff Physical Assault	Patient to Staff Sexual Assault
Type of person affected	Nurse (RN)	Nurse (RN)	CST	Other non-clinical staff	Surgical Technician	Certified Nursing Assistant	Nurse (RN)	Certified Nursing Assistant
Event location	Emergency Department at Hillsborough	3 MPCU	5 Women's New Born Nursery	1 Memorial Observation Unit – UNC Hospital	UNC Hospital operating room 4th floor	3 West	6 Women's	Other, *Elevator*
Parties involved	Patient (assailant)	Patient (assailant) Patient's relative (assailant)	Visitor (assailant)	Patient (assailant)	Manager (assailant)	Patient (assailant)	Visitor (assailant)	Patient (assailant)

Performance

Screen capture video software was used to record participants' interactions with the WPV report. The recording was reviewed to assess the participants' time to complete a task (in minutes). The rate of errors was quantified based on the expected responses assigned by subject matter experts for each use case scenario per key section of the WPV report. Key sections include act(s) of violence, event type, type of person affected, event location, and involved parties. Act(s) of violence include physical or sexual assault, harassment, intimidation, verbal abuse, threat, hate speech, bullying, and lateral violence. Event types include patient-to-staff, visitor-to-staff, and staff-to-staff verbal, physical, or sexual assault. The type of person affected includes all clinical and non-clinical HCW roles and the event location reflects departments and units that exist within the medical facility. Parties involved include patients, visitors, staff who users can classify as a bystander, notified party, or assailant. Expected responses by key section of WPV report and use case scenarios are in Table 1. Performance was not measured for WPV reporting tasks in cases where the participants were asked to think aloud, consistent with standard usability testing protocol.

Results

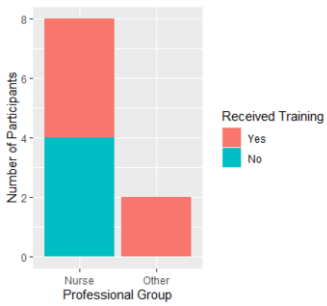
Participants included HCWs ranging from 35 to 49 years old. 8 of the 10 participants were nurses and two were other hospital staff members, including a chaplain and social work manager.

A total of 15 WPV reporting tasks were completed from which perceived usability and perceived cognitive workload were assessed. Performance was evaluated in 10 of the 15 WPV reporting tasks, excluding 5 WPV reporting tasks where participants were asked to think aloud. Think aloud data was used to provide qualitative insights.

Pre-screening questionnaire

All participants reported experiencing WPV and 50% reported receiving training on reporting WPV incidents. Figure 1 displays the number of participants by their professional group and training received (yes or no).

Figure 1 – Number of participants by professional group and training received.



All participants have experienced acts of threat and verbal assault. 60% of participants experienced every type of WPV including threat, physical assault, battery, harassment, verbal assault, hostility, or intimidation. 100% of participants experienced hostility or intimidation, threats, and verbal violence. Responses to WPV are shown in Figure 2. The most common incident response was "told the person to stop", followed by telling a colleague, reporting the incident to a senior staff member, and completing a WPV report. None of the participants "sought help from the union" or "pursued persecution".

Figure 2 – Number of participants by the response to the workplace violence and received training.

Think aloud results

The majority of participants did not initially select the correct WPV report at the start of testing and instead selected the patient incident form. Others shared that in cases where a patient was involved, two separate reports would need to be submitted. In cases where multiple WPV event types occurred, participants expressed frustration in the inability to choose more than one option. In this case, participants agreed that the most appropriate workaround was to submit a separate report for each event, but some expressed frustrations and shared that the likelihood of completing a separate form was low due to real-world time constraints. Notably, there were several occasions where during the testing session participants were interrupted by an urgent phone call.

Participants shared that it was important to provide names or descriptions of all parties involved and include quoted statements when entering the brief factual description. Participants shared that they were only looking to complete the minimum required fields due to lack of time in real-world settings. The ability to select "other" was frequently noted as missing from drop-down option values as participants wanted the option to enter a description when appropriate option values were not present. Participants expressed confusion in the difference between sexual assault and physical assault option values when selecting an event type. At drop-downs, participants want the option to perform keyword or partial word searches to reduce the time it takes to scroll through the option values lists. Drop-down lists were particularly long for type of person affected and event location where there were >50 options to choose from. Flexible and automated formatting when entering dates was an additional reoccurring request.

Participants were also interested in who would receive the WPV report, specifically when a supervisor is an assailant. One participant suggested adding option values to specifically indicate event types that involve supervisors. Generally, participants expressed confusion when classifying the involved parties.

Perceived usability

The mean (SD and recommended HCI standard) PSSUQ score was **2.88** (0.94, <2.82) (Table 2), and the subscale scores are 2.5 (0.89) for system usefulness, 2.89 (0.89) for information quality, and ***3.5*** (1.54) for interface quality [7].

Table 2 – Post-study questionnaire results.

Measures	Mean (std dev)	Human-Computer Interaction recommended standards[7]
Total Score	**2.88** (0.94)	<2.82
System Usefulness	2.5 (0.89)	<2.8
Information Quality	2.89 (0.89)	<3.02
Interface Quality	**3.5** (1.54)	<2.49

Perceived cognitive workload (CWL)

The mean (SD and recommended HFE standard) for global TLX score was 27.90 (19.1, >35 and <54) [13] with mean weighted subscale scores of 5.33 (3.46) for mental demand, 0.24 (0.32) for physical demand, 5.95 (5.65) for temporal demand, 2.95 (6.09) for frustration, 4.43 (4.82) for effort, and 9.00 (6.97) for performance.

Performance

Performance results are shown in tables 3a and 3b. 10 WPV tasks were included in the performance analysis. Results from think aloud sessions (n=5) were excluded from performance analysis. The average overall time taken to complete the report (SD) was 6.30 mins (2.75) and 6.43 (2.99) and 6.00 mins (2.65) for trained and untrained participants, respectively.

The lowest overall percentage of errors occurred in an act(s) of violence and event-type performance measures. The "involved parties" section of the report incurred the most errors.

Table 3a – Time to complete the WPV report.

	Overall (n = 10)	Received Training: Yes (n =7)	Received Training: No (n=3)
Time to complete WPV report (std dev) (in mins)	6.30 (2.75)	6.43 (2.99)	6.00 (2.65)

Table 3b – Rate of error for each WPV report section.

	Overall (n = 10)	Received Training: Yes (n =7)	Received Training: No (n=3)
Act(s) of violence	10%	0%	50%
Type of Person Affected	43%	20%	50%
Event Location	50%	60%	0%
Involved Parties[1]	86%	60%	100%

[1] Allows users to specify involved parties including patients, visitors, staff, and classify each party as a bystander, notified party, or assailant.

Discussion

All participants reported experiencing WPV and the majority of participants experienced more than one type of WPV, validating the prevalence of this issue in the HCW population. 70% of participants reported completing a WPV report at least once in response to a WPV event.

The event location is used to route WPV reports to unit managers and other leadership teams to monitor WPV rates and initiate follow-up action where applicable. This section of the WPV report was incorrect 50% of the time. Similar to the type of person affected, this field contained >50 option values to choose from creating a larger probability of error. Hierarchal categorization of large option values list and the option to select and describe "other" classifications may improve the overall rate of errors in such cases. Moreover, when WPV occurred in the transition from one unit to the other, i.e. in the elevator, participants chose the nearest unit. Participants who received training incurred errors in this section whereas participants who did not receive training selected the correct event location 100% of the time. Further assessment is needed to understand factors contributing to this inverse effect.

Finally, participants were concerned about who received the WPV report, specifically in cases where the supervisor is the assailant or the involved party. Participants suggested an additional set of option values be added to the event type section to differentiate "staff-to-staff" WPV from "supervisor-to-staff" WPV.

Perceived usability results indicate that system usefulness and information quality meet HCI standards. However, the average overall PSSUQ score and interface quality did not meet the recommended HCI standards. Moreover, while the total TLX score is suboptimal per the HFE standards, the performance dimension was relatively higher in comparison to other dimensions of NASA-TLX. Thus, further investigation is required to analyze the factors contributing to the high performance demand.

Participants who received training accurately described the act(s) of violence 100% of the time compared to the 50% error rate for participants who did not receive training. The type of person affected incurred an error rate of 20% for participants who received training, compared to a 50% error rate for participants who did not receive training. Conversely, participants who received the training showed higher rates of error for event type and event location.

The majority of performance errors occurred in the "Involved Parties" section of the WPV report. Participants frequently miscategorized the type of person involved and many skipped this section altogether. The "Involved Parties" section is located near the bottom of the form and the data entry fields were not required. However, participants consistently and accurately described involved parties in the "brief factual description" located at the top of the WPV report. This supports subject matter experts' feedback that the most critical information on the WPV event is contained in the "brief factual description" section. This presents a challenge for the end-users of the WPV reports who cannot easily filter and classify the responses contained in unstructured text, warranting additional conversation in the WPV report data collection strategy.

Future work will focus on increasing the sample size, developing an enhanced WPV report based on the key design ideas shared by participants and using a participatory co-design approach followed by user testing.

Limitations to this study include limited sample size and include HCWs at a single academic medical center. Additionally, the testing environment was in a controlled setting and therefore does not account for other potential barriers preventing HCWs from reporting WPV incidents in the real-world environment. Additionally, as with all survey-based research, the results may be prone to response bias.

Conclusions

Results from this study indicate that our institutional WPV report has suboptimal perceived usability and meets only 2 out of 4 recommended HCI standards. Participants suggest functionality such as the keyword search and the option to select "other" and add descriptive text. Such improvements could subsequently offset end-user's challenge in parsing such key WPV information from the unstructured text entered in the brief factual description. This is particularly important to key WPV report sections such as "involved parties" and "event location" that determine report routing and influences follow-up action by unit supervisors and other end-users. Technological improvements to mitigate added cognitive workload should be targeted at solutions that mitigate perfornance demand involved in WPV reporting. Additionally, while WPV report training appears to positively impact performance in certain sections of the WPV report, more research is needed to understand the inverse impacts of training on WPV reporting task performance.

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