Title

From Warm Handoff to Wrap-Around Care: Role of a Digital Warm Handoff in Improving Emergency Department Care for Domestic Violence Survivors

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Publication Date

2020

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By

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A dissertation submitted in partial satisfaction of the

requirements for the degree of

Doctor of Philosophy

In

Social Welfare

in the

Graduate Division

of the

University of California, Berkeley

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Fall 2020

Abstract

From Warm-Handoff to Wrap-Around Care:
The Role of a Digital Warm-Handoff in Improving Emergency Department Care for Domestic Violence Survivors

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Doctor of Philosophy in Social Welfare

University of California, Berkeley

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Domestic violence represents a pervasive social problem. According to recent national estimates, one in four women and one in ten men will be harmed by a current or former intimate partner, and many more will be harmed by another cohabitant or family member (1). Often these survivors visit emergency departments to seek help, yet few actually receive support beyond the cursory treatment of their injuries. Even emergency department interventions intended to help survivors, such as universal screening and referral or educational information, typically fail to give survivors the support they need.

In recent years, two types of intervention have transformed domestic violence care in some emergency departments. First, eHealth interventions based in digital technology have streamlined and transformed domestic violence care within emergency departments. While digital technology is not a panacea for the challenges emergency departments face in providing domestic violence care, providers are accepting of eHealth interventions, and they appear to facilitate effective care. Second, warm handoff interventions, originally developed for use in other areas of medicine, allow providers to connect survivors directly with a named domestic violence advocate. This approach offers a continuity of care to survivors that limited evidence suggests is likely to support their wellbeing and access to services.

In 2014, a Level 1 trauma center in a large metropolitan California county implemented an eHealth intervention called Domestic Violence Report and Referral (DVRR) that facilitated a warm handoff to advocacy services -- among the first interventions to integrate these two intervention styles. In 2016, two additional private hospitals in the same county implemented the intervention. This dissertation tracks the outcomes of DVRR implementation. Paper 1 estimates the likely causal effect of the intervention on the referrals and local advocacy services survivors received; Paper 2 investigates whether those outcomes varied by race, ethnicity and gender; and Paper 3 explores providers' views on the impact DVRR had on their care of domestic violence survivors.

In Paper 1, I conducted this causal analysis within a multiple baseline design. It included 2292 medical records, reflecting 45-62 months of survivors' emergency

department visits at each of the three study hospitals. Findings in this paper suggest that DVRR was associated with an increase of 2.55 (95% CI: 2.13-3.05) to 6.16 (95% CI: 2.93-12.95) times in survivors' likelihood of connection to advocacy, and that this association was likely caused by providers using DVRR.

In Paper 2, I further analyzed 1366 medical records from Hospital 1, using multiple regression to explore the impact of DVRR by race/ethnicity and gender. This analysis suggested that DVRR was particularly impactful for Black survivors, who averaged 4.66 times higher odds of connection to advocacy with DVRR administration($p<0.01$), and men, who averaged 12.80 times higher odds of connection to advocacy with DVRR administration ($p<0.01$). Latinx, white and female survivors experienced 2.60 increase in odds of advocacy when DVRR was administered. The resulting 43.03% of Latinx survivors who reached advocacy represented the highest proportion of any group.

In Paper 3, ten medical and ten social service providers at two hospitals participated in semi-structured interviews about the impact of DVRR on the domestic violence care they offered to survivors in the emergency department. Emergent themes suggest that providers welcome many features of DVRR, such as its direct connection to advocacy and the provider support offered through its structured nature. However, in addition to minor technical problems, they noticed gaps in inclusivity, particularly for non-English speakers and transgender and nonbinary survivors, that affected their ability and interest in DVRR to care for all survivors.

Taken together, the findings from these analyses suggest that, while imperfect, DVRR appears to improve DV care and connection to advocacy for the participants in this study. This lends support to eHealth delivery of positive interventions, and the promise of warm-handoffs as an intervention strategy that improves supportive care for survivors of domestic violence.

Dedicated with love
to
Robert G. Safsten

Acknowledgments

First and foremost, I want to acknowledge the thousands of DV survivors whose real-life experiences and suffering I witnessed only second-, third- and even fourth hand in writing this dissertation. I can never know you or thank you. I hope this dissertation respects your experience and eases the journeys of those who follow.

I also want to acknowledge the many professionals who helped me through the last seven years to write this dissertation. Hillary Larkin, who gave me access to anything I needed to make this project happen, whether that meant DVRR data or allowing a team of 6 people to work in her office. Betty Goodwin and Mary Woo saw the value of this study early on and opened door after door within their hospitals, including Betty's hours of IRB advocacy and data collection. Harrison Alter signed each Highland IRB and made me prove my causal inference chops; Jen Sun, Kio Pak, Glenda Cheng, Fernando Lens, Arlene Estigoy, and Julie Perkins all helped me identify, gather and organize their hospitals' data. In addition, Gilead Sciences, Inc provided funding for this research (grant #00495).

For six years, Karla Elias-Flores has been my go-to example of a brilliant, passionate advocate; she showed me what advocacy meant and saw me as an advocate-scholar before I saw that in myself. She, Cherri Allison, Stephen Murphy and the rest of the ACFJC staff provided moral and practical support for this project. I owe Roxana Vasquez the most artisanal of chocolates for her hours spent recording de-identified data.

I made meaning out of this data because Anu Manchikanti Gomez, the chair of my committee, expected me to create it at the highest standards. My quintessential grad school memory is feverishly taking notes while you held my three-month-old. Among many, many other things, thank you for teaching me how to write a literature review. I also owe immense gratitude to Jeff Edleson. This project would not have happened without your early vision, advice, support, and eye for funding. Emily Ozer, Adrian Aguilera, Julie Deardorff and Jill Messing offered constructive, thought-provoking commentary each time they read my work. And "my undergrads" – Joy, Miaoli, Cecilia, Eugenia, Michiko, Jennifer, Cheung, Kavya, Adeline, Leslie, Jacklin, Karina, Dharaa – the passion and dedication you put into this project were inspiring and infectious; working with you was the single greatest highlight of my time at Berkeley.

I also want to acknowledge the support of friends who have kept me sane for the last seven years. Lori, Carla, Alicia, Christina, Cami, Louisa, Joe, Briana, Gillian, Nedra, Rachel, Monica, Joey, Phoebe, Ross and Chandler, you were there for me. You filled this graduate school roller coaster with joy.

And, most indelibly in my heart, my family. Kerstin Brignone for showing me what a strong, courageous woman looks like. Mike Brignone for always, always believing in me. John, Karen, Greg, Emily, Elizabeth, Haika, Ashok and Rachel for being in my corner by choice.

Sam, my partner, my best friend. The best writer I know. Thank you for co-creating our life with me during this grad school journey.

Oliver, my eager typist for assorted words and phrases in “the mama’s daysertation”; I am delighted to have finally found a spot where you can type your own (favorite) letters: “W-A-T-E-R.”

Finally Hazel, who somehow deleted the entirety of Paper 1. You simultaneously gave me new appreciation for the command “Ctrl-Z” and reminded me why I wrote this dissertation in the first place.

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Introduction

Nationally, about 25% of women and 10% of men will experience intimate partner violence (IPV) severe enough to result in lasting personal impact (1). IPV typically stems from a perpetrator seeking power and control over their current or former partner, and it may result in physical, sexual, financial, emotional/psychological, or spiritual harm (2,3). Individuals who identify as Hispanic/Latinx (any race), Black, American Indian/Alaska Native or multiracial experience IPV at higher rates compared to non-Hispanic whites (4). Domestic violence (DV), a term often used synonymously with IPV but which may also encompass violence by other family members or cohabitants, is equally widespread and, according to hospital trauma records, may be on the rise (5,6). Violence by current or former intimate partners is assumed to constitute the majority of DV incidents; as a result, DV and IPV are typically studied together and literature describing one phenomenon is often used to shed light on questions regarding the other phenomenon (7–9).

Comprehensive national statistics around the extent and severity of this violence are best developed around IPV. For those who are victimized by IPV, the consequences can be severe. Half of all murdered women nationwide are killed by intimate partners, resulting in thousands of lives lost per year (10,11). In 2007, the last year for which complete data is available, IPV resulted in approximately 2,340 deaths in the U.S (12,13). Experiencing IPV is associated with long-term medical and psychological complications, such as chronic illness, depression and post-traumatic stress disorder for both survivors and their children (14–16).

Seeking care

Seeking care after a violent incident, domestic violence survivors may access help from informal support structures, such as friends and family, or formal supportive resources. While disclosure to informal support networks is common and helpful among survivors, formal support networks offer additional crucial assistance. Three primary types of formal support systems identified in the literature are medical services, legal assistance and law enforcement, and community or advocacy agencies (17). Each of these systems of support operates completely independently of the others, with different paradigms, interventions and visibility to survivors. Most commonly, a lack of coordination between these services leaves survivors to navigate between them and piecemeal together services based on a personal assessment of their own needs (17).

A brief description of these three types of services follow:

Medical services

Medical settings are well poised to detect and provide initial intervention for DV. A review of the health effects of IPV among women include physical injury, to urologic and gynecologic symptoms, to other conditions like frequent headaches (18). Medical providers in primary care, obstetrics and gynecology, emergency care and other departments encounter DV and respond with interventions ranging from first-line responses (treating acute injuries), routine screening, risk assessment and safety planning, and more (8).

Emergency departments (ED) within hospitals are often the first point of care for individuals with acute injuries from DV. EDs respond to IPV primarily through acute injury response. Routine screening and referrals to additional services are highly variable and spotty due to inconsistent guidance, providers' lack of training, and the hurried pace at which most EDs operate (19,20). Callers to the National Domestic Violence Hotline reported that only one in four had been asked about DV by their provider when they visited the ED for DV-related care (21). Referrals typically consist of a paper pamphlet that provides educational information about DV and a phone number to call; a large three-group blinded RCT found that these had no impact on survivors' physical or mental health, quality of life, or likelihood of receiving future hospital or DV agency care (22,23).

Legal services

Legal assistance for survivors of domestic violence is available through civil legal aid and criminal legal aid. Civil legal aid includes assistance with restraining orders, legal services for divorce, and custody and parental rights, as well as helping survivors maintain benefits, avoid eviction, and preserve employment (24). Criminal legal aid may involve law enforcement response after an episode of domestic violence, arrest and incarceration of the perpetrator (and sometimes the survivor), criminal charges, prosecution, and sentencing (25).

Many states mandate legal action in response to DV, such as mandatory reporting of DV to the police by medical professionals. These policies are enacted on behalf of the survivor's safety; however, they operate without regard for survivors' agency and self-determination (25), they ignore racial and ethnic differences in law enforcement response to survivors of DV (26), and they likely deter many survivors from seeking care (27). As of 2019, thirteen states, including California, require medical professionals to report all DV-related injuries to law enforcement officials (28). Such mandates are highly controversial and poorly studied, and existing literature suggests that many providers simply do not comply with this mandate (29).

Nevertheless, limited empirical evidence suggests many survivors welcome some level of law enforcement support (29). Some states have attempted to infuse survivor-centered care into formal law-enforcement responses to DV. One of these policies is routing all DV cases to specialized courts staffed with DV-trained personnel (30,31). Another innovative approach caveats mandatory reporting laws to honor survivors' consent and privacy (28). A final approach adapts the restorative justice model, in which perpetrators engage with a panel of DV survivors to understand the impact of DV actions on survivors' lives (32,33). Limited evidence suggests that this approach may be particularly suited to addressing DV among communities within Black communities and others that experience disproportionately high policing and incarceration (34,35).

Community agencies

As typified in state reports from both Illinois and Texas, community DV agencies specialize in one or more DV-specific services such as shelter and emergency housing, DV hotlines, DV-specific counseling and DV advocacy (36,37).

While these services are more intensive and directly target many survivors' needs, they often struggle for sustainability and resources, rendering them less visible or available than other types of services (9,38).

Yet, where and when available, there is strong evidence for the utility of the services DV agencies provide. Long-term interventions offered through traditional DV agencies reduced the frequency of victimization (39). Programs that connect survivors to concrete resources, protections and opportunities tend to be both effective at bolstering survivors' receipt of practical support and well-received by the survivors themselves (9). Further, DV agencies appear to strengthen survivors' social support and bolster their mental health (40) and, when trauma-informed assistance is offered, to increase survivors' sense of self-efficacy, empowerment, and hopefulness (9,41).

Changes in care

Across medical, legal, and social services agencies, survivors face three primary challenges. First, services can be difficult to locate and access; second, survivors feared the consequences of disclosing their situation; third, certain types of survivors (such as non-English speakers, immigrants and refugees, and those identifying as LGTBQ+) have found available care ill-suited to their situation (17). In the early 2000s, new approaches to DV intervention and healthcare emerged as forces to coordinate and personalize care; by the 2010s, some providers had begun to use them to address DV intervention within healthcare (42–44). These included specialized DV advocacy centers known as Family Justice Centers, warm-handoffs to DV advocacy services, and eHealth interventions for DV. A brief description of these three types of services follow:

Family Justice Centers

An emerging type of DV agency known as the Family Justice Center emerged in the early 2000 as a "one-stop shop" to co-locate individual DV agencies and reduce the number of places survivors must go to receive help (45). Partner agencies include professional DV advocates, DV shelter and housing services, mental health professionals, law enforcement and medical personnel, and agencies serving specialized or marginalized groups such as children, the elderly, non-English speakers, and others (42,46).

eHealth interventions

In the mid-2000s, emergency departments began to explore the potential of recently-developed eHealth technology to screen for DV in the ED (43,47). Since that time, providers have increasingly used digital interventions, also known as eHealth, telehealth or mHealth interventions, to provide a wide variety of DV-related care, including computer-based DV screenings, patient education around DV, and safety planning (48–51). While eHealth interventions typically report similar outcomes to conventional interventions, providers find them highly acceptable because they facilitate and streamline DV care (52).

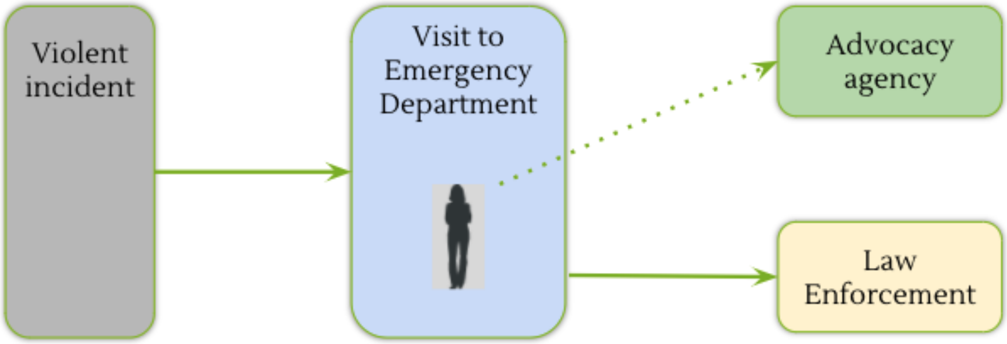
Warm Handoffs

Around 2010, medical literature began to document improvements in patient outcomes as a result of coordinating care transitions through a personal introduction to the next care provider, known as a "warm-handoff" (44,53). Recently, some medical settings have implemented phone-based or in-person warm-handoffs to DV advocates as a replacement for paper-based referral information for DV (54–56). The few sites that have implemented warm handoffs report consistent findings with non-DV research, suggesting that warm-handoffs personalize care and improve both provider and survivor experiences with emergency department DV responses (54–56)

Current dissertation

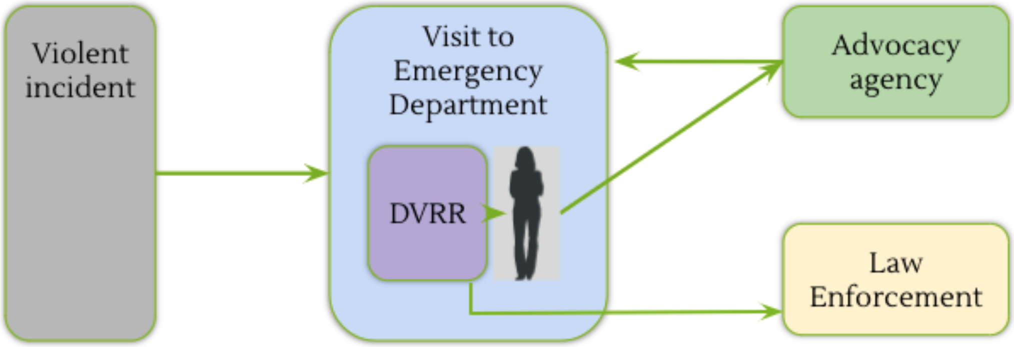
This dissertation is set in three hospitals and one advocacy center in a large metropolitan county in California. Prior to 2014, DV services offered in these emergency departments were not standardized with each other, and were not coordinated with any partner DV or law enforcement agencies. To comply with California's DV reporting mandate, medical providers faxed DV reporting forms to the relevant local law enforcement jurisdiction. While a Family Justice Center with over twenty on-site DV agencies was located near all three hospitals, only one provided survivors with information about accessing this or other local resources; no hospitals assisted survivors with efforts to reach out to DV advocacy services. Figure 1 describes the flow of survivors through the interconnected emergency department, law enforcement and advocacy services in this area.

Figure 1. Survivor flow through local medical, law enforcement and advocacy pathway



This dissertation examines the use of an intervention, Domestic Violence Report and Referral (DVRR), that is among the first to facilitate a warm handoff to advocacy through an eHealth medium. This web-based program allows ED providers to take photographs and detailed notes of injuries, as well as complete the 20-item Danger Assessment survey to assess the survivor's risk of intimate partner homicide (57). The state-mandated report is automatically sent to law enforcement and, with survivor consent, a brief report is sent to an advocate at the local Family Justice Center, who then reaches out to the survivor. Figure 2 describes the flow of survivors through this system as well as the point of intervention of DVRR.

Figure 2. Survivor flow through local medical, law enforcement and advocacy pathway with DVRR



This dissertation consists of five parts. First, this introduction provides contextualizing information about domestic violence and the interventions medical, law enforcement and advocacy organizations offer survivors. Next, the three central chapters of this dissertation provide three academic papers, each addressing a different aspect of DVRR's effect on emergency department DV interventions. Finally, appendices include additional detail for Paper 2 findings, the Paper 3 interview guide, and screenshots of the DVRR program. The three central papers are organized as follows:

Paper 1 presents the core results: a multiple-baseline study of 2292 DV-related patient visits at three participating hospitals and 461 subsequent visits to a local Family Justice Center between 2013-2018. The three hospitals included in this study implemented the intervention at different times, setting up a natural staggered start, or multiple baseline experiment with two groups. Using general linear modeling stratified by hospital, I identify any significant changes in survivors' likelihood of receiving DV-related referrals and advocacy services. Within each hospital, three groups were considered for analysis: survivors seen before DVRR implementation, after DVRR implementation (but who did not receive the intervention) and after DVRR implementation (who did receive the intervention). To establish an initial measure of causality, I tested these findings for external and internal validity using Maentel-Haenszel weighted chi-square tests. I further assessed internal validity using one-way MANOVA and external validity using multiple baseline analysis and logistic regression.

Paper 2 examines the initial findings of Paper 1 by race, ethnicity and gender. Mindful of the disproportionate burden of DV and differential access to adequate healthcare among marginalized groups, as well as these groups' differential receipts of healthcare, this paper aimed to understand the extent to which DVRR perpetuated or mitigated these disparities among the groups studied: male, female, Black, Latinx, and white. To this end, I reviewed medical charts for 1366 DV-associated emergency department visits in an urban, level-1 trauma center with 323 associated visits to advocacy. Within each racial, ethnic or gender group, I compared the difference in odds and predicted probability of receiving advocacy for each group using the same three strata used in Table 1. These included: survivors seen prior to DVRR, survivors seen after DVRR (but who did not receive the intervention) and survivors seen after DVRR (who did receive the intervention). I assessed both the overall impact of DVRR on advocacy services received within each group as well as between-group differences.

Paper 3 examines the qualitative experience of providers responsible for administering the intervention. It consists of findings from semi-structured telephone interviews at two hospitals conducted with 10 medical and 10 advocacy providers that had direct responsibility for administering DVRR to survivors. Understanding that any benefits to survivors found in Papers 1 and 2 relied on provider use of DVRR, I probed for the feasibility and acceptability of DVRR among these providers. In addition, I aimed to explore providers' perspectives on any unintended hardships or challenges faced by providers or survivors as a result of DVRR as well as any perceived benefits to either group. Two research assistants and I conducted interviews for this study. After transcription, a pair (either my two research assistants or myself with one of the two research assistants) coded each interview with inductive and deductive codes using Dedoose, a cloud-based coding software. The third person (research assistant or myself) reviewed these codes and provided suggestions or feedback as necessary. I distilled the paper's themes from these codes in an iterative process involving frequent review of both the codes and the recorded interviews.

Taken together, these papers provide a view into the impact of DVRR on emergency department care for DV. Measured impacts include subsequent survivor access to DV advocacy services, differential access among survivors by race and ethnicity or gender, and providers' views on ways DVRR affects both their and survivors' experiences of emergency department care for DV. As a set of academic papers on a digital direct-to-advocacy referral system, this dissertation adds to the emerging bodies of research around both digital interventions for DV and direct-to-advocacy referrals in emergency departments. In addition, it provides three lenses to explore their hybridization through a digital direct-to-advocacy intervention.

Paper 1

Domestic Violence Report and Referral (DVRR): Improved advocacy access through a digital direct-to-advocacy referral system for domestic violence in emergency departments

Abstract

Background: Emergency department (ED) interventions for domestic violence (DV) are often ineffective at connecting patients to long-term advocacy care. This study explores referral and advocacy outcomes following staggered rollout of a digital direct-to-advocacy referral system in three urban EDs that allows advocates to initiate contact with each survivor.

Methods: We reviewed 2292 DV-related patient visits at the 3 participating hospitals and 461 subsequent visits to a large DV advocacy agency between 2013-2018. General linear modeling stratified by hospital identified any significant changes in patient likelihood of receiving DV-related referrals and advocacy services. We tested these findings for external and internal validity using Maentel-Haenszel weighted chi-square tests; external validity was further assessed using multiple baseline analysis and logistic regression; internal validity was further tested using one-way MANOVA.

Results: Implementing the optional direct-to-advocacy referral system was associated with significant increases in patient receipt of advocacy services at all three hospitals ($p<0.05$) and significant increases in DV referrals at two of the study hospitals ($p<0.01$). When the intervention was available, patients who received it had 1.6-9.0 times the relative likelihood of receiving DV-specific referrals and advocacy services compared to patients who did not ($p<0.01$). External validity tests suggest that changes were localized to the time and place of the intervention ($p<0.01$); internal validity tests suggest that the intervention impacted DV referrals significantly more than non-DV referrals ($p<0.01$). When the intervention was available, patients who received the intervention were given significantly fewer non-DV referrals than those who did not ($p<0.01$).

Conclusion: These findings suggest direct-to-advocacy referrals can improve rates of patient connection to advocacy. The downward trend for non-DV referrals after the intervention implementation warrants further investigation.

Introduction

Background

Intimate partners inflict violence on approximately 6.6 million U.S. women each year (1). For these women, hospital emergency departments (EDs) are often a key point of receiving care. Each year from 2006-2009, EDs across the U.S. coded approximately 28,000 visits for domestic violence (DV), which may include violence perpetrated by intimate partners or other family or household members (58). This is likely to be an underestimate. While national data is sparse, individual hospitals' recent data estimates that DV affects between 3-21% of female ED patients (56,59-62). In addition, among these survivors, a recent point estimate suggests that 61% of these survivors were at high or extremely high risk of intimate partner homicide (57,63).

EDs represent a crucial point of interaction for these patients. Yet a systematic review of guidance around DV interventions in EDs are ambiguous and inconsistent, and typical non-medical DV interventions in EDs, such as universal screening, are inefficient at reducing future DV victimization (19). A systematic review of 30 studies noted that DV screening neither improves patient quality of life nor decreases future DV victimization when compared to the acute treatment of injuries alone (20). Some EDs also provide written educational material or lists of relevant service agencies to patients affected by DV. A randomized controlled trial of 2708 DV patients found that these materials had no impact on future hospitalization, ED visits, or DV advocacy agency contact at one- or three-year follow up (22,23). As of 2019, 44 states mandate medical providers to report at least some DV to law enforcement, and 13 states mandate medical providers to report all injuries caused by DV (28). Yet a systematic review found only sparse, dated empirical research on the effectiveness of mandatory reporting in reducing DV, and the included studies reported mixed and often biased findings (29).

Importance of "Warm Handoffs" and eHealth Tools

Specialist counseling, structured risk assessment, safety planning, and other evidence-based DV interventions may mitigate the risks of harm to DV-affected ED patients (16). Specialist counseling may include direct personal contact within the ED or via ED staff to a named DV advocate, a practice known as a "warm handoff." The Agency for Healthcare Research and Quality considers warm handoffs a best practice for coordinating care between healthcare and social services (64). Several randomized controlled trials highlight the efficacy of warm handoffs in connecting patients to care and improving relevant outcomes in non-DV settings (65-67). While fairly novel in ED settings, individual EDs that have implemented a warm handoff approach to connecting patients to DV advocacy report improved patient connections to needed non-medical care (55,56,64).

Electronic, or eHealth, tools at individual hospitals typically convert existing interventions, such as screening protocols, education materials or referral lists, into digital formats (47-49,68,69). A systematic review of 31 such interventions found that eHealth interventions streamlined traditional interventions but did not improve upon their outcomes (52). eHealth interventions may facilitate promising interventions such as warm handoffs to advocacy. A cluster-randomized trial in the United Kingdom found that when primary care providers sent digital referrals directly to professional DV advocates, the odds of patients receiving DV referral services increased threefold (49).

Goals of this Investigation

This multiple baseline study examines the effect of a digital warm handoff intervention, the Domestic Violence Report and Referral (DVRR), on DV referrals and advocacy services for patients in three Northern California EDs. DVRR, described more fully below, sends digital referrals to advocates on behalf of consenting patients, who then reach out to the referred patient. DVRR combines this novel referral protocol with simultaneous digital DV reports to law enforcement as mandated by the state of California. This study focuses on the advocacy referral pathway and the impact of the intervention on DV referrals and advocacy services.

Methods

Study Design and Setting

This study uses a mixed non-concurrent and concurrent multiple baseline design. Multiple baseline designs are an alternative to randomized controlled trials for situations where withholding an intervention from a control group may not be feasible or ethical, or where researchers want to consider individuals or groups as their own controls (70,71). Within this design, researchers make repeated measurements of multiple individuals or groups while the intervention is introduced at different time points for each group. Causal inference is supported when intervention effects follow the intervention starting point within each group and are not simultaneously observed in other groups (70,72,73). Within public health research, this method is primarily feasible in samples where large effect sizes are anticipated or observed (70).

Data were collected from two sources: chart reviews of eligible patient visits to one of three participating Northern California EDs (referred to as index visits), and client records at a DV advocacy agency within six months of the index visit. If a patient visited the ED and met inclusion criteria for the study multiple times, that patient may have had multiple index visits and advocacy visits included in the data. The three participating EDs implemented the intervention in February 2014 (Hospital 1), April 2016 (Hospital 2), and May 2016 (Hospital 3), providing a natural basis for a multiple baseline design.
Due to the continuous nature of patient index visits and the delay between index and advocacy visits, main effects were assessed using a non-concurrent multiple baseline approach, in which data are collected repeatedly over multiple time points (74). We assessed internal and external validity at baseline and after each intervention time point using a concurrent (therefore more robust) multiple baseline approach (74). Providers at all three hospitals were given discretion as to whether a patient would receive the intervention or the hospital's prior standard of care. As a result, analyses also assessed whether patients who were given the intervention were more likely to reach advocacy than those who were not.

The Committee for the Protection of Human Subjects at a large public university approved the study protocol; the Institutional Review Boards of Hospitals 1 and 3 also approved the protocol while Hospital 2 accepted the university review as sufficient.

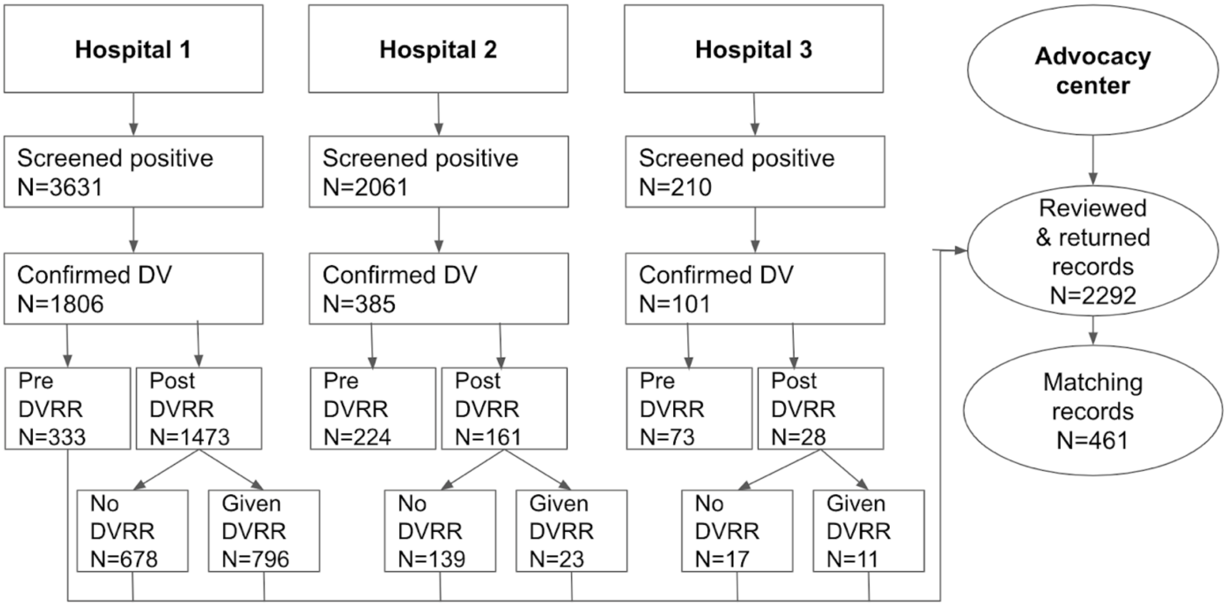
Selection of Participants

Eligible ED visits included patients 18 years or older seen at participating EDs between December 2013 and September 2017 whose charts indicated DV in the diagnosis, chief complaint or medical/social work notes. We used this subset of all patients with a positive DV screen for consistency across hospitals because each of the three study hospitals used a different DV screening protocol and each offered a different definition of a positive screen.

A prolonged baseline at Hospital 1 was screened beginning February 2013 and a prolonged tail was screened at Hospitals 1 and 2 through April 2018. Patient charts were screened for eligibility using hospital database settings and search functions, with a limited exception at Hospital 2. Hospital 2's database screening was unavailable for the data range December 2013-April 2016. As a result, the research team created a customized program to screen all ED charts during this range for eligibility. In a test using three months of data (June 2016-September 2016), the program screened over 10,000 ED records to identify eligible records, with 99.8% accuracy compared to hospital database screening.

Figure 1 describes the selection flow for patient visits entering the study sample. There were 1553 eligible ED visits at Hospital 1, 385 at Hospital 2, and 101 at Hospital 3. Advocacy agency staff reviewed all eligible visits to identify any contact with these patients within six months of their index ED visit; this resulted in 421 matched records from the advocacy agency for the range February 2013 through September 2018.

Figure 3: Flow of charts into study sample



Intervention

DVRR is an eHealth program that connects DV-affected patients to advocacy services and law enforcement. It incorporates the Danger Assessment, a validated tool that indicates a patient's risk of intimate partner homicide (57), as well as information about the assault, a body map to document the patient's injuries, space for medical notes to describe pertinent information about each injury, and, with patient consent, an option to take pictures of the injuries. The health care provider uses DVRR to send a digital copy of the report to local law enforcement as mandated under California law. With patient consent, the health care provider uses DVRR to also send a condensed report that includes the patient's name, their Danger Assessment score, and a safe phone number to a local advocacy agency. Within two weeks of the ED visit, the advocate calls the patient to offer assistance.

Measures

Once eligible charts were identified, members of the research team reviewed them to collect study data. This included patient name, gender, age, race, ethnicity, the result of DV screening, chief complaint, any indication of DV in medical or social work notes, relationship to the perpetrator, any presence of sexual assault, any prior visits to the ED, and the nature of any referrals that had been administered. DV screening protocols differed by hospital; the screening protocols at Hospital 2 and Hospital 3 also included patients who felt unsafe for other reasons, such as homelessness or sexual assault by an unknown perpetrator. As a result, the study only considered confirmed DV cases to include patients who had a chief complaint or diagnosis of DV or had medical/social work notes that indicated DV. At Hospitals 1 and 3, providers categorically offered patients whose victimization included sexual assault medical and psychosocial treatment through their Sexual Assault Response Team (SART). We measured the proportion of DV cases with SART involvement, as this introduced additional referrals and pathways to advocacy contact for affected patients.

At Hospitals 1 and 2, members of the research team trained in medical record-keeping systems and data collection abstracted chart data into a standardized form. The interrater agreement, tested biweekly, averaged 0.93, with a minimum agreement of 0.7 in any abstraction field in any test. Hospital 3 and the advocacy agency staff abstracted their own records using standardized forms provided by the researchers. We used a second customized macro to collect data for selected standardized fields (gender, race, ethnicity, the result of DV screening) within eligible charts at Hospital 2. In a test of accuracy, this program collected data from 157 medical records with 100% accuracy compared to manual data collection. Both programs were created with Pulover's Macro Creator 5.0.5 (75). All other data were collected through manual chart reviews.

After data were abstracted from all three hospitals, the researchers provided the advocacy agency staff the visit dates and first and last names associated with all eligible patient visits. The agency staff documented whether a patient had received services within six months of their index ED visit. Advocates then aggregated the linked dataset by hospital, gender, race/ethnicity, and whether or not the patient had been given the intervention in the ED; due to agency policy, the resulting data could not be linked at the individual level to hospital data. As a result, all analyses including advocacy data were conducted separately and did not include the additional variables in the main hospital dataset.

Outcome Variables

This study examines two key outcome variables: (1) DV-related referrals given during the ED visit; and (2) subsequent patient contact with advocacy services. DV-related referrals indicate that the provider gave the patient tangible information or resources related to DV, such as an educational pamphlet, a phone number for an advocate, or a voucher for emergency shelter. Medical follow-up visits and police referrals were not considered DV-related referrals, although referrals to restraining order clinics or other legal services were included. Contact with advocacy services indicated that the advocacy agency staff documented contact with an individual of the same first and last name within six months of the index ED visit. Contact included in-person advocacy services from on-site advocates or 27 on-site partner agencies as well as phone-based advocacy services from agency advocates.

Data Analysis

Main effects

We grouped ED visits into three categories: visits that occurred (1) prior to DVRR implementation at the hospital; (2) after DVRR implementation but at which time the patient was provided standard care instead of the intervention; and (3) after DVRR implementation and at which time the intervention was administered. We chose individual visits as the unit of analysis because patients could have been victimized by multiple perpetrators or situations during the course of the study, requiring separate interventions from ED and advocacy personnel. We used general linear models stratified by hospital to calculate estimates and 95% confidence intervals for changes in patients' relative likelihood of receiving DV-related referrals and advocacy services before and after the intervention was implemented. We repeated analyses among visits that occurred after the intervention was implemented, stratified by whether or not the provider administered it during the visit. To adjust for hospital-specific effects of the intervention, all models included indicator variables for each hospital and interaction terms between the hospital and implementation status. Multiple baseline graphs visually demonstrate any change in patient referral and advocacy outcomes after the intervention was implemented at each hospital.

External validity

The multiple baseline graphs also convey a measure of the main effects' external validity. They enable examination of changes in referrals and advocacy visits at Hospital 1 during the time period when Hospitals 2 and 3 were not implementing (i.e, their baselines), and vice versa.

First, we used logistic regression and traditional chi-square tests to assess all three hospitals for changes in DV referrals and advocacy services both during their own rollout and during the other hospitals' implementation of the intervention. Hospitals 2 and 3 implemented DVRR almost simultaneously, so they were considered to have the same implementation period for this test. Any significant results from this test suggest the presence of a confounding external factor affecting the measures of all study hospitals during an individual hospital's rollout.

Second, we used the associated Mantel-Haenszel chi-square test statistic to compare whether changes observed in Hospital 1 were significantly different from Hospitals 2 and 3 at each implementation point (76). This modification to a traditional chi-square test statistic gives weight to clusters (i.e., the three study hospitals) based on the number of data points each contains. This was used due to disparate sample sizes between the three hospitals. When cell sizes of 0 precluded Mantel-Haenszel estimation, we used a Breslow-Day test of homogeneity between the two remaining hospitals with a Tarone adjustment to asymptotically limit the resulting distribution (77,78). We set a 95% confidence interval to assess significance; any significant findings suggest that the intervention caused the change in measured outcomes.

Internal validity

We also used Mantel-Haenszel chi-square tests to assess the internal validity of the main effects of this study. We regressed referrals to non-DV resources such as mental health care, general psychosocial care, and all non-police legal support against the two main predictors in this study: whether the hospital had implemented DVRR and whether it had been offered to the patient during their visit. Any significant results from these tests suggest something akin to a placebo effect, wherein heightened training, awareness, or other aspects of ED care related to the intervention influenced the rate of referrals within the ED without specificity to DV.

We compared these results to the intervention's association with DV-related referrals using one-way MANOVA. Any significant results from these tests suggest that the intervention was associated with a significantly greater change in DV-related referrals than non-DV-related referrals. These results speak to the specificity of the intervention in addressing DV. We used Stata statistical analysis software (version 14.2) for all analyses (79).

Results

Sample Characteristics

Patient characteristics varied greatly across this sample (Table 1). More patients screened positive at Hospital 1 and Hospital 2 than at Hospital 3. Before and after implementation, significant differences persisted between hospitals in rates of DV-related referrals, connection to advocacy services, and rates of sexual assault among DV patients. However, among the subset of patients who received the DVRR intervention, these differences disappeared. Implementing the intervention was also associated with a significantly lower rate of DV-related visits at both Hospitals 2 and 3. Providers at Hospital 2 administered the intervention to a significantly lower proportion of DV-affected patients than Hospital 1 or Hospital 3.

Table 1: Description of DV referrals given and advocacy services received among patients with confirmed DV cases before/after hospitals implemented DVRR

Before DVRR implementation								
	Hospital 1 n=333		*Hospital 2 n=224*		*Hospital 3 n=73*		*Total n=630*	
	%	*n*	*%*	*n*	*%*	*n*	*%*	*n*
*DV referrals***	72.97%	243	2.68%	6	9.59%	7	40.63%	256
*DV services***	18.34%	62	3.59%	8	5.97%	4	11.74%	74
Repeat visits	25.23%	84	35.87%	80	---	---	26.03%	164
*Sexual assault***	13.51%	45	2.23%	5	7.04%	5	8.73%	55
After DVRR implementation								
Total								
	Hospital 1 n=1474		*Hospital 2 n=161**		*Hospital 3 n=29**		*Total n=1664*	
	%	*n*	*%*	*n*	*%*	*n*	*%*	*n*
*DV referrals***	76.87%	1133	18.01%	29	41.38%	12	70.55%	1174
*DV services**	24.63%	363	13.04%	21	10.34%	3	23.26%	387
Repeat visits	25.64%	378	21.74%	35	---	---	24.82%	413
*Sexual assault***	15.20%	224	4.35%	7	24.14%	7	14.30%	238
DVRR not administered								
	Hospital 1 n=678		*Hospital 2 n=139*		*Hospital 3 n=17*		*Total n=833*	
*DV referrals***	57.96%	393	8.63%	12	17.65%	3	26.40%	408
DV services	11.65%	79	7.19%	10	0.00%	0	2.82%	89
Repeat visits	27.43%	186	23.19%	32	---	---	26.17%	218
*Sexual assault***	17.85%	121	4.32%	6	21.05%	4	15.73%	131
DVRR administered								
	Hospital 1 n=796		*Hospital 2 n=22*		*Hospital 3 n=12*		*Total** n=829*	
DV referrals	92.96%	740	77.27%	17	75.00%	9	92.64%	768
DV services	35.68%	284	50.00%	11	25.00%	3	35.90%	298
Repeat visits	24.12%	192	13.64%	3	---	---	23.52%	195
Sexual assault	12.94%	103	4.55%	1	25.00%	3	12.91%	107

*Note: *p<0.05; **p<0.01. Repeat visits not measured at Hospital 3.*

Main Results

DVRR implementation was associated with a significantly higher likelihood of the patient receiving a referral to DV services at Hospitals 2 and 3 (Table 2). Intervention implementation was associated with a significantly greater likelihood of receiving advocacy services at all three study hospitals. After implementation, patients who received DVRR during their ED visit had a significantly greater likelihood of receiving referrals at all study hospitals. At Hospitals 1 and 2, patients who received the intervention also had an increased likelihood of receiving advocacy services. At Hospital 3, after DVRR had been implemented, only patients who received it ultimately made contact with advocacy services, thus the likelihood ratio could not be estimated for this site.

Table 2. Relative proportion of patients receiving DV referrals and advocacy services by DVRR status

Before vs after DVRR implementation (total)

	Hospital 1 n=333		*Hospital 2 n=224*		*Hospital 3 n=73*	
	DV referrals	DV services	DV referrals	DV services	DV referrals	DV services
Proportion before DVRR (a)	0.73	0.18	0.03	0.04^	0.09	0.06
Proportion after DVRR (b)	0.77	0.25	0.19	0.13	0.21	0.1
Relative proportion (b/a) (95% CI)	1.05 (0.98-1.13)	1.34* (1.05-1.71)	6.72** (2.86-15.82)	3.55** (1.61-7.81)	4.47** (1.96-10.19)	1.68** (0.40-7.03)

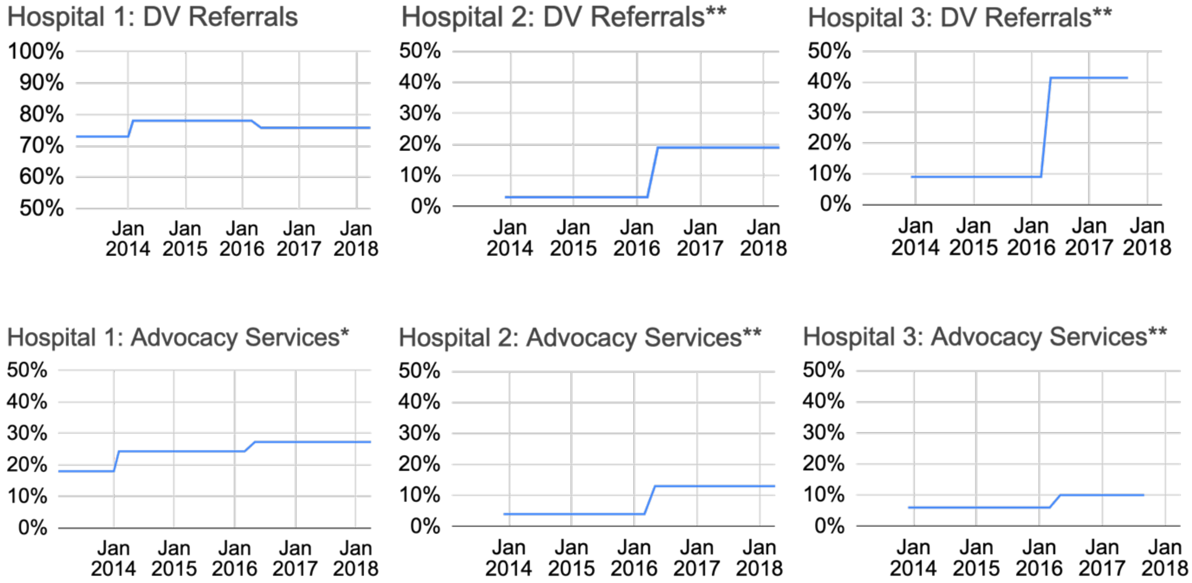
After DVRR implementation: DVRR administered vs not administered

	Hospital 1 n=678		*Hospital 2 n=139*		*Hospital 3 n=17*	
	DV referrals	DV services	DV referrals	DV services	DV referrals	DV services
Proportion given DVRR (a)	0.58	0.14	0.02	0.07	0.08	0
Proportion not given DVRR (b)	0.93	0.36	1.00	0.44	1.00	0.25
Relative proportion (b/a) (95% CI)	1.60** (1.50-1.71)	2.55** (2.13-3.05)	8.95** (4.98-16.09)	6.16** (2.93-12.95)	4.64** (1.60-13.43)	---

*Notes: *p<0.05; **p<0.01. ^Patients had a higher measured relative likelihood of reaching advocacy services (0.04) than being referred to those services (0.03) prior to DVRR implementation. This was not tested for significance.*

Study hospitals had vastly different rates of DV referral and subsequent receipt of advocacy services prior to implementing the intervention (Figure 2). The intervention was significantly associated with increased rates of referral at Hospitals 2 and 3 and increased connection to DV advocacy at all three study hospitals.

Figure 4: Multiple baseline depiction of DV referrals and advocacy services before/after DVRR implementation in EDs



*p<0.05; **p<0.01

These main effects were combined with measures of internal and external validity to assess any causal link between the DVRR intervention and a targeted increase in DV referrals at each hospital. The multiple baseline diagrams in Figure 2 further suggest a preliminary indication of external validity. In these figures, while Hospitals 2 and 3 experienced a significant shift in DV referrals and advocacy services after implementing the intervention in April and May 2016, Hospital 1 appears to have experienced no change at this time. This is also true of the significant change in advocacy services received by Hospital 1 patients after implementing the intervention in February 2014; Hospitals 2 and 3 do not show a similar change at this time point.

In Table 3, these differences are quantified using logistic regression models and Mantel-Haenszel chi-square tests. These tests found that the change in DV referrals and advocacy services differed significantly between Hospital 1 and Hospitals 2 and 3 when Hospitals 2 and 3 implemented the intervention. Because of sample size limitations, Hospital 3 was excluded from analyses during the Hospital 1 implementation period, and, as stated earlier, a Breslow-Day test for homogeneity with a Tarone adjustment was used to examine any change in DV referrals at Hospital 2 after Hospital 1 implemented DVRR. This test found that DV referral rates did not significantly differ between Hospitals 1 and 2 at the time of Hospital 1 implementation. This is consistent with the main finding that Hospital 1 did not experience a significant change in referral rates after implementing DVRR.

Table 3. Relative proportion of patients receiving DV referrals and advocacy services by DVRR status

Before vs. after Hospital 1 implementation						
	DV referrals			*DV services*		
	Hospital 1	Hospital 2	Hospital 3	Hospital 1	Hospital 2	Hospital 3
Odds ratio	1.05	0.78	---	Could not be calculated due to sample size limitations		
95% CI	(0.98-1.13)	(0.10-36.09)				
Mantel-Haenzel chi-square statistic	1.10 (Breslow-Day)		---			
Before vs. after Hospital 2 and 3 implementation						
	DV referrals			*DV services*		
	Hospital 1	Hospital 2	Hospital 3	Hospital 1	Hospital 2	Hospital 3
Odds ratio	1.03	6.67**	11.00**	1.19	3.92**	1.75
95% CI	0.80-1.32	2.86-17.29	3.20-40.21	0.91-1.56	1.61-10.48	0.24-11.05

Taken together, these findings suggest that no extraneous factors other than DVVR implementation affected DV referrals or advocacy services received during the implementation of DVRR at study hospitals.

Finally, we calculated the odds ratios associated with referrals to both DV and non-DV resources before and after each hospital implemented the intervention (Table 4). After implementation, we stratified analyses by whether or not the intervention was offered in individual visits. This model comprised all three hospitals and suggested that the impact of implementing the DVRR intervention was significant for both DV-related referrals and non-DV related referrals ($p<0.01$). This finding was driven by the lack of a significant effect among the large sample at Hospital 1, at which implementation was associated with no increase in the odds of any referrals, and by the significant increase in both DV and non-DV referrals at Hospital 2.

Table 4: Difference in odds between DV referrals and non-DV referrals by DVRR status

Before vs. after DVRR implementation (total)								
	Hospital 1		*Hospital 2*		*Hospital 3*		*Mantel-Haenszel combined*	
	DV referrals	Non-DV referrals	DV referrals	Non-DV referrals	DV referrals	Non-DV referrals	DV referrals	Non-DV referrals
Odds ratio	1.23	1.04	7.98**	0.76	7.07**	0.64	1.65**	0.99
95% CI	0.93-1.62	0.79-1.38	3.13-24.02	0.38-1.49	2.12-24.37	0.01-6.87	1.30-2.10	0.77-1.26
F statistic (MANOVA)	1.25		14.71**		9.75**		96.73** (unweighted)	
After DVRR implementation: Administered DVRR vs not administered DVRR								
	Hospital 1		*Hospital 2*		*Hospital 3*		*Mantel-Haenszel combined*	
	DV referrals	Non-DV referrals	DV referrals	Non-DV referrals	DV referrals	Non-DV referrals	DV referrals	Non-DV referrals
Odds ratio (95% CI)	9.55**	0.60**	35.98**	2.15	21.00**	0	10.34**	0.62**
95% CI	6.94-13.27	0.48-0.76	10.07-141.39	0.46-8.00	2.26-258.10	0.00-0.00	9.41-17.19	0.50-0.79
F statistic (MANOVA)	157.48**		47.95**		12.15**		249.26**	

Notes: **p<0.05; **p<0.01*

After implementation, odds of receiving DV referrals were significantly higher among patients who received the DVRR intervention; this finding was consistent in both the Mantel-Haenszel combined model and at all three individual hospitals (p<0.01). The odds of DV-affected patients receiving referrals to non-DV services significantly decreased in both the Mantel-Haenszel combined model (p<0.01) and at Hospital 1. Individual and combined MANOVA results suggest that the DVRR intervention was associated with a significantly greater impact on DV than non DV-referrals (p<0.01). These results suggest that no other factor internal to the hospitals or study measurements led to a general increase in all referrals. Instead, the intervention was associated with a targeted increase in DV referrals at each hospital. This lends support to the internal validity of the main effects of this study.

Limitations

The small sample size at Hospital 3 and the shorter baselines at Hospitals 2 and 3 posed the most significant limitations to this study. Because of the small sample size at Hospital 3, the estimated results for this hospital have wide confidence intervals. Due to this and the shorter baselines at Hospitals 2 and 3, we were limited in the tests we could conduct for external validity during Hospital 1 implementation.

Internal validity could be assessed for DV referrals but not receipt of advocacy services. Doing so would have required outcome data from non-DV agencies, such as mental health services or substance abuse services, that were unavailable for this study. Because results indicated the DVRR intervention was negatively associated with referrals to non-DV resources, future research measuring services received from other referral destinations would provide further insight into the main effects' internal validity.

Data linkage limitations also affected this study. Because first and last names provided the basis for data linkage between hospitals and the advocacy agency, any differences in spelling between ED and advocacy records would have resulted in a mismatch. Similarly, any advocacy clients with the same first and last name as a hospital patient seen within six months of the hospital visit would have been falsely recorded as a match; no study measures assessed the magnitude of this limitation.

This study only evaluated advocacy contact at the agency that received all referrals from the intervention. It did not evaluate the nature or length of advocacy services received, nor advocacy contact at any other advocacy agencies. This agency had served as the primary referral destination for Hospital 1 and a major referral destination for Hospitals 2 and 3 before the intervention, but it is possible that findings may reflect some rerouting of patients who would have made contact with other DV agencies. However, Hospitals 2 and 3 provided DV referrals to a very low proportion of patients without the DVRR intervention. As a result, it is unlikely many patients would have sought services from an alternative DV agency.

Discussion

The main findings of this study suggest the DVRR intervention is associated with significantly higher rates of patient connection to DV advocacy services through more effective referrals. The tests for external validity suggest that no other global or external factors were responsible for this increase, and the tests for internal validity suggest that this increase also cannot be explained by other factors associated with implementing the intervention, such as increased provider training and awareness.

DVRR is a digital warm handoff intervention for DV, grounded in evidence-based practice. We found that implementing this intervention was associated with an increase in the rate of both referrals and advocacy services offered to DV-affected patients. Upon implementing the intervention, two of the three study hospitals experienced a significant increase in DV referrals, and all three experienced a significant increase in advocacy services received. After implementation, providers administered the DVRR intervention to eligible patients at their discretion. Thus, we also measured differences by whether patients received the intervention. Patients who received the DVRR intervention were one and a half to nine times as likely to receive DV referrals and advocacy services. Measures of internal and external validity suggest a likely causal relationship between the DVRR intervention and increased rates of DV referrals and receipt of advocacy services.

These findings support the utility of eHealth warm handoffs to connect DV-affected patients to advocacy services. In each ED, three to six times as many patients connected with advocacy after the hospital integrated a digital warm handoff into their DV care. This is consistent with previously described research, findings from which suggest that direct connections to supportive services and advocacy improved patient connections, outcomes and financial feasibility (55,56,80). The digital delivery of the present intervention integrates a warm handoff into the existing environments and workflows of both hospital and advocacy agency staff.

Baseline data suggest that the standard of care at Hospitals 2 and 3 often left patients without support. Despite near-universal screening at Hospital 2, fewer than 3% of patients who disclosed DV received any referral to services. As 4% of Hospital 2 patients reached advocacy, many did so despite receiving no referrals or resources from the hospital. Before implementing the intervention, each of the three study hospitals used different DV referral protocols, as well. This resulted in significantly different referral rates. Of known DV-affected patients, for example, Hospitals 1, 2, and 3 had referral rates of 72%, 3%, and 10%. As stated earlier, these inconsistencies are emblematic of the ambiguous, inconsistent guidance around DV intervention across healthcare systems described in a systematic review of 35 studies examining healthcare-based DV interventions (19). As a result, it is unsurprising that few patients connected with advocacy services before the intervention (18%, 4% and 6% at Hospitals 1, 2 and 3, respectively). After implementing the intervention, DV-affected patients were significantly more likely to receive DV-related referrals at Hospitals 2 and 3 and advocacy services after referral from all three hospitals. This may be, in part, due to ways DVRR design differs from usual care. This intervention offers step-by-step guidance to providers and patients and transfers the burdens of seeking and administering DV care from patients and providers to professional DV advocates.

Recent studies suggest that eHealth interventions are not a silver bullet to prevent future harm to DV-affected patients (23,48,80,81). Rather, eHealth interventions tend to add value when they facilitate intervention that otherwise would have required prohibitive financial, time, personnel, or other resources (69). In contrast to typical eHealth interventions, which digitize interventions with minimal impact on patient wellbeing, DVRR streamlines delivery of a best practice intervention using eHealth (55,80). By doing so within existing EDs and DV advocacy infrastructure, it enables a warm handoff between providers and DV advocates that otherwise may not have occurred.

Yet even best-practice interventions leave many DV-affected ED patients unserved. One reason for this is a lack of DV detection in EDs. Inconsistent screening practices within and among EDs render DV identification and intervention highly variable (19,69). Even when providers detect DV and administer direct-to-advocacy interventions, patient prospects of advocacy care are bleak. The two studies to measure this outcome suggest that 27% and 65% of patients (in sample sizes of 41 and 122) never made contact with advocacy services (6,39). In the present study, about 64% of the 829 patients who received the intervention never reached advocacy services, in addition to 97% of the 833 patients who did not receive the intervention. Further, providers administered the intervention to only about half of DV-affected patients at Hospitals 1 and 3, and only 15% of DV-affected patients at Hospital 2. These low rates highlight the vast number of DV-affected patients who received no DV-focused care from ED providers or advocates, in spite of the elevated mortality risks they face. As noted previously, the average lethality risks of patients given

DVRR in one of the study hospitals noted that 61% of patients experienced a high (28%) or extremely high (33%) risk of intimate partner homicide (57,63).

Future research may focus on unanticipated consequences of enhanced DV interventions such as digital warm handoffs. For example, the introduction of the DVRR intervention to Hospitals 2 and 3 was associated with a significant decrease in the rate of patients whose medical records indicated DV; it is unlikely this decrease reflects an actual decrease in DV-related visits to these hospitals. In addition, patients who received the present intervention were less likely to receive other mental health or legal aid referrals. Providers may have anticipated advocates would provide these services through their work with the patients. Yet, many of these patients did not receive follow-up advocacy services and thus received no resources or referrals at all. This scenario would particularly restrict care for DV-affected patients who wanted to be connected to advocacy care but declined DVRR, whether due to the incorporated mandated police report or other reasons. Future research should examine these unintended consequences of care, as well as the trajectories of DV-affected patients after they seek ED care, including barriers to acting on referrals, the nature and impact of advocacy care, future safety, and rates of attempted or completed intimate partner homicide.

Taken together, the findings from this study suggest that digital warm-handoff interventions such as DVRR may causally improve DV-affected ED patients' connection to advocacy services. This highlights a promising, much-needed advance in the comprehensive care of a uniquely vulnerable, high-risk population often seen in the ED.

Paper 2

The impact of a digital warm handoff from the emergency department on domestic violence survivors' access to advocacy by race, ethnicity and gender

Abstract

Background: Racial/ethnic minority survivors of domestic violence (DV) referred from emergency departments (EDs) may face barriers to accessing advocacy services due to systemic inequities in healthcare access. This study assesses the impact of a digital direct-to-advocacy referral system on survivors' likelihood of receiving advocacy by race/ethnicity and gender.

Methods: We reviewed medical charts for 1366 DV-associated ED visits in an urban, level-1 trauma center with 323 associated visits to advocacy. We compared the difference in odds and predicted probability of receiving advocacy by intervention status by survivor race/ethnicity and gender. We identify between-group differences in advocacy services received and the impact of the intervention.

Results: At baseline, survivors offered the intervention experienced 3.63x increased odds of advocacy receipt compared to those without it ($p<0.01$). Latinx survivors experienced an additional 2.5 times the odds of receiving advocacy services ($p<0.01$). We predict an additional 28% of Latinx survivors and 22% of Black survivors received advocacy services due to the intervention, compared to 17% of white survivors ($p<0.01$). We predict an additional 22% of women and 25% of men received advocacy services ($p>0.01$). Prior to the intervention, 20% as many male compared to female survivors received advocacy services; after the intervention, 78% as many male compared to female survivors received advocacy services ($p<0.01$).

Conclusion: Direct-to-advocacy ED referrals facilitated by eHealth technology may reduce disparities in care for marginalized racial and ethnic groups most often victimized by DV.

Introduction

Approximately one in four women is victimized by physical or sexual violence from an intimate partner during her lifetime, and many others are victimized by family members, caregivers, or roommates (82). In addition to physical injury and emotional distress, factors such as isolation, depression, PTSD, internalizing responsibility for the perpetrator's abuse, and fear for their safety or legal status dissuade domestic violence (DV) survivors from help-seeking (3,83,84). Still, many survivors seek help, including emergency department (ED) care for physical injuries. Nationally representative studies suggest that between 28,000 and 120,000 survivors are seen in EDs for DV-related chief complaints annually; the authors note that these are likely vast underestimates due to inconsistent screening and the underutilization of DV-related diagnostic codes (58,85).

While EDs are a primary method of institutional contact for DV survivors, ED providers in multiple studies express concern that they are unable to address the underlying danger, particularly that they lacked training and resources to effectively offer non-medical interventions in DV care and that some providers avoided engaging with DV altogether (86-91). Among ED providers who do intervene, standard care consists of offering a printed referral with a phone number for an advocacy agency to assist survivors with safety planning, practical resources and emotional support (48,92). Survivors report difficulty following up with these resources for reasons including a need to hide the referral documents from the abuser (93), post-traumatic stress inhibiting long-term planning (14,94), and manipulation and coercion from the abuser (3). To address these challenges, some hospitals have implemented a strategy known as a warm handoff, in which the ED provider personally transfers the survivor's DV care to a DV advocate (55,80). This approach, while resource-intensive, appears to successfully connect survivors to advocacy care. However, survivor experiences with DV victimization, help-seeking and intervention vary by race, ethnicity, gender, and other factors. These differences suggest that groups victimized by the highest rates of violence also face the greatest barriers to assistance and quality of DV care.

Race and ethnicity

Significant differences exist in rates of DV victimization by survivor race and ethnicity. In 2017, the Centers for Disease Control and Prevention reported higher victimization rates among individuals who self-identified as Hispanic (all races) (8.6%), Black (9.4%), American Indian/Alaska Native (8.2%) or multiracial (12.5%), compared to non-Hispanic whites (5.7%) in the preceding 12 months (4). Despite these inequities, a systematic review of 36 studies focused on DV and health outcomes among racial and ethnic minority women found that most used too small a sample size to effectively examine racial and ethnic differences and that many studies confounded race and ethnicity with environmental and other social determinants of health (95). Qualitative studies identify the ways in which conventional intervention approaches for DV survivors may implicitly or explicitly prioritize the experiences of white survivors, excluding needs or perspectives of racial and ethnic minority survivors. Extensive interviews with the executive directors of 44 DV shelters in the U.S. South found that shelter staff explicitly normed DV shelters toward white survivors' expectations. For example, one executive director described closing and relocating one shelter because "it became totally Black and the white women would not go" (96). In a separate qualitative study of Black survivors who sought care at a

DV shelter, almost all reported white-centered norming ranging from the food and personal care products offered to the types of support offered by advocates (97).

As noted in a 2019 systematic review of the relationship between neighborhoods and DV, an ecological approach--that is, an integrated study of personal, family, neighborhood and societal factors--is critical to understanding how burdens and experiences of DV differ by race and ethnicity (98). A cross-sectional study of 725 DV survivors supports these results; while survivors' help-seeking and safety behaviors varied by race and ethnicity, significant distinctions disappeared after adjusting for factors such as neighborhood poverty and education (99). Some factors that influence survivors' safety and help-seeking may be unique among particular racial or ethnic groups. For example, a prominent theoretical discussion of DV among Black survivors describes group-specific fears that individuals from whom Black women might seek help will be biased against them, that "snitching" signals disloyalty to their community, that it reinforces negative stereotypes about Black men, and that it may compromise the stereotype of a "strong Black woman" (100). In one qualitative study with Black and white survivors, Black survivors felt uniquely inhibited from seeking help or accessing services by the stereotype of a "strong Black woman" whereas the white survivors felt encouraged to seek help as DV survivors (101).

Latinx survivors of DV also face greater exposure to multi-level factors that intensify the risk of DV and block access to supportive resources. These include greater social isolation, greater unemployment and poverty, less education, more dangerous neighborhood environments, and greater dependence on abusive partners for housing and legal status (102). As described in two systematic reviews comprising 63 articles on either help-seeking among Latinx survivors or the health impact of DV across ethnic minority survivors, Latinx survivors of violence who have immigrated may face challenges associated with transnational migration, such as language barriers, legal documentation status, and cultural differences (95,103). These contexts, in turn, shape Latinx survivors' help-seeking and safety behaviors. A systematic review of 17 articles conducting cross-cultural comparisons of help-seeking behavior after DV found that Latinx women, like Black women, were less likely than white women to seek out mental health and social services for DV, though more likely to seek out hospital and law enforcement support (104). Data from a national study interviewing 1377 immigrant Latinx survivors of sexual violence suggest that while rates of violence and informal help-seeking did not vary between survivors with and without legal residency status, undocumented immigrants were significantly less likely to seek formal help (105). However, these differences disappeared after adjusting for survivors' age, socioeconomic status, employment, relationship status, and country of origin.

However, as Black and Latinx survivors tend to disproportionately face the confounding burdens associated with additional barriers to help-seeking and receiving services for DV, the extant data for these survivors suggest the need for targeted, culturally-relevant services. A systematic review of thirteen interventions developed through community-based participatory research for non-white (predominantly Black and Latinx) women experiencing DV emphasized the roles that patriarchal attitudes, racism and discrimination, immigration, poverty, stigmatization and social support play in non-white DV survivors' lived experiences and needs around DV (106). Furthermore, a cross-sectional study of survivors in five Latina-serving DV organizations across the U.S. suggests that organizations with culturally-specific practices, such as hiring a high proportion of Latinx staff, incorporating elements of Latinx culture (e.g., sayings, holidays) into their interventions, and recognizing the heterogeneity of Latinx cultures and people, promoted survivor well-being and positive trauma-informed outcomes significantly more than trauma-informed practices alone (107). Similarly, a systematic review of interventions targeting violence reduction among Black individuals suggested the need for interventions embedded in Black cultural contexts, or delivered through mechanisms that Black survivors feel will not jeopardize the safety and autonomy of their communities (108), such as restorative justice (34,35,109,110).

Finally, when examining ED-based interventions, the overall level of survivors' access to healthcare becomes an important factor: survivors who face barriers to receiving ED medical care do not have access to ED-initiated DV care and resources. According to the National Health Interview Survey, Asian, Black, and Hispanic (Latinx) white patients all experienced significantly less access to healthcare services than non-Hispanic white patients even after adjusting for insurance status (111). A cross-sectional study of 484 medical students found that they systematically discounted the pain, distress and discomfort of non-white survivors and adjusted their treatment recommendations accordingly (112).

Gender

Social dynamics surrounding gender further affect survivors' experiences of DV and receipt of medical and advocacy care. A cross-sectional survey of over 10,000 American adults found that 2.5 times more women than men experience DV (4), and 4 times more require medical care for an DV-related injury (113). Women account for an even larger proportion of DV-coded ED visits: as many as 93-94%, according to nationwide U.S. surveys (58,85). Female DV survivors experience a greater likelihood of injury, sexual assault, fear, and depression than male survivors (114). In addition, consistent barriers to adequate healthcare for women carry unique costs for survivors of DV. A landmark review of clinical and experimental research found that healthcare providers tend to systematically disbelieve or downgrade women's self-reports of pain and distress by female patients (115); this research led to findings that providers extend similar biases toward elderly and non-white patients as well (116).

In contrast, while male survivors of DV have comparatively straightforward access to needed medical care, they seek and receive DV advocacy care less frequently than female survivors (117). Two systematic reviews of men's experiences with DV, or help-seeking after DV, suggest this difference derives from three primary factors: men's reluctance to acknowledge abuse victimization, which would contradict cultural stereotypes of maleness and masculinity; beliefs that DV services are unavailable to male survivors of DV; and fears of professionals not believing them or that they might be accused of perpetrating abuse (118,119). In some cases, these fears may be founded. Interviews with male DV survivors and DV service providers express stereotypes and expectations of men which interfere both in men's help-seeking and create challenges in offering supportive services (120). In addition, a 2015 literature review of the DV experiences of men vs women suggests that male victimization often co-occurs with perpetration; these men may be harmed by retaliatory violence from a partner against whom they have committed DV (114).

The Domestic Violence Report and Referral Intervention

Emergency departments often seek out DV interventions that enable them to serve this diverse group of survivors. A novel digital intervention, Domestic Violence Report and Referral (DVRR), facilitates a digital warm handoff for survivors between ED providers and community-based DV advocates. A previous analysis of data at three hospitals suggests DV-affected ED patients who receive DVRR are over three times as likely to receive subsequent advocacy services (121). In this paper, we assess the impact of this digital warm handoff referral on survivors' odds and predicted probabilities of receiving advocacy services after an ED visit for DV by race, ethnicity and gender. We compare these findings between groups to determine any differential impact of this intervention on survivors' receipt of advocacy services by race, ethnicity and gender.

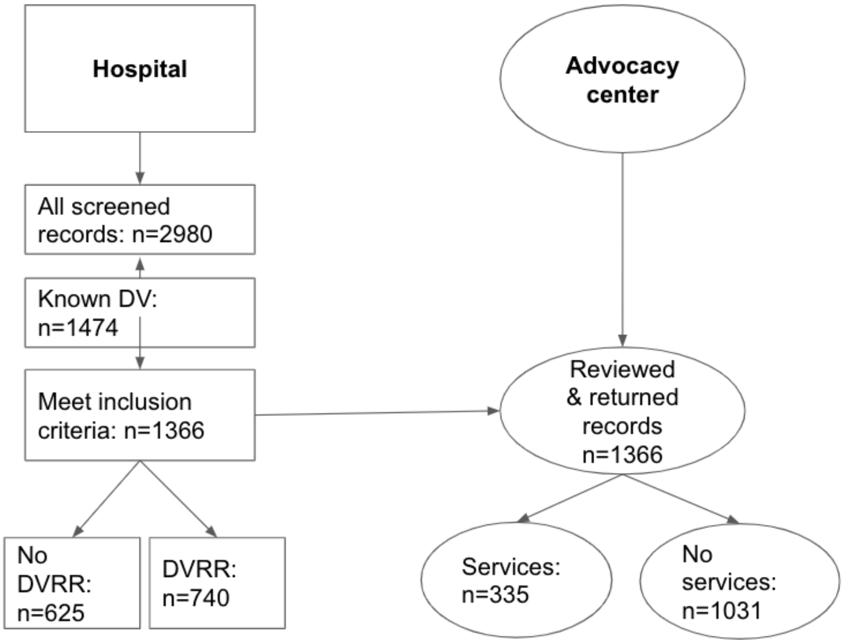
Methods

Data

This study draws on data collected between February 2014 and April 2018 from a Level 1 trauma center ED and a large DV advocacy center. Trained research assistants at the study hospital and trained advocates at the advocacy agency collected data from survivors' electronic health records (EHR) and agency records, respectively, using a standardized abstraction form. Built-in EHR search programs identified all ED visits in which a patient screened positive for DV, received an ICD-9 or ICD-10 (diagnostic) code related to DV, or gave a chief complaint related to DV. We used ED visits as the units of analysis because individual survivors may have been seen multiple times at the ED with different DV-related needs; for this reason, we noted the number of visits by patients seen more than once during the study period. We also noted the number of visits by survivors of sexual assault, as these individuals received a separate intervention protocol that included referrals to services and advocacy intervention. Research assistants reviewed these records and abstracted information including the survivor's gender, race, ethnicity, the relationship between perpetrator and victim, ED visit date, and whether the intervention had been administered. The researchers provided the advocacy agency with the survivor's full name and hospital visit date; using this information, agency staff documented whether or not the survivor received advocacy services within six months of the hospital visit date. To protect the confidentiality of the clients, the agency provided researchers with aggregate client information by race, ethnicity, gender and the date range of their visit. Due to data restrictions for confidentiality, age could not be included in the final aggregated dataset.

The hospital also provided us with ED summary data of the number of survivors with more than one recorded visit during the study. They also provided us with the number of survivors seen with concurrent sexual assault, which leads to a separate response protocol and referral pathway at the study hospital. We retained the records of only white, Black and Latinx survivors due to the small sample sizes of other groups. We detected no missing or incomplete data within our dataset; our final sample included 1366 survivor ED visits. The Committee for the Protection of Human Subjects at the University of California, Berkeley, as well as the institutional review board of the hospital, approved the study protocol. Figure 1 outlines the chart selection process.

Figure 5: Selection flow of medical and advocacy records included for analysis



Characteristics of the study population

Between February 2014 and April 2018, medical records for 1366 survivor visits to the ED documented a diagnosis, chief complaint or medical/social work note that indicated a DV episode precipitated the ED visit. The majority of survivors were female (84.2%), identified as Black or African-American (63.5%), did not experience sexual assault during the DV episode (85.1%), and had no other visits to the trauma center during the study period (74.2%).

Providers administered DVRR in 54.2%, or 740, of the study visits (Table 1). Chi-square tests comparing the characteristics of survivors who received DVRR and those who did not revealed that the groups were similar in terms of race, ethnicity and repeat visit status. However, significantly more female than male survivors received the intervention. Providers were also significantly less likely to administer the intervention to survivors who had also experienced sexual assault during the DV episode.

Table 5: Descriptive characteristics of study ED visits

	(b) Total (n=1366)		(a) DVRR administered (n=740)		(a) DVRR not administered (n=626)	
	%	N	%	N	%	N
Gender						
Female**	*84.2%*	1150	88.6%	656	78.9%	494
Male	*15.8%*	216	11.4%	84	21.1%	132
Race and Ethnicity						
Black	*63.5%*	868	64.9%	480	62.0%	388
White	*13.5%*	185	11.2%	83	16.3%	102
Latinx	*22.9%*	313	23.9%	177	21.7%	136
Sexual Assault						
Yes**	*14.9%*	203	12.2%	90	18.1%	113
No	*85.1%*	1162	87.8%	650	81.8%	512
Multiple DV visits						
Yes	*25.7%*	351	24.5%	181	27.2%	170
No	*74.2%*	1014	75.5%	559	72.7%	455

Intervention

DVRR is a web-based program used at the discretion of the ED provider, who uses it to record the nature, images and treatment of injuries. The program then coaches providers through administering the Danger Assessment, a validated questionnaire that predicts a survivor's risk of being killed by their intimate partner (57). These features help bridge any gaps caused by ED providers' lack of DV training (88,122). Finally, the program directly sends digital referrals to law enforcement in compliance with California's mandatory reporting law and, with survivor consent, to a local DV advocacy agency (123). This referral includes a safe phone number at which the survivor can be reached by the advocate. DVRR is one of very few DV interventions to send referrals directly to advocacy or enable advocates to initiate contact with survivors (49). In addition, DVRR is unique among mandatory reporting interventions because of its dual referral to DV advocacy.

Data Analysis

We used chi-square tests to detect significant differences in receipt of DVRR by race, ethnicity, gender, sexual assault victimization and repeat visit status. We used logistic regression analysis to assess the association between receiving DVRR and the odds of receiving advocacy services. The logistic regression model included indicator variables for survivor race, ethnicity (Black, Latinx, white) and gender (female, male). We also included two interaction terms, one between DVRR administration and gender and the other between DVRR administration and Black race, ethnicity. Stata's *lincom* command was used to estimate the linear combination of coefficients. We tested interactions between DVRR administration and Latinx and white racial and ethnic categories; these interactions were deemed to be insignificant and were not included in the model. For each category of race, ethnicity and gender, we assessed the impact of DVRR on the survivor's eventual connection to advocacy services using predicted probability with 95% confidence intervals. Finally, we measured differences in predicted probability between groups, and tested those differences for significance using chi square tests. We conducted statistical analyses using Stata 14.2.

Results

DVRR administration was associated with a significant increase in the odds of receiving advocacy services (Table 2). Latinx survivors experienced significantly higher odds of connecting with advocacy services, overall (OR: 2.53, 95% CI: 1.58-4.07). White and Latinx women who received the intervention experienced an estimated 2.60 (95% CI: 1.66-4.07) times increase in their odds of accessing advocacy services. Black survivors who did not receive the intervention had approximately the same odds of receiving services as white survivors. However, Black survivors who received the intervention experienced an *additional* 4.66-fold (95% CI: 3.09-7.04) increase in the odds of connecting to advocacy services; this reflects a significant interaction between the intervention and Black identity. Male DV survivors who did not receive the intervention had 0.20 times (95% CI: 0.07-0.55) the odds of accessing advocacy services compared to female survivors. However, due to the significant interaction between the intervention and male identity, we assessed that the intervention was associated with 12.80 times (95% CI: 4.24-38.64) the odds of men accessing advocacy services.

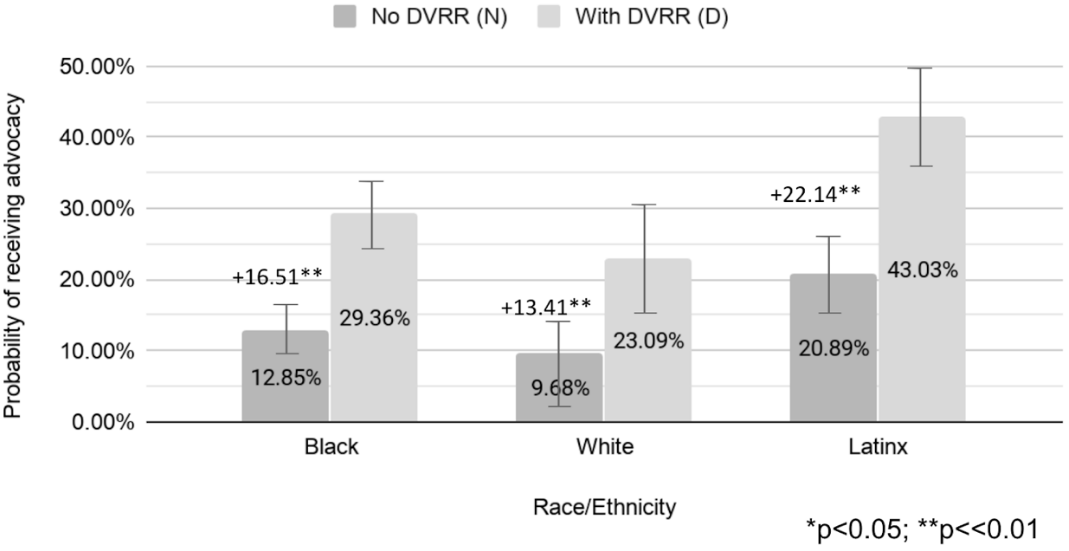
Table 6: Odds ratios of connection to advocacy by patient receipt of DVRR, race, ethnicity and gender

	Baseline odds	*Odds ratios compared to white, female patients who did not receive DVRR*					
	No DVRR, white, female	*No DVRR, Black*	*No DVRR, Latinx*	*No DVRR, male*	*DVRR, female, white and Latinx*	*DVRR, Black*[1]	*DVRR, male*[1]
Odds ratio	0.12**	1.00	2.53**	0.20**	2.60**	4.66**	12.80**
95% CI	0.07-0.20	0.54-1.82	1.58-4.07	0.07-0.56	1.66-4.07	3.09-7.04	4.24-38.64

*p<0.05 **p<0.01 [1]=interaction term

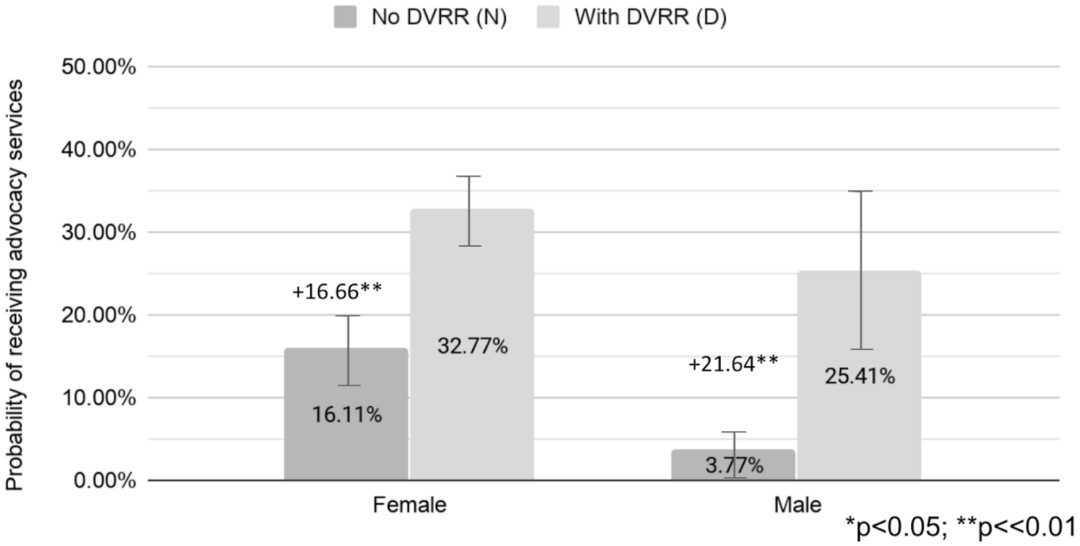
Next, we assessed the predicted probability of Black, Latinx, white, female and male survivors receiving advocacy services with and without the intervention. Without the intervention, 13% of Black, 20% of Latinx, and 10% of white survivors received follow-up services (Figure 2). When DVRR was administered, an additional 17% of Black, 22% of Latinx and 13% of white survivors reached advocacy, and these increases were significant within each group. With the intervention, Latinx survivors were predicted to have a significantly higher probability of reaching advocacy services than white survivors (PP: 1.78; 95% CI: 1.17-2.71; p<0.01, results not shown).

Figure 6. Predicted Probability (95% CI) of Follow-up Advocacy Services by DVRR Status and Race and Ethnicity (see Appendix 2 for detailed results)



Female survivors were significantly more likely than male survivors to subsequently connect with advocacy services (Figure 3). Without the intervention, 16% of women and 4% of men subsequently received advocacy services, a significant difference (Likelihood difference: -9.46%; 95% CI: -13.08% to -5.82%; p<0.01). With DVRR administration, an additional 17% of women and 22% of men received advocacy services, resulting in 33% of women survivors and 25% of men survivors receiving advocacy services. With DVRR, the significant difference between men and women's rates of receiving subsequent services disappeared (Likelihood difference: -9.16%; 95% CI: -18.89 to 0.57%; p=0.06).

Figure 7. Predicted Probability (95% CI) of Follow-up Advocacy Services by DVRR Status and Sex (see Appendix 1 for detailed results)



Discussion

In this study, receipt of DVRR, a digital warm handoff intervention, was associated with significantly higher odds and rate of connection to DV advocacy services for all survivors. It facilitated the highest rates of connection to advocacy among the groups most likely to be affected by DV (4). Latinx survivors experienced the greatest gains when the intervention was introduced, as an *additional* 28% of Latinx survivors reached advocacy. The intervention had a significant effect on Black survivors as well; gains in reaching advocacy services for this group were significantly greater due to the intervention through the interaction between DVRR and Black identity. An *additional* 22% of all Black survivors reached advocacy services.

It should be noted that DVRR was not developed to address the DV care inequities experienced by marginalized groups. However, many of the pathways and mechanisms through which this digital warm handoff intervention operates appear to correspond more closely than other existing interventions to strategies identified as culturally appropriate among Black and Latinx survivors. Existing interventions offer an impersonal referral to survivors, with the expectation that the survivor will initiate contact with additional care (3,48,92). Yet, individual studies highlight the importance of interpersonal solidarity, cultural connections and family support in supporting the safety and resilience of Latinx survivors (124-126). Related themes of cultural solidarity and resisting victimization narratives inform Black survivors' help-seeking efforts (34,101,127). Warm handoff interventions such as DVRR facilitate the advocate reaching out to the survivor, rather than vice versa. In addition, direct-to-advocacy referrals such as DVRR may protect survivors against needing to embrace a stance of victimization and weakness that may conflict with cultural norms (34,101,102) in order to reach advocacy services. These factors may make digital warm handoff interventions uniquely applicable to Black and Latinx survivors and may at least partially explain the large effect size among these groups within this study sample.

Another mechanism for these changes may include a reduction in bias for providers who choose to give the intervention to survivors. Based on historical scholarship and experimental research that suggest providers are more likely to stereotype and discount experiences of pain among racial and ethnic minorities (116,128), it seems plausible that the structured questions and automatic referral in this intervention may bypass these providers' unconscious biases and made non-white survivors more likely to successfully access follow-up services. By offering a digital referral which includes the Danger Assessment as the basis for its report, this digital warm handoff standardizes information-gathering and automates the content, delivery and destination of referrals for these providers. However, any effect of DVRR in reducing provider bias would only apply to providers who chose to use DVRR. While Black, Latinx and white survivors received DVRR at comparable rates in this study, providers administered DVRR at their discretion. Thus, providers who chose to administer DVRR may also have been more likely to proactively connect survivors to services.

Receipt of DVRR was also associated with a significant increase in receipt of advocacy services among both men and women. An estimated *additional* 17% of women and 22% of men reached advocacy services when given the intervention. This suggests that the intervention was associated with a reduction in the barriers that prevented both men and women survivors from reaching care. For women, the standardized Danger Assessment questionnaire may inform this improvement. As for Black and Latinx survivors, this approach may limit provider bias discounting the severity of women's experiences (115). For men, one possible reason for this improvement may be the direct-to-advocacy referral. Structurally, this referral circumvents self-reported reluctance to report or seek help and bypasses potential fears that they may be ineligible for services (118,119).

Strengths and limitations of the study

This study is the first to examine the impact of a digital warm handoff to DV advocacy on survivor outcomes by race and ethnicity and by gender. It represents a unique examination of the care DV survivors receive after presenting in EDs by connecting advocacy and hospital records of DV survivors. In addition, this study contributes to the small body of literature exploring the effect of eHealth interventions for DV in the ED (52). Additionally, it is one of the few to explore how digital interventions facilitate a warm handoff for DV survivors (49,121). Our findings present the potential for digital warm handoffs as a means of addressing racial and ethnic inequities in care among DV survivors.

The primary limitation of this study is a limited sample. As all survivors studied visited a single hospital, these outcomes cannot be generalized to a broader population. In addition, the strategy used to match visits between the hospital and advocacy agency may have affected study results, though not in a way to skew impact ratios. The matching technique between hospitals and advocacy records relies on first and last names, which could give groups with a higher frequency of identical given names (Latinx, male) a higher risk of false positive matches within this sample. However, while this bias may affect the absolute measured rates of services within any given group, it would not affect the measured change in a group's rate of receiving services based on the intervention, since it should affect both intervention and non-intervention groups evenly.

Advocacy data restrictions made it impossible to study additional groups that state-level studies, nationally representative research, and systematic reviews of smaller studies suggest experience heightened barriers to DV response or services. These include Asian, Pacific Islander, and Indigenous survivors (52,95), LGBTQ+ or gender non-binary survivors (62,129), elderly survivors (130), and survivors who live in neighborhoods that may have limited access to services, heightened violence, and other forms of community trauma (98). These limitations restrict the conclusions of this study and therefore may provide fruitful avenues for future research on the efficacy of digital warm handoff interventions in connecting DV survivors, particularly those at the greatest risk of inequities, to advocacy services. Future research should investigate the role of DVRR in reducing inequities among a broader sample to determine the generalizability of these findings. In addition, as DVRR was administered to patients at the provider's discretion, future research should determine if providers differentially administer DV care, including DVRR, and any role this may play in survivor outcomes.

Notably, though rates of advocacy contact, are significantly higher with a digital warm handoff to advocacy, they are still quite low. Despite a two-fold or higher effect size for each group, fewer than half of all DV survivors in this sample ultimately reached contact with advocacy. Future research should investigate the outcomes of survivors who do not connect with advocacy, including their preferences, needs, and interventions that may help them achieve safety, as well as the impact of connection to advocacy services.

Conclusion

The present study found that a digital warm handoff referral to DV advocacy improved access to care across for both women and men and among Black, Latinx, and white survivors, with a significant additional effect among Black and Latinx survivors. While these findings suggest that a digital warm handoff process not only provides meaningful assistance to all DV survivors, they further suggest that such an intervention can be particularly meaningful for members of groups at the greatest risk of DV and inequities in care. Given the disproportionate burden of DV on these groups, as well as the barriers faced by these groups in accessing adequate DV and healthcare, DVRR represents a meaningful step toward adequate support for these groups as they seek DV care in an ED setting.

Paper 3

“A wonderful tool [and] a safety net”: Provider perspectives on a digital direct-to-advocacy referral system for domestic violence in emergency departments.

Abstract

Background: Digital direct-to-advocacy referrals for domestic violence (DV) in emergency departments (EDs) appear to improve survivors' rates of connection to advocacy services, particularly among the underserved. Little is known about the feasibility or acceptability of these interventions among the providers responsible for administering them.

Objective: This study aims to describe the feasibility and acceptability of administering a direct-to-advocacy DV referral system among medical and advocacy providers.
Methods: We conducted semi-structured telephone interviews with 10 medical and 10 advocacy providers who had experience using a digital direct-to-advocacy DV referral system. Interview questions centered around provider perspectives on general DV care in the ED and specific experiences and opinions regarding the direct-to-advocacy referral system.

Results: Providers generally expressed that the direct-to-advocacy intervention was beneficial to their care of ED patients. They reported that the intervention directly improved patient care relative to the prior status quo, fostered collaboration between providers and advocates, and provided formal and informal DV education training to providers and advocates. Providers suggested the content design and user interface could be better adapted to their workflow. These themes cut across all professions of both medical and social services providers.

Conclusion: While providers overwhelmingly consider this intervention highly beneficial to DV care in the ED, minor adjustments may increase the usability of digital direct-to-advocacy DV referrals for DV among medical and advocacy providers.

Introduction

Emergency departments (EDs) offer a crucial point of care for the over 12 million people who experience intimate partner violence (IPV) each year (1). A national study estimated approximately 28,000 ED visits annually given diagnostic codes related to domestic violence (DV), which also includes violence by family members or roommates, between 2006 and 2009 (58). This is likely a vast underestimate, as DV documentation in EDs appears to be both infrequent and inconsistent, and national estimates vary widely (61,85). Yet, individual estimates suggest high rates of ED utilization by DV and IPV survivors. Within Europe, a population-based study found that survivors of sexual or physical abuse sought ED services one or more times per year on average (131). While research in the U.S. is more limited, a detailed study of DV survivors in one Midwestern County found that individuals listed as victims or perpetrators in IPV-related police records visited the ED and were hospitalized for injuries at four times the average county rate (59).

In addition to acute medical care, ED patients who have survived DV and IPV also often need support to address ongoing violence. The Affordable Care Act requires DV screening and brief counseling, often including educational or referral material for survivors (132). These types of interventions often appear insufficient to improve outcomes for survivors (18). A U.S. Preventive Services Task Force systematic review of 30 studies found that DV screening predicted neither harm nor improved survivor outcomes (20). In addition, a randomized controlled trial following 2,364 survivors in Illinois found that distributing pamphlets with DV educational and referral information predicted no difference in hospitalizations, ED visits, proportion of survivors who contacted advocacy, or recurrence of partner violence at one- or three-year follow-up (22,23).

These challenges may be due, in part, to healthcare provider discomfort intervening in DV. Several studies suggest that ED providers feel uncomfortable and ill-equipped in their efforts to identify and assist DV-affected patients due to lack of training, time and resources (86-89,133). Survivors bear the consequences of these challenges. In a study of 207 callers to the National Domestic Violence Hotline, participants reported they had felt fear and uncertainty about discussing DV with a healthcare provider in the previous 12 months, in part due to uncertainty about how the provider would respond; yet only one respondent did not want a provider to inquire about DV. Ultimately, fewer than three in five survivors reported that a provider had asked them about abuse; less than two-thirds of survivors who disclosed were asked any follow-up questions by their provider (134).

Some EDs and other healthcare settings have implemented DV interventions based in digital technology, or eHealth (also known as mHealth or telehealth) interventions, to facilitate and streamline care. Per a systematic review of 31 empirical studies, mHealth tools for IPV allow providers to individualize care without substantial additional time or training (52). Most of the reviewed interventions involved computer-based screening for IPV, sometimes with a patient education component, or aided survivors in safety planning (48,50,51,68). While providers considered most eHealth tools highly acceptable, any measured survivor outcomes did not differ between eHealth and paper-based interventions (52).

An evidence review of healthcare interventions for DV, including 59 systematic reviews, suggests evidence-based interventions, such as specialist counseling and structured risk assessment and safety planning, reduce the extent of future harm to survivors (8). Specialist counseling may include direct personal contact within the ED or via ED staff to a named DV advocate, a practice known as a "warm handoff." Individual EDs implementing in-person (55,56) and electronic (48,49) warm handoff protocols have successfully connected significantly more survivors to DV resources and advocacy. Most of these interventions provide more personalized intervention to survivors (48,55,56), higher rates of contact with trained advocates (49,55,56), and support for providers (48,49,55). Such practices mirror federal-level recommendations for DV interventions and randomized controlled trials of warm handoff interventions in non-DV settings, such as substance misuse, which point to the utility of warm handoffs in connecting patients to needed additional care (64,66,67). Together, this literature suggests that the promise of eHealth for DV may lie primarily in its ability to facilitate effective non-digital interventions, such as warm handoffs.

The present study examines Domestic Violence Report and Referral (DVRR), an eHealth-based DV intervention used in ED settings. DVRR is a web-based, point-of-care ED intervention for DV informed by the eECCM. DVRR allows ED providers to photograph and indicate injuries (with detailed notes including the survivor's medical disposition) on a body map. It includes the Danger Assessment, a validated 20-item questionnaire for the provider and survivor, assessing the current risk of fatal violence (57). With patient consent, a summary referral that includes the Danger Assessment score is digitally transmitted to a local advocacy agency. In a digital warm-handoff, an advocate reaches out to the survivor to assess their needs, help them plan for safety, and connect them with other services they may need. In addition, DVRR sends a report directly to law enforcement in compliance with California's mandatory reporting laws governing any injuries caused by DV.

In this analysis, we examine 20 interviews with ED providers responsible for administering DVRR. We investigate the extent to which DVRR helps address the barriers that providers face in administering DV care in the ED and providers' perceptions of the impact of the intervention on survivors. Additionally, we examine the perceived feasibility, acceptability and utility of digitized evidence-based care, such as warm handoffs.

Methods

Study participants came from two neighboring hospitals in Northern California. Hospital 1 is a public county hospital with an ED that serves as a Level 1 trauma center; Hospital 2 is a private hospital with a small ED. Both hospitals implemented DVRR at least two years prior to the interviews. Eligibility criteria included study participants' employment by a study hospital and self-reported familiarity with DVRR. In total, we conducted 20 interviews. At Hospital 1, participants included physicians (n=4), physician assistants (PA; n=2), registered nurses (RN; n=2), social workers (n=4) and DV advocates (n=6). At Hospital 2, participants included only nurses (n=2), although the ED social worker was eligible for inclusion. Participants were purposively sampled for balanced representation between medical providers and social workers/advocates (Palinkas et al., 2015) and ranged from 6 months to over 30 years in their current employment. Forty-five minute phone interviews were conducted between March and May 2019; participants received a $30 gift card for taking part in the interviews. All research procedures were approved by the institutional review board at Hospital 1 and the Committee for the Protection of Human Subjects at a public research university.

Study participants were recruited via paper and electronic flyers. At the beginning of each interview, the participant called the interviewer, who obtained verbal consent from the participant. Participants were invited to select their own pseudonyms which are used throughout the results. The first three authors conducted semi-structured interviews with participants, which enabled further probes into specific statements (135). Questions aimed to provide context and elicit each participant's opinion regarding the nature, role and impact of DVRR and other DV care administered in the ED. The interview guide (see Appendix 3) was tested for acceptability and relevance with two hospital providers who had used DVRR but were not eligible for the study.

All interviews were digitally recorded and professionally transcribed. All three interviewers reviewed the transcripts of the interviews they conducted against their audio recordings to ensure accuracy. We reviewed and wrote memos for all transcripts. The first author developed an initial codebook including deductive codes based on the interview guide and inductive codes that emerged during the memo-writing phase. We refined the codebook by selecting four interviews for preliminary coding. During this phase, additional inductive codes were added, and both inductive and deductive codes were consolidated and refined. Through this process, we also developed a common understanding of the length of each transcript segment to be coded. By the fourth preliminary interview, we concluded the codebook adequately reflected the interviews' content, and the fourth interview was coded with consistent agreement. After this, the codebook was considered final.

Coding was conducted using Dedoose, a cloud-based coding software that enables collaboration between multiple coders. Among the first three authors, pairs of two coded each interview collaboratively; codes were determined by consensus after discussion. After pair coding, the third coder then reviewed the collaborative coding. As a result, each of the three coders reviewed all interviews. The fourth (senior) author offered ongoing consultation and methodological input. The first author reviewed the coded interviews in aggregate to identify and describe emergent themes in the data. Codes that corresponded to each theme and their associated excerpts were reviewed, and excerpts that best encapsulated the theme were identified. This process was iterative, involving frequent refining and regrouping the assigned themes and subthemes until no new themes emerged (136,137).

Results

"I see [DVRR] as a wonderful tool that's also like this safety net." -- Sarah, RN
"There's been a number of technical issues that we've had." -- Vivian, AD

Our analysis suggests that providers held two key views of DVRR as reflected in the quotes above. First, providers felt DVRR improved the quality of DV survivors' care by replacing the previous standard of care with more survivor-focused, DV-informed education and referral materials. It facilitated collaboration among providers with different areas of expertise and provided them with informal DV training. DVRR also automated a digital referral system to supportive advocacy services and law enforcement; providers felt survivors benefited from this and from survivor education through the Danger Assessment.

Participants generally felt DVRR was beneficial to their care of DV survivors and to the survivors themselves.

At the same time, participants also suggested content and user interface changes that would make DVRR easier to use and better adapted to their workflow. They reported that DVRR could feel cumbersome, in part because it lacked integration features available in other medical software. They suggested adapting DVRR to be more applicable to transgender and non-binary survivors and more accessible to speakers of non-English languages. Some providers resisted conflating mandatory reporting to law enforcement and advocacy referrals, wanting to give survivors more agency in their care. Providers highlighted that these challenges reduced DVRR's efficiency, added redundancy to patient care, and disproportionately impacted the most vulnerable DV survivors. We review these findings in detail in the following sections.

Patient care

Patient education and connection to services

Provider concern for survivor wellbeing was evident throughout the interviews. One participant verbalized a common concern raised by several others, describing DV care as "frustrating, because you want to be able to help your patients, but in a way it's like they've got to be in a place where they're willing to accept help" (Carmen, PA). Nancy (RN) shared that DV care "can be really hard when you see someone that is suffering at the hands of someone they love...and you feel kind of helpless" because "they might be trapped in... that domestic violence cycle of abuse." For many providers, DVRR shifted these feelings of futility to hope that survivors would receive additional supportive resources after leaving the ED. As social worker Diane shared, "When [DVRR] was introduced, I felt it was a wonderful tool…. I felt like the survivors felt like, okay, something can happen. Something is going to happen, because you take pictures. It becomes serious."

Several features within DVRR contributed to this evolution of providers' perspectives. Direct-to-advocacy referrals and the inclusion of the Danger Assessment directly amplified the assistance that providers could offer survivors. Carmen (PA) found direct-to-advocacy referrals "seamless." As Michelle (Social worker) said, "the idea that...after you do the DVRR, the click of the button says something goes to all these different places, and someone is supposed to respond…. I think that's awesome." Similarly, Carmen (PA) noted, "One thing I really love about the DVRR is how...it's kind of like you're having the wrap-around services come to them." Scott (DV advocate) elaborated on the challenge traditional paper referrals may pose to survivors:

> *Getting a referral slip... is what the police do, and most hospitals do: "Here's a list of agencies, or here's the one agency in our area who does this work, give them a call. It's really important you do this, you got lucky tonight. But here's the door, we're not gonna connect you with a shelter, you're on your own now," and we're expecting them, when they're scared and vulnerable and just leaving a hospital, to call up a community-based agency to get an advocate; I think that's a tall order. People certainly do it, and it takes a lot of strength for them to do it, but there's plenty of people that I believe don't do that because they're scared, or they don't have anywhere else to turn, or they don't know what else to do, or it's just like, if you feel like you're*

> *alone, and you feel like this person might retaliate against you if they find out you did this; pretty tall order to ask them to initiate that contact.*

However, he felt DVRR's wrap-around services thoughtfully addressed this concern:

> *Being able to make that automatic referral through the DVRR is great. I think that eliminates the need for the patient to have to make the call themselves. [The DV advocates] have the patient's phone number, the [DV advocacy center] will reach out to them, and of course the patient may not answer… but it does at least increase the odds, from my perspective, that they're gonna be able to get in touch with the folks that are gonna be able to provide the services that they need.*

While direct-to-advocacy referrals facilitated ongoing support for survivors after they left the ED, Scott described the "psychoeducation" of the Danger Assessment within DVRR created a "learning tool" to expand the DV-related assistance that providers offered to survivors during the ED visit itself. Mercedes (DV advocate) called it "a really helpful tool to direct the conversation around this horrible thing that has happened" and "an empowering tool for the patient to see what they want to do." Providers felt they could foster survivors' agency by giving a label to the severity of the abuse the survivor was experiencing. "People like to have a grade," observed Katherine (PA), "and giving them the [Danger Assessment score] and telling them what risk that it puts them in...you can see light bulbs go off in people's heads sometimes." Cierra (DV advocate) noted, "The times that I have done [the Danger Assessment] with patients, they're really grateful that they did it. And they say, 'Wow, I didn't realize it's that bad.'"

DVRR also facilitated a digital report that was sent directly to law enforcement. Some providers were less enthusiastic about this component of DVRR, feeling it risked compromising a therapeutic relationship by including elements of a police investigation. Vivian wanted "to protect our survivors, so depending on what is being told, I don't want to ever criminalize somebody I'm seeing, who has survived something horrible." Marianne (DV advocate) was one of two providers who most strongly disliked the law enforcement portion of DVRR in the ED. She felt that "if your emphasis, right from the beginning, is gathering evidence and getting everything together so that [the legal case] can be charged, then I think that forming that trusting relationship with the patient is going to be made at risk." While acknowledging the importance of documenting injuries and perpetrator information for survivors who want legal intervention, she noted:

> *I think sometimes the focus is on that more than maybe resources and giving the initial emotional support and doing any kind of long-term planning, which is difficult in an ER setting anyway…. As an advocate I should be down there advocating for her or him. Solely looking into their needs. Being there to provide emotional support and follow-up. I shouldn't be the one gathering [data], doing the DVRR.*

Many providers shared experiences of survivors who were not ready to pursue legal aid, and described how combining legal and advocacy aid may have deterred survivors from further help-seeking. Randall (RN) noted, "We've had a couple of cases in the past where the victim refused to answer any questions that are asked on the DVRR itself because they were afraid, so as a last resource we had her talk to one of the specialists [at the DV advocacy center], and she opened up a little bit." However, most providers did not connect survivors to advocacy outside of DVRR, so not participating in DVRR meant that survivors were never connected to any other services. For Elonda (Social worker), "When I have not used DVRR is when the victim does not want to press charges or participate in DVRR." Providers were often uncomfortable with this dynamic and its impact on survivors. Raine (DV advocate) commented, "That's where you have to be just very skilled and quick and swift and just remind the patient that this is documentation that needs to be done as far as their patient stay. They get it. You push through it. That's how I would describe it." Mercedes (DV advocate) suggested that DVRR may burden survivors who do not want law enforcement or even advocacy involvement. She reflected that DVRR "opens up a whole other door for some people who aren't ready for that door to be open," because survivors "thought that they can go to the hospital and be treated for their injuries, where it turns out to be a whole other life changing experience." Such conflicts between prioritizing patient care and complying with hospital or legal protocols complicated providers' process of administering DV care to survivors.

Improved clinical support

Most providers reported that DVRR facilitated their work, often by providing informal DV training or support they may not have had otherwise. It "gives you a step by step of what you're doing," according to Margaret (RN), and "a plan of where you're going, what you need to do, and how to go about the patient getting the help that they need." As Sarah (RN) explained, "[The DVRR training] was probably the most formal training I've had [on DV] and it was invaluable to me. I can say it's opened my eyes…. I really didn't know that much about choking and all that other stuff until I really started doing this." Many participants also described DVRR as improving patient care by consolidating the contributions of providers with different areas of expertise. Cierra (DV advocate) said of the role of DVRR in facilitating collaboration, "I think it's magical. It kind of just brings everybody's role together into one report." Michelle (Social worker) expanded on these benefits: "I liked that it made sure we were kind of looking at the same things...And maybe with less opportunity to miss information that was important to follow up."

Providers particularly appreciated the collaboration DVRR facilitated with DV advocates. DVRR encouraged advocates who received referrals to write brief emails to the referring provider and let them know whether or not they were able to make contact with the survivor. However, DVRR appears to have facilitated these emails to some, but not all, providers listed on a referral. When asked, only about half of providers reported receiving emails after a DVRR referral. Elonda (Social worker) and other providers to whom these emails were sent, declared them "the great piece" of DVRR. Katherine (PA) liked them "because it kind of acknowledges my piece in there," describing that these emails marked a sharp departure from the passive referrals in the previous standard of care: "In the past, God knows if those things were actually making it to...social services."

Without this feedback, providers wanted to rely on advocates' advice to make informed decisions about DV care and treatment, but felt the lack of provider-advocate communication resulted in "a little bit of a black hole," as Rachel (MD) described. She explained "most of medicine doesn't really work that way," referencing other specialties that "tell you, 'this was appropriate to consult me. This is inappropriate to consult me. This is what I did, this is what I didn't do, this is what I'm recommending.'" By comparison, she felt she had to make decisions about DV intervention without expert "feedback [that] helps guide future decision-making." She found this disorienting and frustrating, and described this through the example of one survivor she had worked with:

> *It seemed pretty clear that she wanted [resources], but she didn't know what was available. I actually called on her behalf, and they were like, "You are not allowed to call on someone else's behalf...that's our policy." And I was like, okay, so I don't think I can ever find out did they go? Did they get something? Did they talk to someone?*

Several other providers, including Annika (MD), suggested that feedback indicating a survivor successfully contacted advocacy would "re-energize [providers] and kind of remind them why the work that we are doing is actually helpful." She suggested it might be particularly "helpful from a burnout standpoint" and "improve DV care for other patients."

DVRR represented a transition from paper forms to digital communication among providers, survivors, advocates and law enforcement. Jesse (MD) compared DVRR to a paper-based standard of care, "I have had to fill out [other] abuse paperwork… and [it] is so cumbersome, so if DVRR replaced something like that, which I suspect it did, I'm very thankful for it." Scott (DV advocate) had been surprised that a digital platform constituted such a dramatic innovation. "At first I was like, of course [DVRR is] on the computer, but I didn't realize it was actually such a pioneering program to use, and that most people are still using paper forms."

Usability

While providers described DVRR as an improvement upon the previous standard of care, many noted that DVRR was difficult to use. They presented a variety of design suggestions to improve its usability and increase its impact for survivors and providers alike. These suggestions centered on two sets of recommendations: the expansion of DVRR content to be more inclusive of survivors and adjustments to the design of its user interface.

Patient inclusivity

Within DVRR, providers reported that injuries could only be documented on a cisgender female or male body map, and two participants reported the male body map was hard to find. As Darlene (DV advocate) pointed out, "as far as I know, I've only ever seen the woman body." Excluding transgender and non-binary survivors risked compromising the care of uniquely vulnerable survivors. Carmen (PA) pointed out that "there's no transgender [body map] option," and that "maybe if you had a gender neutral [option], that would be nice. Because...especially male-to-female [transgender patients], they're high risk for being sexually assaulted or in domestic violence."

Currently, DVRR is only available in English. As a monolingual English-speaking provider in a crowded ED serving a very diverse community, Michelle (Social worker) said, "I wish that [DVRR] was in the language of the patient," so that "if I felt it would be better, confidentiality-wise or whatnot, to give them the iPads themselves to complete that Danger Assessment...then [DVRR would] convert it in English for me." Mercedes (DV advocate), a bilingual advocate, said she "would love to see it in different languages," because it was "an added effort to have to translate what I'm reading in my mind and then verbally say it to the patient." Increasing DVRR's inclusivity would both improve the quality of patient care and give providers flexibility to adapt DVRR's administration to the limited privacy available in the ED.

Cierra (DV advocate) mentioned drawbacks of the DVRR process itself, stating that it could be intimidating to patients to complete the assessment and may evoke concerns about privacy and confidentiality. She noted that "the biggest worry, too, is they think when I am filling this out that means that their partner...is gonna go to jail." Vivian (DV advocate) discussed these challenges and surfaced a broader issue with survivors' inability to opt out of mandatory reporting through DVRR due to the legal mandate. She suggested it may harm some survivors "especially when law enforcement are involved, even more so if there are immigration concerns, financial concerns….somebody could risk some type of criminalization, even when they're a victim." Without specifically mentioning DVRR, Michelle connected this harm to broader inequitable treatment of survivors in the ED:

> *Let's say it's a married, middle-aged, Caucasian woman, she may get back to me and appear that things will be more of a movement to hurry up and get her back. To protect her dignity and confidentiality and blah blah blah. But, maybe not so much for the same scenario and it be a woman of color. It doesn't seem consistent in the urgency, if that makes sense….It just seems like the woman of color is not as urgent sometimes. When it is an urgent situation. It feels and seems inconsistent."*

Michelle also detailed the long-term implications of such disparate treatment on marginalized DV survivors using the example of homelessness.

> *Don't be homeless and be a domestic violence client, because...you have nowhere to go already. So we receive you, assist you with services, but you have nowhere to go. Now it's a long-term housing issue. You already had a long-term housing issue. Most programs don't accept you. They're looking for the typical -- I hate to say typical, maybe I shouldn't say that. The case that we usually think about domestic violence, right? The woman, she's at home, the man comes and beats her and she packs her bag and runs off! But, she has a job or she doesn't have a job, she has skills. She can do some things or whatever. She has resources but she can't go there because he knows where those places are. We're looking for that woman. Not "we" meaning the hospital, "we" meaning the general domestic violence community. We're not always looking for the alternative cases like the homeless domestic violence survivor.*

Vivian alluded to similar problems while discussing DVRR: "We are in a housing crisis here...so people live in really unsafe environments, because that's all they have. I can see how having [DVRR] could influence negative impacts, but," similar to other providers, she concluded, "I would say [DVRR] would be more positive than negative overall."

User Interface

While providers welcomed the mobility provided by their ability to administer DVRR on a tablet, several providers highlighted challenges to DVRR's user interface that made patient care more challenging. These concerns centered around duplicated effort and technical glitches. Katherine's (PA) proposed revisions summarized suggestions that were shared by many providers:

> *It's a tool that has way too many glitches and issues right now. It really needs the hand of someone like Apple to come in and make it make sense. I wish we could partner with somebody who really gets it to be an easy tool to use, because right now it's a great concept, but the tool itself is not that easy to use. … I'd like just an ease of use that doesn't exist right now. We would be way more prone to pulling it out and using it.*

Providers described ways DVRR's user interface could be better adapted to their workflow. Jesse (MD) noted "some pretty unsafe consequences of having many different EMRs [electronic medical records] right now." Taylor (MD) was one of many providers who felt that "integration into our existing noting system would probably be the most parsimonious way to encourage clinicians to complexly document" DV visits. Mercedes (DV advocate) said she "would like for there to be some kind of … little extra area for any other notes that you can't really put into somewhere else." To document injuries, Carmen (PA) wanted to be able to "click [on the body map] and you say 'okay. There's an abrasion here,' then you kind of give details about that abrasion." For Katherine (PA):

> *I would like a stylet and some kind of [interface] that lets me draw in the injuries and write what they are, rather than use the drop-down menu and have to keep clicking and clicking to get more and more answers and sizes and places. It's so frustrating. I hate the body mapping chart. I absolutely hate it.*

Medical providers worried that completing DVRR created redundancy with their medical exam and compromised patient care. Providers such as Annika (MD) disliked "having to type everything over again into the iPad" after they "document everything in [their] own medical chart." Rachel (MD) looked for a seamless connection between her physical exam and DVRR because "it would save a repetitive piece of work and probably lead to a more thorough documentation." Taylor (MD) put this idea bluntly: "The less separate work we do, the more likely we are to provide a complete and accurate record willingly, I would say." Two providers proposed specific solutions to this redundancy that involved integrating DVRR with other medical software they used to streamline patient care. Katherine (PA) suggested "we could scan their wristband, and then boom, it puts all their info into the computer. That would be way better than us having to type it all in." Taylor (MD) referenced an app that allows providers to import pictures from their phone into a patient's medical record.

The challenges redundancy posed to care were especially high for survivors of both DV and sexual assault. Providers completed a separate lengthy protocol for each of these concerns, although, as Carmen (PA) described, they saw a "huge overlap" between domestic violence and sexual assault victimization among their patients.

> *I have to go through the whole sexual assault exam, which can take up to four and a half hours. Then on top of that, I have to add in now, I just asked all these intense questions about what happened to you during your sexual assault, and now I have to*

> *go back at the end… [and] ask these questions for the DVRR. If it could be implemented where it's just kind of meshed into the [sexual assault report], that would be great.*

In the study EDs, each survivor's visit is assigned to a specific provider, who logs into DVRR and completes the program under their unique login. Scott (DV advocate) described that if a provider is unable to submit the DVRR report due to a shift change or for any other reason, "Then it's on the next person; they log in with their account, they can't see my case." Vivian (DV advocate) also wanted a way to share information within a team. She suggested a team login "because sometimes a case will flow into another person's shift, right? And so then we come up [against] 'Oh well, how do we get in there? What do we do?'"

Specific improvements to DVRR's user interface would allow providers to spend a greater proportion of their time and energy involved in patient care. Scott (DV advocate) remembered that "they told me it was an app when I first came, and it's not an app, it's access through the browser." After using it "three or four times on the iPad, I was like never again...and to this day I don't use the iPad. I bring my computer up." Many providers mentioned experiencing occasional glitches, such as when a provider tries to "refresh the page and it logs me out sometimes" (Cierra, DV advocate), or "the screen shuts off" (Scott, DV advocate), or "there were problems with things being saved," (Marianne, DV advocate). "Even inputting the name of the patient, sometimes it autocorrects to some other thing if you type too fast," noted Katherine (PA). Several providers mentioned challenges indicating which providers cared for the survivor, because the name must be selected from a drop-down menu (which does not contain all providers' names) rather than typed into a free-entry box. Michelle noted that these challenges were ultimately passed on to the survivor. "In the middle of trying to talk with a patient, you don't need the system to not be accessible."

Even without technical glitches, some providers struggled to use DVRR. This primarily took the form of "a lot of fumbling at the beginning...getting onto it, getting passwords, you know, using it" (Marianne, DV advocate), particularly when providers did not use iPads outside of DVRR. Raine (DV advocate) experienced this frustration personally, as "there were moments where I wanted to quit because I felt like… 'God, I am incompetent at this moment.'" However, she and others noted that after they became acclimated to the program, use of DVRR was "a piece of cake."

Providers' concerns with DVRR's usability highlighted elements of the program that created redundant work or inconvenience in their provision of clinical care. While providers warmly welcomed the Danger Assessment, direct-to-advocacy referral and advocate feedback included in DVRR, concerns with DVRR's inclusivity of all survivors and usability tempered providers' enthusiasm.

Discussion

Participants felt that DVRR streamlined their workflow and improved the quality of clinical care they were able to give DV-affected patients. In particular, they welcomed the innovations introduced by DVRR: digitally-facilitated care, direct-to-advocacy referrals, a provider-advocacy feedback loop, and the use of the Danger Assessment as an educational tool for both survivors and providers. However, providers felt DVRR's lack of customizability led to the exclusion of transgender or gender non-binary survivors and survivors who may not speak or read English. They were concerned about the potential risk that mandatory reporting through DVRR may pose to survivors who are undocumented, are insecurely housed, or who confront other sources of vulnerability and marginalization, such as race and ethnicity. They expressed frustration with its glitchy user interface and lack of interoperability with existing medical technology.

Many implications of these results can be described using two theoretical models: the electronically-Enhanced Chronic Care Model (eECCM) and the Technology Acceptance Model (TAM). Key elements of the eECCM include self-management support for patients, expert decision-making support for providers, a feedback loop among experts, patients and providers, interoperability with existing technology systems, and customizability to patient circumstances (138). Providers described the direct-to-advocacy referral as a self-management tool for survivors as it made expert resources readily available to survivors without them initiating advocacy contact. The receptiveness and warmth of several providers toward this warm handoff resembles that of an in-person warm handoff program at another hospital (80). Providers' perceptions of the high utility of this digital warm handoff align with measured outcomes for survivors, as well. In prior research at these two hospitals and a third, survivors who received DVRR were three to six times more likely to make contact with advocacy than survivors who did not (121).

Providers suggested the Danger Assessment offered clinical decision-making support to providers, and DV education to survivors. Elonda (Social worker), Carmen (PA) and Annika (MD) highlighted the positive role of the advocate-provider feedback loop in administering high-quality care. Interviews with 35 doctors, nurses and social workers at a U.K. hospital suggested that providers felt collaboration with DV advocates was critical to their practice, yet that these relationships were often unavailable to provide the necessary expertise and support (133). In the present study, physicians and PAs pointed to their role as generalist ED providers, highlighting their reliance on collaboration with specialists such as DV advocates. As some participants noted, DVRR can close the distance between DV advocates and ED providers by providing feedback to providers about survivor outcomes, an initial step toward provider/advocate collaboration. While DVRR does so imperfectly, participants still saw its use as a step toward improving survivors' care. Future improvements to DVRR may include further development of this advocacy feedback component.

DVRR appears to resemble other interventions that are based in the eECCM and its parent theory, the Chronic Care Model (CCM), which improve patient care across a wide range of health concerns including IPV (139-143). A study of the use of DVRR in three hospitals found recipients were over three times as likely to connect with advocacy services compared to previous care (121). Provider concerns highlighted a lack of interoperability with existing EHRs and a lack of customizability. These are ways in which DVRR does not correspond with the eECCM; some discussed how these factors contributed to providers' difficulty using DVRR. Evidence around TAM suggests that providers' perception of digital innovations' productivity is the largest predictor of whether providers intend to use it (144-146). This was true of the present study, as providers generally linked their positive feelings about using DVRR to the productive improvements they felt it facilitated in DV care. Many highlighted improvements to the quality of survivors' care through direct-to-advocacy referrals, the Danger Assessment, and advocate feedback. These innovations, particularly those that connect providers and survivors with advocates, represented a dramatic improvement in the productivity of DV interventions. Annika (MD) and Rachel (MD) expected specialist feedback and collaborative relationships derived from a wide variety of interprofessional consultations, including DV. Without it, they felt the standard of DV care fell below their expectation. This is consistent with several qualitative studies, in which providers have suggested that they may view DV as less urgent or less serious than other concerns facing ED patients; this is in part due to the limited training and resources restricting these interventions' perceived productivity (91,147). Theoretical literature on DV interventions and point estimates at individual EDs suggest that collaboration, feedback and interconnectedness between medical providers and DV area experts are critical to productive medical and social care (55,133,138). Based on responses in this study, DVRR's productivity may consist, in part, in elevating the availability of professional DV training, resources and collaboration to more closely match that of other presenting concerns in the ED.

While positive about ways DVRR facilitated productive intervention for DV, providers also raised concerns about its ease of use. Katherine (PA), Rachel (MD) and Taylor (MD) specifically stated that, regardless of its productivity, they would be more willing to use DVRR if it were easier to use and integrated better with their existing medical processes. This is consistent with prior research and has tangible implications for patient care. One systematic review of 24 studies governing TAM-based point-of-care interventions found that, while perceived usefulness was the most important predictor of physician intention to use, technical challenges such as an unfriendly user interface or higher levels of perceived user effort created a consistent barrier to use (145). Providers across all 24 studies in Jun's review generally had positive perceptions of their ED's point-of-care interventions, as did most providers in the present study. However, across the studies in Jun's review, only 30 to 59% of relevant cases received the intervention. DVRR appears to follow this trend, as well. Across three hospitals that implemented DVRR between 2014 and 2016, it was only used in 50% of eligible patient visits (121). These findings suggest that conceptual promise may not be enough to ensure that even an intervention linked to positive outcomes and perceived to be productive by providers ultimately benefits DV survivors.

Providers expressed concern about the additional burden DVRR may place on survivors already restricted or marginalized in society, such as those with transgender or nonbinary bodies; who do not speak English; who have unstable, insecure or inadequate housing; or who are disproportionately subject to law enforcement, such as racial and ethnic minority survivors. Transgender and nonbinary individuals appear to experience high rates of IPV: a study of 204 transgender women in two large urban areas found 42% had experienced IPV (148). Nine transgender IPV survivors interviewed in grey literature reported transphobia, minimization of their abuse, and threats to outness preventing their disclosure to medical professionals (149). In addition, the automatic report sent to police through DVRR (mandatory for California providers responding to injuries caused by DV) may have a differential impact on survivors. In the present study, some providers felt conflicted about DVRR as it facilitated compliance with a mandate they felt risked criminalizing or inflicting further harm upon already vulnerable survivors. A survey of survivors who accessed the National Domestic Violence Hotline suggests that survivors respond to similar fears by not reporting DV at all. Within this study, fear of being reported to law enforcement deterred more than one in four survivors from seeking medical or mental health care, and almost one in five from seeking any help at all (27). Transgender and nonbinary survivors reported significantly greater barriers to disclosure and fear of their own arrest. Fears and negative consequences around child protective services and criminal legal involvement emerged frequently in open-ended responses from 718 of these survivors -- particularly among racial and ethnic minority survivors (27).

This highlights the heightened risk to racial and ethnic minority survivors of embedding an optional direct-to-advocacy referral within a mandatory law enforcement report. Representative data on police encounters in New York City and Baltimore found that negative experiences with police response to IPV and higher levels of IPV were significantly associated with a lower perception of police legitimacy and trust -- especially among Black participants (150). These findings are unsurprising in a national context in which racial and ethnic minority individuals disproportionately experience negative consequences ranging from injury to death as a result of interacting with law enforcement (151,152). While law enforcement may offer aid to many DV survivors, predicating advocacy services on a law enforcement report may create a punitive environment for DV survivors and place both minority survivors and perpetrators at a disproportionate risk of harm. Michelle described systemic differences between the treatment of white and non-white DV survivors at Hospital 1. Cierra and Vivian both described how mandatory reporting through DVRR may directly lead to hardship for survivors vis a vis jail, homelessness or other considerations that national-level research suggests disproportionately affect racial and ethnic minorities (153,154). As a result, mandatory reporting is likely to lead to different outcomes for racial and ethnic minority survivors relative to white survivors. Ultimately, incorporating a warm handoff to advocacy services into this mandatory report broadens the scope of assistance survivors may receive and may make providers more likely to connect survivors to any aid, at all (121). Yet the inverse may also be true. By predicating advocacy services on sending a report to law enforcement, DVRR places all sources of aid at risk for survivors weighing the legal risks of disclosure with the personal risks of silence.

Limitations

This study has several notable limitations. First, while the sample size was robust overall, including participants across two hospitals and five provider specializations, we do not have sufficient data to meaningfully examine patterns by site or specialization. In addition, 18 of the interviews came from one hospital, and this hospital employs DV advocates to assist with DV response in the ED; very few hospitals have implemented a similar caregiving structure (80). Therefore, the data represent the experience of implementing DVRR in a specific context that may not mirror a general standard of ED care. The second limitation is that participants were all interviewed in their capacity as providers. While some participants had experienced family violence, none had received DVRR as an ED patient; thus, survivors' perspectives as they relate to the utility and acceptability of DVRR are absent from this study. DVRR's increased longevity and continued adoption in EDs and other healthcare settings will provide opportunities for these and other future studies. Finally, while we primarily sought to understand the implementation of DVRR from a provider perspective, we also asked providers to speak to the impact of DVRR on survivors. Investigating this question from the perspective of survivors is critical in future inquiry.

Conclusion

This study found that DVRR assisted providers' response to DV in the ED, due to its direct-to-advocacy referrals, facilitation of provider/patient education through the Danger Assessment, and feedback loop among providers, advocates, and survivors. Targeted improvements may facilitate delivery of these promising components. Providers outlined several needed responses, technical improvements, such as a streamlined user interface and improving customizability to meet the needs of transgender and non-binary, non-English speaking and other survivors. This analysis gives depth and context to the subjective impact of DVRR implementation and use in EDs. More broadly, it also suggests promise for the feasibility and productivity of digital warm-handoff programs for DV care in the ED.

Conclusion

When survivors of domestic violence seek ED care, they often encounter providers who have little to no training in DV administering disjointed and ineffective emergency department protocols that facilitate little or no connection to advocacy agencies with DV expertise. Resulting from this lack of non-medical care, many survivors must find their own path to advocacy or other professional assistance. The many steps involved in this journey would be daunting and overwhelming for anyone. They may be especially so for a recent survivor of domestic violence, responding to the constant threat of further violence with the survival responses that accompany trauma.

Due to EDs' prominent position in detecting and responding to DV, survivors should be met by providers adequately trained to connect them to effective resources. In order to administer this assistance, providers require a supportive infrastructure that will allow them to administer this care within the time and space available in the ED. Of the many interventions that have attempted to fill this role -- paper and digital universal screening, referral or educational pamphlets, and more -- none consistently give both providers and survivors enough support to improve survivor safety, mental health, or visits to supportive services (23,52).

As a digital "warm handoff" intervention, DVRR appears ideally poised to fill this gap. Warm handoffs allow providers to link DV survivors directly to professional advocates who are equipped to help that patient with their specific need. This approach requires minimal additional training or expertise from the provider while removing a large burden from the survivor. And removing barriers and burdens from survivors has consequences. Evidence from this dissertation suggests that this warm handoff dramatically improves the likelihood that survivors who seek ED care will reach advocacy services, with particular benefits for Black and Latinx survivors who are often underserved within medical care. This structured, evidence-based warm handoff intervention dramatically improves survivor outcomes with a much larger sample than most hospitals before it, expanding the populations known to be served by warm handoffs for DV.

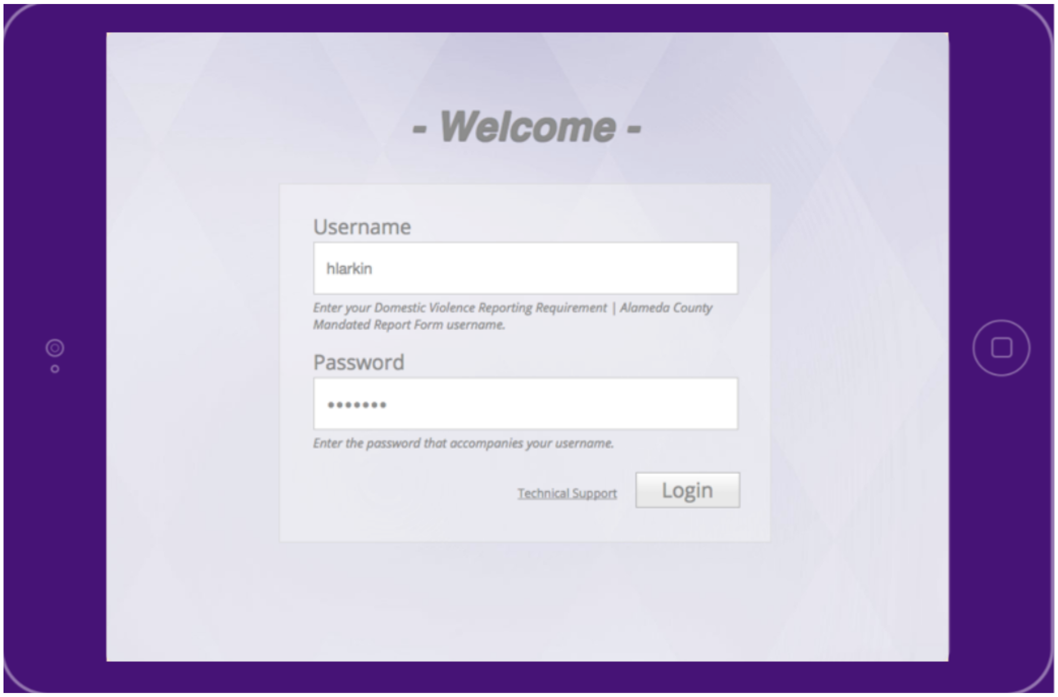
Digital warm handoff interventions are novel, with ample room for growth and support. In particular, because DVRR is an eHealth intervention, it faces systematic technical difficulties such ranging from minor usability issues to the exclusion of trans bodies and speakers of non-English languages that must be addressed in order to fully serve all survivors. And running a warm handoff program is not easy. Both a large hospital system that implemented a warm handoff protocol in the U.K. and providers who responded in Paper 3 noted the importance of a champion to the warm handoff process. This champion understood the needs and perspectives of survivors, providers and advocates and could address concerns to keep the warm handoff protocol functioning smoothly (54). This suggests that neither digital nor in-person protocols run themselves; however, respondents in both the U.K. and in the present study repeatedly emphasized how well the warm handoff protocol worked due to the efforts of this "boundary spanner" (54).

However, the potential is there. Nearly three times as many survivors in every group reached advocacy when given DVRR -- far more for Black survivors -- such that nearly half of all Latinx survivors reached advocacy when given DVRR. With this level of impact even in an intervention that is not yet inclusive of all survivor groups, it exemplifies the vast potential of warm handoffs to connect DV survivors to needed care.

Appendices

Appendix 1: DVRR screenshots

Welcome screen



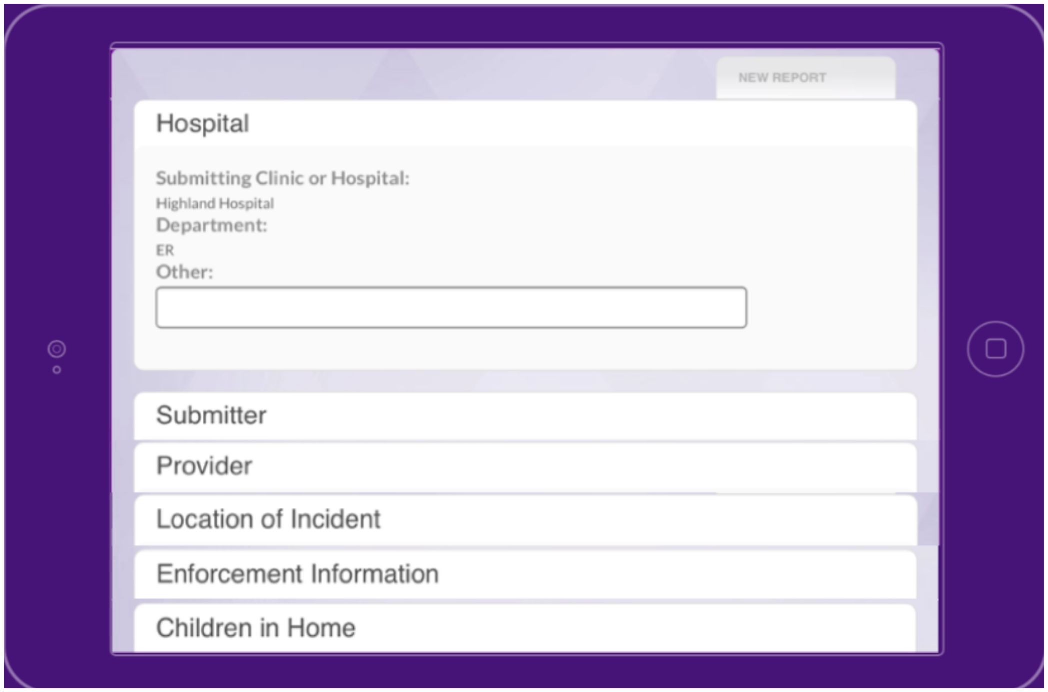
Username: hlarkin

Enter your Domestic Violence Reporting Requirement | Alameda County Mandated Report Form username.

Password: •••••••

Enter the password that accompanies your username.

Survivor information

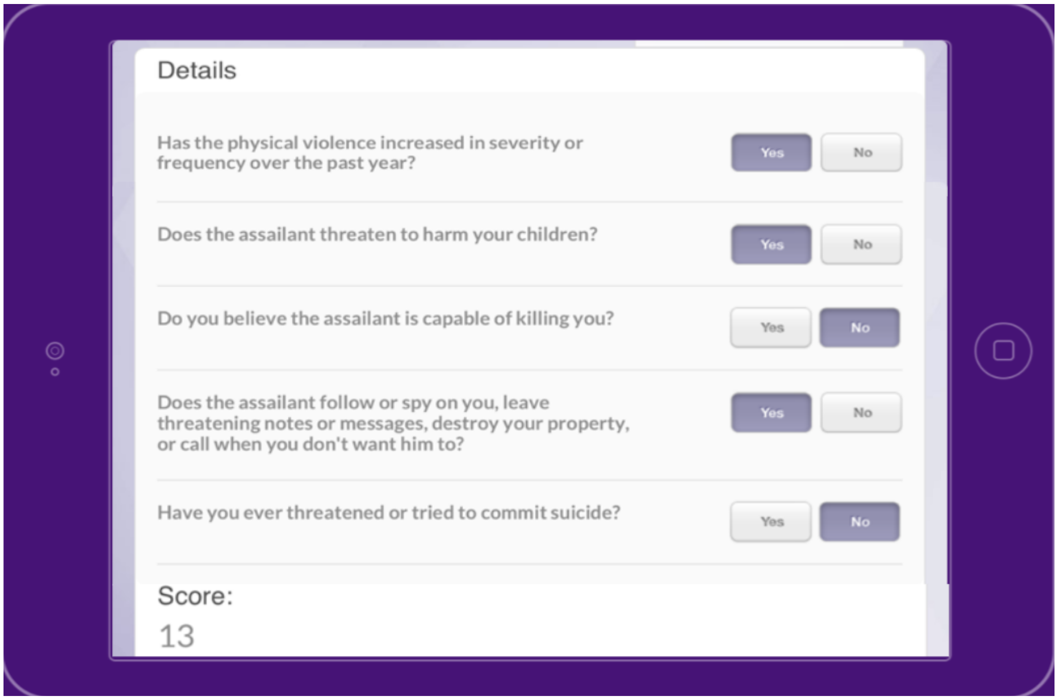


Submitting Clinic or Hospital: Highland Hospital

Department: ER

Other:

Excerpt from Danger Assessment



Details

Has the physical violence increased in severity or frequency over the past year? [✓ Yes] No

Does the assailant threaten to harm your children? [✓ Yes] No

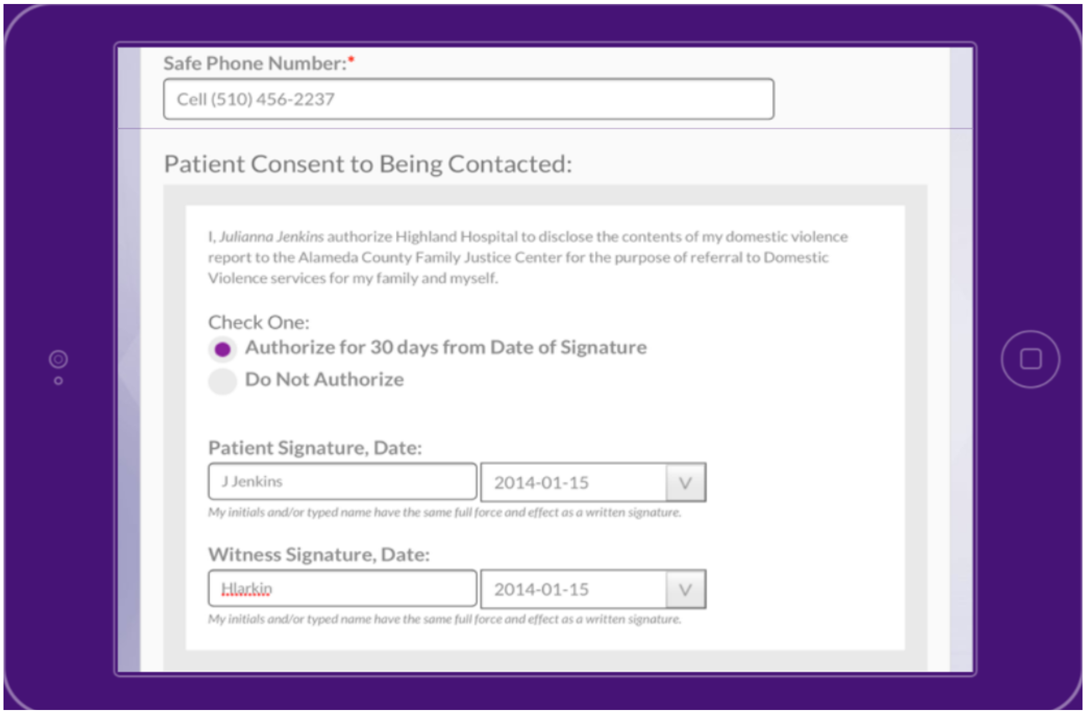
Do you believe the assailant is capable of killing you? Yes [✓ No]

Does the assailant follow or spy on you, leave threatening notes or messages, destroy your property, or call when you don't want him to? [✓ Yes] No

Have you ever threatened or tried to commit suicide? Yes [✓ No]

Score:
13

Mandatory report and survivor consent to advocacy follow-up



Safe Phone Number:*
Cell (510) 456-2237

Patient Consent to Being Contacted:

I, *Julianna Jenkins* authorize Highland Hospital to disclose the contents of my domestic violence report to the Alameda County Family Justice Center for the purpose of referral to Domestic Violence services for my family and myself.

Check One:
● Authorize for 30 days from Date of Signature
○ Do Not Authorize

Patient Signature, Date:
J Jenkins 2014-01-15
My initials and/or typed name have the same full force and effect as a written signature.

Witness Signature, Date:
Hlarkin 2014-01-15
My initials and/or typed name have the same full force and effect as a written signature.

Appendix 2: Individual 95% confidence intervals for estimated group rates of connection to advocacy before and after DVRR

	Appendix 2: Differences in predicted probability of connection to advocacy services with DVRR vs no DVRR								
	No DVRR	95% CI		With DVRR	95% CI		Est. increase	95% CI	
Total N	626			740					
Sex									
Female	0.16	0.12	0.20	0.33	0.28	0.37	0.17	0.12	0.21
Male	0.04	0.00	0.07	0.25	0.16	0.35	0.22	0.18	0.25
Race and Ethnicity									
Black	0.13	0.09	0.17	0.29	0.24	0.34	0.17	0.12	0.21
White	0.10	0.05	0.14	0.23	0.15	0.31	0.13	0.10	0.17
Latinx	0.21	0.15	0.27	0.43	0.36	0.50	0.22	0.17	0.27
*$p<0.05$ **$p<0.01$									

Appendix 3. Interview guide

Get to know you questions

1. In writing about this interview, we will never use any information that would identify you. When we write in the future, is there an alternate name or alias you would like us to use to identify you?

2. Tell me a little about yourself and what you do here at the hospital?

a. What is your professional title?
b. How long have you had this role at the hospital?
c. How long have you been a [professional role]?
d. What does your job look like day-to-day?
e. Have you had any training in domestic violence or sexual assault?

Probes: Can you tell me more about that? What do you mean by ____?

General opinions on domestic violence in hospitals

Thanks for sharing that! [*reflect key points for constructive listening*]. As you know, this is a study about interventions for domestic violence in emergency departments. So, first, I'm going to ask some questions about domestic violence generally, then we'll move on to DVRR, specifically.

3. What has been your experience administering care to domestic violence victims in your emergency department?
    a. What is that like for you?
    b. And how does that compare to other groups of trauma patients, for example, car accident victims?

4. What are the biggest challenges you face when you administer care to domestic violence victims?
    a. How would you describe any challenges facing your emergency department generally when domestic violence victims come to seek care?

Probes: Can you tell me more about that? What do you mean by _____?

5. When done well, what do you think is the emergency department's role in responding to domestic violence?

Probes: same as above for the rest of the interview guide

6. What is your hospital's protocol for responding to domestic violence?
    a. Does your emergency department offer resources directly to patients who have been victimized by domestic violence?

i. If so, what resources does your emergency department offer?
ii. (*If social service is mentioned*): What are the social services available t o/in your hospital like?
iii. (*If social service is mentioned*): If you contacted them for any reason, what were your interactions with social services like?

a. Who is generally responsible for administering this protocol? [*for clarity: this should be (a) professional role(s)*]
b. How does that relate to or affect your job?
c. Have you ever administered these resources to a patient?
    i. If so, what is that like?
    ii. What would be your thoughts on a feedback loop that told you whether or not the patient actually got the services you referred?
  d. What are your legal requirements around domestic violence, if you have them?
    i. What has your experience with these requirements been like?
  e. Remembering that your answers are completely confidential and won't be traceable back to you, were there situations where you had a domestic violence patient and didn't follow this protocol, either the legal components or the hospital components? Can you tell me more about that?

<u>Personal experience using DVRR</u>
Thanks for that! It's good to get a bigger picture of domestic violence in your emergency department generally before delving into specifics! The next few questions are going to talk about how you administer domestic violence interventions to patients, including DVRR,

7. Since DVRR was introduced to your emergency department, what has its role been?
a. How does that role relate to your work?

8. How were you introduced to DVRR?

9. Since you were introduced to DVRR, what has influenced your decision whether or not to use it with any particular patient?
a. Have there been situations where you've had a domestic violence patient and haven't used DVRR? Can you tell me more about that?
b. Have any other barriers made it difficult for you to use DVRR?

10. Have you ever personally administered or tried to administer DVRR to a patient?

11. How do you use DVRR in your job? Could you talk me through the process?
a. How frequently do you use it?
b. How long have you been using DVRR?
c. How long does it take?
d. Does that feel like too long, too short, or just right?

12. How comfortable do you feel using DVRR now, compared to when you started?

13. How would you describe your overall experience using DVRR with patients?
    a. What do you like about using DVRR?
    b. What do you dislike about using DVRR?
    c. How do you feel about the login process?

    d. How do you feel about the content of DVRR?
    e. How do you feel about advocate emails? (*for clarity: that tell you a patient you referred is receiving services*)

14. How do you think domestic violence patients' experiences in your emergency department have changed since the introduction of DVRR?

15. Earlier, you mentioned some challenges you face when intervening in domestic violence. What effect do you think DVRR has on these challenges, if any?
    a. What effect do you think DVRR has on the challenges you mentioned your emergency department faces when addressing domestic violence, if any?

16. How has your emergency department's protocol for handling domestic violence changed since DVRR was introduced, if at all?
    a. How has this affected your work, if at all?

17. The hospital is considering implementing DVRR in other departments, like Labor and Delivery. What do you think about that?

18. What, if anything, would you change about DVRR?

19. What, if anything, would you change about the way DVRR is used in your emergency department?

<u>Final questions</u>

20. Is there anything else you think I should know about what it's been like to use DVRR, both for you and in this emergency department, that I haven't asked?
21. I know DVRR isn't the only mandatory report you fill out, but we've been talking about it like this lone silo, when all these mandatory reports go together. Can you tell me about the other mandatory reports you're responsible for?
    a. What are your thoughts if you had one online platform to fill out all of these reports?
22. In the last 2-3 years, besides DVRR, what other changes have affected your work in the emergency department?
23. Thank you for your time; is there anything else about DVRR or caring for domestic violence patients you'd like to tell me before we end the interview?

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