RESEARCH

Barriers and Facilitators to the Implementation of Injury Prevention Programs: A Qualitative Exploration and Model Development

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ABSTRACT

Background: In 2006, the American College of Surgeons Committee on Trauma mandated implementation of injury prevention programs as a requirement for Level I and II trauma center designation. Little is known about the factors that facilitate or create barriers to establishing evidence-based injury prevention program implementation. The purpose of this research is to generate hypotheses regarding processes used to implement injury prevention programs at trauma centers, identify the factors that facilitate and serve as a barrier to implementation, and develop a model reflecting these factors and relationships.

Methods: This is a qualitative study of injury prevention programs at trauma centers. Study participants were chosen from 24 sites representing trauma centers of different patient volumes, geographic regions, and settings in the United States. Subjects participated in phone interviews based on guides developed from pilot interviews with prevention coordinators. Transcribed interviews from eight subjects were analyzed using a system of member checking to code; analysis informed the identification of factors that influence the establishment of evidence-based injury prevention programs.

Results: Five themes emerged from the data analysis: external factors, internal organizational factors, program capacity, program selection, and program success. Analysis revealed that successful program implementation was related to supportive leaders and collaborative, interdepartmental relationships. Additional themes indicated that while organizations were motivated primarily by verification requirements (external factor), strong institutional leadership (internal factor) was lacking. Employee readiness (program capacity) was hindered by limited training opportunities, and programs were often chosen (selection) based on implementation ease rather than evidence base or local data.

Conclusions: Data analysis reveals five emerging themes of program implementation; using these data, we suggest an initial model of barriers and facilitators for implementing evidence-based injury prevention programs that could serve as the springboard for additional research involving a larger representative sample.

Key Words

Injury prevention, Program implementation, Qualitative research, Theoretical model, Trauma centers

Despite the advancement and proliferation of trauma systems over the past five decades, injury remains the leading cause of death for persons ages 1 to 44 years (National Center for Health Statistics, 2017; National Center for Injury Prevention and Control, 2006). The economic burden of traumatic injury in direct health care costs and lost productivity secondary to resulting disability is estimated to be over $200 billion per year (National Center for Health Statistics, 2011). Although trauma systems have been shown to save lives and improve outcomes, prevention is still a central objective to reduce the burden of trauma (Brockamp et al., 2018; Cirone, Bendix, & An, 2020; Cornwell, Chang, Phillips, & Campbell, 2003; Shackford et al., 1987; Stewart et al., 2019).

Models of trauma center-based injury prevention (IP) programs have been developed to address this important public health problem, and trauma-specific

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guidance requires Level I and Level II trauma centers to include IP professionals on staff and create interventions that address a major cause of injury in their communities. In 2006, the American College of Surgeons Committee on Trauma (ACSCOT) formalized their commitment to IP by including specific criteria in this area for the verification of Level I and II facilities as part of their publication *Resources for Optimal Care of the Injured Patient*, informally referred to as the "Green Book" (Committee on Trauma of the American College of Surgeons, 2006); this edition was replaced with the Orange Book in 2014.

Although some studies have documented IP activities at trauma centers, little is known about the influence of the ACSCOT criteria on the establishment of evidence-based IP programs and the impact of these programs on reducing the burden of injury (McDonald et al., 2007).

The Green Book verification criteria for Level I and II centers mandated that a designated IP staff member must utilize their trauma registry or epidemiological data to address major causes of local injuries and partners with other community organizations to coordinate and disseminate prevention strategies. The Safe States Alliance identifies additional elements essential to the enhancement of IP program capacity, including building and maintaining a solid infrastructure and providing training and technical assistance for the coordinator to provide IP leadership (Safe States Alliance, 2013). In 2017, Safe States published a set of standards and indicators to help guide Level I and Level II trauma center IP programs toward stronger programs aligned with public health practice (Lezin & McPhillips-Tangum, 2017). None of these guidelines provided the details needed by centers to implement an IP program effectively. Furthermore, little research exists exploring institutional structure and processes that influence the integration and success of IP programs.

Historically, although evidence-based programs, tools, and interventions were not widely adopted or successfully implemented in clinical settings, the field of program dissemination and implementation has grown dramatically over the past decade (Brownson, Colditz, & Proctor, 2012).

Implementation science is the study of methods that aid the use of evidence-based practices (Eccles & Mittman, 2006), and has emerged from the gap between care known to be theoretically effective and care that is actually delivered (Proctor et al., 2008). Studies examining the translation of effective interventions are increasingly common in the research literature, with a growing recognition of the practical and theoretical connection between how interventions are implemented and their impact on population outcomes (Green & Johnson, 1996; Herie & Martin, 2002; Moulding, Silagy, & Weller, 1999; Rogers, 1995).

The literature emphasizes the role of organizational factors in successful program implementation, and these factors are commonly included in implementation and dissemination theory (Aarons, Horowitz, Dlugosz, & Ehrhart, 2012; Damschroder et al., 2009; Fixsen, Naoom, Blase, Friedman, & Wallace, 2005; Hasson, 2010; Proctor et al., 2008). Research has shown that there is value in the application of these theoretical approaches to understanding the uptake of programs in multiple areas, including pediatric asthma, addiction, and smoking (Martin, Herie, Turner, & Cunningham, 1998; Mesters & Meertens, 1999; Steckler, Goodman, McLeroy, Davis, & Koch, 1992). We sought to explore how trauma centers have implemented IP programs and to hypothesize how these efforts can be explained through a theoretical lens using models and theories traditionally applied in implementation science, ultimately proposing an emerging model that could be tested quantitatively through a survey of IP professionals.

To assess the implementation of IP programs at trauma centers, we began by drawing from four theoretical approaches explaining how programs are structured, integrated, and implemented within organizations, how and why certain changes within the organization work, and how best to introduce innovation to a system. These included (a) Baldrige Excellence Framework (National Institute of Standards and Technology, 2019); (b) Aarons' organizationally focused model (Aarons et al., 2012); (c) the Consolidated Framework for Implementation Research (CFIR) (Damschroder et al., 2009); and (d) the Implementation Logic Model (American Trauma Society, 2014; Bradford et al., 2013). The first three of these theoretical approaches are generalizable to the implementation process overall.

The Baldrige Excellence Framework includes assessment criteria measuring seven organizational categories: (1) leadership; (2) strategy; (3) customers; (4) measurement, analysis, and knowledge management; (5) workforce; (6) operations; and (7) results. Each category represents a key facet in creating efficient processes and organizational success. An evaluation of these categories provides a profile to help the organization better understand how their specific operations, social climate, and relationships interact and highlights strategies that advance the organization's goals (National Institute of Standards and Technology, 2015).

In addition to the Baldrige Criteria, there is a body of scientific literature about organizational factors influencing the implementation of evidence-based practices. Aarons and colleagues describe organizational factors associated with the process of program implementation, including organizational culture, leadership, and climate (Aarons et al., 2012). Organizational culture refers to the organization's values and assumptions, whereas climate describes members' perception of leadership and support for new initiatives that can impact motivation, energy, and participation (Berberoglu, 2018). Leadership style is

an organizational factor that can impact program implementation, and is described as "transformational" if highly engaged when working in partnership with staff toward change, "transactional" when rewarding or reinforcing desired behaviors, or "passive" when abdicating leadership responsibilities. These factors contribute to overall readiness for change, a critical requirement for successful program implementation in the health care environment.

The CFIR categorizes barriers and facilitators to program implementation into five domains: innovation characteristics, outer settings, inner settings, individual (staff) characteristics, and the implementation process. These factors help explain differences in program or innovation success across multiple contexts (Damschroder & Lowery, 2013). "Innovation characteristics" refer to the program's strength of trialability and adaptability, "outer setting" considers characteristics and strengths of the community served by the innovation and the external policy setting, "inner setting" refers to the implementing organization's resources, readiness, and policy climate, and "process" considers how the innovation or program was implemented.

The Implementation Logic Model describes the implementation of one hospital-based program, the Trauma Survivors Network, and offers two paths to program implementation; the Top Down Model, and the Champion Model. In the Top Down model, leadership recognizes a need for the program and directs staff to be trained to establish the program; the staff member and leadership work together toward program dissemination and build a business case for administration to allocate resources. In the Champion Model, a staff member recognizes the importance of the program, initiates dissemination efforts, and strives to convince hospital leadership of the program's value. In both pathways, training builds efficacy and enthusiasm to create effective champions who articulate the business case for institutional implementation, leading to a program that provides ongoing support for a champion (Bradford et al., 2013).

Each of the frameworks and models described earlier has the potential to add value to understanding the nuances of implementing IP programs; however, there is little literature showing the application of these individually or in combination in this setting. Despite significant national investment in prioritizing compliance with ACSCOT verification requirements, including the establishment of IP programs, little is known about the factors that impact successful program implementation by injury prevention coordinators (IPCs) (Committee on Trauma of the American College of Surgeons, 2014; McDonald et al., 2007).

PURPOSE AND RESEARCH QUESTIONS

The goal of this research is to generate hypotheses regarding processes used to implement successful IP programs at trauma centers and to work toward the creation of a model of barriers and facilitators for the implementation of programs at trauma centers. Understanding the factors facilitating the development of evidence-based programs improves the design of training and capacity-building programs around specific interventions, enhances professional education courses, and potentially guides organizational improvements related to program implementation at trauma centers. A qualitative approach was chosen for this project, as we sought to explore and describe processes and use our findings to develop a quantitative survey to more fully characterize the state of the field.

METHODS

The project was approved by the Johns Hopkins Bloomberg School of Public Health Institutional Review Board with "exempt" research status. This study was conducted in two phases, starting with exploratory pilot interviews conducted with a convenience sample of seven IPCs and one Trauma Program Coordinator, all at Level I or II trauma centers, followed by a "main" study in which participants were chosen from a broader sample. Pilot participants were chosen from sites familiar to the researchers from previous projects (Bradford et al., 2013). The goal of this pilot phase (Phase I) was to familiarize the researchers with the range of programs, processes, activities, and concerns shared by IPCs in trauma centers, and to develop relevant interview guides for the main study.

Data collected from these initial interviews were summarized and reviewed by the research team and used to identify relevant topics for the interview guide for Phase II (see Supplemental Digital Content Interview Guide, available at: http://links.lww.com/JTN/A15). Participants in the main study (Phase II) were then chosen from a list of 450 Level I and II trauma centers that are part of the Trauma Information and Exchange Program (American Trauma Society, 2019). A purposive sample of 24 sites representing trauma centers of different patient volumes, geographic regions, and urban/suburban settings was identified for inclusion. No study team members had prior or current relationships with the centers selected or the personnel contacted. The IP coordinators, administrators, and other officials at each center were contacted via e-mail and phone and asked to participate in a 30-min interview. Two experienced qualitative researchers (A.N. and M.Z.), with experience in rehabilitation and trauma program implementation and research, then conducted semistructured phone interviews with eight study participants from five new sites; data collection ceased when data saturation on topics of program development and implementation had been reached.

Injury prevention coordinators from each of the enrolled sites were interviewed; at the recommendation of initial interviewees, additional staff members were

interviewed in three of the sites, including two trauma program managers, a trauma surgeon, and a fundraiser (Richards & Morse, 2002). Interviews were audiotaped and transcribed by a professional transcription company. Subjects were sent a $25 gift certificate for participation. Hypothesis generation and model development followed the completion of Phase II study interviews and did not utilize data gathered as part of the pilot interviews.

The interviewers created field notes following each interview; the research team used these notes, together with the transcriptions, in their analysis. As a first step, the researchers (A.N., M.Z., R.C., A.C., and S.H.) familiarized themselves with the data by reviewing the transcripts and comparing their notes. A preliminary set of codes drawn from the categories of questions included in the interview guide was supplemented by themes that emerged from the data analysis, suggesting key factors related to the development and implementation of IP programs. A list of domains from our chosen theoretical frameworks was appended to our code book for reference and consideration in the coding process.

Using the resulting code book, several team members (A.C., R.C., S.H., A.N., and M.Z.) coded each transcript; A.N. and M.Z. reviewed the coded data for discrepancies, which were addressed through negotiated consensus (Bradley, Curry, & Devers, 2007). Coding fragments relevant to each theme were extracted from individual transcripts and compiled into a separate dataset. This dataset was further analyzed for consistency and clarity and for recoding as appropriate (Ritchie & Lewis, 2003). Ultimately, we identified the range of experiences and common themes across and between cases.

RESULTS

Although no one model provided a perfect fit for our data, a new model emerged that borrowed heavily from our existing models (Figure 1). Emerging themes fell into five broad categories: (1) external factors; (2) internal organizational factors; (3) prevention program capacity; (4) program selection; and (5) program success. These themes had been a focus in our interview guide and influenced by our four guiding implementation models. We discuss each of these categories and relevant barriers and facilitators in detail in the following section.

External Factors

Although IP coordinators more often reflected on internal factors influencing their work than external policies and

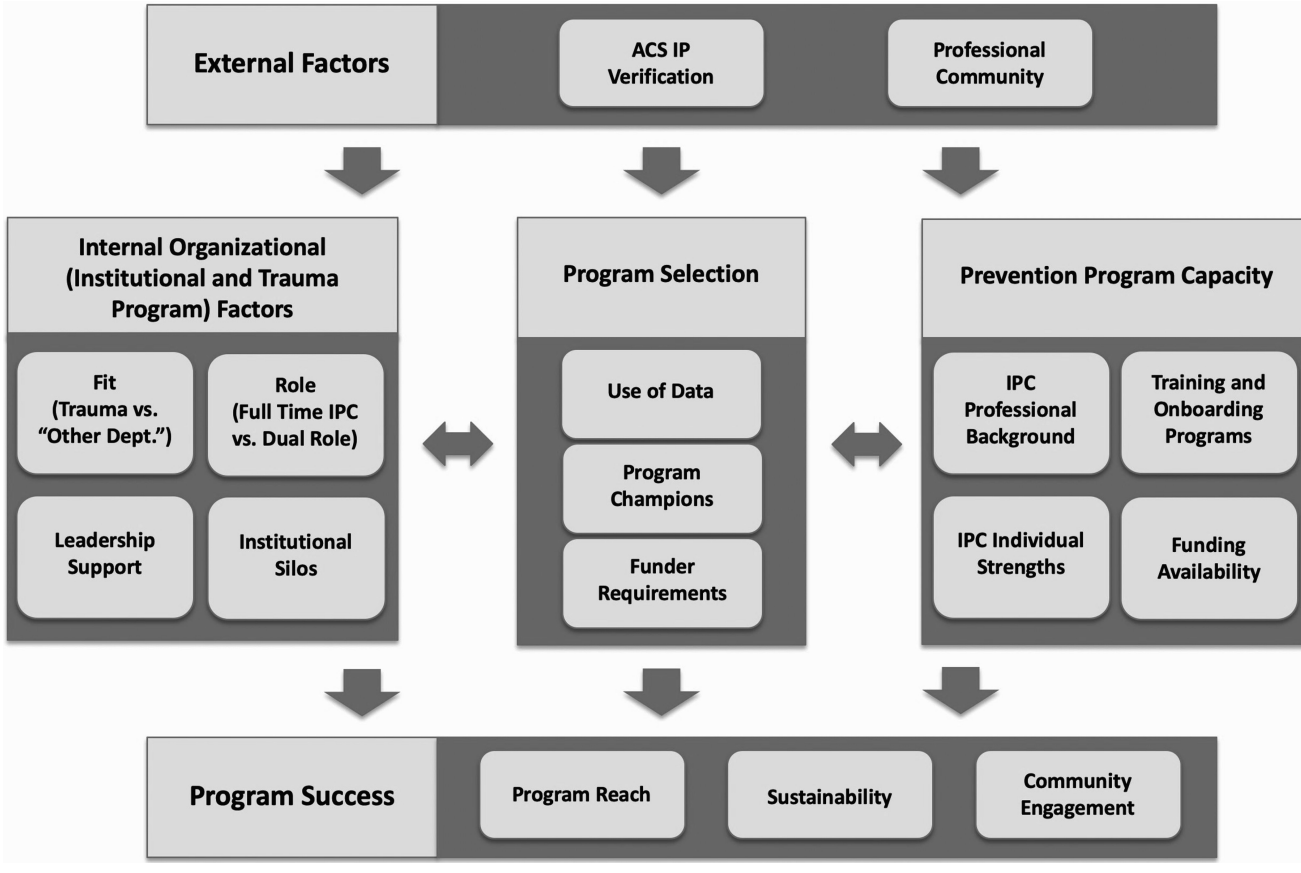

Figure 1. Trauma center injury prevention program implementation model.

resources, all were readily aware of the influence of the ACSCOT verification requirements.

> We have a new CEO, a new CNO, a new CFO … when we had our ACS trauma review last year, it was very eye-opening for them to hear what's going on, and basically, almost learn about us and their facility. [I had] no funding from the hospital, and yet I need to have some kind of program to meet state and ACS trauma requirements. (IPC, West, Level II, rural)

In this particular hospital, leadership became aware of the requirement of an IP program following an ACSCOT review, after which the trauma program manager was able to secure funding for a part-time IPC.

None of the trauma centers in our sample included more than one IPC on staff, leaving the coordinator devoid of onsite prevention colleagues. Several subjects mentioned how external training resources, such as national or state conferences, were important to allow IPCs to connect with their professional community, find mentors, and develop skills and program development expertise. This IPC articulated his appreciation for these opportunities:

> And so [at the state conference] you can network, and you kind of learn what other people in the state are doing, who's doing adult prevention or adult falls really well. (IPC, West, Level I, urban)

Internal Organizational Factors

Participants discussed several internal organizational factors that affected implementation. These included where the IP program fit ("home department"), the role of the IPC, the extent to which the program was supported, and the degree to which the hospital operated in silos.

Organizational "Fit"

The IPCs included in this sample were positioned in the trauma departments in their hospital, although they were aware that some IPCs work in other departments such as Health Promotions, Child Life, Public Relations, and Marketing (Tinkoff, 2014). Reporting structures can be confusing, for example, when accountable to directors in two different departments. Such reporting structure challenges led to struggles, for example, when seeking approvals for marketing or educational materials or when engaging in program activities.

> It is the most bizarre reporting structure I've ever dealt with because … it's just not that black-and-white. (IPC, Midwest, Level I, urban)

Although the trauma department is most invested in the provision of IP programs to fulfill verification requirements, several coordinators underscored the challenge of working on a team of clinicians unfamiliar with program development and coordination, prevention principles, and community outreach.

> [In my department], there is not a healthy understanding of how we do our work or what's needed to do our work because we are the black sheep. I don't think that injury prevention is something that should live within a trauma program. I think it's something that would be more effective with a department that understands the spirit of community health. … I've had to seek out other mentors of people that do similar work to try and figure out how to accomplish things, and so that has been a huge obstacle here. (IPC, Northeast, Level I, rural)

Coordinator Role

By chance, the RN IPCs interviewed for this pilot study all held dual roles, serving as both the trauma center's IPC and either emergency medical service or trauma educators, quality improvement coordinators, or trauma program managers. Those without RNs worked full-time as IPCs in their centers and had extensive IP and public health experience, noting that their previous positions enabled them to "understand how to deliver these types of programs" that required significant time networking. Being afforded a singular focus on the IP work appeared to facilitate the breadth of programs the hospital could implement.

Leadership Support

The IP coordinators' work was influenced by the support from direct managers and senior leadership. The IPCs described the hospital leadership perspective of the IP program on a continuum between an "afterthought" and "the hospital's pride and joy." Few IPCs experienced high levels of support from the leadership. One center stood out as distinctive, with the IPC conveying a feeling of being fully integrated into the organization. At this Level II center, all interviewed subjects expressed great pride over their IP program, using the words "robust" and "innovative" to characterize their program. Hospital staff and medical team members, including registrars, researchers, surgeons, marketing, administrative assistants, and nurse educators, were described as having a stake in the programs and were dependable participants. Administration and clinical team members were involved in the development, implementation, evaluation, and reworking of the programs; the IPC felt they all "want to be a part of it" and that their IP participation was a benefit of employment rather than an added burden. When asking for help, the IPC encountered little resistance:

> So we work together to make [the program] happen, and … when I say, "Okay, Dr. M, I need you

to present for 20 minutes on these bones for these seniors"… [he says] "Well, I'll help you. I'll help." [and then] … "Can we also include this? I'm concerned about this? How do I move this forward in terms of injury prevention?" (IPC, Northeast, Level II, urban)

In this center, the IPC felt strong leadership support for their programs and the sense that the IP programs were in line with their institution's strategic approach. The organization, therefore, provided support and resources needed to achieve the reach and provide a broad range of services. Having multiple internal and external champions of IP supporting the coordinator led to their feeling relevant and productive.

Institutional Silos

Not all IPCs felt the support of hospital leadership or their colleagues. In one trauma center, the IPC felt certain the position existed solely to satisfy ACSCOT requirements rather than realize the institution's commitment to community prevention work. In this center, senior leadership had been convinced of the need for the position following an ACSCOT review; however, appeared disinterested in providing support or understanding the role. Trauma team members were uninvolved in the IPC's activities, and the marketing department's guidelines and branding requirements limited the IPC's capacity to engage the community. The difficulties in communicating and collaborating between departments—in this case, the trauma department distinct from the marketing department—created challenges for the IPC, as she attempted to promote her community programs.

> I had to go to my PR department and marketing, and I met with our VP … but there's some cobranding issues. They wanted to just cancel the brand altogether… nobody really knew what trauma services was. (Trauma Program Manager, West, Level II, rural)

In addition to reporting a lack of leadership support for the program, some program coordinators described difficulty collaborating with colleagues as well. In contrast to the one center with significant support from leadership facilitating the integration of the IP program into all aspects of the trauma department and hospital processes, other IPCs found that their unique role resulted in tension with other staff members in the department whose positions were less flexible:

> It tends to breed a lot of jealousy with other staff that we may be around because of the flexibility we have in the roles that we do … our job does not require us to sit here at our desk from nine to five … Staff around us … don't understand that. They don't know that I was here teaching a class until 10 o'clock last night. So you know what? I didn't come in till 11 o'clock this morning. (IPC, Northeast, Level I, rural)

Prevention Program Capacity

Several categories of organizational characteristics that influenced program implementation arose in participant interviews. Employee readiness can be described by their background and experience, the training they receive in their organization for their program implementation and management work; program capacity is further influenced by the availability of funding for the IP program.

Professional Background

IPCs arrived at their new position with a range of backgrounds, including nursing, health education, IP, and community health, and were either familiar with trauma or familiar with IP prior to their arrival. Those with previous experience in health education or IP felt well prepared for their new roles in the hospital. Having managed prevention programs and coordinated community agencies, they were comfortable with grant writing and teaching and spoke enthusiastically about the IP programs and opportunities available to them in their position.

> I go and speak at conference, and over the past year, I've actually done quite a bit … I have a very unique background in that I've dabbled in all of these different sorts of environments. So I've been in a county health department … and then I've been in the pre-hospital sector, and now I'm in an academic healthcare system. And they are so different in what you have to manage in order to be successful and in your approach. (IPC, Midwest, Level I, urban)

Nurses with little or no IP experience reported feeling uncomfortably challenged by the transition from clinical practice to program coordination, stating, "I just had no idea what it really entailed," and "It was quite a hard position for me because I was very used to being on the floor" and that the position was a "learn as you go" experience in which they followed their predecessors' leads and strove to fulfill the ACSCOT IP requirements for verification. These coordinators noted they were comfortable interacting with patients and other staff members and drew upon their clinical knowledge when educating their audiences regarding injuries.

Training and Onboarding

Regardless of previous experience, we found consistency in the training and onboarding experience as IPCs began their new roles. Newly hired IPCs did not report receiving an orientation to the position by colleagues in the prevention and program management field; instead,

they were informed of current programs and community contacts by a trauma team member, such as the trauma program manager, and were encouraged to develop their program based on online resources and files left by a previous IPC.

> But literally when I came into my position, I had a four-hour orientation, and it was, "You're going to need to do this and this and this and this and this." (IPC, West, Level II, rural)

None of the IPCs interviewed described training on IP guiding principles or skill-building, nor were they connected with IPC mentors outside of their hospital.

IPC Individual Strengths

In addition to background and training, readiness was described by IPC's unique skills and innate capacities. Results from the interviews highlighted that each coordinator relied heavily on their previous experiences and personalities to guide their work. Several key traits were identified as important to their overall success: flexibility, ability to build rapport, creativity, and comfort with public speaking.

Study participants felt their success depended on their ability to juggle multiple roles, including program management and other clinical or administrative duties. Most noted that every day was different, and no standard operations procedures were available to guide them in both their practice and in running their programs.

> Like, it's just really a lot of multi-tasking, traveling from different events and setting up meetings and stuff like that and going to the events and making sure all the programs are running efficiently. (IPC, West, Level I, urban)

Similarly, the ability to relate well and empathically to a variety of people was important. As IPCs were frequently involved in education, event management, and marketing, it was important to be able to connect well with children, parents, patients, administrators, community program directors, the media, and large audiences in classrooms. Day-to-day activities included collaborating and networking both within their institution and within their local and regional communities. IPCs frequently spoke to large audiences covering a range of prevention topics; those with a background in public health education felt well equipped to communicate with a wide variety of audiences as educators and advocates.

Each IPC depended on their creative capacities to adapt their skillset and to adapt programs to their hospital and community environment, adjusting to the unique resources and barriers of their community. One nurse with clinical experience focused on patient and family education from a medical and clinical perspective whereas another nurse used her comfort with children and experience as a mother to develop and implement educational programs for children. A child safety instructor used her connections and background as an IP coordinator to develop multiple community interventions and to tap into the extensive staff resources in the hospital.

Funding Availability

In some cases, funding was the most significant driver of a program's capacity, and these IPCs noted that the areas identified through the registry as having the greatest needs were unaddressed. Here, the IPC worked solely in areas where funding had been secured through a corporate grant:

> [This program is] almost more about advertising, and of course when I advertise, I have to put [corporate funder's name] in there. The program has to be named after [the funder] ... They do put a lot of restrictions, but I also have no funding from the hospital to really go out and do these events … and yet I need to have some kind of program to meet state and ACS trauma requirements. (IPC, West, Level II, rural)

Program Selection

Both internal organization and prevention program capacity influenced program selection and success. IPCs cited common mechanisms to identify programs of focus for the facility, such as which problems would be identified and which program would address those identified problems. Target problems were identified from data and influential champions; programs were chosen based on ease of implementation, fit of program to hospital resources, persuasive program champions, and funder requirements. We hypothesize that the successful implementation of their programs is related to program capacity, internal organization, and the selection of feasible, relevant programs, and interpret "success" as sustainability, community engagement, and program reach.

Use of Data

Problem identification typically included a review of regional or local injury databases and trauma registries, which provided demographics on injury patterns and prevalence in support of program development or retention. For some, targeted areas of service were identified through meetings and discussions: IPCs developed program suggested in meetings with the medical director, local and regional injury program teams or a review of what other hospitals were doing.

> So based on our trauma registry, and based on the town [we determine] where a lot more of the

elderly falls are happening. So based on the location of where these falls are happening for seniors over the age of fifty-five, I will host a two-session workshop training, go to the community center for the community and our PT and our OT therapists offer a Tai Chi lesson to teach about stability and balance control. (IPC, Northeast, Level II, urban)

Program Champions

In several instances, a notable local trauma case inspired the development of a program. In these cases, an individual or committee would be inspired to create an IP initiative without first identifying the public health burden. This IPC recounts her experience:

> Sometimes I just get inspired by something that occurs to me as nothing's being done about it currently … we had had a patient who [was skiing and] … was not wearing a helmet … and skied right into a tower … and suffered horribly devastating injuries … And I'm like, "What are we doing about ski helmets or any helmet use on the slopes?" And kind of on the heels of that, we had a family that wanted to make a donation to the program, and their only task to me was, "Just pick a program that you've not done anything with before. What's a risk area that you've not done anything with before?" And I said, "Okay, well, this case just struck a chord for me." (IPC, Midwest, Level I, urban)

Funder Requirements

Although some IPCs had the freedom and funding to choose a program topic and "just go with it," others found their organizational processes more constraining and needed to present a program plan to trauma or hospital leadership team members for approval to proceed. For instance, the IPC quoted earlier was free to collaborate with the community center and coordinate interventions to address needs while another's programmatic decisions were determined primarily by a funder's requirements.

Program Success

When developing and implementing programs, IPCs connected with their communities in myriad ways as they worked to educate the public. This engagement included participation in community health fairs, delivering programs at local high schools, community centers, and churches, and engaging staff and patients in the hospital or local health facility. Program management frequently required IPCs to recruit volunteer staff, identify or create materials, and solicit community-wide registration in programs.

IPCs noted their success depended on a supportive list of contacts within the hospital and in the community, identifying good sources of educational materials online and in health departments, and having funding for giveaways at their various programs.

> We work very closely with the Department of Motor Vehicles … We have the Chief State's Attorney, we have the … Mayor's Office. We have the Police Department and … each of the three trauma centers in [our city] ... and three or four other injury prevention … organizations supporting it, in addition to some of the local vendors who provided money, the hospital foundations have provided money, the Emergency Nurses Association and the Society of Critical Care Medicine have all contributed. In my opinion, you cannot have injury prevention affect an area or a region unless you have everyone in that region working on injury prevention working together. (Trauma Surgeon, Northeast, Level I, urban)

Others noted that the absence of such sources of support made their work much more challenging, most notably access to sufficient funding, natural collaborators, mentors, and partners.

> I think [an IP program] is something that would be more effective with a department that understands the spirit of community health … it's been difficult for me to find mentorship in my own chain because it's not clinical. I've had to seek out other mentors of people that do similar work to try and figure out how to accomplish things, and so that has been a huge obstacle here. (IPC, Midwest, Level I, urban)

DISCUSSION

Overall, the results are consistent with factors previously identified in the literature as determinants of implementation of programs and innovations. Many factors interacting with each other should be considered when looking for differences in the implementation and diffusion of a program or innovation. An important factor to consider is the role of leadership in creating a successful environment for a program's success. Our data did not reveal a norm of strong institutional leadership or tendency toward evidence-based programs. As IP professionals reflected on the discord between the ASCOT verification requirement and the system's readiness to support an IP program fully, they spoke of confusing reporting structures, nominal training for the position, and limited institutional resources, reflecting an organizational climate unready to support their efforts (Berberoglu, 2018).

Although the external forces, such as ACSCOT verification requirements, ensured the existence of the prevention program, this requirement was insufficient to guide them toward evidence-based practice. A second external factor noted in our analysis—access to nationally available training resources and a community of injury prevention professionals (IPPs)—was not widely discussed by our participants; IPC's lack of knowledge of such a resource was notable, as they discussed their on-the-job training experience. At the time of data collection, few such resources existed for these professionals; since that time, training by national organizations and an annual meeting of IPPs has significantly expanded (https://www.amtrauma.org/page/TPC, retrieved October 13, 2019), with the Injury Prevention Coalition coordinating an annual IPC symposium and summit, developing an IPP curriculum, and implementing a course designed for new IPPs.

Program success of those interviewed depended on supportive leaders and collaborative relationships between departments, as described in Baldrige's "operation focus." Furthermore, the structural characteristics defined by the CFIR model inform the internal organizational factors influencing program implementation: program fit in the organization, IPC role, and the extent to which there are institutional silos. The "inner setting" of the CFIR describes resources needed for an intervention to be successful, such as training, onboarding, and evidence-based educational materials. Program selection in our model involves the use of data, similar to the CFIR construct of community needs. The professional community is important to consider and aligns with the CFIR construct of peer pressure.

Although not explicitly discussed in our developing model, several stakeholders are inferred, including IPPs, trauma program managers, hospital leadership, IP trainers, the ACSCOT, and the injury prevention community as a whole. When considering the factors relevant for program success, each stakeholder would focus on different areas. IPPs tasked with leadership of the prevention efforts would focus on program selection and program success. Day-to-day activities would be defined by data regarding local burdens of injury, as well as building and maintaining community and program champion partnerships. Hospital leadership, including the trauma program manager, contributes to successful efforts by ensuring the IPC position is funded, the coordinator is well-trained, and funding is available for programmatic activities. The professional community, focusing on "external factors," contributes by developing evidence-based IP programs and providing opportunities for program leaders to learn and share best practices.

Limitations

The current study contains a few limitations worth noting, beginning with the use of purposive sampling. The interview sites were selected primarily on the basis of their characteristics (patient volume, center level designation, geography, and urbanicity). The research team hypothesized that these characteristics would help adequately identify the range of variation in IP infrastructure and activities for all trauma centers, in order to develop an interview guide to be used with a larger sample of sites. Second, there were some limitations inherent in many qualitative, interview-driven studies. The process is labor-intensive and time-consuming, data are self-reported and not easy to verify independently, and interview subjects might have been influenced by recollection bias or the desire to offer socially acceptable responses. The study lacked a singular theoretical framework that the research team felt adequately reflected the full breadth of infrastructure, influences, and activities needed to evaluate the implementation of IP at trauma centers. It was necessary to create a new model to serve as the lens through which the authors would evaluate the data collected, and though we feel the data supported this, it is difficult to know empirically whether this is the best approach to study this phenomenon. Finally, the sample size for this effort was still fairly small, and therefore the results might not be generalizable to all U.S. trauma centers. The research team aims to bridge this gap using a survey based on the findings of this study, which has been distributed to all Level I and II trauma centers across the country.

CONCLUSION

This study explores and describes processes used to implement successful IP programs at trauma centers, and we suggest a model of barriers and facilitators for the implementation of programs at trauma centers. Understanding the factors facilitating the development of evidence-based programs improves the design of training and capacity-building programs and can guide organizational improvements related to program implementation at trauma centers. This model can inform a future quantitative survey of a more widely represented sample of trauma centers to understand the state of the field.

KEY POINTS

- Level I and II trauma centers must have a staff position to satisfy ACSCOT verification criteria.
- Little is known about this requirement's influence on the establishment of evidence-based programs in hospitals.
- We describe processes used to implement hospital-based injury prevention programs.
- We propose a model of barriers and facilitators to implementation of evidence-based programs.
- Program success requires supportive leaders, collaborative relationships, staff access to training, and evidence-based resources.

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