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**ABSTRACT** There is increasing knowledge that health care workers (HCWs) can experience a variety of emotional impacts when responding to disasters and terrorism events. The Anticipate, Plan and Deter (APD) Responder Risk and Resilience Model was developed to provide a new, evidence-informed method for understanding and managing psychological impacts among HCWs. APD includes pre-deployment development of an individualized resilience plan and an in-theater, real-time self-triage system, which together allow HCWs to assess and manage the full range of psychological risk and resilience for themselves and their families. The inclusion of objective mental health risk factors to prompt activation of a coping plan, in connection with unit leadership real-time situational awareness, enables the first known evidence-driven “targeted action” plan to address responder risk early before Post Traumatic Stress Disorder and impairment become established. This paper describes pilot work using the self-triage system component in Alameda County’s Urban Shield and the Philippines’ Typhoon Haiyan, and then reports a case example of the full APD model implementation in West Africa’s Ebola epidemic.

**INTRODUCTION** There is increasing knowledge that health care workers (HCWs) experience a variety of psychological consequences when responding to diverse “all hazards” disaster and terrorism events.¹ There is also evidence that incidents involving chemical, biological, radiological, or nuclear scenarios (CBRN), as well as incidents in which workers are exposed to secondary hazardous materials during the response, are associated with increased psychological health risk extending years after the event.¹ Yet, despite this evidence, most models of psychological support for HCWs who respond to emergencies have structural limitations that fail to address the full complexity and continuum of possible outcomes, such as new incidence co-morbid disorders like post-traumatic stress disorder (PTSD) and depression.

Historically, popular models of psychological support for HCWs in disasters, such as Critical Incident Stress Debriefing (CISD), have focused on providing a “one size fits all” single encounter “recital of events or strong emotions” limited to the immediate post response phase of a disaster. This practice continues despite international consensus findings regarding the potential harm of such an approach.¹ It seems clear based on the available literature that a one size fits all approach, accomplished by “chasing tears” (Yin R. Personal communication to M Schreiber. 2012) or singular focus on what is often expectable non-pathologic distress, is inadequate if not harmful to disaster responders.⁴,⁵ More recent work has focused on increasing HCW resilience, with emphasis on educating HCWs to identify roles, likely stressors, possible reactions and symptoms, and/or to develop various cognitive and behavioral coping strategies.⁶ However, to date there have been no known randomized controlled trials of preventive interventions to mitigate psychological distress in disaster responders. Moreover, strategies to meet the needs of families of responders have been largely ignored.²

With the increase in prevalence of both natural disasters and terrorist attacks, the need to protect the physical and mental health of HCWs has become even more essential. In order for HCWs to continue to care for patients effectively (i.e., “mission assurance”), it is important that their mental health risk status be monitored and a continuum of timely interventions be made available to support them. The Anticipate, Plan and Deter (APD) Responder Risk and Resilience Model was developed to provide a new, evidence-informed method for understanding and managing psychological impacts among HCWs, including strategies to manage the full range of risk and resilience in the responder workforce and their families. Specifically, APD focuses on operational actions to enhance worker resilience by offering “hazard specific stress inoculation” training in the pre-incident period that requires participants to create individualized resilience plans prior to deployment. The APD model also integrates the Psychological Simple Triage and Rapid Treatment – Responder (PsySTART-R) self-triage tool. The PsySTART-R allows individual responders to monitor their exposure to risk factors throughout their deployment on a daily and cumulative basis as part of both...
the “plan” and more specifically the “deter” stage of the APD model, which is outlined below. It also allows incident commanders or mental health unit leaders to monitor overall population-level risk for an identified group of responders.

This paper describes the APD model and how the PsySTART-R system is integrated to provide objective “self-triage” metrics for HCWs. Furthermore, this report documents initial piloting of the PsySTART-R self-triage system component in a disaster training exercise and a real-world event, and a case example of the full APD model implementation during the 2014–2015 Ebola response.

The Anticipate, Plan, and Deter Responder Risk and Resilience model

The Anticipate, Plan and Deter (APD) Responder Risk and Resilience model focuses on HCW resilience across pre-incident, response, and recovery phases in public health emergencies (e.g., emerging infectious diseases such as Ebola Virus Disease). Components of the APD responder resilience model for HCWs include:

Anticipate
Participants receive a pre-event stress inoculation training that focuses on the psychosocial impact of mass casualty events on emergency HCWs in the hospital, clinic, pre-hospital, and field disaster settings. The training explains the nature of traumatic and cumulative responder stressors and the impact of these factors on staff, including expected stress reactions and response challenges. Images pertinent to the disaster response hospital environment are also provided as a part of the training. Current versions include prescriptive inoculation components specific to both no-notice penetrating trauma incidents and special pathogen scenarios.

Plan
During the training, participants are given the opportunity to develop a “personal resilience plan” (Fig. 1), which involves asking them to identify and document their anticipated response challenges (i.e., the stressors in the incident-specific scenarios they believe would be most difficult to manage) as well as a range of coping resources, including social support systems, concrete strategies for positive coping they already use, and “resiliency factors” such as a life mission or sense of purpose in their work.

Deter
Participants learn how to use the personal resilience plan that they developed in the “plan” component during a response. An essential component of this training is learning to monitor one’s own stress exposure so that responders know when to invoke their personal resilience plans. Responders are encouraged to use the PsySTART-R self-triage system, described below, as a “personal stress dosimeter,” to assist them in identifying their level of risk for negative mental health outcomes which then serves as a trigger to implement their coping plan.

PsySTART-Responder Self Triage System

The PsySTART-Responder Self Triage System (PsySTART-R) is a mobile-optimized web-based application that prompts responders to indicate which of 19 traumatic stress risk factors they experienced over a given operational period (e.g., 24 hours). Items are based on prior research relating risk factor exposure to subsequent clinical or presumptive (based on questionnaires) PTSD.7,8

PsySTART does not measure thoughts or symptoms of acute distress; rather, it measures exposure to objective features of the event itself, including the nature of the patients (e.g., severe burns or dismemberment), standards of care (e.g., being forced to abandon patients) and impact on providers (e.g., toxic exposures) and their families (e.g., unable to return home). Healthcare workers are asked to log in to the system daily to complete a self-assessment using the PsySTART-R web-based triage tag (Fig. 2). PsySTART-R tracks cumulative exposure to stressors and provides confidential feedback to the responder. As risk exposure increases, the PsySTART-R feedback encourages the individual to use his or her personal resilience plan developed as part of the APD training and to seek out mental health providers as needed. PsySTART-R does not and cannot share individual triage information with group leaders or incident commanders, although it does provide de-identified, aggregated data, as described below. PsySTART-R uses a simple smartphone application and has now been used with varied domestic and international emergency medical response teams during events including the Haitian catastrophic earthquake, Hurricane Maria, and Hurricane Harvey in the US and its territories.

Organizations can use the information generated by the self-triage system to maintain aggregated, de-identified real-time situational awareness of the dynamic risk trending of a defined workforce or team to develop and provide strategies during the response that address the specific risk factors the team is encountering.9 This monitoring capability provides those in disaster incident command with a way to understand acute and cumulative risk by location and discipline using evidence-based risk metrics as they occur, affording a “common operating picture” of workforce risk on par with other disaster information systems.9 This model provides flexibility to mitigate risk factors real-time in the midst of the response as a form of early prevention.

CASE DESCRIPTIONS

Pilot Use of the PsySTART-R Self-Triage System

Homeland Security Exercise and Evaluation Program

(HSEEP)
The Alameda County EMS Agency of Northern California began use of PsySTART-R in a large multi-agency exercise...
called “Urban Shield 2013.” This was a multi-hazard scenario involving local and national first responders and EMS agencies. Medical responders who participated in Urban Shield completed PsySTART-R self-triage in three different response scenarios: an active shooter, an explosion, and a complicated search and rescue. This exercise provided support for ease of use, acceptability and face validity of the in-theater, web-based PsySTART-R self-triage system.

Typhoon Haiyan

In November 2013, the strongest typhoon ever recorded struck the Philippines. Through a special request from colleagues at

FIGURE 1. Anticipate plan deter personal resilience plan. Anticipate,Plan,Deter is copyright 2018, merritt schreiber.
the NIH Emergency Medicine Group in the Philippines, the PsySTART-R system was utilized during recovery efforts for Typhoon Haiyan. This version of the system included the evidence-based risk factors from the version of PsySTART-R that had been simulated in the disaster drill setting described above. The study evaluated the relationship between exposure to PsySTART-R risk factors and PTSD/depression in a sample of deployed health workers from Typhoon Haiyan. The Post Traumatic Stress Disorder Checklist was utilized to measure PTSD and the Patient Health Questionnaire 8 (PHQ-8) to measure depression, assessed approximately 90 days after return home. These three components were then analyzed to determine the relationship between acute deployment exposures on the one hand and presumptive PTSD and depression outcomes on the other. The results suggested that endorsement of six or more of the traumatic or cumulative stress factors, or a combination of three specific factors (performing duties outside of perceived skillset; injury, death or serious illness of coworker; felt own life was in danger) put responders at increased risk for development of PTSD. Overall, the emergency medical responders in Haiyan who participated in this study demonstrated moderate risk for mental health disorders in the context of a catastrophic disaster with substantial morbidity and mortality.

**Implementation of the Full APD System During the Ebola Response in West Africa 2014–2015**

Ebola medical providers from one U.S.-based medical effort were trained in the full APD model, including development of a personal resilience plan and use of the PsySTART-R self-triage system, during pre-deployment training with
instructors who had previously completed APD “train the trainer” education. For this response, a modified version of a mental health coordination structure was utilized known as the Behavioral Health Incident Coordination Team (BHICT). 10

The BHICT coordinated resilience activities and mission assurance across the lifespan of the deployment and was responsible for developing 24, 48, and 72-hour behavioral health operations plans for HCWs throughout their deployment and their reintegration home. The BHICT was composed of non-deployed mental health team leadership and subject matter experts in the continental United States (CONUS) who provided real-time coordination with the deployed mental health assets and leadership team. The deployed HCWs were encouraged, but not required, to complete daily de-identified self-triage of their risk factors for traumatic stress during the past operational period (24 hours) using the PsySTART-R system. The goal was to have each responder complete PsySTART-R once per 24-hour operational cycle. This simultaneously provided individual responders with a real-time index of their level of risk and equipped the embedded behavioral health providers and BHICT with a de-identified, aggregated incident report of population-level risk events in the previous 24 hours and cumulative risk since the mission launch. This timing coincided with the mission operational cycle and allowed for integration of force behavioral health risk information into the overall command level mission awareness and planning cycle.

Based on the real-time situational awareness capability, aggregated PsySTART-R reports alerted the embedded behavioral health providers and BHICT that certain risk patterns were present. For example, the PsySTART-R aggregated data for one operational period indicated that some members witnessed the gruesome death of a pediatric patient. The embedded behavioral health team was unaware of this until they received the daily aggregated PsySTART-R situation report. Armed with this information, they confirmed that a small group of providers had been visiting another Ebola site and while there were exposed to a child’s death from Ebola. The embedded behavioral health provider then checked in with those team members and, for those who expressed need, provided Psychological First Aid as well as encouragement to invoke their personal resilience plans developed during pre-deployment APD training.

Additionally, in one 24-hour period, the aggregated PsySTART-R team report indicated a sudden increase in one of the risk markers that previously had been near zero, namely, “concerned about my possible exposure to chemical, biological or radiological agents.”

At first, the assumption was that this reflected concern regarding team member exposure to Ebola, given this was an Ebola setting. However, prompted by the PsySTART-R data, the embedded behavioral health providers determined that this risk factor was related to concern with chemical exposure, specifically involving the chronic exposure to chlorite decontamination as part of the Ebola decontamination process. As a result of the PsySTART-R situational awareness, small changes were made to decontamination procedures that eliminated this risk factor within two operational cycles.

Given the unfolding nature of the Ebola event and the varied responses of American states to returning “hot zone” health care workers, another of the actionable PsySTART-R reports was related to a rise in the “I am unable to return home” PsySTART-R risk factor and concerns about stigma the returning provider or their family members may encounter. Many states were following the Center for Disease Control (CDC) guidelines regarding returning health care workers and some, such as the State of New Jersey, did not follow CDC guidelines. Unlike returning from a combat zone where the combatant comes home and the threat stays there, the Ebola fighters faced a situation in which their homes and communities feared the HCWs might bring the threat home with them, or be a source of Ebola infection themselves. The fear of Ebola, and subsequent unfounded fear of those HCWs who went to fight it, was an unfortunate part of the reintegration process. The BHICT used this PsySTART-R information to develop a “just in time” anticipatory intervention for coping with stigma on the return home. Scenarios related to home reintegration along with a personal risk communication plan were distributed to HCWs by the behavioral health staff who were assisting with reintegration. In addition, some staff proactively used their individual resilience plans to manage reintegration concerns, including contacting the social supports identified in their plans and engaging in the active coping strategies previously selected. At other times, the embedded behavioral health team reminded team members to engage their individualized resilience plans.

As part of demobilization, HCWs were also asked to view their own aggregated self-triage encounters over the course of their deployment to determine their own time trending and qualitative and quantitative patterns from their cumulative PsySTART-R encounters to help them better understand their experiences and possible follow-up strategies they might wish to take. Through the APD system and the creation of the BHICT concept, individual team members and behavioral health team leadership were able to identify and address a number of unique psychological challenges encountered during the deployment.

Analysis of Aggregated PsySTART-R Triage Encounters from Ebola Response

A retrospective, qualitative, completely de-identified analysis of 186 self-triage encounters from the PsySTART-R system was conducted using data from the first two groups of HCWs deployed to Africa to assist with Ebola. Responders completed PsySTART-R self-triage every few days during their Ebola deployment. Responders were quickly able to
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learn the PsySTART-R self-triage tool as part of the integrated Ebola pre-deployment training that included the full APD system along with medical response procedures, use of personal protective equipment and decontamination techniques.

1. Aggregated, de-identified PsySTART-R triage data were recorded with 186 self-triage encounters among 45 clinical staff included in the first two deployed groups responding to Ebola in West Africa for a two-month period at the end of 2014, reflecting approximately 75% of the total deployed force. Because anonymity is essential to the PsySTART-R system, no demographic or individual identifiers were obtained. Team members were men and women between the ages of 25 and 60, all with postsecondary education, representing a mix of ethnicities, predominantly Caucasian, African-American, and Asian-American.

2. The initial deployed team members had a greater number of cumulative PsySTART-R risk factors compared to the second deployment group (10% vs. 1% above presumptive clinical algorithm), consistent with operational differences, including greater distance between living quarters and the Ebola treatment setting and more uncertainty about disease transmission for the first compared to the second group, the latter also benefitting from mentoring by the former.

3. The vast majority of HCWs (approximately 90%) were below the presumptive PTSD clinical cut off for PsySTART-R.

4. Dynamic trending of risk allowed for real-time identification of the following risk factors which were then a focus of targeted mitigation efforts, including encouraging team members to use their personal resilience plans developed during pre-deployment APD training.
   - Witnessing pediatric death
   - CBRN exposure concerns
   - Concerns for family members facing stigma at home
   - Challenges pertaining to demobilization and returning home due to varied state regulations on returning hot zone workers that in some cases exceeded recommended CDC guidelines.

5. Provided real-time, de-identified situational awareness to embedded behavioral health field team with reach back to CONUS supports and leadership.

CONCLUSIONS

Current literature reveals a significant mental health burden for HCWs who respond to disasters and a paucity of models to provide a continuum of evidence-based care to HCWs and their families. Healthcare workers and their families face unique stressors and a continuum of risk as a result of their disaster work. This report describes a proactive approach using a model with three components: pre-deployment training about the unique cumulative and traumatic stressors that HCWs may face during deployment (“Anticipate”); development of a personal resilience plan (“Plan”); monitoring stress exposure during deployment using the PsySTART-R web-based system and invoking the personal resilience plan when risk is elevated (“Deter”). The inclusion of objective, evidence-informed risk factors for psychological distress (PsySTART-R) to prompt activation of a coping plan as well as to proactively monitor the exposure of a group of HCWs constitutes the first known evidence-driven targeted action plan to address responder risk early before PTSD and impairment become established. Pilot testing of the PsySTART-R system in Alameda County’s Urban Shield and in the Philippines’ Typhoon Haiyan was briefly described. Implementation of the full Anticipate, Plan and Deter (APD) model during West Africa’s Ebola epidemic was highlighted. The West Africa APD experience demonstrates the viability of a system designed to protect HCWs in high-risk deployments from the negative psychological consequences of potentially traumatic acute and cumulative stressors. Areas for future work include randomized, controlled field studies to evaluate the effectiveness of APD versus “deployment as usual” and dismantling studies to determine which APD system components, such as self-triage data for responders, aggregated triage data for leadership, anticipating stressors and development of the personal resilience plan, are essential.

PREVIOUS PRESENTATIONS


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REFERENCES


