

BRIEF REPORT

Just-in-Time Training of Dental Responders in a Simulated Pandemic Immunization Response Exercise

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ABSTRACT

Objective: The reauthorization of the Pandemic and All-Hazards Preparedness Act in 2013 incorporated the dental profession and dental professionals into the federal legislation governing public health response to pandemics and all-hazard situations. Work is now necessary to expand the processes needed to incorporate and train oral health care professionals into pandemic and all-hazard response events.

Methods: A just-in-time (JIT) training exercise and immunization drill using an ex vivo porcine model system was conducted to demonstrate the rapidity to which dental professionals can respond to a pandemic influenza scenario. Medical history documentation, vaccination procedures, and patient throughput and error rates of 15 dental responders were evaluated by trained nursing staff and emergency response personnel.

Results: The average throughput (22.33/hr) and medical error rates (7 of 335; 2.08%) of the dental responders were similar to those found in analogous influenza mass vaccination clinics previously conducted using certified public health nurses.

Conclusions: The dental responder immunization drill validated the capacity and capability of dental professionals to function as a valuable immunization resource. The ex vivo porcine model system used for JIT training can serve as a simple and inexpensive training tool to update pandemic responders' immunization techniques and procedures supporting inoculation protocols. (*Disaster Med Public Health Preparedness*. 2014;8:247-251)

Key Words: dentist, hygienist, porcine model, inoculation, all-hazard

National capability and capacity policy and planning for national health security efforts are designed to access and deploy all health professionals into ever increasing roles. The 2009 National Health Security Strategy helped define a dynamic and evolving planning matrix that relies on the collaborative expertise of a wide range of health care disciplines and preparedness/disaster response professionals (Figure 1) and incorporated dental responders into the health care provider team.¹ Dental health care providers have the capacity and capability to respond to disasters, provide mass casualty triage care, and provide immunizations. Also, they are experts in forensic identification and biometric informatics.²⁻⁵

The reauthorization of the Pandemic and All-Hazards Preparedness Act (PAHPA) in 2013 introduced dental professionals into the federal legislation governing public health response to pandemics and all-hazard

situations.⁶ The 2013 reauthorization of the PAHPA included the following 3 significant changes that allow for the inclusion of dental practitioners in planning for and responding to public health emergencies: (1) the incorporation of dental health care facilities under ambulatory care facilities during public health emergencies, (2) the incorporation of dental health assets (including personnel) after medical assets in coordinating medical triage during a disaster, and (3) supporting training efforts for dental professionals for public health emergencies.⁶

While disaster preparedness and initial response to pandemic and all-hazard situations have traditionally been performed by public health professionals (eg, physicians, nurses, and emergency medicine technicians), oral health care providers have also played a role in response efforts. Military dental responders have a history of serving as disaster and triage care providers and in military forensic identification, and

FIGURE 1

Various Organizations Contributing to Pandemic and All-Hazards Preparedness and Response at Local, Regional, State, and Federal Levels Within the United States.



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the civilian forensic odontology specialty has made vital contributions during mass disaster response. Contributions from dental professionals in other civilian disaster response and immunization roles further support the expanded role of dental responders in public health disaster response. Oral health care providers possess basic medical training that could

be extremely valuable in such situations, including planning and logistical support and collecting and interpreting biometric information.^{2,3,7}

While the PAHPA introduced oral health responders within the purview of disaster preparedness and response within the

United States, it failed to explain how to *implement* dental responders into a disaster response plan at the local, state, and federal levels. In an initial effort to introduce potential dental responders to a plausible pandemic response scenario and to develop training modules specifically designed for dental responders at the local level, we conducted a mass vaccination drill. The drill was conducted to train local dental responders in a simulated influenza pandemic situation, using a just-in-time (JIT) training and ex vivo porcine (pig) model system.

METHODS

The influenza mass vaccination drill, “Operation Sustained Adaptive Prophylaxis (SAP)”, was developed and conducted by the DuPage County Health Department (DCHD) in Wheaton, Illinois. The drill was modified from H1N1 influenza mass vaccination clinics DCHD previously conducted with certified public health nurses serving as vaccinators. The goals of this training exercise included testing vaccination throughput using current plans, policies, and procedures; validating the dental professional as an emergency resource; validating the mass vaccination plan (dispensing); and validating the mass vaccination JIT training for dental practitioners.

Approximately 175 resources were used to conduct Operation SAP effectively. These included 10 command staff, 15 dental responders (8 hygienists, 7 dentists) serving as drill vaccinators, 15 public health nurses and regional emergency response coordinators serving as evaluators, and 15 logistical personnel. An additional 120 participants served as “patients” to simulate measurable throughput. Patients were given pre-scripted vaccine administration records (VARs) to simulate realistic mass vaccination operational conditions.

The 15 dental professionals serving as vaccinators were volunteers from the DuPage County Medical Reserve Corps directory. Participants varied greatly in age, gender, current working capacity (actively practicing, academic, and/or retired), years of clinical experience, and/or emergency response experience. Each dental responder was assigned to a single station that contained various syringes and needles, medication vials, a soft orange foam (NERF®) ball (to practice the injection technique during the JIT), a section of porcine ham (for injections during the drill), and VARs. In addition, each table was outfitted with alcohol wipes, gloves, hand sanitizer, cotton balls, bandages, a disposal box for sharp items, table paper, tape, small garbage can, cooler, pens, incident reports, waste log, bottle of cleaning solution, and paper towels. Other items available on the table included a plastic tray to hold completed VARs, a numbered sign to signal drill organizers of questions/issues arising during the drill, and chairs for both the vaccinator and patient.

A porcine model system was used to simulate injecting patients with the vaccine. Harvested porcine hams with skin

FIGURE 2

Site of Operation Sustained Adaptive Prophylaxis.



Top, Mass vaccination drill setup. Middle, Station setup for each vaccinator. Bottom, Porcine ex vivo model.

(purchased from a certified local butcher) served as tissue mimics for inoculation and immunization puncturing training. Figure 2 shows photographs from operation SAP, including the room setup, individual station setup, and porcine ham used for injection during the drill.

JIT training was provided to the dental responders approximately 35 minutes before the drill started. A short video

(of approximately 15 min) describing inoculation techniques was shown to the dental responders as a group, and the specific protocol to be used for the vaccinations was reviewed as a group. The vaccinators were then brought to their individual stations and allotted approximately 15 minutes to review the drill protocol and to practice their inoculation technique. During the JIT training, certified public health nurses and emergency response coordinators were available to answer questions and to provide feedback and hands-on assistance while the dental responders practiced their inoculation technique.

The drill was limited to 1 hour of vaccination time. Pre-scripted VARs were prepared for both children and adult patients. Vaccinators were given samples of 2 mock vaccines and were required to select the appropriate vaccine based on the age of the patient as indicated on the VAR. Evaluators remained at the station throughout the duration of the event to document any medical errors made by the vaccinators and to monitor vaccination throughput. A vaccination throughput of at least 18 patients per vaccinator and an overall medical error rate of less than 5% were set as minimum thresholds to achieve a successful drill; these rates were determined from previous DCHD immunization exercises conducted by certified public health nurses.

Potential medical errors included misidentifying the correct vaccine to use for a patient, dispensing the incorrect dosage, and/or recording erroneous information on the VAR after the inoculation procedure. Evaluators only observed during the drill and provided written evaluation of the technique; they provided no hands-on guidance during the drill.

RESULTS

During the 1-hour drill, 335 mock vaccinations were administered, resulting in an average throughput of 22.33/hr for each vaccinator. Three of the vaccinators had a significant negative effect on the average throughput: 1 vaccinator missed the group-based JIT training and instead received a condensed individualized JIT training, another was no longer actively practicing dentistry (ie, retired), and the third individual talked extensively with patients.

The medical error rates of the dental responders were found to be very low (7 of 335; 2.08%). Three of these errors resulted from incorrect vaccine dosages administered; the remaining 4 errors resulted from incorrectly labeled VARs.

DISCUSSION

Dental professionals already possess the basic knowledge and skills necessary to perform vaccinations.³ Performing these duties in a disaster response scenario is a natural extension of their skills, and serves as just one example of how oral health care professionals can be a valuable asset during pandemic and all-hazard response events. The mass vaccination drill

described here showed that, even with a short JIT training session, the majority of dental responders could successfully serve as vaccinators in a public health emergency. Error rates (2.08%) demonstrated by the dental responders participating in this drill were comparable to error rates (1%) documented in analogous mass influenza clinics previously operated by DCHD using certified public health nurses. Also, the average error rate per dental vaccinator was within the acceptable threshold determined before the event (below 3%).

It was noted that 3 of the 15 vaccinators did not possess the requisite knowledge of administering vaccines. As a result, a select number of vaccinators negatively affected the comprehensive throughput measurements. The observation that a small number of the dental responders struggled with the administration of the vaccines emphasizes the importance of conducting training sessions, such as this drill, before an emergency event. These drills can help to determine the ability of potential responders to conduct various medical response techniques, identify responders who may need additional training in a particular skill, and determine if potential responders need to be repurposed to other response activities (such as logistical support).

The porcine ex vivo model used in this drill has been used for applied, hands-on medical training for several years.^{8,9} Harvested ex vivo hams can simulate the connections between tissues and anatomic structures and are often considered superior to non-biological models. By using these tissues, clinicians are able to replicate the haptic sense needed to maintain clinical skills, expand clinical training skills, fulfill continuing education needs, and achieve certification training. Harvested ex vivo tissues are inexpensive and readily available from retail butchers, and they can therefore serve as valuable training tools for functional drills involving inoculation training components.

While the background and professional experiences of the 15 dental responders participating in this exercise varied widely, the exercise was successful in validating the JIT training methodology used to train the dental responders as a group and the operational protocol used to conduct the exercise. However, the sample size used in this initial training exercise was too small to measure statistically meaningful effects of how differences in individual characteristics (such as clinical experience and previous emergency response training) affected the throughput and/or error rates observed.

Based on the initial success of the drill described here, future influenza mass vaccination exercises are planned by DCHD. These exercises will study both an increased number of dental responders and the length of vaccination time to gain a more thorough statistical evaluation of vaccination throughput and error rates for this group of professionals. These drills will further serve as a means to better understand the general capabilities of dentists and hygienists and determine the appropriate level of training needed for oral health care

providers of various skill levels and backgrounds. In addition, drills mimicking other pandemic and all-hazard response situations will be developed to test the capability of the dental health professionals in other response areas, including triage and biometric applications.

Given that initial response to a public health emergency occurs at the local level, and is typically coordinated by local/county health organizations, it is imperative that dental responders receive training at the local level. As used in this study, such training could be coordinated through the Medical Reserve Corps, which is already available within many communities throughout the United States. Because many local public health agencies already have training programs in place for public health care responders, these programs could be modified and tailored to the specific skills of dental practitioners, as necessary.

CONCLUSIONS

The dental responder immunization training exercise described in this study supports the use of oral health care professionals as a valuable immunization resource. Also, the *ex vivo* porcine model system used in the drill was demonstrated to be a simple and inexpensive tool for practicing inoculation techniques. Given the breadth and severity with which pandemics can strike,¹⁰ the inclusion of oral health care professionals in pandemic preparedness and disaster response activities is strongly advocated. As part of their day-to-day activities, dentists diagnose and treat manifestations of systemic conditions and provide appropriate interventions, follow-up measures, and referrals.

The entire dental community contributes to the technological, clinical, and ethical practice of medicine and must remain involved in policy discussions, planning, and implementation of care scenarios that dynamically shape their evolving role within the medical and health care communities. Thus, all dental professionals contribute to the advancement of care by supporting oral, systemic, public, and community health care to those in need, in accordance with the primary tenets of medicine.¹¹ In this way, dental responders can be used to their fullest capabilities during pandemic and all-hazard response scenarios, and oral health care professionals will be able to work in partnership with other public health care responders to provide a coordinated, cohesive medical response at the local, state, and federal levels.

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