RESEARCH

Implementing the Cities Readiness Initiative: Lessons Learned From Boston

Howard K. Koh, MD, MPH, Loris J. Elqura, MS, Christine M. Judge, MS, John P. Jacob, BA, Amy E. Williams, BA, M. Suzanne Crowther, MPH, Richard A. Serino, EMT-P, and John M. Auerbach, MBA

ABSTRACT

The federally funded Cities Readiness Initiative (CRI) requires seamless federal, state, and local public health coordination to provide antibiotics to an entire city population within 48 hours of an aerosolized release of anthrax. We document practical lessons learned from the development and implementation of the Boston CRI plan. Key themes center on heightened emphasis on security, a new mass protection model of dispensing, neighborhood-centric clinic site selection, online training of Medical Reserve Corps volunteers, and the testing of operations through drills and exercises. Sharing such lessons can build national preparedness. (*Disaster Med Public Health Preparedness.* 2008;2:40–49)

The theme of maximizing government coordination to build emergency preparedness[1–3] has special relevance to the Strategic National Stockpile (SNS) program, created in 1999 as a mandate by Congress. Stored in strategic national locations, the SNS includes caches of medication and equipment that can be deployed quickly in response to a biological or chemical attack, or any public health emergency, once local inventory has been exhausted. Coordinated deployment of SNS assets ensures that specific medications, antidotes, and supplies reach the public as quickly as possible. In this process, states first receive these essential medications from federal authorities at predetermined Receipt, Storage, and Staging (RSS) locations. There, shipped quantities are broken down ("staged") into smaller pallets, readying them for shipment to specific community point of dispensing (POD) sites overseen by local health departments.[4] The deploying, receiving, and distributing of assets require seamless coordination.

In 2004 the Centers for Disease Control and Prevention (CDC) announced the Cities Readiness Initiative (CRI), a major SNS-related emergency preparedness program.[5] Jointly funded by the Department of Homeland Security (DHS) and the Department of Health and Human Services (DHHS), CRI requires designated cities to develop protocols for the distribution of oral antibiotics to their entire identified populations over 48 hours as part of a specific planning scenario that involves the aerosolized release of anthrax over a widespread area. In its first year, CRI involved the 20 most populous US cities and Las Vegas. In subsequent years, the program expanded to include the metropolitan statistical areas surrounding the initial 21 cities and now involves 72 cities, with at least 1 CRI city in each state.[5]

National organizations have disseminated broad CRI planning guidelines delineating major SNS functions: command and control to activate distribution functions and provide overall coordination; receipt, storage, and staging; inventory control of received medications; distribution of assets to RSS sites then on to PODs and treatment centers; dispensing of medications; repackaging of bulk pharmaceuticals into units of use; communication; and security.[6] However, to our knowledge, no article comprehensively documents practical lessons learned about the concrete rationale and process of implementing these functions. In this article, we present some major practical themes that have emerged from 3 years of planning and implementation in Boston, a CRI city ranking highly in initial national evaluations.

BOSTON CITIES READINESS INITIATIVE: SPECIAL EMPHASIS ON SECURITY AND THE MASS PROTECTION MODEL

Boston, with a population of approximately 600,000 and a greater metropolitan population approaching 1 million, has a number of vulnerabilities relevant to preparedness. Two of the planes hijacked on 9/11 originated from Boston's Logan Airport. An economic, historical, and cultural hub, the city hosts many well-attended national and international events, such as the Boston Marathon and the 2004 Democratic National Convention (the first political convention after 9/11 designated as a National Security Special Event by the US Secret Service).

https://doi.org/10.1097/DMP.0b013e3181644401 Published online by Cambridge University Press

Boston's unique geographic and demographic dimensions shaped CRI planning. In particular, accessibility concerns centered on the densely populated, compact nature of the city, where about one third of residents use public transportation to commute to work.[8] In addition, 51% of the population is nonwhite,[9] and 33% speak a language other than English at home.[8] Each neighborhood (eg, Chinatown, Italian North End) contributes to the city's great diversity with respect to race, ethnicity, cultural identity, and language (Fig. 1).

Upon receiving first-year CDC funding through the Massachusetts Department of Public Health (MDPH), the Boston Public Health Commission (BPHC, the city's public health agency), tackled incorporating Boston's CRI dispensing strategy into local all-hazards planning. Recognizing that the complexity and scope of the security requirements fell well outside of the traditional public health realm, the CRI Security Workgroup secured the participation of the Boston Police Department (BPD) in the planning process, including the appointment of a ranking police official as a "security lead." (Overall, the CRI Security Workgroup would come to include the BPHC Emergency Preparedness Division, BPD, the Massachusetts SNS Program, the Massachusetts State Police, the US Marshals Service, the Boston Municipal Police, Boston Emergency Medical Services, the Boston Metropolitan Medical Response System, the Boston Centers for Youth and Family, Boston Public Schools, and the Boston Amateur Radio Club.) Through a series of subcommittees, the workgroup addressed all of the security issues related to the identification and assessment of dispensing sites, as well as the movement of SNS assets through the city to the PODs.

Although ongoing interactions with the US Postal Service continue to explore the "push" approach to mass prophylaxis (ie, bringing medicine directly to the homes in affected communities), most attention has focused on the "pull" approach of requiring individuals to travel to specially designated dispensing centers.[10]

Implementing CRI to meet unprecedented throughput milestones meant shifting the paradigm away from the traditional "medical model" often used for public mass dispensing events. In 2004, as CRI planning was in its early stages, BPHC conducted 2 traditional large-scale mass immunization clinics (in response to separate foodborne hepatitis A outbreaks). The time-consuming clinics, involving strict clinical standards and education, client registration, counseling, and an exit interview, were clearly not feasible for achieving the milestones mandated by the CRI 48-hour dispensing window. Hence, the goal of boosting throughput and eliminating bottlenecks led to a streamlined "mass protection" model, created to save time by altering key operational aspects of these clinics (Fig. 2). The new model sacrificed some traditional activities—such as patient registration, face-to-face education, and exit interview sessions—to achieve rapid dispensing of pills to as many people as possible. Also, 2 further logistics decisions were made. First, planners adopted a "head of household" model that encouraged 1 representative from each household to pick up the medications for their entire family, thus minimizing the numbers frequenting the PODs. To maximize success, there is a liberal 10-bottle (with each bottle containing 20 antibiotic pills) limit allotted per person, so that clients can claim extra medication for family

FIGURE 1

Map of Boston neighborhoods

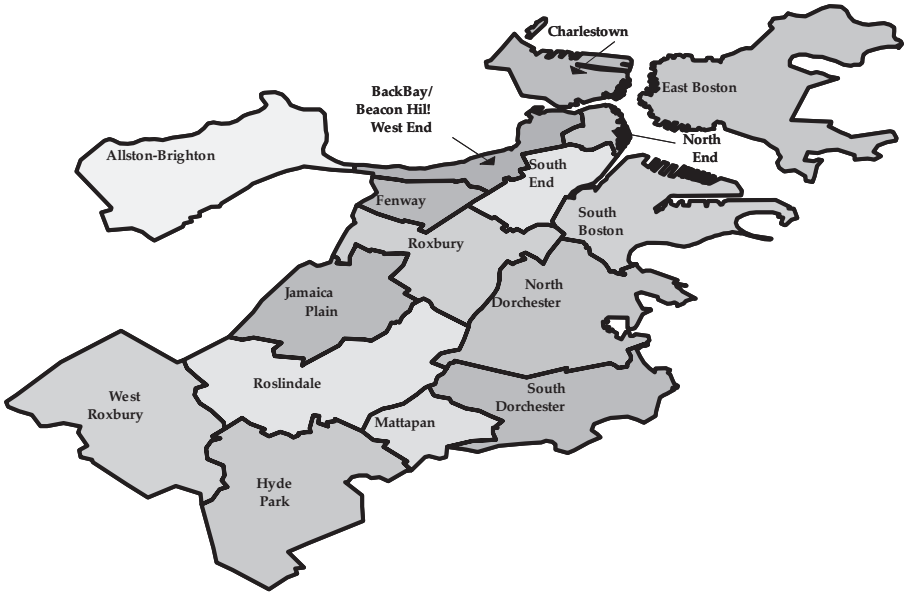
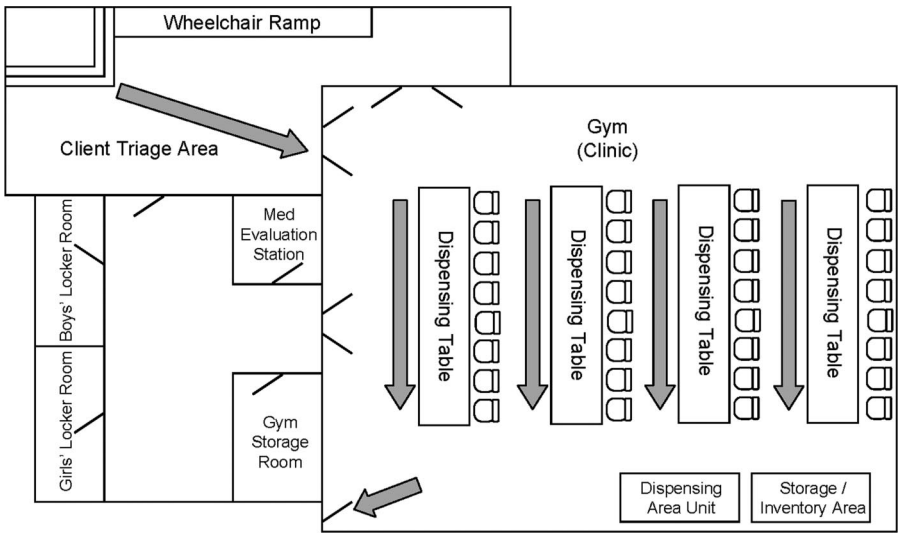


FIGURE 2

Point of Dispensing (POD) clinic flow



members, older adult neighbors, or people who are confined to home. Second, waiving requirements for identification served 2 purposes: eliminating bottlenecks and facilitating attendance by all possibly exposed, including youths and noncitizens. Given that such an event would be in response to an anthrax attack, any concerns about liability would be addressed within the context of a declared public health emergency. Following these decisions, Boston's CRI planners then focused on identifying and selecting optimal POD sites, staffing and training Boston Medical Reserve Corps volunteers, making PODs operational, and assessment and evaluation.

Identifying and Selecting Optimal POD Sites

BPHC began selecting POD sites by consulting the 3 key national planning guides for emergency dispensing: the CDC manual *Receiving, Distributing, and Dispensing Strategic National Stockpile Assets* for state, regional, and local personnel; the National Association of County and City Health Officials reference tool *The Strategic National Stockpile (SNS): A Reference for Local Planners*, and the Agency for Healthcare Research and Quality planning guide *Community Based Prophylaxis: A Planning Guide for Public Health Preparedness*.[4,6,10] Collectively, these guides emphasized major themes for selecting POD sites to include facilities that were publicly owned (therefore readily available to local officials), in densely populated areas accessible by public transportation, large enough to accommodate many people with special consideration for storage and loading areas to receive SNS assets, and amenable to client flow and tailored to the local population.

The CRI Security Workgroup agreed on a neighborhood-centric strategy recognizing the city's diversity and compact geographic nature and specifically focusing on public schools and community centers. Using municipal buildings not only obviated the need for local officials to obtain written memoranda of understanding but also maximized access by response staff in the event of an emergency. Based on the federal guidelines noted above, BPHC determined that 30 primary dispensing sites (and 20 backup locations) could provide prophylaxis over 48 hours to Boston's nearly 600,000 residents. This assumed a rate of 1000 people hourly at each site and 12-hour shifts for staff and volunteers. The workgroup then reviewed the location of municipal schools and community centers in each of Boston's neighborhoods, as well as site eligibility criteria. The workgroup conducted physical assessments of prospective sites, and finalized the list of locations utilizing a customized geographic information systems (GIS) database to catalog site-specific information and images. Each Boston neighborhood included at least 1 POD.

Developing Site Eligibility Criteria

In developing a series of baseline assessment measurements related to site security, logistics, and accessibility, planners required each site to feature the following:

- Ample exterior areas away from street traffic, for crowd queuing
- Ease of access from the street, as well as within the building, for individuals with mobility impairments
- A loading dock that provided a locus for work with pallet jacks, handcarts, and other handling equipment

- A locked, windowless room large enough for the secure storage of medications
- A large modular area, such as a cafeteria or gymnasium on the ground floor, for major dispensing activities
- Separate, enclosed rooms for logistical support functions, such as tactical communications, staff breaks, and psychological first aid

The workgroup developed and distributed a survey for each site's facilities manager to collect specific logistical data. These data included contact information for owners, property managers, security managers, and maintenance staff; information that would affect client flow (eg, quantitative information on daily flow capacity through the site, staff and security, elevators, escalators, custodial capacity); accessibility information (eg, locations of entrances, exits, stairwells, and floors; ability to lock down the facility; after-hours access; identification protocol for staff and security; roof access locations; delivery truck access; emergency vehicle access); environmental and power information (eg, chemicals/hazardous materials and locations, power sources, fuel generator locations, heat and air controls), and security information (eg, surveillance systems and security center locations).

Conducting Physical Assessments of Prospective Sites

A team of representatives from the BPHC, BPD, EMS, Boston Municipal Police, and the facilities themselves conducted comprehensive site visits to assess whether eligibility criteria were met. Such visits ranged in length from a few minutes (when a site was quickly eliminated for failure to meet the minimum requirements listed above) to as long as 3 hours. If the site met the minimum requirements, then the workgroup determined how to make the most effective use of the space by identifying dedicated entrance and exit points and delineating major operational areas for dispensing, delivery of the assets, storage, triage, communications, and so forth. The assessment process included digital photos of all of the areas to be used during a mass dispensing event.

Finalizing the List of Locations: Using a Customized Database With GIS Technology

Of 75 sites visited, 25 were disqualified because they did not meet the minimum criteria. In particular, in many instances, Boston's narrow streets did not leave room for large outside queuing areas. All of the final 30 primary sites were public schools and community centers, and the 20 secondary sites included other types of locations (including 7 of the 9 skating rinks in Boston operated by the Department of Conservation and Recreation). Other nontraditional sites explored included the city's 2 convention centers, which could represent future points for volunteer gathering (although high occupancy rates may render them unavailable for quick conversion during an emergency). Discussions are ongoing about using the largest dozen of Boston's 240 hotels, not for dispensing but rather for mustering and just-in-time training of volunteers. Furthermore, planning for mass dispensing continues for several of Boston's many colleges and universities, which feature not only large auditoriums, gymnasiums, and other halls that could serve as dispensing sites but also substantial resources with respect to student health services, campus security, facilities management, and student volunteers.

BPD developed a customized GIS database to store complete site-specific information from the site assessments, including contact data, floor maps, clinic flow, exterior queue diagrams, interior and exterior images, and accessibility points. GIS technology facilitated storage of a vast amount of site-specific data in a user-friendly spatial database. It also provided a ready resource for use during real-time activation for just-in-time training and onsite orientation of staff and volunteers.

> ...the Boston experience underscores the paramount importance of coordination between public health and public safety to ensure security surrounding timely delivery of SNS assets

Staffing and Training Boston Medical Reserve Corps Volunteers in the Mass Protection Model

BPHC developed a robust Boston Medical Reserve Corps (BMRC) volunteer structure to support the large-scale mass protection model. As part of recruitment, all of the volunteers were required to complete a face-to-face BMRC orientation or online orientation developed in conjunction with the Harvard School of Public Health Center for Public Health Preparedness. The hour-long training module instructed new volunteers on the purpose of the BMRC, the notification and deployment process during an emergency, and other fundamental concepts. The online course automated what had been a time-consuming in-person training session, and prepared volunteers for emergency deployment. BMRC volunteers self-selected as participating at either a "response" level or at a higher "leadership" level. Response level volunteers, considered to be prospective frontline support staff in the operation of PODs, received a basic orientation using the online training module. During an event, they also would receive just-in-time training on specific job functions and dispensing site details relevant to their deployment. Leadership level volunteers, who could serve in managerial roles during a CRI

https://doi.org/10.1097/DMP.0b013e3181f44401 Published online by Cambridge University Press

event, received the online orientation plus a 4-part module of in-person training, focusing on Incident Command System (ICS) basics, managing mass dispensing clinics, leadership skills, and psychological first aid.

BMRC volunteers also were classified into 3 categories, based on their subject matter expertise, training, and licensure: clinical (licensed to administer treatment, such as doctors, nurses, and pharmacists), clinical support (certified medical assistants and pharmacists), and nonclinical (all others). At the time of activation, each participating volunteer would be required to report to a central training site, present a government-issued photo ID, and receive a badge identifying their category of service. In the case of spontaneous (non-BMRC affiliated) volunteers, BPHC can confirm medical licensure through an online state database that lists all of the state's licensed health care professionals. Although BPHC can authorize legal dispensation of medications locally, liability and workers' compensation issues for spontaneous volunteers are still a matter of debate at the state and federal level.

Because national planning guides offered only broad parameters about staffing number requirements, BPHC formalized them. BPHC began by assuming that each POD would operate in two 12-hour shifts per day, using an ICS staffing model. After reviewing all of the job functions involved with POD staffing, BPHC estimated that 60 individuals would be required for each staffing period, or a total of 120 people for each POD location. With 30 primary PODs, the Boston CRI plan would therefore require 3600 volunteers, rounded up to 4000 as an additional buffer.

Outreach and recruitment for BMRC involved an intensive multimedia advertising campaign, with public service announcements, transit advertisements, advertisements on popular local Web sites, and public appeals led by the mayor (Fig. 3). This campaign and ongoing recruitment efforts through traditional community outreach have, to date, resulted in the enrollment of approximately 2348 people, including 998 at the leadership level. Despite this progress, the development of staffing resources for the full deployment of all of the 30 primary PODs remains a major limiting factor in Boston CRI planning.

Making PODs Operational

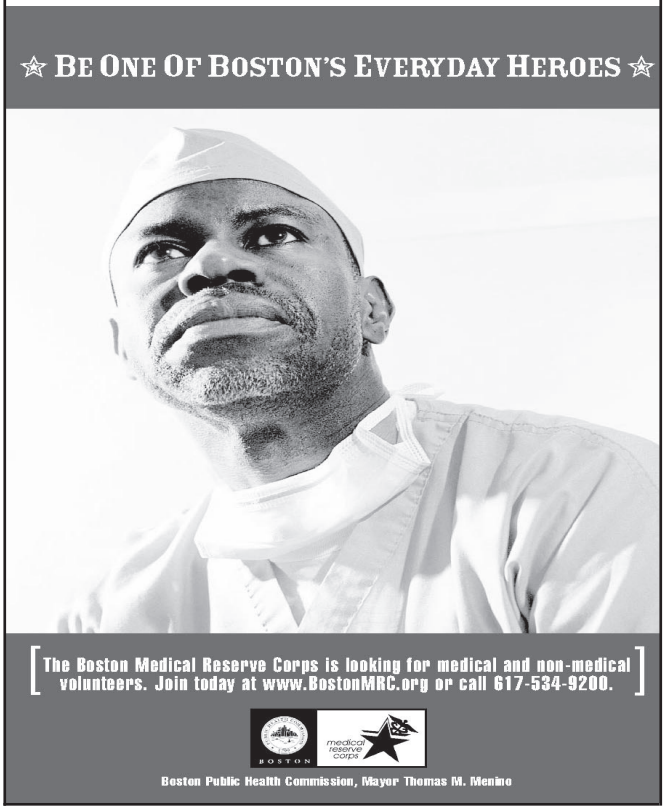
Making PODs operational requires requesting SNS assets and initiating command and control, ensuring security of assets in transit, ensuring security of POD sites, protecting essential personnel, implementing the POD through just-in-time training, and coordinating risk communication.

Requesting SNS Assets and Initiating Command and Control

Requesting SNS assets requires coordination with city, state, and federal officials. A city's decision to dispense would trigger a formal SNS request to the MDPH commissioner, who in turn would notify the director of the Massachusetts Emergency Management Agency and subsequently the governor. These state officials then forward the formal request to the CDC director, who would initiate an immediate situational assessment conference call involving the CDC, federal, state, and local agencies. If assessment concluded that local medication supplies would not suffice, then SNS assets would be released.

FIGURE 3

Recruitment advertisement for Boston Medical Reserve Corps



Upon approval, command and control coordinates overall aspects of SNS. Tactical communication involves initiating call-down lists and communication pathways among PODs, emergency operations centers, and support agencies (eg, MDPH), the RSS location, the unified command center, and hospitals. This requires redundant communication systems, including land-line telephones, e-mail, Web-based communications, cell phones, fax, and ham radio operations.

The local SNS coordinator would convene pre-identified leaders, including the tactical communications head, the security coordinator, dispensing site coordinator, and staffing/volunteer coordinator. Call-down lists would be activated and command structures established for each dispensing site, using the ICS structure.

https://doi.org/10.1097/DMP.0b013e3181644401 Published online by Cambridge University Press

Ensuring Security for SNS Assets in Transit

The CRI Security Workgroup developed comprehensive security plans for the delivery of SNS assets from the RSS site into the city, which require handoffs from federal to state to local officials. Specifically, when the assets reach the RSS facility, official custody of SNS medications is transferred from the US Marshals Service to the Massachusetts State Police. As noted earlier, the medications are then repackaged into smaller POD-specific quantities at the RSS, and loaded onto a convoy of trucks to be delivered to the specific POD locations. State police units escort the convoy, meeting with a BPD security contingent at a predetermined rendezvous point just outside the city, at which point the joint Boston and state police escorts continue into the Boston area. Security for the convoy becomes the primary responsibility of BPD as soon as it crosses into Boston. Physical custody of SNS medications is transferred to BPD as soon as each delivery is off-loaded at each POD.

Ensuring Security of POD Sites

With 30 primary PODs dispersed across the city, the CRI Security Workgroup balanced deploying BPD resources to ensure safety while continuing to provide essential policing for the city as a whole. To do so, the workgroup opted for a nontraditional security approach that offered flexibility during a mass dispensing response; namely, that security operations should entail at least 1 uniformed officer at each POD, augmented by mobile BPD strike teams, stationed within the vicinity of several contiguous POD locations. These could be dispatched immediately if needed. In addition, attention to traffic and crowd control in and around each dispensing site was a high priority.

> Much more attention is needed to reach and serve vulnerable populations, such as people with impaired mobility and non–English speakers

Protecting Essential Personnel

BPHC worked to ensure that all essential personnel involved in mass dispensing operations and security received medications that would allow them to continue assisting in the response. Plans differed for public safety first responders and POD staff. Public safety first responders (including city police, fire, emergency medical services, and BPHC core response staff) would receive postevent prophylaxis well before the arrival of SNS assets at a predetermined dispensing location that is not part of the POD network. Given that this would take place in the initial stages of CRI activation, medications for first-responder prophylaxis would be provided through an existing cache of antibiotics held by the Boston Metropolitan Medical Response System.

In contrast, all POD staff would receive their prophylaxis at the dispensing site to which they were reporting. Volunteers would receive medications for their families as well, an additional incentive for these individuals to participate in a response.

Just-in-time Training to Implement the POD

Once POD staff received their medication, just-in-time training would orient them to their working area and supplies. Staff would review job action sheets detailing both core and support functions for their POD assignment. Individuals assigned as dispensing staff also would review the algorithm (Fig. 4) that they would use to determine the appropriate antibiotic to dispense.

After opening the facility per order of the POD manager, clients would enter the POD and receive information while in line. Triage staff would monitor individuals in queue to identify anyone exhibiting symptoms of anthrax exposure, and would direct those individuals to the hospital for treatment. Clients entering the dispensing area would be directed to the next available dispensing station. Dispensing line staff would use the aforementioned algorithm to determine the appropriate course of prophylaxis. Individuals with complicated medical histories who cannot take doxycycline or ciprofloxacin would be directed to a medical evaluation station within the POD, where they would receive individualized attention from a clinician. The purpose of diverting these individuals is to remove any impediment to accelerated dispensing within the POD. In short, BPHC has used the "basic high flow model" of POD configuration offered by the Agency for Healthcare Research and Quality.[10]

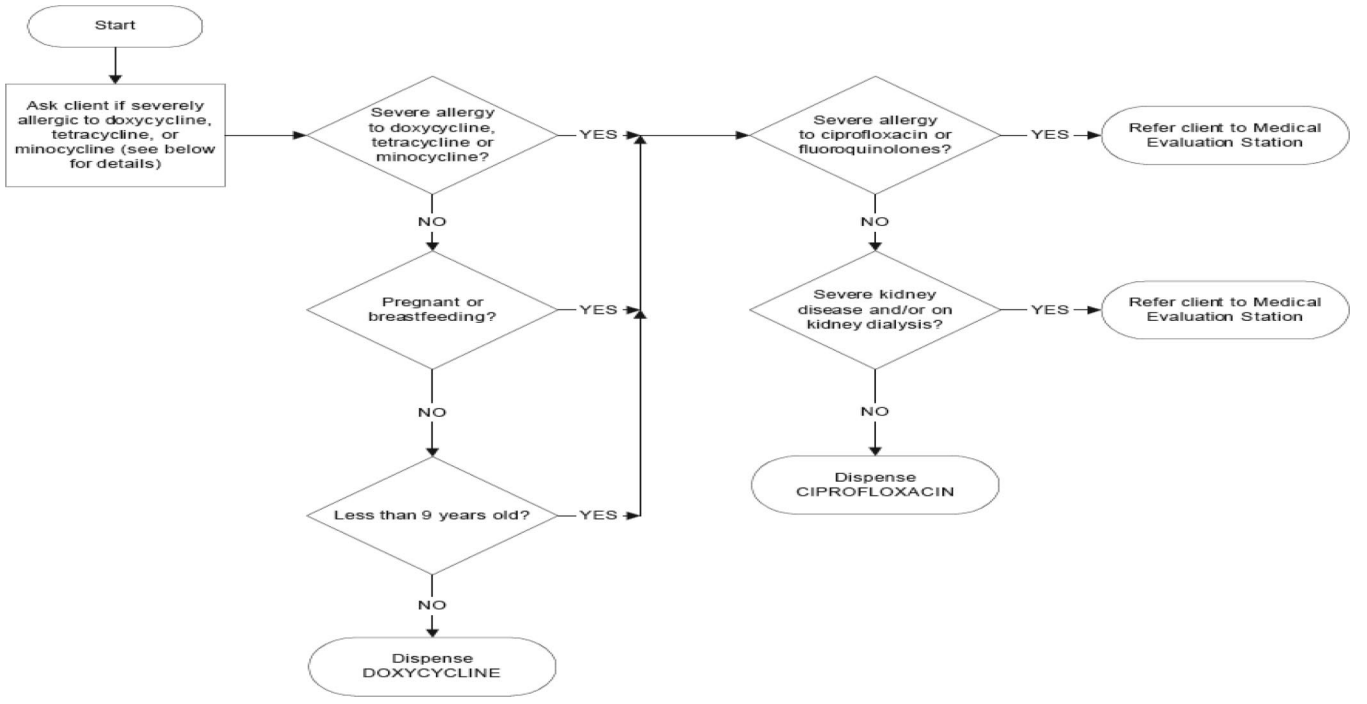
Risk Communication

The BPHC Communications Office divided risk messaging and public information for mass dispensing into a comprehensive public communications strategy before an event and public information materials for use during an event. Materials developed for public information include fact sheets about anthrax and the specific medications being dispensed, directions to sites, and location-specific information on each POD. All of these materials exist in electronic and paper versions, with the capability for rapid additional printing during activation. Patient information sheets already exist in Haitian Creole, English, Chinese, Portuguese, and Spanish, with the capacity for additional translation in the 10 most commonly spoken languages in Boston, if needed.

During an event, activation of a Joint Information Center would ensure coordination of public risk messaging among local, regional, and state stakeholders. The many critical communication modalities involved would first rely heavily on television, radio, and newspapers (both print and elec-

FIGURE 4

Antibiotic dispensing algorithm



tronic versions). The Mayor's Emergency Alert Notification System, which not only allows emergency managers to send prerecorded messages to residents using reverse 9-1-1 technology but also sends customized messages to specific geographic areas of the city, could direct residents within a predefined area to the neighborhood POD.

Furthermore, BPHC has used a podcasting studio to tailor messages to specific audiences. BPHC first used podcasts for potentially exposed workers during a measles outbreak in Boston in 2006 as a timely and targeted form of communication during an emergency.[11] Podcasts enable public information specialists to shape the specific content of each message. For example, recording messages in a specific language and transmitting that audio file to an ethnic radio station helps target and serve that linguistic population. Ongoing interactions with all local media outlets on a variety of emergency preparedness issues re-emphasize their critical communication roles during an emergency.

Assessment and Evaluation

Exercises and Drills

BPHC designed a phased series of drills and exercises to test the Boston CRI plan. The initial set of exercises tested discrete aspects (eg, tactical communications, plan activation, command and control) in a tabletop environment. Next, a full-scale exercise in June 2006 tested the security and logistical aspects of moving SNS assets from the RSS facility to 5 PODs, including complete setup of 1 POD site. Despite the complications posed by 2 real-world events on the day of the exercise—heavy rains required the activation of the State Emergency Operations Center and a tractor-trailer wreck forced the shutdown of a major interstate highway—assets were successfully delivered within the planned 90-minute window and physical set-up of the POD took less than 2 hours. Command centers at both BPHC and BPD coordinated and transferred information throughout the exercise.

Evaluation of the June 2006 exercise, summarized in an after-action report,[12] was conducted by a team of onsite personnel from various public health partner organizations. Data included information from evaluator feedback/debriefing, participant feedback/debriefing, and a Web Emergency Operations Center report of significant events. Lessons learned included issues outside the POD (eg, the need to review transportation routes to avoid hazards such as low bridges and map out sign locations for each site in advance) and within the POD (eg, redesign of queuing and triage areas for ease of throughput, further standardization of ICS charts with job action sheets, provision of ample numbers of clinic signs).

After learning from these exercises, Boston CRI planners

https://doi.org/10.1097/DMP.0b013e3181644d1 Published online by Cambridge University Press

implemented a full-scale operations exercise in June 2007 to test POD throughput. BMRC volunteers staffed the POD. Other BMRC volunteers simulated 150 unique patients, representing a range of health conditions (uncomplicated, required specialized care, or seriously ill), who were obtaining medications for themselves or as head of a household. The volunteers followed scenarios depicted on patient information sheets that described the medical histories of an individual or an entire family (including illnesses, drug allergies, and pregnancy status). All of the medications were dispensed for the presenting individuals and their households within 44 minutes, which extrapolated (by adding all of the individuals in all of the households represented and assuming a full complement of dispensing staff) to an equivalent of 1988 people per hour. Furthermore, evaluation after the exercise of whether simulated patients received the proper medication (eg, not dispensing doxycycline to someone allergic to the drug) found a dispensing accuracy of 98.8% (Fig. 4). Whether such throughput and accuracy can be matched when serving disabled, truly ill, and non–English speaking residents will be the focus of future exercises.

Federal Evaluation

In an initial assessment, the first annual CDC evaluation ranked Boston in the top tier of the 21 pilot cities. The evaluation, based on a standard local SNS assessment tool developed and modified by CDC, involved a checklist of core functions (with different weights) and critical planning steps within each function. A scoring system assigned color ratings (red, amber, or green) and a numeric score (range 0–72). The evaluation cited Boston's progress in identifying sites, in developing close working relationships with partners (eg, MDPH, BPD), in using lessons learned in "real world" hepatitis and flu vaccination clinics to update dispensing strategies, and in developing the comprehensive BMRC recruitment and training plan. Of note, the ratings assessed planning, not the execution of those plans. An updated assessment tool subsequently has been released that focuses on assessing 12 core functions through a point-based system (Table 1).

TABLE 1

CDC Evaluation Schema

Core Functions	Functional Weight, %
Developing an SNS plan	3
Management of SNS command and control plan	10
Requesting SNS	3
Tactical communication	3
Public information and communication	7
Security	10
Regional/local distribution site (if applicable)	14
Controlling inventory	3
Distribution	10
Dispensing prophylaxis	24
Treatment center coordination	3
Training, exercise, and evaluation	10

The "Push" Approach to Mass Prophylaxis

While developing the POD-based "pull" approach to mass prophylaxis, BPHC also partnered with the US Postal Service to augment their CRI dispensing plan with a "push" approach that would bring a limited amount of medication to households in the early hours of CRI activation.

Recently, BPHC completed an exercise testing delivery of medication via the Postal Service,[13] becoming the third city to do so (after Seattle and Philadelphia, respectively). In September 2007, 32 Postal Service carriers, each accompanied by a Boston police officer, distributed empty containers representing boxes of doxycycline in 2 Boston neighborhoods, West Roxbury and the South End. The neighborhoods were chosen by Boston health officials for their differing demographic characteristics and mail delivery methods (by vehicle vs by foot). Postal carriers reached 23,000 households in under 6 hours, a rate better than officials expected.[13]

DISCUSSION

Meeting CRI standards of providing prophylactic antibiotics for an entire city population within 48 hours of release of aerosolized anthrax is a Herculean task, necessitating seamless coordination of federal, state, and local officials. To our knowledge, this article is the first to document, in a comprehensive fashion, the breadth of major practical lessons emerging from CRI planning. Of note, the Boston experience underscores the paramount importance of coordination between public health and public safety to ensure security surrounding timely delivery of SNS assets. In addition, we newly document a range of issues including adoption of the mass protection model, the rationale for identifying and selecting POD sites, online methods for recruiting and training BMRC volunteers, issues in operationalizing PODs, and results of assessment and evaluation through drills and exercises.

BPHC has proposed a "mass protection model" to reach the strict mandates of the CRI. Although the successful adoption of such a new paradigm during an actual emergency remains an open question, particularly with respect to issues such as lack of age or ID requirements regarding participation, other cities have moved toward similar models in attempts to improve client flow. For example, when the District of Columbia Department of Public Health tested their SNS dispensing plans through exercises, researchers there recommended adjusting or eliminating registration and/or triage function to achieve the maximum throughput.[14] The Philadelphia Department of Public Health, in testing a head-of-household approach for mass dispensing at a POD, also concluded that such a method was rapid, accurate, and effective.[15] Yet, other cities are exploring alternative methods of dispensing, including using businesses and corporations as PODs to distribute medication to their employees, or even using public school buses as an alternative push approach.[16]

A fundamental aspect of CRI planning, not previously addressed in great detail in the literature, is optimal site selection. In Boston, this process required establishing explicit criteria (addressing health, security, and logistics considerations), conducting physical site assessments, finalizing PODs with attention to both backup sites and nontraditional sites, and storing site-specific information for ease of retrieval using start-of-the-art GIS technology. Furthermore, establishing sites using a neighborhood-centric strategy allowed BPHC to address issues of accessibility, familiarity, and diversity in culture and language. Other cities, such as San Francisco, also have acknowledged these dimensions in site selection strategy.[17]

Making POD sites operational requires attention to the need, not addressed substantially in the literature to date, to recruit and train thousands of volunteers. Virtually every CRI city finds staffing to be a limiting factor. Boston's outreach campaign, innovative online training, and tailoring of volunteer education to clinical status (clinical, nonclinical, other) and commitment (response level and leadership level) offers an option that needs further evaluation and validation.

Some states—including Washington, Rhode Island, Iowa, and Oregon—have published results of exercises in implementing PODs and their state SNS plans.[18–23] In Washington state, drills involving the recruitment, education, and postexposure prophylaxis of volunteer patients found that the median time spent in the POD for each head of household was 10.6 minutes. Of those, 80% knew how to take the medications, and 73% reported understanding medication instructions for all of the individuals for whom they picked up medication. Most of the POD staff reported feeling comfortable in their job tasks and duties.[20] The Rhode Island exercise, involving 10 municipalities and 12 hospitals, demonstrated the need for modifications in areas such as the system for supply distribution and transportation.[18] Iowa's 3-day drill, focusing on the pharmacists' role in SNS dispensing, found that lack of adequate staffing was the biggest roadblock to achieving efficiency.[23] A recently published evaluation in Oregon showed the feasibility of using just-in-time training for clinics staffed largely (84%) by non–medical professionals.[21] To date, exercises for the Boston CRI initiative preliminarily demonstrate that setup of a POD, including delivery of SNS assets from an RSS site, can occur within 2 hours, and that the equivalent of nearly 2000 clients per hour can be achieved with a 98.8% accuracy rate. However, these initial results based on extrapolated figures need to be validated and extended.

Ultimately, the success of CRI will depend on much further quantitative testing and formal evaluation, particularly around throughput and timing benchmarks. Much more attention is needed to reach and serve vulnerable populations, such as people with impaired mobility and non–English speakers. The proper balance of the push and pull approaches to mass prophylaxis needs clarification. More alternative sites for PODs can be explored; some cities are exploring models for distributing SNS assets that involve using worksites as PODs. In addition, identifying and using quality measures for PODs may inform future directions with respect to efficiency, cost-effectiveness, and optimizing the mass protection model.

The Boston experience serves as only 1 CRI example in a geographically compact, highly diverse city. Other CRI cities have shared best practices through CDC SNS workshops, the Lessons Learned Information System Sharing DHS Web site, electronic mailing lists, and other means. Leveraging such experiences can improve national public health preparedness for the benefit of public health in the future.

About the Authors

Dr Koh is Director, Center for Public Health Preparedness, Harvard School of Public Health; Ms Elqura is a research assistant in the Center for Public Health Preparedness, Harvard School of Public Health; Ms Judge is Research Manager, Center for Public Health Preparedness, Harvard School of Public Health; Mr Jacob is Acting Director, Emergency Preparedness Division, Boston Public Health Commission; Ms Williams is a coordinator, Cities Readiness Initiative, Emergency Preparedness Division, Boston Public Health Commission; Ms Crowther is a senior policy and planning analyst, Massachusetts Department of Public Health; Mr Serino is Chief of Department, Boston Emergency Medical Services, Boston Public Health Commission; and Mr Auerbach is Commissioner, Massachusetts Department of Public Health, Executive Office of Health and Human Services.

Received for publication September 10, 2007; accepted December 11, 2007.

Authors' Disclosures

The authors report no conflicts of interest.

Acknowledgments

The Center for Public Health Preparedness at the Harvard School of Public Health is supported, in part, by grant U90/CCU124242-03 from the Centers for Disease Control and Prevention.

We are grateful to Cmdr Patti Pettis, Sgt Tim Connolly, and Barbara Ferrer for sharing their valuable insights and experience during the preparation of this article.

ISSN: 1935-7893

DOI: 10.1097/DMP.0b013e318164f440

REFERENCES

1. Jenkins WO Jr . Emergency Preparedness and Response: Some Issues and Challenges Associated with Major Emergency Incidents. GAO-06-467T. Washington, DC: US Government Accountability Office; 2006.
2. McHugh M, Staiti AB, Felland LE. How prepared are Americans for public health emergencies? Twelve communities weigh in. *Health Aff (Millwood)*. 2004;23:201–209.
3. Yim RA. National Preparedness: Integration of Federal, State, Local and Private Sector Efforts Is Critical to an Effective National Strategy for Homeland Security. GAO-02-621T. Washington, DC: US General Accounting Office; 2002.
4. Receiving, Distributing, and Dispensing Strategic National Stockpile Assets: A Guide for Preparedness: Centers for Disease Control and Prevention. June 2005.
5. Centers for Disease Control and Prevention. Q&A About the Cities Readiness Initiative (CRI). *http://www.bt.cdc.gov/cri/qa.asp*. Accessed August 31, 2007.
6. The Strategic National Stockpile: A Reference for Local Planners: National Association of County and City Health Officials. *http://*

archive.naccho.org/documents/NACCHO-NPS-Guide.pdf. Accessed June 15, 2007.
7. Reference deleted in proof.
8. US Census Bureau. 2005 American Community Survey. *http://www.factfinder.census.gov*. Accessed August 20, 2007.
9. Boston Public Health Commission. The Health of Boston 2007. *http://www.bphc.org/reports/pdfs/report_224.pdf*. Accessed August 31, 2007.
10. *Community-based Mass Prophylaxis: A Planning Guide for Public Health Preparedness*. AHRQ 04-0044. Rockville, MD: Agency for Healthcare Research and Quality; 2004.
11. Smith S. Boston Public Health Department begins podcasting. *Boston Globe*. *http://www.boston.com/yourlife/health/blog/2007/02/boston_public_h.html*. Accessed February 20, 2007.
12. Boston Cities Readiness Initiative: Full Scale Exercise June 3, 2006. After Action Report: Boston Public Health Commission.
13. Smith S. Anthrax drill is met with relief and skepticism. *Boston Globe http://www.boston.com/news/local/articles/2007/09/24/anthrax_drill_is_met_with_relief_and_skepticism*. Accessed September 24, 2007.
14. Reference deleted in proof.
15. Agocs M, Fitzgerald S, Alles S et al. Field testing a head-of-household method to dispense antibiotics. *Biosecur Bioterror*. 2007;5:255–267.
16. Lindner PJ. CRI Alternative Dispensing Guide: A Collection of Model Practices and Pilot Projects: National Association of County and City Health Officials. *http://www.naccho.org/topics/emergency/documents/AlternativeDispensingGuide_Final_000.pdf*. Accessed December 7, 2007.
17. Pine A. Vaccination Ventures: Explanation and Outcomes of a Mass Smallpox Vaccination Clinic Exercise: San Francisco Department of Public Health. *http://www.dph.sf.ca.us/Reports/June17Drill/FnlJune17Rpt.pdf*. Accessed August 31, 2007.
18. Banner G. The Rhode Island Medical Emergency Distribution System (MEDS). *Disaster Manag Response*. 2004;2:53–57.
19. Beaton RD, Oberle MW, Wicklund J et al. Evaluation of the Washington State National Pharmaceutical Stockpile dispensing exercise: part I—patient volunteer findings. *J Public Health Manag Pract*. 2003;9:368–376.
20. Beaton RD, Stevermer A, Wicklund J et al. Evaluation of the Washington State National Pharmaceutical Stockpile dispensing exercise: II. —Dispensary site worker findings. *J Public Health Manag Pract*. 2004;10: 77–85.
21. Spitzer J, Hupert N, Duckart J et al. Operational evaluation of high-throughput community-based mass prophylaxis using just-in-time training. *Public Health Rep*. 2007;122:584–591.
22. Stergachis A, Wetmore CM, Pennylegion M et al. Evaluation of a mass dispensing exercise in a Cities Readiness Initiative setting. *Am J Health Syst Pharm*. 2007;64:285–293.
23. Young D. Iowa pharmacists dispense from Strategic National Stockpile during drill. *Am J Health Syst Pharm*. 2003;60:1304–1306.