



Staff Perceptions of an Enterprise-Level Approach to Emergency Preparedness Activities in Response to an Ebola Virus Disease Outbreak

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Scholarly Report submitted in partial fulfillment of the MD degree at Harvard Medical School

Date: 01 April 2017

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Title: Staff Perceptions of an Enterprise-Level Approach to Emergency Preparedness Activities in Response to an Ebola Virus Disease Outbreak.

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TITLE: Staff Perceptions of an Enterprise-Level Approach to Emergency Preparedness Activities in Response to an Ebola Virus Disease Outbreak.

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Purpose: As hospitals continue to consolidate to improve efficiency and increase financial stability, leaders will have to determine the relative benefits and challenges of approaching emergency preparedness activities at the enterprise level versus the institution level.

Investigating the perceptions of those most closely involved with enterprise-level emergency preparedness activities in response to events as they occur may provide an opportunity to determine if an enterprise-level approach is more beneficial than an institution-level approach, and, if so, which aspects of that approach are most helpful or burdensome.

Methods: Utilizing our enterprise's central emergency management staff, we first established dedicated communications groups and new organizational structures among leaders from emergency management, infection control, laboratory services, waste management, occupational health, public affairs, and others across the enterprise that were dedicated to EVD planning. At the direction of the centralized enterprise planning group, discipline-specific subgroups were created to concentrate the expertise of staff across multiple sites and expedite the development of common clinical and operational guidelines. The centralized planning group also created a tiered system of care and concentrated several functions at the tertiary, academic medical centers within the system.

The survey consisted of multiple types of queries including multiple choice, Likert scale, ranking, and open-ended questions. A request to participate was e-mailed to 89 individuals who participated in the system's activities. Responses were collected using SurveyMonkey software and data were entered into Microsoft Excel. Descriptive statistics were used to analyze the data. Continuous variables were summarized using mean with standard deviation (SD) while categorical variables were summarized using frequency analysis and percentages.

Results: 89% (17/19) of survey respondents agreed or strongly agreed that that the development of enterprise-wide, discipline-specific subgroups was an effective way to address complex problems, with. Respondents also highly agreed with the concept that they had better access to information (79%) and plans were developed faster with faster issue resolution (79%) because of

the enterprise-wide approach to the response. Most respondents felt that the output of the response activities was worth the time and effort they put into them (79%), while only 11% felt enterprise-level activities were burdensome

Conclusion: Respondents felt that, compared to an institution-level approach, an enterprise-level approach made communications more effective, information easier to access, and guidelines simpler to establish and implement with the identification of leaders and the formation of discipline-specific subgroups. They also reported that enterprise-level activities were a good use of their time, and few felt burdened by the efforts required.

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INTRODUCTION

The Ebola virus disease (EVD) outbreak of 2014-15 claimed more lives than all previous EVD outbreaks combined, with more than 11,000 deaths resulting from more than 28,000 cases.¹ Although the majority of patients who contracted the disease and who died from the disease received care in West Africa, the outbreak nonetheless presented substantial challenges for health systems all around the world. In the United States, many hospitals began to feel pressure to be able to safely provide care to patients with EVD during the spring and summer of 2014, but their sense of urgency intensified when a 33-year-old physician who was working in Liberia was diagnosed with EVD and transferred to the Serious Communicable Disease Unit at Emory University Hospital in Atlanta, Georgia for treatment.² The following month, when the first unintentionally imported case of EVD in the US was diagnosed in a man who had traveled from Liberia to Dallas, Texas, most hospitals' concern for their possible vulnerability to EVD increased dramatically.³ However, due to EVD's non-specific initial clinical syndrome and its high degree of contagiousness, most hospitals found the creation of effective new screening and triage protocols, appropriate equipment purchases, training, and use of special personal protective equipment (PPE), and development of appropriate treatment spaces and clinical care protocols to be exceedingly challenging.

Indeed, in October and November of 2014, fewer than half of emergency departments (44%) reported that their hospitals had the ability to both screen and admit a patient suspected of having EVD.⁴ In order to isolate suspected EVD patients, many hospitals used existing airborne infection isolation (AII) rooms, but 5% of emergency departments had no such room and another 24% only had 1 room.⁴ The same survey found that almost half of emergency departments (45%) believed that they did not have adequate PPE to protect themselves if asked to care for a proven EVD case. Clinicians felt significantly burdened by the demands of preparing for EVD, including training on new types of PPE and needing to learn, and re-learn, frequently changing protocols.⁵

The need for specialized laboratory equipment also limited the ability of many hospitals to care for patients suspected of EVD. According to a study of Society of Healthcare Epidemiology of America (SHEA) members, only 42% of facilities reported being able to process routine laboratory tests and provide basic medical care to suspected EVD patients. Many of the hospitals

that did have available lab capacity ultimately were selected to form the majority of the initial group of 55 CDC-designated Ebola Treatment Centers (ETCs) in the US.⁶ The lack of hospitals' abilities to perform even basic laboratory evaluation of patients meant that most U.S. hospitals either performed no clinical lab testing on patients suspected of EVD, or otherwise had to rely on outside testing at the nearest Laboratory Response Network (LRN) laboratory, which significantly delayed the clinical care of many suspected patients.⁷

At the administrative level, hospitals found the challenges in preparing for EVD to be both extremely burdensome and costly.⁸ Redirection of resources often meant that other routine activities suffered. For example, during a study of one sample week of an institution's EVD preparedness activities, diverted utilization of resources led to 70% of routine infection prevention activities being neglected.⁶ The average initial cost alone to establish 1 of the 55 Ebola treatment centers (ETCs) in an existing hospital was approximately \$1.2 million, with the most expensive start-up costing \$6.5 million.⁹ Further, those very high start-up costs did not include any of the follow-on costs that are required to maintain the capabilities for EVD care, such as training supplies and exercises, and use of equipment.

In order to try to limit the magnitude of these challenges, some healthcare systems took a system-wide (enterprise) approach to planning for EVD care, rather than asking each hospital within their system to prepare individually in isolation. This approach reflected a growing change in healthcare, as multi-institutional healthcare systems have been significantly increasing in number and in size in the past several years, as providers attempt to consolidate to improve efficiency, lower costs, and increase market share.¹⁰ In fact, ninety-five percent of acute care hospitals already participate in some sort of enterprise, partnership, group, or coalition for emergency preparedness planning and response.¹¹ In this study, we analyzed the work of one diverse healthcare system to unify their planning efforts for EVD, and we attempt to describe both the benefits and the challenges of taking enterprise-level response to a significant potential emergency threat.

STUDENT ROLE

The student role consisted of analyzing relevant primary literature, analyzing and interpreting the survey data, and assisting in manuscript preparation.

METHODS

Our healthcare enterprise is a not-for-profit health care system with patient care, research, teaching, and service efforts. It was founded in 1994 and includes 8 hospitals, both community and specialty, a managed care organization, a physician network, community health centers, home care and other health-related entities. Beginning in July of 2014, we began to utilize an enterprise-wide approach to planning for the care of patient with either suspected or confirmed EVD. Utilizing our enterprise's central emergency management staff, we first established dedicated communications groups and new organizational structures among leaders from emergency management, infection control, laboratory services, waste management, occupational health, public affairs, and others across the enterprise that were dedicated to EVD planning. At the direction of the centralized enterprise planning group, discipline-specific subgroups were created to concentrate the expertise of staff across multiple sites and expedite the development of common clinical and operational guidelines. The centralized planning group also created a tiered system of care and concentrated several functions at the tertiary, academic medical centers within the system. This was done to limit the burdens on inpatient, lab, waste handling, and other planning functions across the remainder of the enterprise. All hospitals were required to be able to identify, isolate, and stabilize patients; however, identified patients would be transferred to the tertiary medical centers before additional care was required. Several large purchases of PPE and other supplies were centralized, ensuring all sites had adequate access to PPE (which was a common challenge among other institutions), and decreasing costs of acquiring the supplies. Institutions shared PPE when national shortages and backorders left some system members in short supply.

Lastly, an Ebola Global Task Force was created to address the challenges posed by the enterprise's significant global health presence using experts from global health, human resources, risk management and insurance, and emergency preparedness units. The task force was able to develop guidelines to optimize the deployment of staff to the high-risk working conditions of West Africa, maximize their safety while there, and manage their return to the US and possible need for quarantine upon arrival.¹²

Following the conclusion of our enterprise-wide EVD planning and response efforts in 2015, we created a survey for all leadership staff who participated in our system's EVD preparedness

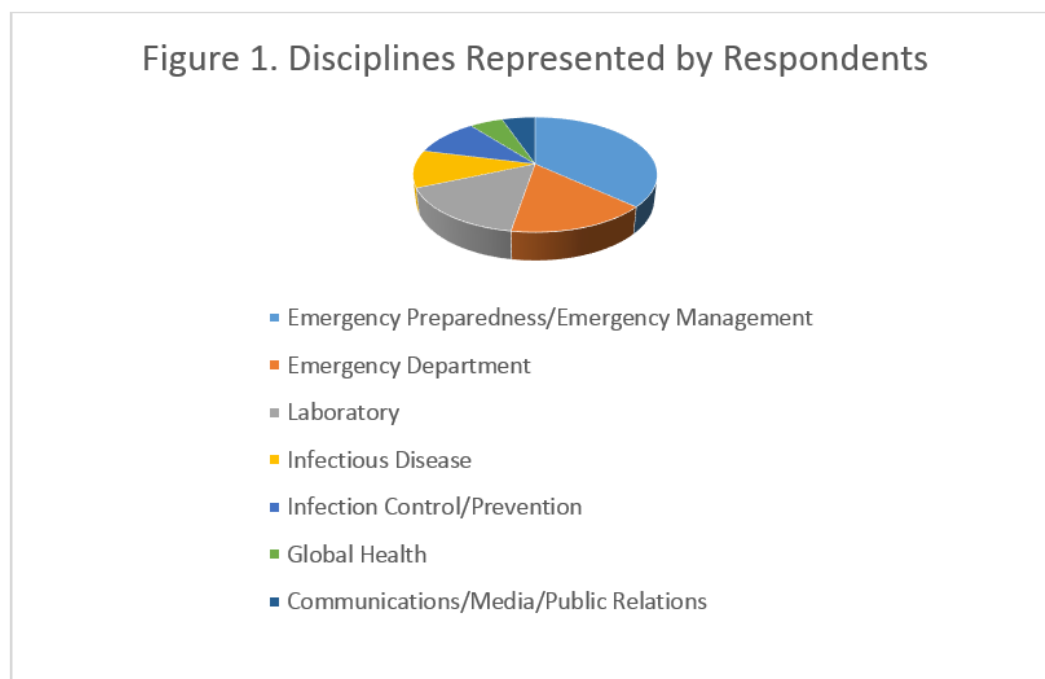
activities in order to assess the effectiveness of our activities, as well as to identify gaps and areas for improvement in future planning. The survey consisted of multiple types of queries including multiple choice, Likert scale, ranking, and open-ended questions. The first section asked the respondents to identify which discipline represented their primary role in the EVD preparedness activities. The second section used a 5-point Likert scale to ask respondents to evaluate the effectiveness of certain system-wide EVD preparedness activities. The third section used a 5-point Likert scale to compare the system-wide EVD preparedness activities to the traditional, institution-based preparedness activities that occurred in response to the H1N1 virus threat in 2009. The fourth and fifth sections used 8-point and 7-point ranking scales, respectively, to ask participant's opinions about the level of helpfulness of specific system-wide activities as well as to ask their opinions about the magnitude of the challenges they faced in regards to other specific system-wide activities. The sixth section used open-ended questions to ask respondents to identify specific activities that were particularly successful and should be used in the future as well as recommend ways to improve future preparedness and response activities.

A request to participate was e-mailed to 89 individuals who participated in the system's activities. The individuals represented the following disciplines: emergency preparedness, emergency medicine, global health and disaster response, infection control, infectious disease, environmental health and safety, laboratory services, public affairs, risk management, environmental services, occupational health, and hospital clinical leadership. Responses were collected using SurveyMonkey software (SurveyMonkey, Palo Alto, CA, USA). The study received an exemption from the enterprise's Institutional Review Board. Data were transcribed into Microsoft Excel 2007 (Microsoft Corporation, Redmond, WA, USA). Descriptive statistics were used to analyze the data. Continuous variables were summarized using mean with standard deviation (SD) while categorical variables were summarized using frequency analysis and percentages.

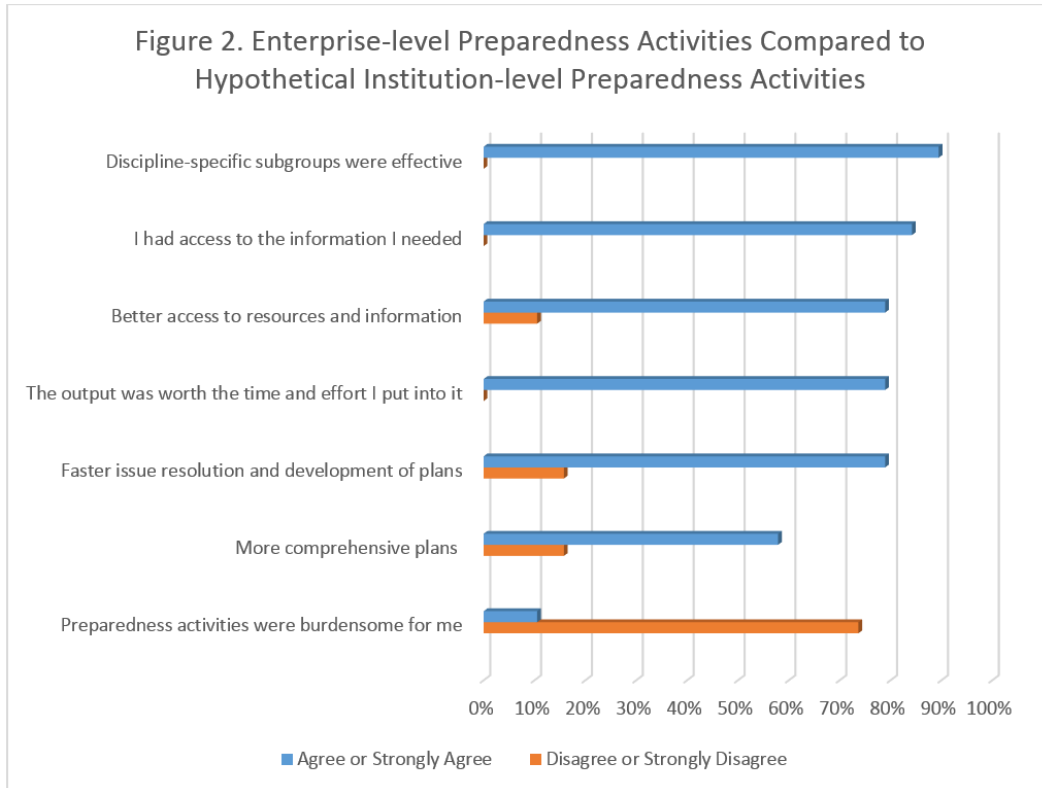
RESULTS

Nineteen of 89 people responded to the survey (21%). Of those, 7 (37%) represented emergency preparedness or emergency management, 3 (16%) were from emergency departments, 3 (16%) were from laboratory services, 2 (11%) were from infectious disease, 2 (11%) were from

infection control and prevention, 1 (5%) was from global health, and 1 (5%) was from public relations/communications (Figure 1).



89% (17/19) of survey respondents agreed or strongly agreed that that the development of enterprise-wide, discipline-specific subgroups was an effective way to address complex problems, with. Respondents also highly agreed with the concept that they had better access to information (79%) and plans were developed faster with faster issue resolution (79%) because of the enterprise-wide approach to the response. Most respondents felt that the output of the response activities was worth the time and effort they put into them (79%), while only 11% felt enterprise-level activities were burdensome for them (Figure 2).



When asked to rank the utility of the eight principal enterprise-level activities performed during the response, respondents reported that the following activities were most helpful to them: dissemination of written information through e-mail updates and the EVD website (rank score 6.1), creation of shared guidelines (5.9), and use of enterprise-wide conference calls (5.7) (Figure 3). Respondents were also asked to rank the main challenged that they experienced when trying to participate in the enterprise response. The most significant challenges noted by respondents included: having difficulty participating in enterprise-level activities and adopting recommended guidelines due to a lack of time (rank score 5.4) and having insufficient resources (5.0) (Figure 4).

Figure 3. Helpfulness of Enterprise-Level Preparedness Activities, Resources, and Characteristics

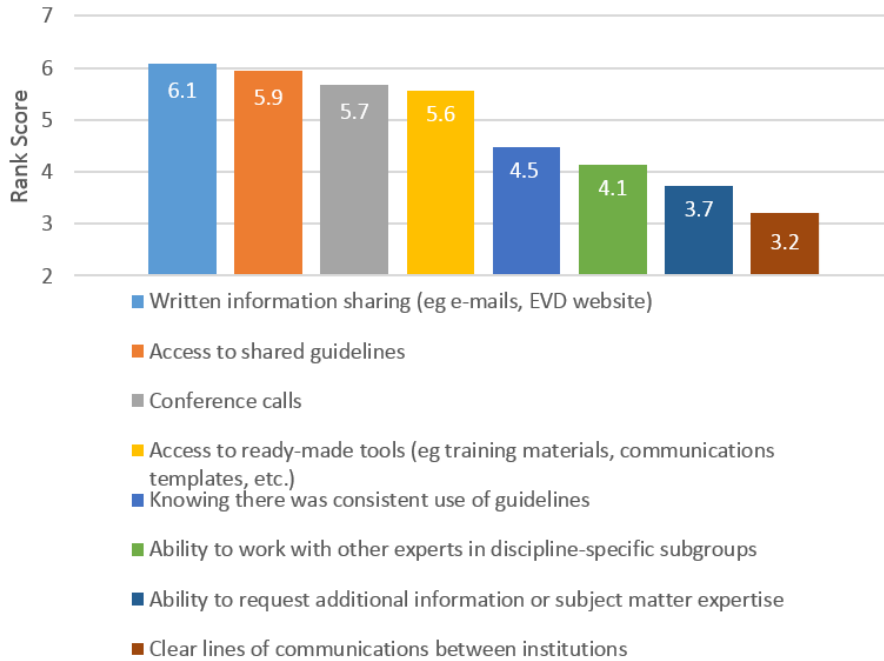
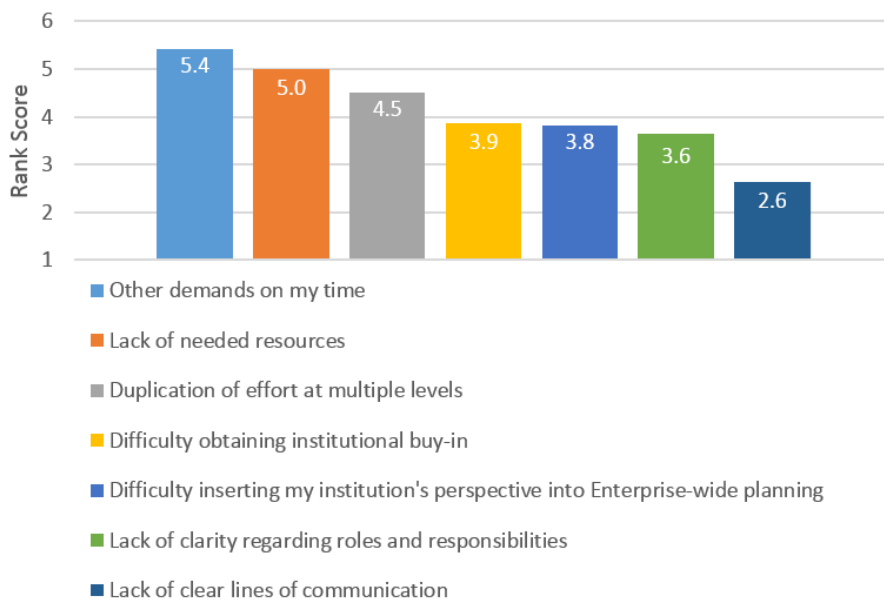


Figure 4. Preparedness Activities, Resources, or Characteristics That Represented the Most Significant Challenge or Gap



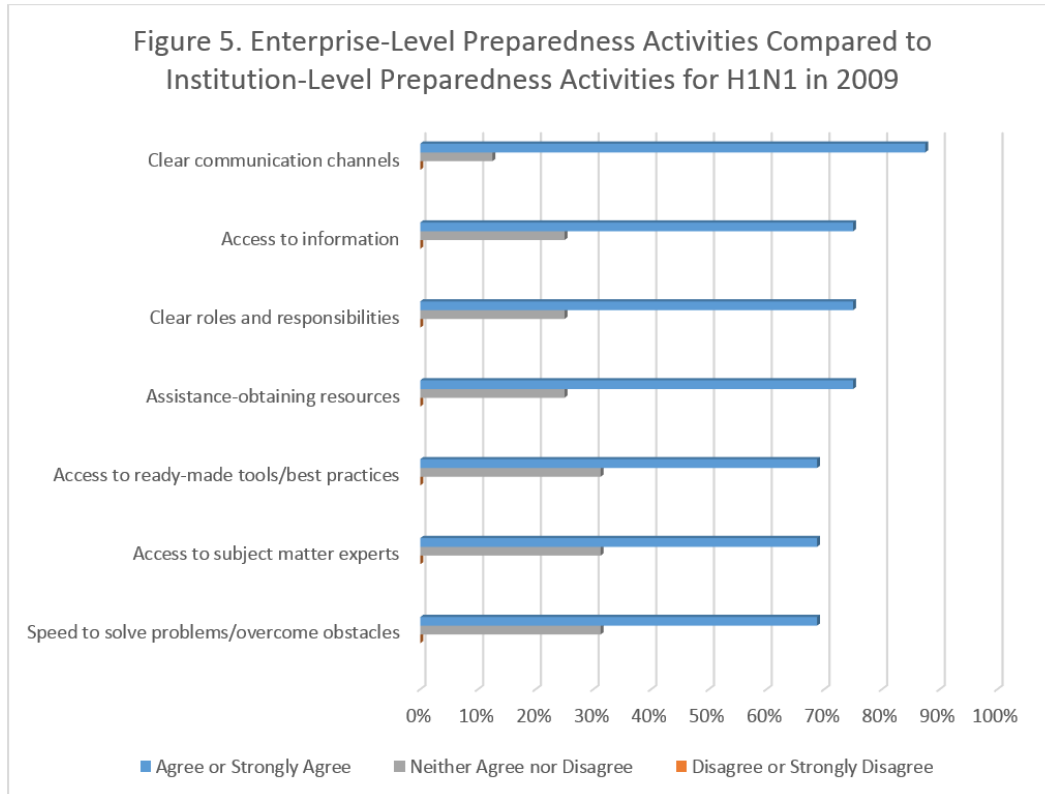
Respondents were also asked to identify specific successes from the enterprise-level EVD preparedness activities that should be continued in response to future events and to make recommendations on areas that could be improved through the use of open-ended questions in the survey. A summary of the themes of the open-ended questions is listed in Table 1. The most frequent theme among the survey responses addressed communications concerns. Fifty-seven percent (8/14) of comments described wanting to continue the enterprise-level approach because of its effectiveness in sharing information among responders. As an example, one respondent stated that, “I did not feel isolated being at a community hospital.” Thirty-six percent (5/14) respondents identified the development of common guidelines and policies as likely being useful in the future.

Table 1. Specific successes of an enterprise-level emergency preparedness approach	Frequency
Communications	57%
Information sharing/access to information	42%
Common guidelines and protocols	36%
Leaders with clear roles	21%
Resources/PPE	21%

Respondents did also note some challenges with the enterprise-level response. One theme described in several comments was the concern that an enterprise-wide response tends to produce a “one-size-fits-all” approach, which does not always work among institutions with varying levels of resources and infrastructure (e.g. tertiary care academic centers, community hospitals, outpatient clinics, etc.) (Table 2).

Table 2. Recommendations for future enterprise-level emergency preparedness efforts	Frequency
Identify and accommodate the different resources and needs of different institution types	36%
More collaboration between institutions	27%
Better equipment sharing	18%
Continue communications plan	18%
Better manage staffing for training vs. patient care	9%

Individuals who participated in preparedness activities for both EVD in 2014-15 and H1N1 in 2009 were asked whether certain aspects improved or worsened using a 5-point Likert scale (Figure 5). Of the 16 responses to each of 7 different aspects, 0% (0/112) responded that any of the enterprise-level EVD preparedness activities were worse or significantly worse compared to the institution-level H1N1 activities. Having clear communication channels was the activity most often identified as being improved or significantly improved at 88% (14/16). Access to information, clear roles and responsibilities, and assistance obtaining resources were each identified as being improved or significantly improved by 75% (12/16) of respondents.



DISCUSSION

As hospitals continue to consolidate to improve efficiency and increase financial stability, leaders will have to determine the relative benefits and challenges of approaching emergency preparedness activities at the enterprise level versus the institution level. Investigating the perceptions of those most closely involved with enterprise-level emergency preparedness activities in response to events as they occur may provide an opportunity to determine if an enterprise-level approach is more beneficial than an institution-level approach, and, if so, which aspects of that approach are most helpful or burdensome. Data on the most useful of the enterprise-wide activities may provide healthcare enterprises with actionable information that they can incorporate in their planning efforts to improve current and future enterprise-level emergency preparedness activities.

The results of this survey support the idea that an enterprise-level approach to emergency preparedness activities may be more effective and efficient than a more-traditional institution-level approach. One of the major themes in our survey results was the satisfaction of respondents with the communications systems. Respondents felt the system-wide conference calls in

particular were especially helpful in allowing leaders to disseminate information widely and efficiently while allowing for dialogue across institutions. The enterprises' robust communications systems likely contributed to the respondents' praise for the easy access to important information through e-mail and the EVD website, as well as the perception that information sharing across sites made the preparedness activities simpler. The development of discipline-specific subgroups and the identification of leaders with clear roles and responsibilities was also popular amongst respondents. The enterprise's use of a wide range of subject matter experts from across the spectrum of medicine may have also played a role in allowing centralized guideline development that could be applied across sites, essentially reducing the redundancy that would result from multiple sites independently creating similar guidelines and protocols. This may also have been a factor in limiting the number of respondents who felt the enterprise-level preparedness activities was burdensome for them.

Notably, no respondent felt any of the enterprise-level EVD preparedness activities were inferior to the institution-level H1N1 preparedness activities 6 years prior. With the enterprise-level approach, respondents acknowledged improved communications, access to information, clear roles, and ease of obtaining resources and equipment. Centralizing some tasks appears to have decreased the redundancy of efforts and increased efficiency among all institutions in the enterprise.

It is important to note that, although many aspects of the enterprise approach went well, respondents clearly felt pressure from their other time demands, which potentially pulled them away from other institutional responsibilities. Efforts must therefore be made to find efficient ways to decrease the total number of person-hours required to implement an effective preparedness campaign. Since healthcare enterprises can consist of a range of institutions from low-resource outpatient clinics in underserved communities to tertiary care academic hospitals with large endowments, it is also extremely important to acknowledge the differing resources that will be available at different sites. This need was made apparent by several respondents who commented in our survey that the leaders of the enterprise response, who were often based preferentially at the academic centers, may not have fully considered the challenges faced by outpatient centers and lower-acuity hospitals when developing common guidelines and protocols. Although there was some purchasing of equipment and supplies, respondents did also

note that there was room for additional improvement in the acquisition and distribution of PPE and other expensive equipment. The argument that the sharing the expensive equipment needed for a low-likelihood event is a benefit of enterprise-level planning does not argue against the enterprise approach, but does mean that this function should likely have been undertaken earlier in the EVD response.

LIMITATIONS

Several limitations exist in this study. The most important limitation is the low the response rate of 21%. However, we believe that since 89% were from the core disciplines of the preparedness activities (emergency preparedness, emergency department, laboratory, infectious disease, and infection control/prevention) were represented among the responses, this survey likely incorporates the majority of the viewpoints of responders whom we tried to reach in this survey

Second, because of the anonymity of the survey, there is no way to differentiate the responses based on the setting in which the respondents were participating. In other words, it is unknown how many respondents worked in large academic centers compared to smaller community hospitals or outpatient centers. This does create the possibility of bias with unequal distribution of responses and may result in the analysis not being fully representative of the perceptions of those in all of the possible settings.

Third, the survey was distributed nearly 1 year after the end of the time period being analyzed, which may create a recall bias. Additionally, this may partially explain the low response rate, if those who received the survey were less likely to respond to inquiries about events from 1 year prior.

FUTURE DIRECTIONS

This study highlights several ways in which an enterprise-level approach to emergency preparedness activities could be more effective than an institution-level approach. Further work to identify the specific details and logistics of the well-received communications systems, or to describe how, specifically, information was shared and access was made available would provide useful guidelines for enterprises wishing to improve their efforts. It would also be helpful in future surveys to stratify respondents into groups based on the type of institution in which they work. By doing so, one could identify what works well and what works poorly at a large

academic hospital, as compared to a small outpatient clinic that is part of the same enterprise, rather than attempting to generalize results based on perceptions of respondents working in very different environments with different challenges. It would be helpful from an economic standpoint to be able to measure quantitatively the number of person-hours saved or the amount of money potentially saved by taking an enterprise-level approach.

CONCLUSION

To our knowledge, this is the first such study that has attempted to specifically study a large enterprise-level approach to emergency preparedness, as compared to the traditional individual institutional approach. In our study, staff involved in enterprise-level preparedness activities for an emerging threat reported that, compared to prior responses, using an enterprise approach made communications more effective, information easier to access, and guidelines simpler to establish and implement with the identification of leaders and the formation of discipline-specific subgroups. They also reported that enterprise-level activities were a good use of their time, and few felt burdened by the efforts required. This study provides insight into the experiences of staff members at a large healthcare enterprise who participated in enterprise-level preparedness activities in response to the most recent EVD outbreak. As more healthcare organizations consolidate into enterprises to increase their efficiency and lower their costs, these insights become valuable in helping guide enterprise-level emergency preparedness activities for future emerging threats.

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REFERENCES

1. Centers for Disease Control and Prevention. Outbreaks Chronology: Ebola Virus Disease. 2016; <https://www.cdc.gov/vhf/ebola/outbreaks/history/chronology.html>. Accessed February 5, 2017.
2. Lyon GM, Mehta AK, Varkey JB, et al. Clinical care of two patients with Ebola virus disease in the United States. *N Engl J Med*. 2014;371(25):2402-2409.
3. Centers for Disease Control and Prevention. Cases of Ebola Diagnosed in the United States. 2014; <https://www.cdc.gov/vhf/ebola/outbreaks/2014-west-africa/united-states-imported-case.html>. Accessed February 7, 2017.
4. Abir M, Moore M, Chamberlin M, et al. Using Timely Survey-Based Information Networks to Collect Data on Best Practices for Public Health Emergency Preparedness and Response: Illustrative Case From the American College of Emergency Physicians' Ebola Surveys. *Disaster Med Public Health Prep*. 2016;10(4):681-690.
5. Santibañez S, Polgreen PM, Beekmann SE, Rupp ME, Del Rio C. Infectious Disease Physicians' Perceptions About Ebola Preparedness Early in the US Response: A Qualitative Analysis and Lessons for the Future. *Health Secur*. 2016;14(5):345-350.
6. Morgan DJ, Braun B, Milstone AM, et al. Lessons learned from hospital Ebola preparation. *Infect Control Hosp Epidemiol*. 2015;36(6):627-631.
7. Centers for Disease Control and Prevention. Interim Guidance for U.S. Hospital Preparedness for Patients Under Investigation (PUIs) or with Confirmed Ebola Virus Disease (EVD): A Framework for a Tiered Approach. 2015; <https://www.cdc.gov/vhf/ebola/healthcare-us/preparing/hospitals.html>. Accessed February 7, 2017.
8. Abraham N JA, Harrison D, Eiting E, Mallon W, Kim H, Patel A, Wei. A Cost Analysis of a County Hospital Emergency Department's Ebola Virus Disease Preparedness. *Ann Emerg Med*. 2015;66(45):S25.
9. Herstein JJ, Biddinger PD, Kraft CS, et al. Initial Costs of Ebola Treatment Centers in the United States. *Emerg Infect Dis*. 2016;22(2):350-352.
10. Tsai TC, Jha AK. Hospital consolidation, competition, and quality: is bigger necessarily better? *JAMA*. 2014;312(1):29-30.

11. Rambhia KJ, Waldhorn RE, Selck F, Mehta AK, Franco C, Toner ES. A survey of hospitals to determine the prevalence and characteristics of healthcare coalitions for emergency preparedness and response. *Biosecur Bioterror*. 2012;10(3):304-313.
12. Wildes R, Kayden S, Goralnick E, et al. Sign me up: rules of the road for humanitarian volunteers during the Ebola outbreak. *Disaster Med Public Health Prep*. 2015;9(1):88-89.