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Using the National Incident Management System to Prepare Physicians for Rapid Responses: A Pilot Study

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Brief Report

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Abbreviations:
CCO, Critical Care Outreach; EMS, Emergency Medical Services; FEMA, Federal Emergency Management Agency; HSPD-5, Homeland Security Presidential Directive 5; ICS, Incident Command System; ICU, Intensive Care Unit; MCI, Mass Casualty Incident; MET, Medical Emergency Team; NIMS, National Incident Management System; RRS, Rapid Response System; RRT, Rapid Response Team

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Abstract

Objective: The study objective was to determine the feasibility of training physicians in the principles of the National Incident Management System (NIMS) and Incident Command System (ICS) as applied to in-hospital rapid responses and to assess physicians' attitudes regarding rapid responses.

Methods: This was an educational pilot study. Resident physicians completed a pre-survey, followed by online training in the principles of NIMS and ICS, a knowledge test, and a post-survey.

Results: The number of residents who participated was 22. In the pre-survey, most (20/22) did not have a working understanding of NIMS/ICS. Participants (21/22) agreed that residents should have more training in resource organization. On the knowledge test, the median score was 9.5/10. In the post-survey, participants felt more comfortable clearing extra resources from the scene ($P < 0.001$) and that it would be easier to keep track of resources ($P < 0.001$). Most indicated that they had a working understanding of NIMS/ICS ($P < 0.001$) and felt more comfortable establishing command using NIMS/ICS ($P < 0.001$). All agreed that they would consider using an NIMS/ICS-based structure on their next rapid response.

Conclusions: Training physicians in the principles of NIMS/ICS as they pertain to rapid responses is feasible and appears to change residents' attitudes about rapid responses.

The need for health systems to maintain a high degree of readiness to manage a large-scale mass casualty incident (MCI) is highlighted by the coronavirus disease (COVID-19) pandemic, an MCI that arguably defies current MCI classification systems.[1] In the United States, the Incident Command System (ICS) and National Incident Management System (NIMS) provide an approach to managing MCIs. Originally developed by the fire service in the 1970s in response to wildfires, ICS is a standardized, on-scene, all-hazard incident management concept currently used in emergency, non-emergency, and private sector settings.[2,3] In 2003, under Homeland Security Presidential Directive 5 (HSPD-5), NIMS was established as a comprehensive, nationwide, systematic approach to incident management.[4] NIMS includes ICS in its command and coordination arm. HSPD-5 also made the adoptions of NIMS and by extension, ICS, requirements to receive federal preparedness funding.[4] As a result, NIMS was widely adopted by fire, emergency medical services (EMS), and health care systems. Despite the crucial role physicians play in any large-scale incident, physicians receive little to no training in NIMS as part of formal medical education. By contrast, prehospital providers practice NIMS on day-to-day, small incidents, building experience with the NIMS framework so that they are ready to scale up for larger incidents. Similar small-scale incidents occur almost daily within hospitals in the form of Rapid Response System (RRS) activations. However, these in-hospital incidents are currently underutilized as an opportunity to practice NIMS.

RRSs, including nurse-led Rapid Response Teams (RRTs)/Critical Care Outreach (CCO) teams and physician-led Medical Emergency Teams (METs), are a relatively new phenomenon to inpatient medicine. These systems are designed to identify non-intensive care unit (ICU) patients who are at risk of imminent clinical deterioration and to quickly summon a team of providers with the requisite expertise and resources to prevent further worsening of the patient's condition, especially progression to cardiopulmonary arrest. To be effective, an RRS must have 2 distinct arms. The first arm involves the identification of deteriorating patients and summoning of the team, while the second represents the actions of the team in response to the RRS activation.

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The effects of RRSs on patient outcomes have been the subject of much debate in recent years. Some studies and systematic reviews suggest the implementation of RRSs has been associated with improved hospital survival and a reduction in cardiac arrest rates and unplanned ICU admissions.[5] Other studies have failed to show an effect of RRS implementation on these outcomes.[6,7] Overall, there is moderate quality evidence that suggests that RRSs decrease rates of cardiac arrest outside the ICU and in-hospital mortality, but the mechanisms of improvement are not clear.

Some experts have suggested that the paucity of unambiguous data supporting RRSs is not because these systems are inherently ineffective, but rather that the design of current systems is suboptimal.[5,7] For the response arm, little is known about how members of the team should be trained to manage an RRS call, if at all. In many ways, RRS calls present many of the same challenges as prehospital calls: Responders from different disciplines must travel to the incident, work together in a time-sensitive situation, and care for unfamiliar, acutely ill patients. Given these similarities, training rapid responders in the principles of NIMS and how they could specifically be applied to a rapid response may be beneficial for both improving the incident response and increasing health system preparedness for larger incidents.

This pilot study sought to develop an educational module to help fill this gap in training for rapid responders, determine the feasibility of teaching rapid responders the principles of NIMS, as well as to assess their attitudes regarding NIMS before and after the educational intervention.

Methods

To address the educational need described above, the authors developed an online training module. The module was created using Microsoft PowerPoint (Office 365, Microsoft Corporation, Redmond, Washington, USA) using voiced narration by the authors, active annotation, and animations to help the training mimic an in-person lecture as much as possible. This module is distinct from the online courses available from the Federal Emergency Management Agency (FEMA). It is not comprehensive training in NIMS and ICS but rather explains key principles and how they might be used in the context of an in-hospital rapid response. The training starts by illustrating the similar issues faced by rapid responders and prehospital personnel, then explains the key NIMS and ICS concepts and terminology, and last applies them in real time to a virtual tabletop simulation of a rapid response. The module most emphasizes the NIMS management characteristics of Dispatch/Deployment, Incident Facilities and Locations, Manageable Span of Control, Establishment and Transfer of Command, and Comprehensive Resource Management. In order to improve participation, the authors' training was designed to be significantly shorter than existing NIMS/ICS offerings. It takes approximately 1 hour to complete, whereas current online trainings range from 2–4 hours per course.

To study the impact of the online module, the authors conducted a survey-based pilot study. Participants were given a pre-module survey assessing demographic, attitudes about rapid responses, experiences in rapid responses, and prior exposure to NIMS content (36 questions). Participants then completed the training module and took a knowledge test (10 questions) to assess their comprehension. Next, participants were allowed to review the answer key with explanations. Last, participants took a post-module survey, evaluating their attitude about rapid responses and perceptions of NIMS (20 questions), and were given the opportunity to provide qualitative feedback. To our knowledge, there are no validated tools to assess rapid response attitudes or to evaluate NIMS/ICS content specific to the rapid response context. As such, all surveys, the knowledge assessment, and answer key were created de novo by the authors. All surveys used Likert Scale questions. For questions pertaining to the frequency with which events occur during rapid responses, answer choices ranged from "Always" to "Never" on a 5-point scale. For questions assessing agreement with the statement presented, answer choices ranged from "Strongly Agree" to "Strongly Disagree" on a 5-point scale. The knowledge test utilized multiple-choice format. The knowledge test was graded on a 10-point scale with 1 point awarded for each correct answer.

A 2-tailed T-Test was used to assess for differences in agreement and frequency between the pre- and post-surveys. Qualitative feedback about the educational module was reported descriptively. Statistical analyses were performed using Microsoft Excel (Office 365, Microsoft Corporation, Redmond, Washington, USA).

The study was limited to internal medicine residents, the leaders of most rapid responses in the authors' health system. Participation was voluntary, and individual performance records were not provided to the program leadership of the participating residents. A US $30 Amazon gift card was given to participants who completed the study. This study was reviewed by the University of Pennsylvania IRB and determined to be exempt by IRB #8 on 24-JAN-2019 under IRB protocol number 832445.

Results

A total of 22 participants completed the study. Table 1 shows the baseline characteristics of the participants. Notably, none of our participants had ever taken a FEMA-sponsored course in NIMS or ICS.

The results of the pre-module survey can be seen in Table 2. Consistent with their lack of prior NIMS/ICS exposure, the majority of our participants indicated that they did not have a working understanding of NIMS/ICS (20/22) and did not feel comfortable establishing command using NIMS/ICS (19/22). Regarding their comfort as team leader in a rapid response, our participants were split, with 9/22 feeling comfortable and 7/22 feeling uncomfortable. Responses varied regarding their comfort dismissing extra resources from the scene, their perceived ease of keeping track of resources as team leader, and their perceptions of the overall organization of the rapid response. However, our participants largely agreed that, in previous rapid responses, there were enough resources (19/22), a team leader was clearly established (17/22), scenes were crowded (18/22), and that residents should have more training in resource organization (21/22). Despite most reporting that team leaders were clearly identified, only 7/22 thought clear roles were defined. While most participants reported that scenes were too crowded, only 7/22 thought there were large enough crowds to block access. The majority agreed that, despite crowding and lack of clear roles, the patient still received the best medical care possible (17/22).

On the knowledge test, scores ranged from 4/10 to 10/10, with half of the participants achieving perfect scores. The median score was 9.5, and the mean was 8. No single question was answered incorrectly by more than 6 participants.

The results of the post-module survey can be found in Table 2. All participants agreed or strongly agreed that they would consider using the principles of NIMS/ICS when running rapid responses,

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Table 1. Pre-survey baseline characteristics

Abbreviated question[1]	n = 22
Level of training	Number (%)
PGY1	10 (45)
PGY2	4 (18)
PGY3	8 (36)
PGY4	0 (0)
PGY5 or above	0
Race	
Black/African American	1 (4)
White/Caucasian	14 (64)
Hispanic/Latino	0 (0)
Asian/Pacific Islander	7 (32)
Other	0
Prefer not to answer	0
Gender	
Male	7 (32)
Female	15 (68)
Trans-male	0 (0)
Trans-female	0 (0)
Other	0 (0)
Intended career	
Hospitalist	2 (9)
Primary care	2 (9)
Pulmonary/critical care	2 (9)
Cardiology	7 (32)
Gastroenterology	2 (9)
Nephrology	0 (0)
Rheumatology	1 (5)
Allergy/immunology	0
Other	6 (27)
Prior FEMA training in NIMS/ICS	
Yes	0 (0)
No	22 (100)
Prior non-FEMA training in NIMS/ICS	
Yes	1 (5)
No	21 (95)
Prior first responder service	
Yes	1 (5)
No	21 (95)
Prior US military service	
Yes	0 (0)
No	22 (100)
Prior foreign military service	
Yes	0 (0)
No	22 (100)
Number of rapid responses participated in	
0	0 (0)
1-2	1 (4)
3-5	9 (41)
>5	12(55)
Number of rapid responses in the past month	
0	3 (14)
1-2	13 (59)
3-5	4 (18)
>5	2 (9)
Number of rapid responses as team leader	
0	7 (32)

(*Continued*)

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Table 1. (*Continued*)

Abbreviated question[1]	n = 22
1-2	6 (27)
3-5	3 (14)
>5	6 (27)
Number of rapid responses led in the past month	
0	12 (55)
1-2	8 (36)
3-5	0 (0)
>5	2 (9)

[1]Full survey questions available in online data supplement.

Table 2. Pre-survey and post-survey responses (n = 22)

Abbreviated question[1]	Pre-survey question number	Post-survey question number	Answer choices	Pre-survey responses[2] number (%)	Post-survey responses[2] number (%)	*P* value
Comfortable as team leader	24	1	Strongly agree	2 (9)	2 (9)	0.278
			Agree	7 (32)	11 (50)	
			Neither agree nor disagree	1 (4.5)	6 (27)	
			Disagree	6 (27)	3(14)	
			Strongly disagree	1 (4.5)	0 (0)	
			I have never been the team leader	5 (23)	N/A	
Comfortable telling extra resources to leave as team leader	25	2	Strongly agree	1 (4)	5 (23)	< 0.001
			Agree	2 (9)	12 (54)	
			Neither agree nor disagree	5 (23)	3 (14)	
			Disagree	7 (32)	2 (9)	
			Strongly disagree	2 (9)	0 (0)	
			I have never been the team leader	5 (23)	N/A	
Comfortable leaving when asked to by team leader	28	3	Strongly agree	9 (41)	14 (64)	0.093
			Agree	12 (55)	8 (36)	
			Neither agree nor disagree	0 (0)	0 (0)	
			Disagree	1 (4)	0 (0)	
			Strongly disagree	0 (0)	0 (0)	
Easy to keep track of resources as team leader	26	4	Strongly agree	0 (0)	3 (14)	< 0.001
			Agree	3 (14)	17 (77)	
			Neither agree nor disagree	7 (32)	2 (9)	
			Disagree	6 (27)	0 (0)	
			Strongly disagree	0 (0)	0 (0)	
			I have never been the team leader	6 (27)	N/A	
Working understanding of NIMS/ICS	18	6	Strongly agree	0 (0)	2 (9)	< 0.001
			Agree	2 (9)	20 (91	
			Neither agree nor disagree	0 (0)	0 (0)	
			Disagree	12 (55)	0 (0)	
			Strongly Disagree	8 (36)	0 (0)	
Comfortable establishing command using NIMS/ICS	19	7	Strongly agree	0 (0)	1 (5)	< 0.001
			Agree	1 (5)	17 (77)	
			Neither agree nor disagree	2 (9)	2 (9)	
			Disagree	10 (45)	2 (9)	
			Strongly disagree	9 (41)	0 (0)	

(*Continued*)

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Table 2. (*Continued*)

Abbreviated question[1]	Pre-survey question number	Post-survey question number	Answer choices	Pre-survey responses[2] number (%)	Post-survey responses[2] number (%)	*P* value
Residents should have more training in how to organize resources during rapid responses	27	16	Strongly agree	12 (55)	10 (45)	0.614
			Agree	9 (41)	11 (50)	
			Neither agree nor disagree	1 (4)	1 (5)	
			Disagree	0 (0)	0 (0)	
			Strongly disagree	0 (0)	0 (0)	

[1]Full survey questions available in online data supplement.
[2]Some answer choices were not an option on the post-survey. These are listed as "N/A."

and that doing so would likely improve resource utilization, crowd control, and quality of care. A majority indicated that residents should receive more training in how to run rapid responses (21/22) and that they would like more ICS/NIMS training (16/22). Compared to their initial responses, participants indicated that they felt more comfortable clearing extra resources from the scene ($P < 0.001$) and that it would be easier to keep track of resources ($P < 0.001$). Most also indicated that they felt more comfortable establishing command using NIMS/ICS ($P < 0.001$) and had a working understanding of the subject matter ($P < 0.001$). Most importantly, all participants agreed or strongly agreed that they would consider using an NIMS/ICS-based structure on their next rapid response.

In the qualitative section of the post-survey, participants indicated that they liked the simple visuals, the concrete example at the end of the training, and the discussion of crowd management. A number of participants criticized the audio speed, technical format, and/or wished that there was a hands-on component. For those who indicated that they would use an NIMS/ICS structure on their next rapid response, their main reason for doing so was to help with resource management and crowd control. Only 1 person cited a reason for not using NIMS/ICS in their next rapid response: as an intern, they did not believe that they would be able to command resources in this way without pushback from others.

Discussion

In this survey-based, educational pilot study, most participants recognized opportunities for improvement in rapid response leadership, including crowded scenes and lack of clearly designated roles aside from team leader. Overall, participants were initially not familiar with NIMS or ICS or how their principles could be used to optimize rapid responses. The vast majority of participants demonstrated understanding of the provided educational material and indicated that it would likely improve their leadership in rapid responses. All but 1 said that they would like more training in this area. Importantly, all agreed or strongly agreed they would consider using an NIMS-based structure in the future.

The final point is particularly important. Recent surveys by the World Society of Emergency Surgery (WSES) and National Association of Emergency Medical Technicians demonstrated that health systems are unprepared to face MCIs.[8,9] In particular, the WSES survey noted that only 47.8% of the 46 institutions surveyed conducted drills. Of those, only 28.3% of them conducted drills annually and 13% biannually.[8] By using NIMS and ICS principles daily during rapid responses, these everyday occurrences could serve as training for mass casualty incidents by drilling in the basic principles. When the next large incident occurs, these responders would only be asked to scale up what they already know, rather than learn an entirely new system.

Limitations

There were several limitations to this study. First, this was a pilot study with a small sample size. Second, the surveys created for this pilot will need further evaluation of their validity and reliability. Third, while the intervention appears feasible, and we demonstrate some impact on participants' attitudes, it is not known whether this will change their behavior in future rapid responses. Further study will be needed to characterize long-term retention of the content, outcomes in actual clinical practice, and potential usefulness to other groups of rapid responders such as nurses and other personnel.

Conclusion

In this pilot study, training physician rapid responders in the general principles of NIMS/ICS as they pertain to rapid responses is feasible and appears to change physicians' attitudes about rapid responses. Participants stated that they are more likely to use NIMS and ICS in the future.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/dmp.2022.197

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