Current Perspectives and Concerns Facing Hospital Evacuation: The Results of a Pilot Study and Literature Review

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Abstract

Objective: To analyze the evacuation preparedness of hospitals within the European Union (EU).

Method: This study consisted of 2 steps. In the first step, a systematic review of the subject matter, according to the PRISMA flow diagram, was performed. Using Scopus (Elsevier, Amsterdam, Netherlands), PubMed (National Library of Medicine, Bethesda, MD), and Gothenburg University’s search engine, 11 questions were extracted from the review and were sent to representatives from 15 European Union (EU)- and non-EU countries.

Results: The findings indicate that there is neither a full preparedness nor a standard guideline for evacuation within the EU or other non-EU countries in this study. A major shortcoming revealed by this study is the lack of awareness of the untoward consequences of medical decision-making during an evacuation. Some countries did not respond to the questions due to the lack of relevant guidelines, instructions, or time.

Conclusion: Hospitals are exposed to internal and external incidents and require an adequate evacuation plan. Despite many publications, reports, and conclusions on successful and unsuccessful evacuation, there is still no common guide for evacuation, and many hospitals lack the proper preparedness. There is a need for a multinational collaboration, specifically within the EU, to establish such an evacuation planning or guideline to be used mutually within the union and the international community.

Introduction

During Major Incidents and Disasters (MID) and with the increasing myriad of crises such as epidemics, pandemics, war, and conflict, civilian hospitals are expected to be functional, receive, and manage victims with a variety of injuries as well as continue the local and referral population in need of emergency or non-emergency care.1-3 A major aim of a hospital disaster plan is to provide professional and material resources to receive as many victims as possible from the...
affected area, and by targeting all 4 elements of the surge capacity, i.e., Staff, Stuff, Structures, and Systems. As the response chain to MID consists of many units, the interaction between these entities at all levels may proceed more efficiently with a central coordination center. These coordinated actions between collaborating partners create the foundation for a plan, which should be tested and validated before MID.

In recent years, it has become clear that hospitals may be the targets of both natural and man-made MID. Vulnerabilities of a medical facility/hospital vary between countries due to the type of event and the geographical conditions. In some countries, e.g., South American countries, more than 50% of healthcare facilities (hospitals and primary care) are in high-risk areas for natural disasters. In comparison, the figure is much lower (8-9%) for other countries such as the United Kingdom. Several potential events such as hurricanes, earthquakes, floods, landslides, tornados, storms, volcanos, cyclones, tsunamis, fires, explosions, CBRN (Chemicals, Biological, Radiological, Nuclear threats), cyberterrorism, terrorism, armed attacks and bombings, as well as rapidly changing technological issues within hospital infrastructure can result in a mandatory hospital evacuation. Some factors such as increasing population numbers and density, rapid unsustainable urbanization, biodiversity losses, and climate changes may complicate the outcome of these events. Indeed, the latter changes are increasingly accelerating infectious disease outbreaks, epidemics, and pandemics. Although each event may have a particular impact on a hospital, it affects either hospitals ‘structural’ or ‘non-structural’ components and, consequently, its functionality. According to the Sendai Framework for Disaster Risk Reduction 2015-2030, substantial reduction of disaster damage to critical infrastructure and disruption of basic services should take place globally. Healthcare and educational facilities are particularly encouraged to develop their resilience by 2030. Although a hospital evacuation might be unavoidable, planning for hospital evacuation will make it more resilient during the future events.

Compared to a disaster plan, a hospital evacuation plan has a reverse pattern, i.e., instead of creating more space and surging capacity within the hospital, all patients should be evacuated and transported to other areas or medical facilities to receive continuous care. An evacuation does not need to be total and patients might be sheltered in place, evacuated horizontally or vertically, within the same hospital. However, although rare, whenever a decision for total evacuation is made, the situation will be more complicated and the task more complex. An extensive/total evacuation of a hospital is associated with several medical and non-medical difficulties such as insufficient internal and external logistics, lack of routine for tracking patients, diverse ethical issues, as well as unattended injury or deaths to patients and staff alike during evacuation.

There is conceptual confusion in available literature about the word ‘EVACUATION,’ which is used to describe the need to transfer, move, or drain materials, equipment, or people from an existing building. Many languages may have different words for evacuation with a different meaning, e.g., ‘EXIT’ and ‘EVACUATION.’ The former correctly indicates the need for time-limited escape from danger (e.g., fire). The term ‘EVACUATION’ might then mean a need for the exit, transport, and final placement in another facility. Such a situation may take a longer time and have a higher impact on patients’ health and outcome. In this report, we aim to study the result of total evacuation. The aim of this paper is 2 fold:

1) To determine the significant difficulties in the management of hospital evacuation through a review of the literature.
2) To confirm the current readiness for evacuation among some European and non-European countries.

Methods

Review

This study consists of 2 steps. In the first step, a systematic review of the subject matter, according to the PRISMA flow diagram was performed. Using Scopus, PubMed, and Gothenburg University’s search engine, the following keywords were used to review the current and related literature about hospital evacuation. The terms ‘hospital evacuation’ or ‘healthcare facilities’ and ‘evacuation’ were searched as MeSH (Medical Subject Heading) terms alone or in combination. Obtained articles were manually searched. Inclusion criteria were articles in English describing evacuations between January 1995 and February 2020. Partial evacuations, healthcare facilities not identifiable as a hospital, and narrative reports were excluded. Figure 1 shows the process of search according to the PRISMA flow diagram.

Questionnaire

The main author (AK) assembled a group of 3 independent professionals (1 physician, 1 hospital nurse, and 1 prehospital nurse, not included as authors), all academically and clinically active within the hospital and prehospital preparedness and disaster management. AK performed the literature review, and presented the results in 3 different rounds, based on the Nominal Group Technique. In the first round, a list of obtained documents was presented by AK, and the group agreed on the literature which should be included for further evaluation. In the second round, the abstracts of chosen literature were presented and literature for the in-depth study was chosen. Finally, in the third round, 2 members of the group studied the selected documents and presented their findings to the whole group. These findings were then sorted and inserted in Table 1. Together, the group summarized these findings into 10 statements/questions based on qualitative saturation of thematic areas. A qualitative content analysis of the manifest content was performed manually by 1 of the authors (EC). First the thematic contents were identified and then condensed into core contents. At a point where no new novel information was extracted from the data, the statements were outlined. Question, number 11, was added to provide all participants a possibility to comment/add other items needed. The questions were sent to 20 professionals, representing 15 different countries in the second step. The respondents (physicians, nurses, or PhDs educated and actively involved in MID management), were asked to answer the questionnaire individually or in collaboration with the responsible units in their countries. Respondents participated voluntarily and were recruited either by showing a direct interest in the topic or indirectly by being recommended as researchers registered in ResearchGate, a European social networking site for scientists and researchers, which is the largest European academic network in terms of active users. Scientists and researchers share papers, ask and answer questions, and find research collaborators. The questions were:

1) Incident Command System is a vital element in the successful management of MID. It is especially essential to see whether various countries have collaboration between hospitals and
management/coordination center. In this perspective, the role of private hospitals should be explored.

a) Central command vs. independent hospital
b) Plans for surge capacity
c) The role of private hospitals

2) Communications, collaboration, coordination with other agencies are attractive measures in all levels of action, including the private sector.

a) Different managerial levels
b) Private organizations

3) Ethical perspectives of hospital evacuation are directly related to the decision-making process and information sharing. How transparent are decisions? How aware are staff and the public? Are there any guidelines/protocols?

a) Awareness of difficult medical decision-making
b) Who makes the final decision (Administrators, Medical Staff, combination, etc.?)
c) Staff and public awareness
d) Any guidelines?

4) Legal perspectives on hospital evacuation may put different agencies in different zones and create difficulties in collaboration between various agencies. How to act? How to respect duties and responsibilities vs. willingness to work?

a) Multi-agencies?
b) Guidelines?

5) An internal logistics plan is a prominent issue to follow regarding internal resource management.

a) Staff
b) Stuff

6) An external logistics plan is a prominent issue correlated with resource utilization.

a) Central dispatch
b) Reserve staff and stuff
c) Ability to move staff, sending stuff
d) Known receiving-hospitals/facilities and whether they are electronically compatible and easily transferable within your system.

7) The lack of specific plans for vulnerable groups may have a significant impact on the outcome.

8) Insufficient or absence of procedures for removing critically sick patients, e.g., ICU patients, is an obstacle.

9) Knowledge about reverse triage/triage (The evacuation triage algorithm uses mobility and dependency to determine the evacuation triage priority, categorizing patients into the groups; Very Dependent, Dependent, and Independent. Independent patients evacuating first.) is decisive in resource utilization and survival outcome.

10) Training and exercise is a parameter always written but never performed.

11) Any comments/missing issues or subjects.
The first 10 questions could be organized as; Command and Control, Ethical and legal perspectives of hospital evacuation, Logistics, Systems-rules-guidelines, Training, and exercises.

**Results**

**Literature Review**

Table 1 presents the summary of the findings from the systematic literature review, presented as significant findings or lessons learned, based on studies from 1997-2018.3,9-31 The results were grouped based on the notions, type of disaster, and country of publication.

| Major published studies | Year | Significant findings/Conclusions |
|-------------------------|------|----------------------------------|
| Fires, United Kingdom   | 2009 | Essential with leadership and knowledge of evacuation routes, spaces, etc. Access to the electrical power source. Regular training and exercises. Proximity to hospitals for transfer of patients. New staff. Information delivery and information sharing. Excellent communication (qualitative and quantitative). |
| Wise J.14               | 2009 |                                   |
| Walping A, et al.13     | 2011 |                                   |
| Murphy GRF, et al.14    |       |                                   |
| Storms, United States   | 2002 | Need for a reliable plan based on risk and vulnerability analyses. Knowledge of routes, spaces, etc. Collaboration with other agencies to optimize resource availability. Plan for vulnerable groups. Role identification within each organization and between agencies. Realistic training/exercises. Evacuation of patients may include the caretaking of relatives. |
| Waring S, et al.15      | 2003 |                                   |
| Scultz CH, et al.16     | 2004 |                                   |
| Sterberg E, et al.17    | 2006 | Important to note safety and security issues. Communication through regular briefing and functional communication system. Knowledge of triage in the evacuation. Staff continuity and adequate supplies. Effective leadership and central command. Surge Capacity measures and early decision-making. Use of volunteers. Emergency departments should plan for continuous patient arrival during evacuation. Shelter-in-place results in critical and prolonged periods of shortage. |
| Vilke GM, et al.18      | 2006 |                                   |
| Brodie M, et al.19      | 2008 |                                   |
| Brunkard J, et al.20    | 2009 |                                   |
| Bagaria J, et al.9      | 2012 |                                   |
| Powell T, et al.21      | 2012 |                                   |
| Redlener I, et al.22    | 2013 |                                   |
| Downey EL, et al.23     |       |                                   |
| Flooding, Thailand      | 2004 | Disaster plan should be based on risk and vulnerability analyses. Action cards for staff. Training. Reliable internal and external communication. Information sharing and delivering. Electrical Power source. Supplies delivery. Collaboration with other agencies. Follow-up of the psychological trauma. Positive reinforcement with hand-written journals and escorting prehospital teams with drug supplies. The role of private facilities. |
| Tanavud C, et al.24     | 2014 |                                   |
| Khorram-Manesh A, et al.23 | 2014 |                                   |
| Earthquake, Japan       | 2017 | ICS. Medical decision-making. Communication, Coordination, and Collaboration. External logistics plan. Disaster Medical Assistance Teams. Revision of disaster plan. |
| Nagata T, et al.15      |       |                                   |
| Chemical, flood, etc.   | 1997 | Information delivery and information sharing. Proximity to other hospitals. Reliable communication. Complete backup system. Access to field hospitals. Access to electrical power sources. Collaboration with other agencies, including armed forces. ICS with stable leadership and decision-makers. Internal supporting systems in hospitals for water, heat, and food. Coordination and collaboration between staff. Patients need assistance and the need for training on evacuation routines. |
| Sweden23                | 1997 |                                   |
| Ammonia leakage26       | 2007 |                                   |
| SoS Fire17              | 2018 |                                   |
| Naismar U, et al.31     |       |                                   |
| Catovic L, et al.28     |       |                                   |
| Other countries         | 2013 | Needs for modern facilities with evacuation considered in design and location. Risk and vulnerability analysis. Surge capacity measures. Create a detailed facility evacuation plan, recovery plan, and debriefing plan. Determine alternative facility plans to meet emergency needs. Assess the planning needs of nursing homes. Communicate with and involve external organizations. Clearly define the necessary minimum timeframe for pre-emptive evacuation, and an early decision-making. Have detailed plans for vulnerable groups. Provide regular simulation experience of evacuation. Regular briefings. Functional and reliable communication system. Information delivery and information sharing. ICS. Internal and external logistics. External resource delivery. New staff. |
| Rojek A, et al.29       | 2017 |                                   |
| Australia28             |       |                                   |
| Mortelmans L, et al.,   | 2017 |                                   |
| Belgium30               |       |                                   |
| De Cauwer, et al.33     |       |                                   |
| Belgium11               |       |                                   |

Table 1. Findings/notions from historical evacuation incidents and some simulation exercises. The results are grouped based on the notions, type of disaster, and country of publication.

According to the participants, all countries have ICS in which hospitals are independent but in collaboration with a central command. Most of the hospitals have a plan for surge capacity, but not specifically for hospital evacuation. In most countries, private hospitals have their own disaster and evacuation plans (unclear in 4 countries, Table 2). However, the content of the plan was not available. Collaboration, coordination, and communication did exist at all managerial levels, both in hospitals and with other agencies outside the hospital. However, collaboration with private hospitals and their managerial levels was not fully functional (Table 3). There was insufficient information about ethical awareness and difficulties in medical decision-making as public hospitals especially seemed to lack enough knowledge about the imbalance between resources and needs and the necessity for critical decision-making. There were no examples of ethical guidelines for the staff and decision-makers (Table 3). It appeared that the legal perspectives of hospital evacuation followed those needed...
Table 2. Presence of Incident Command System (ICS) regarding hospital evacuation in 10 countries. (NSE=Not specifically for Hospital Evacuation, OP=Own Plan)

| Country            | Do you have ICS system? | Do hospitals follow Central command or act independently? | Do you have plans for surge capacity? | Are private hospitals included in your contingency plans? |
|--------------------|--------------------------|----------------------------------------------------------|--------------------------------------|----------------------------------------------------------|
| Belgium            | Yes                      | Collaborative                                            | NSE                                  | OP                                                      |
| Iran               | Yes                      | Both                                                     | NSE                                  | Centrally governed                                       |
| Italy              | Yes                      | Independent hospitals                                    | Yes                                  | Unknown                                                 |
| Netherland         | Yes                      | Collaborative                                            | Yes                                  | OP                                                      |
| Norway             | Yes                      | Independent hospitals                                    | Yes, never tested                     | OP                                                      |
| Philippines        | Yes                      | Both                                                     | Yes                                  | Unknown                                                 |
| Poland             | Yes                      | Independent hospitals                                    | NSE                                  | OP                                                      |
| Portugal           | Yes                      | Independent hospitals                                    | Yes                                  | OP                                                      |
| Saudi Arabia       | Yes                      | Both                                                     | Yes                                  | Centrally governed                                       |
| Sweden             | Yes                      | Collaborative                                            | Yes                                  | Included in the regional plan                           |
| Switzerland        | Yes                      | Independent hospitals                                    | Unknown                              | Unknown                                                 |
| Thailand           | Yes                      | Both due to the size                                     | Mostly                               | Unknown                                                 |
| UK                 | Yes                      | Collaborative                                            | Yes                                  | Yes for small private sector                            |

Table 3. The status of inter-organizational collaboration, coordination, and communication (C3), and ethical perspectives, regarding hospital evacuation in 10 countries. (NSE=Not specifically for Hospital Evacuation)

| Country            | Do you have all managerial levels? | Do Private hospitals have all managerial levels? | Is there an awareness of difficult medical decision-making? | Is there an Ethical awareness staff/public? | Do you have ethical guidelines? |
|--------------------|------------------------------------|-----------------------------------------------|-------------------------------------------------------------|--------------------------------------------|---------------------------------|
| Belgium            | All levels                         | Some                                          | None                                                        | None                                       | None                            |
| Iran               | Unknown                            | None                                          | Yes                                                         | Unknown                                    | None                            |
| Italy              | All levels                         | Some                                          | None                                                        | None                                       | None                            |
| Netherland         | All levels                         | Some                                          | Unknown                                                     | Unknown                                    | None                            |
| Norway             | All levels                         | Some                                          | Yes                                                         | Some/Little                                | None                            |
| Philippines        | All levels                         | Operational                                   | None                                                        | Yes                                        | None                            |
| Poland             | All levels                         | Yes                                           | Unknown                                                     | Yes                                        | None                            |
| Portugal           | All levels                         | Some                                          | Unknown                                                     | Unknown                                    | None                            |
| Saudi Arabia       | All levels                         | Yes                                           | Unknown                                                     | Yes/None                                   | None                            |
| Sweden             | All levels                         | Some                                          | None                                                        | Unknown                                    | None                            |
| Switzerland        | All levels                         | Some                                          | Unknown                                                     | Unknown                                    | None                            |
| Thailand           | Unknown                           | Some                                          | Unknown                                                     | Unknown                                    | None                            |
| UK                 | All levels                         | Some                                          | Yes/unknown                                                | NSE                                        | None                            |

Table 4. The status of legal perspectives of hospital evacuation in 10 countries (NSE = Not specifically for Hospital Evacuation, RD = Red Cross, CD = Civil Defense)

| Country            | Defined legal responsibility, Having any guidelines? | Legal Guidelines for Police tasks before, during, after HE | Legal Guidelines for Rescue teams tasks before, during, after HE | Legal Guidelines for Function of other agencies |
|--------------------|------------------------------------------------------|-----------------------------------------------------------|---------------------------------------------------------------|-----------------------------------------------|
| Belgium            | NSE                                                  | Yes                                                       | Yes                                                          | Yes, CD                                      |
| Iran               | NSE/None                                             | Most of the regions, not synchronized                     | Most of the regions, not synchronized                         | None                                          |
| Italy              | By General director and safety & security dept. / None| Yes                                                       | Yes                                                          | None                                          |
| Netherland         | NSE/None                                             | Yes                                                       | Yes                                                          | RC                                            |
| Norway             | Yes/Yes                                              | Yes                                                       | Yes                                                          | Yes, RC                                      |
| Philippines        | Yes/No                                               | Yes, not synchronized                                     | Yes, not synchronized                                        | Some                                          |
| Poland             | NSE/None                                             | Yes                                                       | Yes                                                          | RC, Volunteers                               |
| Portugal           | Yes/Yes                                              | Yes                                                       | Yes                                                          | Unknown                                      |
| Saudi Arabia       | Unclear                                              | Yes                                                       | Yes                                                          | Unknown                                      |
| Sweden             | Yes/Yes                                               | Yes                                                       | Yes                                                          | Unknown                                      |
| Switzerland        | NSE/None                                             | Only fire                                                 | Only fire                                                    | Unknown                                      |
| Thailand           | NSE/None                                             | Only fire                                                 | Only fire                                                    | Unknown                                      |
| UK                 | Yes/Yes                                               | Yes                                                       | Yes                                                          | Yes                                          |
### Table 5. The status of internal and external logistic plans regarding hospital evacuation in 10 countries (NSE = Not specifically for Hospital Evacuation, RC = Red Cross)

| Country       | Staff | Reserve Vehicles | HR management plan | Plan to move devices | Sending medication | Receiving hospitals | Sending 'medications' | Setting | Note |
|---------------|-------|------------------|--------------------|----------------------|--------------------|--------------------|----------------------|---------|------|
| Belgium       | Yes, NSE | Yes, NSE | Yes | RC | Yes | Probably | No | Yes | 7-10 days of ordinary medication to the receiving hospital and concern cancer patients or those having rare diseases. |
| Iran          | Yes | Yes | Yes | Yes | Yes | Unknown | Unknown | No | No | |
| Netherlands   | Unknown | Unknown | Yes | Unknown | Unknown | Unknown | Unknown | Yes | |
| Norway        | Yes, NSE | Yes, NSE | Some | Yes | Yes | Unknown | Unknown | Yes | |
| Pakistan      | Yes, NSE | Yes, NSE | No | Yes | Yes | Unknown | No | Yes | |
| Portugal      | Yes | Yes | Yes | Unknown | Unknown | Unknown | Unknown | Yes | |
| Saudi Arabia  | Yes, NSE | Yes, NSE | Unknown | Some | Some | No | No | |
| Sweden        | Unknown | Unknown | Unknown | Unknown | Unknown | No | No | |
| Switzerland   | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | Unknown | |
| Thailand      | None | None | No | Unknown | Unknown | Some plans | Unknown | No | |
| UK            | Yes, NSE | Yes, NSE | Yes | Yes | Yes | Unknown | Unknown | Unknown | |

Note: Central dispatch refers to ambulances being dispatched by a central center. HR management plan refers to moving critical equipment such as ventilators. Sending medication refers to sending 7-10 days of ordinary medication to the receiving hospital and concern cancer patients or those having rare diseases.

### Discussion

A shortcoming revealed by this study is the lack of awareness of the untoward consequences of medical decision-making during an evacuation, which is very different from those taken in peacetime, and during the management of MIDI. The medical decisions made during an evacuation do not only concern the quality of care, but rather, how the limited quantity of everything affects or guarantees the best outcome. Although today’s healthcare is under constant pressure to prioritize patients due to the economic strain, the ethical discussion about who is to be prioritized and why, is avoided. The consequences of various medical decision-making will be more difficult in MIDI and much more during an evacuation when 1 decision may indicate no treatment or not implemented. Some countries with strong religious beliefs may trigger anger and confusion in people who are not aware of the principles of reverse triage, i.e., to categorize patients in Very Dependent, Dependent, and Independent, were unknown or not implemented. Some countries with strong religious beliefs referred to their spiritual responsibilities. According to their religion, people have the same value and every individual has the responsibility to act morally and ethically, and treat other individual fairly as written in the holy book. However, they had no official documents, and it was not clear how people with other religious backgrounds might act. All participants, except 1, reported 1 exercise/year. Most of the exercises were fire evacuation, and no specific activity for evacuation was conducted.
the situation, options, and difficulties emergency managers may have.3,34,35

Internal and external logistics are always a big issue in MID. Although several reports indicate a need for the development of external logistics, the internal logistics in the event of an evacuation is much more affected.3,10,11 Experience has shown that in many cases, staff who have accompanied patients out of hospital may not get back.3 Simultaneously, it can be extremely difficult to receive new personnel to a hospital which is already under evacuation. Our study shows a good capacity for internal logistics in MID, yet such ability is unknown or defective in external logistics. Both actions need to be done smoothly. Internal logistics are more demanding in an evacuation, and more consideration should be given to better planning and training. External logistics, on the other hand, demand good collaboration with other entities, which might not be easy to achieve if these entities have not looked into possible ways of cooperation, research, and information sharing.

The Incident Command System has been mentioned as 1 of the significant factors for the successful management of MID.1,3,7,10 Such a procedure enables the systematic management of an event based on experience and scientific sound guidelines. It also enables collaboration between hospitals and regional entities. In our survey, the majority of included countries had ICS, and the partnership between hospitals and local coordination centers was evident. The contribution and participation of private hospitals/medical facilities in the total preparedness system is a critical issue in many countries and needs to be settled in a way that gives both sides responsibilities but also benefits in their collaboration. The need for such engagement is revealed in the results of our survey in which the roles of private organizations and hospitals are very unclear and not synchronized. A significant way of achieving a good collaboration and rational resource and information sharing is interactive courses and exercises to identify each organization’s weaknesses and capabilities and the areas that can be coordinated and synchronized.8 The educational initiatives, exercises, and training methods enable all organizations to identify their limitations and capabilities. A significant benefit is to know and understand the legal responsibility of each emergency organization. Although the legal perspectives in MID seem to be well prepared

| Table 6. The management of vulnerable groups, including critically sick patients, regarding hospital evacuation in 10 countries |
|-----------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| Country         | Deaf       | Blinds     | Elderly    | Children   | Pregnant women | Extreme obesity | Others | Special group |
| Belgium         | No         | No         | No         | No         | No            | No            | No      | Yes          |
| Iran            | No         | No         | No         | No         | No            | No            | No      | Unknown      |
| Italy           | No         | No         | No         | No         | No            | No            | No      | Planned by sections respectively |
| Netherland      | No         | No         | No         | No         | No            | No            | No      | Unknown      |
| Norway          | No         | No         | No         | No         | No            | No            | No      | Not formal, decision-based |
| Philippines     | No         | No         | No         | No         | No            | No            | No      | Unknown      |
| Poland          | No         | No         | No         | No         | No            | No            | No      | None         |
| Portugal        | Unknown    | Unknown    | Unknown    | Unknown    | Unknown       | Unknown       | Unknown | Unknown       |
| Saudi Arabia    | No         | No         | No         | No         | No            | No            | No      | None         |
| Sweden          | No         | No         | No         | No         | No            | No            | No      | None         |
| Switzerland     | Unknown    | Unknown    | Unknown    | Unknown    | Unknown       | Unknown       | Unknown | Unknown       |
| Thailand        | No         | No         | No         | No         | No            | No            | No      | Unknown      |
| UK              | Yes        | Yes        | Yes        | Yes        | Yes           | Yes           | Yes     | Yes          |

Note: The Participants answered that there is a general lack of planning to evacuate vulnerable groups, especially critically sick patients. (Special groups: critically sick patients, e.g., ICU patients, patients under surgery, patients treated for cancer).

| Table 7. The awareness of reversed triage (to identify patients least in need of urgent treatment to free up beds during surge demand), and the status of training and exercises, regarding hospital evacuation in 10 countries |
|-----------------|-----------------|----------------|
| Country         | Awareness of revered triage | Status of training |
| Belgium         | Unknown          | Once a year for fire control, not for evacuation |
| Iran            | Unknown          | Twice a year |
| Italy           | Known, but unclear how many can practice it | Once a year | |
| Netherland      | Unknown          | Small sessions for fire evacuation with no patients |
| Norway          | Not formalized, decision-based | Once a year for fire evacuation. Others: table-top exercises |
| Philippines     | No               | Yes, multiple for fire, earthquakes |
| Poland          | Unknown          | Once every 2 years |
| Portugal        | Unknown          | Once a year |
| Saudi Arabia    | Unknown          | Twice a year |
| Sweden          | Unknown          | Once a year for fire evacuation |
| Switzerland     | Unknown          | Once a year for fire evacuation |
| Thailand        | Known, but only of physicians | Once a year for fire evacuation |
| UK              | Yes              | Once a year |
and can also be used in an evacuation, it is essential to discuss all possible issues that may exist in an evacuation, and which may change the course of management and medical outcomes. Most of the guidelines concerning evacuation deal with short and less complicated cases of fire. Although many countries have legal guidelines that are associated with fire incidents, these guidelines need to be expanded to encompass long-term evacuation of a hospital with all issues it may have. These results can conclude the need for exercise and training within the organization and in collaboration with others. Exercise and training are mentioned in the plans but are rarely conducted. Concerning an evacuation, they deal with short and temporary evacuation due to fires. Although such preparedness is proper, it is far from what is needed for a total evacuation of a large hospital and its consequences. An important factor in an evacuation is to clarify who makes the final decision to evacuate; is it the hospital administrator, the chief of medical services/nursing, chief of security, or a predetermined combination? Such a plan should consist of a list of people, who can make such a vital decision, if 1 or more of the decision makers are not available or incapacitated by the crisis event.

Limitations

The study is mainly based on English and in some cases, Swedish publications. Consequently, some important information published in other languages may have been missed in the review process. Nevertheless, the search was completed by the questionnaire, which was sent to representatives of 15 countries. Although the number of countries included might be low, the combination of the literature search and survey can give a good picture of the field internationally. However, it must be remembered that each participants has reported according to his/her total knowledge of hospital evacuation plan in their countries, and thus specific routines or plans from some hospitals might be missing. Another limitation might be the absence discussion on the recovery phase of the evacuation. However, since recovery is an important phase of the disaster management, it was not included in the discussion about hospital evacuation, which was our primary aim.

Conclusions

Evacuation of a hospital is more complicated than the management of MID, because the reverse actions necessary for hospital evacuation are associated with more technical and ethical decisions. Reported experiences show that significant problems and complications lie in the process of total evacuation. Although sheltering on-site may in the long-term result in severe shortages in a hospital, the complete evacuation presents the hospitals and their managers with more difficulties. It increases the need for more collaboration, coordination, and communication within the hospital as well as outside the hospital. The change of paradigm in disaster management necessitates proactivity in the hospital evacuation plan by activating society’s resources.

The recent discussion on flexible surge capacity targets all elements of surge capacity to find out alternatives for staff, stuff, structure, and systems. In an evacuation situation, it is necessary to plan for all these alternatives. Future research should investigate how civilians can be empowered to act as immediate responders and assist professional first responders. It should also evaluate the need for alternative leadership and alternate care facilities within a community, which could either take responsibility for the care of lightly injured victims or for accepting lighter emergency cases from a nearby hospital to unburden emergency departments. These steps need legal and ethical evaluations but together will facilitate a flexible surge capacity that can be used in hospital evacuation as well as in other emergencies, to achieve the final goal, which is to secure the continuity of medical care for the patients.

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