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REVIEW ARTICLE

Nurses' roles, knowledge and experience in national disaster preparedness and emergency response: A literature review

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Abstract

Aim: Nurses play a central role in disaster preparedness and management, as well as in emergency response, in many countries over the world. Care in a disaster environment is different from day-to-day nursing care and nurses have special needs during a disaster. However, disaster nursing education is seldom provided and a lack of curricula exists in many countries around the world. The aim of this literature review is to provide an overview of nurses' roles, knowledge and experience in national disaster preparedness and emergency response.
Methods: An electronic search was conducted using multiple literature databases. All items were included, regardless of the publication year. All abstracts were screened for relevance and a synthesis of evidence of relevant articles was undertaken. Relevant information was extracted, summarized and categorized. Out of 432 reviewed references, information of 68 articles was included in this review.
Results: The sub-themes of the first main theme (a) roles of nurses during emergency response include the expectations of the hospital and the public, general and special roles of nurses, assignments of medical tasks, special role during a pandemic influenza, role conflicts during a disaster, willingness to respond to a disaster. For (b) disaster preparedness knowledge of nurses, the corresponding sub-themes include the definition of a disaster, core competencies and curriculum, undergraduate nursing education and continuing education programs, disaster drills, training and exercises, preparedness. The sub-themes for the last theme (c) disaster experiences of nurses include the work environment, nursing care, feelings, stressors, willingness to respond as well as lessons learned and impacts.
Conclusion: There is consensus in the literature that nurses are key players in emergency response. However, no clear mandate for nurses exists concerning their tasks during a disaster. For a nurse, to be able to respond to a disaster, personal and professional preparedness, in terms of education and training, are central. The Framework of Disaster Nursing Competencies of the WHO and ICN, broken down into national core competencies, will serve as a sufficient complement to the knowledge and skills of nurses already acquired through basic nursing curricula. During and after a disaster, attention should be applied to the work environment, feelings and stressors of nurses, not only to raise the willingness to respond to a disaster. Where non-existent, national directives and concepts for disaster nursing should be developed and nurses should be aware of their duties. Nursing educators should prepare nurses for disasters, by adjusting the curricula and by meeting the increased need for education and training in disaster nursing for all groups of nurses. The appropriateness of theoretical and practical preparation of disaster nursing competencies in undergraduate nursing courses and continuing education programmes should be evaluated.

Keywords: disasters, disaster planning, emergencies, emergency preparedness, nurses.

Conflicts of interest: Thomas Grochtdreis is a member of the German Red Cross and vice president of the German Red Cross Youth. The other authors do not declare any conflicts of interest.

Introduction

Disasters are defined by the Centre for Research on the Epidemiology of Disasters (CRED) as "*a situation or event, which overwhelms local capacity, necessitating a request to a national or international level for external assistance; an unforeseen and often sudden event that causes great damage, destruction and human suffering*" (1). Disasters are classified as natural, biological, geophysical, climatological, hydrological, meteorological, and technological (2).

Recent examples of major disasters are the earthquake in Haiti in 2010 as an example of a natural disaster and the earthquake followed by a tsunami and the nuclear catastrophe in Japan in 2011 as an example of a mixed natural and manmade disaster. Within the countries of Western Europe, more than five million people have been affected by a variety of disaster types (e.g., 4,295,600 people affected by storms, 684,492 by floods, and 816 by epidemics) in the last 20 years. Within this timeframe, 8,835 people were injured and 38,643 people were killed (3).

In order to master a huge number of affected people due to a disaster within a short period, it is important to have well trained first-response personnel or volunteers. Here, an essential role is allotted to nurses for integrating communicating efforts across these protagonists and for having role competencies in disaster preparation. It is quite probable that at some time in the future, nurses may be called upon to respond to a mass casualty event or disaster outside of the hospitals. Therefore, a need for nurses, who are well trained and prepared, arises on a national as well as on an international level (4).

Referring to the conditions in the USA, four strengths of nurses, which are key to a central role in disaster preparedness and management, as well as in emergency response, can be stated (5):

> *(i) Nurses are team players and work effectively in interdisciplinary teams needed in disaster situations; (ii) nurses have been advocates for primary, secondary, and tertiary prevention, which means that nurses can play key roles at the forefront in disaster prevention, preparedness, response, recovery, and evaluation; (iii) nurses historically integrate the psychological, social support, and family-oriented aspects of care with psychological needs of patients/clients; and (iv) nurses are available and practicing across the spectrum of health care delivery system settings and can be mobilized rapidly if necessary.*

However, approximately two out of five health care professionals would not respond during health emergencies. The nurses' intention to respond to disasters, the needs of nurses who respond to disasters and other health emergencies, and as well as the influence of the nursing shortage and the lack of education preparing nurses for disaster response are important issues which need to be approached (6).

Concerning the anticipated needs of nurses during a disaster, Giarratano, Orlando and Savage (7) report that during a disaster nurses have to live through the uncertainty of the situation and have to be prepared to adapt to the needs that arise in both patient care and self-preservation situations.

In order to prepare for emergency response, education within the field of disaster nursing is essential. Disaster nursing curricula and preparation of nursing faculty members are distinctly needed to teach disaster nursing in order to prepare nursing students for possible disaster situations adequately in future (6). Extensive work towards a comprehensive list of core competencies has been done by the WHO and ICN in their Framework of Disaster Nursing Competencies (8). Pang, Chan and Cheng (9) suggest that this framework should equip nurses with similar competencies from around the world while giving attention to local applications.

There is no comprehensive review covering all relevant fields of professional socialization: role, knowledge and experience. Recent reviews do concentrate on either the nurses' disaster preparedness, or the response of nurses working during a bioterrorism event (10). The aim of this literature review is to provide an overview of the nurses' role, knowledge and experience in national disaster preparedness and emergency response within the international scientific literature.

Methods

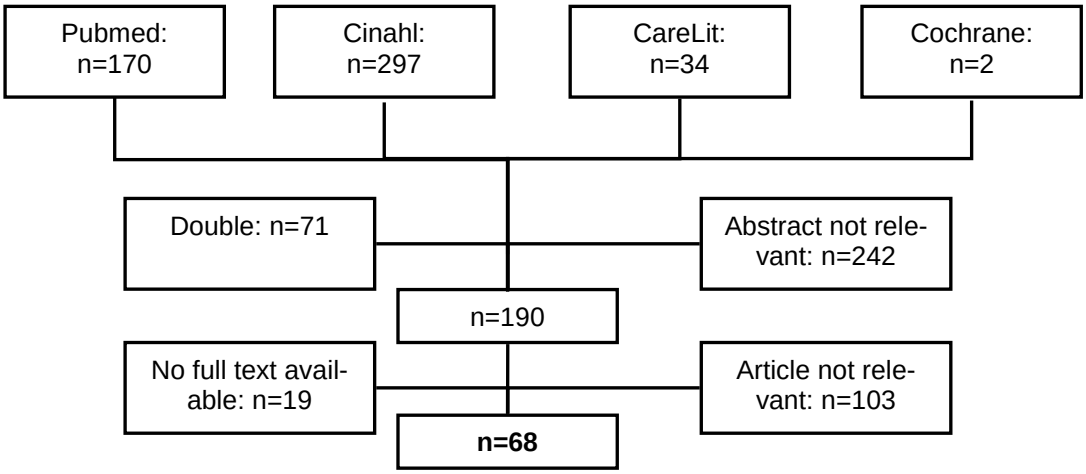
Search strategy

A database search was conducted during September-November 2012 using CINAHL (EBSCO), PubMed, Cochrane Library, and CareLit. A search strategy was used utilizing the terms 'disaster' and 'nursing' as keyword searches or subject headings, where applicable. All study designs as well as expert opinions were included in the review. Inclusion criteria were the existence of a relevant abstract on the role, knowledge and experience in the field of disaster nursing. All results, independent of their publication year and country of publication, written in English or German language, were included.

Selection criteria

In total, 503 articles were identified within the databases; out of these, 71 appeared in more than one database. The abstracts of all included literature (432 references) were scanned for their relevance on the topic. Articles were excluded if they definitely lacked relevance, meaning that the topic of disaster nursing did not appear at all (242 references). As a second step, the articles, which were deemed relevant (190 references), were evaluated in-depth by the first author by initial reading and appraising the relevance in relation to the aim of the literature review. Articles were excluded if they failed to address nurses' role, knowledge or experience in national disaster preparedness and emergency response in their full text (103 references) or if they were not available for evaluation (19 references) resulting in 68 included references. A flow chart of the selection process is presented in Figure 1.

Figure 1. Flow chart of the selection process



Data analysis

As articles differed in their (study) design, no meta-analysis was possible. Therefore, synthesis of the written evidence was undertaken. Categories for analysis, which were predefined through the aim of this literature review, included: (a) roles of nurses during emergency response, (b) disaster preparedness knowledge of nurses and (c) disaster experiences of nurses. For each category, sub-themes were determined out of the different focuses of the articles on disaster nursing (11). For each article, the narratives about a particular sub-theme were extracted. The narratives were paraphrased and generalized, where possible.

Results

In total, 68 relevant sources were identified from the literature search. The majority of the studies were descriptive (40%), or expert opinions/case reports (40%). Furthermore, 15% of the studies were qualitative and correlational studies, whereas 3% were systematic reviews.

The three categories, according to which the articles where analysed, represented also the most important themes: (a) roles of nurses during emergency response, (b) disaster preparedness knowledge of nurses and (c) disaster experiences of nurses. Most of the articles on disaster nursing were drafted in North America. In Europe, no articles concerning disaster experiences of nurses had been published. Below, each theme is divided into paragraphs, which are equivalent to the determined sub-themes.

Roles of nurses during emergency response

The six identified sub-themes include expectations of the public and the hospital, general and special roles of nurses, assignments of medical tasks, special role during a pandemic influenza and biological terrorism, role conflicts during a disaster and willingness to respond to a disaster.

Expectations of the public and the hospital: The public expects that nurses are prepared at a personal and professional level and that they have procedures in place, which enable them to

serve in an emergency (12). Reinforcing, the public has a right to expect effective response from healthcare professional, including nurses (13). Moreover, it is anticipated from the hospitals that nurses know before a disaster what will be expected from them in such a situation, what tasks will have to be fulfilled and who is authorized to issue directives towards them and many employees in hospitals do not know what their role during a disaster will be (14). In order to develop or to optimize the field of disaster nursing nationwide, it is proposed to develop a national committee to help define the discipline, build disaster curricula, and to set disaster competencies. Furthermore, nurses need to participate in disaster preparedness planning to become familiar with their responsibilities in disaster situations (15).

General and special roles of nurses: In general, nurses will have to provide care in a very different context than in their usual practice during disasters (16,17). Further, it is imperative that nurses are able to continue working to provide care to additional patients (18). Different authors acknowledge that nurses are key players in emergency response (15,17-22). In other words, it can be determined that nurses are in a natural position to assist in a disaster (23), they are the most vital resources in dealing with disasters (24), they have been part of disaster response as long as nurses have existed, nurses will continue to be key players (20) and when nurses are not involved yet in the aspects of disaster care, the involvement should become mandatory (25). Particularly, nurses working in disaster-prone areas need to know their professional role in a disaster (26).

Not every nurse is expected to fulfil any assigned role, and special roles before, during and after a disaster are assigned to nurses with different qualifications (Table 1).

Table 1. General and special roles of nurses

Groups of persons	Role description
Nurses meeting surge capacity needs (20)	Conducting surveillance in the field Dispensing mass medication or vaccination in shelters Staffing information hotlines in departments of health Admitting patients in hospitals
Nurses within hospitals (20,27)	Identify signs and symptoms of injuries and exposures Work in a disciplined team Follow clear lines of communication Perform according their assigned role directions and responsibilities
Nurses in general (28-30)	Establish disaster plans Train responders Coordinate the disaster response Provision of care for disaster victims Support and protect others from health hazards Make life-and-death decisions and decisions about prioritization
Nursing executives (31)	Preserve open lines of communication Ensure the quality of patient care, provide current education Influence policy and political decisions Provide security for staff, patients and families.
Public health nurses (20)	Screening Administer first aid and psychosocial support Implement infection control procedures and monitoring

Assignments of medical tasks: During a disaster, nurses are expected to be able to fulfil the role of a medical practitioner in some ways. This role can be described as outside of the normal scope of nursing practice, their knowledge or their abilities (32). Nevertheless, it is im-

perative that nurses are trained in disaster medicine in order to be assigned to medical tasks in emergency response (30). The task of triaging patients as an assigned medical task is figured prominently in the literature (19,29,32).

Special role during a pandemic influenza and biological terrorism: The tasks during epidemic situations are contact tracing, conducting case investigations, engaging in surveillance and reporting, collecting specimens, administering immunizations and educating the community (20). Furthermore, in hospital settings, it is expected from nurses to be able to identify, manage and treat infectious outbreaks (32).

Role conflicts during a disaster and willingness to respond to a disaster: Nurses might have conflicts between their professional, their private and their community role, respectively (33). Nurses might be therefore less willing to respond to work during a disaster. Other reasons influencing the willingness to respond are low baseline knowledge, low perception of personal safety, and low perception of clinical competence (34). It is also stated that these factors will lead to a shortage of nurses to provide care during a disaster. Nurses not responding to a disaster describe having feelings of guilt towards their jobs and co-workers, recognizing the impact of their decision. On the other hand, it is also possible that nurses maintain being able to respond to disasters beyond normal working hours (33).

Disaster preparedness and knowledge of nurses

The six identified sub-themes include definition of a disaster, core competencies and curriculum, undergraduate nursing education and continuing education programs, disaster drills, training and exercises, as well as preparedness.

Definition of a disaster: It is acknowledged that nurses might perceive a disaster differently than described from official definitions and classifications such as the one of the CRED (1,2). In a study by Fung et al. (29), nurses described their perception of a disaster in a fourfold manner. Most of the nurses attributed specific characteristics to disasters. Exemplarily, these characteristics are being unpredictable, sudden, unexpected or unpreventable, being out of control and not manageable, urgent response, horrible crisis or unknown disease with no treatment available. Another way of describing a disaster is by impact, as for example: large numbers of victims, damage to the environment, adverse psychological effects, loss of family, and serious consequences. Moreover, disasters were described as demanding emergency services and care. Examples are being in need for immediate medical attention, a challenge to professional services or requiring extensive work force to cope. Only few nurses described disasters in a way a definition would do: epidemics, accidents, terrorist attacks, natural disasters, extreme weather and war.

Core competencies and curriculum: For preparedness purposes, it is very important to have core competencies for education and training as well as for the effectiveness and efficiency of response during a disaster (35). The identification of core competencies and knowledge needed to help and protect self and others during a disaster is an important first step to qualify nurses for disaster response (20,35). Weiner (36) refers to the core competencies defined by the Nursing Education Preparedness Education Coalition (NEPEC) (Table 2). When comparing knowledge and experiences underpinning these competencies with nursing practice, it can be concluded that many of them are basic to a nursing curriculum (35). Furthermore, others claim that nurses already possess the skills enabling them to respond to a disaster. These are purported to be the values of human caring, creativity, the ability to improvise, communication and management skills (20,23). On the other hand, Usher and Mayner (22) state that working in an emergency department or a similar area is (still) not good enough to meet the

required competencies to respond to a disaster. Others claim that nurses working in acute care already have specific disaster nursing core competencies (28).

Some authors annotate that the area of disaster nursing is underrepresented or lacking in undergraduate nursing curricula, nurses and nurse practitioners are not able to meet required disaster nursing competencies and that it is urgent to include content in order to enable nurses to respond in times of disasters (6,12,15,17). Nursing educators are hold accountable to preparing nurses for disasters, for example by adjusting the curricula and by meeting the increased need for education and training in disaster nursing for all groups of nurses (6,17,37).

Concerning a disaster curriculum, Lund et al. (30) propose seven modules for a comprehensive nursing curriculum to address chemical and biological warfare (Table 2). Elsewhere, such a training of specialized skills and knowledge is criticized because they are unlikely to be retained until an opportunity to use them is afforded (38). Others propose educational components that are more medically oriented (Table 2) (14,24).

Undergraduate nursing education and continuing education programs: The fields of undergraduate education and continuing education programmes for nurses are widely discussed in the literature. Because nurses have to be aware of disasters and be prepared for them, it is imperative that disaster management and nursing contents and experience are integrated into undergraduate nursing and continuing education programme curricula (15,17,22,24,35,39-41). It has to be acknowledged that all nurses, irrespective of being educated and trained or not, may be called during a disaster and therefore, all nurses must have a minimal knowledge and skills for appropriateness of their response (17,26,29,35). Education is critical to the feeling of safety and competence as well as the willingness to participate in an emergency (32,34), but it needs to be tailored according to the specific needs of the location such as capacity and expected role of nurses (16). For Australia, Usher and Mayner (22) state that the theoretical and practical preparation of disaster nursing competencies in undergraduate nursing courses are inadequate or only little is known about the inclusion and that professional development opportunities are needed.

One possibility for an adequate provision of knowledge and skills required in a disaster could be the collaboration and sharing of knowledge between nursing schools and the military medical communities as well as other trained medical professionals, for example volunteers from the Red Cross or Red Crescent and other medical response teams (17). Another effective strategy might be the dissemination of information and educational materials related to disasters (18).

It is central that nurses receive education which is specific to their actual knowledge and skills in order to not duplicate efforts or miss important content because the more advanced nurses are, concerning both experience and knowledge, the more likely they are to implement advanced disaster nursing (15,32,35).

Disaster drills, training and exercises: Drills and training play also an important role for disaster preparedness. It is concluded, that intensive training and periodical drill programs simulating hospitals' emergency plans will improve capabilities of nurses for emergency response (15,20,21,31,42,43). All nurses are recommended to participate in periodic emergency response drills and disaster training, and nursing schools should collaborate with the local EMS to give their students a disaster field experience and to expedite teamwork between first responders and first receivers, because during a disaster an enormous pool of nurses will be needed (20,21,23,25,35).

Further reasons for participating in and specific issues for disaster training are described in Table 3. Others contrarily describe specific medical tasks and conclude that these tasks should be tailored to the nurses' background knowledge and clinical experience (13,16).

With any disaster training, a broad range of topics should be covered in order to prepare nurses to function in disasters due to any hazard and settings other than their work settings (41). Goodhue et al. (21) conclude that having disaster training, besides having a specified role in the workplace disaster plan, is the most easily modifiable variable with the most impact on increasing the likelihood of response in the event of a disaster.

Preparedness: Disaster preparedness of nurses is pivotal to the ability and capacity to respond as well as the delivery of effective disaster response (6,18,24,33). There are two ways of viewing preparedness, personal preparedness and professional preparedness. Special attention is given to bioterrorism preparedness, because being especially prepared for bioterrorism and thus infectious disease emergencies, has a positive impact on patients, families and the nurses themselves, for example by preventing a secondary spread (18,45). Furthermore, bioterrorism preparedness readies nurses for other disasters, because the skills and response actions are the same and misconceptions can be prevented (46). Due to this importance, bioterrorism preparedness should be part of continuing education and nursing school curricula (18,43). Other special fields where preparedness is necessary are described in Table 4.

Table 2. Core competencies and disaster curriculum

Description	Contents
Core competencies defined by the Nursing Emergency Preparedness Education Coalition (NEPEC) (36)	Protect self and others from harm Participate in a multidisciplinary, coordinated response Communicate in a professional manner Recognize disaster situations and potential for mass casualty events Seek additional information and resources needed to manage the event Recognize your roles and limitations in disaster response efforts Cope with challenges that occur in disaster situations Define terms relative to disaster management response Discuss ethical issues related to mass casualty events Describe community health issues related to mass casualty events
Already existing specific disaster nursing core competencies of nurses working in acute care (28,41)	Triage Securing of personnel, supplies and equipment Recordkeeping Patient transport Decontamination Patient management of specific illnesses and injuries Patient management of special needs population Evacuation Development of disaster plans Ethics Response to stress reactions
Disaster curriculum modules of Lund et al. (30)	Anatomy of a disaster Epidemiology of disaster Disaster planning Communications in disaster Introduction to disaster medicine Introduction to pathophysiology of disaster The disaster response
Nursing curriculum to address chemical and biological warfare (40)	Introduction to biological and chemical terrorism Surveillance systems for bioterrorism Identification of agencies Communication Response systems Biological and chemical agents of concern Mass immunization Decontamination and mass triage Therapy and pharmacology Psychosocial effects of terrorism Nursing leadership during emergencies
Medically oriented educational components (14,24)	First aid Basic life support Advanced cardiovascular life support Infection control Field triage Pre-hospital trauma life support Advanced trauma care nursing Post-traumatic psychological care Peri-trauma counselling

Table 3. Reasons for participating and specific issues for disaster training

Description	Contents
Reasons for participating in disaster training (10,13,15,18,21,24,26,27)	Test and maintain disaster preparedness Create awareness for disasters in general Create awareness for physical and mental limits Increase personal safety Increase confidence in disaster management Minimize emotional and psychological trauma
Specific issues for disaster training (38,43,44)	Triage Mass casualty management (Bio-) Terrorism preparedness Communications Command and control Interagency cooperation Waste management Decontamination Personal protection
Specific medical tasks (13,16)	Cardiopulmonary resuscitation Central venous catheter insertion Trauma care

Table 4. Personal and professional disaster preparedness

Description	Contents
Personal preparedness (15,18-20,27,47)	Go-pack containing essential personal supplies Preparing and protecting the family Personal plan for times of disaster Knowing employment contract statement about obligation to report to duty during a disaster
Professional preparedness (15,19,26,27,29,47)	Pre-registering in a disaster registry Developing and knowing disaster plans Assembling emergency supplies Studying evacuation or shelter options Ongoing training and drills Experience in disaster nursing
Special fields of disaster preparedness (33,34,40)	Bioterrorism Disasters involving special need populations Chemical or radiation disasters

According to Al Khalaileh et al. (15), Jordanian nurses consider themselves being weakly to moderately prepared for a disaster and think that additional training would be beneficial. The same issues are made out for Hong Kong nurses and the existence of a lack of understanding their preparedness needs with regard to disaster is concluded (24,29). Being prepared for a disaster as a nurse might maximise safe conditions, decrease vulnerability and minimise risk to individuals during a disaster (12).

Disaster experiences of nurses

The six identified sub-themes are work environment, nursing care, feelings, stressors, and willingness to respond to disasters and to treat patients as well as lessons learned and impacts.

Work environment: Nurses will experience challenging working conditions, an environment of fear and difficult infection control requirement conditions during a bioterrorist event (10). Nurses believe that during a disaster will be a chaotic clinical environment without a clear chain of command, with insufficient protective equipment and little freedom to leave (47). Manley et al. (38) assume, even if hospitals are well prepared, that during a disaster will be chaos, inadequate resources, deaths and injuries, confusion and contention over who is in command, lapses in security and breakdowns in communication. During a disaster, problems concerning organizational and social supports caused by challenges with care for children, elderly or pets during prolonged shifts and quarantine might also prevail (48).
Nursing care: Nursing care during a disaster is a special type of care because of the exceptional situation and the change of routine. During a disaster, care is provided by an interdependent team of nurses, clinicians and EMS professionals, each playing unique roles (41). Thus, nurses especially feel as advocates for their patients, especially those who are frightened or most vulnerable, and their merits of caring and unity are the most appreciated aspects of their rescue experience, reinforced through communal sprit with their colleagues and the feeling of being rewarded by the victims (7,27). Nurses are confronted with conflicts and ethical issues when working during a disaster. Because of increased staff requirement and the allocation of resources nurses come into conflict with the delivery of dependent care (27,48). Other challenges for nurses are the identification of unfamiliar infectious agents, long working hours, limited supplies, unfamiliar environments, provision of care to infected patients, or fear of infection (10). Chaffee (49) concludes that tasks like triage, quarantine and mandatory administration of medication might be ethically challenging during a disaster. If uncertainty of the conditions worsens, nurses might experience discouragement and fear (7).
Feelings: On the one hand, nurses feel guilty when taking leave, are concerned about causing pain and distress to their patients, are overwhelmed by the scale of the tragedy, feel disgusted or distressed at the nature of the injuries and the scale of the suffering or felt apprehensive about being able to cope. On the other hand, nurses also feel excited and challenged by what they have to do, or feel to be valued as much-needed colleague (50). Anger towards people in authority, because of the expectation to fulfil the duty to care, is another feeling described by nurses (7). Fear, anxiety, stress and confusion are perceived to be felt in the event of bioterrorism. Fears might arouse in consequence of the possibility of acquiring a lethal disease from exposure to an infectious agent, transmitting an infectious agent to other patients or the family, lack of knowledge about disease agents, isolation procedures, and access to content resources (47). Other feelings might be uncertainty, hopelessness, or abandonment related to the issue of chaos in general and evacuation in special (7).
Stressors: There is a widespread assumption that nurses "*by virtue of their training and personality traits are relatively impervious to the effects of distressing experiences*", such as disasters (50). Newer studies disqualify this assumption, because for example, the work of nurses can be compromised when a lack of adequate rest, poor nutrition, erratic eating patterns and insufficient fluid intake prevails (26). Other stressors might be information and work overload, crisis, confusion, uncertainty, chaos, disruption of services, casualties, or distractions with crowds and media, decline of infrastructure, limited medical supplies and loss of electricity and potable water (7,25,31,47,48). Moreover, poor knowledge and working skills, combined with a heavy workload and lack of equipment, leads to emotional distress during a disaster (25). A disaster can also lead to personal trauma because of the experienced loss of homes, workplaces, and close relationships as well as suffering or dying patients (7).
Willingness to respond to a disaster and to treat patients: Main issues related to a reduced willingness to treat patients during an epidemic include having a high level of concern about

an infection and lack of medical knowledge (46). During a disaster, nurses will have the same vulnerability to property damage, injury or displacement, will have fear and concern about own and family's safety and will, therefore, have to make a decision whether to report to work or to care for oneself, one's family, or personal property (49). Other reasons for unwillingness to respond to a disaster are responsibilities to children or elderly, a second job, transportation issues or obligations to care for a pet (49). Goodhue et al. (21) found out in their study that less than one third of paediatric nurse practitioners would definitely respond during a disaster. One result of the study of O'Boyle et al. (47) is that many nurses would leave hospitals or would not report for work when a bio-terroristic event occurred. Not all nurses will be willing to respond to chemical, biological or radiological disasters, because of personal risk and not all nurses will be able to respond because of the unavailability of personal protective equipment (33).

In order to raise the willingness to respond to a disaster, nurses need to be educated on what the hospital expects from them and what the implications of certain choices of not responding to work will be (49). Other factors might be: knowing that family members are safe and provided for, having a home disaster plan, having disaster training, having an assigned role in the workplace disaster plan and prior disaster experience (21).

Lessons learned and consequences: Based on experience, often lessons learned and consequences for the future are stated. Ammartyothin et al. (42) conclude that medical personnel, such as volunteers, should be incorporated into the organic medical staff during a disaster as well as that communication systems are important for disaster management and have to withstand the actual event and the unavoidable. As a health institution, it is important to find out about the nurses' determinants of reporting for work when a disaster strikes in order to be better prepared (46). During a disaster, it is imperative, that food, water and a place to sleep or a quiet area are available for continued functioning of nurses. In order to ensure an effective response, nurses need to build functional partnerships with physicians, to support one another and to express a sense of responsibility and empathy for colleagues and patients (7,25,39). For future disaster responses, the performance of nurses during a disaster needs to be evaluated and the most frequently used skills need to be identified for further training (13).

Discussion

Concerning the general role of nurses in disasters, different attributions are observed. On the one hand, there is international consensus that nurses are key players in emergency response is somehow contemporary. On the other hand, it does not seem finally clear which expectations are cherished towards nurses. Is it only the continuation of the provision of care in different circumstances or is the assumption of medical tasks, in fact? Of course, not every nurse needs to be able to fulfil every role, but medical tasks during a disaster might be mandatory to undertake. It does not become finally clear from the literature review which medical tasks most certainly are needed in general and particularly for specific disasters. Moreover, heterogeneity about the field of application of nurses exists in the literature. In some it is described, that nurses will work on-site of the disaster area in others nurses will be deployed in their own hospital or in a hospital in the proximity of the disaster area and yet in others nurses will work in the community. These heterogeneities surely are due to the different healthcare systems and professional qualifications in the different countries, a diversity that is remains unanswered in this review. However, it seems convincing that preparedness for a disaster as well as an effective response are expectations of the public towards nurses in all countries.

Special attention is given to the roles of nurses before and during a pandemic influenza and biological terrorism. Nurses have a share in the identification, management and treatment of

infectious outbreaks. Again, the specific tasks during such an event are dependent on the professional education of the nurses.

The professional roles during a disaster might be in conflict with the personal duties in the family and in the community. Such conflicts can undermine supply of work force during a disaster immensely.

The definition of disaster is perceived differently by nurses than from the officially used definitions. Officially used definitions mainly focus on the cause of a disaster. Thereby, the passage between a mass casualty event and a disaster is fluent. For nurses, a disaster is mainly considered through the impact it has for their daily work, the persons who they care for and their own life. Thus, the unpredictability and suddenness as well as the number of victims, their injuries and clinical picture play a greater role in the perceptions of nurses. Furthermore, terrorism does not explicitly appear in the disaster classification of the CRED; yet, nurses do think that terrorism might be a threat for their country (2).

In order to be prepared for a disaster, it is important to define core competencies applicable to the different professional qualifications of nurses. A comprehensive list might be the WHO and ICN in their Framework of Disaster Nursing Competencies (8). This supranational framework has to be broken down into national core competencies for nurses and a list of competencies for undergraduate and continuous nursing education, at the end, because it may very well be the case that some knowledge and skills acquired through basic nursing curricula already equip nurses for disaster response. On the other hand, some disaster nursing competencies might be highly specialized, and thus uncommon in practise as well as unlikely to be retained. Thereby, a careful choice between specialization and generalization of skills and knowledge for undergraduate and continuous nursing education should be made.

Both, undergraduate education and continuing education programmes have to raise awareness and preparedness for a disaster adequately. By tailoring education to the local needs, such as the likelihood of specific disasters or existing disaster plans, and the needs of the nurses, such as the requirements for general disaster management knowledge or specialized medical skills, all nurses should be able to respond to a disaster appropriately. It remains unclear which strategy for the education of nurses in disaster management is the most effective. The collaboration with medical communities and other medical response teams, as well as the dissemination of information materials on the topic seem to be promising, not only for education but also for drills and training. Emergency response drills and disaster training are important elements of individually and professionally preparing nurses for disaster and evaluating existing disaster plans. Again, emergency response drills and disaster training need to be tailored according to the local needs and the needs of the nurses, leading to an improvement of the nurses' willingness to respond to a disaster and the response as such.

Being prepared for a disaster as a nurse means being personally and professionally prepared. Nurses are considered to be personally prepared, when they are able to protect their family as well as when they know their obligation to report to duty during a disaster and have all their essential personal supplies standing by. Professional preparedness of nurses means the registration in a relevant disaster registry, knowing the disaster plans and being trained. Furthermore, special preparedness is needed for nurses' working areas with special needs populations and specific disaster types.

The work environment of a nurse during a disaster will likely be challenging and chaotic. Nurses need to know beforehand what they might expect; therefore, preparing them through education and training is essential. Furthermore, a need for a good disaster plan, where chains of command and effective alternatives in communication are described, arises considering the high possibility of an adverse work environment. For nurses, it has to be clear, that care dur-

ing a disaster differs from the routine work. Interdependence in a team will become even more important as well as advocacy for patients, the allocation of resources and ethically challenging decisions (for example, during triage).
During a disaster, negative feelings, such as guiltiness, disgust, anger or fear, are dominant in descriptions of nurses' experiences, besides positive feelings of excitement or being challenged. No information is given on the impacts of those feelings on working capacity and mental health. Nurses also experience specific stressors during a disaster, likely leading to emotional distress and possibly to personal trauma. These stressors can either have a personal character, such as uncertainty about the safety of the family or themselves, an organizational character, such as being cut-off from support sources, and an occupational character, such as hazards, lack of equipment or high workload.
The willingness to respond to a disaster is dependent on the level of concern, responsibilities and the medical knowledge of nurses. Concern may exist for example due to property damage or own and family's safety, responsibilities may be towards children, elderly or another employer. It is important that nurses are educated and trained on the expectations of the hospitals and that they have their own disaster plan.
Disaster experiences importantly should lead to impacts for the future, the so-called lessons learned. Often, these lessons learned refer to optimizing communication systems, nurses' determinants of reporting for work, controlling the hospital environment during a disaster and the knowledge and skills of nurses. Nurses themselves will acquire experience, and might rethink their commitment to nursing. In summary, it can be stated that, after a disaster is, with all probability, before a disaster and it is therefore inevitable to prepare anew.

Conclusions and implications

It seems self-evident that nurses are key players in emergency response. In order to prepare nurses for disasters, clear roles should be defined according to the professional education of the nurses, which should be communicated beforehand. These roles of nurses during a disaster should be realistic in relation to their skills and practical experiences. In order to raise the availability of nurses during a disaster, roles should be adjusted to each nurses' personal duties in the family and in the community, in the best case. Roles should also be tailored according to the characteristics of the different disaster types, with special attention to pandemic influenza and biological terrorism. In order to satisfy public expectations towards nurses, national directives and concepts for disaster nursing should be developed, where nonexistent, and nurses have to be called attention to their duties. Moreover, distinctions towards roles of physicians and nurses during a disaster are needed in order to define the medical tasks of nurses clearly, which have to be trained and performed during a disaster.
Existent definitions of disasters seem not to be appropriate for the working environment of nurses. Defining disasters out of the experience of nurses could help to give a better understanding for such a sweeping event. A definition from the perspective of a nurse could be an unpredictable, sudden event that is hardly but urgently manageable with serious consequences to the population and environment demanding an extensive need for professional health services personnel.
In order to develop national disaster nursing core competencies, the Framework of Disaster Nursing Competencies from the WHO and ICN (8) should be interpreted for the needs of each professional group of nurses. National disaster nursing core competencies then should be adjusted to the demands formulated in the undergraduate nursing curricula in order to meet the national criteria. Nurses should receive education and training tailored to the local needs and their actual competencies. Collaboration with relevant national institutions and organiza-

tions is indicated for making education and training in disaster nursing more efficient, precisely if nursing educators are not knowledgeable in the field of disaster nursing.
For personal and professional preparedness and in order to raise willingness to respond, nurses need to pack their essential personal supplies standing by for emergencies, need to know that their families are protected and need to be registered in a disaster registry as well as know their relevant disaster plan. A personal disaster plan will help to arrange personal matters when responding to a disaster.
In order to counteract the high possibility of challenging and chaotic working conditions during a disaster, nurses need to be prepared for many situations and hospitals need to develop or improve their disaster plans. It has to become a given for every nurse, that nursing care during a disaster will change from its routine way, including all consequences, such as the allocation of resources.
Not much is known about the feelings of nurses responding to a disaster and their resistance to stressors. In order to be able raise the willingness to work in a disaster, it is imperative that possible distressing situations during a disaster are identified and reduced, and nurses become prepared for coping. It is central to learn from a disaster experience and to prepare anew. Not only will the optimizing of processes during a disaster written down in a disaster plan have to be evaluated, but the performance of the nurses who were on duty and the reasons of the non-performance of the nurses who were not able or not willing to respond to the disaster, as well.
An overview of the implications and the relevance to nursing practice, nursing education and research is presented in Table 5.

Table 5. Relevance to nursing practice, nursing education and research

Relevance to nursing practice:
All nurses, regardless of their professionalization, need to receive disaster preparedness education in their undergraduate and continuous nursing education, in order to have a great pool of nurses during a disaster.
All nurses should periodically take part in emergency response drills and disaster training in order to be prepared for disasters.
For being prepared for a disaster and willing to respond, nurses need to be personally and professionally prepared. A personal disaster plan will help to arrange personal matters.
Hospitals need to have a disaster plan, wherein chains of commands, alternative communications and task descriptions for groups of nurses during disasters are described.
During a disaster, the routine way of nursing care changes and nurses need to be prepared to make ethically challenging decisions.
Relevance to nursing education and research:
Nursing educators should prepare nurses for disasters, by adjusting the curricula and by meeting the increased need for education and training in disaster nursing for all groups of nurses.
Nursing research should find definitions of disasters appropriate for the working environment of nurses. Research should be done in order to review the appropriateness of theoretical and practical preparation of disaster nursing competencies in undergraduate nursing courses and continuing education programmes.
Disaster preparedness of nurses needs to be evaluated regularly in order to maximise safe conditions, decrease vulnerability and minimise risk to individuals during a disaster.
Distressing situations for nurses during a disaster should be identified and reduced, nurses should be prepared by equipping them with possible coping strategies through education and post-disaster psychosocial care should be ensured.

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