

## Basic principles of disaster medical management

P. GUÉRISSE (\*)

### DISASTER

The last 30 years were witness to a marked escalation in the frequency and magnitude of man-made disasters such as armed conflicts, great scale industrial and transport (railway, road, boat or aircraft) accidents, urban and crowd violence and terrorism. Previously, the negative impact of disasters or major accidents was accepted as a fate or as a tribute to pay for modernity, and the human and economic losses were considered irreducible (1). Most of our political leaders and authorities were living as if a catastrophic event was inconceivable, with the "Titanic turn of mind" (2), believing blindly that the ship could not sink, and therefore refraining from taking any measure intended to be able to cope with a mass emergency. This thinking has changed radically and awareness about disaster preparedness is increasing. The Seveso accident (1976) which, together with Bhopal (1984) and Chernobyl (1986), became a symbol of the pathologies of our technological civilisation (3). At least we were delivered from the first great difficulty in disaster planning, which is the difficulty in believing that the disaster will ever really happen (4). Authorities and agencies do accept now that zero risk does not exist with the result that we are engaged in efforts to prepare for the next disaster (1), which we know will come sooner or later, but we don't know in what form !

Disaster medicine and emergency public healthcare are relatively new fields comprising much more than clinical medical issues and requiring significant contributions from many disciplines, most of them far from the usual medical practice (5). As a result, many concepts, terminology, procedures and practices have been only recently validated or are in progress aiming for standardisation.

Educational curricula dealing with disaster medicine for planning, preparedness and response are gradually accepted and institutionalized.

In Belgium, since 1988, academic programs have been developed so that diplomas of special competence are offered. A university curricu-

lum (6) is yearly organized in both speech communities, covering within about ten days a wide range of mostly non medical subjects all dealing with the management of mass emergencies. Both courses are designed to prepare emergency physicians and nurses, and officers from rescue and security agencies (fire department, police, medical service of the army, civil protection, Red Cross, ...) to perform their roles in managing the medical aspects of a mass casualty incident and to familiarize them with the roles played by others in the community in such circumstances. The final aim is to develop and share a common language and familiarity with the means of preparing for and responding to the threatening scenarios of natural or manmade mass emergencies (7).

### DEFINITION

A mass emergency or a mass-casualty incident is typically a situation when there is a sudden discrepancy between the acute needs and the locally available resources (8) when the extent of damage and injury exceeds the capacity of the community to cope with its consequences. The number of instant deaths are of course totally irrelevant to the definition of a mass emergency (9). Clearly, the significance of a catastrophic event depends on the resources available for taking care of all the casualties (10). For example, 10 severe casualties in a small isolated community could overwhelm that area's resources. Conversely, in a great urban medical community, it would be a routine matter (11).

The American College of Emergency Physicians (12) states that a medical disaster occurs when the destructive effects of natural or man-made forces overwhelm the ability of a given area or community to meet the demand for health care. It is probably suitable to reserve the term **disaster**

(\*) P. GUÉRISSE, Emergency Department, CHU Brugmann-Brien, Brussels, Belgium.  
E-mail : patrick.guerisse@chu-brugmann.be

to situations where the social and medical infrastructure of a community is so damaged by the event that it places in more extraordinary burdens on fundamental societal functions such as law and order, communication, transportation, water and food supply, etc. All these definitions are typically time sensitive : when resources become sufficient (and most times excessive) to meet the needs, the disaster situation ends and the management can return to its normal way.

In Europe and US, the vast majority of medical disasters are rare by world standards, within 50 to 100 casualties (13, 14), most of them resulting in fewer than 40 injuries (15, 16), with the result that the medical care component of the response is usually over in a few hours. Nevertheless, mass emergencies create problems with which the rescue agencies are never faced in day-to-day practice (17) and which require a specific management (2, 7, 9, 14).

#### “NORMAL ACCIDENTS”

Research (2, 18) clearly indicates that mass emergencies amount to more than “large scale incidents”. Attempting to define a mass-casualty incident only by the amount of harm they produced fail to capture the essential features of the events. Indeed, the difference between everyday delivery of first-aid and management of a large mass casualty situation is one of **kind**, rather than just of degree (2, 19). It is not simply a matter of scale and there are many qualitative differences that can be summarized as follows (20, 21).

The classic ‘routine’ emergency consists of a variety of well-known elements. These include a well-understood event of limited scale, believed to be easily manageable and quickly brought under control, involving clearly defined emergency procedures applied by a limited number of participants. These participants are in organizations familiar with each other that have clear-cut roles and responsibilities and are operating under well-accepted authority.

By contrast, a catastrophic event is substantially different. This event involves enormous quantitative and qualitative problems that produce a breakdown of normal arrangements resulting in an emergency “that does not play by the rules”. This sort of event generates multiple and various procedures and initiatives for tackling the problem, most of them inadequate, obsolete or counter-productive. The attempts to manage consequently involve large numbers of people, many of whom belonging

to organizations not familiar with one another, with conflicting roles and responsibilities.

#### PREPAREDNESS

The delivery of medical care in response to a mass casualty incident differs radically from the routine. There is a need for changing the mode of thinking, the mode of action and sometimes the level of ambition. The philosophy of care no longer revolves around the individual patient. Medical resources, personnel, supplies and facilities must carefully be allotted to provide the greatest good to the greatest number (14).

Disaster medicine is fundamentally an organizational framework where each service might contribute with its particular special expertise and where each rescuer has to play his right role in the right place. Many of the problems faced in mass emergencies are not caused by shortages of resources, which in fact does not last a long time, but rather from failures to coordinate their distribution (2, 22).

Consequently, all phases of a mass-casualty incident response must be addressed in a specific disaster plan, prepared at the regional level, containing an organizational structure where functional job descriptions and responsibilities of all agencies and organizations involved should be clearly delineated (15, 21).

The main result of the Seveso accident is the Community Directive on the major accident hazards of certain industrial activities (Council Directive 1982) issued six years after the accident, after long and arduous negotiations among the different member States. The Directive (3) contains a public information requirement which was strengthened in its second amendment (1988). In Belgium, a legal text (23) was published in 1990 containing the definitions, the missions and the means of action of the five agencies called to participate in the rescue operations: fire department, medical and health services, police, logistic support and administrative authorities.

#### MEDICAL MANAGEMENT

In the past, determining what types of medical aid should be brought to the victims of accidents used to be left to the discretion of the fire and ambulance services. The development of emergency medicine these last twenty years in many European countries has evolved to the progressive participation on a regular basis of emergency

physicians and nurses in the first aid teams working daily outside of the hospital.

Under the particular circumstances of a mass emergency, a basic policy question is : should victims be brought to hospitals or should hospitals (care and equipment) be brought to the victims ? The answer does not seem simple and univocal and should be appreciated (considered) according to the existing medical first-aid systems developed in each country.

Until recently, the emphasis had been on removing casualties to the hospitals as quickly as possible (24, 25). This has been questioned whether it would be the best solution (26) and emphasis has been placed on the need for, and the role of, the mobile medical teams that are sent from the hospital to the scene of an accident (24, 27, 28).

On the basis of research records (29, 30, 31), evidence is that in large mass casualty actions, sending medical teams for action on site is the better way of delivery effective and reasonable treatment (2). Consequently, the medical organization of a mass-casualty incident originates today with the first medical team arriving on site (32, 33).

In Belgium, the threshold for the activation of the disaster plan is fixed at the level of five seriously injured or ten injured victims of unknown severity. The automatic response (34) from the command centre (known as rescue-centre "100") should be to dispatch immediately to the site five ambulances and three medical teams, and to warn the senior emergency physician on duty for the province (medical incident officer known as the Director of the Medical first-aid). All the management scene turns around the principle that it is a need for a clear medical leadership at the scene. The role of this medical incident officer include on the one hand the direction and coordination of all medical and paramedical activities and on the other hand communication control and information sharing with the other agencies, the command centre and the hospitals.

#### ON SITE ORGANIZATION

Surprisingly, the first task of the first medical responder arriving on the scene is not rapid initiation of patient care, but rather immediate **information** to the command centre that the accident is one of unusual size and appearance. He should provide with a brief description of the overall conditions of the site and ask for the activation of the emergency plan.

Assessment of the overall size of the medical problem with the help of the fireman and police officers should be his second task. Assessment of the potential number of patients likely to require medical care, the types of injuries that are most prevalent and an estimate of the number of patients who will require evacuation are essential in order to implement an appropriate and effective response (35).

Since the site of a mass-casualty incident becomes rapidly one of confusion and congestion, starting with the implementation of a medical organization on site should be the next priority. One challenge is to gain control of the scene by **gathering the victims** as much as possible in order to prevent patients presenting unheralded at the nearest facility, transported by bystanders or escaped on one's own initiative. Establishing clearly recognizable pivotal points is vitally important to site control and a casualty-collection point must be set up as early as possible (14, 28, 36, 37).

This medically-staffed gathering area (known in the French terminology as "**Poste Médical Avancé**") should be established in a safe place, close to the incident but clear of any remaining hazards, with easy access to both the flow of victims and traffic lanes. Ideally, this area should be protected from the elements, allow adequate separate access and exit, have at one's disposal light, electricity and telephone (35, 38). All casualties should be channelled through this post, where more definitive triage, identification, stabilization and treatment are provided before evacuation to an adequate hospital where they will receive definitive care (37). This clearing and staging area is the "filter" that ensures that priority for stabilization treatment and evacuation is given to the seriously injured and those requiring life-saving procedures.

#### TRIAGE

In the military system, it has long been recognized that in a mass-casualty situation conventional standards of medical care cannot be delivered to all casualties (36).

In the same way, when a civilian mass casualty occurs, it should be understood that the philosophy of care on site differs from the care that is usually rendered to an individual patient. The concept of minimal acceptable care is the key to a staged management approach during a mass-casualty incident (39). The aim of treatment should be to do as little as possible, as quickly as possible, for as

many as possible (24). Medical resources, personnel, supplies and facilities on site must be allotted to provide the greatest good for the greatest number.

In the setting of a mass-casualty incident, the severely injured patients are typically in the minority (10 to 15% of the survivors) (40), with most persons being either uninjured, mildly injured or deceased, all of them in a position to tolerate delays and some degree of suboptimal care. Identifying accurately this small number of patients who will substantially benefit from early scene management, immersed within a much larger group of less severe casualties, is the main objective of the medical action on site (36). Consequently, the medical management of a mass casualty incident revolves around victim triage (36, 39, 40).

**Triage** is a tool by which the victims are categorized into groups to determine their priority for treatment and transport to definitive care facilities (36).

Various triage categories have been suggested (40), the most familiar of them dividing the patients into four groups (36) : priority one, "emergency", a hare or the colour red indicates the need of immediate care; priority two, "urgent", a tortoise or the colour yellow, indicates that care may be delayed for a limited period of time without significant mortality or morbidity ; and priority three, "non urgent", no need of an ambulance, or green colour indicates that care may be delayed until the patients in the other categories have been dealt with. The fourth group, black, is used to denote the dead victims. In practice, before giving any care to somebody, it is mandatory to take the necessary time to examine all the victims one by one, each one individually, in order to be able to separate the severely injured patients from the others.

The Simple Triage and Rapid Treatment (START) algorithm is used widely in North America by first responders (40, 42). It uses the ability to walk to a marked place, respiratory rate, capillary refill and mental status (state of consciousness) (40). It is also in use in Belgium, where a set of five red and five yellow disk-shaped badges is available in each ambulance that operates in the national emergency first-aid system. Consequently, the first crews arriving on scene are able to begin a quick binary sort through the victims, making a clear distinction between the apparently severely injured ones and the others. This quick-tagging method-system would ensure that the most severely injured were the first transported to the casualty collection area where they should profit from the resuscitative efforts of the medical teams (43).

Accurate record keeping is also important to identify patients and their status (40). **Triage tags** have been developed that allow recording identification, physical findings, medical interventions, medications as well as the triage group to which the patient has been assigned. Their unfamiliarity to users may be the greatest difficulty to obtain correct completion of labels and accurate descriptions. At the hospital, more detailed information will be collected to assist in locating victims and notifying families (36).

The Medical Emergency Triage tag (MET-TAG) (36) is a system designed in the early '1980 by the American Civil Defense Association. It is commonly used at the scene by medical teams and is the one selected on a national basis in Belgium. It is universally usable, whatever the rescuer's language may be, because all the possible annotations are illustrated by logos. The annotations include date and time, patient's name and home address, initial care rendered as well as blank lines for the type of injuries and a vital signs chart which permits indication of blood pressure, pulse and respiratory rate at three different times. Moreover, indication of the visible injuries is possible on a body diagram of face and back. At the lower end, coloured detachable tabs allow indication of the priority by tearing off the tabs below the determined priority. Each tag has a serial number which is repeated on the tabs and also on the two upper corners which can be torn off for recording at the triage station and on arrival at the hospital. Described as hardest resistant by the manufacturer, it is however not weather resistant.

**Care** given on site is limited to lifesaving actions such as airway opening or stopping a major haemorrhage and to stabilization actions such as alignment and reduction of fractures, correction or prevention of hypovolemia, wound protection and pain control. The mnemonic "BASIC" has been suggested to aid the rescuer in this task : it comprises Bleeding and Airway control, Shock prevention, appropriate Immobilization and Classification (36).

The dead must be certified and adequately labelled to prevent other medical teams from wasting valuable time confirming the diagnosis (44). Emergency mortuary arrangements should be made in collaboration with the Red Cross and in agreement with the police.

Another goal of triage is to assign each patient the appropriate **hospital destination** in adequacy with his or her medical condition, and to determine the most appropriate mean of transportation.

Allocation of the injured must take into account the treatment capacities and specificities of surrounding hospitals <sup>17</sup> in order to select the appropriate hospital for each victim. Conversely, specialized facilities should not be overwhelmed by large numbers of patients with minor injuries (Kennedy). From the scene, in first intention, the victims will be allocated according to the hospital capabilities registered in their disaster plans.

**Transport** of the injured to hospital usually is carried out by the local and regional ambulances services, which may be backed up by ambulances belonging to the Red Cross or private companies (17). Typically, ground transportation is used, but occasionally transport by helicopters or aircraft is needed. Coordination is essential to ensure respect of the triage priorities and proper allocation of each patient to the adequate facility.

#### HOSPITAL DISASTER PLANS

Whatever the expected quality of medical action on scene, it is non realistic to assume that all of the accident victims will be transported by ambulance in the appropriate hospitals after being triaged and stabilized by out-of-hospital medical teams. In fact, the hospital nearest to the accident will most probably be overwhelmed in a first wave by victims who are still able to walk or being transported by personal vehicles (45, 46). This was typically experienced in Ghislenghien (Belgium, 30<sup>th</sup> july, 2004) where about 40 burned people were admitted in the emergency room of the nearest hospital in the 20 minutes following the explosion.

Overloading a facility with non critical cases has been suggested to increase the morbidity and the mortality of the critical cases at that facility (47). Consequently, even in the best case, when victim evacuation is quickly under control and spontaneous flights prevented as soon as possible, the nearest facility should be considered as not available for further transportation of injured victims. The appropriate distribution of casualties from the accident scene is important so that all available resources are used efficiently and the arrival of patients at facilities unable to manage them are avoided.

The goal of the emergency plan of the hospital is to provide severely injured patients with a level of care that approximates the care given to similar patients in similar conditions. Knowledge of hospital capabilities will help guide response leaders and out-of-hospital care providers to direct victims to the most appropriate facility. The hospi-

tal treatment capacity is very different from the number of beds that can be made available, which has been the criterion up until recently (17).

In real-life incidents, the actual bottleneck lies in the emergency room capacity to handle with a large number of injured victims, and the realistic admitting capacity of the hospital should be determined primarily by the number of medical teams that can be recruited in the emergency room (39). Furthermore, the conception that the hospital capacity for severely injured patients can be expanded by reinforcement with personnel who do not deal with emergencies on a daily basis is a dangerous misconception (39). Efficiency and accuracy in the emergency department processing of victims may be enhanced by limiting access to specific medical

The hospital disaster plan should be prepared and regularly updated by a disaster planning committee which must construct a reference scenario with an appropriate and realistic case load that forms the basis for preparation and training (39).

In Belgium, a legal text (48) about the methodology of hospital disaster plans is in application since 1991 where all the necessary requirements are listed. It should include protocols and policies that meet the following needs : recognition and notification, assessment of hospital capabilities, personnel recall, implementation of a crisis and coordination board, specific organization for the reception and identification of the victims, record keeping, internal and external communication, psychosocial support, ...

It should also take into account that the disaster may involve the hospital. Disaster drills are required but rarely organized because disasters are low probability events and the cost of maintaining preparedness and readiness is high.

#### CONCLUSION

Managing a large number of casualties in a short period of time is not a good experience nor is it easily handled. It is an error to think that we will be able to handle the medical aspects of mass emergency believing it is an extension of our everyday activities (49).

The effectiveness of the medical management of a mass casualty incident is based on two major elements : the existence of a disaster plan that anticipates the implementation of a specific crisis organization and the particular methods of the daily first medical aid system.

Rapid participation on the scene of medical

teams having daily practice of work outside the hospital makes the difference in the management of a mass casualty incident between the anglo-saxon (GB and USA) attitude and that of most European countries. In this respect, the recent reports (50, 51) about New York 9/11 emergency medical response and London terrorist bombings compared with those of Madrid bomb explosions (52) deserve further analyse. Anyway, the key of proper management of such mass emergencies lies in keeping in mind that they may happen and in appropriate preparedness to manage them.

## References

1. Pretto E. A. *Anesthesia and disaster medicine*. ANESTHESIOLOGY NEWS, **1**, 1-4, 2002.
2. Quarantelli E. L. *Converting disaster scholarship into effective disaster planning and managing : possibilities and limitations*. INT. J. MASS. EMERGENCIES AND DISASTERS, **11**, 15-39, 1993.
3. De Marchi B. *Uncertainty in environmental emergencies*. J. CONTINGENCIES AND CRISIS MANAGEMENT, **3**, 103-112, 1995.
4. Rutherford W. H. *Disaster procedures*. BMJ, **1**, 445-447, 1975.
5. Waeckerle J. F., Lillibridge S. R., Burkle F. M., Noji E. K. *Disaster medicine : challenges for today*. ANN. EMERG. MED., **23**, 715-718, 1994.
6. Ecole de Santé Publique ULB – Programme des cours 2005-2006 - Etudes complémentaires et formations continuées - Enseignement de Médecine de Catastrophe : Organisation et Gestion des Secours Médicaux en Situation d'Urgence Collective.
7. Johannigman J. A. *Disaster preparedness : it's all about me*. CRIT. CARE MED., **33**, S22-S28, 2005.
8. Noji E. *Disaster epidemiology*. EMERG. MED. CLIN. NORTH AM., 289-300, 1966.
9. Mahoney L. E., Rantershan P. *Catastrophic disasters and the design of disaster medical care systems*. ANN. EMERG. MED., **16**, 1085-1091, 1987.
10. Al-Madhari A. F., Keller A. Z. *Review of disaster definitions*. PREHOSPITAL AND DISASTER MEDICINE, **12**, 17-21, 1997.
11. Cowley R. A., Myers R. A. M., Gretes A. J. : *EMS Response to mass casualties*. EMERG. MED. CLIN. N. AMER., **2**, 687-93, 1984.
12. American College of Emergency Physicians. Policy #400053 approved June 2000.
13. Finch P., Nancekievill D. G. *The role of hospital medical teams at a major accident*. ANAESTHESIA, **30**, 666-676, 1975.
14. Waeckerle J. F. *Disaster planning and response*. NEW ENGL. J. MED., **324**, 815-821, 1991.
15. Mothershead J. L. *Disaster planning*. [www.emedicine.com/emrg/topic718.htm](http://www.emedicine.com/emrg/topic718.htm). Last update Jan. 19, 2005.
16. Adnet F., Maistre J. P., Lapandry C., Cupa M., *Lapostolle F. Organisation des secours médicaux lors de catastrophes à effets limités en milieu urbain*. ANNALES FRANÇAISES ANES RÉA, **22**, 5-11, 2003.
17. De Boer J. *An introduction to disaster medicine in Europe*. J. EMERG. MED., **13**, 211-216, 1995.
18. Tazieff H. in Lagadec P. *Etats d'urgence – Défaillances technologiques et déstabilisation sociale*. pp. 298-303. Ed. Seuil, 1988.
19. Quarantelli E. L. *What is a disaster ?* INT. J. MASS. EMERGENCIES AND DISASTERS, **13**, 221-229, 1995.
20. Jackson A. A. *Recent developments in civil protection and the implication for disaster management in the United Kingdom*. INT. J. MASS. EMERGENCIES AND DISASTERS, **12**, 345-355, 1994.
21. Lagadec P. *La civilisation du risque – Catastrophes technologiques et responsabilité sociale*. pp. 173-190. Ed. Seuil, 1981.
22. Kaji A. H., Waeckerle J. F. *Disaster Medicine and the emergency medicine resident*. ANN. EMERG. MED., **41**, 865-870, 2003.
23. Circulaire du 11 juillet 1990 relative aux plans d'urgence et d'intervention. Moniteur Belge du 5 sept 1990.
24. Nancekievill D. G. *Disaster management : practice makes perfect*. BMJ, **298**, 477, 1989.
25. Staff of the Accident and Emergency Department of the Derbyshire Royal Infirmary ... etc. *Coping with the early stages of the M1 disaster : at the scene and on arrival at hospital*. BMJ, **298**, 651-654, 1989.
26. Finch P., Nancekievill D. G. *The role of hospital medical teams at a major accident*. ANAESTHESIA, **30**, 666-676, 1975.
27. Savage P. E. A. *Disaster planning. A major accident exercise*. BMJ, **4**, 168, 1970.
28. Huguenard P., Larcen A., Noto R. *Médicalisation de l'avant et médecine de catastrophe*. REV. PRATICIEN, **38**, 648-656, 1988.
29. Members of the staff of three London hospitals. *Moorgate train disaster : response of medical services*. BMJ, **3**, 727-731, 1975.
30. Frykberg T. R., Tepas J. J. *Terrorist bombings : lessons learnt from Belfast to Beirut*. ANN. SURG., **208**, 569-576, 1988.
31. Martin T. E. *The Ramstein airshow disaster*. J. R. ARMY MED. CORPS, **136**, 19-26, 1990.
32. Pasteyer J. *Place des SAMU et des SMUR dans les plans de secours*. URGENCES, **8**, 289-298, 1989.
33. Barrier G. *Emergency medical services for treatment of mass casualties*. CRIT. CARE MED., **17**, 1062-1067, 1989.
34. Guérissé P., Servais J. M., Todorov P. *L'organisation des secours médicaux en situation d'urgence collective*. HÔPITAL BELGE, **1**, 19-23, 1995.
35. Bissel R. A., Becker B. M., Burkle F. M. *Health care personnel in disaster response*. EMERG. MED. CLIN. N. AMERICA, **14**, 267-288, 1996.
36. Kennedy K., Aghababian R. V., Gans L., Lewis C. P. *Triage : techniques and applications in decisionmaking*. ANN. EMERG. MED., **28**, 136-144, 1996.
37. Fairley J. *Mass disaster schemes*. BMJ, **4**, 551-553, 1969.
38. Julien H., Fontaine P., Menage P., Lienhard A. *Caractéristiques des postes médicaux avancés en situation de catastrophe civile*. URGENCES, **9**, 293-306, 1990.
39. Hirshberg A., Holcomb J. B., Mattox K. L. *Hospital trauma care in multiple-casualty incidents : a critical view*. ANN. EMERG. MED., **37**, 647-652, 2001.
40. Garner A., Lee A., Harrison K., Schultz C. H. *Comparative analysis of multiple-casualty incident triage algorithms*. ANN. EMERG. MED., **38**, 541-548, 2001.
41. Arcos Gonzales P., Del Busto Prado F., Herrero Puente P. *Criteria for the classification of mass casualties*. JEUR, **9**, 98-104, 1996.
42. Benson M., Koenig K. L., Schultz C. H. *Disaster triage : START then SAVE – a new method of dynamic triage for victims of a catastrophic earthquake*. PREHOSP. AND DISASTER MED., **11**, 117-124, 1995.
43. Gerace R. V. *Role of medical teams in a community disaster plan*. CAN. MED. ASS. J., **120**, 923-928, 1979.
44. Yates D. W. *Major disasters : surgical triage*. BRIT. J. HOSP. MED., 323-328, 1979.

45. Hogan D. E., Waeckerle J. F., Dire D. J., Lillibridge S. R. *Emergency department impact of the Oklahoma city terrorist bombing*. ANN. EMERG. MED., **34**, 160-167, 1999.
46. Caro D., Irving M. *The Old Bailey explosion*. LANCET, **1**, 1433-1435, 1973.
47. Fryberg E. R., Tepas J. J. *Terrorist bombings : lessons learned from Belfast to Beirut*. ANN. SURG., **55**, 134-141, 1989.
48. Arrêté Royal du 17 octobre 1991 portant sur ... le plan d'action dont doit disposer chaque hôpital pour la Mise en Alerte des Services Hospitaliers (MASH) faire face aux accidents majeurs. Moniteur Belge du 6 décembre 1991, pp. 27504-27501.
49. Klein J. S., Weigelt J. A. *Disaster management : lessons learned*. SURG. CLIN. N. AMERICA, **71**, 257-266, 1991.
50. Cook L. The World Trade Center attack – *The paramedic response : an insider's view*. CRITICAL CARE, **5**, 301-303, 2001.
51. Ryan J., Montgomery H. *Terrorism and the medical response*. N. ENGL. J. MED., **353**, 543-546, 2005.
52. Perral Gutierrez de Ceballos J., Turégano-Fuentes F., Perez-Diaz D. et al. *The terrorist bomb explosions in Madrid*. CRITICAL CARE, **9**, 104-111, 2005.