Surgery and Disaster

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ABSTRACT

It is generally accepted that surgeons are the key personnel in disasters. Surgery in disasters is distinct from classical operations and hospital care and covers a larger area. It starts from the search and rescue in the field; triage, patient evacuation and transport, and operating and intensive care rooms are the basic stages of this service. Recently, in our country, surgery teams have begun providing services outside the hospital and have taken part in both national and international missions. The organization and training of these teams becomes an important issue. In this review, we aimed to present the duties of a surgeon during a disaster, their role in the organization, the current needs, and the training programs presently available to surgeons regarding disaster medicine.

Key words: Disaster, Surgeon, Disaster medicine, Surgical team, Triage

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ÖZET

Cerrahi ve Afet


Anahtar kelimeler: Afet, Cerrah, Afet tıbbi, Cerrahi ekip, Triage

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It is generally accepted that surgeons are the key personnel in disasters. The expected service is distinct from classical operations and hospital care and covers a larger area. Service begins from the search and rescue in the field; triage, patient evacuation and transport, the emergency process, inter-hospital patient transport, and operating and intensive care rooms are the basic stages of this service.

In fact, the execution required during disasters is not that different from basic surgical principles. However, one must be ready for complex injury types, which is not usual in regular practice, and aware of all updated principles regarding damage control surgery and resuscitation. Injury infections are frequently encountered in disaster situations, so injury care deserves special attention. Furthermore, another common type of injury in massive casualties following a disaster is contusion. Contusions should be considered often in the aspect of compartment syndrome, and patients should be observed with hot compression followed by cold compression for the first 48 hours. It is usually sufficient to wash scratches and grazes with soapy water.

**DUTIES of the SURGERY TEAM in DISASTERS**

Recently, in our country, as in developed countries, surgery teams have been charged to serve in the field, outside the hospital, both domestically and internationally. These teams may occasionally encounter having to provide health services for people confined in building debris depending on the extent of the disaster, such as in an earthquake or flood. When local facilities and response teams are insufficient, medical search and rescue teams have been constituted for domestic and international duties. In Turkey, organizational structuring of National Medical Rescue Teams (UMKE) has been completed in all provinces. Surgeons are also members of these teams. In these teams, where standardization has been accomplished through periodic training and practice, surgeons are employed to perform major surgical operations if determined essential, such as amputation under debris. The surgery is a team effort. Training of a single surgeon will not be sufficient to ensure optimal quality of the provided service. All members of the surgery team might have to work under debris, in a constricted field, and under adverse conditions with limited possibilities. Thus, it is desired that the surgery team be well-trained, experienced and aware regarding massive injuries. This sufficiency applies not only to the surgical operations performed in the field but also to patient transport, reception in the emergency room, triage, and acceptance to the operating room, and then in the intensive care and follow-up periods.

**DUTY AREAS of SURGEONS and SURGERY TEAMS in DISASTERS**

**Surgical Materials in Disasters**

The tools and materials needed by surgeons will differ depending on the nature of the disaster and conditions of the working place. In the literature, there are many suggestions on this subject but no consensus has been reached. Therefore, it is agreed that all surgery teams must prepare their own equipment/tool list based on analysis of the particular professional skills required and the institution and/or region to be served. A logistic support plan and stock of materials that might be needed for the operating room, intensive care department and hospitalized patients are essential under massive injury conditions. All these plans must be prepared in advance and conducted during any disaster.

**Surgical Triage in the Emergency Room**

The sorting of cases according to priority for surgical operation is a decision process. It is advised in the literature and in the ESTES 2009 conclusion declaration that there must be a surgeon in triage in the emergency room. The surgeon performing this task must be experienced and competent with respect to the disaster plan.

**Mobile Surgery Teams**

The most systematic teams in all the examples throughout the literature are those from the United States. There are numerous teams in the U.S. National Medical Disaster System (NMDS) with expertise in individual specialties. One of those is the Disaster Medical Assistance Team (DMAT). These teams are primarily focused on first intervention, and consist of physicians, nurses and emergency room technicians. They perform triage and initial intervention, and then subsequently transfer the cases to appropriate hospitals. In recent years, these teams have varied according to their increased expertise on specific equipment or certain ability. Therefore, under the name of National Medical Response Team, they have been structured for complicated events such as contaminated situations, which require more detailed equipment and medical experience. Another team, the International Medical Surgical Response Team (IMSuRT), is very similar to the military Forward Surgical Team (FST), and they are constituted by spe-
cially trained personnel and specific equipment. In the case of any necessity, the teams are prepared to help in intercontinental situations. If the local government requests help from the United States, these teams will be invited for duty. IMSuRT is responsible for performing all necessary surgical operations and medical sterilization in the field under adverse conditions. They bring all necessary facilities in order to achieve this task. If necessary, burn and pediatric surgeons may be called to participate in these teams[1].

Mobile Hospital

Although it was advised previously to perform medical intervention in the field only as a life-saving measure, today, many important surgical operations can be performed in mobile hospitals by means of the mobilization of surgical teams. There are many mobile hospitals belonging to various institutions and organizations. Numerous mobile hospitals have been acquired in the inventory of the Turkish Ministry of Health, Red Crescent, and Turkish Armed Forces.

It has been reported by representatives of the Ministry of Health that Turkey is one of the numerous countries in the world that is prepared against disasters with their civil action and armed forces, and there are 2700 medical personnel employed in the National Rescue Team, consisting mainly of volunteer sanitarians. Significantly well-trained, these personnel have managed to conduct successful operations in both domestic and international fields. Moreover, it was also reported in 2010 that 27 inflatable tent hospitals have been constituted by the Ministry of Health, each of which has a 50-bed capacity; they are located in 11 regions. All these hospitals can serve in conjunction with various departments such as emergency, operating room, intensive care, and laboratory[2].

HOSPITAL DISASTER PLANS

In this chapter, it is purposed to form an ideal behavior format of precautions for all surgical units for application during the entire process, from the field to intensive care aftermath of any kind of unexpected situation or terrorist attack. In such a case, a modern surgical center with its operating rooms and intensive care units would encounter a great number of injured, so all services must be planned to produce a high level of medical service, and this must be supported through exercises.

In order to utilize all possible health services efficiently and in coordination for all victims of disaster, surgical services and clinics, operating rooms and intensive care departments must become ready and this must be supported by the health system. There is no way to predict our progress against disasters. No consensus has been achieved in the domestic or international area when the literature is searched. It is known that there are some difficulties in organizing inter-disciplinary fields for all countries of the world. All current information is based on some hypothesis and interpretations. During the period in which this study was prepared, no study published domestically or internationally from our country was found. Therefore, it is difficult to define how to organize surgical service, operating rooms and intensive care units under the conditions observed in our country.

At present, the most common planning model used worldwide is called the “Hospital Incident Command System (HICS)”, the fourth edition of which was published in 2008.

According to the HICS, the mission of the responsible surgical department in any disaster plan is to supply all needs, based on the type of disaster, of newly applying or transported patients as well as of the existing hospitalized patients, to create the highest level of surgical accomplishments, and to maintain continuity. In achieving this mission, it is the responsibility of the surgery department to check the hospitalized patients and ascertain those who can be discharged or dismissed. The person responsible for this particular task is identified, if present; otherwise, an individual is assigned this responsibility. He reads urgently the tasks consigned by the hospital disaster plan. He inspects the organizational structure of the general disaster plan. He reviews the capacity of the preoperative area, operating room and postoperative care area. He draws a conclusion regarding the extent of surgical service he can provide according to these data. He evaluates the priority of patients and indicates the proper procedures in this regard. By communicating with other services and clinics, he decides regarding the feasibility of capacity enlargement. He informs the hospital manager or chief about the needs of the already hospitalized patients. Based on the determined sufficiency of the operating team, new operating teams can be recruited or personnel called from their homes as needed.

Once the situation is stabilized, areas in the clinic might be defined for urgent and relatively non-urgent cases. All information regarding patients to be transported should be given to the responsible personnel, who will remain in touch with the hospital’s security department. The logistic units of the hospital, inclu-
ding stock management, administrative and financial offices, and inventory units, should also be contacted and remain well-informed.

As the next step, it must be queried whether all personal information is updated and absolutely correct. All laboratory information must be similarly checked. All personnel employed in surgical services or clinics must be evaluated for their capacity regarding efficiency and activity. Help must be found for the personnel under excessive stress or whose performance is insufficient. Rest periods must be provided periodically. All records must be checked and approved regularly. All unauthorized personnel should be sent away.

Unfortunately, when the plans from foreign countries are reviewed, it is clear that the details related to disaster plans in Turkey are not quite realistic. There is a significant difference in the number of employed personnel and the structuring of hospitals and other health organizations when compared with the U.S., United Kingdom, Germany, and France. Hence, genuine hospital disaster plans that can be realistically reached in Turkey must be targeted.

PLACE of a SURGEON in ORGANIZATION and PLANNING

The American College of Surgeons declares clearly that surgeons must be in leadership positions in all local, regional and national disaster plans. It is mentioned that the surgeon is a significant organ of the required multidisciplinary team for the achievement of successful disaster plans.

The subcommittee “Disaster and Mass Casualties” of the Trauma Committee of the American College of Surgeons is cooperating with various institutions and entities in the context of disaster planning and management. However, none of the institutions in our country has a structure that focuses only on disaster and traumatic mass casualties.

Disaster management requires exercises distinct from the usual surgical applications. There is a paradigm shift here. Usually, a great number of resources are used for a single injured person, while in a disaster, the rescue of masses of injured people and great numbers of surgical operations are required using scarce resources. The success of this paradigm shift is directly related with planning, education, and exercise. There is no doubt that the efficiency of this shift will increase through exercises locally with the cooperation of all the institutions and in hospitals within their own structures.

The American College of Surgeons aims to educate surgeons in the following areas:

- Disaster planning and training,
- Integration of local, regional, and national resources in a disaster system,
- Hospital disaster plans,
- Communication and security,
- Public relations,
- Security of the persons and institutions of the health service,
- Diagnosis and decontamination aspects of chemical, biological, radiological, nuclear and explosive (CBRNe) procedures,
- Triage principles and applications,
- Providing the required materials for the medical evacuation, stabilization, and recovery of the injured,
- Recording, informing regarding post–disaster activities, critical evaluation, and reporting,
- Stress management for the critical venue,
- Studying, researching, and issuing the disaster management.

The important thing is to ensure that all surgeons have the required education and experience and become models for responding to the disaster and mass casualties together in the framework of the same principles and application bases.

A good organization is needed for responding to the disaster in the shortest time and matching the right person with the right work at the right time. Mentioning the requirements is essential in the original organization. The staff has a vital role in this organization.

RISK ANALYSIS and PRE-HOSPITAL HEALTH SERVICES

Risk analysis and threat inquiry should be made beforehand while recognizing that unusual situations will arise during the provision of services. Risk, in general terms, explains ambiguity, suspect, loss, or harm probability. There is a probability of any case damaging the system via weakening the system. However, risk analysis evaluates the probability of an unwanted case, and if this occurs, it deals with every aspect of the risk comprehensively. The preparations for the possible disaster potentials should be evaluated, and the required planning should be realized in the regions served. Risk and threat analysis should be brought up and the plans should be adopted according to these requirements.
Extraordinary Situation Planning

1. There is no perfect plan. Those institutions seeking the perfect plan will not be successful in organization. There will be absolute deficiencies and overestimations in the plan.

2. The paper plans in the folders will never be useful. These plans must be exercised and their practicability must be on trial. All personnel including night shifts and weekend workers exercise the plan.

3. The personnel with a responsibility in the plan must be “dedicated personnel”. Faith in the plan and active participation in the drills are sine qua non. Personnel should make contributions to the plan. Otherwise, enforcing a plan of action upon them will weaken the plan before it is even used.

4. A prepared plan must reconcile with the facts of the cases and the events.

5. A plan must be practical, rationalistic, realistic, and sincere.

6. A plan must include assistance from all related disciplines. External institutions must also participate.

7. The disaster or extraordinary situation plans that are prepared in hospitals and health institutions and the drills must not be solely the hospital administration's responsibility. This duty requires the entire staff to fulfill its medical, legal and conscientious responsibilities.

8. Communication between the staff and the various components of the system is required. The telecommunication technologies are significant in this regard. The communications should include the patient, the patient’s family, and the others in the hospital concurrently.

As a matter of fact, preparation for the unusual situations is a multilateral variable. It is not possible for all the institutions to be perfectly prepared. The flexibility of the plans is a key factor. The success depends on the quality and maintenance of the education.

DISASTER PLAN for SURGICAL SERVICES/CLINICS

It is a necessity that surgical clinics make an increasing capacity plan for the extraordinary situations in our country. Determining the surgical clinics that can serve as a triage hospital in mass casualties must be done by analyzing their personnel, facilities and functional capacities. Planned drills in surgical clinics must be applied bearing in mind mass casualties. The main part of the drill must contain the emergency surgical procedures which should be available within 24 hours. The scenarios must be prepared based on the local risk analyses. The experience gained after each drill must be evaluated and the innovations incorporated into the new plans.

WHAT is a TRIAGE HOSPITAL?

A triage hospital is the hospital nearest to the event scene. This hospital can even be a mobile hospital or an already functioning undamaged hospital that is near the event scene. It is usually the hospital in which vital interventions are expected, and is the hospital that determines evacuation of the wounded. It is a hospital at which only resuscitation procedures can be carried out; no intervention is performed in the other cases, but the triage hospital can determine their evacuation to other hospitals.

The following is a list of basic emergency surgery procedures suggested by the World Health Organization for clinics with limited opportunities[5]:

- Constitution of teams for trauma and disasters, training, preparation and management of these teams.
- First evaluation of patients/casualties, emergency surgery procedures and evacuation of critical patients.
- Basic life support, cardiopulmonary resuscitation, principles of approaching unconscious and shock patients.
- Oxygen therapy.
- Intravenous (IV) catheterization, IV therapy, fluid balance.
- Cross-matching techniques, blood types.
- Use of the basic surgical equipment and monitoring.
- Psychotherapy.
- Regional anesthesia, preventing the complications of anesthesia, checklist of preoperative procedures.
- Recognizing anemia in the early period, and awareness of the preoperative respiratory diseases.
- Awareness and prevention of the possible postoperative complications.
- Diagnosing the acute surgical diseases, such as abscess, in the early period and early intervention.
- Early diagnosis of hemorrhage.
- Sterilization of the equipment.
- Training in lessons such as handwashing, glove-wearing, and proper disinfection and cleaning of the surgical area.
• Practicing splint/cast skills, traction, and immobilization of fractures and dislocations.
• Procedures for open fractures and soft tissue wounds.
• Burns, freezing and insect bites.
• Guidelines for surgical procedures.
• Early-period complications of pregnancy.
• Approaching preeclampsia and hemorrhage in pregnancy.
• Perineotomy, repairing cervical tears, repairing postpartum vagina.
• Record-keeping.

**DISASTER TRAINING of SURGICAL TEAM**

A syllabus as part of a formal education is rare. However, there are many national and international postgraduate training programs (Table 1).

**SURGICAL SERVICES in INTERNATIONAL DISASTERS**

There are changes daily in the medical support in disasters. Today, services of the civilian surgery teams in wars, terror attacks, earthquakes, and meteorological events in the international field are commonplace[6-8]. The surgical teams in the Red Crescent in particular have substantial duties in international missions, towards which they contribute largely. Actual international disasters follow no rules. It is not possible to predict the next disaster time, place or amplitude. Foreigners refer to this unusual aspect as “Mass Casualty Incident Response”. This emergency action plan has four steps:

1. Search and rescue,
2. Triage and first intervention,
3. Certain surgical intervention,
4. Evacuation.

Surgeons must have missions and tasks in each part of this action plan based on their triage and critical patient therapy experiences and fast adjudication abilities[7-10].

**CONCLUSION and SUGGESTIONS**

When we evaluate surgical clinics, a surgical clinic behavior model should be managed with a commission of components of the clinic, emergency physicians, and the hospital laboratory, pharmacy, radiology department, biochemistry department, and managers. There is no definitive correct line of action in this state. Every clinic must find answers to the questions/problems in their action plan according to their conditions prior to a disaster. They must enforce this plan in collaboration with their personnel. There is a need to incorporate the experience gained thus far into the plans. All information in all forms of workshops must be evaluated and synthesized according to existing conditions. The spectrum of surgical services offered in international mobile hospitals in disasters is growing daily. The nature of the event, geography, organization, culture, and ethnic and political disparities will play a role in any disaster situation. A surgeon acting in good faith is not enough for a good disaster response. They must be in command of modern disaster management. Despite the obvious benefits of a surgeon being well educated, experienced, and trained, he must also be well-informed about subjects such as event venue management, triage, decontamination, and international response in disasters.

**REFERENCES**


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**Table 1. Training programs about disaster medicine for surgeons**

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<th>A. International programmes:</th>
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<td>- HICS: Hospital Incident Command System</td>
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<td>- Ambulatory &amp; Definitive Surgery</td>
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<td>- ATLS: Advanced Trauma Life Support</td>
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<td>- TRCS: Trauma Refresher Course for Surgeons</td>
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<td>- BDLS: Basic Disaster Life Support</td>
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<td>- ADLS: Advanced Disaster Life Support</td>
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<td>- DSC: Definitive Surgical Course</td>
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<td>- Critical Care Course for Disasters</td>
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<td>- CCAT: Critical Care Air Transport Course</td>
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<td>- Damage Control Resuscitation</td>
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<td>- Damage Control Surgery</td>
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<td>- SICU: Surgical Intensive Care Unit Management</td>
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<td>- TRC: Trauma and Resuscitation Course</td>
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<td>- DSC: Definitive Surgical Course</td>
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