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Review Article

Understand the Complexities and Development in Order to Improve Emergency Medical Status

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Abstract

The properness of function of different parts of Emergency Medical Services will be resulted in a quick and timely dispatch of ambulances to patients and preventing deaths as well as lack of disability in damage. The success of this set depends on various factors such as the ability of those responsible, trained personnel, equipment, coordination and communications systems. Today, in the city's health care system, generally the first treatment for critical patients is carried by pre-hospital emergency and the more accurate and faster care for patients by EMS, the less deaths and disabilities caused by diseases and public confidence in the system increases. Emergency centers as a part of the health care provider in the community play an important role in public satisfaction and referrals to health care because emergency on the one hand is considered the first institution to receive treatment for many patients and on the other hand because a lot of clients to implement treatment programs these centers receive special attention by health managers. Since the trauma and damages resulting from accidents are the most common cause of death among people ages fourth decade as well as known as the third leading cause of death in all ages, emergency medical services on trauma has given special emphasis. So in terms of trauma, identification and grading of patients at risk of dying, transfer of injured patients in the best time and transferring them to best-equipped emergency centers and finally appropriate treatment program is of particular importance. Given the major role of emergency medical services in ensuring the health of people during accidents and the need for improved basic services prompted us to study the complexities and factors involved in improving the look of a medical emergency.

Keywords: Medical Services; Hospital Emergency Rooms; Trauma

Introduction

Care provided in hospital emergency departments (EDs) is considered as major component to improve the quality of health care in many countries. The hospital emergency is a vital regional operation for patients with severe disease [1]. Emergency plays key role in half of hospital admissions and emergency room also constitutes an important part of the security network, because it is legally necessary all patients regardless of their ability to pay are evaluated [2]. In 2010, about 130 million people in America were referred to the emergency department and the number of visitors each year always surpass population growth rate [3]. In all countries health care systems provide health care to people. These systems are large and complex and a network of hospitals, clinics, diagnostic facilities, physicians, nurses, pharmacists, patients and information systems are included. These systems because of different reasons sometimes are contradictory in beneficiaries and goals. As providers, payers and the public about the quality of emergency care have different opinions and views. For example, most people are just paying, classify emergency as a costly section and extra work. However, in the view point of emergency medicine specialists, this section (department) is a very safe and effective and the increasing use public can be an indication that more people consider the emergency department as a section (department) with high quality treatment [3]. Meanwhile the government is also seeking a balance between performance and costs, while pays attention to consent of patients and the public [4]. Hospital emergency department as one of the first points of contact for patients with health care system is facing a variety of problems. Factors such as lack of

hospital beds for admitted patients, lack of patients access to ambulatory care led to increased congestion in this section which ultimately lead to prolong patient waiting time to get the service and poor quality of service [5]. Despite the fact that most emergency departments in hospitals are under pressure from the rising demand, often accompanied with budget and manpower constraints. To enhance the quality of emergency services, the National Strategy for Quality Improvement in Health Care was published in 2011, so that the regions based on quality improvement were classified according to three objectives: better care, more healthy people and community and more affordable caring [3].

In this study, we examined the challenges facing medical emergencies, relevant policy, emergency care and services for biomarkers used in the diagnosis of traumatic situation. Also in this study, some general principles in the development of systems for trauma and critical components in the system were mentioned.

Method

The study was a systematic review. At first, we needed to gather studies related to our upcoming study. Therefore, a set of keywords related to research, such as medical services, hospital emergency rooms, trauma was obtained. Then these keywords were searched in domestic (internal) and foreign (external) databases. Foreign bases used included PubMed, Medline, Embase, Sciensedirect and Springer. Of domestic (internal) databases can be pointed out to Iranmedex, Medlib, Mag Iran. Finally the collected essays in the period from 1990 to 2015 were studied and compared, and ultimately the final results in classified parts were shown as following.

Development of clinical policies

Recently, in order to improve care in emergency departments, considering the services cost, speed of service, congestion, and safety patients admitted to a large degree and increasing demand for emergency care, the relevant policy makers and managers are seeking new solutions to provide effective treatment services for patients [6,7]. More management research in the field of health and care aims to reduce patients waiting (confusion) time and increase throughput in hospitals. Other studies also have been carried out to patient's confusion time as well as reduce the daily processes within the system [8]. Ministry of Health and Medical Education also has taken the emergency medical as one of its priority and underlying programs. This sector (department) due to its high sensitivity must be organized structurally in the right way and the process of service provision must be attended and with applying efficient and effective management can have a good performance in providing quality services to patients in need. Statistics released by the various organizations representing increasing deaths from accidents compared to other causes, such as infectious agents [9]. In this context, global healthcare systems are trying by establishing emergency centers deal with the problems caused by medical emergency. The main focus is on emergency management and logistics resources [10]. Necessary resources include emergency management program, trained manpower, equipment, communications and decisive management [9]. According to national health reform program in 1394 [in Persian date], to develop the hospital and pre-hospital emergency of ministry of health in six areas (management, human resources, physical resources, financial resources, processes and information systems) are considered the following objectives:

- The program to improve knowledge, skills and competen cies, the Ministry of Health hospital directors
- The implement of quality improvement program for Minis try of Health hospitals hoteling
- Supply and development of hospitals equipment of the Min istry of Health
- Development of special care units
- Development of cancer diagnosis and treatment
- Promotion program of pre-hospital emergency personnel
- Development and improvement of medical emergency/ promotion processes of hospital emergency services
- Construction of level 3bio-safety level laboratories

Since the trauma imposes direct and indirect economic and social costs on society, this has forced the policy-makers and practitioners of health systems to adopt concrete measures in this area. Today these systems' policy has been formed based on preventive measures and needed care for these patients [11,12]. The reduction of mortality rates, ultimate improvement of patients with severe injury and reduce in socio-economic burden of benefits have been caused by these policies in different countries. Further improvements in this area require information gathering, planning and the codification of new strategies [3,13].

The growth of prevention of disease and injury practices (strategies)

In general, prevention is better than cure and is always cheaper. Although many factors affecting safety and safety improvement programs in our country [Iran] are affected by global trends, but it should be noted factors influencing health, safety and well-being aren't similar (the same) and this makes people and society to maintain control over the environment need to meet certain demands. The localization of these interventions will increase the appropriateness and effect of them with the local culture and community coordinate and given that each community has its own priorities in the field of accidents and injuries caused by them, it is necessary to prioritize damages caused by accidents and its prevention and control strategies according to local amenities some measures to be taken [14].

One of the reported cases of emergency is injuries in elderly people caused by their collapse. To prevent this situation several proposals have been suggested including stretching and balance exercises, nutritional supplements such as calcium and vitamin D, reducing the use of psychotropic drugs, cataract surgery, and evaluation of professional risks at home. At the same time, there are some plans to assess and reduce many risk factors predisposing and risk situation factors prevent the fall (collapse), but they may be expensive to implement. The prevention of damage from falling(collapse), stretching and balance exercises have been more adaptable and accompanied by best results then followed by dietary supplements include vitamin D and calcium had good results. In the case of fractures of the hip, the use of hip protectors can be a useful alternative. Food additives and the use of hip protectors are likely to be institutionalized for people at risk [15].

Also in the last fifty years, studies have shown the most important factors that are causing disability and premature death, have been changed from infectious and communicable diseases to chronic and degenerative diseases [16]. Among the 10 main causes of death in America, 4 causes directly associated with lifestyles that include: coronary heart disease (CHD), cerebrovascular accident (CVA), type II diabetes and certain types of cancer. Two other causes include accidents and suicides are associated with increased consumption of alcohol. In Iran also, these diseases are the major causes of death and disability. In these years due to the economic well-being of industrialized societies, indulgence in fats, meat, sugar, salt and ultimately tobacco use and physical activity, the incidence of non-communicable diseases has increased. Therefore, to reduce the prevalence of these diseases and the prevention of chronic diseases, the best way is modification of lifestyle that for this purpose, the risk factors such as unhealthy nutrition, lack of physical activity, obesity, smoking, tobacco, stress, blood pressure, and abnormal glucose tolerance should be amended [16-18].

Emergency department has a wide range of damaged and injured patients and their relatives may spend their time waiting for their medical care. So emergency department is the primary location for training patients at risk of damage and has effective preventive strategies [14].

Finally, in order to strengthen the management of accidents, medical emergencies and accident prevention the following measures should be taken:

- Organizing emergency network, increasing urban and roads emergency centers
- Increase the number of ambulance
- Increase the number of cities covered by air rescue
- Training classes for the general public such as first aid train ing
- Setting up guidance room for critical operations as the core guidance and coordination of activities related to health in the face of disaster
- Establishment of triage system in the emergency sections
- Improvement and establishment of community-based pat tern programs to improve the safety and accident preven tion in the primary care system
- Strengthen the surveillance system events
- The development and promotion of network of epidemio logical research in the field of priorities of accidents and their causes
- To increase the awareness and participation of political and social authorities
- To increase the awareness and skills of health personnel in the prevention and control of events

The evaluation (assessment) of emergency department performance

To ensure the effectiveness of the emergency services the emergency department activity should be measured (assessed). Today,

different methods and tools are used to measure (assess) the performance in organizations and if done correctly and consistently, it will be led to enhance and executive accountability and public confidence in the performance and efficiency and effectiveness of public and private sector and organizations. One of the distinctive and helpful features of performance evaluation is its quantitative aspect and converts the outcomes and results of assessments to calculable amounts. And in fact is a process to measure, evaluate or judge the performance during a particular period and organizationally is usually synonymous with efficiency activities. The efficiency means the achievement of the objectives and programs with feature of efficient activities. The evaluation of the performance in the resources aspect can be expressed in the form of performance indicators [19]. Performance evaluation process as any process involves a series of activities and purposeful initiatives with logical sequence and order and any model or pattern chosen, includes the same process that following the identification of goals is the second stage to develop indicators and this stage of important stages because organizations with determining their criteria and indicators, examine their achievement to objectives and mission and in the most organizations, the general indicators are defined for the organization and a series of factors to be considered for measurement (evaluation) of these indicators [19]. To measure (assess) the performance of the hospital, including the emergency department, after review the missions, goals and strategies of hospital emergency unit, the setting of performance indicators should be considered. Hospital indicators are the most important indicators of hospital performance in a variety of areas [20]. So full attention to these markers (indicators) is essential because looking at the state of hospital indicators, hospital performance is clearly clarified and with further reflection on these indicators, the strengths and weaknesses of them become apparent as well as show the indicators related to emergency department performance in a variety of fields. Since the number of health indicators is high and few of them are correctly measured, so it is necessary in the beginning the priority indicators are identified and assessed [21]. One of priority indicators of emergency is the percentage of unsuccessful CPR. Emergency room is the first treatment level with critically ill patients brought to the hospital. Therefore operation cardiovascular resuscitation or CPR takes place more than other parts of the hospital in this section. Based on previous studies, cardiopulmonary resuscitation means to save patients who have cardiac, respiratory or cardio-respiratory arrest and the quality of CPR, marks life and death. Lowering (reducing) this indicator shows good performance of emergency and ability to team work and awareness of emergency personnel in the management of acute conditions of emergency patients which is among the most important reasons for existence of emergency department [22].

Development and evolution of emergency medical services

The pre-hospital emergency is a critical component of emergency medical services system and has been undergone major changes over recent decades and has shown improvement in treatment and survival rates of patients. This type of emergency in fact, is a comprehensive system that answer the treatment needs of injured people or patients with acute diseases and emergencies, outside of health care institutions until their transfer to a medical center gives [23,24]. According to the article 1973 of America system of emergency medical services, emergency medical services and emergency medical service center for Highway Traffic Safety Administration America, this system not only includes emergency services; but also includes a range of preventive services, emergency medical and health care in specialized centers such as emergency trauma centers [25,26]. In the UK emergency services includes ambulance for pre-hospital services and accidents and emergency to emergency hospital [27]. The activities of this system have been specified which include: find best responds to appeals for emergency calls, dispatch to the location, care provided by trained individuals at the scene, continuing care in the transport vehicle such as ambulance and helicopter and transfer individual (person) to medical center determined by the emergency command center [27]. The system also is responsible of moving patients between health care institutions. Based on these experiences and operating range, pre-hospital emergency with timely and rapid screening and find best responds to emergencies, guarantee providing care with pre-hospital quality [28]. Pre-hospital emergency as a gateway of emergencies acts in the emergency care area and improve treatment outcomes for patients. Studies have shown a direct relationship between early (rapid) pre-hospital emergency service provided by pre-hospital and positive health outcomes and mortality reduction [29-31]. One of the influencing factors in this context is the necessary information and access to them at the moment of service delivery [32]. The pre-hospital emergency is considered always a problem in the health care system in most of the worldwide countries. Emergency constitutes (forms) the heart of treatment system and modifying it will improve other therapeutic sectors. As well as the fact that this

section is the transferee of critically ill patients from other medical centers and is responsible the vital task of stabilizing patients for entry to hospitalization, operating rooms and intensive wards, and in addition to this, this ward of the most important components of the hospital because patients referring this ward in terms of physical condition are in critical condition and addressing them as soon as possible and with the highest quality of tasks medical staff and nurses working in the sector duties. So, effective service delivery at the right time is in the shadow of effective and efficient performance of this war [33]. Of the things that can be led to better dealing with patients, work space, equipment and personnel in emergency centers can be noted.

Undoubtedly, medical and clinical knowledge indebts its extensive improvements to the treatment of emergency patients to appropriate space and equipment and speed and skill of human resources these wards (sectors). The most fundamental part of health care services are human resources [34]. The people constitute emergency team should have a strong foundation of theory and practice in the intensive care ward since in many cases, the reaction of sick or injured person is in relation to the behavior of personnel in interacting with patients and his/her family [35]. The emergency in terms of sensitivity should structurally be organized properly and the process of service provision in this ward should be attended carefully to applying efficient management practices can have a good performance in providing quality services to patients in need. Improving emergency room services and speed in providing effective services, all in the shadow of proper management structures, designing efficient process and effective and efficient performance will be possible [33]. Of effective factors in providing better health care to patients can be human resources, space, facilities, equipment and activities available at the center's regulations and guidelines. Regarding the sensitivity of the emergency department, if any of the above-mentioned factors have shortcomings in these units, working effectively and timely care to patients will be failed and may be irreparable losses to be followed [33]. In a study, Rahimi and colleagues in 1378 [in Persian date] assessed the structure, process and performance of emergency departments in educational hospitals of Urmia and Tabriz. Results showed that 80% of emergency wards of studied hospitals in terms of managing were in good condition and 20% in comparison with existing standards, were in average condition. Also in this study, in terms of human resources' indices, 90% were in the average state and 10% of the surveyed hospitals had a favorable condition. Meanwhile, in terms of facilities and equipment, 50% of emergency sectors (wards) were in weak condition and the rest 50% were in the average state [36].

Emergency trauma care

Trauma in modern and industrial societies today is one of the important topics and problems in many countries has been considered. According to the World Health Organization estimates damage caused by trauma is the main cause of death worldwide between the ages of 15 and 45 years in both men and women and by 2020 trauma will be third leading cause of disability and death in all age groups.

Death caused by trauma causes important social and economic damage that to some extent is preventable [37]. So, optimizing trauma care, not just in hospitals, but in that moment in which trauma patient establish the first contact with emergency department is essential. Personal care systems and civilians often have been developed for trauma patients or patients with myocardial infarction while pre-hospital ward is responsible for all emergency patients, so according to this by staff and appropriate equipment can be equipped. In previous years it has been tried treatment for trauma patients to be standard, but 50% of mortality in traumatic patients caused by spinal cord injury, aortic rupture and massive bleeding into the abdominal cavity occurred in the accident scene and to a large extent appropriate treatment is not possible. So, preventing the trauma has been of interest to scholars and these patients are at satge1 [38].

In the second stage, trauma centers and trauma systems have perhaps the greatest interference. 30% of trauma deaths are in this category and the main leading cause of death is severe brain damage and uncontrollable bleeding. It has been shown that using the system of trauma and trauma centers mortality rate reached from 90% to 30% [38]. In the third stage which lasts one day to one month after the trauma, includes about 10-20% of traumatic deaths that leading cause of death in this category are increased intracranial pressure and pulmonary complications and uncontrollability of them. In trauma patients in intensive care, today sepsis with an origin other than lung, renal failure and multiple organ failure leading less is the main cause of death [38,39].

So the main thing in the care of trauma patients is appropriate timing and transfer of patients to appropriate centers. This is actually the main factor of triage creation. The term of triage has been from a military idea came into existence in France that means simply to treat patients based on their classification and treatment facilities. This study and classification may be performed at the accident scene or in hospitals. In the triage of trauma, most close emergency, is not the most appropriate place to transfer patients to the center [40]. Several methods of ranking before hospital have been used to help make decisions in trauma triage. It is expected using this method of ranking, 5-10% of patients who require more care, are easier identified [41].

To reduce the death rate from trauma and to minimize complications and disabilities associated with it, it is necessary an appropriate organization be done to care and treatment of these injuries. Of course, these organizations are started from pre-hospital care and will be ended rehabilitation centers. The pre-hospital care consists of the first component of treatment care system of trauma. At this stage the initial diagnosis of lesion, triage and initial resuscitation of patient are performed. Successful operation of this component of system has a very essential role in the prognosis of trauma patients.

Development of biomarkers in trauma

So far the obtained information on the biomarkers suggests that these released molecules in brain injuries have the potential applications of diagnosis, prediction and secondary treatments in the surgery related trauma and cerebral ischemia. In this context, two approaches have been used, including the assessment of structural damage markers and quantification of cellular, biochemical or molecular cascades intermediaries in the secondary damages. The biochemical markers of neuronal damages, glial and axonal such as S100B, neuron special enolase specific neurons, glial fibrillary acidic protein (GFAP) and MBP easily are detectable in biological samples such as serum or cerebrospinal fluid (CSF) and in patients with ischemic and traumatic brain injuries have been studied. In addition, a number of studies have shown that new tools for simultaneous assessing of multiple biomarkers such as molecular details in the cascade of cell death, inflammation and oxidative stress can be provided [42].

The subject of biomarkers in brain injuries and damages is a very broad topic that to a comprehensive address has been challenged in the current review study. In this section we will try to focus on the key studies on clinical grounds. We believe that focusing on the markers and proteins related to genomic markers is very important. Regarding the fact that attacks of such injuries and ischemic damages routinely associated with regional or generally energy disabilities as well as disruption in protein synthesis, gene array technique and other methods can't provide appropriate information about the protein expression [43]. Post-translational modification of proteins is a vital aspect of injury respond and will not be evaluated by genomic approaches. This study investigated the long-term benefits related to the use of biomarkers in the diagnosis of injuries in emergency department patients after the accident. The researchers always have used a number of clinical samples including cerebrospinal fluid (CSF), serum and interstitial fluid in the brain micro-dialysis. Often, clinical studies by measured mechanism or markers in CSF by molecular working in the human brain contusion removed from patients with severe injuries and life-threatening cerebral edema have been strengthened [44]. CSF in patients undergoing traumatic brain injury (TBI) in very small amounts for managing the intracranial pressure is much more accessible. Therefore, clinical content about TBI with the study of CSF biomarkers significantly compared to heart attacks and strokes are richer. Considering the fact that micro-dialysis is considered still as a research tool, while in patients with central nervous system damages, both serum and CSF are available. For this purpose, in this study the studies of biomarkers in CSF and serum will be focused. A biomarker is a indicator for biological or a particular disease that can be measured using taken samples of both damaged (injured) tissue or body fluid environment. These markers can be led to enzymatic activity, changes in protein expression or post-translational modification, gene expression, protein or fat metabolites or combinations of these mutations. As a result, various types of strategies to discover markers such as profile transcription, proteomic and metabolic methods have been used. To date, most research on biomarkers related to TBI has been focused on protein profiles. However, in human genome around 23,000 genes has been estimated. For example, the shared human proteome organization only with 889 abundant serum protein (using two-dimensional gel spectrometry copper) with 95% confidence level has been detected. This shows that 10% of serum proteins core (it is estimated

that at least 10,000 protein) has been sampled. In order to increase the likelihood of detecting small amounts of protein biomarkers, some methods including fractures, reduced safety abundant proteins, subsets proteomic applications (such as inflammatory proteome, glycol-proteins, phospho-proteome), arrays and separation techniques such as combinatorial ligands library have been used. Advantages and disadvantages of these techniques have studied in other parts [45,46]. In this part we refer to some of the most important biomarkers involved in TBI.

S100B is one of the most important biomarkers for TBI that the most studies have been done on it. It has also been demonstrated that changes in gene expression of this gene are associated with a large amount of damage, the life power and neurological outcomes [47]. S100B is a protein binding to calcium with low molecular weight (about 10.5 kDa) that mainly secreted and expressed from astrocytes cells and include about 1-1.5 µg/mg of solution protein. S100B would be detected in low levels of CSF of human serum and the usual levels of this protein have been linked strongly with intracranial injuries [47]. Following brain damages, S100B releases into CSF liquid and serum. Its half-life in the serum is about 60 minutes and following injury easily is recognizable. Increased levels of this protein have been suggested instead biomarkers with weak outcome. For example, Vos and colleagues demonstrated that in patients with severe TBI, S100B serum concentration of more than 1.13 ng/ml that is associated with the increased risk of death (100 sensitivity; 43% specificity) and incidence (88% sensitivity; 43% specificity) [48]. The glial fibrillary acidic protein (GFAP) is filament protein in intermediate monomer which is expressed in astrocytes. The brain-specific protein is released following TBI. Following TBI, increased levels of serum GFAP have been seen that predict the Intracranial pressure (ICP), reduction of mean arterial pressure, low cerebral perfusion pressure, low Glasgow Outcome Scale (GOS) and increased mortality. For example, high concentrations of 1.5 ng/ml predict the mortality rate with sensitivity of 85% and specificity of 52% [48-50]. The neuron-specific enolase (NSE) is one of five glycolytic enzymes of enolases. At first, it was determined that NSE is expressed in neurons but then was observed in neuro-endocrine cells, oligodendrocytes, thrombocytes and erythrocytes. The half-life of this protein in serum is approximately 24 hours and can be detected in the first 6 hours of injury. Its serum levels typically is less than 12.5 ng/Ml that increases following TBI which in this case is associated with the severity of injuries [51-53]. If its serum levels of more than 21.7 ng/Ml, it has been shown that NSE can then be used as a sensitive scale for mortality (sensitivity 85%) and poor outcomes (80% sensitivity) to be considered. Serum levels above NSE do not necessarily show the existence of brain injuries because it has been reported this proteins can be used as markers in small cell lung cancer, bladder neuroendocrine tumors, ischemic stroke and neuroblastoma [53,54].

MBP is one of the main protein components of myelin and following damaged white matter is released into the CSF and blood. Typical serum level of MBP is very low and usually less than 0.3 ng/Ml. In the study of brain-damaged children, it has been known that high serum level of MBP is associated with bad outcomes of injury. Interestingly, in a similar study has been demonstrated that MBP level in encephalopathy children with hypoxic-ischemic isn't increased [55].

Conclusion

In recent decades, significant advances have been made in the emergency department and its medical services. Since the emergency medical centers and emergency medical centers of hospitals considering their sensitive role in providing immediate medical care to patients, needed to therapeutic interventions at all times the day and all days of the year are one of the necessary and inevitable pillars of public hospitals. None of the aspects of emergency care is as much as the ability of emergency in the assessment, management and disposition of a patient, in a reasonable and acceptable time framework important. This leads to the measurement of patients' waiting time in the emergency department, as one of the most important markers to assess the emergency ward status. However, according to the results of recent decades, it has recognized that in the most countries pre-hospital care as the first group encountered with critically ill patients transferred to hospital, equal to international standards [56]. While, according to results of these studies, in some countries the emergency department has been faced with some difficulties. Lack of human resources and physical resources, the necessity of teaching staff, lack of awareness of the emergency services and the high level of expectations of the problems mentioned. One of the most important as a catalyst for overcoming the problems caused by personnel skills and need for retraining employees has been mentioned that this in addition to affects the ability of new personnel, is also an important factor for employees with experience that can increase both their moti-

vation and performance. However, these educations (trainings) should be oriented and based on personnel requirements and in addition to their functional skills, consider interactive manner with patients. On the other hand the main obstacles in providing high quality services in hospital related to overcrowding patients in emergency and thus increase the waiting time for recipients of health care in hospital.

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