Review Article

Emergency room to the intensive care unit in Hajj

The chain of life

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ABSTRACT

Hajj, which brings more than 2 million Muslims together, represents a special challenge for healthcare services especially the intensive care unit. The main goal for healthcare providers is to provide the best service to the largest number of patients with the available resources. The purpose of this article is to outline the admission criteria from the emergency room to the intensive care and to review some of the unique features of providing these services during the Hajj season.

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Hajj, the pilgrimage to Makkah and holy places is one of the 5 pillars of Islam that every financially and physically able Muslim must perform once in his lifetime. It brings together the Muslims of all races and tongues for one of life's most moving spiritual experiences. Hajj, which brings more than 2 million Muslims together, represents a special challenge for healthcare services. The main goal for healthcare providers is to provide the best service to the largest number of patients with the available resources. This is especially true for the use of intensive care resources. The purpose of this article is to review the admission criteria from the emergency room (ER) to the intensive care unit (ICU) during Hajj period.

Intensive care has been defined as a "service for patients with recoverable conditions who can benefit from more detailed observation and invasive treatment that cannot be safely provided in general wards or high dependency areas."[1] Several factors make the admission from the ER to the ICU during Hajj unique and challenging. First, the number of patients that can present at any given time can be very large. As shown in **Table 1**, the number of patients seen in Emergency Departments of the Mashaer Hospitals and Makkah hospitals was 47416 and in Madinah 23675 patients during 1422H Hajj.[2] Second, many of the pilgrims are elderly and have chronic illnesses.[3] The stress of Hajj can put them at higher risk of de-compensation as a result of dehydration, heat-related-injury or irregular use of their own medications. Third, because the pilgrims come from a large number of countries, the ER physician and the intensivist should have the background of dealing with some unusual diseases that he may not see otherwise. As an example, one study from the Ajyad Hospital in Makkah during the Hajj season of

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Table 1 - Hajj health services statistics (year 1422).[2]

Variable	Makkah and sacred place	Madinah
Emergency room visits	47416	23675
Number of hospitalized patients	6432	5368
In-hospital deaths	525	90
Deaths of inpatients (%)	4%	1%

2000, found 130 suspected cases of malaria, of which 19% were confirmed by blood smear.[4] Another study found tuberculosis to be the most common single etiology of pneumonia during the Hajj season. In this study conducted in 2 hospitals during the 1994 Hajj, microbiologic diagnosis was established in 46/64 patients (72%), with *Mycobacterium tuberculosis* being the most common causative organism (20%), followed by gram-negative bacilli (18.8%).[5] Fourth, the ERs and ICUs should be prepared to handle mass casualty in case of major accidents. Fifth, the field hospitals can provide service to certain limits, after which consideration should be made for transfer to higher facilities. Sixth, certain illnesses have special prevalence during Hajj. Heatstroke is a specific concern when Hajj occurs during the summer as the temperature may exceed 50^{o}C.[6] Meningococcal meningitis is another important health problem during Hajj.[7-9] Seventh, transferring patients can be a major challenge considering the logistic factors, the crowdness of the roads and the availability of the receiving hospitals. Finally, patient's preference and attitude towards treatment and staying in the hospital during the holy season is often different from that of other times. For many pilgrims, the hospital is the least likely place they wanted to be during the Hajj period. Furthermore, many pilgrims come with the idea that they would like their death to happen during this season and in these areas.

Despite all the above, however, the general guidelines applied for ER and ICU care still apply during the Hajj.[1,10] In this article, we will outline general guidelines to be used as a framework for admission and discharge criteria.

Respiratory indications. The need for respiratory support or monitoring is one of the most common reasons for ICU admission during Hajj.[11] In a prospective study performed in 2 hospitals in Arafat on the 9th of Dhul Hijjah 1422H, corresponding to 21st of February 2002, and in 2 hospitals in Mina on the 10th of Dhul Hijjah 1422, corresponding to 22nd of February 2002, the respiratory system was the most commonly affected (57%). Pneumonia was encountered in 39.4% and exacerbation of asthma and chronic obstructive pulmonary diseases in 14.4%.[11] Influenza and its complication are common during Hajj.[12,13] The following conditions represent the main indications for ICU admission: 1. acute respiratory failure requiring ventilatory support, 2. pulmonary embolism with respiratory or hemodynamic compromise, 3. deteriorating respiratory status with potential need for mechanical ventilation, 4. the need for chest physiotherapy to clear secretion more frequently than twice hourly, 5. the need for non-invasive ventilation, and 6. patients intubated for airway protection not for ventilatory support. In patients presenting with pneumonia or unexplained pulmonary infiltrate, tuberculosis should always be considered due to the high prevalence.[5,14]

Table 2 - Pilgrims deaths by cause and place during the period 1-15 Dhul Hijjah in Hajj season (year 1422).[2]

Cause of death	Total	(%)
Diarrhea and gastroenteritis	**2**	(0.5)
Infectious and parasitic diseases	**4**	(1)
Septicemia	**6**	(1.5)
Pulmonary tuberculosis	**7**	(1.7)
Diabetes mellitus	**5**	(1.2)
Heart, blood and vascular diseases	**175**	(43.1)
Hypertension	**11**	(2.7)
Cerebrovascular diseases	**14**	(3.4)
Pneumonia, asthma, and bronchitis	**38**	(9.4)
Other respiratory diseases	**11**	(2.7)
Digestive system diseases	**1**	(0.2)
Renal failure	**4**	(1)
Respiratory and heart system failure	**58**	(14.3)
Senility	**7**	(1.7)
Fractures, injuries, falls, poisoning, and burns	**2**	(0.5)
Traffic accidents	**24**	(5.9)
Sun stroke	**-**	(0.0)
Ill-defined causes	**6**	(1.5)
Other causes	**31**	(7.6)
Total	**406**	**(100)**

Cardiovascular support. Cardiovascular disease is the most common cause of death during Hajj. Based on the Ministry of Health statistics, cardiovascular disease is responsible for 43% of deaths[2] (**Table 2**). Monitoring and support of the cardiovascular system represent the indication for ICU admission in a majority of patients: 1. Shock - is a syndrome characterized with failure of tissue perfusion. It

is a failure of blood flow and not blood pressure. While hypotension is one of the manifestations of shock, normal blood pressure does not exclude shock. Admission to the ICU and starting treatment at an early stage of shock is likely to provide better outcomes.[15] The main types of shock are hypovolemic, cardiogenic, septic, and obstructive. Physicians must maintain a high level of suspicion. The patient needs to be admitted to the ICU for fluid management, to give vasoactive drugs and to monitor central venous pressure. 2. Acute myocardial infarction and unstable angina - myocardial infarction is a common presentation during the Hajj season in elderly patients precipitated by factors such as excessive exertion and hypovolemia. These patients require admission to the ICU to start the proper treatment, and to monitor for arrhythmias and other complications. 3. Complex arrhythmia - such as those associated with hemodynamic instability, myocardial ischemia and decreased level of consciousness require ICU admission. 4. Acute congestive heart failure. Patients with acute heart failure with respiratory failure and requiring hemodynamic support should be managed in the ICU. 5. Hypertensive emergencies. 6. Post cardiac arrest. 7. Complete heart block. 8. Dissecting aortic aneurysm, and 9. Pericardial tamponade.

Neurological indications. Patients with acute neurologic illnesses may need to be admitted to the ICU for one of several reasons. First, specific treatment of the neurologic disease may need ICU monitoring or intervention. Second, many of these patients require intubation for airway protection. Third, the respiratory drive can be affected in certain neurologic diseases leading to hypoventilation requiring mechanical ventilation. The following list represents some of the most common admission diagnosis during the Hajj season: 1. Acute stroke with altered mental status, 2. Intracranial hemorrhage, 3. Subarachnoid hemorrhage, 4. Meningitis with altered mental status or respiratory compromise, meningococcal meningitis should be suspected in any patient with meningitis during the Hajj season, 5. Metabolic coma from a variety of reasons such as electrolyte disturbances, uremia, hepatic encephalopathy and so forth, 6. Status epilepticus and 7. Traumatic brain injury.

In hospitals with no CT scan facility or neurosurgical support, arrangements need to be made as early as possible to transfer patients who require such services to higher facilities.

Endocrine disorders. 1. Complications of diabetes are the most common endocrine indications for ICU admission.[3,16] Diabetic ketoacidosis with hemodynamic instability, altered mental status, respiratory insufficiency or severe acidosis. 2. Thyroid emergencies such as thyroid storm or myxedema coma. 3. Hyperosmolar state with altered mental status and hemodynamic instability. 4. Severe hypocalcemia or hypercalcemia with altered mental status. 5. Hypernatremia or hyponatremia with neurologic manifestations, and 6. Severe hyperkalemia with cardiac manifestations or muscular weakness

Surgical indications. These include postoperative patients requiring hemodynamic monitoring, fluid resuscitation, mechanical ventilation support or extensive nursing care. In a study on patients hospitalized for surgical management, acute appendicitis, and diabetic foot were the most common cause of admissions.[17]

Trauma admissions. 1. Patients with severe head injury defined as Glasgow coma score (GCS) ≤8 or require mechanical ventilation. 2. Trauma patients with hemodynamic instability or requiring mechanical ventilation. In a prospective study on 713 trauma patients presented to the ER during Hajj period, 248 patients were admitted to surgical departments and the ICU.[18] Orthopedic and neurosurgical cases are the most common surgical cases during the Hajj period.[18]

Heat-related disorders. These disorders are common when the Hajj season comes during summer.[6,19-22] These include heat exhaustion and heatstroke. Patients are admitted to the ICU for resuscitation, and for actively lowering body temperature and for hemodynamic and ventilatory support. For the management of heatstroke, hospitals are equipped with special cooling units (Makkah Body Cooling Units).

Admission criteria based on objective findings. Commonly, the intensivist is asked to see a patient whose diagnosis has not been clearly defined.[1,10] The intensivist then relies on the patient's physical examination and laboratory work to make the decision for admission to the ICU.[10] These criteria includes vital signs, laboratory works, or ECG changes or some other clinical findings. The following represent the most commonly used parameters that guide the physician to admit to the ICU: 1. Vital signs; heart rate of <40 or >150 beats/minute, systolic blood pressure of <80 mm Hg or mean arterial pressure <60 mm Hg, diastolic arterial pressure >120 mm Hg, tachypnea with respiratory rate of >35 beats/minute. 2. Laboratory values; serum sodium <110 mEq/L or >165 mEq/L, serum potassium <2 mEq/L or >6.5

mEq/L, severe hypoxia with PO_2 <50, Ph <7.1 or >7.7, serum glucose >800 mg/L, serum calcium 15 mg/dl. 3. Physical findings; unequal pupils in unconscious patient; burns covering more than 10% of body surface area, aneuria, air obstruction, continuous seizures, cyanosis, sudden change in level of consciousness determined by a drop in GCS of >2 points from baseline, repeated seizures, rising arterial carbon dioxide with respiratory acidosis.

Prioritization of admission to the ICU. Admission to the ICU should be reserved for patients who are most likely to benefit from this admission.[1,23-25] The following system represents prioritization of admission to the ICU: 1. Priority number 1 - This group includes the unstable critically ill patients who need treatments and monitoring that cannot be provided outside ICU. This group includes for example those who need vasoactive drugs and ventilatory support. 2. Priority Number 2 - This group includes patients requiring intensive monitoring and may potentially require immediate intervention. This group includes patients who have co-morbid conditions and develop severe or surgical illness. 3. Priority Number 3 - This group includes patients who are unstable and have limited chance of recovery due to their severe underlying disease. These patients may receive intensive therapy with limits to the therapeutic efforts, such as intubation or cardiopulmonary resuscitation. Example of these patients are those who have end-stage organ disorders or advanced cancer. 4. Priority Number 4 - This include patients who are least likely to benefit from the ICU. Admissions of these patients should be made on individual basis under unusual circumstances. These include 2 sub-categories: a) The patients who are too well to benefit from the ICU care. These are the patients who have little anticipated benefits from the ICU care due to low risk of active intervention.[23-25] Example are those who are hemodynamically stable with ketoacidosis or mild congestive heart failure. b) The patients who are too sick to benefit from the ICU, like those who have terminal or irreversible illness facing imminent death. Examples of these patients are those with irreversible multi-organ failure.[23-25]

Triage. The decision to admit patients to the ICU should be based on their potential of benefit from the ICU care.[23-25] However, during Hajj season, the number of potential ICU admissions exceeds the available beds. In these cases, decision regarding admitting to the ICU should be made based on the priority model that was mentioned before. Patients who are most likely to benefit from the ICU should be given higher priority than those patients who are unlikely to benefit from the ICU. Ethnic origins, gender, social or financial status should never be considered in triage decisions.

Patient treatment preferences during Hajj. The hospital is the last place in which any pilgrim would like to be during the Hajj season. For many pilgrims, Hajj is a once in a lifetime experience. Furthermore, many patients with chronic diseases come to the Hajj hoping that their death happens during this holy period. These factors affect substantially patients' preferences towards advanced life support. The physician's primary goal is to provide the most appropriate therapies to save life and function. However, when expected benefit from the therapy is doubtful, these preferences should be taken in consideration.

In conclusion, triaging patients to the ICU during Hajj can be challenging considering the large number of patients compared with the available resources. Close coordination between the Emergency Department Physicians and the intensivists is essential for the optimal resource utilization. Admissions should be prioritized based on the likelihood of benefit.

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