



# Assessment of Shift Programs of Emergency Department Health Personnel in Four Hospitals Providing Medical Training in Turkey and Iran, A Brief Report

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## Abstract

**Background:** Emergency departments provide continuous 24 - h health services. The working shifts required for health workers to provide high - quality and continuous services are still the subject of debate. This descriptive study compares the emergency department working shifts in Turkey with the emergency department working shifts in Iran.

**Methods:** This cross sectional descriptive study assesses numbers of paramedics, nurse, resident physicians, specialist physicians, faculty members, shift hours, numbers of patient admission per day, and compares the shift systems worked by emergency department staff in three hospitals providing medical training in Turkey and emergency department staff from a medical faculty providing training in Iran.

**Results:** The highest numbers of residents (N = 50) and members of teaching staff (N = 14) were observed in Tabriz - Iran Imam Reza Hospital. Resident physicians at Turkey's Karadeniz technical University (KTU) Medical Faculty Emergency Department work 24 - h block shifts, while those in other centers work various shift patterns. The teaching staff at the Imam Reza Hospital work actively for 24 h, while those in hospitals in Turkey work actively in the daytime and are on standby in the evening. The Emergency Severity Index triage system is applied in the Imam Reza Hospital, while the three centers in Turkey use the yellow, red, and green triage coding system.

**Conclusions:** Presentation of teaching a faculty member in 24 hours in shifts and using ESI triage system with divided shift times in a day can improve emergency management by decreasing personnel burnout and increasing care satisfaction in patients.

**Keywords:** Emergency Department, Shift, Triage

## 1. Background

Emergency medicine was first instituted as a separate department at Dokuz Eylul University in 1993. The numbers of both clinics and physicians have risen increasingly since then. In 2015, there were 86 departments in Turkey providing emergency medicine training. The total number of emergency medicine specialists and residents exceeded 2000 (1). The emergency department was established in most hospitals before 1979 revolution, however, emergency medicine training as a specialty began in 2000 and the first group of residents started education in Iran, Tehran, and Shahid Beheshti University of Medical Sciences in 2001, 2003, and 2004, respectively. The emergency medicine residency program started in 2006 in Tabriz University of Medical Sciences. There is a board exam in emer-

gency medicine in Iran; at the end of the residency program all graduated residents can take board exam and if pass they are board certified (2).

Patient numbers and long working hours represent constant stress factors in the emergency department of personnel. Working hours in the shift system are arranged at regular intervals. This allows health workers to take care of routine matters in their spare time. However, the constant state of stress occurring in staff can give a rise to adverse effects in work, family, and social life, as well as in occupational enthusiasm over the long term. Problems known as "burnout syndrome", which generally occurs in individuals' in their 40s can develop as a result. Burnout syndrome leads to professional dissatisfaction, a negative attitude toward patients and a loss of occupational enthusiasm, especially in health workers. These adverse effects of

a burnout can be avoided with an appropriate shift system. Difficulty in adapting to day - night sleep changes, daytime sleep providing insufficient benefits, deficiencies in REM sleep, and similar phenomena can lead to stress, fatigue, and impairment of body physiology in individuals (3, 4). Working unsuitable shifts has cumulative effects and represents one of the reasons why physicians do not continue in that specialty (5).

The purpose of this study was to compare the shift systems worked by physicians and auxiliary personnel (nurses and paramedics) in Turkey's Karadeniz Technical University (K.T.U) Emergency Medicine Department, Akdeniz University (A.U) Emergency Medicine Department, Istanbul Education and Research Hospital (I.E.R.H), and in the Tabriz University of Medical Science (M.U) Imam Reza Hospital (I.R.H) Emergency Medicine department in Iran.

## 2. Methods

This is a cross - sectional descriptive study that investigates numbers of paramedics, nurse, resident physicians, specialist physicians, faculty members, shift hours, numbers of patient admission per day, as well as compares the shift systems worked by the emergency department staff in three hospitals providing medical training in Turkey and emergency department staff from a medical faculty providing training in Iran.

The two university hospitals of Turkey are Karadeniz Technical University in Trabzon (North of Turkey) and Akdeniz University in Antalya (south - west of Turkey). Istanbul Education and Research Hospital in Istanbul (west of Turkey) (health ministry directly manages this hospital not by University).

The University hospital of Iran is Imam Reza Hospital of Tabriz University of Medical Sciences, which is a referral hospital in North - West of Iran.

All of these hospitals have an emergency department and work as a training and educational hospital.

## 3. Results

### 3.1. An Analysis of Shift Systems in Three Educational Institutions in Turkey and One in Iran

Numbers of Resident physicians, specialist physicians, members of teaching staff, shift hours, daily presentations to the emergency department and times when these are most intensive, and distribution of physicians in working areas during shifts were examined during the analysis. The data obtained are shown in [Table 1](#).

## 4. Discussion

### 4.1. The Effects of the Shift System on Body Physiology

Various shift patterns are applied in Turkey and elsewhere in the world in order to overcome these problems. In arranging these programs it must be remembered that humans have biological clocks and that these clocks are regulated by circadian rhythms. Circadian rhythms involve such physiological systems such as the sleep - wakefulness cycle, body temperature and plasma cortisol, adrenalin, noradrenalin, and melatonin levels (5). These systems are regulated by endogenous and exogenous factors. The most common symptom caused by the shift system is impairment of sleep quality and regularity (6). This is due to the fact that REM and non - REM sleep in nocturnal sleep cannot be fully provided and to various environmental factors in the sleeping area (such as light, noise, and other family members). One important cause of a decrease in sleep quality is that the circadian rhythm has a stable structure. It takes time to adapt if affected by environmental factors, a process known as desynchronization (5). Wakefulness is a serious problem among shift workers. Wakefulness during the day is at its lowest level at 03:00 - 06:00. Phenomena such as false diagnosis and treatment are most commonly encountered during these times (6). This can be overcome with the application of short sleep periods during night shifts (7). Duration of sleep among shift workers decreases by 1 - 4 h, and much of this lost period consists of Stage 2 and REM sleep (5). 'Shift Work Sleep Disorder' is now included in the International Sleep Disorders Classification (8).

### 4.2. The Shift Systems Applied in Emergency Departments

The shift patterns applied in emergency departments include clockwise (CW), counter - clockwise (CCW), and block shifts. The French shift model is a commonly applied system today. This consists of CW shifts arranged in the form of daytime, evening, and night shifts. CW shift patterns are recommended in favor of CCW shift programs (consecutive day, night, and evening shifts) as these are more compatible with circadian rhythms (5).

Twelve - hour shifts are applied in many emergency departments. Eight - hour shifts are recommended in order to regulate a functioning biorhythm (4). Twenty - four - hours shifts are a pattern quite commonly seen in Turkey. This working system is not generally recommended. The 24 - h shift system can generally be applied in emergency departments where the number of people is limited (7). Shifts involving variable hours are applied in some places in the light of circadian principles. For example, there are variable programs including a 10 - h day shift, an 8 - h evening shift, and a 6 - h night shift (4). Research has shown

**Table 1.** Comparison of Emergency Departments

Hospitals	K.T.U	A.U	I.E.R.H	I.R.H
Number of residents	24	40	21	50
Number of specialists	-	-	8	-
Number of teaching staff (faculty member)	6	9	2	14
Mean number of patients	250 - 300	350 - 400	550 - 800	250 - 350
Number of physicians on a shift	6 - 8 res, 1 t.staff (standby)	7 - 9 res, 1 t.staff (standby)	5 - 7 res, 1 - 2 spc	7 - 8 res, 1 t.staff
Triage application	Green, yellow, red	Green, yellow, red	Green, yellow, red	ESI

Abbreviations: ESI, emergency severity index; int, resident; spc, specialists; t.staff: teaching staff.

that emergency department physicians prefer short shifts (5).

Specific rules are set out for shift systems for emergency medicine Residents by the Accreditation Council for Graduate Medical Education (ACGME) in the US. These state that shifts more than 12 h are not to be worked, that there must be at least 12 h between shifts, that one day in every seven must be entirely free, that shifts must not exceed 60 h a week, and that the total hours worked a week, including clinical conferences and all other activities, must not exceed 72 h (9, 10).

There is yet no definitive standard in Turkey. Twelve - hour shifts have the advantages of shift rosters being easy to produce and giving enough free days. Disadvantages include the impossibility of working an exact 40 - h week and that they are tiring in the context of the intensive nature of emergency departments. There have been no studies to date concerning 24 - h shifts. The physician must be able to sleep for at least 4 h in such shifts (11). This working system contains numerous free days. One study reported that sleeping for not less than 1 h increased perception of visual signs, however, sleep requirements did not decrease by the end of the shift and reactions were delayed for approximately 10 - 15 min after waking (12). It is important for shift patterns to be determined according to hours of patient density; for example, 8 - 10 - h daytime and 14 - 16 - h night shifts might be applied in emergency departments that are very busy in the daytime. The shift system and physician numbers recommended for emergency departments by the American College of Emergency Physicians (ACEP) in 1990 are shown in Table 2 (7).

The ACEP recommends CW rotation shifts in order to avoid shift intolerance. Factors such as case volume and severity and personnel characteristics must be considered in shift planning. Night workers' shifts must be carefully regulated, the daytime workload should be avoided if possible and a place should be provided for them to sleep when coming off shift in the daytime (4). Approximately 74% of traffic accidents involving emergency department

staff after their shifts occur after night shifts (13). Intubation in a mannequin has been determined to take longer night shifts than day shifts (8). The risk of occupational injury and disease during shifts lasting 16 - 24 h has been found to increase by 60% compared to those lasting 8 h or less, with this risk increasing with the length of the shift, the highest risk being determined after 24 h (10). A survey carried out among emergency medicine Residents in the US reported that 73% of participants preferred 8- and 10 - h shifts, while 21% preferred 12 - h shifts (14). Although these shifts design can increase or decrease burnout possibility, the emergency medicine residents and specialist can easily perform all procedures in the emergency department perfectly and can also decrease the length of stay and make disposition rapidly (15-19).

Amini et al., shows that most of the physicians had an undesirable situation in their life style according to screening tests (20).

In our research, when the three centers providing medical training in Turkey were compared with the Tabriz - Iran Imam Reza Hospital in terms of Resident numbers, the highest number was observed in the Imam Reza Hospital (N = 50). Resident physicians work 24 - h block shifts only in the KTU Medical Faculty Emergency Department as well as work shifts of different hours in other centers. The only center with specialist physicians is the Istanbul ERH Emergency Medicine Clinic (N = 8), while the highest number of members of teaching staff (faculty member) was again determined in the Imam Reza Hospital. Members of teaching staff work 24 h actively in the Imam Reza Hospital, while in the hospitals in Turkey they work actively in the daytime and are on standby in the evening. Nurses work variable shift hours in all the hospitals. While there are no paramedics in Iran's Imam Reza Hospital or the Istanbul ERH Emergency Medicine Clinic, the other two centers provide services based on a variable time shift system. Since the Istanbul ERH does not train medical students, resident physicians do not work in the emergency department. Residents in the other hospitals receive training on a variable

**Table 2.** Patient Number/Shift Hours/Physician Number

Patient Numbers/Years	Shift Hours	Number of Physicians per Shift	Minimum Number of Physicians Needed
< 8000	24	1	3
8000 - 12000	12	1	4
12000 - 20000	12	2	4
20000 - 30000	8 - 10	2	5
>3 0000	8 - 10	3	6

hours shift system. Considering the mean number of patients presenting to the emergency department in one day and the number of physicians on duty, the highest number of patients per physician is at the Istanbul ERH Emergency Medicine Clinic. The Imam Reza Hospital applies the ESI triage system, while the three centers in Turkey operate the yellow, red, and green triage coding system.

#### 4.3. Limitation

This study is only a descriptive comparison of 4 emergency departments, it is better to design a checklist for the evaluation of advantages and disadvantages of shift time and staff number in evaluation of all types in these 4 universities.

#### 4.4. Conclusion

Active presentation of a faculty member in the emergency department in I.R.H of Tabriz, Iran is a cornerstone of success in the management of the emergency department. According to the ACEP guideline, it seems that KTU and IRH, in comparison to other hospitals, physicians' number are near to standard. Using ESI for triage is only used in IRH and using 5 level triage makes management of patients easier than three color level triage.

#### Footnotes

**Authors' Contribution:** Study concept and design: Ozgur Tatli, analysis and interpretation of data: Ozgur Tatli and Ogun Kupcuk, critical revision of the manuscript for important intellectual content: Ozgur Tatli, Ogun Kupcuk, and Samad Shams Vahdati.

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