



Emergency Operating Room Workload Pattern: A Single Center Experience from Southern Iran

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► ABSTRACT

Objective: To determine the epidemiology and pattern of emergency operating room workload in Nemazee hospital affiliated with Shiraz University of Medical Sciences, Shiraz, Iran.

Methods: All surgical emergency operations which were performed in Nemazee hospital, Shiraz, Iran were collected over twelve months (September 2007 to September 2008). The data obtained included indications, presenting symptoms the services provided and the demographic information of the patients.

Results: Overall number of recorded emergency operations in this cross sectional descriptive study was 3946, with males constituting 72% of the patients. The highest male/female ratio reported in trauma patients was 6.4:1 with the median age of 23 years, and the mean age of the operated patients was 27.8 years. Second to neurosurgery (19.64%) the general surgery was the busiest discipline in emergency operations (59.14%). Appendectomy (11.77%), double/triple lumen/central venous catheter insertion (9.4%), and fiber optic/rigid bronchoscopy (3.27%) were the commonest general surgical operations. Among trauma patients, neurotrauma was the commonest reason for operation (10%).

Conclusion: Based on a new approach toward emergency operating room workload, in our country and centre, we showed that it is necessary to devote particular and individualized attention to the fields of agenda and hospital management of emergency operations. This is due to a high emergency operating room workload and its unique characteristics in our centre in contrast to other hospitals and departments. Although a decision making and operational strategy is recently seen to improve the quality and quantity of emergency services available to our patients, there is still a gap between present and optimal emergency healthcare which should be provided for our residents.

Keywords: Emergency Operating Room; Workload; Epidemiology

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Introduction

Emergency surgical admissions have shown an increasing trend in the recent years [1,2]. Surgical operations are classified according to timing. In this context, they are divided into four groups of emergent, urgent, semi-collective, and collective [3]. The emergency group constitutes about half of all surgical admissions, which can affect health providing management strategies.

[4,5] An overall increase in hospital emergency admissions over recent years and limited facilities impose a considerable strain on hospitals' ability to undertake elective operations. Although Iran has made advances in emergency services, provided for its citizens during recent years, there is still a lag between ideal high quality health care service and present condition, due to insufficient resources and inadequate governance and management. There are few studies about workload of emergency

operating room in some parts of the world. One study conducted by Campbell *et al.* during 25 years in Oxford district revealed some changing patterns in the emergency surgical admissions such as increased, decreased or unchanged incidence conditions [6]. Another study carried out by Tuong and colleagues shows timing of admissions and length of hospitalizations [7]. However, there is no study concerning the nature and volume of emergency surgical admissions in Iran. It is essential to access statistics about Emergency operating room workload in regard to the provision of surgical care for each group of patient and better management. Since admission pattern varied at different times and between different districts and Hospitals, we decided to study Emergency operating room workload in Nemazee hospital affiliated with Shiraz University of Medical Sciences, Shiraz, Iran.

Materials and Methods

In this cross sectional study, all surgical emergency operations which were performed in Nemazee hospital, Shiraz, Iran operating room were collected over twelve months from 23rd September 2007

Table 1. Characteristics of patients undergoing emergency surgery in Nemazee Hospital during 2007.

Variable	Value
Total admissions	3946(100%)
Male	2843 (72%)
Female	1103 (28%)
Mean Age	27.8
Most common emergency operations (patients over 60 years old)	
Abdominal non-traumatic	109 (25.9%)
CV line insertion	86 (20.4%)
N/S non traumatic	70 (16.6%)
Vascular non traumatic	32 (7.6%)
Trachostomy tube insertion	30 (7.1%)
N/S traumatic	19 (4.5%)
Most common emergency operations (pediatrics patients)	
Appendectomy	304 (23.7%)
CV line insertion	185 (14.4%)
Broncho/esophagoscopy	145 (11.3%)
Conge. Anomaly correction	114 (8.9%)
N/S non traumatic	76 (5.9%)
N/S traumatic	58 (4.5%)
Month of admission	
September	328 (8.27%)
October	367 (9.30%)
November	319 (8.08%)
December	343 (8.68%)
January	366 (9.27%)
February	298 (7.55%)
March	201 (5.09%)
April	250 (6.33%)
May	332 (8.41%)
June	354 (8.97%)
July	364 (9.22%)
August	362 (9.17%)

to 22nd September 2008. In order to obtain the information, the operation notes of all emergency operations in Nemazee hospital within the study period was extracted from the hospital registry. This hospital is not a center for pure gynecological or obstetrics cases, which are admitted to our center due to high emergency. Therefore, gynecological/obstetrics emergency patients were not included in our study. Additionally, Nemazee hospital is not a referral centre for maxillofacial trauma cases, nor is it a centre for urological emergency except for pediatric traumas. This operation notes, available in access program, were used as a bank to prepare a Delphi- based program, which gave us an open hand in entering, editing, sorting, searching, and counting each of the needed criteria for our study. Information were obtained from operation notes written by the consultant surgeons or surgical residents. All collected data were anonymous. The final diagnoses were made after operations, and were recorded according to the post-operation diagnoses made by the consultant surgeons or surgical residents, as mentioned in operation notes. Patients who required emergency operations in more than one surgical discipline, or underwent more than one operation during 12 months, were counted as one case for each of the performed operations. Therefore, the overall number of patients might have been less than the total number of performed operations. All collected data used for this descriptive analysis included number and type of operations, date, age, sex, surgical discipline (service), and common diagnosis. All data and details were collected by one person for the sake of uniformly. Statistical analysis was performed using SPSS 15.0 for windows (SPSS, Chicago, IL, USA) and data are expressed as mean \pm SD.

Results

Of a total of 3946 recorded emergency surgical admission 2843 (72%) were males and 1103 (28%) females. The mean age of the patients was 27.8 ± 23.0 years with the median 23 years (range: 1–94 years). Busiest time for emergency operation room, with 367 operations (9.3%), was between 23th October and 22th November 2007, corresponding with month of Aban in Persian calendar (second month of autumn). However, the difference in rate of operations in this month was not significantly higher than most other months. The least emergency operations, with 201 operations (5.09%), were performed in March 2008, roughly corresponding with month of Farvardin (first month of spring) in Persian calendar (Table 1). Six most common procedures performed on patients for more than 60 years were abdominal

Table 2. Types of emergency operations being performed during 2007 in Nemazee Hospital, Shiraz, Iran.

Operation	N (%)	M	F	M:F	Median age (Range)
Trauma	1276 (32.33)	1190	186	6.4:1	25(1d-88)
Neurosurgery	394 (10)	353	41	8.55:1	25(3d-88)
Orthopedic operations	285 (7.22)	218	67	3.28:1	26(10-70)
Laparotomy	241(6.11)	210	31	6.77:1	25(1-76)
Vascular operations	118 (3)	101	17	5.94:1	25(11-67)
Thoracic procedures	69 (1.74)	61	8	7.62:1	24(11-84)
Urologic operations	49 (1.24)	43	6	7.17:1	25(2-68)
Maxillofacial surgery	20 (0.51)	17	3	5.66:1	24(15-51)
Poly trauma	59 (1.5)	51	8	6.37:1	27(8m-61)
Others trauma	41 (1.05)	36	5	7.2:1	23(1-79)
Vascular	148 (3.75)	91	57	1.6:1	53(20-88)
AAA repair ^a	15 (0.38)	9	6	1.5:1	67(46-84)
Amputation	22 (0.55)	15	7	2.14:1	53(24-88)
Emboli/thrombectomy/fugarty insertion	33 (0.83)	21	12	1.75:1	61(23-83)
EVAR ^b	39 (0.99)	22	17	1.3:1	32(20-80)
A-V shunt ^c	27 (0.68)	17	10	1.7:1	47(13-73)
Others	12 (0.03)	7	5	1.4:1	51(29-81)
General surgery	2002(51)	1333	669	2:1	29(1d-94)
Open appendectomy	463 (11.773)	315	148	2.12:1	14(4m-78)
I&D ^d of abscesses	88 (2.23)	67	21	3.19:1	34(2.5m-80)
Herniorrhaphy	66 (1.67)	52	14	3.71:1	1.7(4d-83)
Rigid/fiber optic bronchoscopy	129 (3.27)	84	45	1.87:1	2(1d-58)
Esophagoscopy	53 (1.34)	34	19	1.79:1	3(4d-80)
Double/triple lumen/CV insertion	371 (9.4)	242	129	1.87:1	40(3d-94)
Cuts down	113 (2.86)	64	49	1.31:1	1m(2d-64)
Trachostomy tube insertion	73 (1.85)	59	14	4.2:1	40(1m-90)
Tumor resection/debulking	59 (1.5)	38	21	1.81:1	50(3d-80)
Anal sphincteroplasty/tomy	32 (0.8)	25	7	3.57:1	6m(2d-79)
Adhesion band release	59 (1.5)	43	16	2.69:1	30(5d-79)
Cholecystectomy	97 (2.46)	45	52	0.86:1	58(9-90)
Gastro/duodeno/jejuno/ilio/colostomy	104 (2.64)	73	31	2.35:1	56(13-91)
HPS ^e /TEF ^f /omphalocele correction	49 (1.24)	29	20	1.45:1	4d(1d-2.5m)
Colectomy	31 (0.79)	21	10	2.1:1	60(6m-77)
Release of atresia	29 (0.73)	17	12	1.42:1	6d(2d-3m)
Exploratory laparotomy	46 (1.17)	33	13	2.54:1	49(6m-84)
DUP ^g repair	13 (0.33)	10	3	3.33:1	30(18-79)
Others	127(3.2)	82	45	1.82:1	12(1d-90)
Neurosurgical operations	340 (8.62)	233	107	2.18:1	44(2d-90)
V-P shunt	109 (2.76)	60	49	1.22:1	12(15d-80)
Ventriculostomy	78 (1.98)	51	27	1.89:1	51(5m-87)
Others	153 (3.88)	122	31	3.93:1	57(5m-90)
Urologic operations	80 (2.02)	52	28	1.86:1	15(2d-77)
Orthopedic operations	67 (1.7)	30	36	0.83:1	22(2m-69)
Miscellaneous	32 (0.8)	12	20	0.6:1	41(19-84)
Overall	3946(100)	2843	1103	2.57:1	23(1d-94)

^aAAA: abdominal aortic aneurysm; ^bEVAR: endovascular aneurismal repair; ^cA-V: arterio venous; ^dI&D: irrigation and debridement; ^eHPS: hypertrophic pyloric stenosis; ^fTEF: trachea esophageal fistula; ^gDUP: duodenal ulcer perforation

non-traumatic general surgical operations, surgical central venous (CV) line insertion, non-traumatic neurosurgical operations, vascular operations, trachostomy tube insertion, and neurosurgical trauma procedures. Six most common procedures were performed as emergency operations by various surgical disciplines in pediatric service (0-16 years) included appendectomy, surgical CV line insertion, bronchoscopy/Esophagoscopy for removal of foreign body aspiration/ingestion, operations performed by pediatric surgeons for correction of congenital anomaly, neurosurgical non-traumatic operations, and traumatic neurosurgical operations.

Distribution of operated patients, according to the surgical specialty comprised general surgery (also including trauma and vascular surgery with 2608 operations (77.11% of all operations), neurosurgical with 775 (19.64%), Orthopedics with 382 (9.68%), Urologic with 144 (3.65%), and others involving 34 (0.63%) operations.

Table 2 details the distribution of operated patients according to type of surgery, specialty, sex ratios, and number of performed operations. The frequent general surgical operations comprised appendectomy (11.77%), double/triple lumen/CVP insertion (9.4%), and fiber optic/rigid

bronchoscopy (3.27%). Among trauma patients neurotrauma (10%) was the commonest reason for operation. Different surgical services had various rates of post-operative problems. This was highest for urology service with 12.5%, followed by neurosurgery service with 5.55%, orthopedic surgery with 4.71%, with general surgery having the least post-operative problems (1.03%).

Discussion

Overall number of performed emergency operations during one year was 3946, that reveals higher rates compared with similar studies in three of the UK hospitals with 1085, 1241, and 1210 operations, and an Irish hospital with the emergency operation rate of 456, during 6 months [7-9].

Median age of the operated patients in our centre was 23, which was significantly lower than other studies with reported age of 41 and 47 years. Also mean age of our patients was 27.8 years which was lower than that of other centers. The Age of admitted patients ranged from 1 to 94 years that was wider than 28-60 years of other reports. The patients' age ranged from 12 to 99 years in studies conducted in two UK hospitals, and 17-100 years reported from a hospital in US [7,10, 11]. This might be a result for high rate of emergency operations in pediatric group.

According to our study, abdominal non-traumatic general surgeries, surgical CV line insertion, and non-traumatic neurosurgical operations were the commonest emergency operations in patients of over 60 years. The emergency operations carried out in UK on geriatric patients aged over 80 years demonstrated that 34% of admissions were due to GI conditions, which was consistent with our study. This was followed by 13% for urologic conditions, and 8.5% for peripheral vascular disease [12]. The lower rates of urologic operations can be acceptable considering that the centers involved, were not the referral site for such services.

Our study reveals that, appendectomy, surgical CV line insertion, and broncho/Esophagoscopy were three most common emergency operations in pediatrics, compared with a study from Nepal that reported GI operations, orthopedic procedures, and wounds as the most frequent operations [13]. Difficulties in providing a peripheral IV line in pediatrics caused high rate of pediatric operations to access a venous line. Being a pediatric referral center equipped with broncho/Esophagoscopy facilities might be a reason for the high rates of broncho/esophagoscopy procedures.

In our centre, among the traumatic emergency operations, neurotrauma was the most common diagnosis for the operated individuals, conditions consistent with another study from UK [7]. According to a study reported from Nemazee hospital Emergency department, high percent of the chest trauma patients required chest tube insertion. They managed instantly in the emergency department, and were not referred to operation room, and as expected it accounted for the lower rates of chest trauma patients in our study [14].

An overall 3.75% of vascular operations in our centre were significantly lower than those reported by a UK hospital [7,9], owing to the higher rates of geriatric operations in their study. Whereas abscess, non-specific abdominal pain, and acute appendicitis were the commonest general surgical diagnosis in a hospital from UK, our study reveals greatest need for managing CV line, acute appendicitis, and foreign body aspiration/ingestion. [7].

We reported high rates of double/triple lumen insertion and cuts down. These procedures have not been reported in similar studies. In developed countries such procedures are most commonly performed at patient's bedside, or a specific unit. However, in our center, due to lack of acquired monitoring in wards, high turnover of the operating rooms, and excessive need for surgeons to be always available, patients are referred to operating rooms, causing a higher turnover rate.

Tracheostomy tube insertion was not reported as an emergency procedure in any of the referenced studies, but in our center, it rated 1.85% of all emergency operations. Audit establishment encourages assessment of surgical unit, and patient care, highlights points of strengths, weaknesses, and points to be changed. It also enables compressions between the units itself in different times, and between various departments and hospitals.

In conclusion, it is necessary to devote particular and individualized attention to the fields of agenda and hospital management of emergency operations. This is due to a high emergency operating room workload and its unique characteristics in our centre in contrast to other hospitals and departments. Although a decision making and operational strategy is recently seen to improve the quality and quantity of emergency services available to our patients, there is still a gap between present and optimal emergency healthcare which should be provided for our residents.

Conflict of Interest: None declared.

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