

The Workload in the Emergency Room: Direct Assessment by the Therapeutic Intervention Scoring System-76 and Indirect Assessment by the NASA Task Load Index

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Abstract

Introduction: The number of emergency room admissions continues to increase each year, which increases the care workload of the emergency department staff, who should to use its theoretical and practical knowledge in order to provide quality care in difficult working conditions.

Aim: The aim of our study was to assess the emergency room staff workload its impact on health workers and patients and to suggest an improvement strategy to decrease this workload.

Methods: A prospective, monocentric cohort study with descriptive and analytic approach over one month (December 2018) conducted at the Emergency Department of Mongi Slim academic hospital. The workload endured by the emergency room staff was evaluated by the NASA Task Load Index and on patients by the Therapeutic Intervention Scoring System-76.

Results: There were 286 cumulative days of hospitalization in 67 consecutive patients admitted to the emergency room. The average age was 61 ± 15 years. The average length of stay at the emergency room was about 103 ± 48 h. The average TISS-76 score was 31.7 ± 14.9 . Factors associated with important care workload were: age ≥ 65 years, diabetes, more than 3 comorbidities, the use of intravenous antibiotics; the use of vasoactive drugs and the use of mechanical ventilation; a high TISS score was predictive of emergency room mortality. In the indirect assessment of the care workload, 41 medical and paramedical staff were interviewed, 73% of them were under 40 years old with a sex ratio of 0.58. A high level of mental and physical workload was expressed by ED staff with considerable level of frustration; The ED staff suggested mainly to improve the working conditions, communication and to redefine tasks "who does what".

Conclusion: Our study had shown a significant workload in the emergency room, a process to reduce this workload is being implemented.

Keywords: *Workload; Emergency Room; Therapeutic Intervention Scoring System-76; NASA Task Load Index*

Abbreviations

CI: Confidence Interval; ED: Emergency Department; ER: Emergency Room; MeSH: Medical Subject Headings; NASA-TLX: NASA Task Load Index; NS: Not Significant; OR: Odds Ratio; SD: Standard Deviation; SWOT: Strengths, Weaknesses, Opportunities and Threats; TISS: Therapeutic Intervention Scoring System

Introduction

The Emergency Department (ED), as a public health service, receive daily patient's visits and admissions. The ED is the front door of the public Hospital with permanent medical, surgical, psychiatric and social solicitations, a real platform to provide care, education, prevention and medical training. Currently, there is an imminent increase in the number of emergency consultants, 7 000 000 per year in Tunisia [1], associated with a frequent emergency room admissions and increased ED staff workload. Important care activity may reduce the performance of health workers with a risk of harm to the well-being and health of the patient. Emergency room health care involves significant physical and mental effort to manage critically ill patients, which increases ED staff work stress and can lead to burn-out syndrome [2] and depressive signs [3].

Aim of the Study

The aim of our study was to assess the emergency room staff workload its impact on health workers and patients and to suggest an improvement strategy to decrease this workload.

Methods

Study design

It was a prospective monocentric cohort study, with descriptive and analytic approach, over one month (December 2018) at the emergency department of Mongi Slim Academic Hospital, which receives 70000 visits, 2700 admissions in hospitalization area and more than 900 admissions in the emergency room per year. Two approach were used to assess workload in the emergency room: The direct and the indirect one. "Workload" is a MeSH (Medical Subject Headings) term, introduced in 1992, defined as "The total amount of work to be performed by an individual, a department, or other group of workers in a period of time" [4].

Selection of participants, data collection and outcomes measures

Two approach were used to assess workload in the ER: The direct and the indirect one.

For the direct approach, workload was estimated by calculating Therapeutic Intervention Scoring System 76 (TISS-76) [5] in patients admitted to the ER using a computer-based application. The Data for epidemiological characteristics, medical history, diagnosis and management were also collected.

For the indirect approach, forty one ED staff: 18 physicians, 4 emergency technicians, 9 nurses, 2 caregivers, 5 service agents, psychologist and two administrative agents who worked alternately in the ER during December 2018 were asked to complete the NASA-TLX [6] rating at the end of this period; an informed oral consent was obtained from each of the participants. The NASA-TLX workload assessment tool contains 6 items: mental requirements, physical demands, time pressure, performance, effort and frustration. The user responds by positioning himself on a scale of 3 levels: low, moderate and high.

Then we suggested to the participants seven solutions to reduce workload in the ED: to reduce the number of patients supported by each ER staff, to improve the communication between health workers in the ED, to improve communication between the patient and ED staff, to redefine the tasks practiced by each health worker, to improve communication between the ED staff and the staff of other departments, to improve the working conditions and to develop team spirit. The ED Staff were asked to choose three of the seven proposed solu-

tions in order of priority to reduce the workload. Finally, the results of this study were analyzed according to the SWOT Matrix (Strengths, Weaknesses, Opportunities and Threats) [7,8] to propose a strategy to improve the working conditions of ED Staff as well as the quality of care provided to patients in the ER.

Statistical analysis

We used the Statistical Package for Social Sciences (SPSS 18.0, IBM) for analysis. Comparisons of two independent series were made using Student's Independent T-test and in case of non-validity, the non-parametric Mann-Whitney test was used. Comparisons of percentages were made by the Pearson chi-square test, and in case of non-validity of this test, by Fisher's exact test. The value of $p < 0.05$ was considered significant. Odds ratios were estimated from the b coefficients obtained, with respective 95% confidence intervals (CI 95%).

Results

Direct approach

In December 2018, 4495 patients visit the ED of Mongi Slim Academic Hospital, 196 were hospitalized in this department of which sixty seven patients in the emergency room with 286 cumulative days of hospitalization (Figure 1).

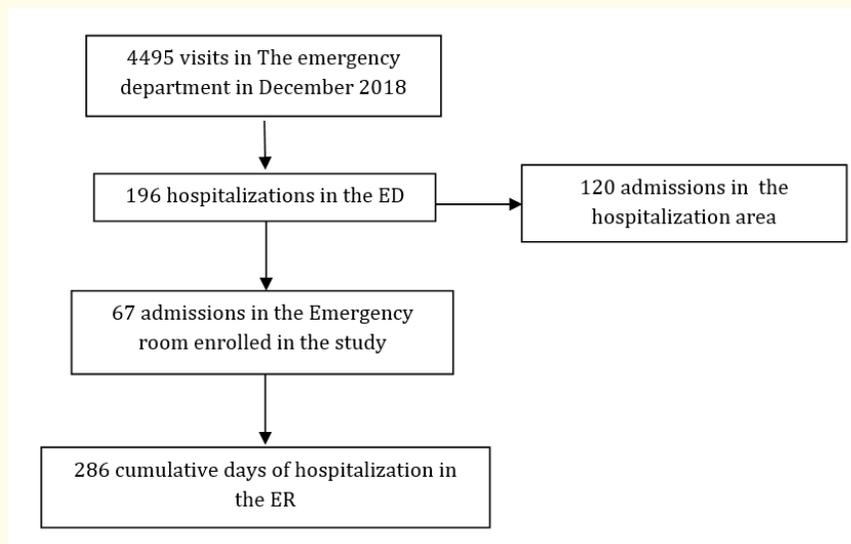


Figure 1: Flow diagram of the direct approach.

The average age of the patients was 61 ± 15 years, the sex ratio was 1.56. The most frequent reasons for admission in the ER were respectively respiratory distress (44%), neurological distress (20%), traumatism (14%) and seizure (9%). The average stay in the ER was 103 ± 48 hours. The medical and paramedical emergency care provided by ER staff was summarized in the table 1. During the study period, 1144 physical examination was done by the doctors and more than 850 phone call to the critical care, cardiology, surgery, orthopedic, neurosurgery, dialysis services and to the emergency medical assistance service.

The average TISS-76 score at the ER was 31.7 ± 14.9 . According to the TISS-76 categorization, class III was founded in the half and class IV in 26% of the patients. The factors associated with an work overload according to the TISS score was shown in table 2. Nineteen patients died in the ER during this study and the TISS-76 score was predictive of mortality ($p < 0.002$; CI 95% [4.93 - 19.95]).

ED staff	Emergency Care	n (%)
Emergency physicians	Urinary catheter	52 (77%)
	Non Invasive ventilation	28 (41%)
	Orotracheal Intubation and controlled ventilation	26 (38%)
	Central Venous Catheter	20 (30%)
	Chest Drain	3 (4%)
	External Electric Shock	2 (2.9%)
Emergency technicians and Nurses	Hourly vital signs	62 (92%)
	Continuous Supplemental oxygen	60 (89%)
	Intravenous Antibiotics	38 (56%)
	Active anticoagulation	30 (44%)
	Vasoactive drug infusion	18 (26%)
	Continuous antiarrhythmia infusions	8 (11%)
	Transfusion	6 (8.9%)
	Anticonvulsant treatment	6 (8.9%)
Caregivers and service agents	Nursing care	67 (100%)
	Delivery blood and urinary tests	67 (100%)
	Transportation of patients to other services	61 (91%)
Psychologist	Psychotherapy sessions with patients	14 (20%)
	Announcement of a serious diagnosis or death	17 (25%)
Administrative	Organization and archiving of the medical files of the Emergency Room	67 (100%)

Table 1: The medical and paramedical emergency cares provided by the emergency room staff.
ED: Emergency Department; ER: Emergency Room.

Factors	Yes (n) Average TISS ± SD	No (n) Average TISS ± SD	p	CI 95%
The age ≥ 65 years	(35) 36.54 ± 14.56	(32) 26.78 ± 13.79	< 0,03	[2.84- 16.68]
The diabetes	(31) 36.71 ± 15.96	(36) 27.72 ± 12.77	< 0.02	[1.97 - 16.00]
Patients with more than 3 comorbidities	(30) 36.10 ± 15.57	(37) 28.46 ± 13.63	< 0.01	[1.06- 14.89]
The use of intravenous antibiotics	(38) 36.68 ± 16.58	(29) 25.59 ± 9.45	< 0.01	[4.22 - 17.97]
The use of vasoactive drugs	(20) 40.80 ± 14.25	(47) 28.09 ± 13.65	< 0.02	[5.08 - 20.34]
The use of mechanical ventilation	(26) 42.81 ± 13.90	(41) 24.95 ± 10.94	< 0.01	[11.76 - 23.95]

Table 2: The factors associated with work overload in the emergency room according to the TISS-76 score.
n: Number; TISS: Therapeutic Intervention Scoring System; SD: Standard Deviation; CI: Confidence Interval.

Indirect approach

To assess the impact of this workload on health workers, forty-one staff, who worked alternately in the emergency room during this month, were enrolled in this study, 73% of them were under 40 years old with a sex ratio of 0.58. The average seniority in the ED was about 8 ± 6 years. Figure 2 shows the workload felt by ER staff according to the NASA TLX with its three levels low moderate and high. Table 3 shows the comparison of workload according to the gender, the function and the seniority.

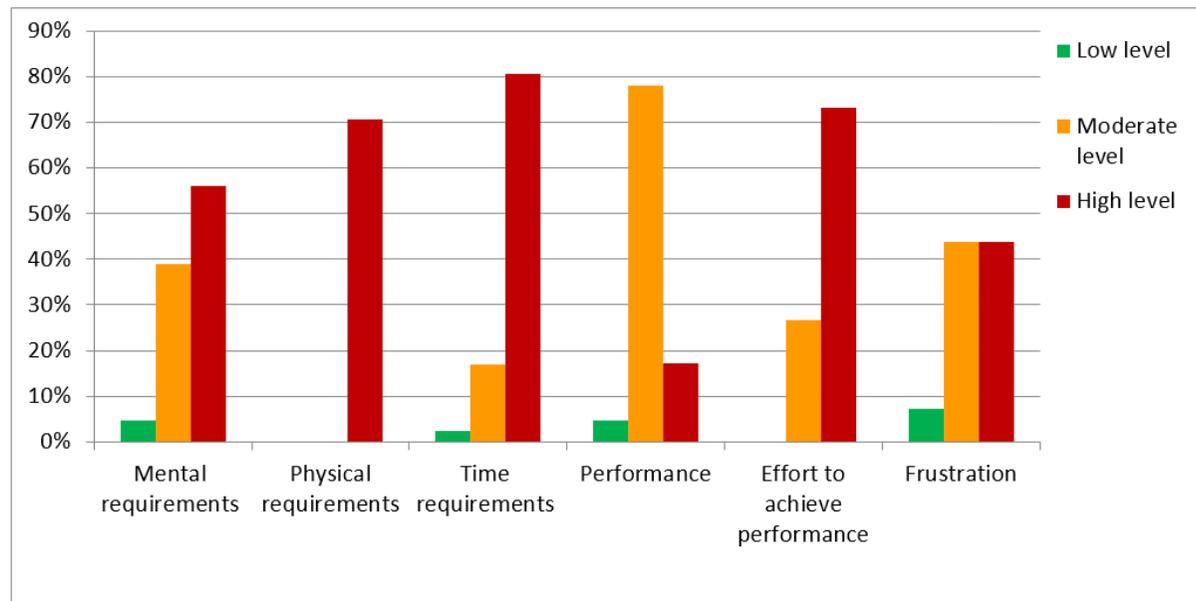


Figure 2: The workload felt by the ER staff according to the six items of the NASA-TLX.

	Mental Requirement (High level)	Physical requirement (High level)	Temporal requirement (High level)	Performance (low level)	Effort (High level)	Frustration (High level)
Female	p < 0.04 OR 2.47 CI 95% [1.19 - 5.10]	NS	NS	NS	NS	NS
Physicians	p < 0.006 OR 2.16 CI 95% [1.20 - 3.89]	NS	NS	NS	NS	NS
Emergency technicians	NS	NS	NS	NS	NS	NS
Nurses	NS	NS	NS	NS	NS	NS
Caregivers	NS	NS	NS	NS	NS	NS
Service agents	NS	NS	NS	NS	NS	NS
Seniority	NS	NS	NS	NS	NS	NS

Table 3: The workload felt by ER staff according to the gender, the function and the seniority.

OR: Odds Ratio; CI: Confidence Interval; NS: Not Significant.

At the next step the health workers had chosen three solutions in order to reduce the workload in the ER, the results are showed in table 4.

Suggestions	n (%)
To improve the working conditions in the ED	26 (63.4%)
To improve the communication between ED staff and the staff of other departments	23 (56%)
To redefine the task of each health worker	22 (53.7%)
To improve the communication between health workers in the ED	17 (41.2%)
To reduce the number of patients supported by each ER staff	15 (36.6%)
To develop team spirit	13 (36.1%)
To improve communication between the patient and ED staff	5 (12.1%)

Table 4: The suggestions chosen by the ED health workers in order to reduce the workload in the emergency room.
ED: Emergency Department, n: Number.

Discussion

The assessment of the care workload by the TISS-76 score in a sample of 67 patients admitted to the ER with 286 cumulating days of hospitalization, during December 2018 and appreciated by the ER staff, according to the NASA-TLX scale, had demonstrate that this burden was very important. The impact of this workload on ER health workers was worrying with a high level of mental, physical and emotional demands. The increase in the workload of emergency team had an impact on quality of care and safety for patients with an inevitable risk of increase in ER mortality.

Direct approach

In this study, the patients admitted in the ER had an average age of 61 ± 15 years, the advanced age was associated with an important workload in the ER ($P < 0.03$, IC 95% [2.84 - 16.68]). In Tunisia, the prevalence of adults aged of 65 years and older was about 8% and life expectancy has increased from 74 years in 2000 to 76 years in 2017 [9,10]. Elderly admitted to the ER, had often a poly-pathology source of polypharmacy and disability, they required more care workload than young patients. In our study the average length of stay in the emergency room was 103 ± 48 h. The multicentric study of Rose, *et al.* [11] had shown an average length of stay of 7 (4 - 13) hours in the ER, 10.5% has stayed 24 hours or longer. The prolonged length of stay in the ER may be explained by the reduced hospitalization capacity in the hospital. The TISS-76 score [5], including 76 points, with 1 to 4 points depending on the acts, the sum of points classified the patient into 4 categories and each category depends on the severity of the patient and the therapeutic workload. Many scores [12,13] had only evaluated the care activity while TISS score measures therapeutic activity with assessment of technical care and pathology severity. In our study the average TISS-76 score at the ER was 31.7 ± 14.9 . Factors associated with important care workload were: age ≥ 65 years, Diabetes, more than 3 comorbidities, the use of intravenous antibiotics; the use of vasoactive drugs and the use of mechanical ventilation; a high TISS score was predictive of ER mortality. In the study of Magalhães AMM and all intended to describe the workload of the nursing team and to relate it with patient safety outcomes, there was a significant association between the workloads in the inpatient units and average length of stay, urinary infection related to invasive procedure and the satisfaction of patients with nursing care. The increase in the workload of the nursing team had an impact on quality of care and safety for patients [14].

Indirect approach

In this study, 41 ER health workers were enrolled, their age was under 40 years in 74% of cases with a female predominance. According to the results of the French study SUMER's 2003 survey which studied the occupational risks exposures of health care workers [15]

paramedics was young and had a female majority (86%). Our population was multidisciplinary with emergency physicians, emergency technicians, nurses, caregivers, service agents, psychologist and administrative staff. The emergency technician is a new profile which has been recently created to receive training in order to meet the requirements of the ED and especially of the ER. The first promotion has been graduated in Tunisia in 2006.

The workload on its three components: mental, physical and emotional, defined by Robert Jean-Marc [16] was judged to be important in our study according to the answers of the ER staff to the NASA-TLX. This scale was used to evaluate 6 dimensions: the mental, the physical and the temporal requirements, the performance, the effort to accomplish the care task and the frustration. The first three dimensions was referred to the demands placed on the person and the other three was referred to the person's interaction with the task. The mental load was significantly higher on female care workers ($p < 0.04$; OR 2.47 IC 95% [1.19 - 5.10]) and on physicians ($p < 0.006$; OR 2.16 IC 95% [1.20 - 3.89]). The ED staff suggested mainly to improve the working conditions, communications and to redefine the tasks "who does what".

A review of Basu S and all provides a guide to developing interventions that target the origins of stress in the ED. It suggests that proceedings which reduce demand and increase worker's control over their job, improve managerial support, establish better working relationships and make workers' feel more valued for their efforts could be beneficial [3].

The SWOT analysis

Upon completion of this emergency workload assessment, the results of our study were used to conduct a SWOT analysis to propose an improvement strategy based on health management basics. The SWOT analysis is a strategic planning technique used to help a person or organization identify strengths, weaknesses, opportunities, and threats related to business competition or project planning, it was often used in marketing [7,8]. In our study, the SWOT plan was carried out to analyze, diagnose and suggest a project to manage care load and improve the working conditions in the short and medium term in the ED with the ultimate objective of patient safety (Table 5).

	Helpful	Harmful
Internal to the ED	<p>Strengths</p> <ul style="list-style-type: none"> • The young and motivated team • The multidisciplinary staff • The team spirit approved by the staff • The motivation to communicate 	<p>Weakness</p> <ul style="list-style-type: none"> • The few number of care workers • The unsuitable premises • The risk of burnout
External to the ED	<p>Opportunities</p> <ul style="list-style-type: none"> • To create new jobs • To provide coaching on communication and on team building 	<p>Threats</p> <ul style="list-style-type: none"> • Limited new staff recruiting • The small ED budget • The small hospitalization capacity in the hospital

Table 5: The SWOT analysis with strengths, weaknesses, opportunities, and threats related to the ED improvement strategy.

The strengths were the young and motivated team in the ER, the multidisciplinary staff in this department, the team spirit approved by the staff and the motivation to communicate.

The opportunities to seize were to improve the working conditions, to create new jobs in the emergency department and to provide coaching on communication able to reduce the feeling of frustration.

However, there is many weakness to improve in the ED: The few number of care workers in comparison with the growing number of patients admitted to the ER, the unsuitable premises with the daily activity and the burnout risk of the ED staff.

The threats were mainly the limited recruiting of new staff because of the health Ministry's budget restriction as well as the small budget provided to the ED compared to its needs and the difficulties on the downstream of the ED with the limited hospitalization capacity of the hospital.

Limitations

The limitations of this study include the small sample size from only one center, and the lack of collaboration with the occupational health service. Further multicentric studies would be valuable in contributing to these findings and to provide a better appreciation of the ER workload.

Conclusion

The large number of emergency room admissions results in an important care workload for the ED Staff. Two approach were employed during the study using the TISS score for the patients and the NASA-TLX for the staff revealed a very important care workload imposed on the ER staff. By the SWOT analysis model, we suggested a project to manage care load and improve the working conditions in the ED in order to improve the quality of care and patient's safety. This project will be applied and evaluated as progress.

Data Availability

Data Available on Request, Corresponding Author, Nourelhouda Noura Mzahma, should be contacted to request the data at; nouira_n1_h2@yahoo.fr.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper

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