



# The Relationship between Patient Load and Nursing Staffing Strength in Various Shifts of the Day in Emergency Department of a Major Tertiary Care Hospital in India

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## Abstract

**Introduction** A hospital has to function 24 hours a day, which makes shift duties almost inescapable for the nurses. However, shift wise staffing of nursing in emergency departments (EDs) of most hospitals continues to parallel that of other clinical departments.

**Objective** The aim of this study was to see the adequacy of staffing in reference to patient load in the different shifts of the day in the ED of a major tertiary care hospital in India.

**Methods** This is a prospective cross-sectional study. The number of patients entering the ED in each shift as well as the number of nurses assigned in each shift were taken from the rotation over a period of 1 week. A single point questionnaire was also administered to all five nurses in each shift over the study period to assess staff perception of patient load in the shift. Ethics approval was taken from institutional ethics committee.

**Results** For calculating the differential patient load in different shifts. We have calculated the average number of registered patients entering the emergency in over 1 week was 24 in the morning shift, 24 in the evening shift, and 81 in the night shift. The average nursing strength was 11 in morning shift, 11 in the evening shift, and 10 in the night shift. The average response from 15 nurses after interviewing them was 1 (overstaffed) in the morning, 2 (properly staffed) in the evening shift (properly staffed), and 4 in the night shift.

**Conclusion** The ratio of registered patients entering the emergency and the number of nurses deployed in each shift does not match, which gives an important view to revise roster in such a way that will not compromise the patient care.

## Keywords

- ▶ Emergency Departments
- ▶ shift duties
- ▶ nursing staffing pattern

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## Introduction

Hospitals need to run their services 24 × 7. In order to maintain such services healthcare workers also need to be present around the clock. This is why, shift duty is considered the standard method of working among healthcare professionals like nurses. The three standard shifts are the 8-hour morning (A) and evening (B) shifts and the 12-hour night (N) shift. In most clinical departments, maximum staffing is the morning shift followed by the evening and night shifts, ostensibly to cater to the increased administrative and clinical workload in the mornings. However, in the emergency department (ED) this may not hold true as there is a continuous patient flow and workload may be higher in the evening and night shifts. Nevertheless, shift wise staffing of nursing in ED of most hospitals continues to parallel that of other clinical departments. The objectives of this study were to see the adequacy of staffing in reference to the different shifts of the day in the ED of a major tertiary care hospital.

We wanted to know if there was any shift wise differential patient load in the ED and the nurses staffing pattern in every shift. We also wanted to know the nurse's perception of the adequacy of nursing staff in each shift of the ED.

## Methodology

### Study Design

This is an institution-based descriptive cross-sectional study that was conducted among the nurses of the ED.

### Setting

This study was conducted in the ED of a tertiary care hospital in New Delhi. The participants were recruited and data were collected from the month of June. The study was done over 1 week period.

### Participants

#### Nurses

The nurses have the following shifts in the ED. Morning shift (also called "A" shifts) timing is from 7.30 am to 2 pm, evening shift ("B" shift) timing is from 2 pm to 8 pm, and the night shift ("N" shift) is from 7.30 pm to 7.30 am.

The nurses who are doing the shift duties and ready to give informed consent were eligible to participate in the study. Administrative staff who are not involved in the bedside care of patients like the deputy nursing superintendent (DNS), assistant nursing superintendent (ANS), and the senior nursing staff were excluded from the calculation.

#### Patients

All patients entering the red and yellow area of the adult ED over the study period were included.

#### Variables

In this study, the dependent variables were the nursing staffing pattern and independent variables were the patient load.

## Data Sources/Measurement

Total number of patient registrations done in each shift in the study period were noted. In addition, number of patients triaged to red and yellow area were also noted for each shift. There were in total of 24 beds in red area (6 cubicles of 4 beds each). There was no standard bed strength in yellow area, as patients were managed on stretchers and load varied with every shift. The average number of patients for each shift over this 1-week period was then calculated.

For understanding the staff perception regarding patient load, we interviewed nurses across all shifts over a week. Five staff of every shift were interviewed and a single-point questionnaire administered to them with reply marked over a 4-point Likert scale (► **Table 1**).

### Bias

As the questionnaire was administered to select group of nurses and was subjective, there was chance of bias.

### Statistical Methods

Descriptive statistics were used in this study

### Ethical Consideration

Ethical approval was obtained from the All India Institute of Medical Sciences, New Delhi, Ethical Review Board with the reference no: IEC-434/06.05.2022. Individual consent was taken from all the participants.

## Results

### Patient Load

► **Table 2** shows the differential patient load across the three daily shifts. After taking the average of 1 week, the total number of patients reporting in the morning shift were 24, while 24 in evening shift and 81 in the night shift. As the red area beds were 24 (which were always occupied), the rest of patients occupied yellow beds in each shift.

### Nursing Strength

The average nursing strength was 11 (6 staff for red area and 5 staff for the yellow area) in morning shift, 11 (6 staff for red area and 5 staff for the yellow area) in the evening shift, and 10 (6 staff for red area and 4 staff for the yellow area) in the night shift (► **Table 2**).

### Subjective Perception of Staff Regarding Staffing in Each Shift (► **Table 3**)

Fifteen nurses (5 in each shift) were interviewed over a span of 1 week and the single point questionnaire administered to them. The average response in the morning shift was 1 (overstaffed), 2 in the evening shift (properly staffed), and 4 in the night shift (unmanageable).

One-hundred percent of the staff felt stressed out in the night shift with inadequate rest. Majority of the staff (4 out of 5 posted in night shift) opined that at least 16 nursing staff need to be present in the night shift with the current workload to ensure that patient care is not compromised and stress levels are bearable.

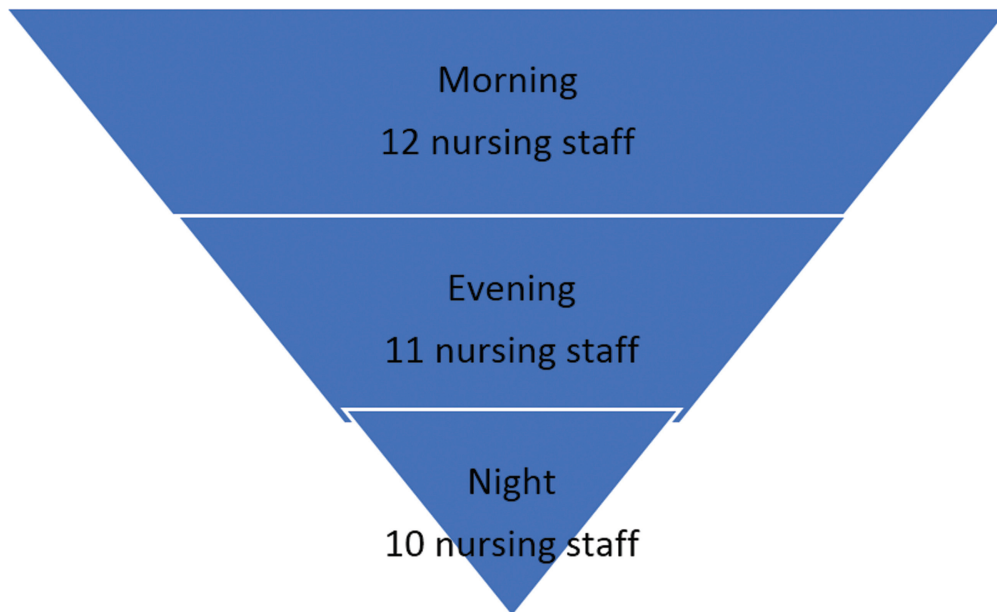


Fig. 1 The inverted paradigm.

Table 1 Four-point Likert scale

Shifts of the day	Question	1	2	3	4
		Overstaffed	Properly staffed	With Effort	Unmanageable
Morning	Your perception on adequacy of nursing staff with the current patient load				
Evening					
Night					

### The Pyramidal Paradigm

►Fig. 1 (pyramid paradigm) showed the nursing staffing pattern in emergency in each shift of the day that comes out to be inverted, while ►Fig. 2 (pyramid paradigm) showed the number of patients entering the ED in each shift of the day that comes out to be the upright one.

### Discussion

This study looked into the nurses staffing pattern on the nurses working in the ED along with the impact of patient load. Major findings showed that the patients entering in to the ED peaked at almost fourfold in the night during a 24-hour period as compared to the morning and evening shifts. The allocated nurses in the morning were overstaffed and in the evening there was adequate staff as compared to the night where there was acute staff shortage. But still, the number of nursing staff allotted in the night shift did not match the flow of incoming patients.

This study showed that the ratio between the patients and nurses that varied highly across the time of the day. The number of allocated nursing staff did not match the patients entering the ED especially during the night time. The findings

were consistent with the study done by Amritzer et al<sup>1</sup> that also showed the same results.

There are so many studies lacking in this field that describes the dynamics of the nursing staffing pattern with the number of patients entering the ED in a particular shift. It has a direct impact on the patient care outcome as reported by Recio-Saucedo et al.<sup>2</sup> The findings of this study highlight the need to maintain the patient and nurse ratio to an extent that decreases the burnout in nurses and increases the patient care quality.

The study done by Ball et al showed the impact of short nursing staff ratio on direct patient care. They have stated that as the patient ratio increases there are high chances of missed nursing care. Salvation of the patient is of utmost importance in the emergency department, and can be compromised because of missed nursing care.

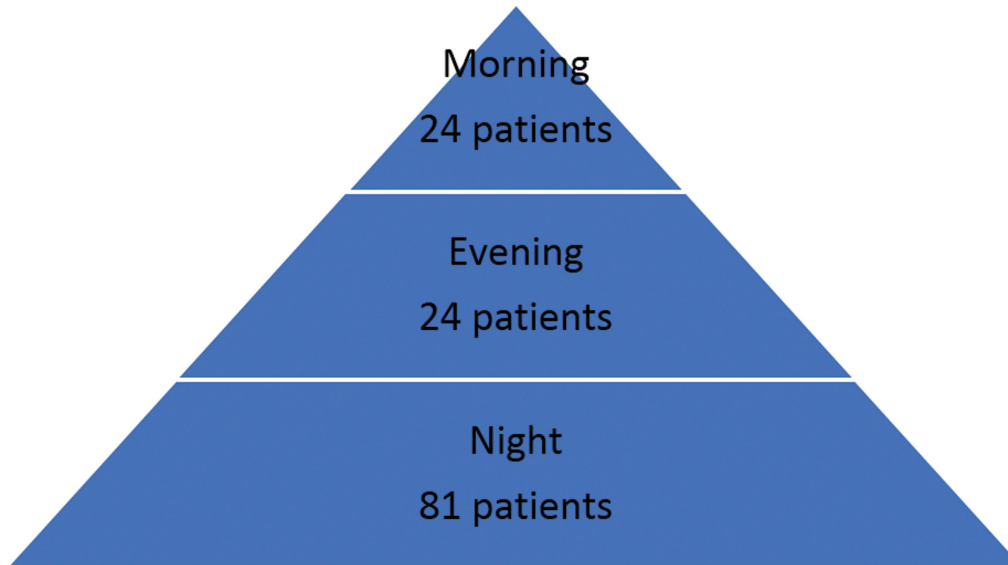
Our findings put the light on the nursing staff ratio that does not go parallel to the incoming patients entering the ED. The night staff nurse patient ratio is inversely proportional to the each other. The findings are in line with the study done by Amritzer et al<sup>1</sup> where their results also showed that nursing staff ratio did not match the patients flow in the emergency department.

**Table 2** Patients and the assigned nursing staff in the emergency department, presented as an average during a 24-h period and by shift

Day	Morning shift				Evening shift				Night shift			
	Number of patients entering the emergency	Assigned nursing staff		Discharged patients	Number of patients entering the emergency	Assigned nursing staff		Discharged patients	Number of patients entering the emergency	Assigned nursing staff		Discharged patients
		Red	Yellow			Red	Yellow			Red	Yellow	
1	14	7	5	14	30	7	4	11	97	5	4	33
2	23	6	4	18	23	6	5	12	62	6	4	30
3	30	6	5	14	20	5	4	11	78	6	4	28
4	23	7	5	18	28	6	4	8	66	5	4	26
5	27	7	5	13	23	6	5	10	93	6	4	29
6	24	8	6	08	28	6	5	12	88	6	4	34
7	26	8	5	15	21	5	6	7	86	5	4	32
Average	24	7	5	14	24	6	5	11	81	6	4	30

**Table 3** Assigned nursing staff response for staff adequacy by using the Likert scale

Shifts of the duty	Likert scale response															Average		Staff adequacy
	N1	N2	N3	N4	N5	N6	N7	N8	N9	N10	N11	N12	N13	N14	N15			
Morning	2	1	1	2	1	1	1	1	1	1	1	1	1	2	1	1	Overstaffed	
Evening	2	2	2	3	3	2	3	2	2	3	3	3	2	3	3	2	Adequate	
Night	4	4	4	4	3	4	4	4	4	3	4	4	4	3	4	4	Unmanageable	



**Fig. 2** The upright paradigm.

### Limitations

We have not investigated the consequences of short nursing staff ratio on the direct patient care and the extent of missed nursing care by measuring the workload performance.

### Recommendations

For further understanding, the concept of missed nursing care with the incoming patient ratio in each shift and the total amount of time spent at each patient need to be studied. It will be worth the effort to study in detail the flow of patients as these findings can support the staffing pattern in each shift in the ED. Adequate baseline nursing staff will lead to have appropriate roster that will directly increase the quality of patient care. The future study should find the association between the nurses staffing pattern and its effect on the patient's mortality.

### Implication for Emergency Clinical Care Section

This research has put light on the loopholes in the ED. The shortfalls in rotation of the nurses is the reason of such inappropriate staffing pattern in the three shifts. This study will help in revising the nurses staffing pattern in relation to the patients entering the ED in the morning, evening, and night.

### Conclusions

EDs need a complete overhaul of the staffing pattern to provide better emergency care to patients. Urgent efforts are required to address issues of stress and burnout among healthcare workers, especially in night shifts so that patient care is not compromised.

Details of Conference if the Manuscript was Presented in a Meeting, Conference, etc.

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Permission Request, if any  
Nil.

Registration Number in Case of a Clinical Trial and Where It Is Registered (Name of the Registry and Its URL)  
Nil.

#### Authors' Contributions

**Deepak Agrawal** proposed the methodology, formulated the Likert scale, and reviewed the manuscript. **Manisha Mehra** validated the Likert scale from different experts and wrote the manuscript. **Metilda Robin** contributed to data collection and reviewed the manuscript.

Conflict of Interest  
None declared.

#### Acknowledgment

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