Studying the Variability in Patient Inflow and Staffing Trends on Sundays versus Other Days in the Academic Emergency Department

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Abstract

Background: Resource limitation, staff deficiency, and variability in patient inflow contribute to emergency department (ED) overcrowding, associated with delayed care, poor care, and poor patient outcomes. This study seeks to describe and analyze patient inflow variability and staffing trends on Sundays versus other days in a tertiary academic ED from South India. Methods: Patient inflow and staffing data for 2 years were collected from hospital records, cross-checked, and statistically analyzed using Epi Info 7.0. Results: Significant increase in patient inflow (45.6%) was noted on Sundays compared to other days (155.9 [95% confidence interval (CI): 152.75–159.05] vs. 107.1 [95% CI: 105.98–108.22]; P < 0.001), with higher inflow in the morning shifts (67.4 [95% CI: 65.41–69.45] vs. 32.1 [95% CI: 31.45–32.70]; P < 0.001). All categories of ED staff were deficient across all shifts (2.1 [95% CI: 2.05–2.15] tier-2 physicians, 4.9 [95% CI: 4.86–4.94] nurses, and 1.9 [95% CI: 1.88–1.92] nurse assistants on an average), especially tier-1 physicians (0.3 [95% CI: 0.24–0.36] on Sundays and 0.5 [95% CI: 0.48–0.52] on other days; P < 0.001). Patient-per-hour (PPH)-per-provider based on patient arrival rate was generally high. PPH per tier-1 physician was the highest, being 10.6 (95% CI: 9.95–11.14) versus 5.4 (95% CI: 5.26–5.59; P < 0.001) in the morning and 7.2 (95% CI: 6.95–7.45) versus 6.6 (95% CI: 6.43–6.74; P = 0.08) in the evening shifts on Sundays and other days, respectively. Conclusions: There were deficiencies in all categories of ED staff on all days, and this was pronounced on Sundays due to significantly higher patient inflow. Inadequate ED staffing, especially due to a significant dearth of tier-1 physicians is a pointer toward quality compromise in developing EDs. Authors recommend adequate staff deployment in developing EDs for optimum quality care. This should be implemented such that staffing is based on expected patient inflow so that a PPH-per-provider goal of 2.5 is targeted across all shifts.

Keywords: Emergency department overcrowding, emergency department staffing, emergency department workload, Indian emergency department, patient inflow, patient-per-hour, Sundays

INTRODUCTION

Emergency medicine (EM) is a nascent specialty in India, with recent induction of accredited residency programs, namely, Doctor of Medicine (MD) and Diplomate of National Board. Existing literature supports better emergency care delivered by EM trained physicians. However, emergency departments (EDs) worldwide experience operational hurdles such as overcrowding and suboptimal patient care. ED overcrowding as a global phenomenon merits attention as its toll on human lives is silent and unrecognized irrespective of disease etiologies. Overcrowding is a situation where ED function is impeded primarily because the number of patients waiting, undergoing assessment and treatment, or waiting disposition exceeds the physical and/or staffing capacity of the ED. ED workload is attributable to many factors such as patient attendance, case-mix, severe trauma, turnover of emergent, and critically ill patients as represented by immediate (red) and very urgent (orange) levels of Manchester Triage categories or levels 1 and 2 of

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How to cite this article: Madavan Nambiar KT, Nedungalaparambil NM, Aslesh OP. Studying the variability in patient inflow and staffing trends on Sundays versus other days in the academic emergency department. J Emerg Trauma Shock 2017;10:121-7.

Received: 20.11.16. Accepted: 09.03.17.
ED staffing requirement depends on patient turnover, number of subunits in ED, and patient management involving teamwork.[21‑23] Patient turnover may vary with seasons, weekends, and holidays.[24‑25] In contrast to developed countries, staff pattern in most Indian EDs and trauma centers is linear.[6] Resultant mismatch between workload and ED staff availability leading to suboptimal patient care may not be easily quantifiable.[26,27] Nonfunctional outpatient departments (OPDs) and probably nonavailability of physicians in primary care centers on weekends could precipitate ED overcrowding in developing countries where public health systems with limited resources cater to a vast population. Whether the increase in patient inflow on Sundays is significant enough to necessitate the need for extra physicians and nursing staff in the ED is a question to be answered.[28]

Although there are studies in this regard from other countries,[29,30] Indian studies are definitely lacking as most Indian EDs are in infancy. Our study aimed to describe and analyze the variability in patient inflow on Sundays and other days in relation to staff availability in the ED of a public sector tertiary teaching hospital to recommend workforce needs for developing tertiary care EDs.

**METHODS**

This observational study was conducted in the ED of a 1200‑bedded National Highway facing public sector tertiary teaching hospital in Kannur district of Kerala, South India. The 48‑bedded ED provided emergency and trauma care services to patients of all age groups among a population of nearly 5.5 million from four adjacent districts.

The Institutional Research and Ethics Committee approved the study, and informed consent was waived as it did not involve data revealing patient identity. Daily data regarding patients attending ED during the study period were collected from hospital records. Data regarding the attendance of physicians, nursing staff, and nurse assistants in the ED were collected from rosters and cross-checked. Interns and ancillary staff such as radiographers, trolley handlers, security personnel, housekeeping, and central laboratory staff were not included as ED staff though they essentially contributed to ED services. The study period was 2 years from October 1, 2012, to September 30, 2014.

**Statistical analysis**

Data were entered into Microsoft Excel Sheet, and descriptive analysis was carried out. Time of registration to ED at the first point of entry was clocked as patient arrival time and included in the corresponding shifts as “patient inflow.” Patient records were maintained electronically using an indigenously developed software (AMNIS™) in Microsoft Windows platform. The registration of patients occurred almost instantaneously as they were being triaged without any queue or time lag between actual time of arrival and triaging. The ED duty shifts were from 08:00 to 13:59 h (6 h-morning shift), 14:00‑19:59 h (6 h-evening shift), and 20:00‑07:59 h (12 h-night shifts) for physicians, nurses as well as nurse assistants. Hence, the average “patient‑per‑hour” (PPH) was calculated by dividing total patient inflow during a particular shift with the total number of hours in that shift during the period of study. This PPH was used to calculate PPH-per-provider ratios (nurse–patient and doctor–patient ratios).

The study analyzed ED patient inflow and staffing trends on Sundays compared to the remainder of the week. Monday to Saturday was grouped as weekdays in this study, as there were regular outpatient services in all departments of the hospital on these days. Statistical analysis was performed using Epi Info 7.0 Software (developed by CDC, Atlanta, Georgia, USA). Student’s t-test and Kruskal–Wallis test were used to compare patient volume to ED staffing and a P < 0.05 was determined to be statistically significant a priori.

**Hospital emergency department workflow pattern**

The hospital OPDs for all specialties worked from 08:30 to 15:30 h on weekdays and were closed on Sundays. Patients could attend the ED 24 × 7 without prior appointment or referral. The ED had eight subunits with separate areas for triage, resuscitation (red zone), very urgent and urgent cases (green or blue zones), and observation wards for males and females. There were separate designated areas for pediatric, obstetric, and burns patients, trauma care, minor operation theater, splinting and plastering, decontamination, septic patients, corpse area, simulation laboratory, and point‑of‑care laboratory along with a four‑bedded emergency ICU. The ED had facilities for bedside ultrasonography and radiology with picture archiving and communications system facility to view digital radiographic images. Case‑mix consisted of patients with high acuity medical illness, polytrauma, deliberate self‑harm, bites, stings as well as “walk‑in” patients.

**Emergency department staffing**

The ED staff comprised physicians, nurses, and nurse‑assistants. Physicians were classified into either tier‑1 ED physicians comprising ED consultants and senior residents who completed 3 years of work experience in EM after medical graduation and internship and tier‑2 physicians comprising junior residents enrolled in MD program and medical officers who completed internship. Patients were triaged by an intern and a senior nurse as per Manchester five‑level triage categories[8] and shifted to appropriate areas. The red category patients were resuscitated without any time lag by a team of staff as per Advanced Cardiac Life Support or Advanced Trauma Life Support protocol as...
appropriate. Orange and yellow category patients underwent prompt assessment, evaluation, monitoring, and treatment measures in designated areas. Green and blue category patients were initially attended by interns and later evaluated by ED physicians. All patients were examined by tier-1 or tier-2 physicians or both as per availability, investigated appropriately and stabilized. After initial resuscitation and stabilization, patients were retriaged and cross-consultations sought from concerned specialists for admission or disposition. Patients who could be managed by the ED physicians were disposed with treatment and follow-up advice.

RESULTS

Patient inflow pattern
During the study period, a total of 796,899 patients attended the hospital, of which 83,260 patients (10.45%) attended the ED. There was a small increment in patient attendance (1.51%) during the 2nd year of the study [Table 1]. Month-wise distribution revealed a minimum variation in patient inflow throughout the study period [Figure 1]. Average daily patient inflow was 114.1 (95% confidence interval [CI]: 112.42–115.69). Patient volumes were higher during evening shifts (40.4; 95% CI: 39.72–40.98) compared to the morning shifts (37.1; 95% CI: 36.03–38.19) and night (36.6; 95% CI: 36.18–37.12) shifts [Table 2].

Average patient turnover on Sundays (155.9 [95% CI: 152.75–159.05] vs. 107.1 [95% CI: 105.98–108.22]; P < 0.001) were significantly higher (45.6% increase) than on other days [Table 3]. Sundays, in comparison to weekdays had maximum average patient turnover in morning shifts (67.4 [95% CI: 65.41–69.45] vs. 32.1 [95% CI: 31.45–32.70]; P < 0.001) than evening (48.7 [95% CI: 46.91–50.44] vs. 38.9 [95% CI: 38.35–39.58]; P < 0.001) and night shifts (39.8 [95% CI, 38.28–41.33] vs. 36.1 [95% CI, 35.52–36.60]; P<0.001). The increases in patient inflow on Sundays compared to weekdays were by 110% in the morning, 25.2% in the evening, and 10.3% during night shifts. The average PPH was 5.3 (95% CI: 5.21–5.43). The PPH on weekdays was on an average 5.0 (95% CI, 4.94–5.06), whereas on Sundays, the average rose to 7.6 (95% CI, 7.45–7.75). A significant increase in PPH (P < 0.001) was noted for all the shifts on Sundays compared to weekdays [Table 4].

Staffing pattern
On many days, there were no tier-1 physicians available during all three shifts, averaging 0.3 (95% CI: 0.24–0.36) on Sundays and 0.5 (95% CI: 0.48–0.52) on weekdays (P < 0.001). Evening shifts on Sundays were the most affected as the average available tier-1 physician was only 0.1 (95% CI: 0.08–0.21). Tier-2 physicians were more evenly distributed irrespective of weekdays and Sundays, averaging 2.1 (95% CI: 2.05–2.15) in total across all shifts. On an average, there were 4.9 (95% CI: 4.86–4.94) nurses during any shift irrespective of days. The average number of nurses was significantly less on Sundays compared to weekdays during evening (4.9 [95% CI: 4.69–5.04] vs. 5.5 [95% CI: 5.45–5.55]; P < 0.001) and night shifts (4.7 [95% CI: 4.54–4.88] vs. 5.0 [95% CI: 4.94–5.06]; P < 0.001) were significantly higher (45.6% increase) than on other days [Table 3]. Sundays, in comparison to weekdays had maximum average patient turnover in morning shifts (67.4 [95% CI: 65.41–69.45] vs. 32.1 [95% CI: 31.45–32.70]; P < 0.001) than evening (48.7 [95% CI: 46.91–50.44] vs. 38.9 [95% CI: 38.35–39.58]; P < 0.001) and night shifts (39.8 [95% CI, 38.28–41.33] vs. 36.1 [95% CI, 35.52–36.60]; P<0.001). The increases in patient inflow on Sundays compared to weekdays were by 110% in the morning, 25.2% in the evening, and 10.3% during night shifts. The average PPH was 5.3 (95% CI: 5.21–5.43). The PPH on weekdays was on an average 5.0 (95% CI, 4.94–5.06), whereas on Sundays, the average rose to 7.6 (95% CI, 7.45–7.75). A significant increase in PPH (P < 0.001) was noted for all the shifts on Sundays compared to weekdays [Table 4].

Table 1: Distribution of patients in emergency department during the study period

| Period          | 2012-2013 (Year 1), n (%) | 2013-2014 (Year 2), n (%) |
|-----------------|---------------------------|---------------------------|
| Males           | 23,054 (55.8)             | 22,753 (54.3)             |
| Females         | 18,265 (44.2)             | 19,188 (45.7)             |
| Total           | 41,319 (100)              | 41,941 (100)              |

n: Number of patients

Table 2: Average number of patients attending emergency department on all days across various shifts

| Shifts | Patients per day (mean±SD) | 95% CI  |
|--------|---------------------------|---------|
| Morning| 37.1±14.9                 | 36.03–38.19 |
| Evening| 40.4±8.7                  | 39.72–40.98 |
| Night  | 36.6±7.1                  | 36.18–37.12 |
| Total  | 114.1±22.5                | 112.42–115.69 |

SD: Standard deviation, CI: Confidence interval

Table 3: Average number of patients attending emergency department on weekdays and Sundays

| Shifts | Patients on weekdays (mean±SD) | 95% CI  | Patients on Sundays (mean±SD) | 95% CI  |
|--------|-------------------------------|--------|-------------------------------|--------|
| Morning| 32.1±7.9                      | 31.45–32.70 | 67.4±10.4               | 65.41–69.45 |
| Evening| 38.9±7.7                      | 38.35–39.58 | 48.7±9.1                | 46.91–50.44 |
| Night  | 36.1±6.9                      | 35.52–36.60 | 39.8±7.9                | 38.28–41.33 |
| Total  | 107.1±14.3                    | 105.98–108.22 | 155.9±16.4              | 152.75–159.05 |

P<0.05 significant. SD: Standard deviation, CI: Confidence interval

Figure 1: Monthly variation of patient inflow in emergency department during 1st and 2nd years of study
4.9 [95% CI: 4.87–4.95]; P = 0.002). Average number of nurse assistants across all days was 1.9 [95% CI: 1.88–1.92]. However, their numbers decreased significantly on Sundays compared to weekdays during morning (1.7 [95% CI: 1.62–1.8] vs. 1.9 [95% CI: 1.87–1.94]; P < 0.001) and evening (1.8 [95% CI: 1.72–1.88] vs. 1.9 [95% CI: 1.84–1.96]; P = 0.04) shifts [Table 5].

**Patient-per-hour-per-provider**

On comparing PPH per staff category, the number of patients per tier-1 physician (on days when tier-1 physicians were available) was high on both weekdays and Sundays across all shifts. On Sundays, PPH per tier-1 physician was significantly higher in the morning (10.6 [95% CI: 9.95–11.14] vs. 5.4 [95% CI: 5.26–5.59]; P < 0.001) and night shifts (3.3 [95% CI: 3.17–3.52] vs. 3.0 [95% CI: 2.95–3.05]; P < 0.001) though the increase during evening shifts (7.2 [95% CI: 6.95–7.45] vs. 6.6 [95% CI: 6.43–6.74]; P = 0.08) was not statistically significant. PPH per staff was significantly higher on Sundays for tier-2 physicians, nurses, and nurse assistants [Table 6].

**DISCUSSION**

A minimal annual increment in patient inflow (1.5%) was noted during the 2nd year of study. Contrary to a female preponderance (50.8%) found in a Canadian study[31] and in the backdrop of a higher prevalent sex-ratio in

| Shift       | PPH on weekdays (mean±SD) | 95% CI  | PPH on Sundays (mean±SD) | 95% CI  | P*      |
|-------------|---------------------------|---------|--------------------------|---------|---------|
| Morning     | 5.4±1.3                   | 5.24–5.45| 11.2±1.7                 | 10.90–11.58 | <0.001  |
| Evening     | 6.5±1.3                   | 6.39–6.60| 8.1±1.5                  | 7.82–8.41 | <0.001  |
| Night       | 3.0±0.6                   | 2.96–3.05| 3.3±0.7                  | 3.19–3.44 | <0.001  |

*|Test. P<0.05 significant. SD: Standard deviation, CI: Confidence interval, PPH: Patients-per-hour

| Staff category | Duty shift | Staff available on weekdays (mean±SD) | 95% CI | Staff available on Sundays (mean±SD) | 95% CI | P* |
|----------------|------------|---------------------------------------|--------|--------------------------------------|--------|----|
| Tier-1 physician | Morning    | 0.5±0.2                              | 0.42–0.50| 0.2±0.4                           | 0.15–0.31 | <0.001** |
|                | Evening    | 0.6±0.5                              | 0.59–0.68| 0.1±0.4                           | 0.08–0.21 | <0.001** |
|                | Night      | 0.7±0.4                              | 0.69–0.77| 0.5±0.5                           | 0.44–0.64 | <0.001** |
| Tier-2 physician | Morning    | 2.0±0.7                              | 1.94–2.06| 2.1±0.6                           | 1.92–2.21 | 0.3  |
|                | Evening    | 2.2±0.8                              | 2.10–2.22| 2.3±0.9                           | 2.10–2.43 | 0.2  |
|                | Night      | 2.0±0.6                              | 1.97–2.09| 2.0±0.8                           | 1.80–2.10 | 0.3  |
| Nurse          | Morning    | 4.5±0.8                              | 4.47–4.59| 4.7±1.0                           | 4.48–4.85 | 0.12 |
|                | Evening    | 5.5±0.7                              | 5.45–5.55| 4.9±0.9                           | 4.69–5.04 | <0.001 |
|                | Night      | 4.9±0.6                              | 4.87–4.95| 4.7±0.9                           | 4.54–4.88 | 0.002|
| Nurse-assistant | Morning    | 1.9±0.5                              | 1.87–1.94| 1.7±0.5                           | 1.62–1.8 | <0.001 |
|                | Evening    | 1.9±0.4                              | 1.84–1.96| 1.8±0.4                           | 1.72–1.88 | 0.04 |
|                | Night      | 1.9±0.3                              | 1.91–1.96| 1.9±0.4                           | 1.86–2.02 | 0.77 |

*|test. **Kruskal-Wallis test. P<0.05 significant. SD: Standard deviation, CI: Confidence interval

| Staff category | Shift | PPH on weekdays (mean±SD) | 95% CI | PPH on Sundays (mean±SD) | 95% CI | P* |
|----------------|-------|---------------------------|--------|--------------------------|--------|----|
| Tier-1 physician (on available days) | Morning | 5.4±1.4                   | 5.26–5.59| 10.6±1.4                  | 9.95–11.14 | <0.001 |
|                | Evening | 6.6±1.6                   | 6.43–6.74| 7.2±1.3                  | 6.95–7.45 | 0.08 |
|                | Night   | 3.0±0.6                   | 2.95–3.05| 3.3±0.7                  | 3.17–3.52 | <0.001 |
| Tier-2 physician | Morning | 3.1±1.6                   | 3.01–3.26| 6.2±2.5                  | 5.70–6.68 | <0.001 |
|                | Evening | 3.4±1.6                   | 3.32–3.56| 4.1±1.9                  | 3.75–4.50 | <0.001 |
|                | Night   | 1.7±0.7                   | 1.68–1.81| 2.0±0.9                  | 1.84–2.22 | 0.002 |
| Nurse          | Morning | 1.2±0.4                   | 1.19–1.25| 2.5±0.7                  | 2.38–2.66 | <0.001 |
|                | Evening | 1.2±0.3                   | 1.18–1.22| 1.8±0.6                  | 1.64–1.85 | <0.001 |
|                | Night   | 1.1±0.1                   | 1.08–1.13| 2.5±0.8                  | 2.35–2.64 | <0.001 |
| Nurse-assistant | Morning | 3.1±1.3                   | 2.95–3.15| 7.2±2.7                  | 6.71–7.77 | <0.001 |
|                | Evening | 3.1±1.3                   | 2.98–3.17| 6.9±2.4                  | 6.40–7.34 | <0.001 |
|                | Night   | 2.9±1.1                   | 2.81–2.99| 6.1±2.0                  | 5.75–6.53 | <0.001 |

*|Test. P<0.05 significant. SD: Standard deviation, CI: Confidence interval, PPH: Patients-per-hour
Kerala (1084 females per 1000 males), the current study revealed a male predominance among patients attending ED in both the years. This is consistent with the Indian ED study by Tiwari et al. This could be because in India, males involve more in outdoor activities exposing to a higher incidence of accidents, assaults, stings, and bites. Average patient turnover during the 12 h night shifts was lower than that during other shifts. Similar periodic variations with time of day in patient inflow were observed by Tandberg and Qualls. On weekdays, a higher number of patients attending the ED during evening shifts might be due to surge of nonemergent cases after OPD hours, people attending ED after work hours and increased alcohol-related incidents. An increase by 110% in patient turnover in morning shifts on Sundays in comparison to weekdays could be due to lack of routine OPDs in hospitals and peripheries and could be a matter of concern. Schmulewitz et al. found that the staffing and access to diagnostic tests during weekends for emergency patients were lower. Powell et al. observed greater likelihood of early mortality among patients with sepsis admitted through the ED on weekends compared to weekdays. Similarly, Nwosu et al. observed a higher weekend death rates in the labor ward than weekdays in Nigeria. The significantly higher patient inflow on Sundays (45.6%) observed in this study was in stark contrast to a Danish study by Nielsen et al. who found that Monday had the highest inflow while Saturday the lowest, plausibly due to the fact that their ED patients were referred by the general practitioners working only on weekdays. Given the common factor of lack of general practitioners on weekends, this paradox in observations of both studies could possibly be due to more patients attending Indian EDs without proper referral. The current study did not analyze individual weekday flow of patients but considered weekdays as a group since there were OPDs on all weekdays to tackle possible nonemergent patient load.

The average PPH of 5.3 ± 1.2 for all days and an increase to 7.6 ± 0.8 on Sundays in the current study was way above the American College of Emergency Physicians data (1.8–2.2 PPH) for appropriate patient volumes in ED and mean PPH of 2.25 ± 0.25 quoted by Vukmir and Howell. Low number of tier-1 physician per shift on all days reflected scarcity and this along with high PPH per tier-1 physician (on days when available) implied that either a majority of patients were not attended by them during these shifts or the care quality was suboptimal.

Lack of tier-1 physicians in ED could lead to more cases of left before treatment completion, left before being seen, and left against medical advice. The reason for dearth of tier-1 physicians in ED could be linked to fewer accredited EM residency training programs in India and reluctance on the part of physicians from other specialties to accept ED jobs due to their apprehension and lack of training. This also meant that to improve the quality of care, the current ED workflow pattern needed to be redesigned with available tier-2 physicians. Despite significantly higher PPH per tier-2 physician on Sundays, the tier-2 physicians were evenly distributed irrespective of days across all shifts and hence could act as additional physicians in busy shifts. This could help reduce the length of stay of patients in ED, thus reducing overcrowding by early disposition of dischargeable patients without significant effect on patients who needed admission as observed by Bucheli and Martina.

Due to scarcity of trained emergency physicians and paucity of providers, optimizing staffing in relation to patient load is necessary to prevent overcrowding. Unfortunately, there are no published guidelines or policies on the optimum number of PPH-per-provider. American Academy of EM policy statement upholds that an average PPH load of 2.5 per ED physician should not be exceeded for an optimal balance in adequate time for data acquisition, detailed evaluation, and decision-making. Accordingly, authors recommend additional staffing for developing EDs to maintain a PPH-per-provider <2.5. This means that the number of both tier-1 and tier-2 physicians on all days are to be increased, except tier-2 physicians in the night shifts.

The fact that 4.9 ± 0.5 nurses managed eight subunits of ED meant that their average numbers were inadequate. One nurse managing different subunits simultaneously implied a compromise in quality. This may be read in line with a study by Wai et al., who concluded that reducing the number of staff reduced the EDs capacity to provide timely care. The average number of nurses and nurse assistants on duty were significantly lower on Sundays leading to significantly higher PPH per staff. Since this study only took into account patient arrival for PPH calculation, prolonged resuscitation of acutely ill patients and long boarding times would only add to the estimated PPH burden for all categories of ED staff, especially nurses. How would an ED which pulls through such a routine scenario cope up with a possible major incidence or disaster is to be anticipated by policymakers in the field of EM.

**Limitations**

The current study did not analyze other objective measures of overcrowding such as bed ratio (number of patients in relation to the available treatment spaces), acuity ratio (average triage category of all patients in ED), provider ratio (dividing arrivals per hour by sum of the average PPH usually disposed for each provider), demand value or length of stay, boarding, case-mix, severe trauma presentation, or staff skills. This study considered patient arrival for calculating PPH as arrival rates were the most useful metric for evaluating ED crowding as concluded by Friesen et al. However, this calculated PPH may represent far lower values than the actual burden, taking into consideration the acuity of patients and boarding times. As this was a single-center study, some of the facts revealed may not be extrapolated to centers with different management policies.

**Future directions**

Evidence from the current study and other systematic reviews suggest that ED performance can be improved if
adequate demand-based staff are made available. Staffing must be adjusted with expected patient flow on busy days, predictably Sundays as revealed by this study. Extrapolating this inference to other EDs, the staff pattern needs to be nonlinear and in accordance with the individual hospital expected patient inflow variability. As recommended above, additional staffing to maintain a PPH-per-provider <2.5 is the goal to target for developing EDs in countries like India.

In developing EDs, where the demand for qualified emergency physicians (particularly tier-1 emergency physicians) exceeds their availability, authors recommend a revised schedule for realigning physician staffing in ED as proposed by Savage et al.[40] or a lean model of thinking as described by King et al.[41] Streamlining of patients is to be carried out by tier-2 physicians before tier-1 physician attended them in view of scarcity of tier-1 physicians in ED. More operational studies from the developing world are required to frame guidelines to solve the issues of overcrowding and workload-related issues in ED.

Conclusions
Deficiencies in all categories of ED staff on weekdays were significantly more on Sundays. The significantly increased patient inflow on Sundays pronounced the deficiency of ED staff and pointed toward suboptimal quality of care. The unacceptably high PPH-per-provider values and severe dearth of tier-1 physicians in developing EDs are alarming and merit urgent remediation. Adequate staff deployment according to expected patient inflow needs to be ensured in EDs by policymakers. This should be implemented such that a PPH-per-provider goal of 2.5 is targeted across all shifts. Future studies are required to elucidate solutions for problems endemic to EDs globally.

Acknowledgments
- Dr. Suresh G., HOD and Professor, Emergency Medicine, Academy of Medical Sciences, Pariyaram, Kannur, Kerala, for his valuable support in general for this project
- Dr. Bhakti Hansoti, Assistant Professor of Emergency Medicine, Johns Hopkins University, USA and Dr. Suresh Kumar K. K., Associate Professor of Medicine, Temple University, USA, for polishing the manuscript
- Mr. Rameshan, Mr. Prasanth, Mrs. Bindu, Mrs. Sreelatha, Mrs. Gigi, and all staff from the Emergency Medicine Department, Academy of Medical Sciences, Pariyaram, Kannur, Kerala, for helping us collect all data for this study.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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