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RESEARCH ARTICLE

FACTORS ASSOCIATED WITH OVERCROWDING IN EMERGENCY ROOM AT DOS DE MAYO NATIONAL HOSPITAL LIMA - PERÚ

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Abstract

Aim: To determine associated factors related to overcrowding in the emergency room at the Dos de Mayo National Hospital.

Design and Study Population: Analytical, observational, quantitative study.

Variables and Measurements: Demand was determined. Times in triage, admission, medical care, auxiliary tests and stay were measured to assess the efficiency of the processes. Finally, the existing free beds in hospitalization were determined.

Statistical Analysis: Bivariate analysis and multivariate logistic regression were used. $P < 0,05$ was considered significant.

Results: The average age of the patients was 48.79 (SD \pm 19,50). Demand in these last two years has increased around 1.57% monthly and 18.85% annually. The total care time was 286,12 minutes \pm 36.45 (4,76 hours \pm 0.60). The increase in demand (input), and the deficiency of health care processes were not associated with overcrowding, according to bivariate analysis ($p > 0.05$). Contrary, to the output processes, were closely associated with overcrowding according to the multivariate logistic regression analysis. X^2 : 48.46, OR: 18.50, p : 0.00.

Conclusions: The absence of available beds in hospitalization of medicine service is associated with overcrowding, it was found that the availability of less than 8 beds / day in hospitalization rooms leads to 80% overcrowding per day/ month of the emergency room.

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Introduction:-

In the last decade, hospital overcrowding has intensified especially in emergency rooms. Various factors determine the congestion of emergency services, from non-urgent or superfluous cares to unnecessary or inappropriate admissions. The overcrowding of emergencies not only reflects unsatisfactory health care, but also, it leads to legal problems and decrease in the quality of care. Recent publications describe this phenomenon, as a crisis of health systems that happens worldwide, which directly affects the quality and access to health care in emergency services.¹

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Quality of care according to the World Health Organization (WHO), not only leads to the provision of appropriate care to each health problem, but, due to limited resources in developing countries, this should be done at the lowest possible cost, without affecting the opportunity, quality and accessibility to health services.^{2,3,4}

It is postulated that overcrowding is associated with multiple factors: inefficiency in care processes: delayed administrative processes, delayed medical care and inability to discharge patients (stays longer than 48 hours in emergency, unnecessary admissions and low number of hospitalizations in medical wards). The increase in demand does not seem to be a determining factor related to overcrowding according some studies.^{2,4}

The study conducted at Dos de Mayo National Hospital,⁵ reported that 10.22% of emergency hospitalizations were unnecessary, in that same study, unnecessary hospitalizations were greater (49.33%), when the patient was treated as outpatient. In addition, it was found that the possibility of producing an unnecessary hospitalization was eight times greater, when the patient was admitted by an external medical office instead of an emergency room. OR: 8.61 (95% CI: 4.76-15.64).

Overcrowding is not only a national problem; it also occurs in the vast majority of hospitals in the world. In the research conducted by Kellerman A, in hospital emergencies in the USA, reported an increase in demand by 32%, during 10 years of follow-up (1994 to 2004), the demand increased from 90.3 million to 119.2 million, equivalent to 325 000 daily hospital visits. Paradoxically, in that same period, the emergency services that provided care decreased quantitatively by 4.6% from 4,019 to 3,833 emergency services.⁶

A proportion of patients receiving emergency care need to be admitted, but it happens that, hospital beds are constantly occupied either by a low rate of medical discharges, unnecessary admissions, extended stays, among others. In 2003, Asplin B et al, used a consensus of experts and developed a model of 'input', 'performance' and 'output' to describe the flow of patients in the emergency department, as an attempt to systematize and explain the causes of emergency overcrowding. They concluded that the inability to move patients from the emergency service to hospital beds was the most important factor that generated overcrowding. The lack of beds in hospitalization wards was a constant, it mainly, related to the number of reduced discharges on weekends, extended stays and unnecessary hospitalizations. In the investigation carried out in 2011 in the medicine rooms of the HNDM, it was found that between 25.76 and 33.60% of admissions were unnecessary and unjustified,⁸ these unnecessary hospitalizations produced saturation of the medicine wards, block the flow of patients from emergency to hospitalization wards. Additionally, it was determined that the specialties of gastroenterology and hematology were associated with a greater number of inadequate hospitalizations 71.43% and 62.50% respectively.⁹

Hoot and Aronsky, conducted a systematic review regarding emergency overcrowding in the MEDLINE database, in order to determine the possible causes, effects and solutions of overcrowding in emergency units, they reported that the main factors for overcrowding were the care of non-urgent cases, excess in the number of relatives or visitors, prolonged stay of patients and limited availability of beds in hospitalization rooms.¹⁰

Material and Methods:-

An analytical, exploratory, unicentric, observational, quantitative and prospective study was carried out. There were 4538 emergency medical care, during the study period (September 2018), surgical, gynecological emergencies were excluded. A representative sample of the population of 118 cases was obtained, using the formula for stratified sampling for finite sample proportions, with a significance level of 5% and 95% confidence level. The election of the starting number was chosen at random, the following numbers in the sample were extracted using the table of random numbers and the numbers less than four digits were chosen in the total population.

The dependent variable (overcrowding) was dichotomized and was defined as the situation in which demand exceeds supply, measured by the number of beds, stretchers, chairs or additional wheelchairs. The factors related to overcrowding were classified into three groups: admission factors (input), efficiency of emergency processes (triage, admission, care, diagnostic tests and hospital stay) and output (availability of beds in hospitalization, deaths and patients who they left the emergency before receiving medical attention). For the first group, the demand for the emergency was determined and added the proportion of patients who were referred to an emergency from external medical offices. The demand was determined by the number of patients that increased in the last two years and then their monthly percentage growth. In the second group of variables (efficiency of processes), the times that the patient spent in triage, admission, waiting prior to the consultation, time of the medical care itself, time elapsed in

arriving the reports of auxiliary examinations were quantified, in order to, measure the efficiency of emergency care processes. Finally, in order to, determine the outflow or “output”, hospitalization-free beds, percentage of hospitalized, deceased patients and patients who left the emergency before receiving care were measured.

Patients over 15 years old and without age upper limit were included, who went to the topics of emergency medicine and received health care at the Dos de Mayo National Hospital, in addition, accredited their care with the recorded emergency medical history in the emergency service database. Pediatric patients (with a pediatric emergency), gynecological, traumatological and surgical patients and patients with an incomplete medical history that made it impossible to specify the nature and behavior of the variables were excluded.

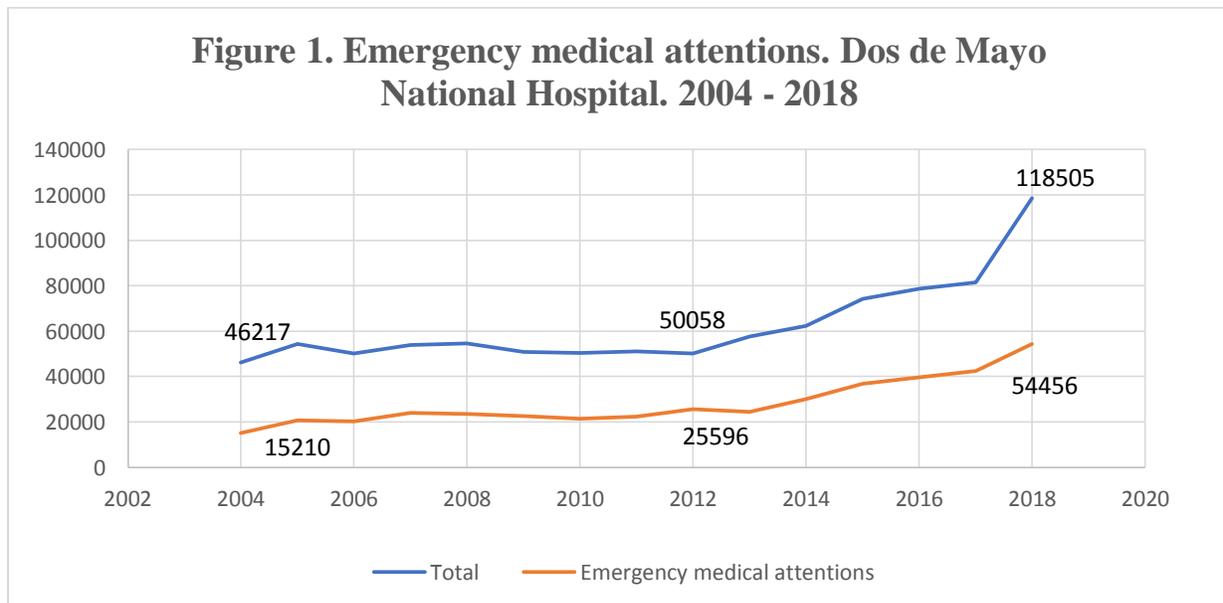
The data collected were entered into a database in SSPS version 24, for their respective tabulation. To determine the normality of the variables the Kolmogórov-Smirnov test was used, in addition, statistical tests of central tendency and dispersion were used. Tables of relative and absolute frequency were constructed for the presentation of the results. The association between qualitative variables was processed using the Chi square (X^2) and the Pearson correlation test respectively. A value of $p < 0.05$ was considered significant. To identify the associated factors, a bivariate analysis was initially performed and then the statistically significant findings were analyzed with the step-by-step multivariate logistic regression model.

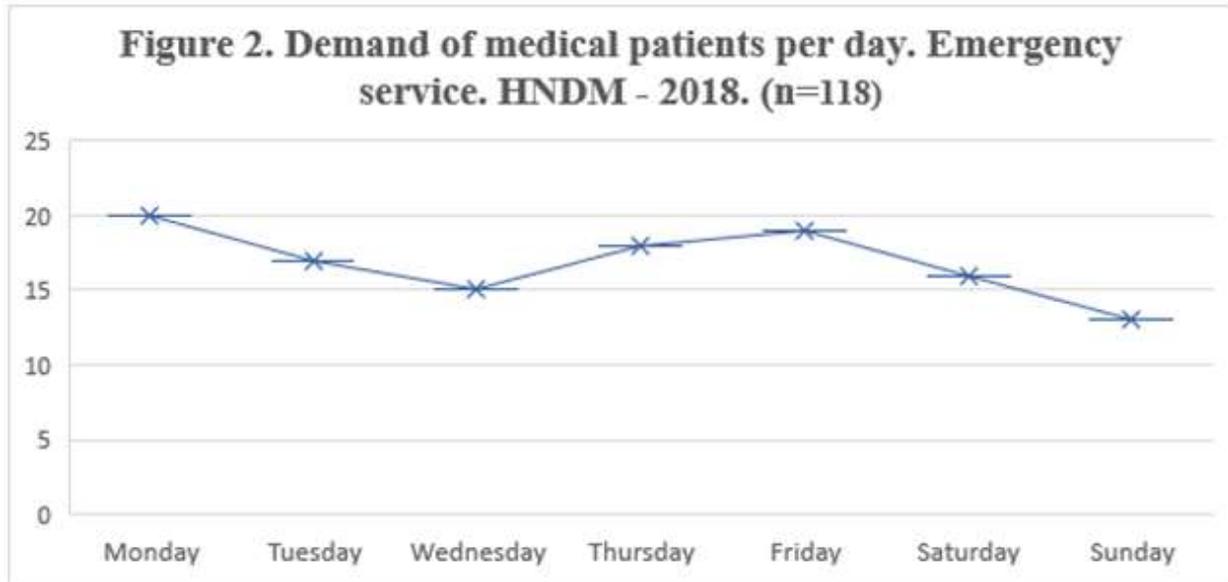
Results:-

In the last three years (2016-2018), the total demand for patients in the emergency service of the Dos de Mayo National Hospital has increased by around 1.57% per month and 18.85% annually (Figure 1). Specifically, in the topics of medicine the increase in demand was from 42 542 to 54 456, that is, 28% in 2018.

During 2018, 118,505 attentions were performed, during the study period (September 2018), 9551 attentions were made in the different topics of Medicine, surgery, traumatology, gynecology and obstetrics and shock trauma. Of which 4091 corresponded to medicine station and 447 to the fast care module making a total of 4538 attentions (47.51%), of the total emergency care.

The average age of the patients was 48.79 SD: ± 19.50 , median 49 and range of 77 (15-92). The female population was 54.20% (64/118) and the male population 45.80% (54/118). 39% of patients come in the morning shift, 37.30% in the afternoon shift and 23.70% in the night shift. The greatest demand occurred on Monday and Friday, but they follow an undulating pattern with increase on the first and second day of the week, decreases on Wednesday, to increase again on Thursday and Friday and decrease on Sunday (Figure 2).



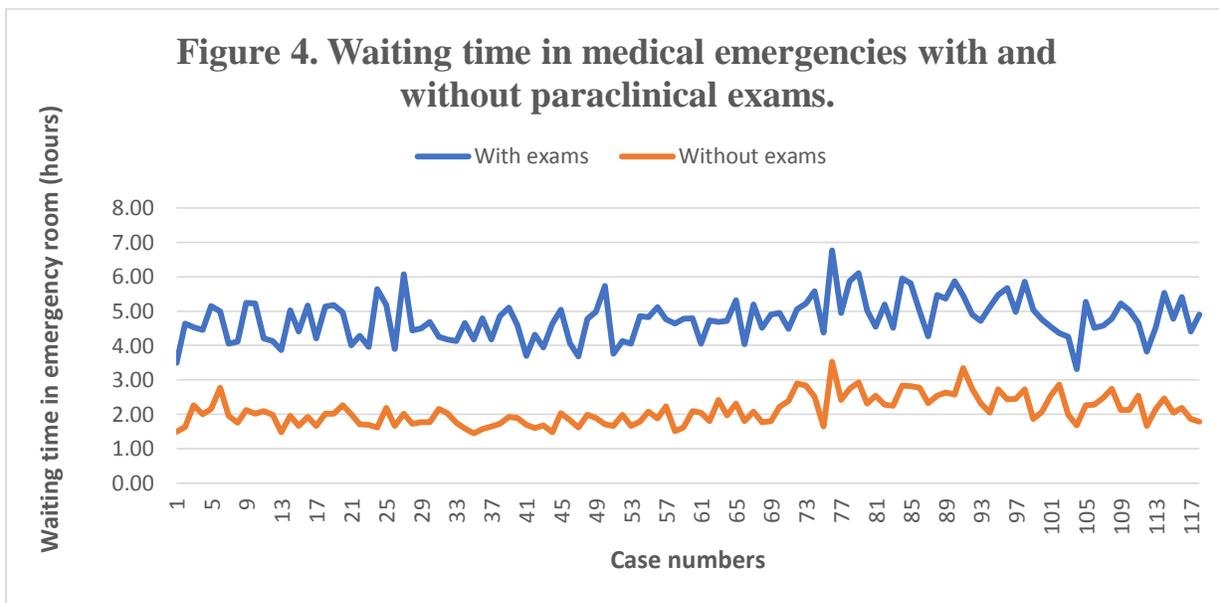
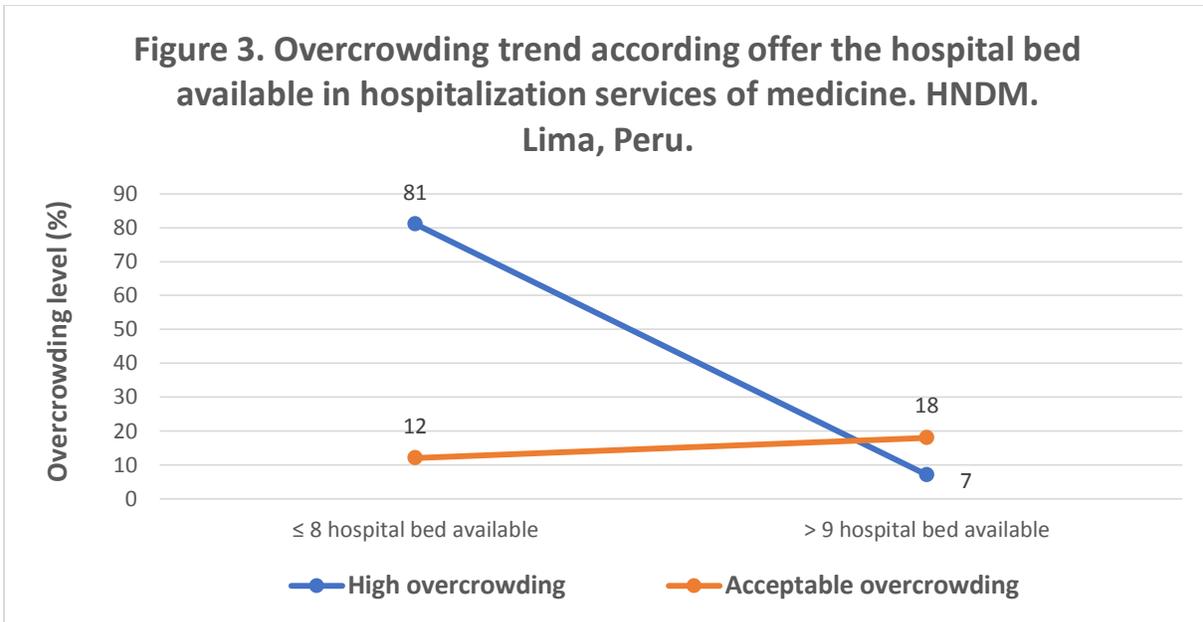


71.2% of the health care were priority II, 7.6% priority III, 18.6% priority IV, and 2.5% priority I. The average of patients who are referred from outpatient clinic was 3.86 ± 1.80 patients per day, the mean was 4, mode 2, with a range of 1 to 7, the days that derived the greatest number of patients were Monday and Friday, with no significant difference compared to the rest of the days. ($p: 0.19$).

The average time that the patient takes in triage was 19.89 minutes SD: ± 6.61 , ranging between 10 and 42 minutes. Admission delay time ranged from 12 to 54 minutes, with an average of 24.86 SD: ± 7.88 , mean of 24 and mode of 21-minutes. The waiting time before receiving care was 43.88 minutes SD: ± 22.42 with a minimum of 16 and a maximum of 125 minutes, mean of 37 and mode of 27 minutes. The average duration of the consultation fluctuated between 23 and 64 minutes, with an average of 38.55 ± 7.93 minutes, with 38.55 and 37 of mean and mode respectively. The average time needed to obtain the results of the auxiliary exams was: 160.07 minutes SD: ± 29.09 (range 90 to 243 minutes), median of 163.50 min and mode of 164. The average total time Attention in the hospital was 286.12 minutes ± 36.45 (4.76 hours ± 0.60), median 286.5, mode of 287, minimum of 199 and a maximum of 406 minutes, before go to pharmacy to pick up his recipe. 61.00% (72/118) of patients remained in the emergency service waiting for hospitalization for more than 24 hours, 27.70% (31/118), for more than 48 hours and 12.16% (15/118), for more than 72 hours. According to the bivariate analysis, the increase in demand, prolonged stay in emergency observation and the relative deficiency in the care processes were not associated with overcrowding ($p > 0.05$).

The multivariate analysis through logistic regression step by step forward, reported as the main factor associated was the insufficient availability of hospital beds in medical services. ($X^2 48.46$ OR: 18.50 $p: 0.00$). 80% overcrowding / day / month was found, when hospitalization rooms had ≤ 8 beds per 12-hour day shift, when this occurred, the likelihood of overcrowding was 18 times more than when medical services offered > 9 beds per shift. Likewise, a significant and marked decrease in the trend and overcrowding probability of 80% to 10% was observed. On the contrary, when a number greater than 9 empty beds were available in hospitalization services, the tendency to overcrowding does not stop, but it rises very gradually forming an almost flat and irrelevant trend curve, reducing overcrowding by around 60% (Figure 03).

The average time to obtain the auxiliary exams was 2.7 hours (1.5 to 4.05 hours), the absence of paraclinical examinations in the evaluation of patients, reduced the average total time of care by about 50% from 4.7 to 2.7 hours. (Figure 04).



Discussion:-

In the last decade, the demand for medical emergency care at the Dos de Mayo National Hospital has increased by around 50%. Figure 1, shows the trend of this phenomenon of demand growth from 25,596 attentions in 2012 to 54,456 in 2018. In addition, there was an increase of 1.57% monthly and 18.85 annual in the last 2 years. The analysis, perhaps, could make us think that hospital congestion is simply due to an increase in demand, it is likely that this increase is associated with overcrowding, but various investigations have so far demonstrated no association.^{6,10}

The average age found was 48.79 ± 19.50 (range 15 to 92), this population relatively young, generally with low pluripatology and early emergency discharge, was not an associated factor significant for overcrowding ($p > 0.05$), probably, due to most of them were quickly discharged without sophisticated paraclinical exams. These results differ from those found by Vasquez et al, at E. Rebagliati M hospital, which found an average of 60 years in patients who

came to the emergency, obviously with more comorbidity, more complex diseases, which required further diagnostic studies.¹¹

The emergency overcrowding began to be described in the 60s, but, the installed capacity of the emergency services allowed some "inefficiency" of the processes, due to this, overcrowding was an irrelevant problem that went unnoticed. In recent years, several investigations were carried out to study this phenomenon, some of them, ruled out as an overcrowded cause, to the inadequate infrastructure and inefficiency of the processes (performance), rather, they found that overcrowding was associated with the absence of hospital beds to discharge the emergency. That is, hospitalization rooms would not be complying with optimizing the outflow of patients. Therefore, it is mentioned that emergency congestion is not only the responsibility of the emergency services, but also, of the whole hospital. Emergency services have been forced to adapt to congestion, relocating and increasing the number of professionals, optimizing triage, creating rapid health care modules, but despite this, the evaluation and care of many patients is carried out in waiting room or in the halls.¹² So, if this is current knowledge, why is it only recharged to an emergency and not to other hospital services? The study by Viccell et al. reported that the hospitalization services of medicine could collaborate in mitigating overcrowding, treating patients in the corridors and waiting rooms of their services, the authors demonstrated that this managerial attitude is feasible and safe.¹³ and not only that, but in the survey conducted by Garson C. et al, at patients in overcrowded emergency units, revealed that they preferred to be in corridors of the hospitalization services than in the emergency passageways.¹⁴

While hospital administrators do not recognize that overcrowding of emergencies is really a congestion of the hospital, this problem will continue without a solution and far from addressing the underlying issues.¹⁵ it should be noted that the problem is international, most countries report congestion in emergencies, except for Scandinavian countries where it is rare to find overcrowding, probably, due to the strengthening of the primary care system and greater social awareness.¹⁶

The performance of the emergency processes was not found consistent with "4-hour rule" what was proposed by some countries as the standardized time to terminate the care of an emergency patient. According to this, the objective is to have attended and resolved in this period of time 98% of emergency consultations.¹⁷ the total average time used by patients in our series was 4.7 hours, despite being for Above the standard average, it was not associated with overcrowding in the bivariate and multivariate analysis, this could be related to the resolving capacity of the health team through adaptation and ability to satisfactorily meet the demand of growing patients with limited resources. Auxiliary exams consume an average of 2.66 hours (1.5 - 4.05) of the medical care. This means that the patient stays from 3:32 to 7:17 hours in emergency, congesting the service. The growing tendency to excess paraclinical examinations was reported by Tudela & Modol, who reported this attitude, such as the practice of a defensive medicine, that is, clinicians feel pressured to perform complementary examinations, of low clinical suspicion, with the consequent slowdown and increasing the assistance process.^{18,19} Other times, doctors are quick to request extra auxiliary exams, in order to avoid physical, verbal or legal medical problems. In our investigation, we found that, by improving the clinical diagnostic ability, some complementary examinations could be skipped and the patient quickly discharged from the emergency, reducing the time of stay not only of the same patient, but also, of relatives in the hospital corridors and concomitantly improving the satisfaction of the health users.

Ours conclusion is that the absence of available beds in hospitalization of medicine is the main factor associated with overcrowding, the availability of less than 8 beds / day in hospitalization rooms leads to 80% overcrowding / day / month in the emergency service. We recommend that, the internal medicine services of the Dos de Mayo Hospital should offer at least two free beds / day exclusively for emergency use, to avoid overcrowding in an emergency. This offer of beds must be greater than 2 on Monday, Thursday and Friday because they are the days of greatest demand for medical emergencies.

Complementary examinations must be requested prioritizing the clinical diagnosis to initiate the therapy, they must be requested when they are strictly necessary and the minimum relevant, in order to, reduce the total attention time by about 50%, with this, probably, we would can reach standardized time for emergency patient care "4-hour rule". Due to, overcrowding is not only a problem of emergency services, but also, of the whole hospital, internal medicine services should be involved in the solution of emergency overcrowding, because they represent the main outflow of the care process of medical emergencies.

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