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The influence of crowding on clinical practice in the emergency department

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ABSTRACT

Background: This study aimed to clarify the association between the crowding and clinical practice in the emergency department (ED).
Methods: This 1-year retrospective cohort study conducted in two EDs in Taiwan included 70,222 adult non-trauma visits during the day shift between July 1, 2011, and June 30, 2012. The ED occupancy status, determined by the number of patients staying during their time of visit, was used to measure crowding, grouped into four quartiles, and analyzed in reference to the clinical practice. The clinical practices included decision-making time, patient length of stay, patient disposition, and use of laboratory examinations and computed tomography (CT).
Result: The four quartiles of occupancy statuses determined by the number of patients staying during their time of visit were <24, 24–39, 39–62, and >62. Comparing >62 and <24 ED occupancy statuses, the physicians' decision-making time and patients' length of stay increased by 0.3 h and 1.1 h, respectively. The percentage of patients discharged from the ED decreased by 15.5% as the ED observation, general ward, and intensive care unit admissions increased by 10.9%, 4%, and 0.7%, respectively. CT and laboratory examination slightly increased in the fourth quartile of ED occupancy.
Conclusion: Overcrowding in the ED might increase physicians' decision-making time and patients' length of stay, and more patients could be admitted to observation units or an inpatient department. The use of CT and laboratory examinations would also increase. All of these could lead more patients to stay in the ED.

1. Introduction

According to a task force report from the American College of Emergency Physicians in 2008, emergency department (ED) crowding is generally defined as occurring "when there is no space left to meet the timely needs of the next patient who needs emergency care" [1]. In addition, since the first article discussed ED crowding about 25 years ago [2], issues that pose a potential threat to patient health and public safety must be confronted urgently [3]. Various studies have been published in the past few decades regarding the association between ED crowding and patient outcomes, and most of them revealed an unfavorable result [4-8]. Sion et al. also found that increased mortality among admitted critically ill patients is associated with ED crowding [6]. Sun et al. described that periods of high ED crowding are associated with increased inpatient mortality, length of stay (LOS), and costs for admitted patients [9]. ED crowding also affects patient satisfaction. Pine et al. described that poor ED service experience, measured by ED hallway use and prolonged boarding time, are adversely associated with ED satisfaction and even predict lower satisfaction with the entire hospitalization [10]. ED crowding was also associated with worse patient perceptions of clinician-patient communication, and poor communication may further increase the risk of adverse physiologic outcomes [11].

In addition to patient outcomes and satisfaction, ED crowding might also influence the clinical practice of emergency physicians (EPs). Some studies have discussed ED crowding in association with compromise of medical behavior [12-14]. One study that was conducted in Cincinnati suggested that ED crowding is associated with a delay in the reassessment of critically ill pediatric patients [15]. Another study also described that there is an association between ED crowding and delayed administration of analgesia in patients presenting with acute abdominal pain [16]. According to our experience, EPs might increase the use of diagnostic tools such as laboratory examinations or imaging studies due to the lack of time for complete physical examinations and giving patients instruction, but EPs could also decrease the use of diagnostic tools to facilitate patient disposition. To clarify this problem, we investigated the association between ED crowding and three clinical parameters: clinical

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Table 1
Demographics of the patients.

		1st quartile	2nd quartile	3rd quartile	4th quartile	*P* value
Age		58.1 ± 18.57	57.1 ± 18.88	56.8 ± 19.07	57.1 ± 19.17	<0.001
Male		8960 49.8%	8496 49.6%	9305 52.0%	9021 52.5%	<0.001
Urgent		3521 19.6%	3644 21.3%	4335 24.2%	4505 26.2%	<0.001
Hospital	Northern	2125 11.8%	5853 34.1%	13,885 77.6%	17,098 99.4%	<0.001
	Southern	15,859 88.2%	11,287 65.9%	4014 22.4%	101 0.6%	

efficiency, diagnostic tool use, and patient disposition, which have been used to evaluate the clinical practice of EPs before [17]. The aim of this study was to clarify how ED crowding influences the clinical practice of EPs.

2. Materials and methods

2.1. Study design

This was a retrospective 1-year cohort study approved by the institutional review board of the Chang Gung Medical Foundation. All patients' and physicians' records and information were anonymized and de-identified before analysis.

2.2. Study setting and participants

This study was conducted in two EDs of the tertiary referral medical centers located in northern and southern Taiwan separately. The total bed capacity of these two EDs were 80 and 60, and total beds of observation room were 160 and 148, respectively. An observation room was set up for short stay to follow up clinical changes or status upon hospital admission. The inpatient beds are >3500 and 2500 in the two hospitals.

From July 1, 2011, to June 30, 2012, all adult non-trauma patients who presented to the EDs during the day shift were included in the analysis. The day shift in the two EDs comprised of 8 h corresponding to the emergency physicians' working hours, which was 7:00 to 15:00 and 7:30 to 15:30, respectively. The attending physicians should complete all day-shift patients' disposition (including discharge, hospital admission, or ED observation room admission).

In both EDs, three attending physicians were in charge in the day shift. As all study sites were teaching medical units, residents assisted in the treatment of ED patients under an attending physician's supervision. Overall, 76 full-time attending physicians were involved in this study, 59 and 17 for each medical center.

2.3. Measures

The ED occupancy status was used to measure crowding. Patients were grouped into four occupancy statuses based on the number of patients staying in ED during their time of visit and divided into quartile [4,18]. The main analysis involved the differences of clinical practice in reference to these four occupancy statuses. The patient demographic and clinical information were drawn from the ED administrative database. All ED visits were classified into different disease acuities based on Five Level Taiwan Triage and Acuity Scale (TTAS), which is a commonly used triage system formulated by the Department of Health in Taiwan [19]. According to the TTAS, patient acuity were determined based on their initial vital sign (heart rate, blood pressure, respiration rate, oxygen saturation) and chief complaints. For example, a patient presenting dyspnea with unstable vital sign would be determined as triage 2, or even triage 1, if immediate resuscitation is needed. Based on these criteria, patients identified as triage levels 1 and 2 should be seen immediately or within 10 min, respectively, and are defined as urgent. Patients with triage levels 3, 4, and 5 should be assessed within 30, 60, or 120 min, respectively, and are classified as non-urgent. The patient diagnosis were divided into six categories, i.e., neuromuscular (ICD-9-CM: 320–389 and 430–438), gastrointestinal (ICD-9-CM: 520–579), genitourinary (ICD-9-CM: 580–629), respiratory (ICD-9-CM: 460–519), cardiovascular (ICD-9-CM: 390–429 and 439–459), neoplasm (ICD-9-CM: 140–239) diseases. The clinical practices were divided into three parts, including clinical efficiency, patient disposition, and diagnostic tool use. The clinical efficiency was further divided into decision-making time of EP (the time interval between the patient registration and the EP completing the disposition decision) [20] and ED LOS (the time interval between patient registration and patient leaving ED). Patient disposition was categorized into ED discharge, ED observation (admission to ED observation unit), general ward admission,

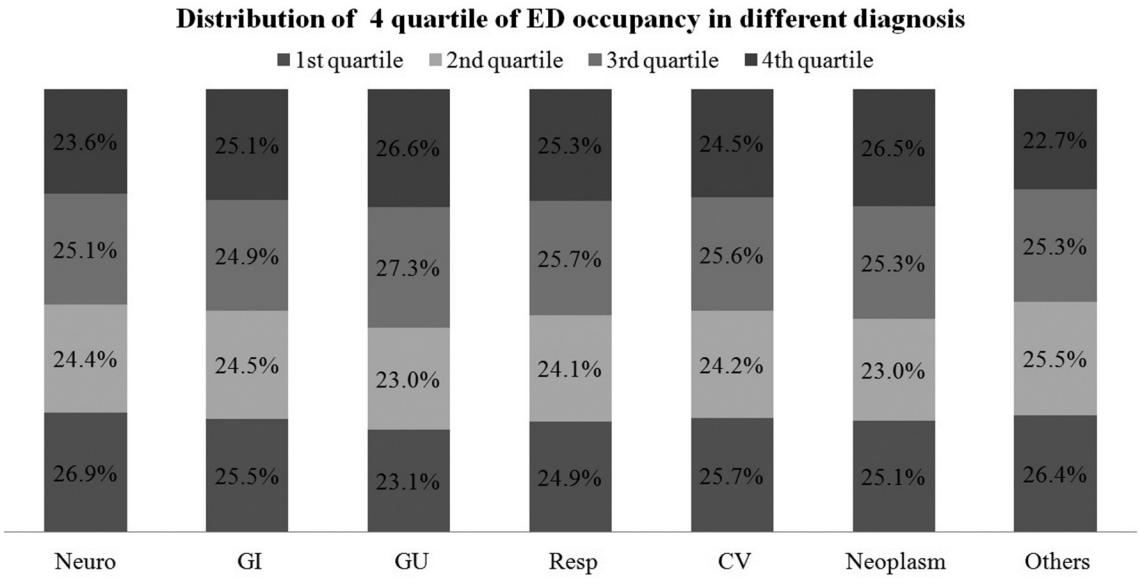

Fig. 1. The distribution of 4 quartile ED occupancy in different diagnosis ($p < 0.001$) Abbreviation of the diagnosis: neuromuscular disease (Neuro), gastrointestinal disease (GI), genitourinary disease, respiratory disease (Resp), cardiovascular disease (CV), disease of neoplasm (Neoplasm) and others.

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