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Emergency Department Overcrowding and Its Potential Impact on Care Processes: A Literature Review

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ABSTRACT Emergency department overcrowding was a obstacle of providing timely and effective care in emergency department. This condition had negatively impact on many aspect of care process. There were different finding related to impact of emergency department overcrowding in care process. The aim of the study was to analyze research articles that discusses emergency department overcrowding and its potential impact on care process. The study was literature review using database journal resources from PubMed, Proquest, and ScienceDirect. Emergency department (ED), Overcrowding, and impact we used as keyword. Inclusion criteria of the study were original article, Published at 10 years later (2012-2022), written in english language, focus on patient, staff, or health care system level. Whereas, the exclusion criteria were overcrowding because of other condition (endemic or infection disease), and not focus on patient, staff, or health care system. 9 selected articles that met inclusion criteria were analysed based on author, years, title, and main idea of the study. The finding of the study were emergency department overcrowding had negatively impact on care process including patients, staff, and healthcare system. Impact on patients including increasing mortality and admission rate, impact on staff including increasing workload and non-adherence for practicing best guidelines, meanwhile impact on healthcare system including inappropriate triage process and increasing Length of Stay (LOS). Need an effort to decrease impact of ED overcrowding especially on patient, staff, and healthcare system. The result of the study could be used as considering to formulate an effort to reduce impact of ED overcrowding by controlling patient, staff, and healthcare system factors

INDEX TERMS overcrowding, emergency department (ED), literature review

I. INTRODUCTION

Emergency department was a front of hospital healthcare that expected to provide timely and effective care [1]. However, implementation of effective care in emergency department was very complex and difficult, it depended on many factors as causes. The one is overcrowding [2]. Emergency department overcrowding was defined as condition when increasing need for emergency services exceeds available resources in emergency department or hospital [3,4].

Emergency department overcrowding was one obstacle factors in caring processes of patients [4]. Ireland, Canada, and Australia had been experiencing significant and sustainable increases in emergency department performance and enhancing number of visiting patients as manifestation of emergency department overcrowding [5]. In United States, there were increasing of visiting patients in emergency department was about 131 million in 2012, from which 14,5 million (11%) had in hospital admission, meanwhile 13% of patients number were carry out into intensive care unit because

of deteriorate condition. In South Korea, there were increasing emergency department visiting patients up to 4,9 million patients in 2012, from which 995.326 patients (20%) in hospital admission because of deteriorate condition [6].

Emergency department overcrowding had effect on decreasing quality of healthcare services, such as delaying medication time [7], increasing mortality rate of admitted patients [8,9]. Other effects were prolonged waiting times for triage and treatment [10], decreasing patient satisfaction[11], and hospital profit loss [12].

There were some different finding related to impact of emergency department overcrowding in care process [13]. Previous studies proved that emergency department overcrowding effect on three aspects including patient, staff, and healthcare system level [14]. Some studies proved that impact on patient including delaying getting health care and increasing inpatient mortality [15], other studies focused on

healthcare system impact including ineffective triage process and increasing Length of Stay (LOS) [16,17].

Based on patient effect, there were contradicted finding related to impact of ED overcrowding on patient [18]. Some studies reported that increasing inpatient mortality was not correlation with emergency department overcrowding [19,20]. Increasing inpatient mortality was happened because of their disease severity (majority on patient with Acute Coronary Syndrome (ACS) [21]. But other study reported that emergency department overcrowding had impact on increasing rate events of cardiovascular patients with both acute coronary syndrome (ACS) and non-ACS related to chest pain admitted to emergency department [22].

Based on health care system, there were also contradicted findings related to impact of ED overcrowding to health care system. Some study proved that ED overcrowding impact to timing and modality of triage process, there was increasing waiting time for first triage process conducted, so it impact on delaying diagnosis and initiation of treatment [23]. But other study proved that triage processes including timing and triage decision were not depended on condition of ED (overcrowding), but depended on ED resources and patient severity condition [24].

The findings of the study was emergency department overcrowding negatively had impact on patient, staff, and healthcare system level. Impact on patient including increasing mortality and admission rate. Impact on staff were increasing workload and non-adherence for practicing best guidelines. and impact on healthcare system including triage process and Length of Stay (LOS). Based on this phenomenon, the researcher intent to identify several recent articles related to impact of ED overcrowding on care process using articles that publish at least 10 years recent (2012-2022). The study goal was to examine integrative studies related to impact of ED overcrowding on patient, staff, and health care system.

II. MATERIAL AND METHODS

Study design was literature review using PRISMA approach that consisted of four steps including identification, screening, eligibility, and included. Identification was searching articles from journal databases sources. This study using PubMed (MEDLINE), Proquest, and ScienceDirect to identify articles based on title/ abstract that same with the purpose of the study. In this section, we found 122 articles from pubmed (n=12 articles), ScienceDirect (n=90), and Proquest (n=20). After the title/ abstract identified , the articles that duplicated were excluded (n=14).

The second steps was screening. In this study, there were 108 articles available based on quality of article components including title, abstract, introduction, methods, result, discussion, and other information. Using manual screening, there were 48 articles excluded related to low level of study. 60 articles reviewed because of met standart as PRISMA considered. The third step was eligibility. In this section, there were 24 articles reviewed were excluded because of non specific discuss about ED overcrowding, whereas 12 articles accessed based on inclusion criteria. Inclusion criteria of the

study were original article, articles in english language, Publish at 10 years later (2012-2022), discuss specific impact of ED overcrowding on patient, staff, or health care system level. Whereas, exclusion criteria were not original article, overcrowding because of other contributed factors (endemic or infection disease), not focus effect on patient, staff, or health care. The last step was article included. There were 9 articles were selected because met inclusion criteria and eligible to analyse. The process of searching articles be presented in **FIGURE 1**.

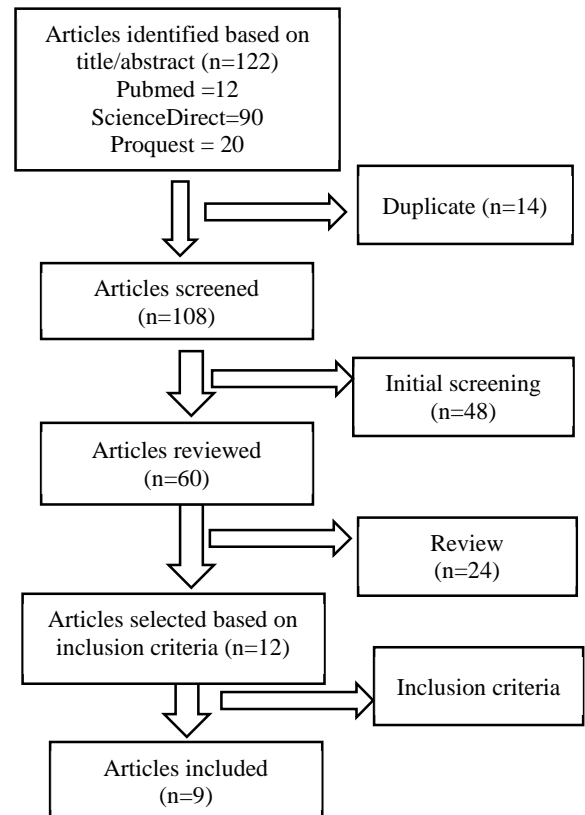


FIGURE 1. Data Selection Process From Journal Database

III. RESULTS

Based on result of the articles that had been analysed, we classified or categories articles into year of publish, place of aticles publish, and main idea of articles. Based on year of publish, majority articles (7 articles) were publish at 5 years later (2018-2022), and 2 articles was published between 2012 to 2017. Based on place of published, majority articles were published in USA (3 articles), followed by Canada (2 articles), Sweden (1 article), Netherland (1 article), South Korea (1 article), and Saudi Arabia (1 article). Based on main idea of the study, majority studies discusses about impact of ED overcrowding on patients (4 articles), healthcare system (3 articles), and staff (2 articles). The summaries of articles had been analysed and presented in **TABLE 1**.

TABLE 1
Summaries of Article about Emergency Department and Its Impact on Care Process

Author	Title of article	Country	Main idea of the study (Result)
Castner & Suffoletto (2018) [25]	Emergency Department Crowding and Time at the Bedside: A Wearable Technology Feasibility Study	New York (USA)	<ol style="list-style-type: none"> 1) Emergency department overcrowding impact on increasing physician- patient contacting time 2) There were no correlation for (patient gender, triage acuity level, shift at arrival, disposition to home, or discharge diagnosis category) with increasing physician- patient contacting time
Chen et al. (2020) [26]	The effects of emergency department crowding on triage and hospital admission decisions	USA	<ol style="list-style-type: none"> 1) There were significant correlation between ED overcrowding with triage or disposition decision 2) Increasing ED occupancy was found on patient with higher level of triage acuity and hospital admission
Connor et al. (2014) [27]	Evaluating the effect of emergency department crowding on triage destination	Canada	ED overcrowding impacted on changing triage destination (need more long time for triage, many patient not to be triaged), more longer for investigation, and increasing number of unscheduled patient return to ED
Khutbani et al. (2020) [28]	Association between Emergency Department Overcrowding and Mortality at a Teaching Hospital in Saudi Arabia	Saudi Arabia	<ol style="list-style-type: none"> 1) There were correlation between ED overcrowding with mortality rate of ED patients 2) There were increasing number of mortality patient in ED during overcrowding (38%) that dominated patient age (30-44 years), 60 and 74 years old 3) Highest number of patients was dominated by patient triage at level four (62,7%), and level five (33,1%) 4) There were increasing admission rate during ED overcrowding
Jung et al. (2021) [29]	The effect of overcrowding in emergency departments on the admission rate according to the emergency triage level	South Korea	<ol style="list-style-type: none"> 1) Level of ED overcrowding was dominated by high level (34%), low level (33,9%), and normal level (32,1%) 2) There was correlation between ED overcrowding with patient admission rate 3) Increasing admission rate was experienced by patient triage with high level (4,5)
Linden et al. (2016) [30]	Emergency department crowding affects triage processes	Netherlands	<ol style="list-style-type: none"> 1) ED overcrowding impacted on triage process (more prolonged time for triage) and increasing od ED <i>Leng of Stay</i> (LOS) 2) ED overcrowding did not effected to triage destination 3) Triage process was not effective during overcrowding (time for triage more often elapsed, and more patients were not triaged)
Ouyang et al. (2022) [31]	The impact of emergency department crowding on admission decisions and patient outcomes	Canada	<ol style="list-style-type: none"> 1) ED overcrowding had positive correlation with patient admission and physician workload 2) ED overcrowding had negative correlation with number of boarding patients 3) There was positive correlation between patient readmission 7 days after hospitalization with number of boarding patients
Berg et al. (2019) [32]	Associations Between Crowding and Ten-Day Mortality Among Patients Allocated Lower Triage Acuity Levels Without Need of Acute Hospital Care on Departure From the Emergency Department	Sweden	<ol style="list-style-type: none"> 1) There was positive correlation between ED overcrowding with 10 days mortality rate 2) Higher mortality was found on patient with aged 80 years or older (51%) and triage with acuity level 3 (63,3%) dan had greater comorbidity 3) Increasing 10 days mortality was found on patient with ED LOS greater than or equal 8 hours 4) Majority ED occupation was found in ratio quartile 2,3, dan 4
Abir et al. (2019) [33]	Evaluating the impact of emergency department crowding on disposition patterns and outcomes of discharged patiets	USA	<ol style="list-style-type: none"> 1) ED overcrowding effected to decreasing of patient hospitalization, but enhancing patient discharging 2) There was increasing number of patient return to ED after 2 weeks with deteriorate condition

IV. DISCUSSION

A. IMPACT OF EMERGENCY DEPARTMENT OVERCROWDING ON PATIENT

Based on patient mortality rate, study result showed that there was correlation between emergency department overcrowding with mortality rate of ED patients [28,34,35]. There were increasing number of mortality patient in ED during overcrowding. This result was contradicted with other study that increasing mortality patients do not directly happened because of ED overcrowding, but also effected by increasing Length of Stay (LOS), patients age, and level of triage acuity [22,36,37]. Increasing 10 days mortality was found on patient with ED LOS more than or equal 8 hours, with age more than 80 years old, and triage with level acuity 3 [38]. Increasing mortality patient in emergency department was primarily affected by overcrowding and other contributed factors (patients age and severity condition).

Based on patient admission rate, there was correlation between emergency department overcrowding with patient admission rate [29,39,40,41]. There were increasing patient admission rate during overcrowding that dominated by patient with triage level acuity 4 and 5. This result was contradicted with other study that emergency department overcrowding had impact on increasing patient discharging, not patient admission [32,42,43]. When overcrowding in ED, patient with triage high acuity at level 4 and 5 was discharged without any early treatment in ED, finally the patient would return to ED after 2 weeks with deteriorate condition [32,44]. Increasing incidents of patients admission in emergency department was primarily affected by overcrowding and other contributed factors (patients triage level acuity and finally decision by physician).

B. IMPACT OF EMERGENCY DEPARTMENT OVERCROWDING ON HEALTH CARE SYSTEM

Based on triage process, the study result proved there was significant correlation between ED overcrowding with triage or disposition decision [26,45,46]. There were increasing patient with higher level of triage acuity (at level 4,5) during ED overcrowding [47]. The result was similar with other study that ED overcrowding impact on changing triage destination [27]. There were changing of triage process when ED overcrowding (need more time to initiate triage, many patients not to be triaged). Whereas, other study proved that ED overcrowding did not effect on triage destination, but effect on Length of Stay [30,48,49]. Triage process could not conducted optimally during overcrowding, many patient directly to treated or discharging by the physician [50]. So implementing of triage process when ED overcrowding was not effective without any supported by number and quality of staff ED (physician and nurses).

Based on Length of Stay (LOS). The study found that there was correlation between ED overcrowding with Length of Stay (LOS) [30,51,52]. There were increasing LOS both in emergency department and hospital ward during overcrowding [30,53]. Whereas, other study proved that increasing Leng of Stay (LOS) was happened related to patient disease complexity and other comorbidity [29,54,55]. Patient with severe condition need more long time for

treatment and other diagnostic test, so this condition tend to increasing Length of Stay (LOS) in emergency department [56]. Increasing LOS both in emergency department and hospital ward affected by overcrowding and other factors (patient disease complexity and other comorbidity).

C. IMPACT OF EMERGENCY DEPARTMENT OVERCROWDING ON STAFF

Based on workload, there was correlation between ED overcrowding with ED physician workload [31,57,58]. There were increasing of physician workload while ED overcrowding. Increasing physician workload was also related by increasing of patient admission that dominated by patients with high level acuity (triage at level 4 and 5) [29,59,60]. The result was similar with other study that ED overcrowding made increasing time of contacting between patient- physician that effected to workload, but there were also supported by other contributed factor including patient gender, triage acuity level, shift at arrival, disposition to home, or discharge diagnosis category [25,61,62]. Based on non-adherence for implementing of best practice guidelines, overcrowding in emergency department had negatively impact on implementation of best practice guidelines by physician and nurses [63,64,65]. There were increasing incidents of non-adherence for implementing of practice guidelines by ED staff (physician and nurses) during ED overcrowding. This condition caused by decreasing of focus level and exhaustion related to enhancing workload during ED overcrowding, especially when facing patients with deteriorate condition (stroke, acute coronary syndrome (ACS) [64,66]. Whereas, other studies reported that events of non-adherence for practicing best guidelines by ED staff not caused by ED overcrowding, but based on supporting of ED management, facilities, and their self efficacy [62,65,67]. increasing incidents of non-adherence for best practicing guideliness was affected by ED overcrowding and supported by other factors (internal based on self efficacy of staff and external from hospital management)

V. CONCLUSION AND RECOMMENDATION

Emergency department overcrowding negatively impact on patient, healthcare system, and staff. Impact on patient including increasing mortality rate and patient admission. Impact on healthcare system including ineffective triage proccess and increasing Length of Stay (LOS) both in ED and hospital ward. Meanwhile, impact on staff including increasing workload and non-adherence for practicing best guidelines. Need an effort to decrease impact of ED overcrowding especially on patient, staff, and healthcare system. The result of the study could be used as considering to formulate an effort to reduce impact of ED overcrowding by controlling patient, staff, and healthcare system factors.

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the study could be best guidelines of emergency nursing subject, so had positive impact on learning outcome of emergency nursing object in academic.

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