

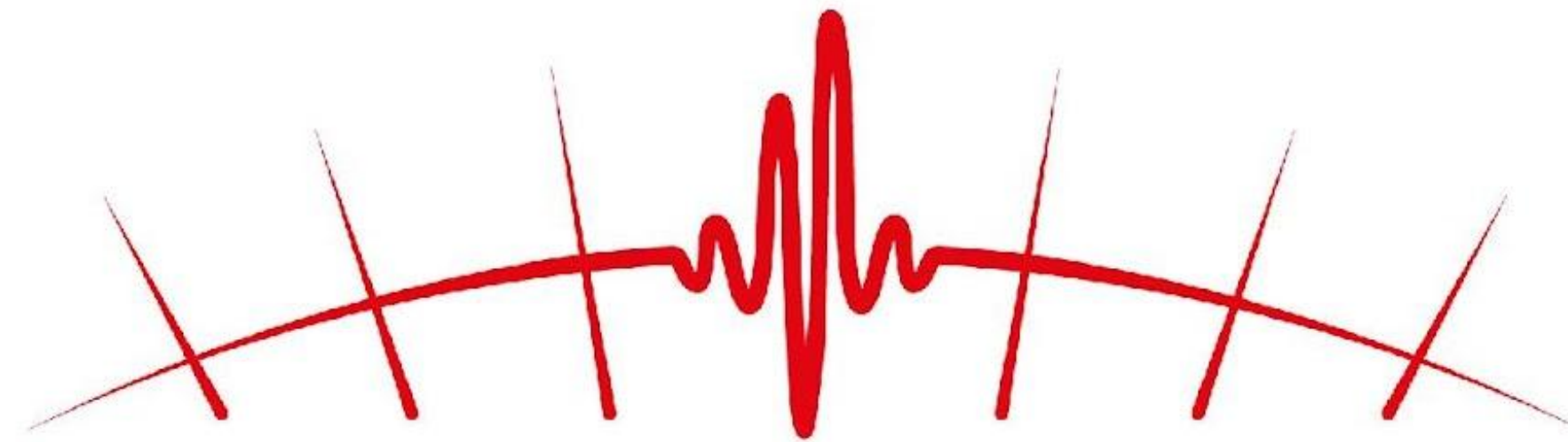


XIII congresso nazionale

simeu

GENOVA 30 MAG - 1 GIU 2024

Gabriele Savioli



XIII congresso nazionale

simeu

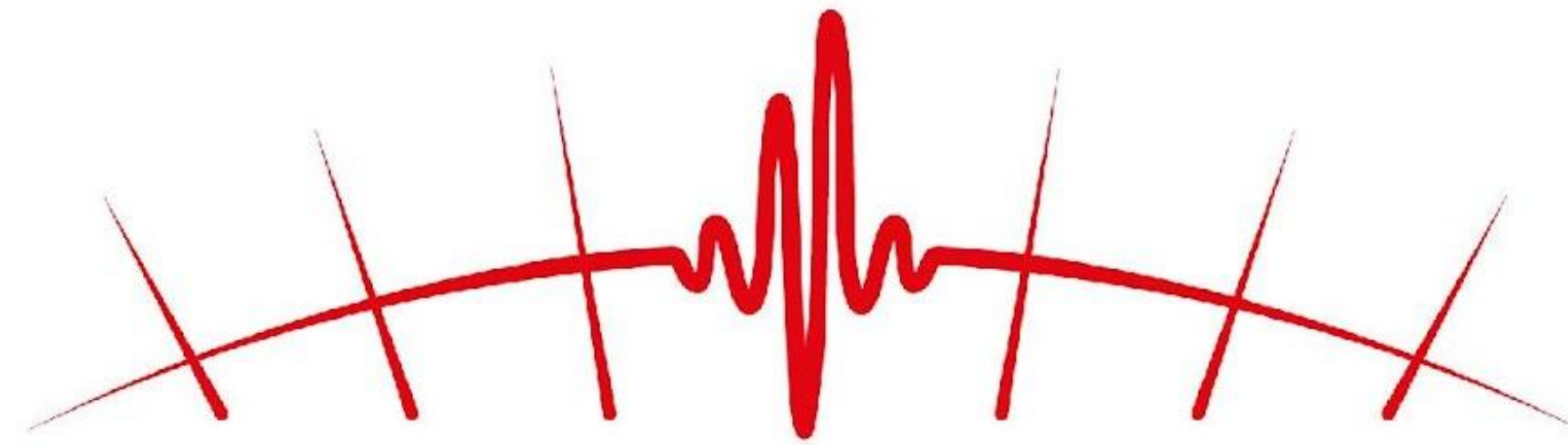
GENOVA 30 MAG - 1 GIU 2024





IL SOVRAFFOLLAMENTO

HOSPITAL CROWDING



XIII congresso nazionale

SIMEU

GENOVA 30 MAG - 1 GIU 2024



EUSEM Workgroup on Quality & Safety in Emergency Medicine

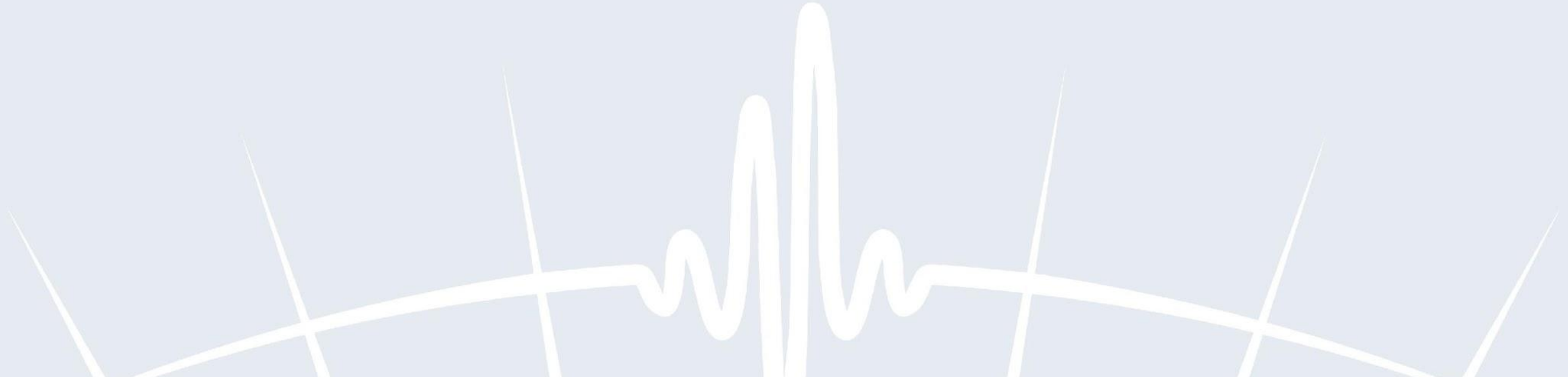
[Home](#) > [Sections & Committees](#) > [Working groups](#) > [Workgroup on Quality & Safety in Emergency Medicine](#)



ABOUT EWQSEM

SUBMENU EWQSEM

- [EWQSEM - Education in Q&S](#)
- [EWQSEM - Guidelines and Organisation Q&S](#)
- [EWQSEM - Research/Technology Innovation/Databases](#)
- [EWQSEM - Leadership](#)
- [EWQSEM - Global Health in Q&S](#)

A large, stylized white ECG line graphic is centered in the upper half of the image, set against a light blue background. The line shows a regular heartbeat pattern with several peaks and troughs.

HOSPITAL CROWDING



ED crowding: Unvecchio problema

The Journal of Emergency Medicine, Vol. 8, pp. 785-790, 1990

Printed in the USA · Copyright © 1990 Pergamon Press plc

Emergency Forum

THE ETIOLOGY OF MEDICAL GRIDLOCK: CAUSES OF EMERGENCY DEPARTMENT OVERCROWDING IN NEW YORK CITY

E. John Gallagher, MD,* and Stephan G. Lynn, MD†

*Director, Emergency Department, Bronx Municipal Hospital Center, Albert Einstein College of Medicine, Bronx, New York;

†Director, Department of Emergency Medicine, St. Luke's/Roosevelt Hospital Center, Columbia University, College of Physicians and Surgeons, New York, New York

Reprint address: E. John Gallagher, Director, Emergency Department, 1-W-20, Bronx Municipal Hospital Center, Pelham Parkway & Eastchester Road, Bronx, New York 10461

Abstract — Overcrowding of emergency departments in New York City is the most apparent symptom of a crumbling health care system. There is a growing need for the care of a largely impoverished population suffering from an increasing prevalence of AIDS, substance abuse, and psychiatric disease. Institutions crippled by critical shortages of inpatient beds and nurses lack the resources to meet this rising demand. Although the epidemic of medical gridlock began in New York City, it is spreading rapidly to involve other areas of the country. Short-term efforts to resolve this crisis have thus far been unsuccessful. Long-range solutions are likely to be costly and may require a reconfiguration of societal health care priorities.

inpatient occupancy rates which approach saturation. This in turn limits the bed flexibility necessary to accommodate unscheduled admissions, causing stretcher gridlock in the emergency department (ED). The gridlock metaphor — a term ordinarily used to describe traffic jams occurring at busy intersections during rush hour — refers to the configuration of interlocking stretchers that characterizes most EDs in New York City at the present time.

To understand gridlock, one must look beyond the ED to the over-burdened inpatient portion of the hospital. Here there are fewer beds and even fewer nurses

Editorial

Emergency department overcrowding

Garth Dickinson, MD, FRCPC

Occasional overcrowding in emergency departments is to be expected. People injured in motor vehicle accidents or fires can quickly fill an emergency department and fully occupy its staff. The unscheduled nature of emergency visits creates peaks and valleys in patient volume that can quickly transform a vacant emergency department into an overflowing area. These are the normal features of an emergency department that contribute to the excitement and stress of working in emergency medicine.

During the past several years emergency departments in urban and suburban hospitals have been pressured by the needs of admitted patients. For various reasons bed occupancy rates in city hospitals have risen, frequently exceeding 100%. When the number of admitted patients exceeds the number of beds, patients in the emergency department have nowhere to be transferred; they remain

patients arriving by ambulance stops, the emergency department gradually becomes less congested. Patients held in the emergency department are eventually given an inpatient bed or discharged home. The hospital has solved, almost effortlessly, its problem of an overcrowded emergency department. A single call to ambulance dispatchers advising them that the emergency department is closed to ambulance traffic eases the demands on the department and allows the hospital to continue to admit elective patients and function normally. This scenario occurs regularly at many urban and suburban hospitals in Ontario. Closing emergency departments to patients in ambulances has become common, accepted practice in this province. It should be condemned.

When an emergency department closes, acutely ill and injured patients lying in the back of ambulances in the vicinity of that hospital are at

Crowding ospedaliero

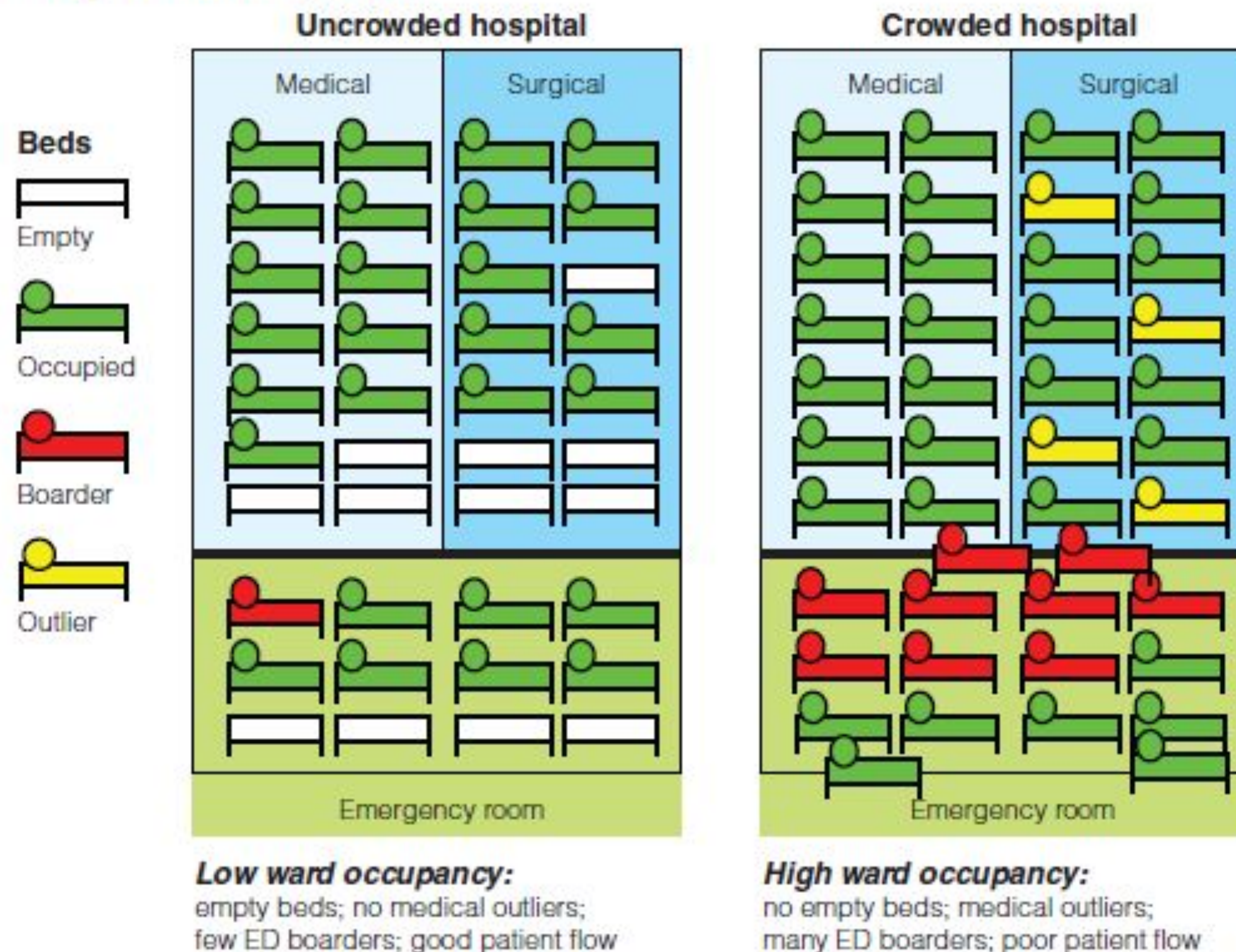
Crowding ospedaliero

The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments

Peter C Sprivulis, Julie-Ann Da Silva, Ian G Jacobs, Amanda RL Frazer and George A Jelinek

Sprivulis_The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments_Med J Aust_2006

1 Hospital crowding states



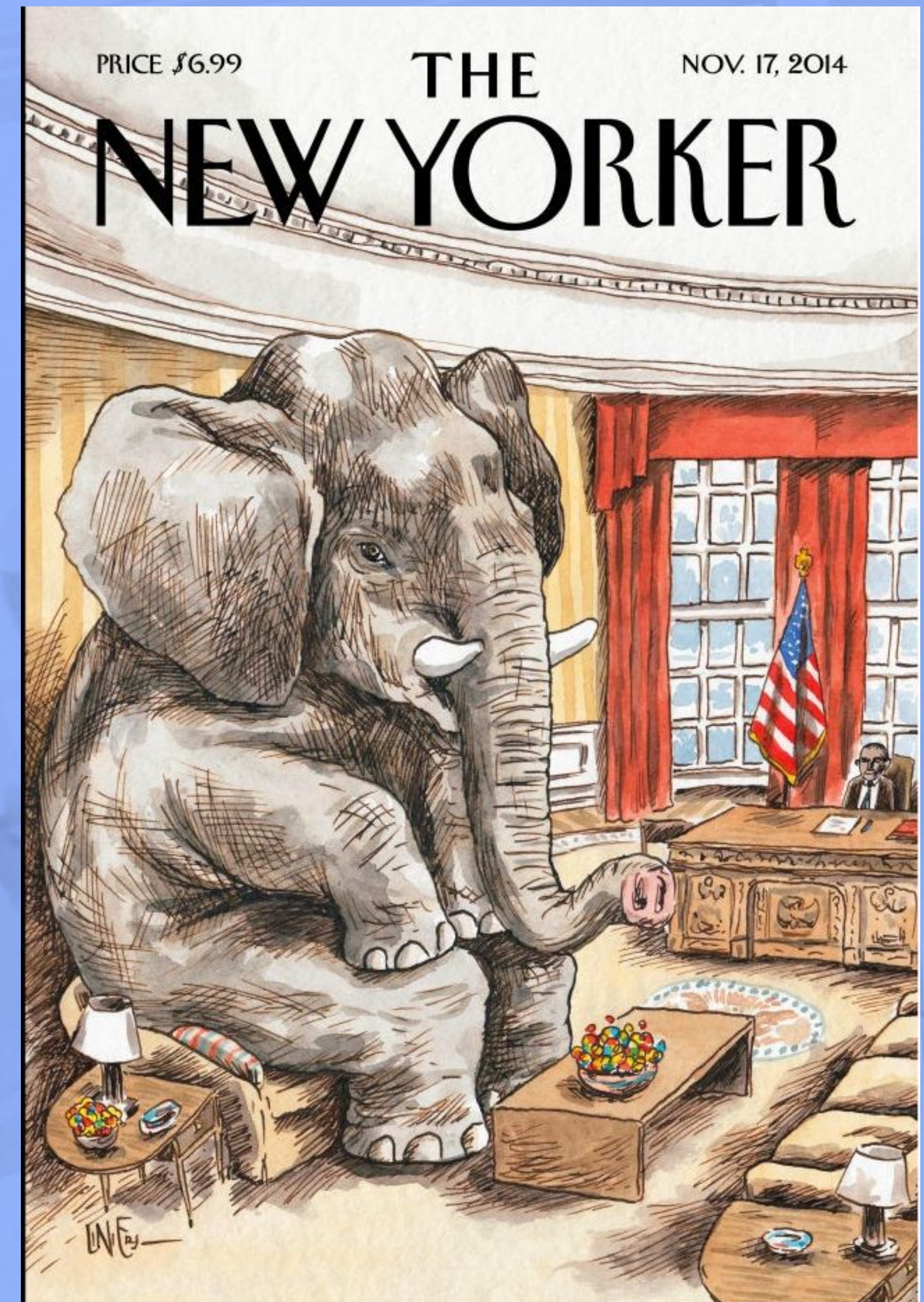
ED – emergency department. Boarders – patients waiting for an inpatient bed. Outliers – patients unable to be admitted to the "correct" ward (eg, medical patients on surgical wards).

Sovraffollamento del Pronto Soccorso: ED-Crowding

Il Sovraffollamento del Pronto Soccorso è come un elefante che si trova in una stanza: è molto difficile descrivere

- quanto sia pesante
- quanto sia sgradevole
- fino a quando il pavimento reggerà

Pines JM: Moving closer to an operational definition for Emergency Department crowding. *Acad Emerg Med* 2007, 14:382-383.



Sovraffollamento del Pronto Soccorso: definizioni delle società scientifiche

American College of Emergency Physicians (ACEP)

L'affollamento si verifica quando la necessità identificata di servizi di emergenza supera le risorse disponibili per l'assistenza ai pazienti nel Pronto Soccorso, in ospedale o in entrambi.

Crowding. *Ann Emerg Med* 2006; **47**:585.

Canadian Association of Emergency Physicians (CAEP)

Il sovraffollamento del pronto soccorso si verifica quando la domanda di servizi di emergenza supera la capacità di un pronto soccorso di fornire assistenza di qualità entro tempi adeguati.

Canadian Association of Emergency Physicians. Emergency Department Overcrowding: Position Statement. 2009. http://caep.ca/sites/default/files/edoc_position_statement_board_approved_june_2009

Australasian College of Emergency Medicine (ACEM)

Il sovraffollamento del Pronto Soccorso si riferisce alla situazione in cui la funzione dello stesso è ostacolata a causa del numero di pazienti in attesa di essere visti, di quelli sottoposti a valutazione e trattamento o di quelli in attesa di ricovero e tale ostacolo supera le capacità di accoglienza fisica (numero di letti e barelle) o del quella del personale del Pronto Soccorso.

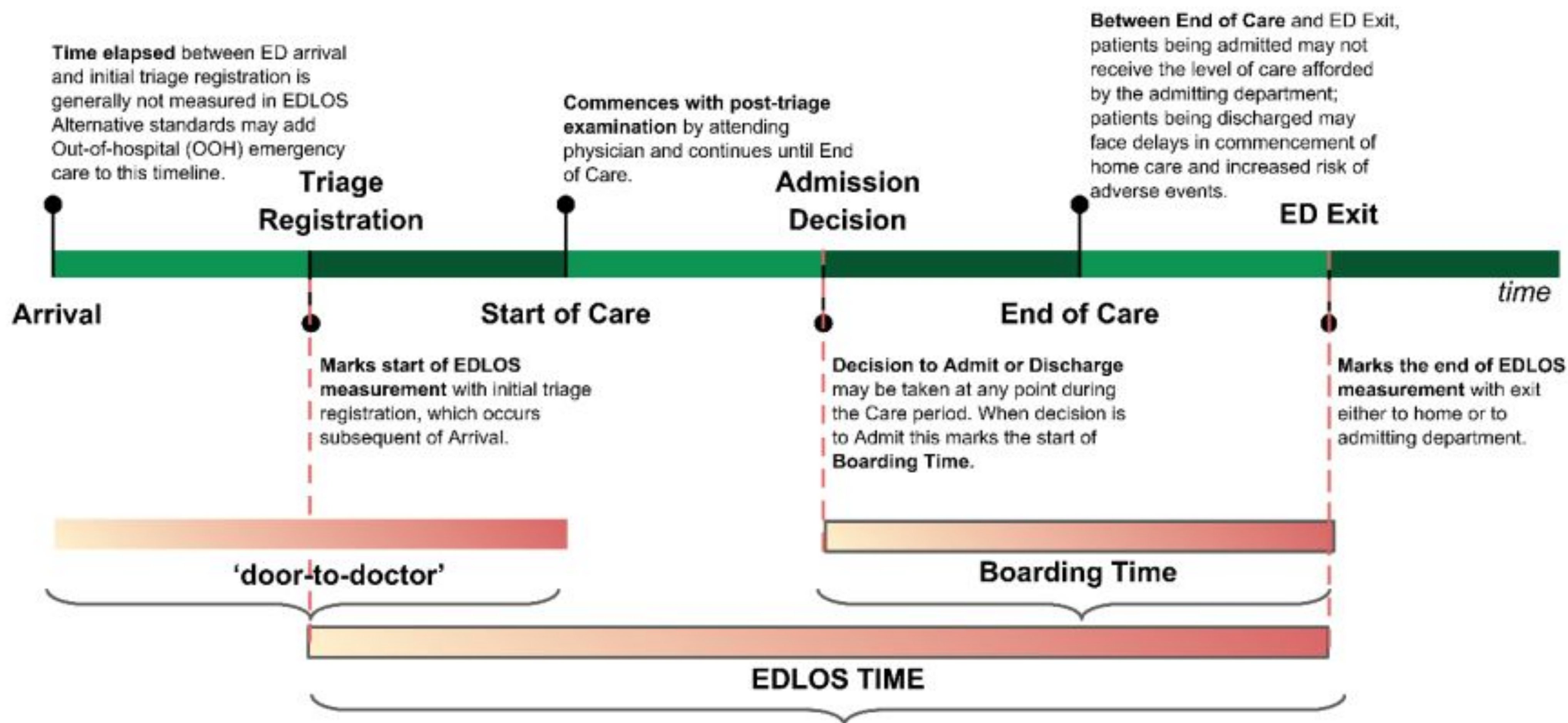
Australasian College for Emergency Medicine. Statement on Emergency Department Overcrowding. 2006. http://www.acem.org.au/media/policies_and_guidelines/111012_S57_Emergency_Department_Overcrowding

Review

Length-of-Stay in the Emergency Department and In-Hospital Mortality: A Systematic Review and Meta-Analysis

Dominique Lauque ^{1,2,*}, Anna Khalemsky ^{3,†}, Zoubir Boudi ^{4,5,†}, Linda Östlundh ⁶, Chang Xu ⁷, Mohammed Alsabri ^{2,8}, Churchill Onyeji ², Jacqueline Cellini ^{9,10}, Geroge Intas ¹¹, Kapil Dev Soni ¹², Detajin Junhasavasdikul ¹³, Jose Javier Trujillano Cabello ¹⁴, Niels K. Rathlev ¹⁵, Shan W. Liu ¹⁶, Carlos A. Camargo, Jr. ¹⁶, Anna Slagman ¹⁷, Michael Christ ¹⁸, Adam J. Singer ¹⁹, Charles-Henri Houze-Cerfon ¹, Elhadi H. Aburawi ²⁰, Karim Tazarourte ^{21,22}, Lisa Kurland ²³, Phillip D. Levy ²⁴, James H. Paxton ²⁴, Dionyssios Tsilimingras ²⁵, Vijaya Arun Kumar ²⁴, David G. Schwartz ²⁶, Eddy Lang ²⁷, David W. Bates ²⁸, Gabriele Savioli ²⁹, Shamai A. Grossman ^{2,*} and Abdelouahab Bellou ^{2,5,24,30,*}

J. Clin. Med. 2023, 12, 32



Fattori che determinano il Sovraffollamento

Il Pronto Soccorso è affollato se l'ospedale è affollato.

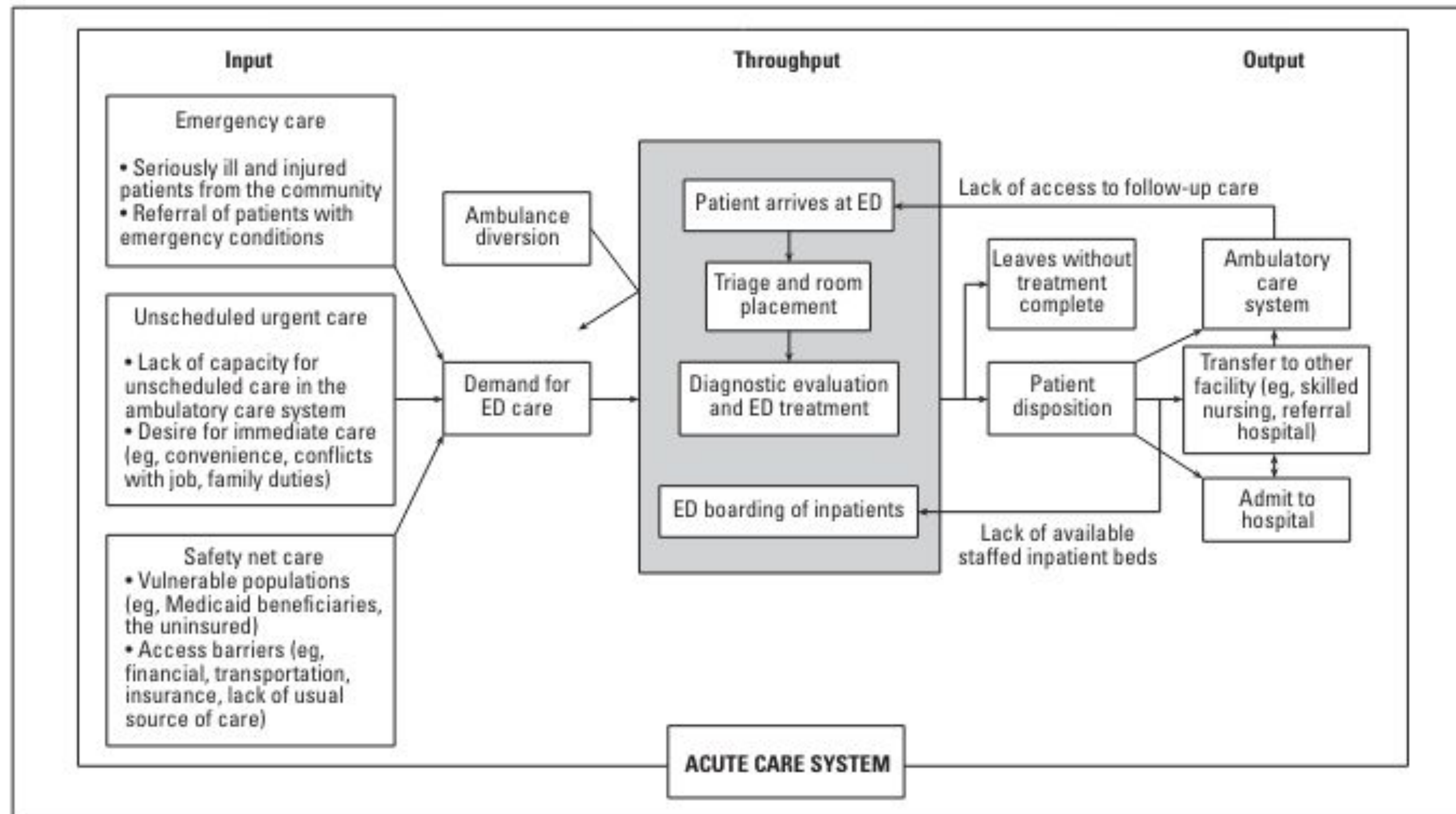
- Fattori in ingresso (input factor)
- Fattori all'interno (throughput factors)
- Fattori in uscita (output factor)



Asplin BR, Magid DJ, Rhodes KV, Solberg LI, Lurie N, Camargo CA Jr. A conceptual model of emergency department crowding. Ann Emerg Med. 2003; 42(2):173±80.

<https://doi.org/10.1067/mem.2003.302> PMID: 12883504

Figure 2.
The input-throughput-output conceptual model of ED crowding.



Asplin, BR, et al. A Conceptual Model of Emergency Department Crowding. *Ann Emerg Med*. 2003; 42:173-180



Emergency department overcrowding

Analysis and strategies to manage an international phenomenon

Gregor Lindner · Bertram K. Woltok

Received: 5 November 2019 / Accepted: 10 December 2019 / Published online: 13 January 2020
 © Springer-Verlag GmbH Austria, part of Springer Nature 2020

Summary Overcrowding in emergency departments is a common and worldwide phenomenon, which is widely reported even in the lay press. Strategies to address this incriminating situation for patients, nurses, physicians and hospital administrators are urgently

who had to be hospitalized [3]. In total, 1.6 million consultations were registered at Swiss emergency services in 2011. The increase in consultations, together with a demographic change in the sense of an aging population, as well as an increase in migra-

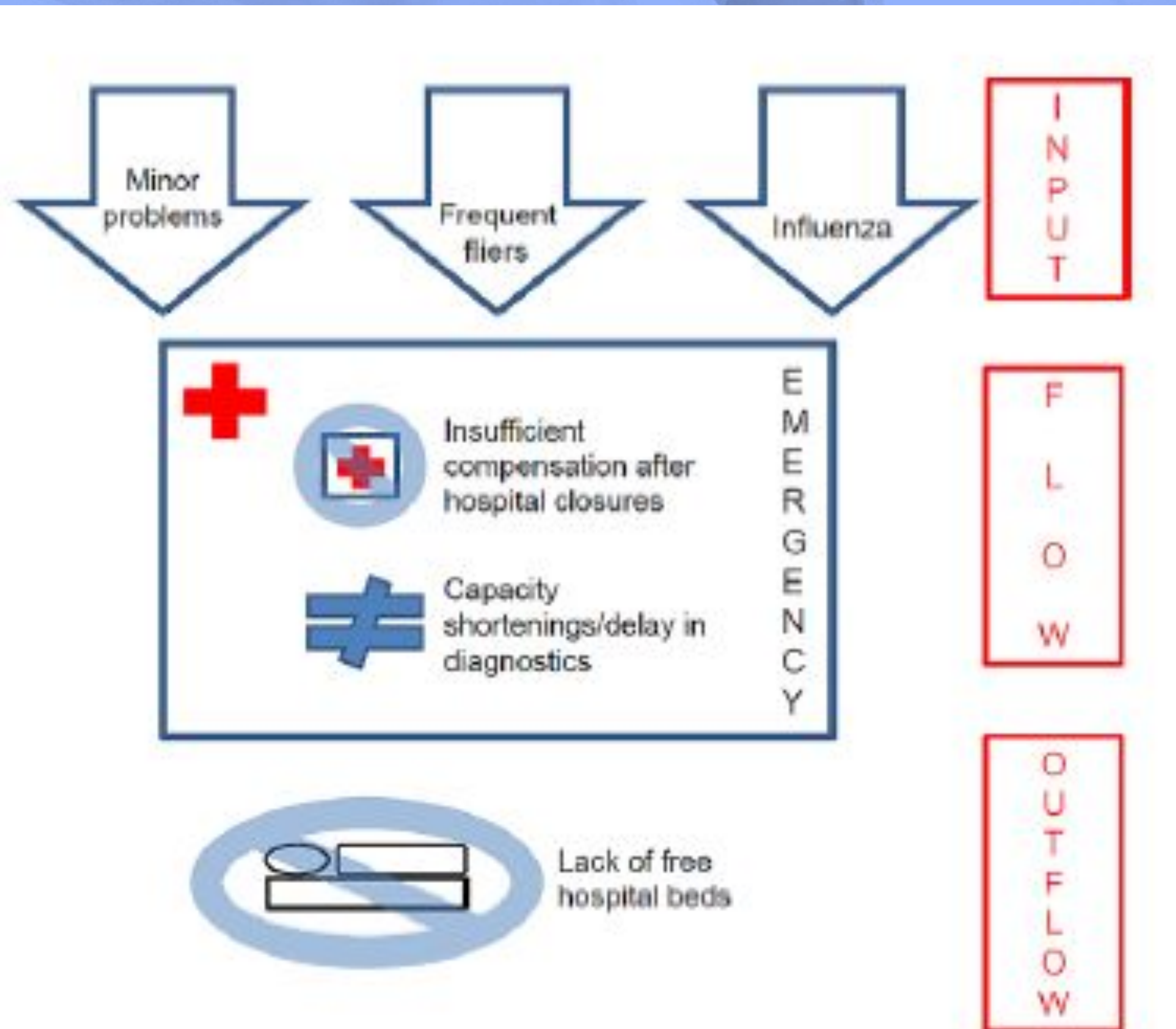


Fig. 1 Factors for emergence of overcrowding situations

Lindner_Emergency department overcrowding Analysis and strategies to manage an international phenomenon_Wien Klin Wochenschr_2021

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh^{1*}, Yonathan Freund², Philippe Gabriel Steg³, Richard Body^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

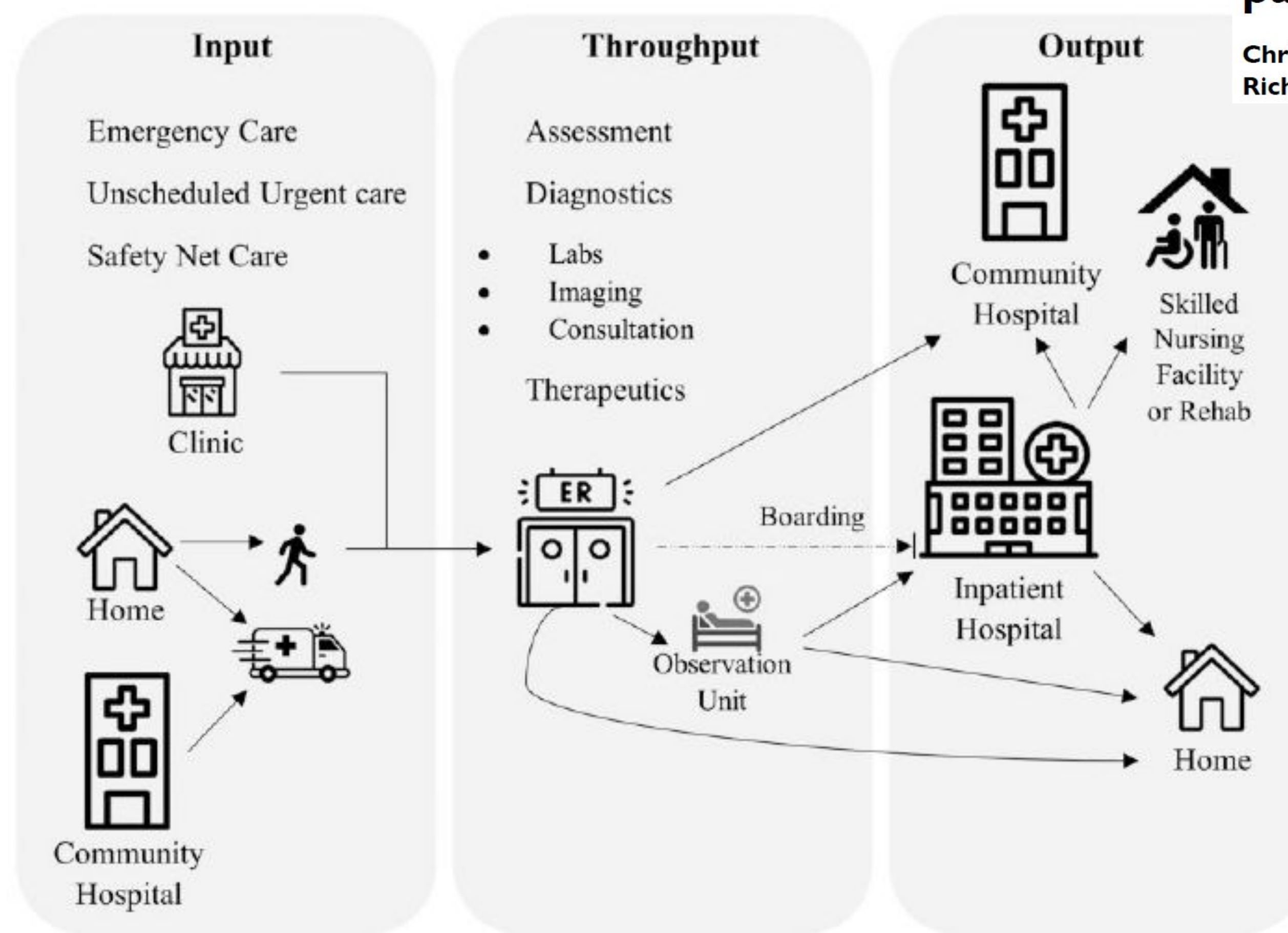


Figure 2 Emergency department patient flow model: input-throughput-output. Emergency department flow as represented by three sequences: input (patient arrival to emergency department), throughput (activities within emergency department), output (patient disposition from emergency department). Adapted from Asplin BR, Magid DJ, Rhodes KV, Solberg LI, Lurie N, Camargo CA. A conceptual model of emergency department crowding. *Ann Emerg Med* 2003; 42:173–180. ED, emergency department.

Review

Emergency Department Overcrowding: Understanding the Factors to Find Corresponding Solutions

Gabriele Savioli ^{1,2} , Iride Francesca Ceresa ³, Nicole Gri ⁴, Gaia Bavestrello Piccini ^{4,5} , Yaroslava Longhitano ^{6,7} , Christian Zanza ^{6,7,8,*}, Andrea Piccioni ⁸ , Ciro Esposito ⁹ , Giovanni Ricevuti ¹⁰  and Maria Antonietta Bressan ¹

Table 1. Factors contributing to overcrowding.

Parameter	Contributing Factors
Input	- emergencies (both medical and surgical) - visit type (both urgent and nonurgent) - ambulance arrivals - number of patients - triage score
Throughput	- time of processing - patients' degree of gravity - process of triage and bed placement - bed availability (both in the ED and in the hospital) - staffing (nursing and other healthcare professionals), considering their experience and their training - other services (consultant and ancillary) - degree of boarding
Output	- hospital occupancy - inpatient bed shortage - transport delay (both internal and external) - staffing ratios - inefficient process of transferring care - inefficient planning of discharging patients - need of higher level of care - inpatients' degree of gravity - lack of home care (both medical and not)



Fattori che determinano il Sovraffollamento: fattori in ingresso

- Numero di pazienti
- Percentuale o numero di pazienti con codici di elevata priorità alla visita medica
- Percentuale o numero di pazienti necessitanti alta intensità di cure
- Numero di frequent flyers
- Tempi di attesa alla visita medica (totale e per codice di priorità alla visita medica).



Fattori che determinano il Sovraffollamento: fattori all'interno

- esami ematochimici e di laboratorio
- esecuzione imaging
- refertazione dell'imaging
- consulenza specialistica
- terapia



Fattori che determinano il Sovraffollamento: fattori all'interno

- Personale sanitario
- Livello di formazione del personale
- Esperienza del personale di turno
- Turni serrati
- Turni oltre le 6 ore



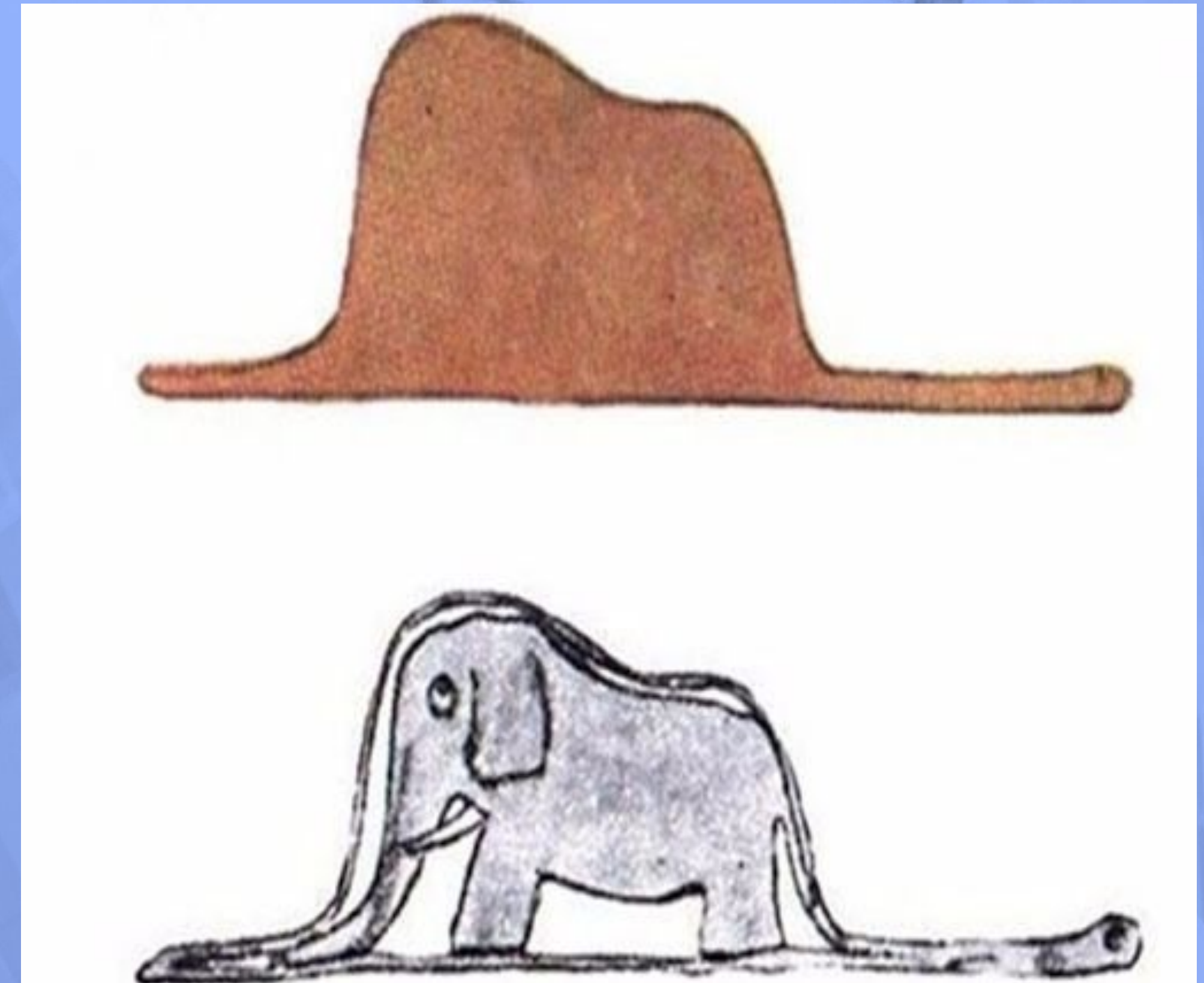
Fattori che determinano il Sovraffollamento: fattori all'interno

- monitoraggio del paziente
- osservazione del paziente
- tempo necessario tra le esecuzione di un primo esame e un esame di controllo
- tempo di processo
- tempo totale di stanza in Pronto Soccorso (LOS)



Fattori che determinano il Sovraffollamento: fattori in uscita

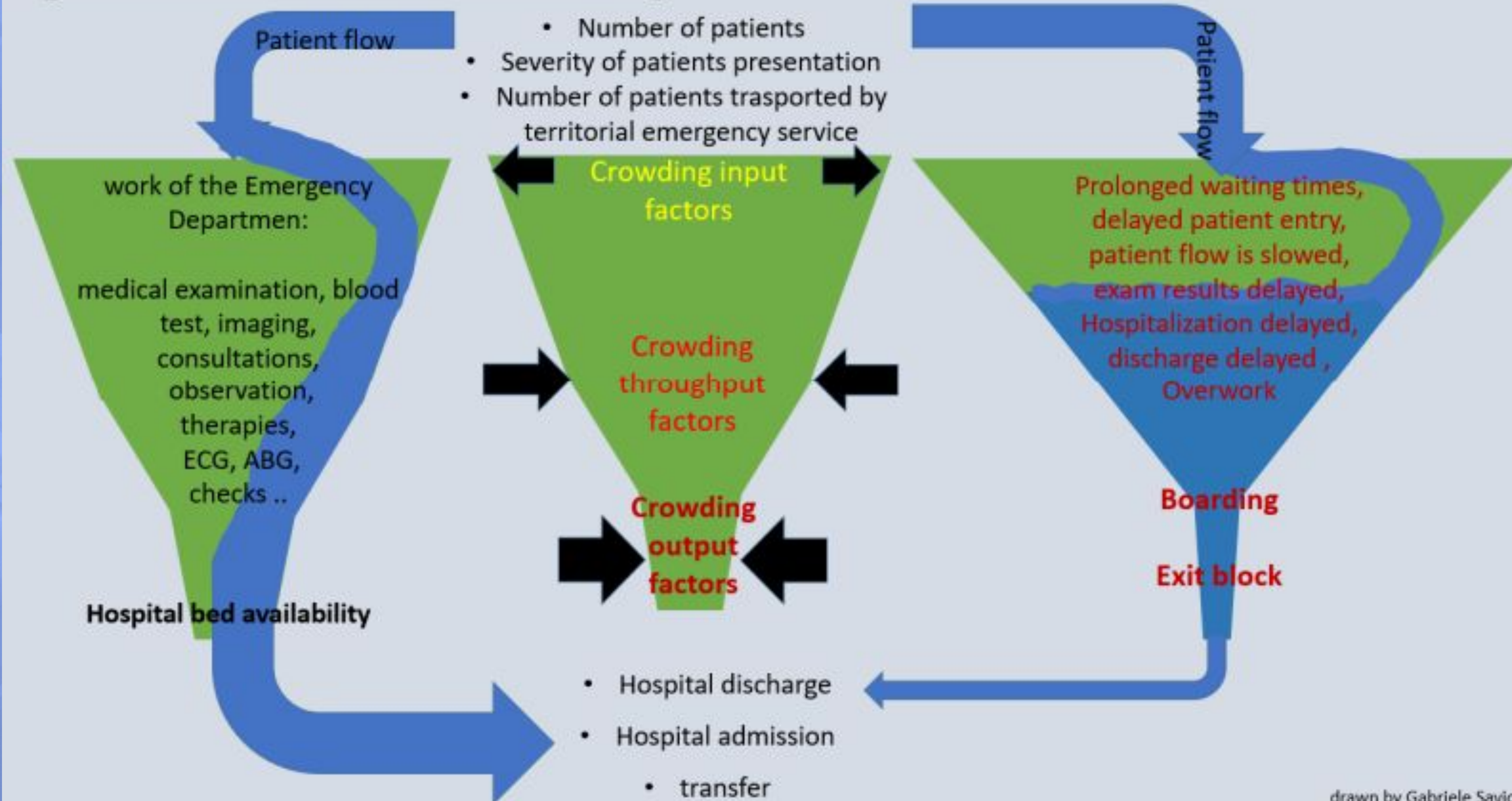
- mancanza di posto letto
- mancanza di caregiver o assistenza domiciliare adeguata
- ritardo nel mezzo di trasporto che deve portare il paziente dal Pronto Soccorso al Domicilio
- ritardo nel mezzo di trasporto che deve portare il paziente dal Pronto Soccorso al reparto



Emergency Department Overcrowding: Understanding the Factors to Find Corresponding Solutions

Gabriele Savioli ^{1,2}, Iride Francesca Ceresa ³, Nicole Gri ⁴, Gaia Bavestrello Piccini ^{4,5}, Yaroslava Longhitano ^{6,7}, Christian Zanza ^{6,7,8,*}, Andrea Piccioni ⁸, Ciro Esposito ⁹, Giovanni Ricevuti ¹⁰ and Maria Antonietta Bressan ¹

representation of the causes of crowding





Durand _Nonurgent patients in emergency departments_rational or irresponsible consumers_Perceptions of professionals and patients_BMC Res Notes_2012

Table 3 Perceptions of ED health professionals regarding nonurgent ED patients	
Theme and sub-category	Descriptors
Theme 1. Problem of defining a nonurgent visit and an inappropriate visit	
No specific definition	■ "It's easy to consider a nonurgent case at the end of the consultation, but it's very difficult in the triage area."
Perception of what constitutes a nonurgent case	■ "Anything that is not life-threatening." ■ "A condition is nonurgent if it can be treated in 2 to 3 days." ■ "Consultations are nonurgent if the chief complaint is a non-serious illness that can be treated by a PCP."
Difference between nonurgent cases and inappropriate cases	■ "If no other sources of care are available, patients have no other choice but to go to the ED. In this case, a nonurgent consultation could be considered appropriate." ■ "All patients whose care can be given at a facility other than the ED." ■ "We must redefine what is an emergency, what is an appropriate visit to the ED, and what is inappropriate, but it is very difficult to define."
Theme 2. Reasons for using EDs for nonurgent complaints	
Lack of access to PCPs	■ "PCPs are not available evenings and weekends..." ■ "Continuity of care in primary care services is not guaranteed on Saturdays and Sundays." ■ "In some geographical sectors, there is virtually no primary health care structure ensuring continuity of care. EDs are the only medical places available 24 hours a day, seven days a week."
Health care consumerism	■ "The use of care is similar to that of products, i.e. fast and easy... We are in the Internet age, where everything is readily available, and the use of health care is no exception to this trend." ■ "The population evolves towards the need for rapid response to a need." ■ "People want to receive care on the same day, including access to technical facilities." ■ "Frustration is not acceptable".
No advance payment at the time of the ED visit	■ "Some patients come to EDs for financial reasons. There is a perception that the hospital is free, but it is not." ■ "People believe that the medical consultation is free at the time of the ED visit, but the consultation is supported by our health insurance system."
Theme 3. Consequences of the increase in nonurgent ED visits	
	■ "It is a problem when there are peaks of activity... This increase in utilization of EDs has induced overcrowding, prolonged wait times, delayed diagnosis and treatments, reduced quality of care, and increased the risk of adverse outcomes" ■ "Most ED colleagues are stressed because EDs are not structured for primary care." ■ "They (ED colleagues) feel that they no longer practice emergency medicine!"
Theme 4. Solutions to reduce the number of ED visits for nonurgent complaints	
Patient education	■ "We should communicate more about what is a real urgent problem." ■ "Perhaps if people were educated regarding the importance of primary care and the appropriate use of EDs, they might seek ED care less often."
To reorganize the health care system by improving the continuity of care outside regular business hours	■ "We could have primary care consultations in close proximity to the ED. These consultations would be opened between 8 a.m. and midnight. When there is a real emergency, patients would be sent back to the ED." ■ "A working collaboration between EDs and PCPs would improve accessibility to ensure that services are used effectively and efficiently."
To integrate a "gatekeeper" at the ED	"To determine patients having authorization for care in ED, a physician should discern whether the consultation is appropriate or not."
A financial penalty for patients categorized as nonurgent after the consultation	■ "If it's not urgent, we look after you, but you will pay - you will pay at least an "emergency fee". ■ "No significant financial penalties to prevent the use of EDs exist."

Durand et al. BMC Research Notes 2012, 5:525
http://www.biomedcentral.com/1756-0500/5/525



BMC
Research Notes

RESEARCH ARTICLEOpen Access

Nonurgent patients in emergency departments: rational or irresponsible consumers? Perceptions of professionals and patients

Anne-Claire Durand^{1*}, Sylvie Palazzolo¹, Nicolas Tanti-Hardouin¹, Patrick Gerbeaux², Roland Sambuc¹ and Stéphanie Gentile¹

Abstract

Background: For several decades, overcrowding in emergency departments (EDs) has been intensifying due to the increased number of patients seeking care in EDs. Demand growth is partly due to misuse of EDs by patients who seek care for nonurgent problems. This study explores the reasons why people with nonurgent complaints choose to come to EDs, and how ED health professionals perceive the phenomenon of “nonurgency”.

Results: Semi-structured interviews were conducted in 10 EDs with 87 nonurgent patients and 34 health professionals. Interviews of patients revealed three themes: (1) fulfilled health care needs, (2) barriers to primary care providers (PCPs), and (3) convenience. Patients chose EDs as discerning health consumers: they preferred EDs because they had difficulties obtaining a rapid appointment. Access to technical facilities in EDs spares the patient from being overwhelmed with appointments with various specialists. Four themes were identified from the interviews of health professionals: (1) the problem of defining a nonurgent visit, (2) explanations for patients’ use of EDs for nonurgent complaints, (3) consequences of nonurgent visits, and (4) solutions to counter this tendency.

Conclusions: Studies on the underlying reasons patients opt for the ED, as well as on their decision-making process, are lacking. The present study highlighted discrepancies between the perceptions of ED patients and those of health professionals, with a special focus on patient behaviour. To explain the use of ED, health professionals based themselves on the acuity and urgency of medical problems, while patients focused on rational reasons to

Durand _Nonurgent patients in emergency departments_rational or irresponsible consumers_Perceptions of professionals and patients_BMC Res Notes_2012

Table 2 Reasons for ED use for nonurgent patients: category descriptions

Theme and sub-category	Descriptors
Theme 1. Fulfill health care needs	
To alleviate pain or discomfort	■ "It's urgent because it hurts" ■ "I suffered for a while there. I've been trying to tough it out, but I suffer too much."
Anxiety generated by the complaint	■ "I don't consider my problem serious, but I am worried because I am hurting." ■ "I do not know what I have, but it worried me, so I preferred to come immediately to the ED so at least I am reassured." ■ "I was afraid; I was concerned because I did not know if my problem was serious."
Theme 2. Barriers to primary care providers	
Difficulty obtaining an appointment with their PCP in a timely manner	■ "When I called my doctor, he said that he was booked up, and he instructed me to go to the ED." ■ "It is impossible to see him during the week if you are sick (speaking of her PCP). It is too long." ■ "I called my doctor but he could not see me, so I preferred to come to the ED because the pain was unbearable."
ED is the only alternative to accommodate work schedules	■ "When I am sick and miss a day of work, I need to see a doctor that day. I can't afford to be off work any longer. I need to feel better and go back to work the next day" ■ "After 6 p.m., nothing else is open."
Discerning health consumers	■ "I preferred the ED to my doctor because it is so hard to get in to see him." ■ "I knew that my doctor could not see me. So, I came to the ED." ■ "My doctor consults by appointment only. He doesn't have time for me."
Theme 3. Advantages of the ED	
Availability of diagnostic tests and treatment	■ "My doctor cannot do X-rays or laboratory tests, while the ED has all the technical support." ■ "I'd rather be here than run around. At least here x-rays can be done."
Convenience	■ "Everything is in one place." ■ "The doctors perform things a lot faster."

Comparison of presenting complaint vs. discharge diagnosis for identifying “non-emergency” emergency department visits

Maria Raven, MD, MPH, MSc [Assistant Professor of Emergency Medicine],

Department of Emergency Medicine, University of California, San Francisco, 505 Parnassus Ave, San Francisco, CA 94707, Maria.raven@emergency.ucsf.edu /917-499-5608 (mobile)

Robert A. Lowe, MD, MPH [Professor],

Department of Medical Informatics and Clinical Epidemiology, Department of Emergency Medicine, Department of Public Health and Preventive Medicine, Senior Scholar, Center for Policy and Research in Emergency Medicine (CPR-EM), Oregon Health and Science University, 3181 SW Sam Jackson Park Road, Mail Code BICC-504, Portland, Oregon 97239-3098, lowero@ohsu.edu /503 494-7134

Judith Maselli, MSPH [Senior Statistician], and

Department of Medicine, University of California, San Francisco, 3333 California St, Box 1211, San Francisco, CA 94143-1211, jmaselli@medicine.ucsf.edu / 415-502-4068

Renee Y. Hsia, MD, MSc, FACEP [Assistant Professor of Emergency Medicine]

University of California San Francisco, San Francisco General Hospital, Department of Emergency Medicine, 1001 Potrero Ave, 1E21, San Francisco, CA 94110, renee.hsia@ucsf.edu / 415-206-4612

COMMENT

Patients present to the ED with chief complaints, symptoms, and signs, but usually not with diagnoses. For a list of ED discharge diagnoses to be considered “non-emergency,” the ED discharge diagnoses must be predictable based on chief complaint information available at triage. Our study illustrates the challenges of mapping from discharge diagnosis to chief complaint. Although only 6.3% of ED visits had “primary care treatable” discharge diagnoses, the chief complaints reported for these visits encompassed 88.7% of all ED visits. If a triage nurse were to redirect patients away from the ED based on “non-emergency complaints,” 93% of the redirected ED visits would *not* have “primary care treatable diagnoses.” Adding vital signs to the decision rule would add little discriminatory power, because 79.7% of ED visits with “non-emergency complaints” had abnormal vital signs, including 76.8% of ED visits with “primary care treatable diagnoses” and 80.0% with other diagnoses.

These results highlight the flaws of a conceptual framework that fails to distinguish between information available at arrival in the ED and information available at discharge from the ED. The results call into question reimbursement policies that deny or limit payment based on discharge diagnosis. Attempting to discourage patients from using the ED based on the

ORIGINAL RESEARCH CONTRIBUTIONS

International Perspectives on Emergency Department Crowding

Jesse M. Pines, MD, MBA, MSCE, Joshua A. Hilton, MD, Ellen J. Weber, MD, Annechien J. Alkemade, MD, Hasan Al Shabanah, MD, Philip D. Anderson, MD, Michael Bernhard, MD, Alessio Bertini, MD, André Gries, MD, Santiago Ferrandiz, MD, Vijaya Arun Kumar, MD, Veli-Pekka Harjola, MD, Barbara Hogan, MD, Bo Madsen, MD, MPH, Suzanne Mason, MD, Gunnar Öhlén, MD, PhD, Timothy Rainer, MD, Niels Rathlev, MD, Eric Revue, MD, Drew Richardson, MBBS, Mehdi Sattarian, MD, and Michael J. Schull, MD, MSc, FRCPC

Abstract

The maturation of emergency department has become a public health problem where periodic supply and demand mismatches in ED and hospital resources cause long waiting times and delays in critical treatments. ED crowding has been associated with several negative clinical outcomes, including higher complication rates and mortality. This article describes emergency care systems and the extent of crowding across 15 countries outside of the United States: Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, India, Iran, Italy, The Netherlands, Saudi Arabia, Catalonia (Spain), Sweden, and the United Kingdom. The authors are local emergency care leaders with knowledge of emergency care in their particular countries. Where available, data are provided about visit patterns in each country; however, for many of these countries, no national data are available on ED visits rates or crowding. For most of the countries included, there is both objective evidence of increases in ED visit rates and ED crowding and also subjective assessments of trends toward higher crowding in the ED. ED crowding appears to be worsening in many countries despite the presence of universal health coverage. Scandinavian countries with robust systems to manage acute care outside the ED do not report crowding is a major problem. The main cause for crowding identified by many authors is the boarding of admitted patients, similar to the United States. Many hospitals in these countries have implemented operational interventions to mitigate crowding in the ED, and some countries have imposed strict limits on ED length of stay (LOS), while others have no clear

Abstract

The maturation of emergency medicine (EM) as a specialty has coincided with dramatic increases in emergency department (ED) visit rates, both in the United States and around the world. ED crowding has become a public health problem where periodic supply and demand mismatches in ED and hospital resources cause long waiting times and delays in critical treatments. ED crowding has been associated with several negative clinical outcomes, including higher complication rates and mortality. This article describes emergency care systems and the extent of crowding across 15 countries outside of the United States: Australia, Canada, Denmark, Finland, France, Germany, Hong Kong, India, Iran, Italy, The Netherlands, Saudi Arabia, Catalonia (Spain), Sweden, and the United Kingdom. The authors are local emergency care leaders with knowledge of emergency care in their particular countries. Where available, data are provided about visit patterns in each country; however, for many of these countries, no national data are available on ED visits rates or crowding. For most of the countries included, there is both objective evidence of increases in ED visit rates and ED crowding and also subjective assessments of trends toward higher crowding in the ED. ED crowding appears to be worsening in many countries despite the presence of universal health coverage. Scandinavian countries with robust systems to manage acute care outside the ED do not report crowding is a major problem. The main cause for crowding identified by many authors is the boarding of admitted patients, similar to the United States. Many hospitals in these countries have implemented operational interventions to mitigate crowding in the ED, and some countries have imposed strict limits on ED length of stay (LOS), while others have no clear



ORIGINAL RESEARCH CONTRIBUTIONS

International Perspectives on Emergency Department Crowding

Jesse M. Pines, MD, MBA, MSCE, Joshua A. Hilton, MD, Ellen J. Weber, MD, Annechien J. Alkemade, MD, Hasan Al Shabanah, MD, Philip D. Anderson, MD, Michael Bernhard, MD, Alessio Bertini, MD, André Gries, MD, Santiago Ferrandiz, MD, Vijaya Arun Kumar, MD, Veli-Pekka Harjola, MD, Barbara Hogan, MD, Bo Madsen, MD, MPH, Suzanne Mason, MD, Gunnar Öhlén, MD, PhD, Timothy Rainer, MD, Niels Rathlev, MD, Eric Revue, MD, Drew Richardson, MBBS, Mehdi Sattarian, MD, and Michael J. Schull, MD, MSc, FRCPC

Abstract

The maturation of emergency medicine (EM) as a specialty has coincided with dramatic increases in emergency department (ED) visit rates, both in the United States and around the world. ED crowding has become a public health problem where periodic supply and demand mismatches in ED and hospital resources cause long waiting times and delays in critical treatments. ED crowding has been associated

One of the major factors frequently cited as a cause for ED crowding is “inappropriate use,” and the rise in ED visits is often attributed to use of the ED for problems that could potentially be cared for in a physicians’ office. With so many individuals in countries with good primary care and health insurance coverage making the ED their choice for such complaints, however, perhaps it is time to recast these visits as more “preference-sensitive,” since many patients across so many countries appear to prefer to use EDs over primary care. EDs may not have been originally designed for the treatment of non-life-threatening conditions, but perhaps similarities in global ED demand indicate that EDs fill an important niche otherwise lacking in some of the best-designed and most affordable health care systems. Primary care settings may simply not be able to handle urgent needs that require same-day care, even if they are not life-threatening, and may not be able to provide all the services that are now requisite to evaluating complex conditions.

Dual equipoise shared decision making: definitions for decision and behaviour support interventions

Glyn Elwyn^{*1}, Dominick Frosch² and Stephen Rollnick¹

Address: ¹Clinical Epidemiology Interdisciplinary Research Group, Department of Primary Care and Public Health, School of Medicine, Cardiff University, Heath Park, CF14 4YS, UK and ²Department of Health Services Research, Palo Alto Medical Foundation Research Institute, 795 El Camino Real, Palo Alto, CA 94301 USA

Email: Glyn Elwyn^{*} - elwyng@cardiff.ac.uk; Dominick Frosch - dfrosch@mednet.ucla.edu; Stephen Rollnick - s.rollnick@virgin.net

^{*} Corresponding author

Published: 18 November 2009

Received: 19 February 2009

Implementation Science 2009, 4:75 doi:10.1186/1748-5908-4-75

Accepted: 18 November 2009

This article is available from: <http://www.implementationscience.com/content/4/1/75>

© 2009 Elwyn et al; licensee BioMed Central Ltd.

This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/2.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Abstract

Background: There is increasing interest in interventions that can support patients who face difficult decisions and individuals who need to modify their behaviour to achieve better outcomes. Evidence for effectiveness is used to categorise patients care. Effective care is where evidence of benefit outweighs harm: patients should always receive this type of care, where indicated. Preference-sensitive care describes a situation where the evidence for the superiority of one treatment over another is either not available or does not allow differentiation; in this situation, there are two or more valid approaches, and the best choice depends on how individuals value the risks and benefits of treatments.

Discussion: Preference-sensitive decisions are defined by equipoise: situations where options need to be deliberated. Moreover, where both healthcare professionals and patients agree that equipoise exists, situations may be regarded as having 'dual equipoise'. Such conditions are ideal for shared decision making. However, there are many situations in medicine where dual equipoise does not exist, where health professionals hold the view that scientific evidence for benefit strongly outweighs harm. This is often the case where people suffer from chronic conditions, and where behaviour change is recommended to improve outcomes. However, some patients, are either ambivalent or find it difficult to sustain optimal behaviours, *i.e.*, patients will be in varying degrees of equipoise. Therefore, situations where dual equipoise exists (or not) help to clarify the definitions of two classes of support, namely, decision and behaviour change support interventions. Decision support interventions help people think about choices they face; they describe where and why choice exists, in short, conditions of dual equipoise; they provide information about options, including, where reasonable, the option of taking no action. These interventions help people to deliberate, independently or in collaboration with others, about options by considering relevant attributes; they support people to forecast how they might feel about short, intermediate, and long-term outcomes that have relevant consequences, in ways that help the process of constructing preferences and eventual decision making appropriate to their individual situation. Whereas, behavioural support interventions describe, justify, and recommend actions that, over time, lead to predictable outcomes over short, intermediate, and long-term timeframes, and that have relevant and important consequences for those who are considering behaviour change.

Summary: Decision and behaviour support interventions have divergent aims, different relationships to equipoise, and form two classes of interventions.

Why are people increasingly attending the emergency department? A study of the French healthcare system

Helene Colineaux,^{1,2} Fanny Pelissier,³ Laure Pourcel,³ Thierry Lang,^{1,2}
Michelle Kelly-Irving,² Olivier Azema,³ Sandrine Charpentier,^{2,4} Sebastien Lamy²

Emerg Med J: first published as

ABSTRACT

Objective It is often asserted that the crowding phenomenon in emergency departments (ED) can be explained by an increase in visits considered as non-urgent. The aim of our study was to quantify the increase in ED visit rates and to determine whether this increase was explained by non-severe visit types.

Methods This observational study covers all ED visits between 2002 and 2015 by adult inhabitants of the Midi-Pyrénées region in France. Their characteristics were collected from the emergency visit summaries. We modelled the visit rates per year using linear regression models, and an increase was considered significant when the 95% CIs did not include zero. The severity of the patients' condition during ED visit was determined through the 'Clinical Classification of Emergency' score. Non-severe visits were those where the patient was stable, and the physician deemed no intervention necessary. Intermediate-severity visits concerned patients who were stable but requiring diagnostic or therapeutic procedures.

Results The 37 studied EDs managed >7 million visits between 2002 and 2015. There was an average increase of +4.83 (95% CI 4.33 to 5.32) visits per 1000 inhabitants each year. The increase in non-severe visit types was +0.88 (95% CI 0.42 to 1.34) per 1000 inhabitants, while the increase in intermediate-severity visit types was +3.26 (95% CI 2.62 to 3.91) per 1000 inhabitants. This increase affected all age groups and all sexes.

Discussion It appears that the increase in ED use is not based on an increase in non-severe visit types, with a greater impact of intermediate-severity visit types requiring diagnostic or therapeutic procedures in ED.

Key messages

What is already known on this subject

- ▶ Over the last 30 years, many countries have faced emergency department (ED) crowding.
- ▶ This crowding has been, at least in part, attributed to an increase in ED attendance for reasons considered as 'non-urgent'.
- ▶ The role of non-severe visits in ED crowding is, however, still controversial.

What this study adds

- ▶ This study provides some insight into the involvement of severity visit types in the crowding phenomenon in the French care system, based on data of the longest running French regional 'emergency department observatory'.
- ▶ Our results confirmed an increase in ED visits unexplained by population growth nor by the population aging.
- ▶ This increase in ED visit rates was mainly based on an increase in intermediate-severity visit types, that is, non-admitted visits but requiring diagnostic or therapeutic procedures.

delivery since major reorganisation occurred in the 1990s, found that ED visit rates had doubled from 125 visits per 1000 inhabitants in 1993⁴ to 286 per 1000 inhabitants in 2013.⁵ In the early 1990s, this increase had already been attributed to visits considered as 'inappropriate'.⁴ In 2000, a published study by the Ministry-of-Health Statistics Department

Prevalenza degli OUTput factors

Canadian Journal of Emergency Medicine (2021) 23:26–28
<https://doi.org/10.1007/s43678-020-00065-9>

CAEP GUIDELINES



The International Federation for Emergency Medicine report on emergency department crowding and access block: A brief summary

Arshia P. Javidan^{1,2} · Kim Hansen^{3,4} · I. Higginson⁵ · P. Jones^{6,7} · Eddy Lang^{8,9} on behalf of the IFEM Task Force on Emergency Department Crowding, Access Block

Received: 2 August 2020 / Accepted: 10 August 2020 / Published online: 14 January 2021
© The Author(s) 2021

Riduzione a livello mondiale dei posti letto negli ospedali



- Richardson Myths versus facts in emergency department overcrowding and hospital access block. April 2009 The Medical journal of Australia
- Institute of Medicine, Committee on the Future of Emergency Care in the United States Health System. Hospital-based emergency care: at the breaking point. Washington, DC: National Academy Press, 2006.
- Ardagh M, Richardson S. Emergency department overcrowding. Can we fix it? *N Z Med J* 2004; 117: U774.
- Australasian College for Emergency Medicine. Policy document —standard terminology. *Emerg Med (Fremantle)* 2002; 14: 337-340.
- American College of Emergency Physicians. Crowding. *Ann Emerg Med* 2006; 47: 585.
- Hwang U, Concato J. Care in the emergency department: how crowded is overcrowded? *Acad Emerg Med* 2004; 11: 1097-1101.



Riduzione a livello mondiale dei posti letto negli ospedali

Boarding



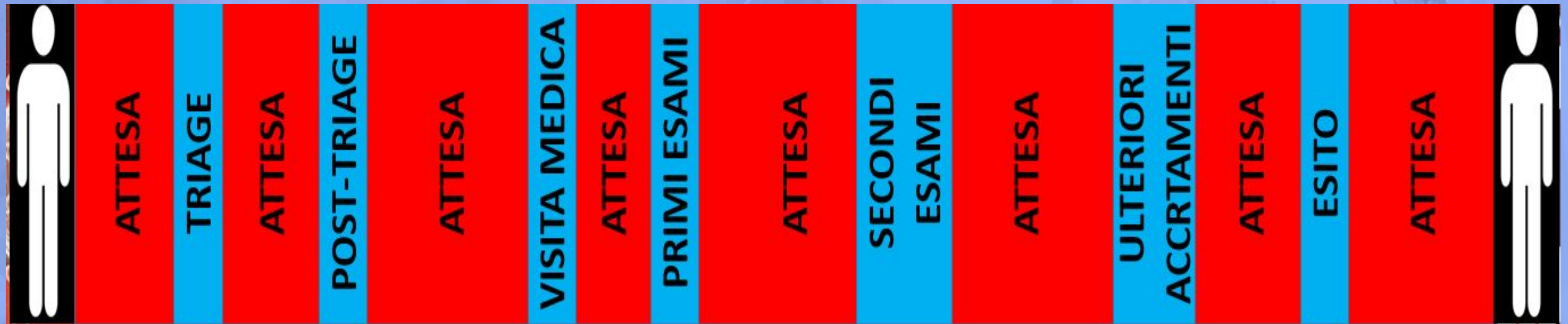
- Jones SS, Allen TL, Flottemesch TJ, Welch SJ. An independent evaluation of four quantitative emergency department crowding scales. *Acad Emerg Med* 2006; 13: 1204-1211.
- Raj K, Baker K, Brierley S, Murray D. National emergency department overcrowding study tool is not useful in an Australian emergency department. *Emerg Med Australas* 2006; 18: 282-288.
- Hostetler MA, Mace S, Brown K, et al; Subcommittee on Emergency Department Overcrowding and Children, Section of Pediatric Emergency Medicine, American College of Emergency Physicians. Emergency department overcrowding and children. *Pediatr Emerg Care* 2007; 23: 507-515.
- Australian Institute of Health and Welfare. Australia's health 2008. Canberra: AIHW, 2008. (AIHW Cat. No. AUS 99.) <http://www.aihw.gov.au/publications/index.cfm/title/10585> (accessed Mar 2009).

Posto letto è un bene prezioso

Admit to care → Care to admit

**Ricoverare per
curare → Prendersi cura
per ricoverare**

Esempio pratico: un paziente va in Pronto Soccorso



come il paziente percepisce la sua esperienza di Pronto Soccorso se non consapevole dei meccanismi dello stesso

Di qui la necessità di informazione

Quali sono gli effetti di sovraffollamento ?



Effetti del sovraffollamento

- Aumento della insoddisfazione del paziente
- Allungamento dei tempi di attesa



Australasian College for Emergency Medicine. Policy document — standard terminology. *Emerg Med (Fremantle)* 2002; 14: 337-340.

Richardson DB. Quantifying the effects of access block [abstract]. *Emerg Med (Fremantle)* 2001; 13: A10.

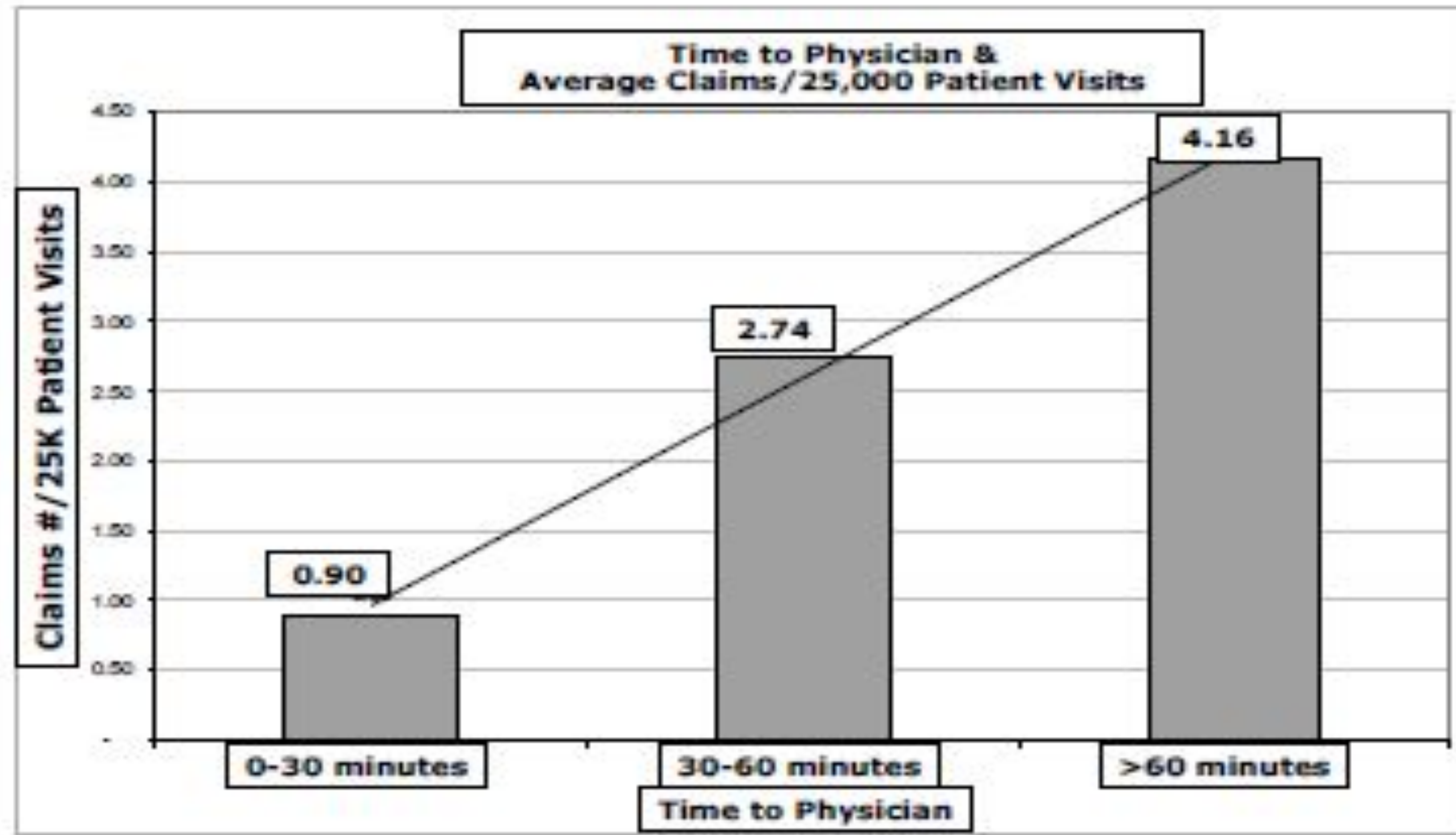
Bernstein SL, Aronsky D, Duseja R, et al. SAEM Emergency Department Crowding Task Force. The effect of emergency department crowding on clinically oriented outcomes. *Acad Emerg Med* 2009; 16: 1-10.

Cameron PA. Hospital overcrowding: a threat to patient safety? *Med J Aust* 2006; 184: 203-204.

Chalfin DB, Trzeciak S, Likourezos A, et al; DELAY-ED study group. Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. *Crit Care Med* 2007; 35: 1477-1483.

Waiting time- time to doctor

Time to Doc/Malpractice Claims



Courtesy CEP America Physician Partners, Emeryville, CA, 2006

Effetti del sovraffollamento

- Allungamento del LOS
- Aumento degli eventi avversi
- Riduzione della qualità delle cure



Australasian College for Emergency Medicine. Policy document — standard terminology. *Emerg Med (Fremantle)* 2002; 14: 337-340.

Richardson DB. Quantifying the effects of access block [abstract]. *Emerg Med (Fremantle)* 2001; 13: A10.

Bernstein SL, Aronsky D, Duseja R, et al. SAEM Emergency Department Crowding Task Force. The effect of emergency department crowding on clinically oriented outcomes. *AcadEmerg Med* 2009; 16: 1-10.

Cameron PA. Hospital overcrowding: a threat to patient safety? *Med J Aust* 2006; 184: 203-204.

Chalfin DB, Trzeciak S, Likourezos A, et al; DELAY-ED study group. Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. *Crit Care Med* 2007; 35: 1477-1483.

Sprivilis PC, Da Silva J-A, Jacobs IG, et al. The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments. *Med J Aust* 2006; 184: 208-212.

Effetti del sovraffollamento

- Aumentata mortalità



Australasian College for Emergency Medicine. Policy document — standard terminology. *Emerg Med (Fremantle)* 2002; 14: 337-340.

Richardson DB. Quantifying the effects of access block [abstract]. *Emerg Med (Fremantle)* 2001; 13: A10.

Bernstein SL, Aronsky D, Duseja R, et al. SAEM Emergency Department Crowding Task Force. The effect of emergency department crowding on clinically oriented outcomes. *Acad Emerg Med* 2009; 16: 1-10.

Cameron PA. Hospital overcrowding: a threat to patient safety? *Med J Aust* 2006; 184: 203-204.

Chalfin DB, Trzeciak S, Likourezos A, et al; DELAY-ED study group. Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit. *Crit Care Med* 2007; 35: 1477-1483.

Table 3 Mortality among admitted and discharged patients, crowding defined as EDOR at arrival

EDOR _A	OR	95% CI	<i>p</i> value
Admitted (a)			
Q1 (< 0.36)	1		
Q2 (0.36–0.54)	1.16	0.95–1.41	0.148
Q3 (0.55–0.75)	1.03	0.83–1.26	0.804
Q4 (> 0.75)	1.23	0.99–1.52	0.064
Discharged (a)			
Q1 (< 0.36)	1		
Q2 (0.36–0.54)	1.36	0.74–2.50	0.330
Q3 (0.55–0.75)	1.56	0.83–2.90	0.165
Q4 (> 0.75)	1.79	0.93–3.46	0.084

^aAll analyses adjusted with age, sex, shift, ESI, and transport mode

Mortalità aumentata

Table 2 10-Day mortality risk for EDOR at arrival, adjusted logistic regression

	OR	95% CI	<i>p</i> value
EDOR _A			
Q1 (< 0.36)	1		
Q2 (0.36–0.54)	1.18	0.98–1.43	0.079
Q3 (0.55–0.75)	1.09	0.90–1.33	0.386
Q4 (> 0.75)	1.31	1.07–1.61	0.009
Age (per year)	1.06	1.05–1.07	< 0.001
Male sex	1.65	1.45–1.87	< 0.001
Shift			
Day	1		
Evening	0.80	0.69–0.92	0.002
Night	0.94	0.77–1.14	0.538
Triage acuity			
ESI 4–5	1		
ESI 3	1.56	0.88–2.78	0.128
ESI 1–2	3.47	1.91–6.31	< 0.001
EMS transport	3.76	3.10–4.56	< 0.001

ORIGINAL RESEARCH

Emergency department crowding and mortality for patients presenting to emergency departments in New Zealand

Peter G JONES¹ and Bert VAN DER WERF²

¹Adult Emergency Department, Auckland City Hospital, Auckland, New Zealand, and ²Epidemiology and Biostatistics, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand

Key findings

- Access block was the crowding measure with the strongest association with increased mortality for patients presenting to EDs. New patients presenting to EDs had a 10% relative increase in mortality when more than 10% of current patients waiting for admission were suffering access block.

Mortalità aumentata

TABLE 3. Categories of crowding metric, number of deaths and unadjusted mortality

Crowding metric†	Categories	Number in category, %	7-day mortality, n	7-day mortality, % (95% CI)	Unadjusted hazard ratio	95% CI
Arrivals in previous hour	(0,3]	619 622, 28.2%	3189	0.51 (0.50, 0.53)	Reference	—
	(3,6]	626 550, 28.5%	3095	0.49 (0.48, 0.51)	0.96	0.91, 1.01
	(6,9]	439 266, 20%	2231	0.51 (0.49, 0.53)	0.98	0.93, 1.04
	(9,46]	511 632, 23.3%	2642	0.52 (0.50, 0.54)	0.99	0.94, 1.04
Arrivals in previous 6 h	(0,19]	513 840, 23.4%	2611	0.51 (0.49, 0.53)	Reference	—
	(19,32]	561 360, 25.6%	2879	0.51 (0.49, 0.53)	1.00	0.95, 1.06
	(32,51]	558 898, 25.4%	2708	0.48 (0.47, 0.50)	0.95	0.90, 1.00
	(51,Max]	562 972, 25.6%	2959	0.53 (0.51, 0.54)	1.02	0.96, 1.07
Time to assessment (min)	(0,30]	835 453, 38%	4066	0.49 (0.47, 0.50)	Reference	—
	(30,60]	910 352, 41.4%	4688	0.51 (0.50, 0.53)	1.05	1.01, 1.10
	(60,90]	298 722, 13.6%	1544	0.52 (0.49, 0.54)	1.06	0.99, 1.12
	(90,120]	86 199, 3.9%	480	0.56 (0.51, 0.61)	1.15	1.05, 1.27
Triage time compliance	(120,Max]	66 344, 3%	379	0.57 (0.51, 0.63)	1.17	1.05, 1.30
	(0,28.6]	562 893, 25.6%	2976	0.53 (0.51, 0.55)	Reference	—
	(28.6,46.9]	559 603, 25.5%	2945	0.53 (0.51, 0.55)	0.99	0.94, 1.05
	(46.9,70]	560 969, 25.5%	3005	0.54 (0.52, 0.56)	1.02	0.96, 1.07
Median boarding duration (h)	(70,100]	513 605, 23.4%	2231	0.43 (0.42, 0.45)	0.83	0.79, 0.88
	(0,1]	655 988, 29.9%	3005	0.46 (0.44, 0.47)	Reference	—
	(1,2]	717 329, 32.6%	3458	0.48 (0.47, 0.50)	1.05	1.00, 1.11
	(2,4]	576 856, 26.3%	3105	0.54 (0.52, 0.56)	1.18	1.12, 1.24
Proportion with boarding duration >2 h	(4,Max]	246 897, 11.2%	1589	0.64 (0.61, 0.68)	1.42	1.33, 1.51
	(0,0.25]	727 766, 33.1%	3225	0.44 (0.43, 0.46)	Reference	—
	(0.25,0.5]	754 319, 34.3%	3797	0.50 (0.49, 0.52)	1.13	1.08, 1.18
	(0.5,0.75]	469 550, 21.4%	2697	0.57 (0.55, 0.60)	1.29	1.23, 1.36
	(0.75,1]	245 435, 11.2%	1438	0.59 (0.56, 0.62)	1.34	1.26, 1.42

Mortalità aumentata

ORIGINAL RESEARCH

Emergency department crowding and mortality for patients presenting to emergency departments in New Zealand

Peter G JONES¹ and Bert VAN DER WERF²

¹Adult Emergency Department, Auckland City Hospital, Auckland, New Zealand, and ²Epidemiology and Biostatistics, Faculty of Medical and Health Sciences, The University of Auckland, Auckland, New Zealand

TABLE 3. Continued

Crowding metric†	Categories	Number in category, %	7-day mortality, <i>n</i>	7-day mortality, % (95% CI)	Unadjusted hazard ratio	95% CI
TPCT	(0.25,0.5]	236 982, 10.8%	1502	0.63 (0.60, 0.67)	1.38	1.30, 1.46
	(0.5,0.75]	66 830, 3%	536	0.80 (0.73, 0.87)	1.73	1.59, 1.89
	(0.75,1]	17 107, 0.8%	109	0.64 (0.52, 0.76)	1.42	1.17, 1.71
	(0,21.9]	485 977, 22.1%	2177	0.45 (0.43, 0.47)	Reference	—
	(21.9,52.1]	532 454, 24.2%	2537	0.48 (0.46, 0.50)	1.06	1, 1.12
	(52.1,120]	555 796, 25.3%	2840	0.51 (0.49, 0.53)	1.13	1.06, 1.19
	(120,Max]	622 843, 28.3%	3603	0.58 (0.56, 0.60)	1.27	1.21, 1.34
Boarder number	(0,2]	534 256, 24.3%	2309	0.43 (0.42, 0.45)	Reference	—
	(2,7]	571 831, 26%	2731	0.48 (0.46, 0.50)	1.10	1.04, 1.16
	(7,15]	483 793, 22%	2589	0.54 (0.52, 0.56)	1.22	1.16, 1.29
	(15,59]	607 190, 27.6%	3528	0.58 (0.56, 0.60)	1.33	1.26, 1.4
ED occupancy	(0,0.85]	1 183 715, 53.9%	6003	0.51 (0.49, 0.52)	Reference	—
	(0.85,1]	284 672, 13%	1281	0.45 (0.43, 0.48)	0.88	0.83, 0.94
	(1,1.25]	275 440, 12.5%	1434	0.52 (0.49, 0.55)	1.02	0.96, 1.08
	(1.25,Max]	453 243, 20.6%	2439	0.54 (0.52, 0.56)	1.06	1.01, 1.11
Change in ED occupancy	Decreasing ↓	543 005, 24.7%	2800	0.52 (0.50, 0.54)	Reference	—
	Static 0	551 611, 25.1%	2759	0.50 (0.48, 0.52)	0.97	0.92, 1.02
	Increasing ↑	1 102 454, 50.2%	5598	0.51 (0.50, 0.52)	0.98	0.94, 1.03
Change in TPCT	Decreasing ↓	658 352, 30.0%	3259	0.50 (0.48, 0.51)	Reference	—
	Static 0	11 094, 0.5%	71	0.64 (0.49, 0.79)	1.33	1.05, 1.69
	Increasing ↑	1 527 624, 69.5%	7827	0.51 (0.50, 0.52)	1.03	—
Proportion with boarding duration >6 h	(0,0.25]	1 827 518, 83.2%	8720	0.48 (0.47, 0.49)	Reference	—
	(0.25,0.5]	275 833, 12.6%	1767	0.64 (0.61, 0.67)	1.35	1.29, 1.43
	(0.5,0.75]	69 372, 3.2%	523	0.75 (0.69, 0.82)	1.58	1.45, 1.73
	(0.75,1]	24 347, 1.1%	147	0.60 (0.51, 0.70)	1.30	1.10, 1.53

Mortalità aumentata

Increase in patient mortality at 10 days associated with emergency department overcrowding

Drew B Richardson

Overcrowding causes dysfunction in the emergency department (ED): it is associated with longer waiting times,¹ increased delays in admission to hospital,² and even with transmission of infectious disease (during the outbreak of severe acute respiratory disease [SARS] in Canada).³ Delays in transfer to an inpatient bed from the ED are associated with increased inpatient length of stay,^{4,5} but there have been few studies of the relationship between ED overcrowding and patient outcomes. An understanding of the human cost of overcrowding is important to guide appropriate distribution of health care resources.

A recent study to validate a measure of ED overcrowding based on the number of patients receiving treatment ("occupancy")⁶ noted a trend ($P=0.08$) towards increased inpatient mortality at 10 days in patients presenting at times of ED overcrowding. This prompted further study, which is reported here, with the aim of quantifying any such relationship.

Of the possible definitions of ED overcrowding, the simplest and least subjective is occupancy with patients under treatment

ABSTRACT

Objective: To quantify any relationship between emergency department (ED) overcrowding and 10-day patient mortality.

Design and setting: Retrospective stratified cohort analysis of three 48-week periods in a tertiary mixed ED in 2002–2004. Mean "occupancy" (a measure of overcrowding based on number of patients receiving treatment) was calculated for 8-hour shifts and for 12-week periods. The shifts of each type in the highest quartile of occupancy were classified as overcrowded.

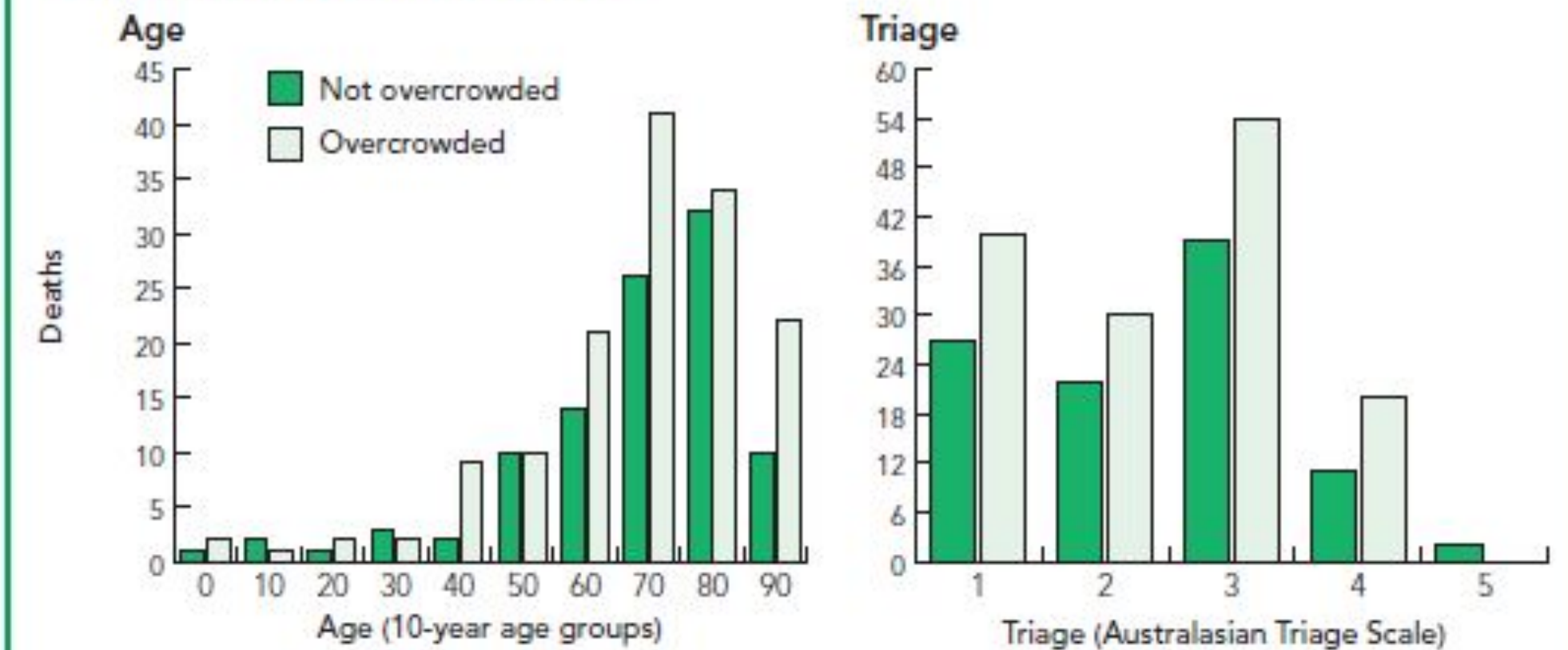
Participants: All presentations of patients (except those arriving by interstate ambulance) during "overcrowded" (OC) shifts and during an equivalent number of "not overcrowded" (NOC) shifts (same shift, weekday and period).

Main outcome measure: In-hospital death of a patient recorded within 10 days of the most recent ED presentation.

Results: There were 34 377 OC and 32 231 NOC presentations (736 shifts each); the presenting patients were well matched for age and sex. Mean occupancy was 21.6 on OC shifts and 16.4 on NOC shifts. There were 144 deaths in the OC cohort and 101 in the NOC cohort (0.42% and 0.31%, respectively; $P=0.025$). The relative risk of death at 10 days was 1.34 (95% CI, 1.04–1.72). Subgroup analysis showed that, in the OC cohort, there were more presentations in more urgent triage categories, decreased treatment performance by standard measures, and a higher mortality rate by triage category.

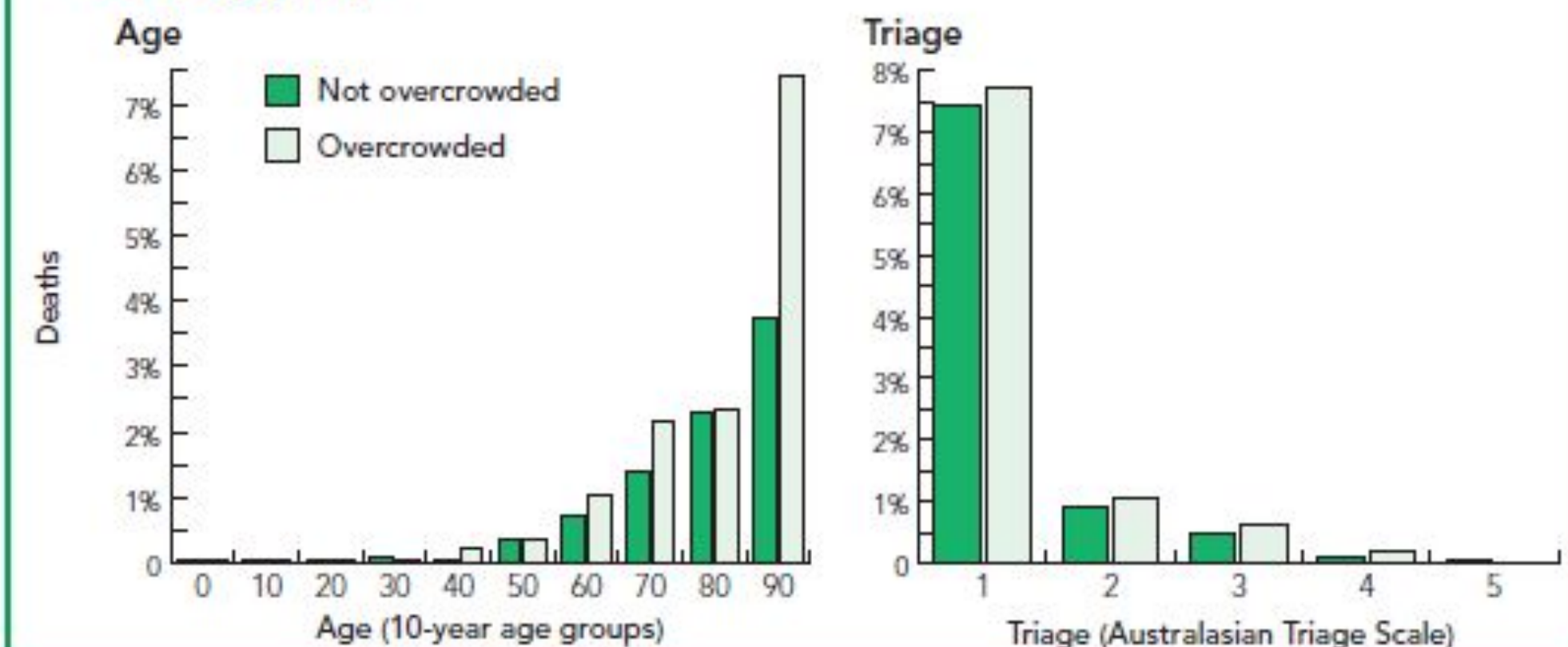
Conclusions: In this hospital, presentation during high ED occupancy was associated with increased in-hospital mortality at 10 days, after controlling for seasonal, shift, and day of the week effects. The magnitude of the effect is about 13 deaths per year. Further studies are warranted.

4 Distribution of 10-day mortality by subgroup. The y axis represents the actual number of deaths in each subgroup in overcrowded (OC) and not overcrowded (NOC) cohorts



There were 7% more presentations and 43% more deaths in the OC cohort compared with the NOC cohort. ♦

5 Absolute mortality rate by subgroup. The y axis represents the percentage mortality rate in that group. There was excess mortality even within triage category groups



Richardson_Increase in patient mortality at 10 days associated with emergency department overcrowding_Med J Aust_2006

Mortalità aumentata

RESEARCH

The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments

Peter C Sprivulis, Julie-Ann Da Silva, Ian G Jacobs, Amanda RL Frazer and George A Jelinek

Emergency department (ED) overcrowding is common in North America, the United Kingdom and Australasia.¹⁻³ Overcrowding results in ambulance diversion and impaired ED responsiveness.^{2,4,5}

Inpatient bed "access block" is the principal cause of ED overcrowding.^{1,4,6} Access block is defined as the proportion of ED patients requiring admission whose total time within the ED exceeds 8 hours.⁷ Access block is correlated with total hospital inpatient bed occupancy of 90% or more, as measured by a midnight bed census.⁷⁻⁹ A target occupancy of 85% has been suggested as a balance between unused bed capacity and efficient inpatient flow.^{8,10}

Some studies have identified a relationship between high occupancy, access block and adverse patient outcomes, as measured by inpatient length of stay, hospital readmission or reattendance for emergency care.¹¹⁻¹³

Our study examines whether high hospital occupancy and ED access block is also associated with increased patient mortality.

ABSTRACT

Objective: To examine the relationship between hospital and emergency department (ED) occupancy, as indicators of hospital overcrowding, and mortality after emergency admission.

Design: Retrospective analysis of 62 495 probabilistically linked emergency hospital admissions and death records.

Setting: Three tertiary metropolitan hospitals between July 2000 and June 2003.

Participants: All patients 18 years or older whose first ED attendance resulted in hospital admission during the study period.

Main outcome measures: Deaths on days 2, 7 and 30 were evaluated against an Overcrowding Hazard Scale based on hospital and ED occupancy, after adjusting for age, diagnosis, referral source, urgency and mode of transport to hospital.

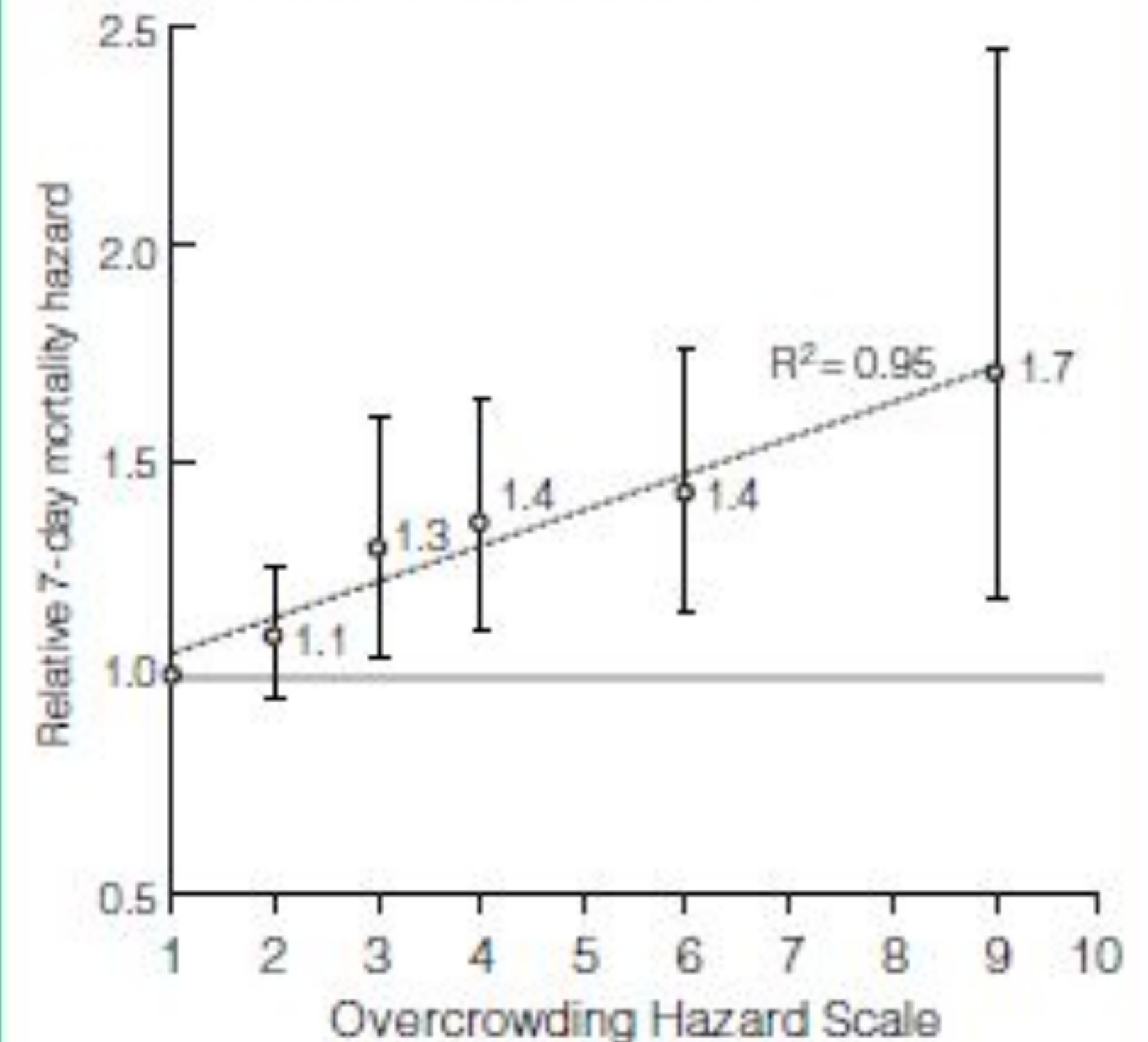
Results: There was a linear relationship between the Overcrowding Hazard Scale and deaths on Day 7 ($r = 0.98$; 95% CI, 0.79–1.00). An Overcrowding Hazard Scale > 2 was associated with an increased Day 2, Day 7 and Day 30 hazard ratio for death of 1.3 (95% CI, 1.1–1.6), 1.3 (95% CI, 1.2–1.5) and 1.2 (95% CI, 1.1–1.3), respectively. Deaths at 30 days associated with an Overcrowding Hazard Scale > 2 compared with one of < 3 were undifferentiated with respect to age, diagnosis, urgency, transport mode, referral source or hospital length of stay, but had longer ED durations of stay (risk ratio per hour of ED stay, 1.1; 95% CI, 1.1–1.1; $P < 0.001$) and longer physician waiting times (risk ratio per hour of ED wait, 1.2; 95% CI, 1.1–1.3; $P = 0.01$).

Conclusions: Hospital and ED overcrowding is associated with increased mortality. The Overcrowding Hazard Scale may be used to assess the hazard associated with hospital and ED overcrowding. Reducing overcrowding may improve outcomes for patients requiring emergency hospital admission.

METHODS

MJA 2006; 184: 208–212

4 Relationship between the Overcrowding Hazard Scale and the 7-day mortality hazard for emergency admissions



Sprivulis_The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments_Med J Aust_2006

Mortalità aumentata

Eur J Emerg Med. 1999 Jun;6(2):105-7. doi: 10.1097/00063110-199906000-00003.

Decreased health care quality associated with emergency department overcrowding

O Miró¹, M T Antonio, S Jiménez, A De Dios, M Sánchez, A Borrás, J Millá

Affiliations + expand

PMID: 10461551 DOI: 10.1097/00063110-199906000-00003

Abstract

The objective of this study was to assess the influence of overcrowding on health care quality provided by emergency departments (ED). The study was carried out in an urban, university tertiary care hospital. All patients seen at the internal medicine unit (IMU) of the ED who returned during the following 72 hours, and those who died in the ED rooms were included in the study. During a consecutive period of 2 years (104 weeks), we prospectively quantified the number of weekly visits, revisits and deaths. We calculated revisit and mortality rates (in respect of percentage of all visited patients) for each week. Correlation between the number of weekly visits, and revisit and mortality rates was assessed using a simple linear regression model. We consigned 81,301 visits, 1137 revisits and 648 deaths; mean (+/- SD) number of weekly visits, revisits and deaths were 782 (68), 10.93 (3.97) and 6.23 (3.04) respectively; weekly revisit rate was 1.40% (0.48%) and weekly mortality rate was 0.79% (0.36%). We observed a significant, positive correlation between mortality rates and weekly number of visits ($p = 0.01$). Although a similar trend was also found for revisit rates, such an increase did not reach statistical significance ($p = 0.06$). It is concluded that since revisit and mortality rates constitute good health care quality markers, present data demonstrate that ED overcrowding implies a decrease in the health care quality provided by it.

Miró O, Antonio MT, Jiménez S, De Dios A, Sánchez M, Borrás A, Millá J. Decreased health care quality associated with emergency department overcrowding. Eur J Emerg Med. 1999 Jun;6(2):105-7. doi: 10.1097/00063110-199906000-00003. PMID: 10461551.

Mortalità aumentata

Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit*

Donald B. Chalfin, MD, MS, FCCM; Stephen Trzeciak, MD, MPH; Antonios Likourezos, MA, MPH; Brigitte M. Baumann, MD, MSCE; R. Phillip Dellinger, MD, FCCM; for the DELAY-ED study group

Objective: Numerous factors can cause delays in transfer to an intensive care unit for critically ill emergency department patients. The impact of delays is unknown. We aimed to determine the association between emergency department “boarding” (holding admitted patients in the emergency department pending intensive care unit transfer) and outcomes for critically ill patients.

Design: This was a cross-sectional analytical study using the Project IMPACT database (a multicenter U.S. database of intensive care unit patients). Patients admitted from the emergency department to the intensive care unit (2000–2003) were included and divided into two groups: emergency department boarding ≥6 hrs (delayed) vs. emergency department boarding <6 hrs (nondelayed). Demographics, intensive care unit procedures, length of stay, and mortality were analyzed. Groups were compared using chi-square, Mann-Whitney, and unpaired Student’s *t*-tests.

Setting: Emergency department and intensive care unit.

Patients: Patients admitted from the emergency department to the intensive care unit (2000–2003).

Interventions: None.

Measurements and Main Results: Main outcomes were intensive care unit and hospital survival and intensive care unit and hospital length of stay. During the study period, 50,322 patients were

admitted. Both groups (delayed, *n* = 1,036; nondelayed, *n* = 49,286) were similar in age, gender, and do-not-resuscitate status, along with Acute Physiology and Chronic Health Evaluation II score in the subgroup for which it was recorded. Among hospital survivors, the median hospital length of stay was 7.0 (delayed) vs. 6.0 days (nondelayed) (*p* < .001). Intensive care unit mortality was 10.7% (delayed) vs. 8.4% (nondelayed) (*p* < .01). In-hospital mortality was 17.4% (delayed) vs. 12.9% (nondelayed) (*p* < .001). In the stepwise logistic model, delayed admission, advancing age, higher Acute Physiology and Chronic Health Evaluation II score, male gender, and diagnostic categories of trauma, intracerebral hemorrhage, and neurologic disease were associated with lower hospital survival (odds ratio for delayed admission, 0.709; 95% confidence interval, 0.561–0.895).

Conclusions: Critically ill emergency department patients with a ≥6-hr delay in intensive care unit transfer had increased hospital length of stay and higher intensive care unit and hospital mortality. This suggests the need to identify factors associated with delayed transfer as well as specific determinants of adverse outcomes. (Crit Care Med 2007; 35:1477–1483)

KEY WORDS: emergency service/hospital; emergency medicine; critical care; crowding; health resources/utilization; hospital bed capacity

Table 4. Univariate outcomes

	DEL (n = 1036)	Non-DEL (n = 49286)	<i>p</i> Value
ICU LOS ^a			
Mean, days	3.1 ± 3.6	3.1 ± 4.3	
Median (range)	1.9 (0.1–30.8)	1.8 (0.1–82.9)	<.01
Hospital LOS ^b			
Mean, days	10.1 ± 11.2	8.7 ± 9.8	
Median (range)	7.0 (1–154)	6.0 (1–256)	<.001
ICU mortality, %	10.7	8.4	<.01
In-hospital mortality, %	17.4	12.9	<.001

DEL, delayed; Non-DEL, non-delayed; ICU, intensive care unit; LOS, length of stay.
^aFor subjects that survived to ICU discharge and had no do-not-resuscitate (DNR) order at the time of admission; ^bfor subjects that survived to hospital discharge and had no DNR order at time of admission.

Chalfin_Impact of delayed transfer of critically ill patients from the emergency department to the intensive care unit_Crit Care Med_2007

Association between waiting times and short term mortality and hospital admission after departure from emergency department: population based cohort study from Ontario, Canada

Astrid Guttman, senior scientist,^{1,2,3,4} Michael J Schull, senior scientist and 2010-11 Commonwealth Fund Harkness fellow,^{1,4,5,6,7} Marian J Vermeulen, epidemiologist,^{1,6} Therese A Stukel, senior scientist^{1,4,6}

Mortalità aumentata

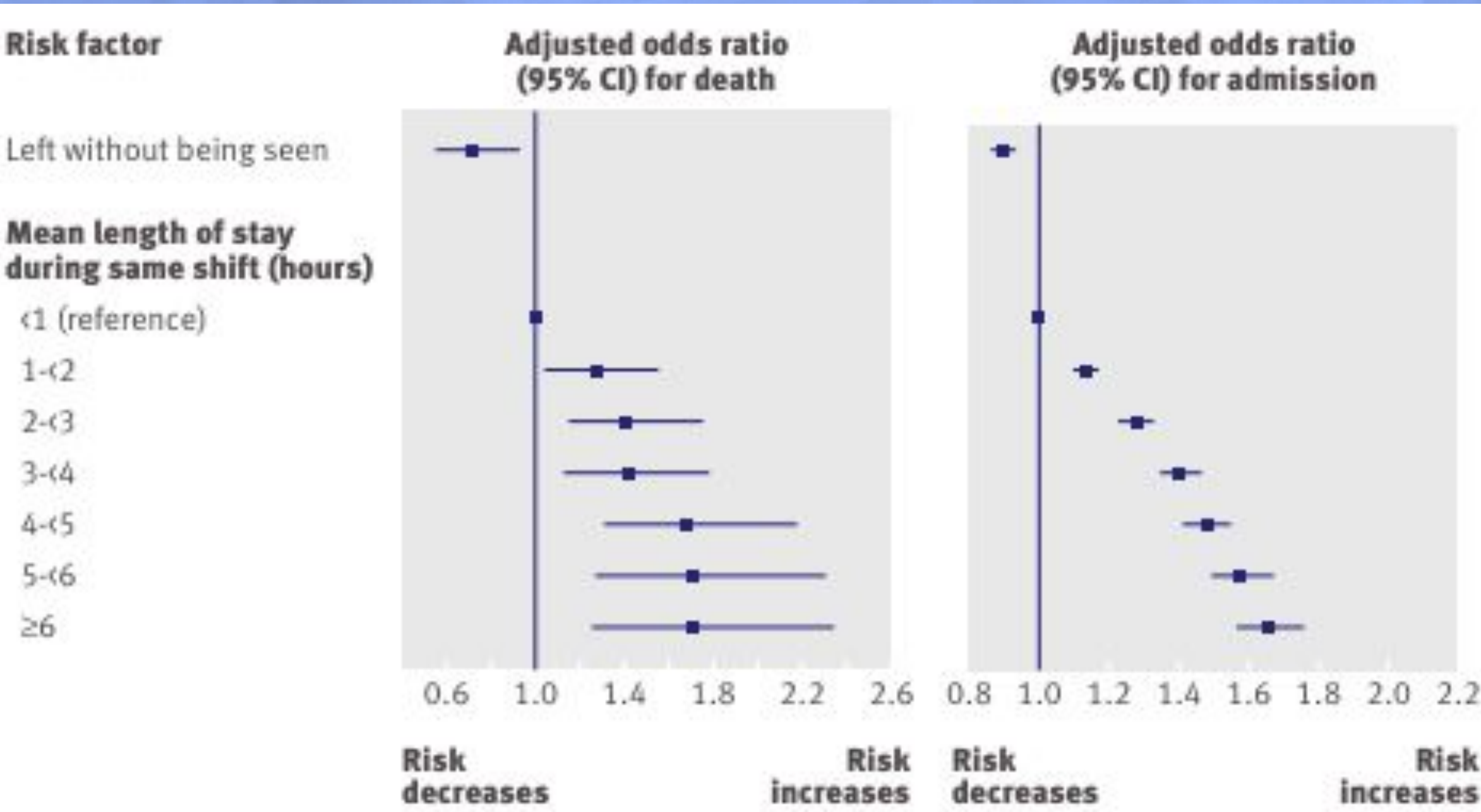


Fig 2 | Adjusted odds ratios (95% confidence intervals) for death and admission to hospital within seven days of emergency department visit among all non-admitted (seen and discharged and left without being seen) low acuity patients (Canadian triage and acuity scale levels 4 to 5). Odds ratios adjusted for triage level, age group, sex, calendar month, income fifth, urban/rural community, No of visits to emergency department in previous year, chief complaint, time/day of shift

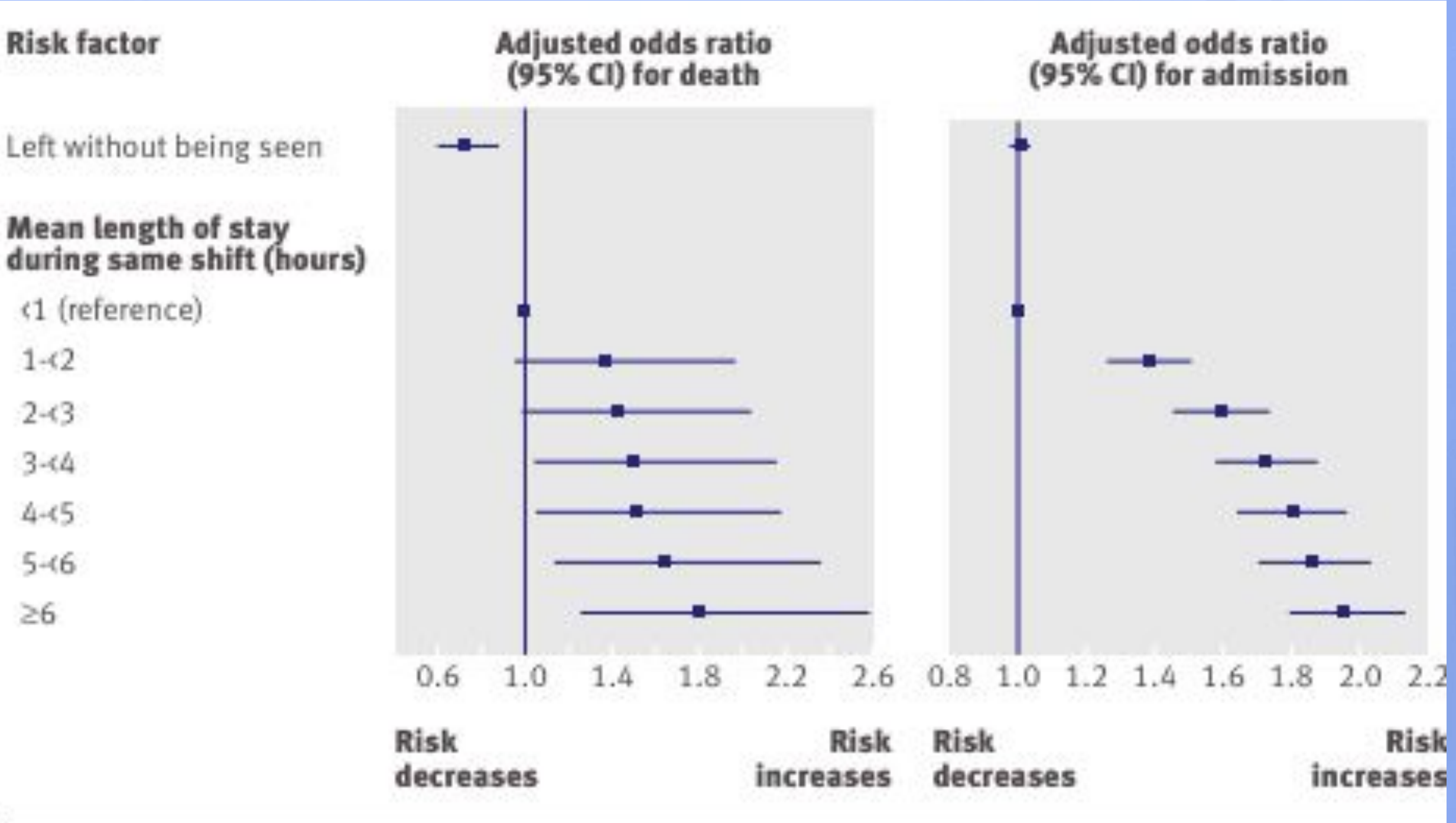


Fig 1 | Adjusted odds ratios (95% confidence intervals) for death and admission to hospital within seven days of emergency department visit among all non-admitted (seen and discharged and left without being seen) high acuity patients (Canadian triage and acuity scale levels 1 to 3). Odds ratios adjusted for triage level, age group, sex, calendar month, income fifth, urban/rural community, No of visits to emergency department in previous year, chief complaint, time/day of shift

Guttman _Association between waiting times and short term mortality and hospital admission after departure from emergency department_population based cohort study from Ontario_Canada_BMJ_2011

Association between waiting times and short term mortality and hospital admission after departure from emergency department: population based cohort study from Ontario, Canada

Astrid Guttman, senior scientist,^{1,2,3,4} Michael J Schull, senior scientist and 2010-11 Commonwealth Fund Harkness fellow,^{1,4,5,6,7} Marian J Vermeulen, epidemiologist,^{1,6} Therese A Stukel, senior scientist^{1,4,6}

Mortalità aumentata

Table 4 | Outcomes among emergency department patients who were seen and discharged or left without being seen according to mean length of stay of similar patients in emergency department on same shift, 1 April 2003 to 28 February 2008

Mean length of stay (hours)	High acuity (Canadian triage and acuity scale 1-3)			Low acuity (Canadian triage and acuity scale 4-5)		
	No	Died (%)	Admitted (%)	No	Died (%)	Admitted (%)
<1	34 087	0.094	2.23	685 544	0.020	0.67
1-<2	330 507	0.120	2.82	2 636 122	0.023	0.74
2-<3	888 838	0.110	2.78	2 203 178	0.026	0.83
3-<4	1 456 504	0.112	2.76	1 190 722	0.029	0.95
4-<5	1 593 044	0.119	2.83	529 281	0.039	1.06
5-<6	1 238 144	0.132	2.90	214 925	0.043	1.18
≥6	1 364 478	0.151	3.04	181 132	0.045	1.24

Guttman _Association between waiting times and short term mortality and hospital admission after departure from emergency department_population based cohort study from Ontario_Canada_BMJ_2011

Mortalità aumentata

ORIGINAL ARTICLE

The Association Between Crowding and Mortality in Admitted Pediatric Patients From Mixed Adult-Pediatric Emergency Departments in Korea

Won Chul Cha, MD,* Sang Do Shin, MD, PhD,† Jin Sung Cho, MD,‡ Kyoung Jun Song, MD,§ Adam J. Singer, MD,|| and Young Ho Kwak, MD, PhD¶

Pediatric Emergency Care • Volume 27, Number 12, December 2011

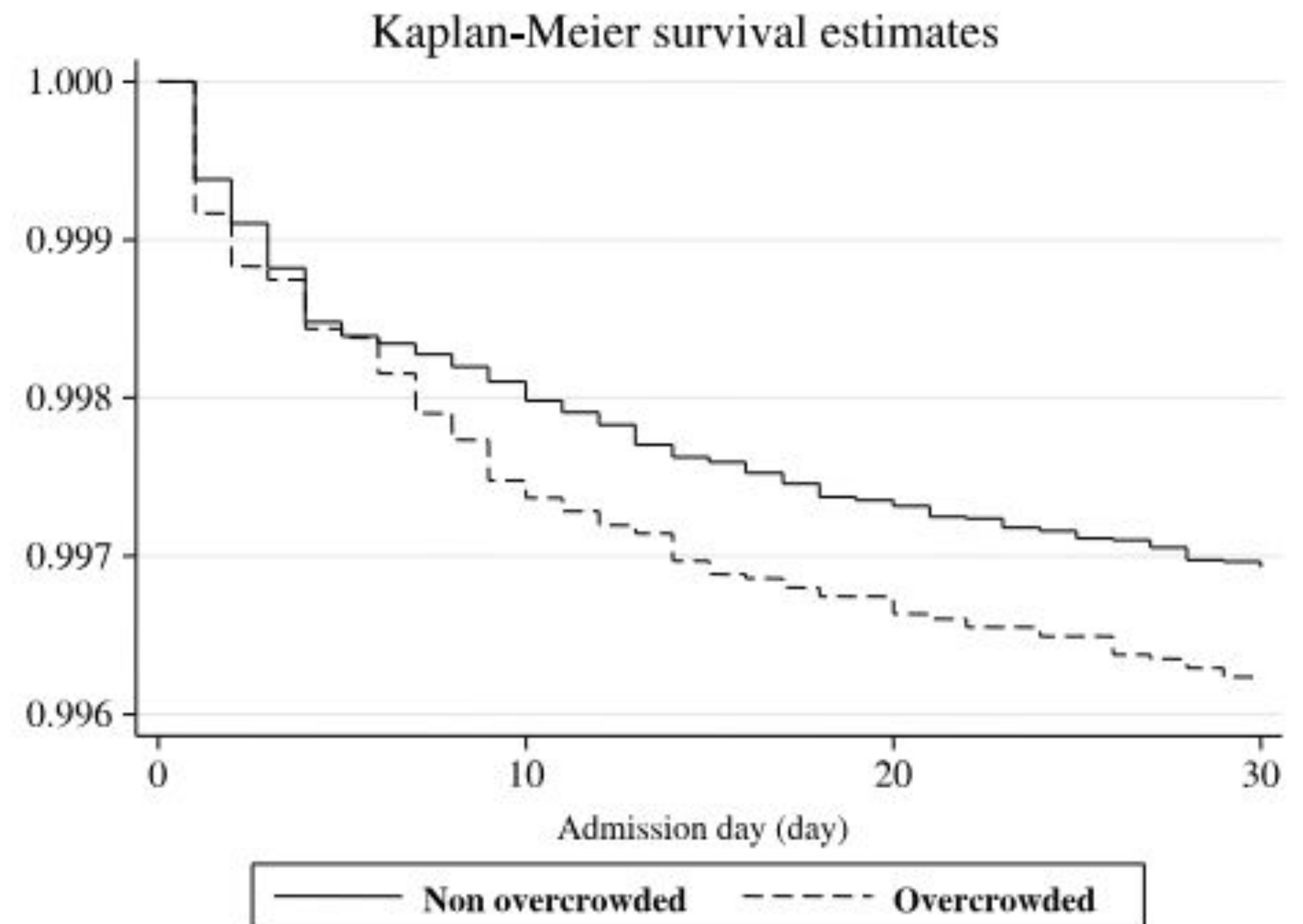


FIGURE 3. Kaplan-Meier survival curve of both groups. The C group showed lower survival rate than the NC group. However, the difference did not show statistical significance ($P = 0.063$).

Cha_The association between crowding and mortality in admitted pediatric patients from mixed adult-pediatric emergency departments in Korea_Pediatr Emerg Care_2011

The Association Between Emergency Department Crowding and Adverse Cardiovascular Outcomes in Patients with Chest Pain

Jesse M. Pines, MD, MBA, MSCE, Charles V. Pollack Jr, MD, MA, Deborah B. Diercks, MD, Anna Marie Chang, MD, Frances S. Shofer, PhD, and Judd E. Hollander, MD

Table 2
Adverse Cardiovascular Outcomes That Occurred During Hospitalization and Complication Timing (n = 251)

Complication	≤24 hours	>24 hours	Total
Heart failure			
ACS	5	20	25
Non-ACS	8	59	67
Hypotension			
ACS	2	9	11
Non-ACS	13	20	33
Supraventricular dysrhythmias			
ACS	3	18	21
Non-ACS	11	21	32
Delayed myocardial infarction			
ACS	1	13	14
Non-ACS	3	2	5
Cardiac arrest with CPR			
ACS	2	13	15
Non-ACS	2	2	4
Ventricular dysrhythmias			
ACS	1	8	9
Non-ACS	2	4	6
Bradydysrhythmias			
ACS	0	1	1
Non-ACS	1	7	8

ACS = acute coronary syndrome; CPR = cardiopulmonary resuscitation.

Eventi avversi

Table 3
Adjusted ORs for Any Adverse Cardiovascular Outcome for Patients With Chest Pain With Documented ACS and Non-ACS

ED Crowding Measures	25th–49th	50th–74th	≥75th
ACS Cohort (n = 803)			
Waiting room number	1.1 (0.4–3.2)	0.9 (0.3–2.9)	3.7 (1.3–11.0)
Patient care hours	1.3 (0.5–3.5)	1.4 (0.5–4.3)	5.2 (2.0–13.6)
Number of admitted patients	1.3 (0.6–2.8)	1.3 (0.5–3.3)	1.6 (0.6–4.1)
Occupancy	0.9 (0.3–2.8)	1.3 (0.4–4.4)	3.1 (1.0–9.3)
Recent ED LOS for admitted patients*	1.0 (0.5–2.0)	0.6 (0.2–1.4)	1.5 (0.5–4.0)
Non-ACS cohort (n = 3,371)			
Waiting room number	1.6 (0.8–3.4)	2.3 (1.1–5.0)	3.5 (1.4–8.4)
Patient care hours	2.7 (1.5–5.0)	2.2 (1.2–3.9)	4.3 (2.6–7.3)
Number of admitted patients	0.9 (0.5–1.5)	0.8 (0.4–1.3)	0.6 (0.4–1.1)
Occupancy	0.9 (0.5–1.6)	1.2 (0.6–2.2)	1.8 (0.9–3.3)
Recent ED LOS for admitted patients*	0.9 (0.5–1.5)	0.8 (0.5–1.3)	1.2 (0.6–2.0)

Adjusted model included TIMI risk score, a history of heart failure, time of day in three categories, year of service, weekend versus weekday, age, race, and sex and all reported ORs are compared to the lowest quartile, which corresponds to the lowest level of ED crowding. Reported ORs represent a single crowding measure placed in each model. 95% CIs are represented in parentheses.

ACS = acute coronary syndrome; LOS = length of stay; TIMI = Thrombolysis In Myocardial Infarction.

*Refers to other patients in the ED (admitted patients who were transferred to inpatient beds within 6 hours of a patient’s ED triage time).

PROLUNGAMENTO DEI TEMPI alla terapia ANTIBIOTICA

HEALTH POLICY AND CLINICAL PRACTICE/ORIGINAL RESEARCH

The Impact of Emergency Department Crowding Measures on Time to Antibiotics for Patients With Community-Acquired Pneumonia

Jesse M. Pines, MD, MBA,
MSCE

A. Russell Localio, PhD

Judd E. Hollander, MD

William G. Baxt, MD

Hoi Lee, MD

Carolyn Phillips, MD

Joshua P. Metlay, MD, PhD

From the Department of Emergency Medicine (Pines, Hollander, Baxt, Lee, Phillips) and Center for Clinical Epidemiology and Biostatistics (Pines, Localio, Metlay), University of Medicine, Philadelphia, PA; the Department of Medicine (Metlay), Leonard Davis Institute of Health Economics (Pines), University of Pennsylvania, Philadelphia, PA; and the Center for Equity Research and Promotion, VA Medical Center, Philadelphia, PA (Metlay).

Study objective: We seek to determine the impact of emergency department (ED) crowding on delays in antibiotic administration for patients with community-acquired pneumonia.

Methods: We performed a retrospective cohort study of adult patients admitted with community-acquired pneumonia from January 1, 2003, to April 31, 2005, at a single, urban academic ED. The main outcome was a delay (>4 hours from arrival) or nonreceipt of antibiotics in the ED. Eight ED crowding measures were assigned at triage. Multivariable regression and bootstrapping were used to test the adjusted impact of ED crowding measures on delayed (or no) antibiotics. Predicted probabilities were then calculated to assess the magnitude of the impact of ED crowding on the probability of delayed (or no) antibiotics.

Results: In 694 patients, 44% (95% confidence interval [CI] 40% to 48%) received antibiotics within 4 hours and 92% (95% CI 90% to 94%) received antibiotics in the ED. Increasing levels of ED crowding were associated with delayed (or no) antibiotics, including waiting room number (odds ratio [OR] 1.05 for each additional waiting room patient [95% CI 1.01 to 1.10]) and recent ED length of stay for admitted patients (OR 1.14 for each additional hour [95% CI 1.04 to 1.25]). When the waiting room and recent length of stay were both at the lowest quartiles (ie, not crowded), the predicted probability of delayed (or no) antibiotics within 4 hours was 31% (95% CI 21% to 42%); when both were at the highest quartiles, the predicted probability was 72% (95% CI 61% to 81%).

Conclusion: ED crowding is associated with delayed and nonreceipt of antibiotics in the ED for patients admitted with community-acquired pneumonia. [Ann Emerg Med. 2007;50:510-516.]

PROLUNGAMENTO DEI TEMPI alla terapia ANTIBIOTICA

HEALTH POLICY AND CLINICAL PRACTICE/ORIGINAL RESEARCH

Effect of Emergency Department Crowding on Time to Antibiotics in Patients Admitted With Community-Acquired Pneumonia

Christopher Fee, MD
Ellen J. Weber, MD
Carley A. Maak, MD
Peter Bacchetti, PhD

From the Division of Emergency Medicine, Department of Medicine (Fee, V Medicine (Maak), and Department of Epidemiology and Biostatistics (Bacc California, San Francisco Medical Center, San Francisco, CA.

Dr. Maak is currently affiliated with the Department of Emergency Medicine, Oregon Health Sciences University, Portland, OR.

Study objective: We hypothesize that emergency department (ED) volume and increased patient complexity are associated with lower quality of care, as measured by time to antibiotics for patients being admitted with community-acquired pneumonia.

Methods: This was a cross-sectional study at a university tertiary care hospital ED. Community-acquired pneumonia patients admitted from the ED and discharged between January 2004 and June 2005 were reviewed by our institution for The Joint Commission's antibiotic timing core measure. Medical records were abstracted for patient age, sex, race, mode of transport, arrival time, triage acuity, inpatient level of care, and arrival-to-antibiotic-administration times. Controlling for patient characteristics, multivariate logistic regression determined association of antibiotic administration within 4 hours of arrival, with total ED volume at the time of the community-acquired pneumonia patient's arrival, and with number of ED patients requiring admission at the time of arrival.

Results: Four hundred eighty-six patients were eligible for the study; antibiotic administration time was available for 405. Sixty-one percent of patients received antibiotics within 4 hours. Antibiotic administration within 4 hours was less likely with a greater number of patients (odds ratio 0.96 per additional patient; 95% confidence interval 0.93 to 0.99) and a greater number of patients ultimately admitted (odds ratio 0.93 per patient; 95% confidence interval 0.88 to 0.99) in the ED. The effect of additional patients was present below total ED capacity.

Conclusion: As ED volume increases, ED patients with community-acquired pneumonia are less likely to receive timely antibiotic therapy. The effect of additional patients appears to occur even at volumes below the maximum bed capacity. Measures to ensure that quality targets are met in the ED should consider the impact of ED volume. [Ann Emerg Med. 2007;50:501-509.]

PROLUNGAMENTO DEI TEMPI alla terapia ANTIBIOTICA

The Association between Emergency Department Crowding and Hospital Performance on Antibiotic Timing for Pneumonia and Percutaneous Intervention for Myocardial Infarction

Jesse M. Pines, MD, MBA, Judd E. Hollander, MD, A. Russell Localio, PhD, Joshua P. Metlay, MD, PhD

Abstract

Background: Antibiotics within four hours of arrival for patients with pneumonia and percutaneous intervention (PCI) within two hours for patients with acute myocardial infarction (AMI) are standard measures of emergency department (ED) quality.

Objectives: To assess the institutional-level association between measures of ED crowding and process measures for pneumonia and AMI.

Methods: The authors used summary data from 24 academic hospitals in the University Health Consortium. Analysis included the 2004 ED cycle time survey and performance data from January to December 2004 regarding the Joint Commission for Accreditation of Healthcare Organizations' PN-5b (initial antibiotic administration within four hours) for pneumonia and AMI-8a (PCI received within 120 minutes). Spearman correlation coefficients were used to determine associations between crowding and performance measures.

Results: Across all institutions, 59% (range 43%–77%) of pneumonia patients received antibiotics within four hours, and 57% (range 22%–95%) of AMI patients received PCI within two hours. An increase in overall ED length of stay (-0.44 , $p = 0.04$) and for admitted patients (-0.37 , $p = 0.08$) was associated with a decrease in the proportion of pneumonia patients receiving antibiotics within four hours. An increase in chest x-ray turnaround time (-0.83 , $p < 0.001$) and an increase in the left-without-being-seen rate (-0.51 , $p = 0.01$) were also associated with a decrease in the proportion of pneumonia patients receiving antibiotics within four hours. No measures of crowding exhibited an association with time to PCI for AMI patients.

Conclusions: Administrative measures of ED crowding showed an association with poorer performance on pneumonia quality of care measures but not with AMI quality of care measures. Hospitals might consider improving ED throughput, reducing boarding times for admitted patients, and reducing chest x-ray turnaround times to improve pneumonia care.

ACADEMIC EMERGENCY MEDICINE 2006; 13:873–878 © 2006 by the Society for Academic Emergency Medicine

Keywords: pneumonia, emergency department crowding, acute myocardial infarction, quality, timing

PROLUNGAMENTO DEI TEMPI alla TROMBOLISI

Abstract

Objective: Emergency department overcrowding sometimes results in diversion of ambulances to other locations. We sought to determine the resulting prehospital delays for cardiac patients.

Methods: Data on consecutive patients with chest pain who were transported to Toronto hospitals by ambulance were obtained for a 4-month period in 1997 and a 4-month period in 1999, which represented periods of low and high emergency department overcrowding respectively. Multivariate analyses were used to model 90th percentile system response (initiation of 9-1-1 call to arrival on scene), on-scene (arrival on scene to departure from scene) and transport (departure from scene to arrival at hospital) intervals. Predictor variables were study period (1997 or 1999), day of the week, time of day, geographic location of the patient, dispatch priority, case severity, return priority and number of other patients with chest pain transported within 2 hours of the index transport.

Results: A total of 3609 patients (mean age 66.3 years, 50.3% female) who met the study criteria were transported by ambulance during the 2 study periods. There were no significant differences in patient characteristics between the 2 periods, despite the fact that more patients were transported during the second period ($p < 0.001$). The 90th percentile system response interval increased by 11.3% from the first to the second period (9.7 v. 10.8 min, $p < 0.001$), whereas the on-scene interval decreased by 8.2% (28.0 v. 25.7 min, $p < 0.001$). The longest delay was in the transport interval, which increased by 28.4% from 1997 to 1999 (13.4 v. 17.2 min, $p < 0.001$). In multivariate analyses, the study period (1997 v. 1999) remained a significant predictor of longer transport interval ($p < 0.001$) and total prehospital interval ($p = 0.004$).

Interpretation: An increase in overcrowding in emergency departments was associated with a substantial increase in the system response interval and the ambulance transport interval for patients with chest pain.

Research

Recherche

Emergency department overcrowding and ambulance transport delays for patients with chest pain

Michael J. Schull, Laurie J. Morrison, Marian Vermeulen, Donald A. Redelmeier

Emergency Department Crowding and Thrombolysis Delays in Acute Myocardial Infarction

Michael J. Schull, MD, MSc
Marian Vermeulen, MHSc
Graham Slaughter, PhD
Laurie Morrison, MD, MSc
Paul Daly, MD

See editorial, p. 586.

Study objective: We estimate the effect of emergency department (ED) crowding on door-to-needle time for patients given intravenous thrombolysis for suspected acute myocardial infarction.

PROLUNGAMENTO DEI TEMPI alla terapia ANTALGICA

HEALTH POLICY AND CLINICAL PRACTICE/ORIGINAL RESEARCH

Emergency Department Crowding Is Associated With Poor Care for Patients With Severe Pain

**Jesse M. Pines, MD, MBA,
MSCE**

Judd E. Hollander, MD

From the Department of Emergency Medicine (Pines, Hollander), the Center for Clinical Epidemiology and Biostatistics (Pines), University of Pennsylvania School of Medicine, and the Leonard Davis Institute for Health Economics, University of Pennsylvania, Philadelphia, PA.

Occupancy Rates and Emergency Department Work Index Scores Correlate with Leaving Without Being Seen

Erik B. Kulstad, MD, MS*

K. Michael Hart, MD†

Simon Waghchoure, MBBS‡

* Advocate Christ Medical Center, Oak Lawn, IL

† University of Illinois, William Beaumont Hospital, Peoria, IL

‡ Bronx-Lebanon Hospital Center, Bronx, NY

Supervising Section Editor: Michael Epter, DO

Submission history: Submitted May 13, 2009; Revision Received December 4, 2009; Accepted December 27, 2009

Reprints available through open access at http://escholarship.org/uc/uciem_westjem

LWBS

Objective: Two crowding metrics are often used to measure emergency department (ED) crowding: the occupancy rate and the emergency department work index (EDWIN) score. To evaluate these metrics for applicability in our community ED, we sought to measure their correlation with the number of patients who left without being seen (LWBS) and determine if either, or both, correlated with our daily LWBS rate. We hypothesized a statistically significant positive correlation between the number of patients who LWBS and both crowding metrics.

Methods: We performed a retrospective observational study by reviewing data on all patients who LWBS from December 1, 2007, to February 29, 2008. Occupancy rates and EDWIN scores were obtained through our electronic patient tracking board. We identified LWBS status by searching the final disposition entered into our electronic medical record. We measured the correlation between each crowding metric averaged over each 24-hour day and the number of patients who LWBS per 24-hour day using Spearman's rank correlation, and created receiver operator characteristic (ROC) curves to quantify the discriminatory power of occupancy rate and EDWIN score for predicting more than two patients per day who LWBS.

Results: We identified 1,193 patients who LWBS during the study period, including patients who registered but then left the waiting room (733), as well as those who left before: registration (71), triage (75), seeing a physician (260), or final disposition (54). The number of patients who LWBS per day ranged from one to 30, with a mean of 13 and median of 11 (IQR 6 to 19). The daily number of patients who LWBS showed a positive correlation with the average daily occupancy rate (Spearman's $\rho = 0.771$, $p = 0.01$) and with average daily EDWIN score (Spearman's $\rho = 0.67$, $p < .001$). Area under the ROC curve for occupancy rate was .97 (95% CI .93 to 1.0) and for EDWIN score was .94 (95% CI .89 to 1.0).

Conclusion: Average daily occupancy rates and EDWIN scores both correlate positively with, and have excellent discriminatory power for, the number of patients who LWBS in our ED; however, the scale of our EDWIN scores differs from that obtained at other institutions. For studies of crowding, occupancy rate may be the more useful metric due to its ease of calculation. [West J Emerg Med. 2010; 11(4):324-328.]

Kulstad_Occupancy rates and emergency department work index scores correlate with leaving without being seen_West J Emerg Med_2010

Emergency Department Overcrowding: Analysis of the Factors of Renege Rate

Phillip V. Asaro, MD, Lawrence M. Lewis, MD, Stuart B. Boxerman, DSc

Abstract

Background: Reneging (i.e., leaving without being seen) is an important outcome of emergency department (ED) overcrowding. The input-throughput-output conceptualization of ED patient flow is helpful in understanding and measuring the impact of various factors on this outcome.

Objectives: To quantify the impact of input and output factors on ED renege rate.

Methods: The authors used patient-level and system-level data from multiple sources in their institution to build logistic regression models, with reneging as the dependent variable. This approach provides the impact of each input and output factor on renege rate expressed as an odds ratio (OR).

Results: The OR for reneging attributable to the difference between the 80th and 20th percentile values for inpatient bed utilization is 1.05. Comparing 80th and 20th percentile values for boarded ED admits as of 7 AM, the OR is 1.73; for daily ED arrivals, the OR is 2.00; and for admission percentage, the OR is 1.12. The OR for evening versus morning patient arrival time is 3.9 and for patient arrival on a Monday versus a Sunday is 2.7. The OR for reneging for a patient presenting on Monday evening versus Sunday morning is 10.5.

Conclusions: The effects of ED input and output factors on renege rate are significant and quantifiable. At least some of the variation in these factors and subsequently their effects are predictable, suggesting that further refinement in the management of ED and inpatient resources could affect improvement in ED renege rate. Continued efforts at quantifying the effects are warranted.

ACADEMIC EMERGENCY MEDICINE 2007; 14:157-162 © 2007 by the Society for Academic Emergency Medicine

Keywords: crowding, hospital emergency services, bed occupancy, patient care, regression analysis

Asaro_Emergency department
overcrowding_analysis of the
factors of renege rate_Acad
Emerg Med_2007

Crowding LOS & LWBS

E' stato inoltre dimostrato che il sovraffollamento dell'ED influisce negativamente generando un aumento dei tempi di attesa e dei LOS, con un conseguente ritardo nella diagnosi e nell'inizio del trattamento.

Questo a sua volta è responsabile di una maggiore percentuale di pazienti che abbandonano gli ED sovraffollati senza essere visti (LWBS).

Polevoi, S.K.; Quinn, J.V.; Kramer, N.R. Factors associated with patients who leave without being seen. Acad. Emerg. Med. 2005, 12, 232–236. [CrossRef]

Weiss, S.J.; Ernst, A.A.; Derlet, R.; King, R.; Bair, A.; Nick, T.G. Relationship between the National ED Overcrowding Scale and the number of patients who leave without being seen in an academic ED. Am. J. Emerg. Med. 2005, 23, 288–294. [CrossRef]

Vieth, T.L.; Rhodes, K.V. The effect of crowding on access and quality in an academic ED. Am. J. Emerg. Med. 2006, 24, 787–794. [CrossRef]

Asaro, P.V.; Lewis, L.M.; Boxerman, S.B. Emergency department overcrowding: Analysis of the factors of renege rate. Acad. Emerg. Med. 2007, 14, 157–162. [CrossRef]

Kulstad, E.B.; Hart, K.M.; Waghchoure, S. Occupancy Rates and Emergency Department Work Index Scores Correlate with Leaving Without Being Seen. West. J. Emerg. Med. 2010, 11, 324–328.

Effetti del sovraffollamento: UN PROBLEMA ETICO

PROGRESSIVE CLINICAL PRACTICE

The Effect of Emergency Department Crowding on Clinically Oriented Outcomes

Steven L. Bernstein, MD, Dominik Aronsky, MD, Reena Duseja, MD, Stephen Epstein, MD, Dan Handel, MD, MPH, Ula Hwang, MD, MPH, Melissa McCarthy, ScD, K. John McConnell, PhD, Jesse M. Pines, MD, MBA, MSCE, Niels Rathlev, MD, Robert Schafermeyer, MD, Frank Zwemer, MD, Michael Schull, MD, and Brent R. Asplin, MD, MPH, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force

Effetti del sovraffollamento: UN PROBLEMA ETICO

PROGRESSIVE CLINICAL PRACTICE

The Effect of Emergency Department Crowding on Clinically Oriented Outcomes

Steven L. Bernstein, MD, Dominik Aronsky, MD, Reena Duseja, MD, Stephen Epstein, MD, Dan Handel, MD, MPH, Ula Hwang, MD, MPH, Melissa McCarthy, ScD, K. John McConnell, PhD, Jesse M. Pines, MD, MBA, MSCE, Niels Rathlev, MD, Robert Schafermeyer, MD, Frank Zwemer, MD, Michael Schull, MD, and Brent R. Asplin, MD, MPH, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force

IOM Quality Domain	Main Outcome	Study	Effect of ED Crowding on Main Outcome
Safety and effectiveness	Mortality	Richardson ⁹	In a single ED, RR of mortality at 10 days was 1.34 (95% CI = 1.04 to 1.72).
		Sprivulis ¹⁰	In three hospitals, hazard ratios for mortality at 2, 7, and 30 days were 1.3, 1.3, and 1.2 for patients admitted during periods of greater ED and hospital occupancy.
		Miro ¹¹	In a single ED, weekly visit volume and ED mortality rate correlated (p = 0.01).
		Chalfin ¹²	In a consortium of 120 hospital ICUs, in-hospital mortality when transferred to ICU > 6 hours was 17.4% vs. 12.9% for transferred < 6 hours (OR = 0.71; 95% CI = 0.56 to 0.89).
	Walkouts	Baker ¹³	At a single public hospital ED, 11% of 186 patients who left without being seen were hospitalized within the next week; three required emergency surgery.
		Stock ¹⁴	In a logistic model using data from 30 EDs, waiting time, fraction of patients uninsured, and teaching status had independent positive associations with patients who left without being seen.

Effetti del sovraffollamento: UN PROBLEMA ETICO

PROGRESSIVE CLINICAL PRACTICE

The Effect of Emergency Department Crowding on Clinically Oriented Outcomes

Steven L. Bernstein, MD, Dominik Aronsky, MD, Reena Duseja, MD, Stephen Epstein, MD, Dan Handel, MD, MPH, Ula Hwang, MD, MPH, Melissa McCarthy, ScD, K. John McConnell, PhD, Jesse M. Pines, MD, MBA, MSCE, Niels Rathlev, MD, Robert Schafermeyer, MD, Frank Zwemer, MD, Michael Schull, MD, and Brent R. Asplin, MD, MPH, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force

Timeliness	Time to antibiotic	Pines ¹⁵	Of 694 patients admitted with pneumonia at a single ED, 69% received antibiotics within 4 hours when waiting room occupancy and ED LOS were in the lowest quartile vs. 28% during the highest quartiles for both measures of crowding.
		Fee ¹⁶	Of 405 patients admitted with pneumonia at a single ED, antibiotic administration within 4 hours was less likely with a greater number of patients (OR = 0.96 per additional patient; 95% CI = 0.93 to 0.99) and a greater number of patients ultimately admitted (OR = 0.93 per patient; 95% CI = 0.88 to 0.99) in the ED.
		Pines ¹⁷	In 24 hospitals, ED LOS was inversely associated with probability of receiving antibiotics for pneumonia within 24 hours (Spearman $\rho = -0.44$, $p = 0.04$).
	Time to thrombolysis	Schull ¹⁸	In the 25-ED region of Toronto, Ontario, Canada, high crowding as measured by total out-of-hospital time (associated with the proportion of EDs on diversion) was 2.1 minutes longer than during noncrowding ($p = 0.004$).
		Schull ¹⁹	In Toronto, median door-to-needle times were 40, 45, and 47 minutes in conditions of no, moderate, and high network crowding, respectively ($p < 0.001$). Moderate and high crowding conditions were associated with longer median door-to-needle time (3.0 minutes, 95% CI = 0.1 to 6.0) and 5.8 minutes (95% CI = 2.7 to 9.0), respectively.

Effetti del sovraffollamento: UN PROBLEMA ETICO

PROGRESSIVE CLINICAL PRACTICE

The Effect of Emergency Department Crowding on Clinically Oriented Outcomes

Steven L. Bernstein, MD, Dominik Aronsky, MD, Reena Duseja, MD, Stephen Epstein, MD, Dan Handel, MD, MPH, Ula Hwang, MD, MPH, Melissa McCarthy, ScD, K. John McConnell, PhD, Jesse M. Pines, MD, MBA, MSCE, Niels Rathlev, MD, Robert Schafermeyer, MD, Frank Zwemer, MD, Michael Schull, MD, and Brent R. Asplin, MD, MPH, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force

IOM Quality Domain	Main Outcome	Study	Effect of ED Crowding on Main Outcome
Patient-centeredness	Satisfaction	Yancer ²³	72% reduction in diversion improved patient satisfaction scores.
		Sun ²²	Not feeling informed about prolonged waits was associated with greater dissatisfaction (OR = 0.48; 95% CI = 0.39 to 0.57).

Effetti del sovraffollamento: UN PROBLEMA ETICO

Efficiency	LOS	Krochmal ²⁴	ED LOS for admission >24 hours was associated with 10% increase in hospital LOS.
PRACTICE		Liew ²⁵	ED LOS and hospital LOS were <4 hours, 3.73 days; 4–8 hours, 5.65 days; 8–12 hours, 6.60 days; > 12 hours, 7.20 days (p < 0.001). The corresponding excess hospital LOSs were 0.39, 1.30, 1.96, and 2.35 days (p < 0.001).
	Emergency Department Clinically Oriented Outcomes	Bayley ²⁶	In a single ED, 817 chest pain patients were admitted 904 times. ED LOS was not associated with total hospital LOS or other variables, but annual opportunity costs in lost hospital revenue for chest pain patients was \$168,300 (\$204 per patient waiting >3 hours for a hospital bed).
		Bernstein ²⁷	In a single ED, inpatient LOS for patients admitted during increasing quartiles of ED crowding was 5.00, 5.67, 5.81, and 5.85 days, exclusive of ED LOS (p < 0.001).
		Lambe ²⁸	Waiting time to see ED provider was longer at hospitals in poorer neighborhoods: for every \$10,000 decline in per-capita income, patients waited 10.1 minutes longer (95% CI = 1.8 to 18.4 minutes; p = 0.02).
Equitability	Healthcare disparities	Burt ²⁹	Bivariate correlation was found between proportion of uninsured using ED and waiting

Quali misure sono associate alla qualità delle cure?

REVIEW ARTICLE

Review article: Emergency department crowding measures associations with quality of care: A systematic review

Peter G JONES^{1,2}, David MOUNTAIN³ and Roberto FORERO⁴

¹Department of Surgery, School of Medicine, Faculty of Medicine and Health Sciences, The University of Auckland, Auckland, New Zealand, ²Adult Emergency Department, Auckland City Hospital, Auckland, New Zealand, ³Emergency Department, Sir Charles Gardner Hospital, Perth, Western Australia, Australia, and ⁴Simpson Centre for Health Services Research, The University of New South Wales, Sydney, New South Wales, Australia

Effect measures

Effect measures were what authors used to quantify associations between crowding metrics and quality of care (Appendix S1).

Reference standards were categorised into Processes and Outcomes of care as suggested by Donabedian^{16,17} and associated with the domains of quality according to those described by the IOM:¹⁴

- Patient-centred: Patient experience;
- Timely: Timeliness/Time to Assessment;
- Efficient: ED length of stay (LOS) components/did not wait for assessment (DNW)/Diversion;
- Effective: Receiving Care/Representation;
- Safe: Mortality/Adverse Events/Hand Hygiene/Violence in ED; and
- Equitable: Effect measure explored with respect to healthcare inequities.

Clinically important differences for times to treatment are condition-specific and discussed in the evidence summaries where relevant, based on prior studies (Appendix S1).^{18–20}

Quali misure sono associate alla qualità delle cure?

EMA

Emergency Medicine
Australasia



doi: 10.1111/1742-6723.13743

Emergency Medicine Australasia (2021) 33, 592–600

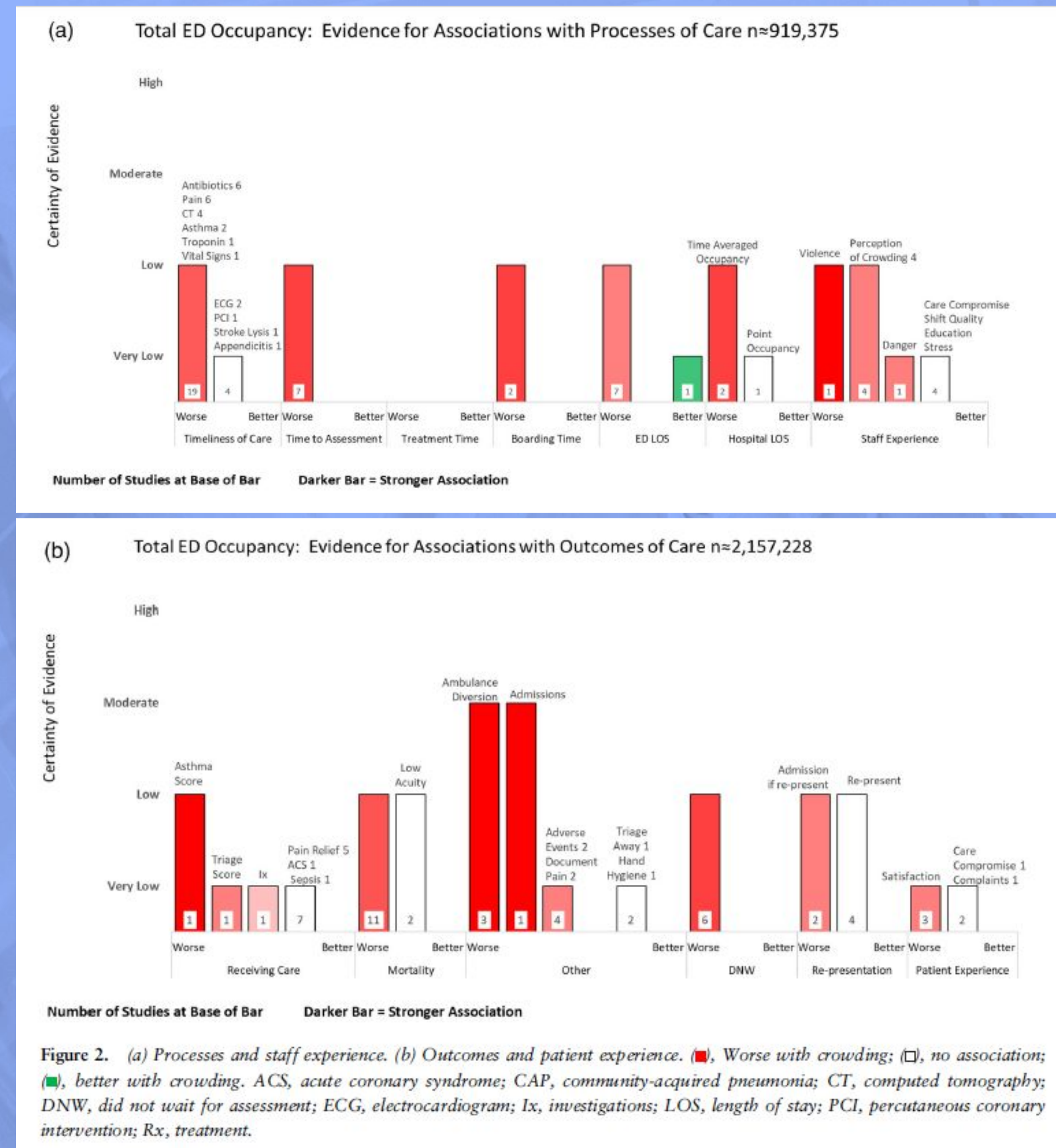
REVIEW ARTICLE

Review article: Emergency department crowding measures associations with quality of care: A systematic review

Peter G JONES ^{1,2} David MOUNTAIN ³ and Roberto FORERO ⁴

¹Department of Surgery, School of Medicine, Faculty of Medicine and Health Sciences, The University of Auckland, Auckland, New Zealand,

²Adult Emergency Department, Auckland City Hospital, Auckland, New Zealand, ³Emergency Department, Sir Charles Gardner Hospital, Perth, Western Australia, Australia, and ⁴Simpson Centre for Health Services Research, The University of New South Wales, Sydney, New South Wales, Australia



Quali misure sono associate alla qualità delle cure?

EMA

Emergency Medicine Australasia

doi: 10.1111/1742-6723.13743

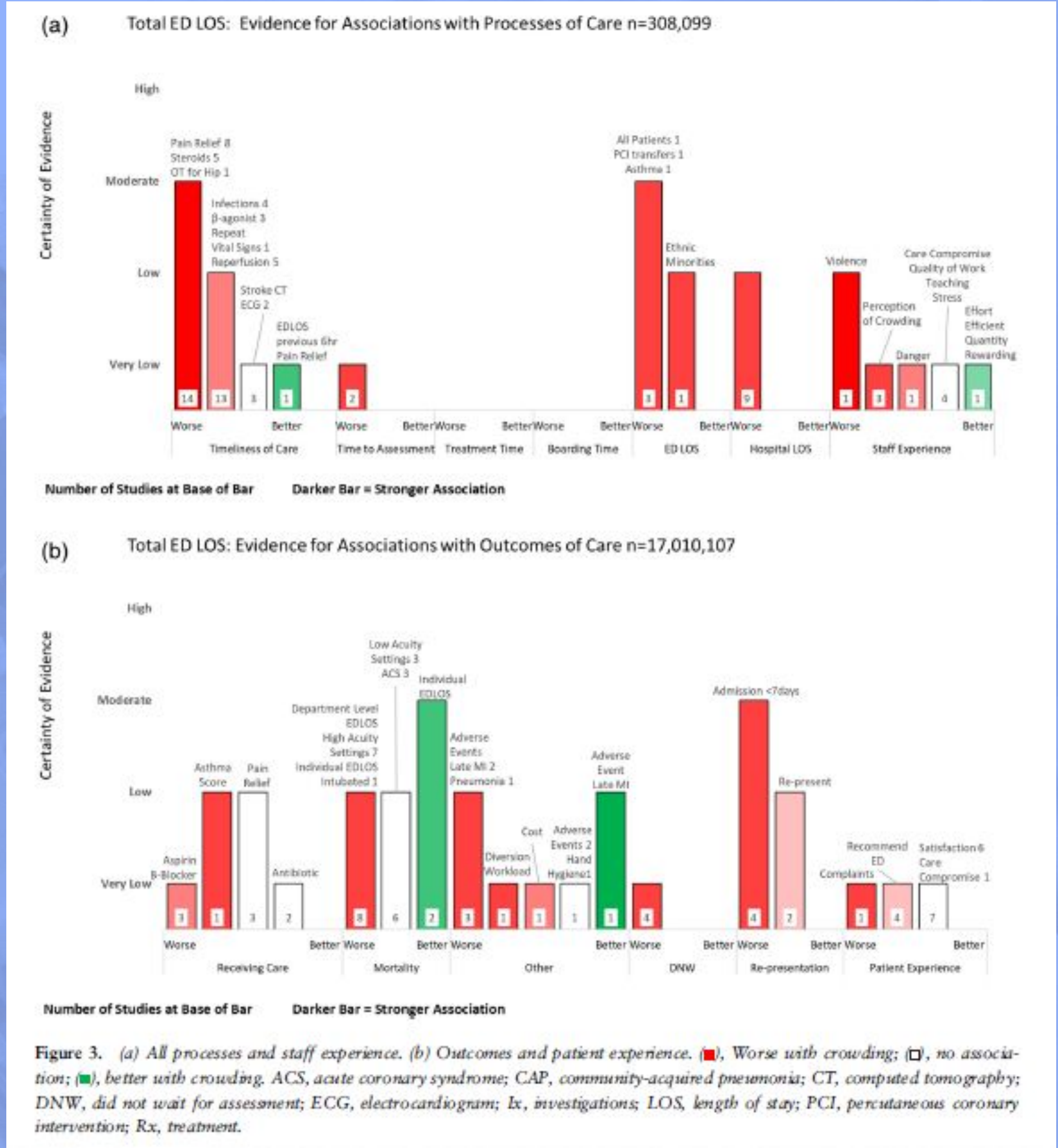
Emergency Medicine Australasia (2021) 33, 592–600

REVIEW ARTICLE

Review article: Emergency department crowding measures associations with quality of care: A systematic review

Peter G JONES ^{1,2} David MOUNTAIN ³ and Roberto FORERO ⁴

¹Department of Surgery, School of Medicine, Faculty of Medicine and Health Sciences, The University of Auckland, Auckland, New Zealand, ²Adult Emergency Department, Auckland City Hospital, Auckland, New Zealand, ³Emergency Department, Sir Charles Gardner Hospital, Perth, Western Australia, Australia, and ⁴Simpson Centre for Health Services Research, The University of New South Wales, Sydney, New South Wales, Australia



Quali misure sono associate alla qualità delle cure?

EMA Emergency Medicine Australasia
Emergency Medicine Australasia (2021) 33, 592–600
doi: 10.1111/1742-6723.13743

REVIEW ARTICLE

Review article: Emergency department crowding measures associations with quality of care: A systematic review

Peter G JONES ^{1,2} David MOUNTAIN ³ and Roberto FORERO ⁴

¹Department of Surgery, School of Medicine, Faculty of Medicine and Health Sciences, The University of Auckland, Auckland, New Zealand, ²Adult Emergency Department, Auckland City Hospital, Auckland, New Zealand, ³Emergency Department, Sir Charles Gardner Hospital, Perth, Western Australia, Australia, and ⁴Simpson Centre for Health Services Research, The University of New South Wales, Sydney, New South Wales, Australia

Key findings

- Crowding measures with the strongest associations with quality of care were total ED occupancy and total EDLOS (measured as a departmental average rather than at individual level, and in higher acuity settings).
- Occupancy varies from hour to hour and is a useful measure to trigger real-time interventions to mitigate immediate harm to patients. Whereas EDLOS at departmental level may be a more reliable measure of overall system performance over time and be more suited as a quality indicator at state or national level to drive long term system changes.

Little's law

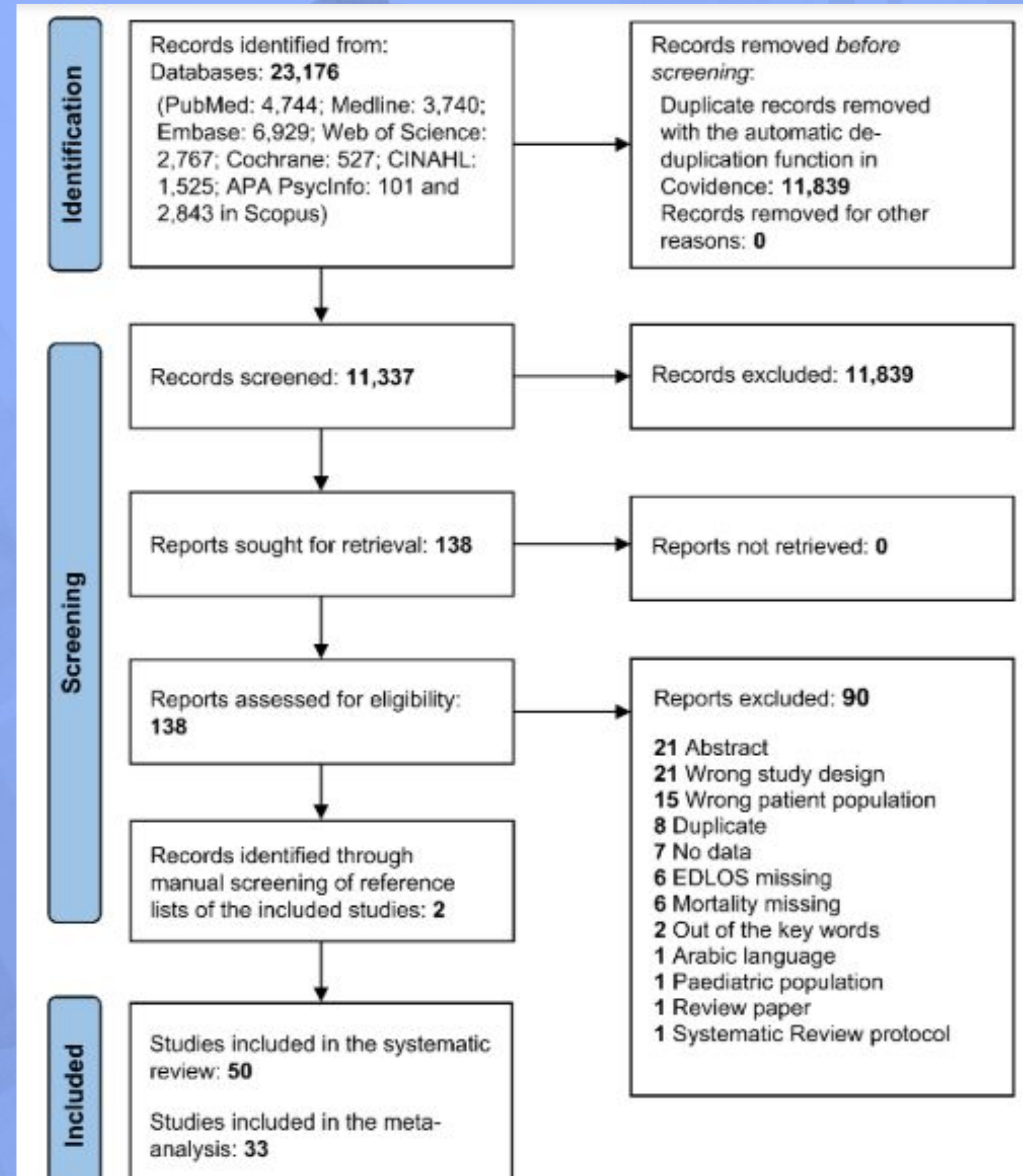
$$L = \lambda W.$$

LOS e suo significato

Review

Length-of-Stay in the Emergency Department and In-Hospital Mortality: A Systematic Review and Meta-Analysis

Dominique Lauque ^{1,2,*}, Anna Khalemsky ^{3,†}, Zoubir Boudi ^{4,5,†}, Linda Östlundh ⁶, Chang Xu ⁷, Mohammed Alsabri ^{2,8}, Churchill Onyeji ², Jacqueline Cellini ^{9,10}, Geroge Intas ¹¹, Kapil Dev Soni ¹², Detajin Junhasavasdikul ¹³, Jose Javier Trujillano Cabello ¹⁴, Niels K. Rathlev ¹⁵, Shan W. Liu ¹⁶, Carlos A. Camargo, Jr. ¹⁶, Anna Slagman ¹⁷, Michael Christ ¹⁸, Adam J. Singer ¹⁹, Charles-Henri Houze-Cerfon ¹, Elhadi H. Aburawi ²⁰, Karim Tazarourte ^{21,22}, Lisa Kurland ²³, Phillip D. Levy ²⁴, James H. Paxton ²⁴, Dionyssios Tsilimingras ²⁵, Vijaya Arun Kumar ²⁴, David G. Schwartz ²⁶, Eddy Lang ²⁷, David W. Bates ²⁸, Gabriele Savioli ²⁹, Shamai A. Grossman ^{2,*} and Abdelouahab Bellou ^{2,5,24,30,*}



Review

Length-of-Stay in the Emergency Department and In-Hospital Mortality: A Systematic Review and Meta-Analysis

Dominique Lauque ^{1,2,*}, Anna Khalemsky ^{3,†}, Zoubir Boudi ^{4,5,†}, Linda Östlundh ⁶, Chang Xu ⁷, Mohammed Alsabri ^{2,8}, Churchill Onyeji ², Jacqueline Cellini ^{9,10}, Geroge Intas ¹¹, Kapil Dev Soni ¹², Detajin Junhasavasdikul ¹³, Jose Javier Trujillano Cabello ¹⁴, Niels K. Rathlev ¹⁵, Shan W. Liu ¹⁶, Carlos A. Camargo, Jr. ¹⁶, Anna Slagman ¹⁷, Michael Christ ¹⁸, Adam J. Singer ¹⁹, Charles-Henri Houze-Cerfon ¹, Elhadi H. Aburawi ²⁰, Karim Tazarourte ^{21,22}, Lisa Kurland ²³, Phillip D. Levy ²⁴, James H. Paxton ²⁴, Dionyssios Tsilimingras ²⁵, Vijaya Arun Kumar ²⁴, David G. Schwartz ²⁶, Eddy Lang ²⁷, David W. Bates ²⁸, Gabriele Savioli ²⁹, Shamai A. Grossman ^{2,*} and Abdelouahab Bellou ^{2,5,24,30,*}

Table 2. Factors analyzed and association between EDLOS and in-hospital mortality in the selected studies for the systematic review.

N	Author	Type of ED Population	Study Group (n)	Statistics	Factors Analyzed	Association with IHM
1	Carter [25]	ICU	48,803	Logistic regression Adjusted	Age, comorbidity, source of admission, year of admission, number of admissions to ICU from ED per day, type of hospital, diagnosis, MV, acute renal failure	No
2	Mitra [26]	Non-ICU	10,107	Logistic regression Adjusted	Age, sex, triage category, time to disposition plan	Yes
3	Chong [27]	Non-ICU	15,886	Logistic regression adjusted	Age, sex, comorbidities	No
4	Flabouris [28]	Non-ICU	43,484	Backwards stepwise regression	Age, EDLOS, sex, admission source, admitting unit, ED arrival time and day of week, ED departure time, Australasian triage scale	No
5	Akhtar [29]	Non-ICU	894	Logistic regression Adjusted	Sex, Health Technology Assessment, atrial fibrillation, smoking, thrombolysis complications, urinary tract infection, bedsores, Foley's catheter	Yes
6	Diercks [30]	Non-ICU	42,780	Logistic regression Adjusted	Age, sex, Body Mass Index, race, insurance, cardiac risk factor, past cardiac history	No
7	Chen [31]	Non-ICU	432	No logistic regression	Age, sex, comorbidities, renal function, cardiac biomarkers, systolic and diastolic blood pressure, heart rate, time of primary PCI, door to balloon, advanced heart failure, Killip score, TIMI risk score, respiratory failure, anterior wall STEMI, any post myocardial complications, left ventricular ejection	No
8	Jones [32]	ICU	162	Logistic regression Adjusted	Age, sex, Baseline Intracerebral Hemorrhage Score (age, GCS, intracerebral hemorrhage volume and location, intraventricular hemorrhage)	Yes
9	Mowery [33]	Non-ICU	3973	Logistic regression Adjusted	Age, sex, ISS, revised trauma score	Yes
10	Serviá [34]	ICU	243	Logistic regression Adjusted	Age, sex, mechanical ventilation, head injury with AIS ≥ 3 , TRISS ≥ 20	No

Table 1. Cont.

N	Author	Year	Journal	Country and ED Setting	EDLOS Cut-Off
13	Plunkett PK [37]	2010	Eur J Em Med	1 U.K. hospital	Qualitative with multiple cut-offs: 2.6 h, 3.9 h, 5.8 h, and 8.7 h No specific EDLOS cut-off
14	García-Gigorro R [38]	2016	Med Intensiva	1 Spanish hospital	Qualitative (6 h)
15	Agustin M [39]	2017	Crit Care Res Pract	1 U.S. hospital	Qualitative (6 h)
16	Siletz A [40]	2017	J Surg Res	1 U.S. hospital	1.5 h
17	Junhasavasdikul D [41]	2013	Em Med J	1 Thailand hospital	No specific EDLOS cut-off
18	Soni KD [42]	2018	J Emerg Trauma Shock	1 Indian hospital	No specific EDLOS cut-off
19	Paton A [43]	2018	Emerg Med Australas	3 Australian hospitals	4 h
20	Zhang Z [44]	2019	Em Med J	1 Chinese hospital	Qualitative (<6 h, 6–12 h, 12–24 h, >24 h)
21	Intas G [45]	2012	Adv Emerg Nurs J	1 Greek hospital	Qualitative (6 h)
22	Richardson JD [46]	2009	J Am Coll Surg	1 U.S. hospital	6 h
23	Aitavara-Anttila M [47]	2019	Acta Anaesthesiol Scand	1 Finnish hospital	3 h
24	Khan BA [48]	2016	J Pak Med Assoc	1 Pakistani hospital	6 h
25	Byrne D [49]	2018	Acute Med	1 U.K. hospital	6 h
26	Greenland CN [50]	2019	Crit Care Med	6 university hospitals in The Netherlands	1.2 h
27	Haji K [51]	2010	Crit Care Shock	1 Australian hospital	Continuous No specific EDLOS cut-off
28	Santos FR [52]	2020	Rev Bras Ter Intensiva	1 Brazilian hospital	Continuous No specific EDLOS cut-off
29	Mejaddam AY [53]	2013	J Emerg Med	1 U.S. hospital	Continuous No specific EDLOS cut-off
30	Saukonen KA [54]	2006	J Intern Med	1 Finnish hospital	Continuous No specific EDLOS cut-off
31	Hung SC [55]	2014	Crit Care	1 Chinese hospital	4 h
32	Cardoso LT [56]	2011	Crit Care	1 Brazilian hospital	Continuous No specific EDLOS cut-off
33	Ashkenazi [57]	2021	Am J Em Med	28 Israeli hospitals	4 h
34	Stey [58]	2021	J Int Care Med	4 U.S. hospitals	6 h 6 h 12 h 24 h
35	Choi [59]	2021	Emerg Med Intern	5 Korean hospitals	6 h
36	Lin [60]	2021	QJM: An International Journal of Medicine	2 U.S. hospitals	4 h
37	Altreby [61]	2021	Rev Bras Ter Intensiva	1 Saudi Arabian hospital	No cut-off
38	Wessman [62]	2021	Internal and Emergency Medicine	1 Swedish hospital	6 h
39	Rana [63]	2021	Pakistan Journal of Medical and Health Sciences	1 Pakistani hospital	No cut-off
40	Thibon [64]	2019	Ann. Fr. Med. Urgence	1 French hospital	No cut-off
41	Asheim [65]	2019	European Journal of Emergency Medicine	1 Norwegian hospital	No cut-off
42	Cheng [66]	2022	World J Emerg Med	1 Chinese hospital	No specific cut-off
43	Crilly [67]	2019	Emergency Medicine Australasia	1 Australian hospital	No specific cut-off
44	Davis [68]	2021	Journal of Neuroscience Nursing	U.S. hospitals	3 h
45	Elay [69]	2020	Eurasian J Emerg Med.	1 Turkish hospital	No specific cut-off
46	Rose [3]	2016	Annals ATS	Canadian hospitals	6 h
47	Sabaz [70]	2020	Iran Red Crescent Med J.	1 Iranian hospital	No specific cut-off
48	Verma [71]	2021	Indian Journal of Critical Care Medicine	1 Indian hospital	8 h and 24 h
49	Deroose [9]	2014	Med Care	14 U.S. hospitals	No specific cut-off
50	Jain [72]	2013	Western J Emerg Med	1 U.S. hospital	No specific cut off

EDLOS, Emergency Department Length of Stay.

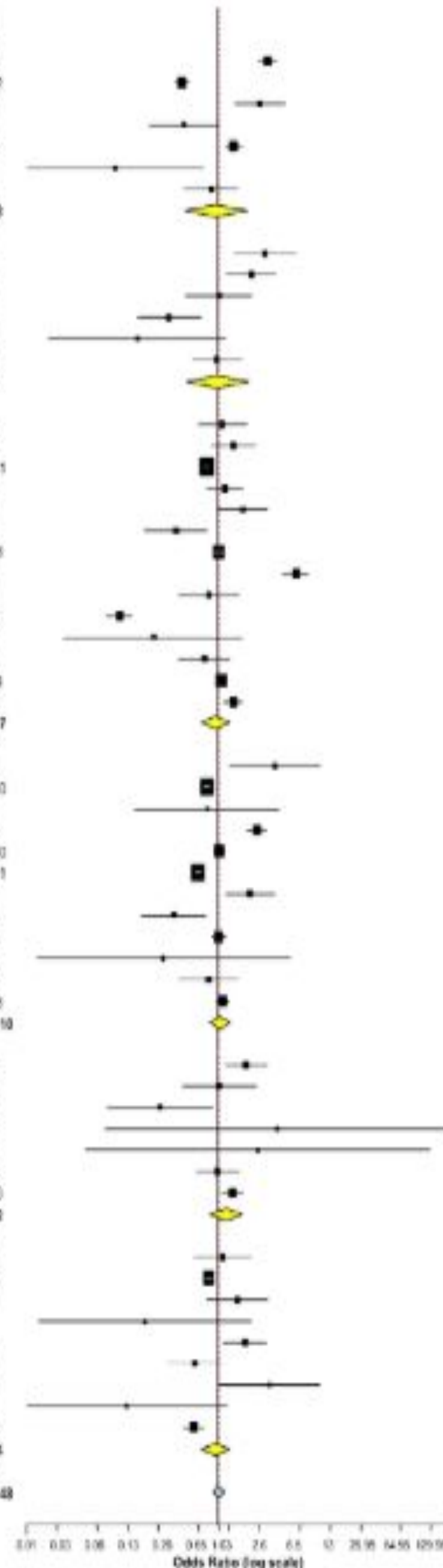
Review

Length-of-Stay in the Emergency Department and In-Hospital Mortality: A Systematic Review and Meta-Analysis

Dominique Lauque ^{1,2,*}, Anna Khalemsky ^{3,†}, Zoubir Boudi ^{4,5,†}, Linda Östlundh ⁶, Chang Xu ⁷, Mohammed Alsabri ^{2,8}, Churchill Onyeji ², Jacqueline Cellini ^{9,10}, Geroge Intas ¹¹, Kapil Dev Soni ^{12,13}, Detajin Junhasavasdikul ¹³, Jose Javier Trujillano Cabello ¹⁴, Niels K. Rathlev ¹⁵, Shan W. Liu ¹⁶, Carlos A. Camargo, Jr. ¹⁶, Anna Slagman ¹⁷, Michael Christ ¹⁸, Adam J. Singer ¹⁹, Charles-Henri Houze-Cerfon ¹, Elhadi H. Aburawi ²⁰, Karim Tazarourte ^{21,22}, Lisa Kurland ²³, Phillip D. Levy ²⁴, James H. Paxton ²⁴, Dionyssios Tsilimingras ²⁵, Vijaya Arun Kumar ²⁴, David G. Schwartz ²⁶, Eddy Lang ²⁷, David W. Bates ²⁸, Gabriele Savioli ²⁹, Shamai A. Grossman ^{2,*} and Abdelouahab Bellou ^{2,5,24,30,*}

Abstract: The effect of emergency department (ED) length of stay (EDLOS) on in-hospital mortality (IHM) remains unclear. The aim of this systematic review and meta-analysis was to determine the association between EDLOS and IHM. We searched the PubMed, Medline, Embase, Web of Science, Cochrane Controlled Register of Trials, CINAHL, PsycInfo, and Scopus databases from their inception until 14–15 January 2022. We included studies reporting the association between EDLOS and IHM. A total of 11,337 references were identified, and 52 studies (total of 1,718,518 ED patients) were included in the systematic review and 33 in the meta-analysis. A statistically significant association between EDLOS and IHM was observed for EDLOS over 24 h in patients admitted to an intensive care unit (ICU) (OR = 1.396, 95% confidence interval [CI]: 1.147 to 1.701; $p < 0.001$, $I^2 = 0\%$) and for low EDLOS in non-ICU-admitted patients (OR = 0.583, 95% CI: 0.453 to 0.745; $p < 0.001$, $I^2 = 0\%$). No associations were detected for the other cut-offs. Our findings suggest that there is an association between IHM low EDLOS and EDLOS exceeding 24 h and IHM. Long stays in the ED should not be allowed and special attention should be given to patients admitted after a short stay in the ED.

Studies	Estimate (95% CI)	EvTx	EvCn
Alstey (cut-off 4)	3.113 (2.496, 3.885)	219/794	182/1093
Ashkenazi (cut-off 4)	0.449 (0.380, 0.530)	214/14876	41/113130
Aras (cut-off 4)	2.031 (1.469, 2.744)	89/116	28/60
Jahanavadi (cut-off 4)	0.472 (0.214, 1.040)	21/314	10/67
Patel (cut-off 4)	1.437 (1.167, 1.740)	300/18293	149/8499
Servis (cut-off 4)	0.598 (0.013, 0.735)	1/38	48/208
Soni (cut-off 4)	0.862 (0.468, 1.586)	44/160	22/72
Subgroup 4 ($I^2=67.29\%$, $P=0.009$)	0.958 (0.465, 2.018)	1029/32655	627/23138
Garcia-Gigero (cut-off 5)	2.957 (1.432, 6.106)	28/126	12/140
Aras (cut-off 5)	2.187 (1.216, 3.862)	84/112	32/94
Jones (cut-off 5)	1.033 (0.479, 2.229)	13/66	24/134
Jahanavadi (cut-off 5)	0.332 (0.162, 0.660)	18/286	16/66
Servis (cut-off 5)	0.163 (0.021, 1.239)	1/38	48/208
Soni (cut-off 5)	0.989 (0.559, 1.718)	34/120	32/112
Subgroup 5 ($I^2=81.16\%$, $P=0.009$)	1.355 (0.484, 3.846)	168/726	164/767
Auguin (cut-off 6)	1.120 (0.649, 1.933)	37/150	31/137
Bader (cut-off 6)	1.438 (0.861, 2.401)	44/161	34/154
Byrne (cut-off 6)	0.785 (0.744, 0.828)	2359/46277	3459/57511
Choi (cut-off 6)	1.189 (0.752, 1.896)	82/280	93/179
Aras (cut-off 6)	1.752 (1.012, 3.139)	95/100	45/96
Jahanavadi (cut-off 6)	0.355 (0.190, 0.701)	17/267	17/134
Lin (cut-off 6)	1.027 (0.508, 1.137)	893/8056	1177/6578
Rena (cut-off 6)	0.977 (4.481, 7.972)	30/1480	10/1480
Ree Ann Hindi (cut-off 6)	0.526 (0.411, 1.659)	24/162	19/70
Richardson (cut-off 6)	0.107 (0.080, 0.143)	64/2763	202/1123
Servis (cut-off 6)	0.232 (0.030, 1.780)	1/17	48/208
Soni (cut-off 6)	0.744 (0.406, 1.362)	21/85	45/147
Day (cut-off 6)	1.080 (0.968, 1.204)	682/10107	663/15804
Zhongheng (cut-off 6)	1.435 (1.168, 1.777)	166/675	260/1358
Subgroup 6 ($I^2=67.11\%$, $P=0.009$)	0.952 (0.690, 1.315)	4565/74538	8123/38817
Ahler (cut-off 8)	3.729 (1.310, 10.614)	34/229	4/265
Camer (cut-off 8)	0.785 (0.737, 0.837)	1325/6333	889/38470
Chen (cut-off 8)	0.789 (0.151, 4.118)	2/148	5/287
Cheng (cut-off 8)	2.480 (1.960, 3.067)	226/666	132/608
Dennis (cut-off 8)	1.044 (0.922, 1.182)	373/4456	1679/38330
Flakouris (cut-off 8)	0.840 (0.587, 0.666)	1893/25613	1793/17871
Aras (cut-off 8)	2.101 (1.185, 3.725)	22/88	44/158
Jahanavadi (cut-off 8)	0.389 (0.177, 0.770)	12/210	22/162
Mora (cut-off 8)	1.038 (0.878, 1.228)	448/8768	213/3333
Servis (cut-off 8)	0.283 (0.016, 5.286)	0/0	48/237
Soni (cut-off 8)	0.821 (0.413, 1.632)	14/55	52/177
Venna (cut-off 8)	1.119 (0.985, 1.294)	58/1063	115/2278
Subgroup 8 ($I^2=64.02\%$, $P=0.009$)	1.264 (0.838, 1.932)	4695/56867	12095/19810
Choi (cut-off 24)	1.927 (1.183, 3.141)	36/86	95/253
Aras (cut-off 24)	1.049 (0.446, 2.461)	12/24	84/172
Jahanavadi (cut-off 24)	0.272 (0.081, 0.912)	3/54	31/287
Servis (cut-off 24)	3.329 (0.077, 200.494)	0/0	49/243
Soni (cut-off 24)	2.534 (0.049, 127.488)	0/0	66/232
Tilochary (cut-off 24)	1.004 (0.012, 1.046)	28/164	91/338
Venna (cut-off 24)	1.421 (1.107, 1.825)	168/279	1628/3150
Subgroup 24 ($I^2=45.56\%$, $P=0.008$)	1.220 (0.851, 1.748)	248/587	2046/4762
Atawana-Antia (low EDLOS)	1.125 (0.581, 2.160)	13/68	45/380
Greenland (low EDLOS)	0.823 (0.788, 0.904)	2548/11832	739/2958
Aras (low EDLOS)	1.579 (0.770, 3.199)	83/156	18/40
Jahanavadi (low EDLOS)	0.191 (0.017, 2.166)	33/278	1/3
Mowery (low EDLOS)	1.888 (1.158, 3.072)	276/5552	18/421
Servis (low EDLOS)	0.987 (0.317, 1.121)	22/134	27/128
Bliz (low EDLOS)	3.284 (1.052, 10.319)	8/82	8/158
Soni (low EDLOS)	0.127 (0.013, 1.246)	83/228	3/4
Davis (low EDLOS)	0.588 (0.458, 0.755)	85/615	379/2263
Subgroup low ($I^2=75.48\%$, $P=0.003$)	0.954 (0.685, 1.336)	2128/7277	1233/6384
Overall ($I^2=84.6\%$, $P=0.000$)	1.333 (0.886, 1.191)	13824/182782	22408/232748





Article

The Association between Emergency Department Length of Stay and In-Hospital Mortality in Older Patients Using Machine Learning: An Observational Cohort Study

Lijuan Wu ^{1,2,†}, Xuanhui Chen ^{3,†}, Anna Khalemsky ⁴, Deyang Li ¹, Taoufik Zoubeidi ⁵, Dominique Lauque ^{6,7}, Mohammed Alsabri ^{6,8}, Zoubir Boudi ^{9,10}, Vijaya Arun Kumar ¹¹, James Paxton ¹¹, Dionyssios Tsilimingras ¹², Lisa Kurland ¹³, David Schwartz ¹⁴, Said Hachimi-Idrissi ^{10,15}, Carlos A. Camargo, Jr. ¹⁶, Shan W. Liu ¹⁶, Gabriele Savioli ¹⁷, Geroige Intas ¹⁸, Kapil Dev Soni ¹⁹, Detajin Junhasavasdikul ²⁰, Jose Javier Trujillano Cabello ²¹, Niels K. Rathlev ²², Karim Tazarourte ^{23,24}, Anna Slagman ²⁵, Michael Christ ²⁶, Adam J. Singer ²⁷, Eddy Lang ²⁸, Giovanni Ricevuti ²⁹, Xin Li ^{30,*}, Huiying Liang ^{3,*}, Shamai A. Grossman ^{6,*} and Abdelouahab Bellou ^{1,6,10,11,30,*,†}

5. Conclusions

This MA was designed to analyze the association between EDLOS and IHM; we did not find evidence supporting this hypothesis when all ED patients were included for each cut-off. However, we did find a new and relevant result confirming an association with EDLOS and IHM for patients exceeding 24 h in ED ICU-admitted patients and for low EDLOS below 3 h in non-ICU-admitted ED patients. Other factors involved in the negative outcomes after ED care should be carefully explored to determine the role of EDLOS in the occurrence of IHM.



Article

The Association between Emergency Department Length of Stay and In-Hospital Mortality in Older Patients Using Machine Learning: An Observational Cohort Study

Lijuan Wu ^{1,2,†}, Xuanhui Chen ^{3,†}, Anna Khalemsky ⁴, Deyang Li ¹, Taoufik Zoubeidi ⁵, Dominique Lauque ^{6,7}, Mohammed Alsabri ^{6,8}, Zoubir Boudi ^{9,10}, Vijaya Arun Kumar ¹¹, James Paxton ¹¹, Dionyssios Tsilimingras ¹², Lisa Kurland ¹³, David Schwartz ¹⁴, Said Hachimi-Idrissi ^{10,15}, Carlos A. Camargo, Jr. ¹⁶, Shan W. Liu ¹⁶, Gabriele Savioli ¹⁷, Geroge Intas ¹⁸, Kapil Dev Soni ¹⁹, Detajin Junhasavasdikul ²⁰, Jose Javier Trujillano Cabello ²¹, Niels K. Rathlev ²², Karim Tazarourte ^{23,24}, Anna Slagman ²⁵, Michael Christ ²⁶, Adam J. Singer ²⁷, Eddy Lang ²⁸, Giovanni Ricevuti ²⁹, Xin Li ^{30,*}, Huiying Liang ^{3,*}, Shama A. Grossman ^{6,*} and Abdelouahab Bellou ^{1,6,10,11,30,*,†}

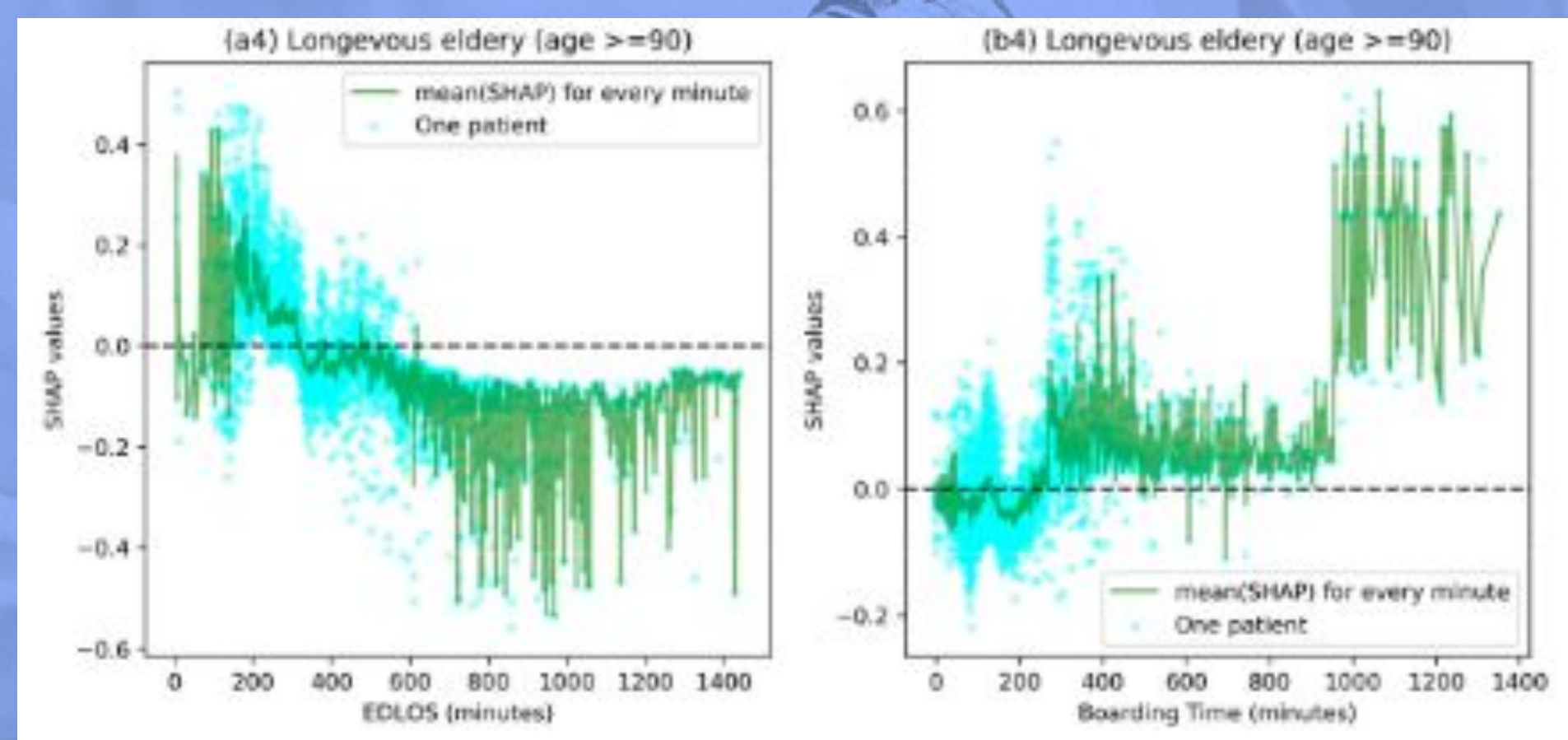
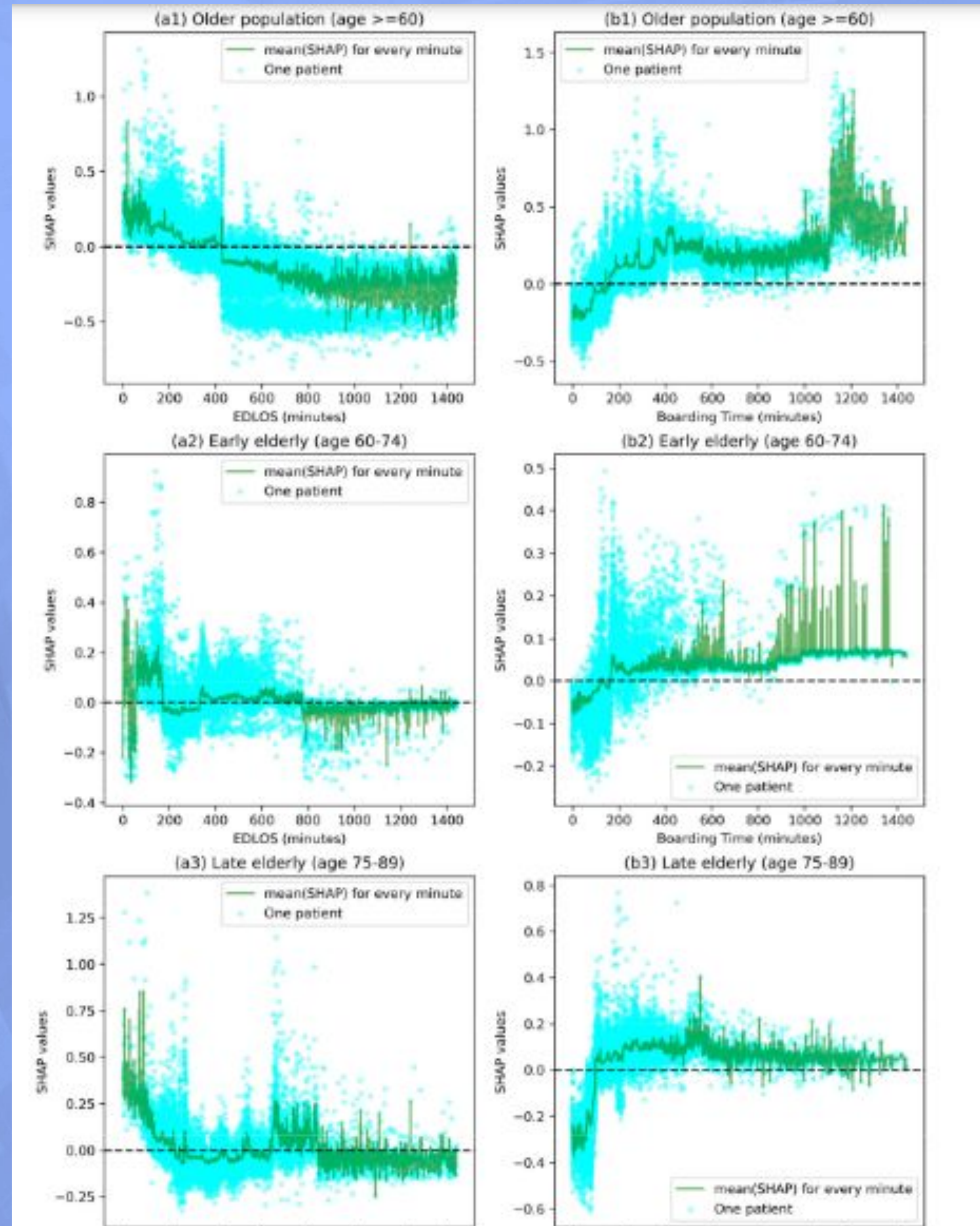


Figure 4. Effect of varying emergency department length of stay (EDLOS, in minutes) and boarding time (BT, in minutes) on in-hospital mortality (IHM) for the whole older population and three age subgroups based on the SHAP method. These plots show the IHM risk for a given EDLOS/BT value for all samples. Each cyan dot represents a patient. The higher the SHAP value of EDLOS/BT, the higher risk of IHM due to this feature value. The dark green line represents the average risk of all samples with a given EDLOS/BT value (in minutes).





Article

The Association between Emergency Department Length of Stay and In-Hospital Mortality in Older Patients Using Machine Learning: An Observational Cohort Study

Lijuan Wu ^{1,2,†}, Xuanhui Chen ^{3,†}, Anna Khalemsky ⁴, Deyang Li ¹, Taoufik Zoubeidi ⁵, Dominique Lauque ^{6,7}, Mohammed Alsabri ^{6,8}, Zoubir Boudi ^{9,10}, Vijaya Arun Kumar ¹¹, James Paxton ¹¹, Dionyssios Tsilimingras ¹², Lisa Kurland ¹³, David Schwartz ¹⁴, Said Hachimi-Idrissi ^{10,15}, Carlos A. Camargo, Jr. ¹⁶, Shan W. Liu ¹⁶, Gabriele Savioli ¹⁷, Geroge Intas ¹⁸, Kapil Dev Soni ¹⁹, Detajin Junhasavasdikul ²⁰, Jose Javier Trujillano Cabello ²¹, Niels K. Rathlev ²², Karim Tazarourte ^{23,24}, Anna Slagman ²⁵, Michael Christ ²⁶, Adam J. Singer ²⁷, Eddy Lang ²⁸, Giovanni Ricevuti ²⁹, Xin Li ^{30,*}, Huiying Liang ^{3,*}, Shama A. Grossman ^{6,*} and Abdelouahab Bellou ^{1,6,10,11,30,*}

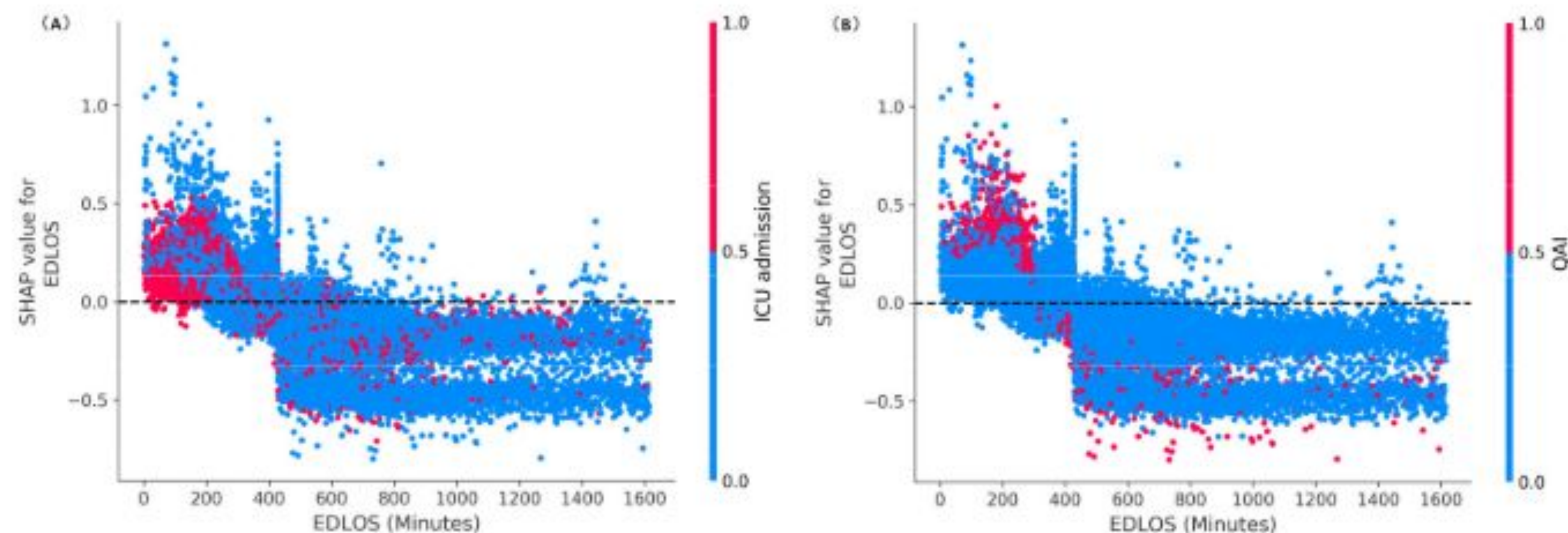


Figure 5. SHAP dependence plots of EDLOS with the ICU admission (A) and QAI (quality assurance issue) (B) interaction in the older population. The higher the SHAP value of a feature, the higher its impact on the risk of IHM. Each dot represents a patient. Dots are colored by the feature value for that person and piled up vertically to show density. Particularly, for binary ICU and QAI variables (i.e., {0,1}), the red dot represents a value of 1, and the blue represents a value of 0. QAI, quality assurance issue; EDLOS, length of stay in the emergency department.

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

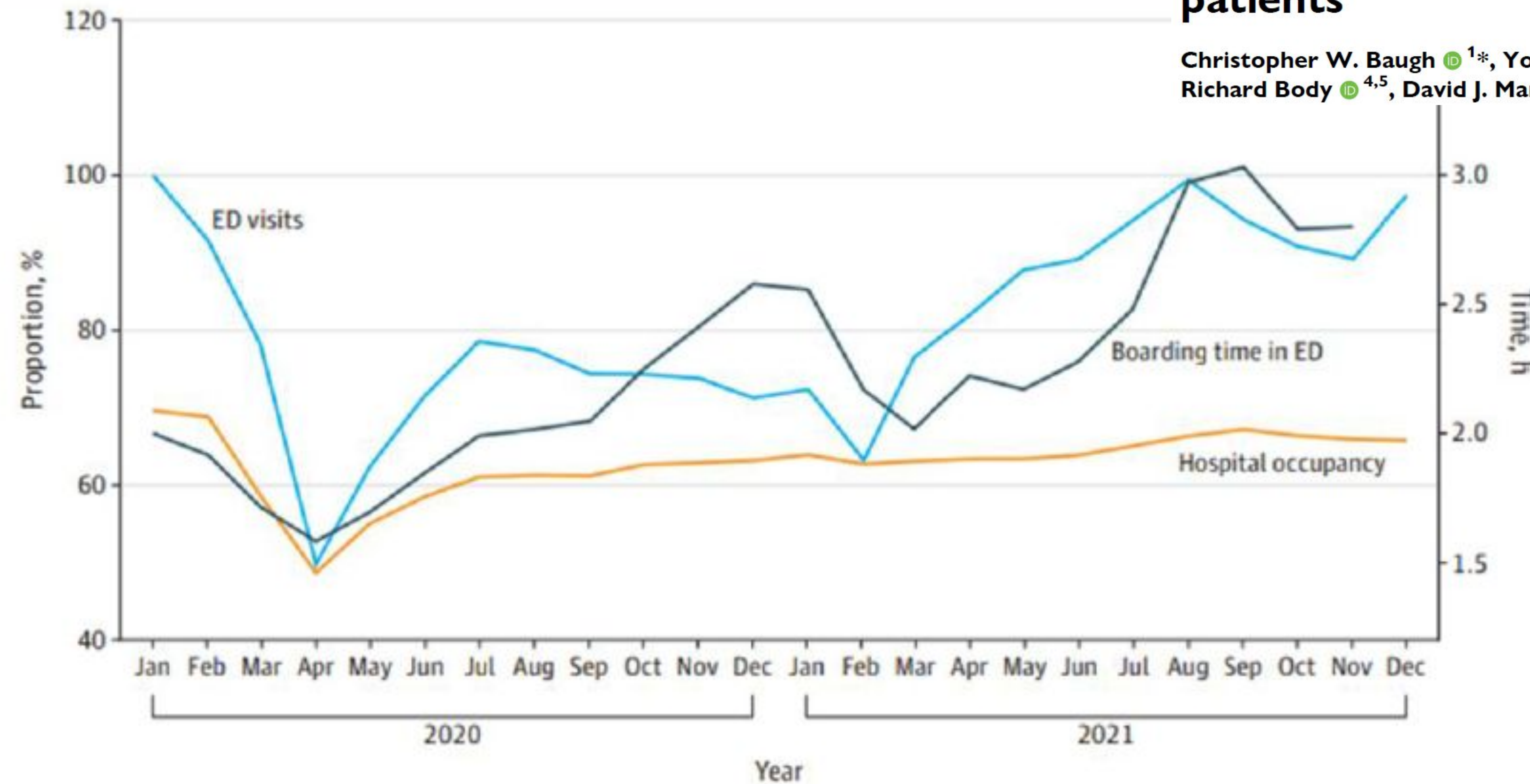


Figure 1 Recent trends in US emergency department visits, boarding time, and hospital occupancy. Emergency department boarding time and hospital occupancy rates rise in association with emergency department visits. When the emergency department need for in-hospital beds increases, there is often limited hospital capacity to transition care for those admitted. Reproduced with permission (CC-BY license) from Janke AT, Melnick ER, Venkatesh AK. Hospital Occupancy and Emergency Department Boarding During the COVID-19 Pandemic. JAMA Netw Open 2022; 5:e2233964. ED, emergency department.

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

an Freund², Philippe Gabriel Steg³,
and Maame Yaa A. B. Yiadom⁷

Table 1 Risks of emergency department crowding on specific cardiovascular conditions

	Input	Throughput	Output
ACS	Delayed EMS response time, delayed ECG acquisition and identification of STEMI; delayed initiation of troponin testing to identify evidence of occlusive disease with infarction vs. ischaemia	Delayed troponin lab processing to get test results to initiate an intervention for those with acute infarction	Prolonging care in the ED due to delay to transition to in-hospital care
Atrial fibrillation/flutter	Delayed ECG acquisition and identification of AF	Reduced rhythm control due to lack of cardioversion resources such as nurse and physician availability for sedation, monitoring, etc.	Increased inpatient admission rate
Unstable arrhythmias	Delayed acquisition of triage vital signs to identify rate or non-sinus rhythm	Limited availability of ED beds to initiate medication or electrical intervention	Delayed consultation times due to in-hospital service volume increasing cardiovascular specialist workload
Pulmonary embolism	Delayed physician evaluation to assess risk factors and pre-test probability to guide testing	Delayed d-dimer lab result time for low to moderate risk patients which delays therapy in those with PE; delayed imaging for diagnosis of PE, which slows time to therapy for those with PE; delayed anticoagulation when indicated or initiation of empiric anticoagulation in setting of diagnostic testing delays that can expose patients to bleeding risk	Delay to transfer to tertiary care centre for specialty intervention

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

Output



Table 1 Risks of emergency department crowding on specific cardiovascular conditions

Input		Throughput	Output
Tamponade	Delayed recognition of history, exam, and vital signs suggesting tamponade to prompt intervention or initiation of diagnostic testing	when indicated or initiation of empiric anticoagulation in setting of diagnostic testing delays that can expose patients to bleeding risk Limited bed availability reduced ability for ED physicians to do physical exam or bedside echo to evaluate for tamponade	Delay to transfer to tertiary care centre for specialty intervention
Cardiac arrest (VT/VF, ACLS, and post-ROSC)	Delayed EMS scene response	If cooling protocols are initiated on the hospital floor delays to available hospital bed can worsen neurocognitive outcomes	Prolonged time in the ED for critical care patients has been associated with increased mortality. Delay to specialist intervention, e.g. cardiac catheter laboratory, extracorporeal membrane oxygenation (ECMO)
Syncope (cardiac vs. non-cardiac)	Delayed ECG acquisition and identification of arrhythmia	Delay to cardiac monitoring or laboratory testing to risk stratify for the need for admission or discharge	Delay to inpatient care for evaluation and testing, and prolonged stay in the ED without added diagnostic value. EDOUs can aid, but if they are also full, patients may have
Heart failure	Delayed recognition. Delayed time to initiate diuretics	Delay to cardiac monitoring or laboratory testing (e.g. turnaround time for natriuretic peptide levels) to risk stratify for the need for admission or discharge	Delay to inpatient care for evaluation and testing, and prolonged stay in the ED without added diagnostic value. EDOUs can aid, but if they are also full, patients may have in-hospital care in ED setting.

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

er W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³,
ody ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

Table 2
Strategies to mitigate the impact of emergency department crowding on common cardiovascular conditions

	Input			Throughput		
	ED avoidance/clinic access/telehealth	EMS protocols	Triage protocols	POCUS	ADPs	Code teams
ACS	Elective PCI for patients with stable angina	Pre-hospital cath lab activation for STEMI; transport to primary PCI centre	Lean processes to identify walk-in and EMS arrival patients with chest pain to obtain initial EKG < 10 min	Identification of regional wall motion abnormalities to confirm diagnosis	Chest pain ADP featuring hs-cTn to risk stratify; coronary CTA for eligible patients	Code STEMI
Atrial fibrillation/flutter	Pill in the pocket/telehealth self-treatment for recurrent episodes	Pre-hospital rate control			AF ADP to identify eligible patients for ED cardioversion	



Input			Throughput			
	ED avoidance/clinic access/telehealth	EMS protocols	Triage protocols	POCUS	ADPs	Code teams
Unstable arrhythmias		Prehospital cardioversion and anti-arrhythmic medications	Triage EKG for patients with complaints like syncope, dizziness, palpitations			Code Blue
Pulmonary embolism	Outpatient initiation of oral anticoagulants in patients with subsegmental PE and uncomplicated DVT found on outpatient imaging			Rapid identification of right heart strain, RV:LV ratio	PE risk stratification criteria to identify cohort eligible for discharge on oral anticoagulants	PERT Team/Code PE
Tamponade				Rapid identification of pericardial effusion		
Cardiac arrest (VT/VF, ACLS, and post-ROSC)	Pre-hospital confirmation of death	Pre-hospital cardioversion and anti-arrhythmic medications, pre-hospital cooling			Cooling protocols, ACLS algorithms	Code Blue/Code STEMI

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷



Table 2
Strategies to mitigate the impact of emergency department crowding on common cardiovascular conditions

Input			Throughput		
ED avoidance/clinic access/telehealth	EMS protocols	Triage protocols	POCUS	ADPs	Code teams
Syncope (cardiac vs. non-cardiac)			Rapid assessment of volume status, cardiac function; comprehensive echo to identify patients with severe valvular disease	Risk stratification criteria to identify cohorts who need inpatient care vs. alternatives	
Heart failure	Specialty clinics to administer IV diuretics, telehealth visits to assess volume status and adjust medications	Pre-hospital treatments; nitrates, NIPPV, diuretics	Limited echo to assess volume status, EF, pulmonary oedema, portal vein filling	Risk stratification criteria to identify cohorts who need inpatient care vs. alternatives	

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

	Output			
	Observation units	Rapid outpatient follow-up	Expedited treatment	Home-based care
ACS	Setting to extend visit for additional cardiac testing (e.g. stress testing)	Cardiology clinic follow-up; outpatient stress testing	Cath lab for PCI	
Atrial fibrillation/flutter	Setting to extend visit for spontaneous cardioversion and/or rate control and initiation of anticoagulation	AF clinic follow-up, anticoagulation clinic follow-up	ED cardioversion, initiation of anticoagulation in ED	Home hospital admission for titration of new rate control agents

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷



	Output				
	Observation units	Rapid outpatient follow-up		Expedited treatment	Home-based care
Unstable arrhythmias	Extended telemetry monitoring to identify patients with suspected arrhythmias			Temporary pacemaker placement for bradyarrhythmias	
Pulmonary embolism	Setting to delay discharge for symptom control, anticoagulation initiation and extended haemodynamic monitoring prior to discharge	Close vascular medicine/Cardiology/haematology/Anticoagulation clinic follow-up for discharged patients			Home hospital admission for ongoing monitoring
Tamponade				Pericardiocentesis (POCUS-guided in ED for unstable patients)	
Cardiac arrest (VT/VF, ACLS, and post-ROSC)				Cath lab; expedited CCU admission	

Strategies to mitigate emergency department crowding and its impact on cardiovascular patients

Christopher W. Baugh ^{1*}, Yonathan Freund², Philippe Gabriel Steg ³, Richard Body ^{4,5}, David J. Maron⁶, and Maame Yaa A. B. Yiadom⁷

	Output			
	Observation units	Rapid outpatient follow-up	Expedited treatment	Home-based care
Syncope (cardiac vs. non-cardiac)	Setting to delay discharge for extended telemetry monitoring and additional diagnostic testing prior to discharge			Home hospital admission for ongoing monitoring
Heart failure	Setting to delay discharge for diuresis, repeat labs	Close Cardiology clinic follow-up for discharged patients, case management discharge planning		Home hospital admission for ongoing IV diuresis



Crowding ospedaliero 5.0 la soluzione e le soluzioni tampone

Una disfunzione dell'intero ospedale richiede una risposta dell'intero ospedale o dell'intero sistema

È noto che alti livelli di sovraffollamento sono associati a una cattiva funzionalità ospedaliera e del sistema, cure inefficienti e aumento degli episodi di sovraffollamento ospedaliero e ED. In effetti, è una constatazione universale che operare a piena capacità per periodi prolungati sia inefficiente e insostenibile.

Hostetler MA, Mace S, Brown K, et al; Subcommittee on Emergency Department Overcrowding and Children, Section of Pediatric Emergency Medicine, American College of Emergency Physicians. Emergency department overcrowding and children. *Pediatr Emerg Care* 2007; 23:507-515.

Cameron PA. Hospital overcrowding: a threat to patient safety? *Med J Aust* 2006; 184: 203-204.

Richardson DB. Reducing patient time in the emergency department. *Med J Aust* 2003; 179: 516-517.

Una disfunzione dell'intero ospedale richiede una risposta dell'intero ospedale o dell'intero sistema

Il sovraffollamento del PS è meglio visto come un indicatore di disfunzione dell'intero ospedale che richiede una risposta dell'intero ospedale o dell'intero sistema. La disponibilità di posti letto dipende non solo dal numero fisico di letti, ma anche dal modo in cui il letto viene gestito (uso appropriato, buone pratiche di flusso), usi concorrenti per i letti (ad esempio, cure elettive contro cure acute), la disponibilità di unità dedicata alla dimissioni e un'adeguata assistenza comunitaria.

Figure coinvolte nella risposta sono molteplici:

- Medici/infermieri del sistema dell'urgenza
- Medici/infermieri dell'ospedale
- Medici di base
- Politici
- Cittadini

Soluzioni proposte input factor

- Diminuire uso degli ED:
 - educational/increase health literacy; potenziare accessi alle cure primarie e alle cure specialistiche
 - Affrontare i social determinants of health (vita sedentaria, alimentazione...)

Emergency Department Crowding: High Impact Solutions



Emergency Medicine Practice Committee
May 2016

RIDURRE INPUT FACTORS



Posting wait times

Anecdotal evidence supports the public posting of wait times as a means to distribute flow around a system or geographical area. This can be done online, with billboards, and through smartphone applications or texting, for example. Patients with non-emergent conditions can use this information to make better informed decisions about where they seek care,²⁶ although posted and actual wait times may not correspond in larger EDs.²⁷

RIDURRE INPUT FACTORS

ED appointments

Appointment times, or ED reservations, have been suggested as another means to smooth the arrival curve and have patients arrive to the ED at times that resources are available to care for them. Combining historical data with predictive software, EDs can model arrivals, and allow patients with non-emergent complaints to schedule a visit in the future. Conversely, if a surge of patients arrives, future appointments can be blocked off. One survey study in the United Kingdom found that 79% of patients with minor injuries prefer such a reservation system to the current walk-in method.²⁸ In addition to re-distributing arrivals, appointments provide patients with the convenience of waiting at home for their visit, and may also motivate ED staff to meet certain benchmarks to deliver scheduled appointments on time.²⁹



RIDURRE INPUT FACTORS



Increasing primary care access

Improving access to primary care has the potential to decrease the influx of patients into the ED. A national study in Britain found that 26% of ED visits were due to an inability to obtain an appointment with a primary care physician,³⁰ and data from the US showed that patients with non-business hours access to their PCP had 7% fewer ED visits.³¹

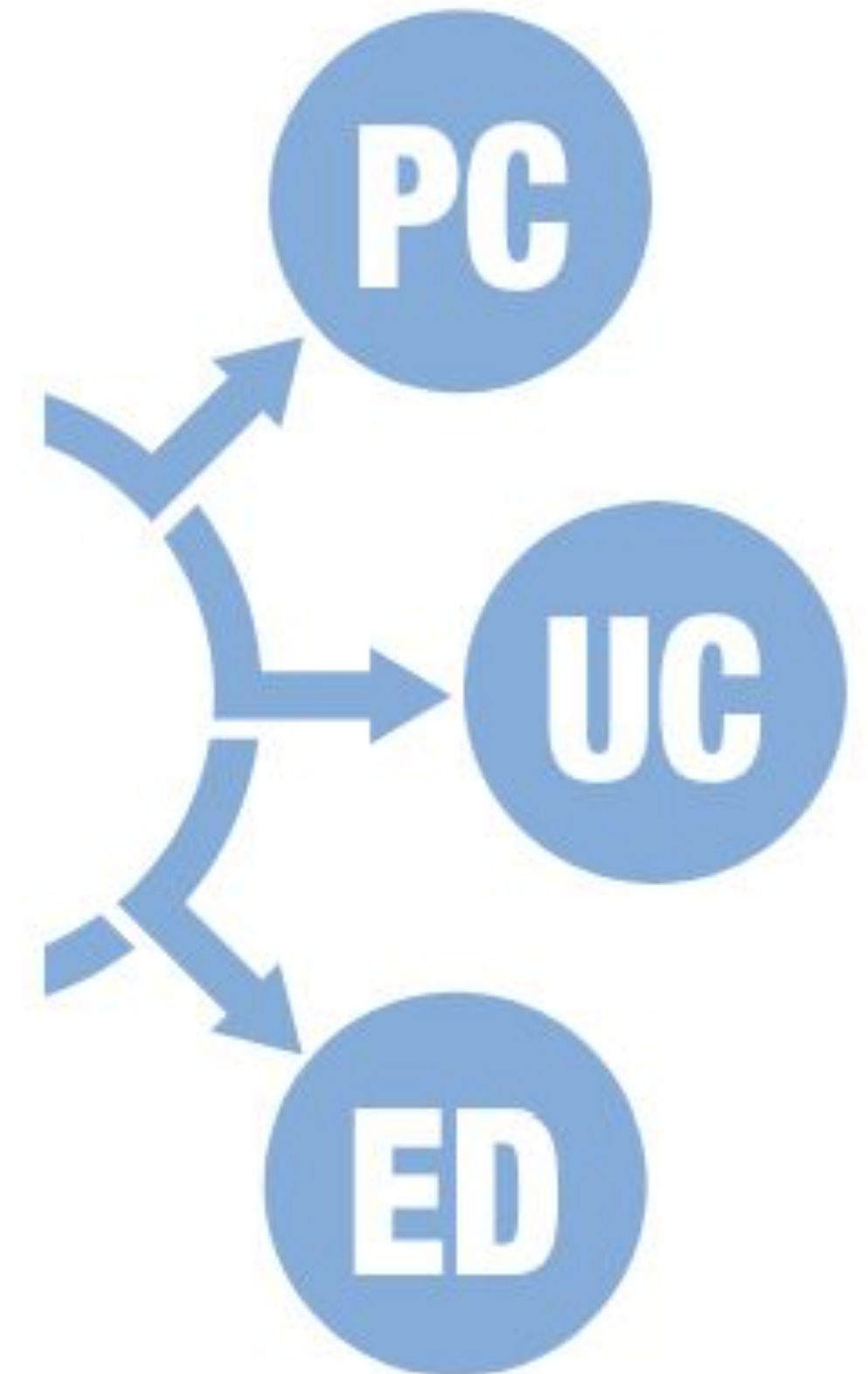
RIDURRE INPUT FACTORS

Triage to non-ED setting

37% of patients presenting to an ED may be triaged as appropriate to be treated in non-ED settings such as urgent care (UC).³² UCs may be a viable alternative for appropriate patients. Subsequent analysis places the potential for patient diversion to UCs and other alternative ambulatory settings at 13.7-27.1% of all ED visits³³ with cost savings to the patient of over \$400 per visit.³⁴

Diversion of lower acuity patients from the ED may result in increased ED acuity and decreased volume. However 5.5% of patients triaged as low acuity will eventually result in acute hospitalization.³² There should be clearly defined transfer protocols to an ED from UC, and good relationships in place with local EDs to minimize the risk to patients who choose UC incorrectly.

In patients who have used ED's in the past, when given the option to self-triage to UC, a 48% reduction in ED utilization within that population would result.³⁵ As the uninsured rate continues to fall in the US patients have increased access to primary care,³⁶ and as many as 33% of patients will attempt to seek direction from their primary care provider prior to seeking ED care.³⁷ However education for providers, as well as patients, must improve as even providers have difficulty agreeing upon what constitutes an appropriate patient for evaluation at UC.³⁸



RIDURRE THROUGHPUT FACTORS



Quick registration

Efforts to streamline front-end operations have led to direct bedding with bedside registration. Traditional patient processing involves a series of queues upon arrival to the ED, including waits for triage, registration, medical screening, and the next available ED bed. Reductions in wait times may be achieved with a transition to parallel, as opposed to sequential, processing. In place of traditional triage, patients are seen simultaneously by a nurse, registration worker, and care provider.

Direct bedding necessitates quick registration, entailing a brief intake of basic patient demographics to permit electronic charting and order entry. Full registration may then be completed at some point during the patient's ED stay.³⁹ With such measures in place, several EDs have reported decreased LWBS rates, wait times, and LOS.⁴⁰⁻⁴⁵

RIDURRE THROUGHPUT FACTORS

Registration kiosk

One technological advance increasingly used in the ED is the registration kiosk. Mostly used in airports, restaurants, and stores, self-service touch screens may also be used in EDs to register patients.^{39,46}



RIDURRE THROUGHPUT FACTORS

Provider in triage

The placement of a physician, or advanced practice provider, in triage is another method used to reduce delays in patient care. This triage provider may initiate medical screening exams, testing, and/or management until a bed becomes available in the ED. In addition, low acuity patients may be evaluated, managed and discharged directly from the waiting room. Though this operational change requires both space and funding, it has been shown to reduce LOS and LWBS.⁴⁷⁻⁴⁹

CODICI DI ACCESSO AL PRONTO SOCCORSO

CODICE N° / COLORE	DENOMINAZIONE	DEFINIZIONE
1 ROSSO	EMERGENZA	Interruzione o compromissione di una o più funzioni vitali
2 ARANCIONE	URGENZA	Funzioni vitali a rischio. Rischio evolutivo o dolore severo
3 AZZURRO	URGENZA DIFFERIBILE	Condizione stabile con sofferenza. Richiede prestazioni complesse
4 VERDE	URGENZA MINORE	Condizione stabile. Richiede una prestazione semplice
5 BIANCO	NON URGENZA	Problema non urgente o di minima rilevanza clinica

RIDURRE THROUGHPUT FACTORS

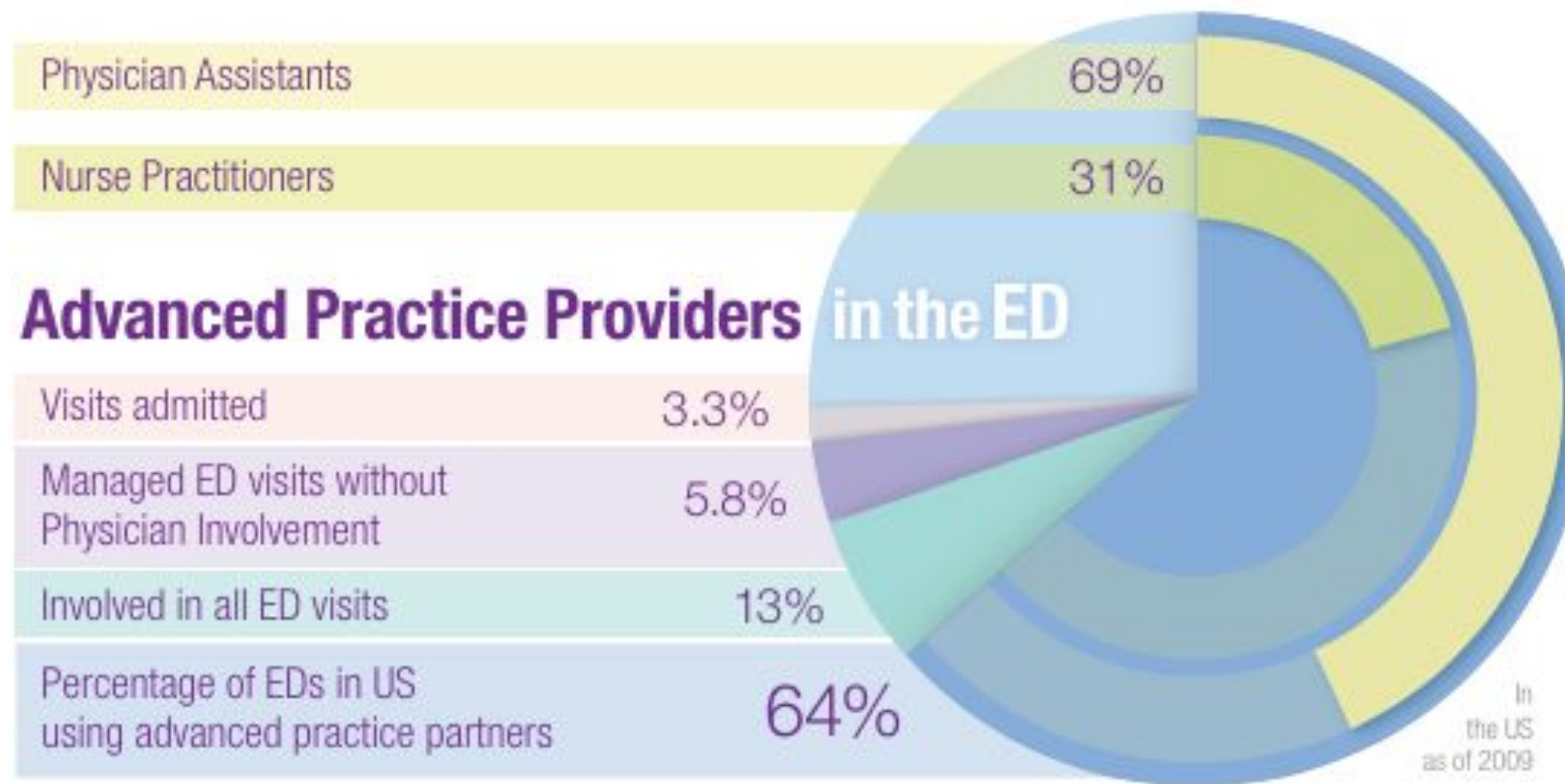


ED physicians and triage nurses can predict which patients will be discharged after a quick triage with over 90% accuracy.

Nurse initiated orders

The use of evidence-based, standardized order sets has been shown to improve timeliness of care and reduce medical errors.^{39,50,51} Initiation of testing in triage is a possible solution for the congested ED, as results are returned earlier in the patient's visit, reducing LOS.⁵² Protocols involving medication administration are reported to improve time to pain medication,^{53,54} time to antibiotics,⁵⁵ and time to thrombolysis in myocardial infarction.⁵⁶

RIDURRE THROUGHPUT FACTORS



Nurse practitioners and physician assistants/advanced practice providers

As of 2009, 64% of EDs in the US were using advanced practice providers; 69% are physician assistants and 31% nurse practitioners. In 2009, they were involved in 13% of all ED visits, managed 5.8% of ED visits without physician involvement, and 3.3% of their visits were admitted.⁶³ Their hourly cost is lower than a physician's, making them a cost-effective option to improve throughput.

REDUCING THROUGHPUT FACTORS

Streaming, split flow, fast track

Streaming, or split flow, is an ED management technique by which patients with different needs are stratified during triage into different treatment protocols. Often, this strategy places specific patients in a different physical area of the ED and assigns a different treatment provider, although different streams can be specified through colors or other indicators besides physical location. Several studies show that split flow decreases LOS, wait time to see a provider and LWBS, and increases patient satisfaction.⁵⁷⁻⁵⁹ Patients can be split by acuity level, need for a bed, need for lab studies, chief complaint, or any other designation.



<https://doi.org/10.1016/j.jemermed.2022.10.007>

Administration of Emergency Medicine

Implementation of Vertical Split Flow Model for Patient Throughput at a Community Hospital Emergency Department

Alex Hsieh, MD,* Alexander Arena, MD,* Anthony Orah, MD,* Adrian Cotarelo, MD,* Mary McLean, MD,* Adam Hsieh, MD,† Alan Hsieh, MD,‡ Ida Chen, PA-C,§ Norman Mok, MD,* and Raffaele Milizia, MD*

*St. John's Riverside Hospital, Yonkers, New York, †University of Toronto, Toronto, Ontario, Canada, ‡Jackson Memorial Hospital, Miami, Florida, and §Columbia University Irving Medical Center, New York, New York

Reprint Address: Alex Hsieh, St. John's Riverside Hospital, 967 N Broadway Ave, Yonkers, NY 10701

PRACTICE IMPROVEMENT

ARE SPLIT FLOW AND PROVIDER IN TRIAGE MODELS IN THE EMERGENCY DEPARTMENT EFFECTIVE IN REDUCING DISCHARGE LENGTH OF STAY?



Authors: Beth A Pierce, DNP, MSN, BA, RN, NEA-BC, and Denise Gormley, PhD, RN, Cincinnati, OH

A quality improvement (QI) project was completed early in 2015 to evaluate the split flow model of care delivery and a provider in triage model within a newly constructed emergency

The provider in triage model enhances patient triage assessment, as well as patient flow within the emergency department, by allowing patients to be evaluated by an ED provider immediately at the point of triage when the patient first presents to the emergency department. The QI project demonstrated that the split flow model alone reduced DLOS for all ED patients, and when coupled with the provider in triage model, a greater reduction in DLOS, as well as an improvement in front-end throughput metrics, was realized.

Key words: Split flow; Provider in triage; Throughput; Patient flow; Discharge length of stay; Care delivery models

The Journal of Emergency Medicine, Vol. 64, No. 1, pp. 77-82, 2023
© 2022 Elsevier Inc. All rights reserved.
0736-4679/\$ - see front matter

departments
employs
the patient
total of
impose of
stream of
all to the
units with
mes that
a door to
patients.

RIDURRE THROUGHPUT FACTORS

Rotational assignment

In EDs with multiple providers, rotational patient assignment instead of physician self-assignment showed a decreased median arrival to provider time (39 to 22 minutes), median LOS (232 to 207 minutes), LWBS (0.73% to 0.36%) and complaint ratio (9.0/1000 to 5.4/1000).⁶⁴

RIDURRE THROUGHPUT FACTORS

Improved turnaround time (TAT) for laboratory and radiology

Laboratory testing TAT can be improved with certain point of care testing (POC). Use of POC blood glucose and urine pregnancy tests are well established in emergency medicine. There are currently many POC testing options available, however, not all are cost effective. POC troponin decreases TAT for patients with chest pain.⁶⁵ Mean LOS decreased by 1.5 hours (8.46 to 7.14) in patients with chest pain and POC D-dimer testing.⁶⁶ Additional examples of tests that could decrease time to disposition include lactate in sepsis patients, and coagulation tests for stroke.⁶⁷

A dedicated radiologist available to read ED studies can decrease delays in results and reduce time for disposition. In one study, extending attending radiologist hours from 8am-5pm to 6:45am-11pm decreased imaging report times by greater than thirty minutes.⁶⁸

RIDURRE THROUGHPUT FACTORS

Medical scribes

ED providers spend a large amount of time dedicated to documentation, upwards of 22-32% according to several studies.⁶⁹⁻⁷¹ Scribes allow physicians to spend more time directly related to patient care. Although the literature describing improved patient throughput related to scribes is not as robust as those related to patient/provider satisfaction and financial implications, several studies have shown improvement in patients per hour, time to clinician, and time to disposition after implementing scribe programs.⁷²⁻⁷⁶

RIDURRE THROUGHPUT FACTORS

Electronic health records

Driven by both internal quality improvement initiatives as well as incentives related to the HITECH act ('meaningful use'), a large number of health care systems nationwide have transitioned (or intend to transition) to electronic health records (EHRs) and computerized order entry (COE). When designed and utilized appropriately, this transition may carry several theoretical benefits with regard to patient throughput.⁷⁷ These benefits can include rapid availability of past history and work-ups, standardized discharge information, streamlined medication ordering, and improved discharge communication.⁷⁸⁻⁸¹ As such, some studies have demonstrated a long-term reduction in patient throughput times after the implementation of an EHR. Of note, however, is the initial increase in throughput metrics during EHR implementation for upwards of 7-12 months. Some studies have demonstrated an increase in ordering of tests and treatments with EHR, which may offset associated operational improvements.⁸² Implementation of an EHR and COE as tools to combat ED crowding should be considered carefully.



RIDURRE THROUGHPUT FACTORS

ED expansion

ED expansion as a means to speed patient flow was first suggested in 1984, and reiterated in 2000.⁸³ Without other patient flow modifications, expansion alone also led to decreased patient satisfaction; increased door-to-provider time, LOS and boarding; and either unchanged or increased rates of LWBS.^{84,85} There are mixed effects on ambulance diversion, with some demonstrated improvement and some unchanged.⁸⁶



RIDURRE THROUGHPUT FACTORS

Increased staffing

The study of staffing levels and its effect on crowding

is difficult and is affected by several variables.^{90,91} One study showed that a decreased LOS is associated with the addition of a senior resident or attending, while an increased LOS is associated with an extra junior level resident.⁹²



Government mandates on nurse/patient ratios are not evidence-based,⁹³ though it has been shown that patient wait time and total care time were decreased when nurse/patient ratios were in compliance in California.⁹⁴ There is an association of improved patient outcomes with increased nurse staffing, but causation has not been proven.⁹⁵

RIDURRE THROUGHPUT FACTORS

Observation units

The rate of disposition from ED to observation unit has tripled from 0.6% in 2001 to 1.87% in 2008.¹⁰² 34.1% of EDs had a dedicated observation unit in 2008, and 56% of them were administered by the ED. Disposition to observation more than doubles in EDs that control their own observation units, from 15% for general observation units to 38% for ED-controlled units.¹⁰³ There are no differences in one year outcomes or costs for chest pain patients placed in observation versus inpatient,¹⁰⁴ and evidence shows that effective, independent protocol-driven units can save \$950 million to \$3.1 billion per year through 23-38% shorter lengths of stay and 17-44% lower inpatient admission rates.^{105,106} 2.1% of patients admitted from the ED stay less than 48 hours and have similar characteristics and diagnoses to patients admitted to observation units, presenting an additional opportunity for time and cost savings.¹⁰³ It is recommended that ED LOS end once admitted to observation in order to accurately measure ED throughput.

MIGLIORARE OUTPUT FACTORS



Reverse triage

Reverse triage is a military concept where the lowest acuity combatants are treated first so they may return to the battlefield. In the hospital setting the concept is used to create surge capacity by identifying inpatients at lowest risk of adverse outcome if discharged or placed in a lower level of care earlier than would normally be anticipated. Patients who are discharged should have an acceptably low rate of consequential medical events (CMEs), though this rate may be higher than under normal operations. Studies looking at the process estimate a hospital can increase its bed capacity by 10-20% in a matter of hours using reverse triage.¹⁰⁷

Patients are classified into 5 categories of risk, with individual categories being ranked acceptable for discharge/downgrade based on the severity of resource constraints. In pediatric patients the target CME rate for the lowest category is < 2%, which is a CME rate similar to a routine discharge under normal operations. The target CME rate for the next category up was 7%.¹⁰⁸ In studies looking at adults, the acceptable CME rates were approximately double for each category. Higher categories of risk were not considered acceptable for early discharge or downgrade except in exceptional circumstances.

MIGLIORARE OUTPUT FACTORS

Inpatient hallway boarding

Inpatient hallway boarding describes moving admitted patients from the ED to inpatient hallways until inpatient beds become available, in an effort to improve ED capacity. Patients who are boarded on inpatient hallways are typically a limited class of patients (up to and including telemetry patients but usually excluding stepdown/intermediate care or critical patients) who do not have one of a few exclusion criteria, such as incontinence. The decision to board in hallways may include time, where ED LOS exceeds a set threshold, or volume, where there are an excessive number of ED boarders.

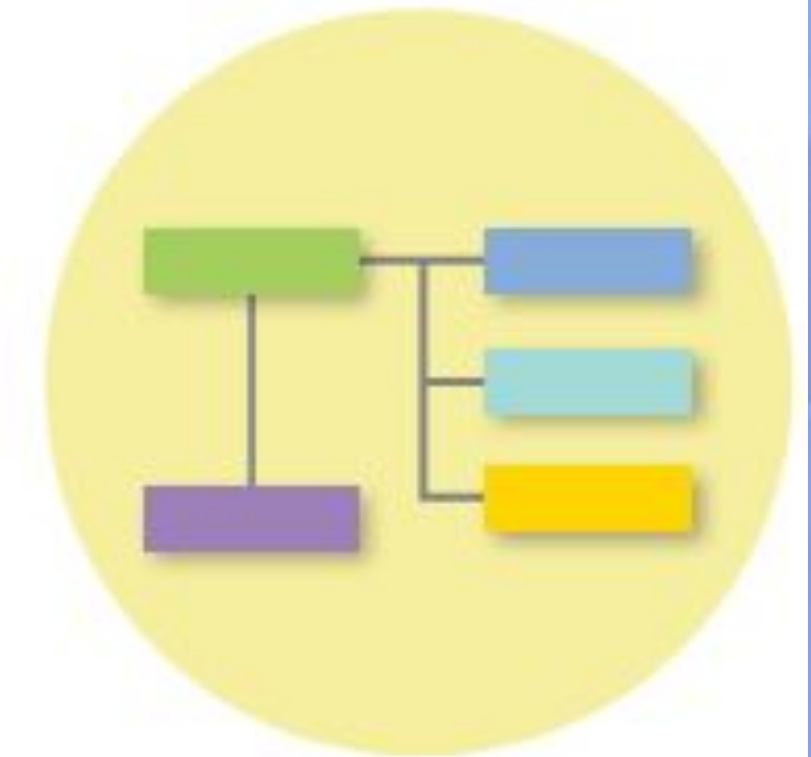
The process is safe and preferred by 85% of surveyed patients.¹⁰⁹ Mortality and ICU transfer rates were less among patients placed in inpatient hallway beds compared to those awaiting standard bed placement.¹¹⁰ 50% of patients sent to inpatient hallways to board end up spending an hour or less in the hallway. Some limited evidence shows up to a 25% drop in ED LOS when inpatient hallway boarding is utilized.¹¹¹



MIGLIORARE OUTPUT FACTORS

Active bed management

A person acting as a bed czar or bed director can manage all inpatient beds to coordinate and match ED admissions. This person should also facilitate timely transfer from the ED to inpatient beds and can mobilize resources to aid in ED throughput issues. Alternatively there can be a point person in the ED to help navigate admissions during times of high ED boarding. There should be real-time bed census availability so the ED is aware of the number and type of beds available. A strategy to actively manage hospital beds has been associated with decreased ED LOS and fewer hours on ambulance diversion.¹¹²⁻¹¹⁵



Coordination of elective surgeries

Patients scheduled for elective surgery often require post-operative hospital admission. Elective surgery times should be matched to available inpatient beds by smoothing the schedule to include all days of the week, and to schedule more intensive procedures throughout the week.¹¹⁶



Discharge lounge

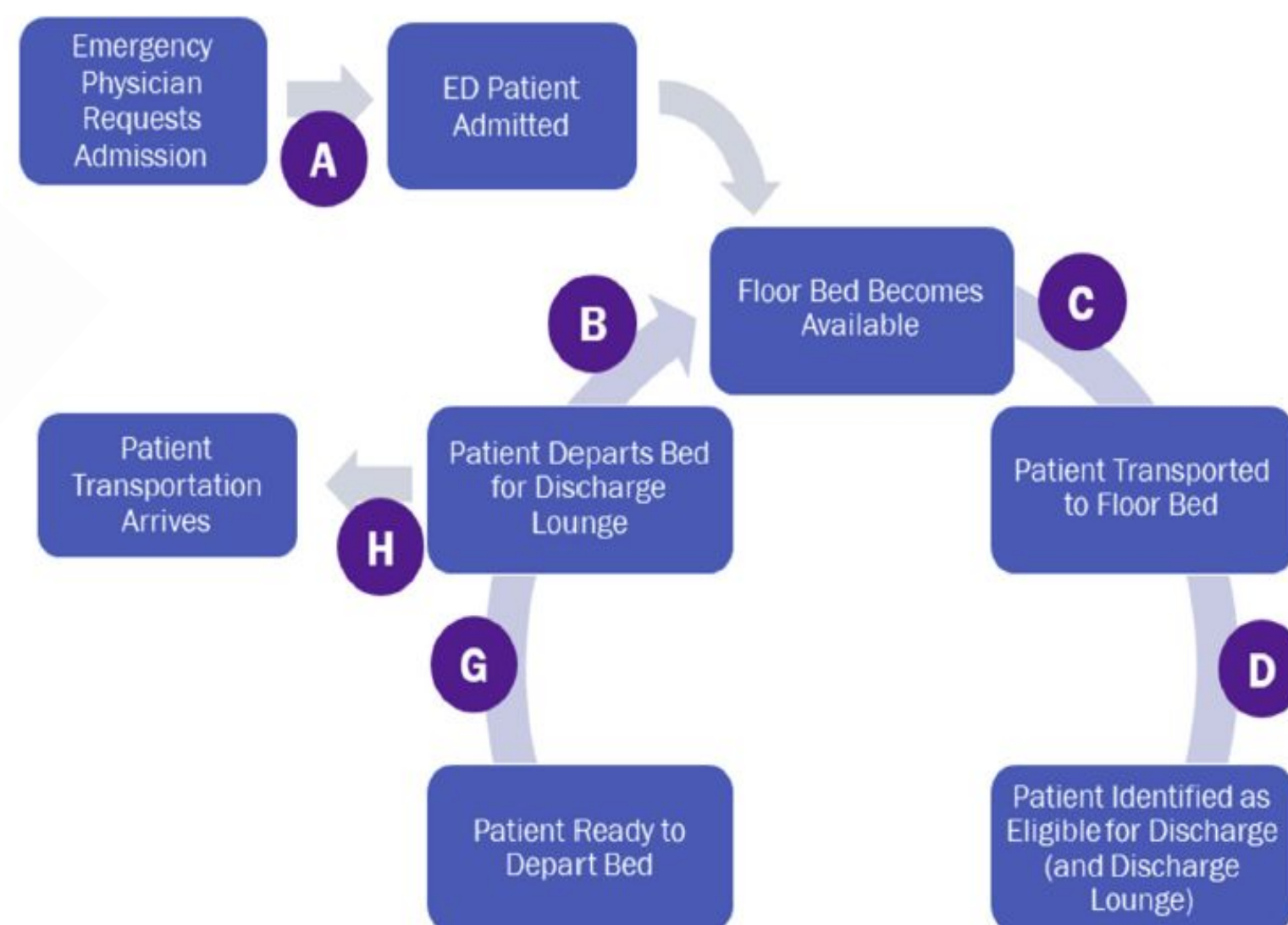
A specific space for hospital patients who are awaiting discharge allows inpatient beds to become available sooner.

THE PRACTICE OF EMERGENCY MEDICINE/CONCEPTS

The Inpatient Discharge Lounge as a Potential Mechanism to Mitigate Emergency Department Boarding and Crowding

Brian J. Franklin, MBA*, Sharif Vakili, MD, MBA; Robert S. Huckman, PhD; Sarah Hosein, MSc; Nicholas Falk, MBA; Katherine Cheng, MBA; Maria Murray, RN, MM; Sheila Harris, BS; Charles A. Morris, MD, MPH; Eric Goralnick, MD, MS

*Corresponding Author. E-mail: BrianJF@umich.edu, Twitter: [@BrianFranklin1](https://twitter.com/BrianFranklin1)



	Emergency Department Bed	Inpatient Bed	Discharge Lounge
Without Discharge Lounge	 Patient 2 is boarding in the ED while awaiting the inpatient bed occupied by Patient 1	 Patient 1 is discharged, but occupying an inpatient bed while awaiting transportation or other services	
With Discharge Lounge	 Patient 3 is seen more quickly by emergency physician	 Patient 2 is moved to an inpatient bed more quickly, reducing ED boarding time	 Patient 1 is awaiting transportation or other services in the discharge lounge without unnecessarily occupying an inpatient bed

Delayed access to inpatient beds for admitted patients contributes significantly to emergency department (ED) boarding and crowding, which have been associated with deleterious patient safety effects. To expedite inpatient bed availability, some hospitals have implemented discharge lounges, allowing discharged patients to depart their inpatient rooms while awaiting completion of the discharge process or transportation. This conceptual article synthesizes the evidence related to discharge lounge implementation practices and outcomes. Using a conceptual synthesis approach, we reviewed the medical and gray literature related to discharge lounges by querying PubMed, Google Scholar, and Google and undertaking backward reference searching. We screened for articles either providing detailed accounts of discharge lounge implementations or offering conceptual analysis on the subject. Most of the evidence we identified was in the gray literature, with only 3 peer-reviewed articles focusing on discharge lounge implementations. Articles generally encompassed single-site descriptive case studies or expert opinions. Significant heterogeneity exists in discharge lounge objectives, features, and apparent influence on patient flow. Although common barriers to discharge lounge performance have been documented, including underuse and care team objections, limited generalizable solutions are offered. Overall, discharge lounges are widely endorsed as a mechanism to accelerate access to inpatient beds, yet the limited available evidence indicates wide variation in design and performance. Further rigorous investigation is required to identify the circumstances under which discharge lounges should be deployed, and how discharge lounges should be designed to maximize their effect on hospitalwide patient flow, ED boarding and crowding, and other targeted outcomes. [Ann Emerg Med. 2020;75:704-714.]

MIGLIORARE OUTPUT FACTORS

Modified admission protocols

Modification of the admission process to create a more efficient, streamlined process can lead to a reduction in ED LOS and ED boarding times.^{117,118} This may involve establishment of transition orders, allowing patients to be admitted prior to completion of all diagnostic testing and having admitting providers see patients on the floor, rather than in the ED.

A protocol requiring transfer of admitted patients to an inpatient unit within 120 minutes, when measured over a one year period, would have increased ED capacity by 10,397 hours, translating into an additional 3,175 ED visits and revenue of over \$3.9 million.¹⁷ A reduction of ED boarding by one hour would have resulted in almost \$10,000 additional daily revenue in an inner-city teaching facility with over 118,000 visits annually, based on improvements in LWBS and ambulance diversion.¹¹⁹

MIGLIORARE OUTPUT FACTORS

Early discharges

Computer modeling has shown that shifting peak hospital discharge time one hour earlier cuts ED boarding hours in half, and four hours earlier eliminates ED boarding.^{120,121} When weekend discharges occur at the same rate as during the week,

there is a significant improvement in ED boarding and hospital LOS.¹²² While not specific to the ED, similar improvement is demonstrated when surgical schedules are smoothed.¹²³

When daily peak discharge time can be shifted to precede peak admission time, there is a lower peak occupancy in the hospital, a lower overcrowding rate, and lower ED boarding hours. The effect is accentuated with more lead-time between peak discharge and admission.



Soluzioni proposte throughput factor

- Adeguato organico
- Adeguata formazione dell'organico presente
- Alliging staffing with census and volume
- Divisione di flussi (per intensità di cura, acuti non acuti..)
- Fast track
- percorsi standardizzati per sottogruppi di pazienti (disturbi mentali, pazienti geriatrici, bambini...)

Soluzioni proposte throughput-output factor

- Centralized hospital-wide operations center
 - Bed turnover, servizi di trasporto, servizio di pulizie (housekeeping)
 - Use of alcove and hallway beds
 - Transferring certain cohorts of patients to affiliated hospital for inpatient care

Soluzioni proposte throughput-output factor

- Hospital-wide surge plan
 - Riprogrammare le procedure elettive
 - Sospensione attività ambulatoriale per reclutamento di personale
 - Posticipare l'imaging ambulatoriale
 - **Reclutamento staff ancillare**

Sheikhbaqir H, Patel AR, Adkoe-moghaddam M, et al. Surge capacity of hospitals in emergencies and disasters with a preparedness approach: a systematic review. Disaster Med Public Health Prep 2017;11(5):612–20.

Adalja AA, Watson M, Bouri N, et al. Absorbing citywide patient surge during Hurricane Sandy: a case study in accommodating multiple hospital evacuations. Ann Emerg Med 2014;64(1):66–73.e1.

Soluzioni proposte throughput-output factor

• Observation or short stay units

- Baugh CW, Venkatesh AK, Bohan JS. Emergency department observation units: a clinical and financial benefit for hospitals. *Health Care Manage Rev* 2011;36(1):28–37.
- Rutman L, Migita R, Spencer S, et al. Standardized asthma admission criteria reduce length of stay in a pediatric emergency department. *Acad Emerg Med* 2016;23(3):289–96.
- Lee IH, Chen CT, Lee YT, et al. A new strategy for emergency department crowding: high-turnover utility bed intervention. *J Chin Med Assoc* 2017;80(5):297–302.
- Konnyu KJ, Kwok E, Skidmore B, et al. The effectiveness and safety of emergency department short stay units: A rapid review. *Open Med* 2012;6(1):10–6.
- Role of a Brief Intensive Observation area with a dedicated team of doctors in the management of acute heart failure patients: a retrospective observational study.
- Gabriele Savioli, Iride Francesca Ceresa, Federica Manzoni, Giovanni Ricevuti, Maria Antonietta Bressan, Enrico Oddone; *Medicina (Kaunas)*. 2020 May 21;56(5):251. doi: 10.3390/medicina56050251.PMID: 32455837
- Brief Intensive Observation areas in the management of acute heart failure in elderly patients leading to high stabilisation rate and less admissions
- Gabriele Savioli, Iride Francesca Ceresa, Elena Novara, Tonia Persiano, Francesca Grulli, Giovanni Ricevuti, Maria Antonietta Bressan, Enrico Oddone. *Journal of Gerontology and Geriatrics*. In press.

Factors Affecting Emergency Department Crowding



James F. Kenny, MD^{a,*}, Betty C. Chang, MD^a, Keith C. Hemmert, MD^b

Observation or short stay units

Other strategies that can impact hospital admissions are disposition pathways. These programs represent a bridge between microlevel and macrolevel factors because they lay at the intersection of ED and inpatient care.⁶⁸ One such strategy is building an observation unit or a short stay unit. After the initial evaluation and management in the ED, some patients may require additional time for evaluation and treatment, but not enough to warrant a full hospital admission. Rapid treatment and evaluation units or observation units fulfill this role by serving as an extension of treatment initiated in the ED. To decompress ED crowding, these units are often geographically separated from the ED.⁶⁹

Certain illness and disease processes are highly conducive to observation admissions where objective criteria for risk stratification can help to streamline care. Conditions such as asthma, cellulitis, congestive heart failure, nonspecific abdominal pain, chest pain, and acute kidney injury have been shown to be safely managed within an observation setting, which can often avoid many of the time and staffing constraints of inpatient units.⁶⁰ Observation units can decrease ED boarding by moving a cohort of patients who would have otherwise occupied in-patient hospital beds to more temporary units, thus freeing up inpatient beds and resources for critically ill patients and ED beds for undifferentiated patients.^{55,70}

Factors Affecting Emergency Department Crowding

James F. Kenny, MD^{a,*}, Betty C. Chang, MD^a, Keith C. Hemmert, MD^b



medicines



Article

Impact of ED Organization with a Holding Area and a Dedicated Team on the Adherence to International Guidelines for Patients with Acute Pulmonary Embolism: Experience of an Emergency Department Organized in Areas of Intensity of Care

Gabriele Savioli ^{1,2,*}, Iride Francesca Ceresa ¹, Paolo Maggioni ¹, Massimiliano Lava ³, Giovanni Ricevuti ⁴, Federica Manzoni ⁵, Enrico Oddone ⁶ and Maria Antonietta Bressan ¹



medicina



Article

Role of a Brief Intensive Observation Area with a Dedicated Team of Doctors in the Management of Acute Heart Failure Patients: A Retrospective Observational Study

Gabriele Savioli ^{1,2,*}, Iride Francesca Ceresa ¹, Federica Manzoni ³, Giovanni Ricevuti ⁴, Maria Antonietta Bressan ⁵ and Enrico Oddone ⁶



solution propose throughput-output factor

Medical home or hospital-at-home programs

Factors Affecting Emergency Department Crowding



James F. Kenny, MD^{a,*}, Betty C. Chang, MD^a, Keith C. Hemmert, MD^b

Medical homes or hospital-at-home programs

Medical homes or hospital-at-home programs are another novel way to decrease overall hospital admissions. Here, select cohorts of patients are discharged home after their initial treatment in the ED. Patients can now stay in the comfort of their homes, while clinicians are deployed to continue the care.⁷¹ The hospital may consider enacting a med-to-bed program to ensure that care is not interrupted during the peridischarge period. Medications that will be needed after the initial treatment are dispensed to patients at discharge.

Technological innovations such as telemedicine and continuous remote vital sign monitoring can enhance this alternative.⁷² Using telemedicine, patients can be followed closely by a clinician after discharge from the ED, and can also receive other services remotely (consultants, care managers, social workers, etc). Although understudied, these hospital-at-home programs can likely decrease ED boarding by diverting less acute patients home while maintaining some of the benefits of an inpatient stay.

LEAN THINKING

European Review for Medical and Pharmacological Sciences

2016; 20: 4209-4219

Emergency Department crowding and hospital bed shortage: is Lean a smart answer? A systematic review

S. BUCCI¹, A.G. DE BELVIS¹, S. MARVENTANO², A.C. DE LEVA¹,
M. TANZARIELLO¹, M.L. SPECCHIA¹, W. RICCIARDI¹, F. FRANCESCHI³

¹Institute of Public Health, Hygiene Section, Catholic University of the Sacred Heart, School of Medicine, Rome, Italy

²Department "G.F. Ingrassia", Section of Hygiene and Public Health, University of Catania, Catania, Italy

³Department of Emergency, Internal Medicine Institute, Catholic University of the Sacred Heart, Rome, Italy

The Chronicity of Emergency Department Crowding and Rethinking the Temporal Boundaries of Disaster Medicine



Bryan P. McNeilly, MD*; Benjamin J. Lawner, DO; Timothy P. Chizmar, MD

**Corresponding Author. E-mail: bryan.mcneilly@gmail.com.*

0196-0644/\$-see front matter

Copyright © 2022 by the American College of Emergency Physicians.

<https://doi.org/10.1016/j.annemergmed.2022.07.016>

A **podcast** for this article is available at www.annemergmed.com.

Some disasters happen so gradually that no one takes notice. For example, infectious disease outbreaks, drought, and famine, may receive less consideration than earthquakes, tornadoes, or wars. Nevertheless, these prolonged phenomena should also be classified as disasters.

medicine should first address ED crowding before turning to other prolonged disasters.

The chronicity of gradually evolving disasters makes them insidious. As a disaster lingers, prolonged exposure to its negative effects can result in the normalization of limited responses. When communities and societal systems begin

Alcuni Autori...



The Chronicity of Emergency Department Crowding and Rethinking the Temporal Boundaries of Disaster Medicine



Bryan P. McNeilly, MD*; Benjamin J. Lawner, DO; Timothy P. Chizmar, MD

**Corresponding Author. E-mail: bryan.mcneilly@gmail.com.*

0196-0644/\$-see front matter

Copyright © 2022 by the American College of Emergency Physicians.

<https://doi.org/10.1016/j.annemergmed.2022.07.016>

A **podcast** for this article is available at www.annemergmed.com.

Some disasters happen so gradually that no one takes notice. For example, infectious disease outbreaks, drought, and famine, may receive less consideration than

medicine should first address ED crowding before turning to other prolonged disasters.

The chronicity of gradually evolving disasters makes them insidious. As a disaster lingers, prolonged exposure to

Em * **SIMEU**
società italiana media
d'entertainment

JOHN WAYNE
PUGNI, PUPE
E PEPITE



**Crowding
ospedaliero 4.0
riassa tra miti e
fatti**

Miti da sfatare sul sovraffollamento del Pronto Soccorso e sul fenomeno dell' Access Block

ACCESS BLOCK

Myths versus facts in emergency department
overcrowding and hospital access block

Drew B Richardson and David Mountain

Richardson Myths versus facts in emergency department overcrowding and hospital access block. April 2009 The Medical journal of Australia

Myths versus facts in Emergency Department Crowding and Hospital Access Block

- Gli accessi “impropri” o “da medico di base” causano il sovraffollamento
- Il sovraffollamento è in gran parte il risultato dei pazienti che devono essere ricoverati ma permangono in PS in attesa di letti di degenza adeguati

- Nagree Y, Ercleve TN, Sprivulis PC. After-hours general practice clinics are unlikely to reduce low acuity patient attendances to metropolitan Perth emergency departments. *Aust Health Rev* 2004; 28: 285-291.
- Richardson Myths versus facts in emergency department overcrowding and hospital access block. April 2009 The Medical journal of Australia
- Dent AW, Phillips GA, Chenhall AJ, McGregor LR. The heaviest repeat users of an inner city emergency department are not general practice patients. *Emerg Med (Fremantle)* 2003; 15: 322-329.
- Sprivulis P. Estimation of the general practice workload of a metropolitan teaching hospital emergency department. *Emerg Med (Fremantle)* 2003; 15: 32-37.
- Colineaux H, Pelissier F, Pourcel L, et al. *Emerg Med J* 2019;36:548–553

Original article

Why are people increasingly attending the emergency department? A study of the French healthcare system

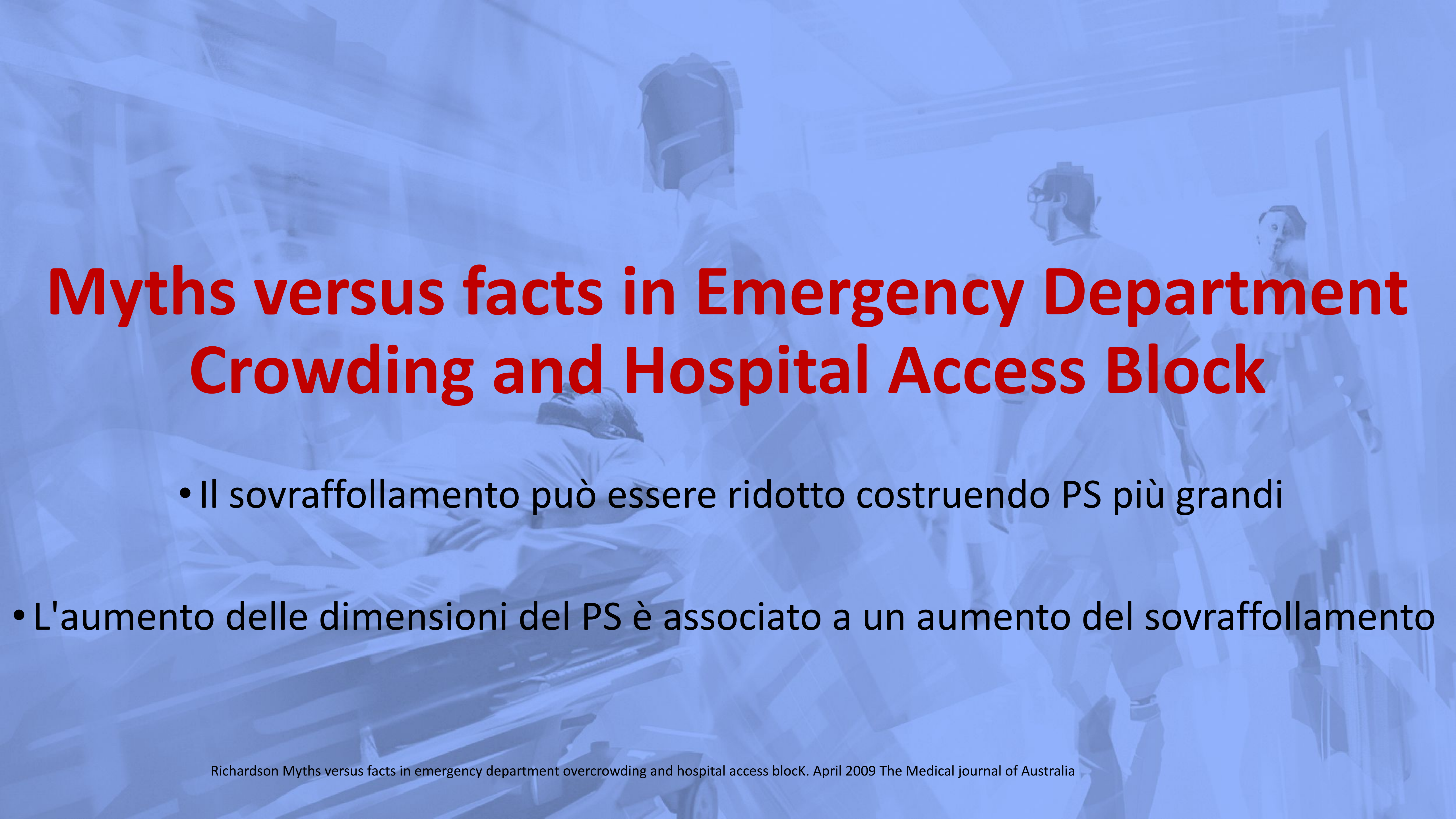
Helene Colineaux,^{1,2} Fanny Pelissier,³ Laure Pourcel,³ Thierry Lang,^{1,2}
Michelle Kelly-Irving,² Olivier Azema,³ Sandrine Charpentier,^{2,4} Sebastien Lamy²

Conclusion and implication

Since at least 2002, there has been an increase in visits to the ED, independently of population size increase or structural changes. It appears that the increase is not attributable to non-severe visits but rather to moderately severe visits.

Myths versus facts in Emergency Department Crowding and Hospital Access Block

- Il sovraffollamento è il risultato di un numero eccessivo di pazienti che arrivano e aspettano di essere visti da un medico
- Gli accessi dei pazienti al PS sono aumentate, ma il numero di pazienti in attesa di vedere un medico rimane inferiore al numero in attesa di un letto ospedaliero



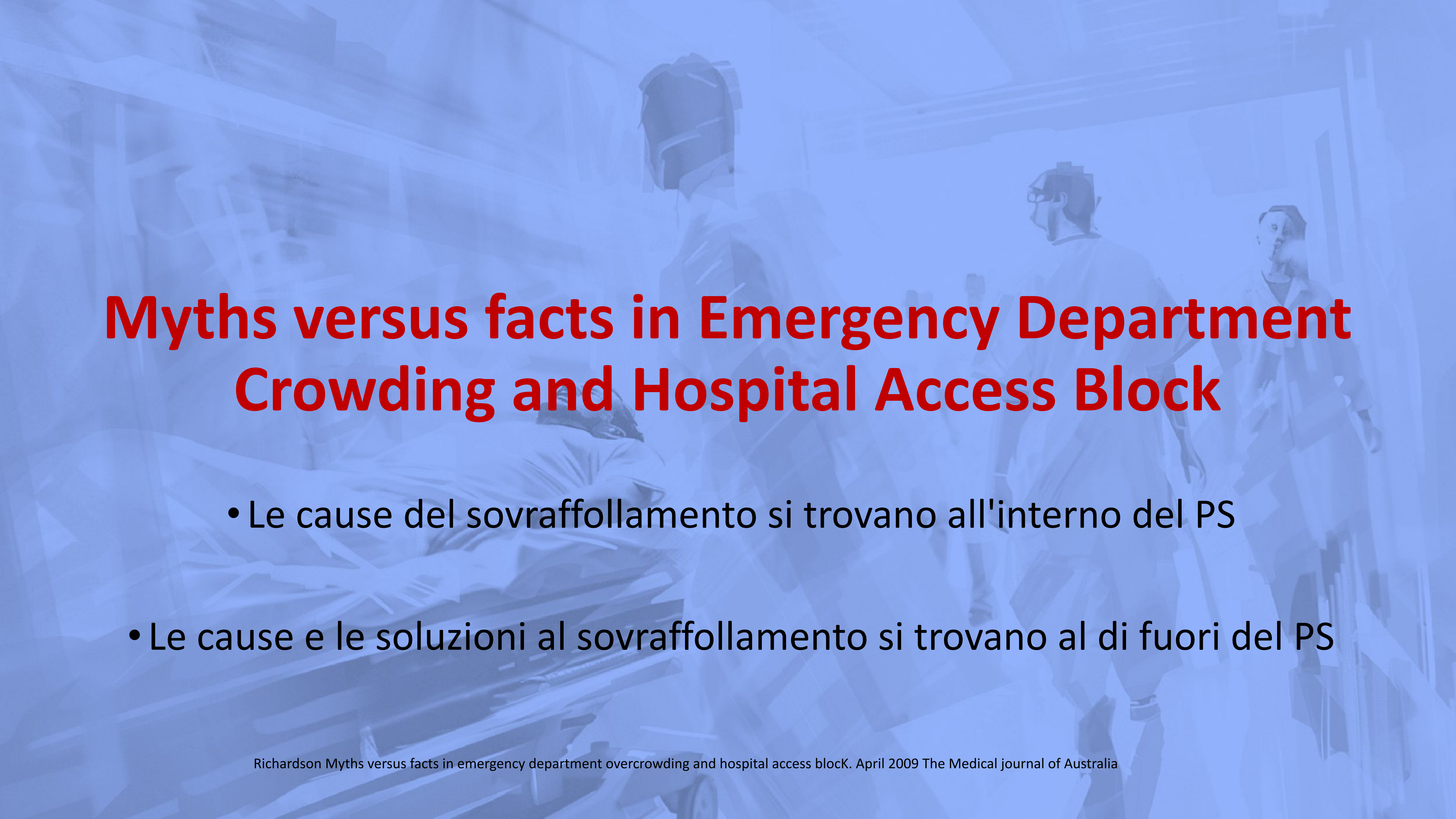
Myths versus facts in Emergency Department Crowding and Hospital Access Block

- Il sovraffollamento può essere ridotto costruendo PS più grandi
- L'aumento delle dimensioni del PS è associato a un aumento del sovraffollamento

Myths versus facts in Emergency Department Crowding and Hospital Access Block

- Il sovraffollamento non influenza gli esiti dei pazienti
- Il sovraffollamento ha gravi effetti negativi sui processi ospedalieri, sulla qualità delle cure e sugli esiti dei pazienti, inclusa la mortalità

- Pines JM, Iyer S, Disbot M, Hollander JE, Shofer FS, Datner EM (2008) The effect of emergency department crowding on patient satisfaction for admitted patients. Acad Emerg Med 15(9):825–831
- Richardson Myths versus facts in emergency department overcrowding and hospital access block. April 2009 The Medical journal of Australia
- Richardson DB (2002) The access-block effect: relationship between delay to reaching an inpatient bed and inpatient length of stay. Med J Aust 177(9):492–495
- Krochmal P, Riley TA (1994) Increased health care costs associated with ED overcrowding. Am J Emerg Med 12(3):265–266
- Liu SW, Thomas SH, Gordon JA, Hamedani AG, Weissman JS (2009) A pilot study examining undesirable events among emergency department-boarded patients awaiting inpatient beds. Ann Emerg Med 54(3):381–385. doi:10.1016/j.annemergmed. 2009.02.001
- Richardson DB (2006) Increase in patient mortality at 10 days associated with emergency department overcrowding. Med J Aust 184(5):213–216
- Sprivulis PC, Da Silva JA, Jacobs IG, Frazer AR, Jelinek GA (2006) The association between hospital overcrowding and mortality among patients admitted via Western Australian emergency departments. Med J Aust 184(5):208–212
- Cardosos LT, Grion CM, Matsuo T, Anami EH, Kauss IA, Seko L, Bonametti AM (2011) Impact of delayed admission to intensive care units on mortality of critically ill patients: a cohort study. Crit Care 15(1):R28. doi:10.1186/cc9975
- Bernstein SL, Aronsky D, Duseja R, Epstein S, Handel D, Hwang U, McCarthy M, John McConnell K, Pines JM, Rathlev N, Schafermeyer R, Zwemer F, Schull M, Asplin BR, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force (2009) The effect of emergency department crowding on clinically oriented outcomes. Acad Emerg Med 16:1–10. doi:10.1111/j.1553-2712.2008.00295.x
- Plunkett PK, Byrne DG, Breslin T, Bennett K, Silke B (2011) Increasing wait times predict increasing mortality for emergency medical admissions. Eur J Emerg Med 18:192–196. doi:10.1097/MEJ.0b013e328344917e
- Guttman A, Schull MJ, Vermeulen MJ, Stukel TA (2011) Association between waiting times and short-term mortality and hospital admission after departure from emergency department: population based cohort study from Ontario, Canada. BMJ 342:d2983. doi:10.1136/bmj.d2983
- Zoubir Boudi, Dominique Lauque, Mohamed Alsabri, Linda Ostlundh, Churchill Oneyji, Anna Khalemsky, Carlos Lojo Rial, Shan W. Liu, Carlos A. Camargo, Jr., Elhadi Aburawi, Martin Moeckel, Anna Slagman, Michael Christ, Adam Singer, Karim Tazarourte, Niels K. Rathlev, Shama A. Grossman, Abdelouahab Bellou; Association between boarding in the emergency department and in-hospital mortality: A systematic review; PLOS ONE | <https://doi.org/10.1371/journal.pone.0231253> April 15, 2020



Myths versus facts in Emergency Department Crowding and Hospital Access Block

- Le cause del sovraffollamento si trovano all'interno del PS
- Le cause e le soluzioni al sovraffollamento si trovano al di fuori del PS

MISURANDO GLI INTERVENTI INTRAPRESI

American Journal of Emergency Medicine 70 (2023) 127–132



Contents lists available at ScienceDirect

American Journal of Emergency Medicine

journal homepage: www.elsevier.com/locate/ajem



Adoption of emergency department crowding interventions among US hospitals between 2007 and 2020



Leila Azari, BA, MA^a, Kea Turner, PhD, MPH, MA^{b,c},
Young-Rock Hong, PhD, MPH^{d,e}, Amir Alishahi Tabriz, MD, PhD, MPH^{b,c,*}

^a University of South Florida Morsani College of Medicine, Tampa, FL, USA

^b Department of Health Outcomes and Behavior, Moffitt Cancer Center, Tampa, FL, USA

^c Department of Oncological Sciences, University of South Florida Morsani College of Medicine, Tampa, FL, USA

^d Department of Health Services Research, Management and Policy, College of Public Health and Health Professions University of Florida, Gainesville, FL, USA

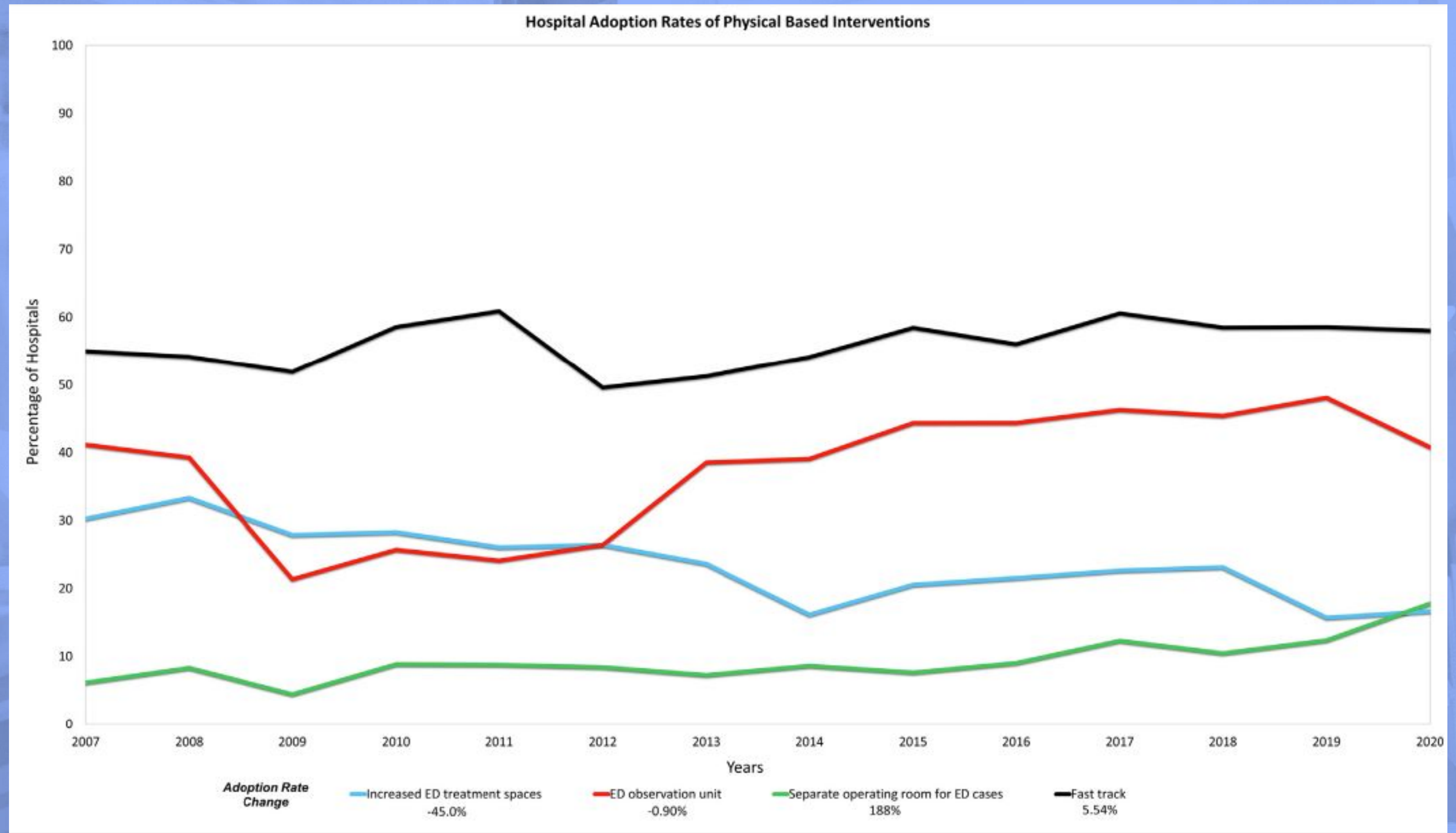
^e UF Health Cancer Center, Gainesville, FL, USA

MISURANDO GLI INTERVENTI INTRAPRESI

Table 1
The average adoption rate of ED crowding interventions, 2007–2020.

Name	Description	Average adoption rate across all hospitals (min-max)	Trend
Physical-based Interventions			
Increased ED treatment spaces	ED's physical space has been expanded in the past two years	24.7% (15.7%–30.3%)	Downward
ED Observation Unit	Observation units or clinical decision units (CDUs) are designated areas within a hospital, often near or adjacent to the ED, that provide an alternative to discharge or hospital inpatient admission for the emergency department patient who may benefit from an extended observation period	36.1% (21.4%–48.1%)	Static
Separate operating room for ED cases	Dedicating an operating room with adequate surgical staffing to ED cases.	8.8% (4.5%–17.8%)	Upward
Fast track	Having a separate area for patients with minor illness or injury	55.7% (49.6%–60.9%)	Upward

MISURANDO GLI INTERVENTI INTRAPRESI



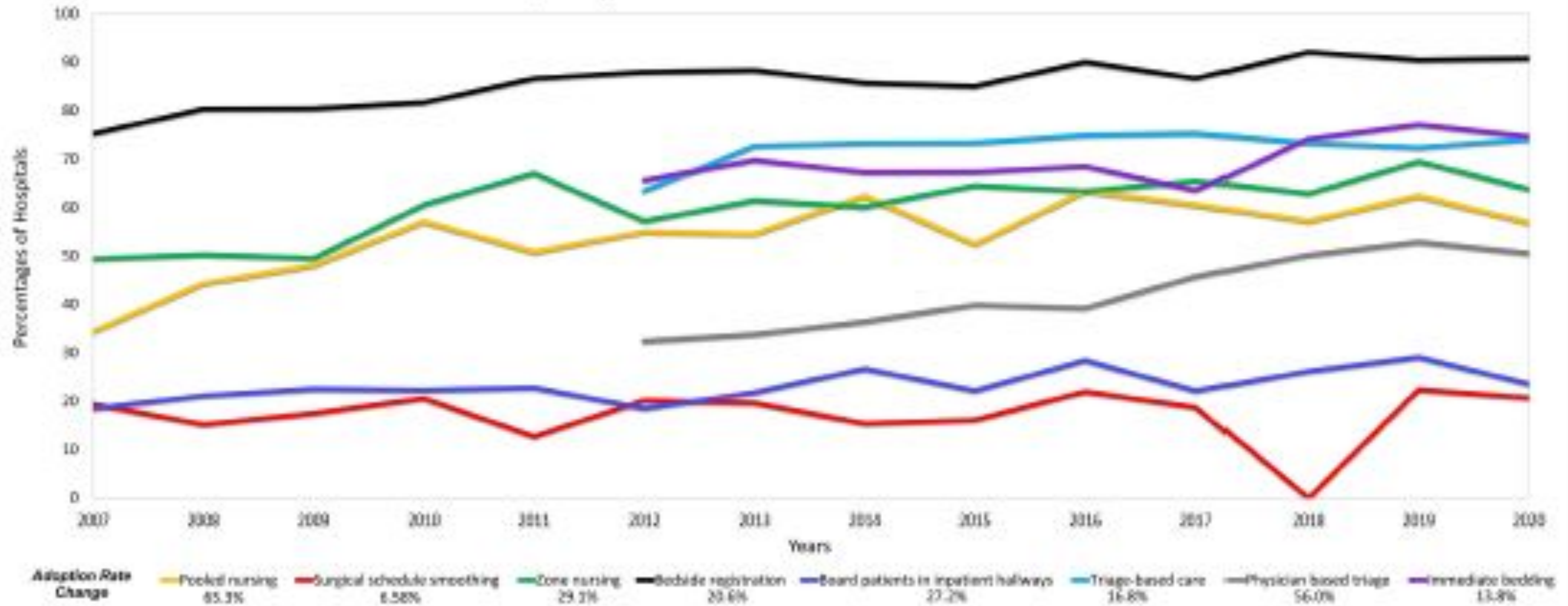
MISURANDO GLI INTERVENTI INTRAPRESI

Flow Modification Interventions

Pooled nursing	Use ancillary nursing staff depending on patient volume and staffing need	53.3% (34.4%–63.4%)	Upward
Surgical schedule smoothing	Planning surgical schedules to match availability of inpatient beds, including scheduling elective surgeries six or seven days a week	18.3% (64.4%–80.1%)	Static
Zone nursing	Put all of a nurse's patients in a particular area of the ED	59.4% (49.4%–69.5%)	Upward
Bedside registration	Use a system to register patients while they are in triage or in the treatment room	85.1% (80.4%–92.1%)	Upward
Board patients in inpatient hallways	A policy to move admitted patients from the ED hallways to inpatient hallways (usually part of Full Capacity Protocol)	21.6% (18.5%–29.0%)	Upward
Triage-based care	Using advanced triage protocols	72.0% (63.5%–75.4%)	Static
Physician based triage	Using physician/practitioner at triage	41.1% (32.4%–52.9%)	Upward
Immediate bedding	Patient is seen by a triage nurse (instead of clerk) in waiting room and immediately placed into a ready room where triage, registration and assessment happen at the bedside	69.4% (63.5%–77.1%)	Static

MISURANDO GLI INTERVENTI INTRAPRESI

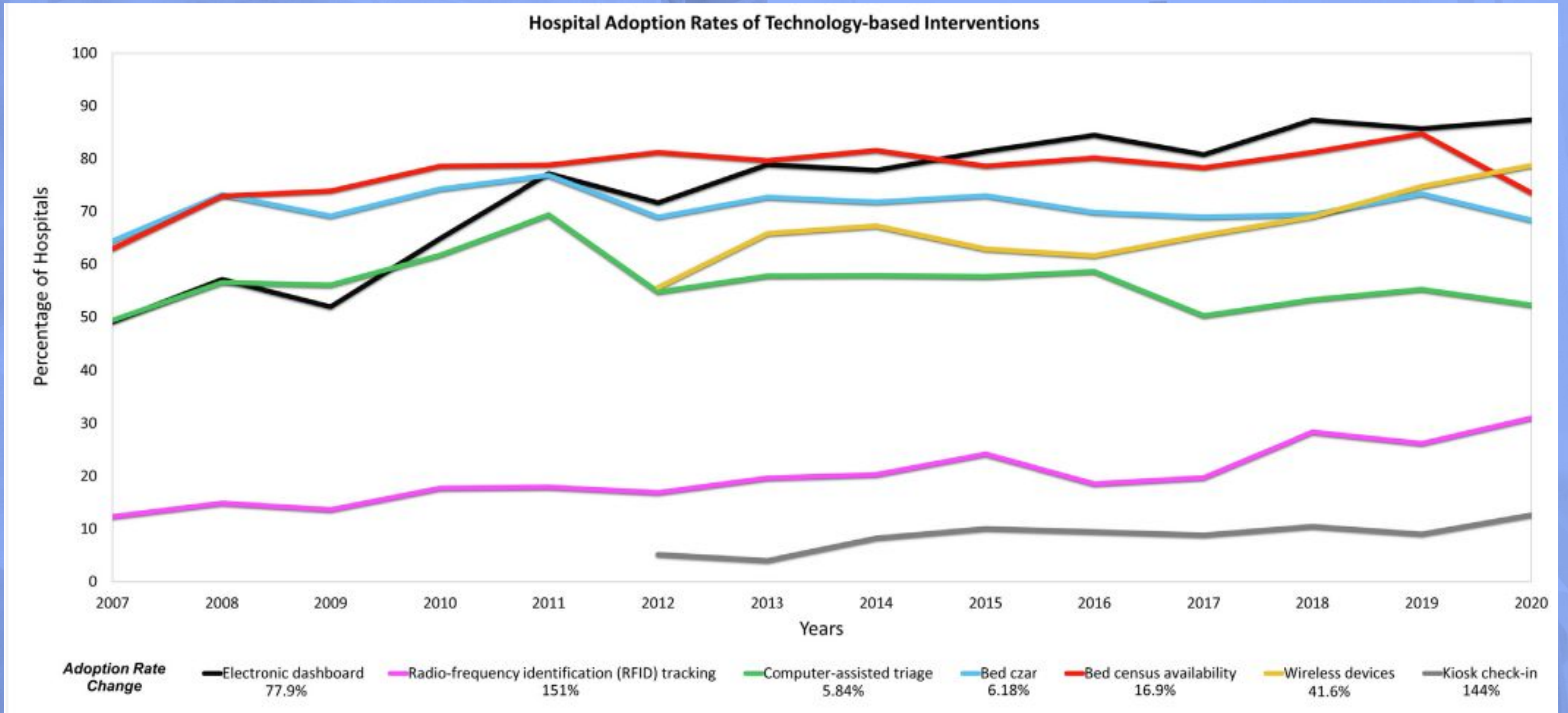
Hospital Adoption Rates of Flow Modification Based Interventions



MISURANDO GLI INTERVENTI INTRAPRESI

Technology-based interventions				
Electronic dashboard	Use of a centralized electronic tracking system to monitor patients in the ED	71.7% (49.1%–87.4%)		Upward
Radio-frequency identification (RFID) tracking	Tagging patients with RFID allows their location to be tracked in the ED to improve patient safety and throughput	19.2% (12.4%–31.0%)		Upward
Computer-assisted triage	Use of electronic algorithms to improve the reliability of triage decisions	56.8% (49.4%–69.4%)		Static
Bed czar	Have someone responsible and empowered for to match bed availability with patient need and timely transfer of ED patients to inpatient beds (i.e., centralizing bed control with authority). Some hospitals refer to this person as a Hospital Patient Flow Coordinator	71.1% (64.4%–76.9%)		Static
Bed census availability	Use a system that makes the ED staff aware of the hospital capacity and number and type of available beds for admitted patients	77.2% (62.9%–84.8%)		Upward
Wireless Devices	Using wireless communication devices by providers	65.7% (55.6%–78.7%)		Upward
Kiosk check-in	Patients could check into ED without the help of medical administrators, using kiosk self-check-in	8.3% (4.0%–12.6%)		Upward

MISURANDO GLI INTERVENTI INTRAPRESI





Presto saremo chiamati a scegliere
tra ciò che è giusto e ciò che è facile

A digital illustration of a movie theater. In the foreground, rows of empty red seats are visible. The theater floor is a dark red. At the back of the theater, a stage is framed by heavy red curtains. On the stage, a large blue target with concentric circles is centered. The words "The End" are written in a white, serif font across the center of the target.

The
End

GRAZIE DELL'ATTENZIONE!!

gabrielesavioli@gmail.com





Pandemia COVID-19



Crowding ospedaliero 2.0

La pandemia

UC Irvine

**Western Journal of Emergency Medicine: Integrating Emergency
Care with Population Health**

ORIGINAL RESEARCH

**Impact of Coronavirus Disease 2019 Pandemic on Crowding: A
Call to Action for Effective Solutions to “Access Block”**

Gabriele Savioli MD, PhD^{*#}
Iride Francesca Ceresa^{*}
MD, Roberta Guarnone, MD^{*}
Alba Muzzi, MD[†]
Viola Novelli, MD[†]
Giovanni Ricevuti, PhD^{‡§}
Giorgio Antonio Iotti, PhD[¶]
Maria Antonietta Bressan, MD^{*}
Enrico Oddone, MD^{||}

^{*}Fondazione IRCCS Policlinico San Matteo, Department of Emergency Medicine,
Pavia, Italy

[†]Fondazione IRCCS Policlinico San Matteo, Medical Direction, Pavia, Italy

[‡]University of Pavia, Department of Drug Science, Pavia, Italy

[§]Saint Camillus International University of Health Sciences, Department of Drug
Science, Rome, Italy

[¶]Fondazione IRCCS Policlinico San Matteo, Intensive Care Unit, Pavia, Italy
University of Pavia, Department of Public Health, Experimental and Forensic Medicine,

^{||}Pavia, Italy

[#]University of Pavia. Department of Clinical-Surgical, Diagnostic and Pediatric Sciences.

Internal and Emergency Medicine

<https://doi.org/10.1007/s11739-021-02732-w>

EM - ORIGINAL



How the coronavirus disease 2019 pandemic changed the patterns of healthcare utilization by geriatric patients and the crowding: a call to action for effective solutions to the access block

Gabriele Savioli^{1,2}  · Iride Francesca Ceresa¹ · Viola Novelli³ · Giovanni Ricevuti⁴ · Maria Antonietta Bressan¹ · Enrico Oddone⁵

Received: 26 November 2020 / Accepted: 30 March 2021

© The Author(s) 2021

Table 4. Selected time variables accounting for crowding, by period.

	Period*	Observations	Mean	Standard error	Sum	P ^a
Wait time (min)						
	Control period	51,405	83	0.36	-	<0.001
	Pandemic	6,729	66	0.98	-	
LOS (min)						
	Control period	51,405	314	1.84	-	<0.001
	Pandemic	6,729	625	11.36	-	
Process time (min)						
	Control period	51,405	231	1.81	-	<0.001
	Pandemic	6,729	560	11.30	-	

*The considered pandemic period was February 21–May 1, 2020. The control period was the sum of the timespans January 1–May 1, 2018; January 1–May 1, 2019; and January 1–February 20, 2020.

^at-test.

^bMean calculated only for hospitalized patients.

^cAccess block total time and boarding total time calculated only for hospitalized patients; by definition, it is not an average but the sum of each patient's access block times. Access block total time and boarding total time were calculated from February 21–May 1, 2020 for the pandemic period and as the mean of the periods February 21–May 1, 2019, and February 21–May 1, 2018 for the control period.

Min, minute; LOS, length of stay.

Table 5. Risk of overtime for selected time variables accounting for crowding, by period.

	Period*	OR ^a	95% Confidence interval	P
LOS	Control period	1.00 (Ref.)	-	
	Pandemic	2.58	2.40-2.78	<0.001
Boarding	Control period	1.00 (Ref.)	-	
	Pandemic	2.67	2.46-2.89	<0.001
Access block	Control period	1.00 (Ref.)	-	
	Pandemic	2.52	2.33-2.72	<0.001

*The considered pandemic period was February 21–May 1, 2020. The control period was the sum of the timespans January 1–May 1, 2018; January 1–May 1, 2019; and January 1–February 20, 2020.

^aORs estimated by multiple regression analysis adjusted by age, gender, priority code at triage, presence of fever or respiratory symptoms, and need for moderate to high-intensity care.

LOS, length of stay; OR, odds ratio.

Table 4. Selected time variables accounting for crowding, by period.

	Period*	Observations	Mean	Standard error	Sum	P ^a
Access block time per patient ^b (min)						
	Control period	3,183	718	11.81	-	
	Pandemic	1,260	1223	40.29	-	<0.001
Access block total time aggregate ^c (hours)						
	Control period	3,183	-	-	5,420 ^c	
	Pandemic	1,260	-	-	22,653 ^c	-
Boarding time per patient ^b (min)						
	Control period	3,183	640	13.42	-	
	Pandemic	1,260	1150	45.35	-	<0.001
Boarding total time aggregate ^c (hours)						
	Control period	3,183	-	-	6,970 ^c	
	Pandemic	1,260	-	-	25,954 ^c	

Table 3. Selected reasons for access to emergency department for patients included in the study, by period of observation.

	Period*		P ^a	Total
	Control	Pandemic		
Minor medical issues				
No (%)	44,629 (86.8)	6,057 (90.0)		50,686 (87.2)
Yes (%)	6,780 (13.2)	672 (10)	<0.001	7,452 (12.8)
Minor trauma				
No (%)	39,692 (77.2)	5,954 (88.5)		45,646 (78.5)
Yes (%)	11,717 (22.8)	775 (11.5)	<0.001	12,492 (21.5)
Major trauma				
No (%)	51,182 (99.6)	6,725 (99.9)		57,907 (99.6)
Yes (%)	227 (0.4)	4 (0.1)	<0.001	231 (0.4)
Occupational accident				
No (%)	49,710 (96.7)	6,569 (97.6)		56,279 (96.8)
Yes (%)	1,699 (3.3)	160 (2.4)	<0.001	1,859 (3.2)

Table 3. Selected reasons for access to emergency department for patients included in the study, by period of observation.

	Period*		P ^a	Total
	Control	Pandemic		
Disease with fever				
No (%)	49,790 (96.8)	5,572 (82.8)		55,362 (95.2)
Yes (%)	1,619 (3.1)	1,157 (17.2)	<0.001	2,776 (4.8)
Respiratory symptoms				
No (%)	48,085 (93.5)	5,836 (86.8)		53,921 (92.8)
Yes (%)	3,324 (6.5)	893 (13.3)	<0.001	4,217 (7.3)
Thoracic pain				
No (%)	47,227 (91.9)	6,136 (91.2)		53,363 (91.8)
Yes (%)	4,182 (8.1)	593 (8.8)	0.057	4,775 (8.2)
Neurologic disease				
No (%)	48,364 (94.1)	6,222 (92.5)		54,586 (93.9)
Yes (%)	3,045 (5.9)	507 (7.5)	<0.001	3,552 (6.1)

Impatto della pandemia sul sovraffollamento

Internal and Emergency Medicine

<https://doi.org/10.1007/s11739-021-02732-w>

EM - ORIGINAL

How the coronavirus disease 2019 pandemic changed the patterns of healthcare utilization by geriatric patients and the crowding: a call to action for effective solutions to the access block

Gabriele Savioli^{1,2}  · Iride Francesca Ceresa¹ · Viola Novelli³ · Giovanni Ricevuti⁴ · Maria Antonietta Bressan¹ ·



ORGANIZZAZIONE DEI
PRONTO SOCCORSO E DEI
PERCORSI PAZIENTE NELLA
FASE 2 DELLA PANDEMIA
COVID-19

Impatto della pandemia sul sovraffollamento

- La attività di Pronto Soccorso ordinaria prosegue
- Riduzione dell'influenza dei fattori di affollamento in ingresso
- Aumento dei fattori di affollamento all'interno
- Aumento dei fattori di affollamento in uscita



How the coronavirus disease 2019 pandemic changed the patterns of healthcare utilization by geriatric patients and the crowding: a call to action for effective solutions to the access block

Gabriele Savioli^{1,2} · Iride Francesca Ceresa¹ · Viola Novelli³ · Giovanni Ricevuti⁴ · Maria Antonietta Bressan¹ ·

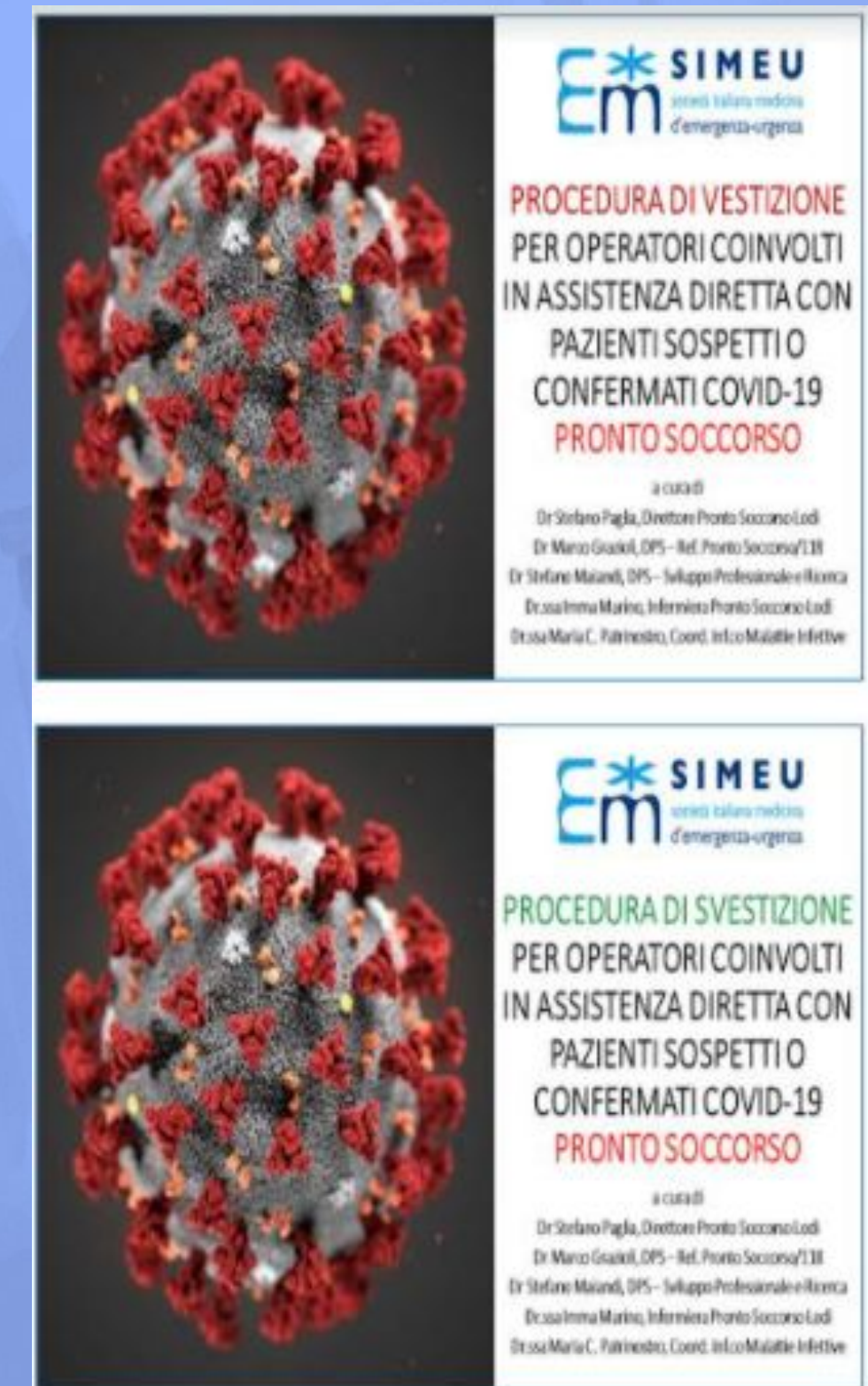
Impact of Coronavirus Disease 2019 Pandemic on Crowding: A Call to Action for Effective Solutions to “Access Block”

Gabriele Savioli MD, PhD**
Iride Francesca Ceresa*

*Fondazione IRCCS Policlinico San Matteo, Department of Emergency Medicine, Pavia, Italy

Fattori di affollamento all'interno dovuti alla pandemia

- vestizione e svestizione
- disinfezione delle sale e degli ambienti
- l'esito del tampone
- comunicazione telefonica con i familiari
- agevolare il dialogo dei pazienti ricoverati con i loro parenti



How the coronavirus disease 2019 pandemic changed the patterns of healthcare utilization by geriatric patients and the crowding: a call to action for effective solutions to the access block

Gabriele Savioli^{1,2}  · Iride Francesca Ceresa¹ · Viola Novelli³ · Giovanni Ricevuti⁴ · Maria Antonietta Bressan¹ ·

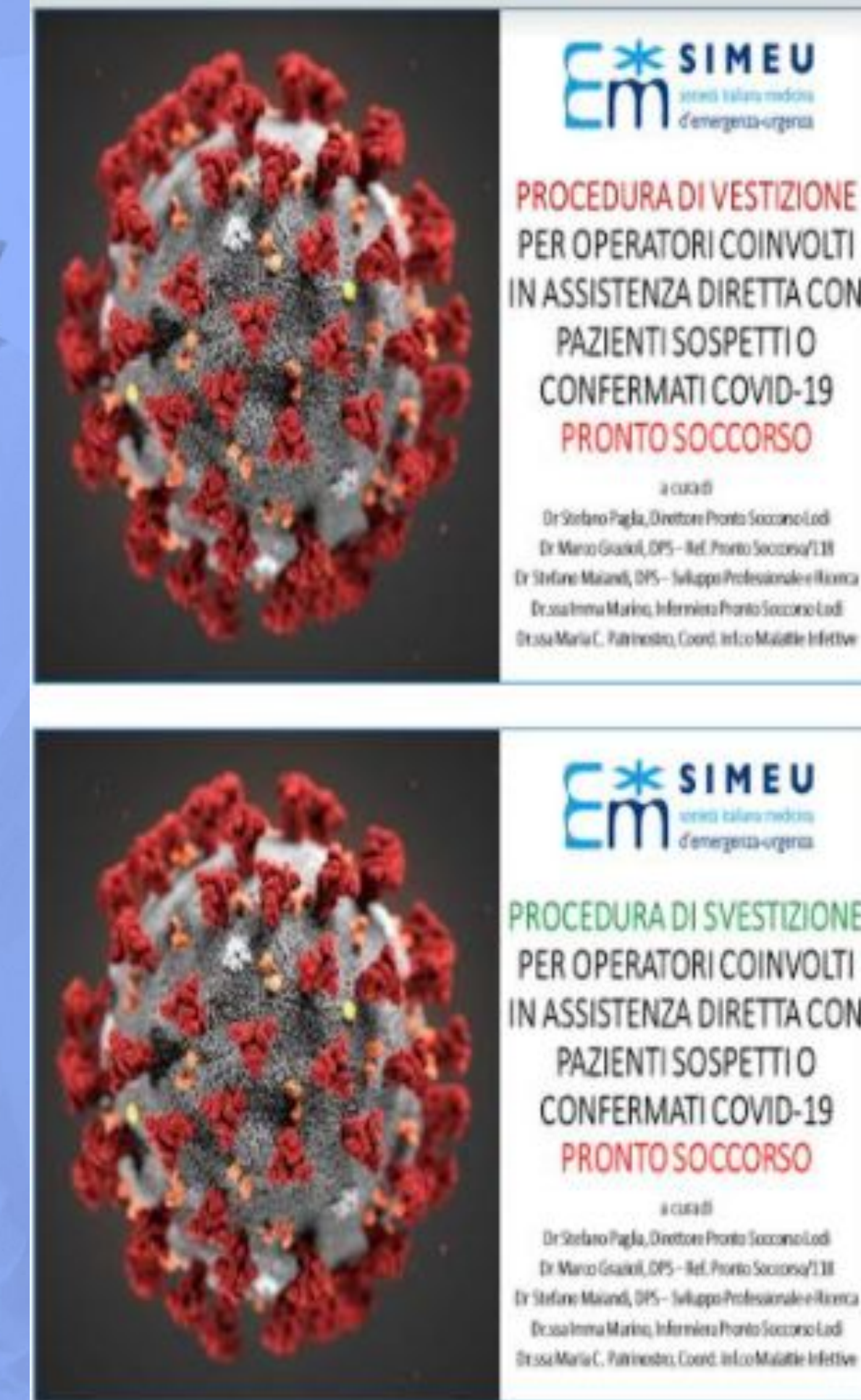
Impact of Coronavirus Disease 2019 Pandemic on Crowding: A Call to Action for Effective Solutions to “Access Block”

Gabriele Savioli MD, PhD**
Iride Francesca Ceresa*

*Fondazione IRCCS Policlinico San Matteo, Department of Emergency Medicine,
Pavia, Italy

Fattori di affollamento all'interno dovuti alla pandemia

- i tempi di esecuzione della terapia
- i flussi che abbiamo visto separati ab inizio implicano lo sdoppiamento, o ancor meglio, il raddoppio del lavoro per la stessa Equipe medico infermieristica e di personale del sistema dell'urgenza.
- Occorre seguire pazienti su più flussi, flussi che non si possono incrociare.



How the coronavirus disease 2019 pandemic changed the patterns of healthcare utilization by geriatric patients and the crowding: a call to action for effective solutions to the access block

Gabriele Savioli^{1,2} · Iride Francesca Ceresa¹ · Viola Novelli³ · Giovanni Ricevuti⁴ · Maria Antonietta Bressan¹ ·

Impact of Coronavirus Disease 2019 Pandemic on Crowding: A Call to Action for Effective Solutions to “Access Block”

Gabriele Savioli MD, PhD**
Iride Francesca Ceresa*

*Fondazione IRCCS Policlinico San Matteo, Department of Emergency Medicine,
Pavia, Italy

Fattori di affollamento in uscita dovuti alla pandemia

- Fenomeno del Boarding per ricovero per attesa tampone pre-ricovero dal PS ai reparti.
- Exit block per attesa tampone pre-dimissione dei pazienti dall'ospedale.



How the coronavirus disease 2019 pandemic changed the patterns of healthcare utilization by geriatric patients and the crowding: a call to action for effective solutions to the access block

Gabriele Savioli^{1,2}  · Iride Francesca Ceresa¹ · Viola Novelli³ · Giovanni Ricevuti⁴ · Maria Antonietta Bressan¹ ·

Impact of Coronavirus Disease 2019 Pandemic on Crowding: A Call to Action for Effective Solutions to “Access Block”

Gabriele Savioli MD, PhD*
Iride Francesca Ceresa*

*Fondazione IRCCS Policlinico San Matteo, Department of Emergency Medicine, Pavia, Italy

Crowding Indices

Causes of Crowding

Crowding of EDs has been reported for several decades. Our study found that input factors played a modest/ambivalent role in crowding in this pandemic. ED crowding had two main causes: the worsening of output and throughput factors. With regard to output factors, crowding was caused by the access block phenomenon and in particular by an

important for both ensuring appropriate emergency surge capacity and providing evidence to redesign emergency services to decrease healthcare-related infections after disease outbreak.

Various Causes of ED Visits

During the pandemic there was a net reduction in some reasons for ED visits such as minor trauma or minor medical issues, confirming the reduction of low-acuity visits. Although the percentage of patients who had febrile symptoms at home was much higher during the pandemic, the proportion of patients who had fever at triage was not increased. This is also likely attributable to the fact that body temperature has been measured in a greater number of patients during the pandemic (53.2% vs 12.7% before the pandemic).

Crowding Indices

Causes of Crowding

Crowding of EDs has been reported for several decades. Our study found that input factors played a modest/ambivalent role in crowding in this pandemic. ED crowding had two main causes: the worsening of output and throughput factors. With regard to output factors, crowding was caused by the access block phenomenon and in particular by an unprecedented need for care in medium- and high-intensity care units.¹ In a study conducted prior to this pandemic, through tabletop simulations of a potential maxi-emergency, our research group had anticipated that such a scenario was possible. In particular, we had shown how wards with high- and medium-intensity care could most easily determine boarding time and access block.¹⁷

However, it is important to emphasize that all patients, even those in need of low-intensity care, have struggled against access block. Therefore, the lack of beds seems to be the main cause of access block. Our opinion is that EDs are crowded when hospitals are crowded. The waiting time for

Impact of COVID-19 Pandemic on Crowding

Savioli et al.

low-acuity conditions most strongly decrease when the risk of infection overwhelms the benefits of emergency service use. The rate of visits for serious conditions did not decline in the same manner. Even the inputs for high-acuity diseases, albeit stable in percentage terms, were reduced, although to a smaller degree. This is the case, for example, with presentations for chest pain and neurological disorders. This has been highlighted by some studies which reported an increase in late diagnoses.⁴⁷⁻⁵⁰ When fears of an epidemic spread and ED visits decrease, preparations for serious conditions must be focused, and patients with severe diseases should not face barriers to emergency care. This situation also underlines the need to consider “clean” or low-risk infectious pathways for the most serious reasons for ED visits.

However, it is important to emphasize that all patients, even those in need of low-intensity care, have struggled against access block. Therefore, the lack of beds seems to be the main cause of access block. Our opinion is that EDs are crowded when hospitals are crowded. The waiting time for hospitalization was also prolonged because it was necessary to screen all patients before assigning them to a “clean” vs COVID-unit bed to ensure that infected (and perhaps asymptomatic) patients were not admitted to “clean” wards or wards in which the risk of infection had to remain low.

With regard to throughput factors, crowding has resulted from changes in the role of emergency physicians and EDs. Emergency departments are no longer merely where patients are sorted into specialist departments; patients are now treated and stabilized, and differential diagnostic tests

With regard to throughput factors

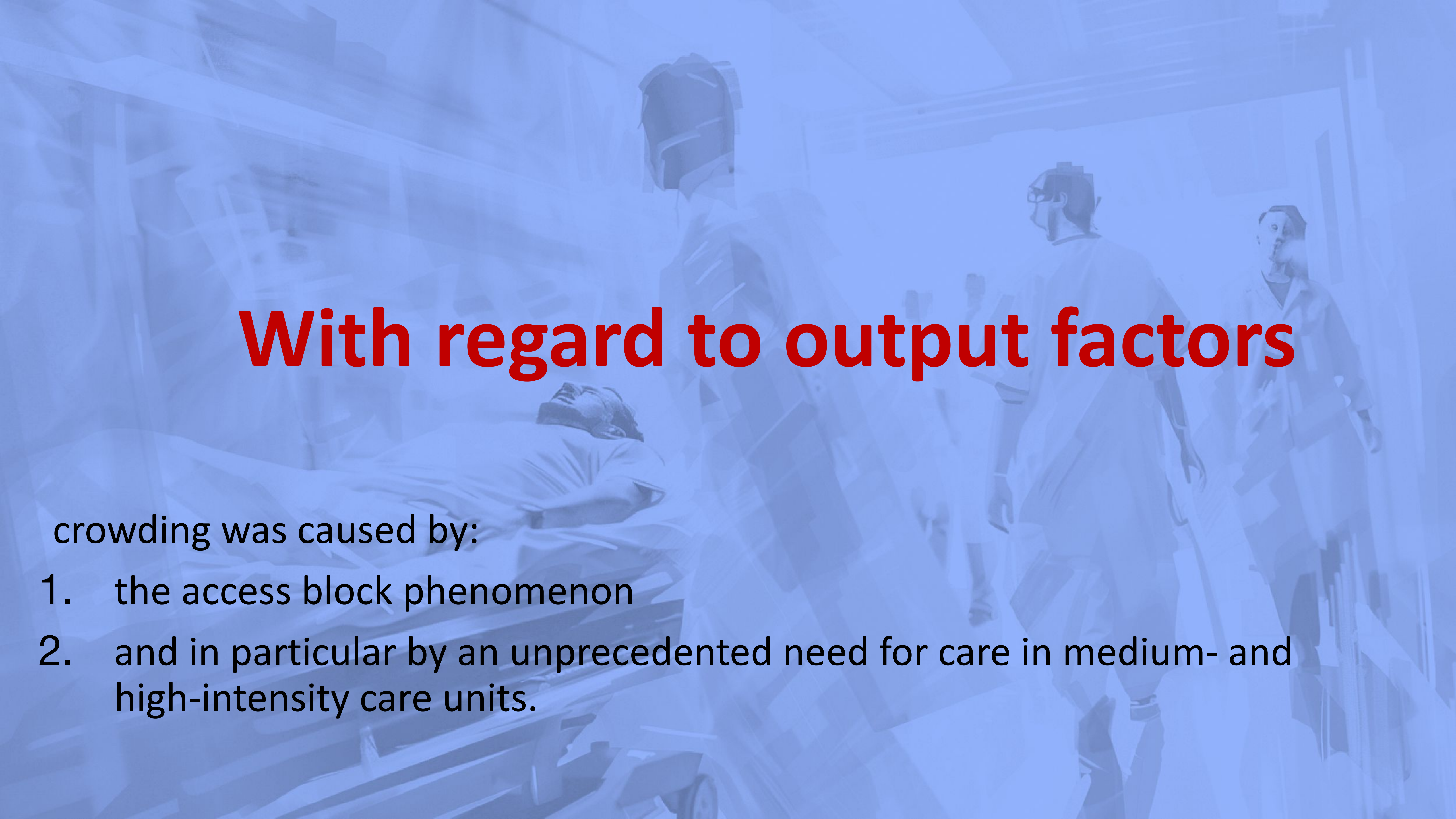
an epidemic spread and ED visits decrease, preparations for serious conditions must be focused, and patients with severe diseases should not face barriers to emergency care. This situation also underlines the need to consider “clean” or low-risk infectious pathways for the most serious reasons for ED visits.

wards in which the risk of infection had to remain low.

With regard to throughput factors, crowding has resulted from changes in the role of emergency physicians and EDs. Emergency departments are no longer merely where patients are sorted into specialist departments; patients are now treated and stabilized, and differential diagnostic tests

are performed in the ED. This change in the level of care has been exacerbated in the pandemic because of the high number of critically ill patients who require stabilization before transfer to the hospital wards, and the change in patient management caused by the pandemic. In particular, the need for frequent checks, ventilatory therapies, nasal

To improve the practice of boarding patients, the American College of Emergency Physicians (ACEP) established a task force to develop a list of low-cost, high-impact solutions.⁴²⁻⁴³ One of the key solutions proposed by ACEP is the use of a full-capacity protocol.⁴¹ Although this was an effective response, the need for effective solutions for



With regard to output factors

crowding was caused by:

1. the access block phenomenon
2. and in particular by an unprecedented need for care in medium- and high-intensity care units.

Crowding ospedaliero 3.0 **cose attese e cose inattese**

**Il fatto che tale fabbisogno
fosse senza precedenti
significa che non potevamo
aspettarcelo?**



Coronavirus disease 2019 (COVID-19)

PubMed.gov savioli g
Advanced

Search results Save Email

► Open Access Emerg Med. 2020 Nov 16;12:377-387. doi: 10.2147/OAEM.S267069. eCollection 2020.

Preparing for the Maximum Emergency with a Simulation: A Table-Top Test to Evaluate Bed Surge Capacity and Staff Compliance with Training

Iride Francesca Ceresa¹, Gabriele Savioli^{1 2}, Valentina Angeli³, Viola Novelli⁴, Alba Muzzi⁴, Giuseppina Grugnetti⁵, Lorenzo Cobianchi⁶, Federica Manzoni⁷, Catherine Klersy⁷, Paolo Lago⁸, Pierantonio Marchese⁹, Carlo Marena⁴, Giovanni Ricevuti¹⁰, Maria Antonietta Bressan¹¹

Affiliations + expand
PMID: 33235525 PMCID: PMC7678714 DOI: 10.2147/OAEM.S267069
[Free PMC article](#)

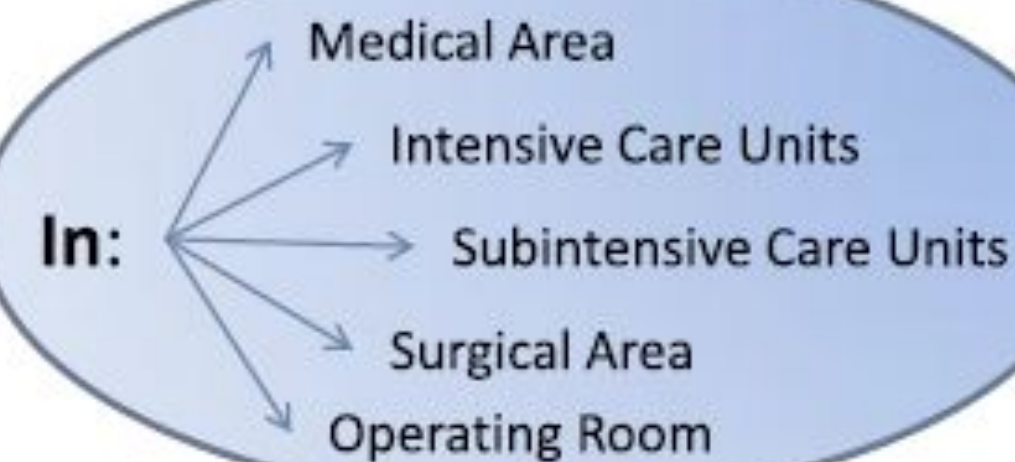
Coronavirus disease 2019 (COVID-19)

Ceresa et al

Dovepress

Bed surge capacity. Infographic sketching

Evaluation of the proportion of dismissible patients



Hospital setting

- ✓ public hospital
- ✓ City of Pavia (Italy)
- ✓ over 1000 accredited beds
- ✓ catchment area of 700 thousand inhabitants.
- ✓ 37,000 hospitalizations all
- ✓ over 245,000 days of hospitalization;
- ✓ 4,700,000 performances outpatient;
- ✓ 100,000 Emergency Department visits
- ✓ 650,000 emergency-urgency services;
- ✓ over 30,000 surgical interventions
- ✓ average of 2,000 births per year;
- ✓ over 230 transplants every year.

Table top simulation

through :

- ☐ 2 Phases
- ☐ four scenarios (3 with regard to Phase 1 and 1 for Phase 2)
- ☐ at 2 (T2) and 24 (T24) hours after a simulated maximum emergency

Performed by:

1 Phase

105 subjects :

68 doctors on guard

36 nurses

2 Phase

18 subjects :

18 Nursing Coordinator

when: On weekdays and holidays

Coronavirus disease 2019 (COVID-19)

classification of patients to find dismissible ones

A	patient's need for a high-intensity care
B	patient's need for a intensity care equal to that provided at the time of detection one
C	Patients who are able to transfer to either a bed with a below-current level of care/intensity
D	Patients who are able to transfer in a hypothetical discharge-room
E	Patients who are able to transfer in a hospital with a lower intensity of care/rehabilitation structure
F	Patients who are able to safe home discharge

patients evaluated

Phase 1: 3 simulation waves (I, II, III) performed at T2 and T24.

2.326 assessments were carried out on an average of 388 hospitalized patients

I T2: 369, I T24: 399; II T2: 399, II T24: 387; III T2: 413, III T24: 385

Phase 2: 1 simulation waves (I) performed at T2 and T24

699 Assessments

285 T2 and 414 T24 patients

Conclusions

- The availability of beds in the simulations is greater than the theoretical bed surge capacity
- Intensive and Sub-Intensive Areas limit the Hospital Bed Surge Capacity
- Age is a parameter that influences the Bed Surge Capacity
- The availability of DEA ORs are not a problem during an ME
- The analysis of response times allowed to see how the compliance increased with the recurrence of the surveys.

Figure I Infographic sketching.