Another Look at the Persistent Moral Problem of Emergency Department Crowding

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This article revisits the persistent problem of crowding in US hospital emergency departments (EDs). It begins with a brief review of origins of this problem, terms used to refer to ED crowding, proposed definitions and measures of crowding, and causal factors. The article then summarizes recent studies that document adverse moral consequences of ED crowding, including poorer patient outcomes; increased medical errors; compromises in patient physical privacy, confidentiality, and communication; and provider moral distress. It describes several organizational strategies implemented to relieve crowding and implications of ED crowding for individual practitioners. The article concludes that ED crowding remains a morally significant problem and calls on emergency physicians, ED and hospital leaders, emergency medicine professional associations, and policymakers to collaborate on solutions. [Ann Emerg Med. 2019;74:357-364.]

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INTRODUCTION

The long-standing problem of endemic crowding in US hospital emergency departments (EDs) and strategies to relieve or prevent ED crowding have been subjects of intense discussion in the medical literature for almost 3 decades, with more than 750 articles referenced in the MEDLINE database since 1989.[1,2] In a 2-article series published in 2009, members of the American College of Emergency Physicians (ACEP) Ethics Committee examined the issue of ED crowding, including definitions, measures, causes, moral consequences, and responses.[3,4] In this article, we revisit the problem of ED crowding. We consider how research and practice during the past decade have addressed this issue, and we review additional published evidence for the adverse moral consequences of ED crowding. We conclude that crowding remains a widespread and serious problem and recommend actions that stakeholders can take to address it.

ORIGINS, TERMS, DEFINITIONS, AND MEASURES

Beginning in the 1980s, the United States experienced a steady and significant increase in the total number of ED visits.[5,6] One contributor to this increase may be the federal Emergency Medical Treatment and Labor Act (EMTALA).[7] This legislation, enacted in 1986, requires US hospitals that receive Medicare funding to evaluate, stabilize, and treat or transfer patients who present to the ED with an emergency medical condition, regardless of their ability to pay for their care.[8] It established hospital EDs as the safety-net providers of medical care in the United States for all patients with emergency medical conditions. The act mandates patient assessment and treatment of emergency medical conditions, but it does not create medical emergencies where none existed. Patients who lack health insurance or other ready access to care also seek care in EDs for nonemergency medical conditions, however, and many hospital EDs choose to treat those patients rather than turn them away after the required medical screening examination.[9]

During this same period, the United States experienced a decrease in the total number of EDs and of ED beds because of hospital closures and the decisions of some hospitals to close their EDs.[5,6] This led to a further increase in patient volume for the EDs that remained.

Soon after EMTALA's enactment, articles began to report crowded conditions in US EDs. This growing problem was brought to national attention by ACEP and the National Academy of Medicine.[1,5,10] In 2016, ACEP's Emergency Medicine Practice Committee reported that greater than 90% of EDs routinely experience crowded conditions.[11]

"Crowding" has largely replaced the redundant "overcrowding" as the preferred term to describe the mismatch between ED capacity and the number of patients presenting in a given period. An obstacle to standardization of crowding terminology is the use of the term "overcrowding" in a widely used tool for measuring

crowding, the National ED Overcrowding Study tool. This tool defines "overcrowding," as well as "severe overcrowding," all gradations of the same problem.[12] ACEP defined crowding in 2006 as a condition in which "the identified need for emergency services exceeds available resources for patient care in the ED, hospital, or both."[13] Synonyms for the term "crowded" include "packed," "full," "mobbed," and "congested," and these terms illustrate how patients may experience crowded EDs.

Various conceptual frameworks have been proposed to describe and measure ED crowding and its causes. In 2003, Asplin et al[14] offered a conceptual model of ED crowding based on 3 components: input (the number and acuity of patients seeking treatment), throughput (patient time in the ED), and output (admission to the hospital or discharge). Several federal agencies have endorsed core measurements and flow models to gauge crowding, and in 2012 The Joint Commission (TJC) published revised standards for measuring ED patient flow.[15–17] The most widely accepted flow model has been summarized as follows: lack of inpatient beds prevents disposition, resulting in boarding of admitted patients in the ED, reduced capacity to evaluate and treat new ED patients, and ED crowding.[18] Flow models recognize that EDs are not infinitely elastic. Even with maximum adaptability of human and material resources, at some point the number and acuity of ED patients exceed available ED resources, resulting in a crowded ED.

Although the actual incidence and prevalence of crowding in US EDs are unknown, the literature suggests that crowding is an ongoing worldwide problem.[19] ED crowding is not reported as a separate metric in any broad, systematic way. The National Hospital Ambulatory Medical Care Survey database is used to predict and infer crowding, but this survey is based on probability sampling, and the latest available data significantly lag real time. One recent review suggests "a D grade for reliability and accuracy" of the survey's data-gathering process.[20] Implementation of a standard crowding metric is complicated by the lack of consensus about an exact definition of ED crowding and a preferred crowding measure.

Although proponents of the Patient Protection and Affordable Care Act claimed that it would reduce visits to EDs, most reports cite either no change or an increase in ED visits since the act's implementation.[21–24] With the continuing high frequency of ED visits, available evidence suggests that ED crowding remains as frequent a problem as it was when the moral consequences of this condition were last reviewed.[3]

CAUSAL FACTORS

The National Academy of Medicine ED crowding report was published more than a decade ago, but ED clinicians still frequently find themselves caring for too many ED patients, with too few resources.[5] This leaves individual hospitals and ED managers struggling to identify their own causes of crowding and to devise effective solutions to this problem. There is no single cause of ED crowding, but contributing factors can be identified in each of the 3 areas described below.

Input Factors

Patients are often blamed for misusing the ED for nonemergency conditions, but this response may fail to recognize patients' valid reasons for seeking ED care.[25] Most adult patients report that they visited an ED because they believed that they had a serious medical problem, suggesting that these patients are appropriately using the ED.[23] Legislation recognizing the prudent layperson standard for insurance reimbursement of ED visits endorses reliance on patients to assess the seriousness of their conditions in choosing a treatment venue.[26] In contrast, some ED patients just seek convenience care, in part because of the absence of alternatives or to accommodate their personal schedules.[27]

An increasing number of ED patients have complex diseases, often with incomplete treatment or inadequate outpatient support.[28,29] Patients may be sent to the ED from outpatient settings for high-technology diagnostic tests and treatments or for admission when inpatient crowding prevents direct admission. Finally, our health care system forces many patients to seek care at an ED for nonurgent medical conditions because they are uninsured or underinsured and have no other access to care.

Throughput Factors

ED patients are increasingly older, with more complex diseases.[28,30] They commonly require multiple laboratory tests, diagnostic imaging, and medication interventions, which often have to be completed in the ED because there is no available observation unit space and patients' conditions do not satisfy payer-mandated criteria for inpatient care. Delays can occur at any step in the process and may be outside the control of the ED as, for example, a shortage of radiology staff or a laboratory machine malfunction.[31] A recent Canadian study reported that ED patient waiting room time in one city was strongly associated with the number of ED patients receiving diagnostic imaging studies.[32]

Output Factors

The shortage of inpatient beds, resulting in ED retention of patients who require inpatient care, is widely recognized as the most significant cause of ED

crowding.[6,11] When a hospital's inpatient beds are fully occupied, admitted patients accumulate in the ED, sometimes for many hours or even days, a circumstance referred to as "boarding." This situation delays both definitive inpatient treatment for boarding patients and the evaluation and treatment of new patients presenting to the ED, with demonstrated adverse effects on morbidity and mortality.[33] This phenomenon is a result of the multiple services, procedure areas, and financial incentives of large acute care hospitals, and of hospital culture factors.[34] Delayed discharges caused by traditional inpatient team rounding schedules can prevent beds from opening until late afternoon. Although a significant percentage of hospital inpatients present through the ED, they are often uninsured or underinsured and are therefore not the hospital's most profitable admissions.[35] For example, the scheduled brief admissions of well-insured patients for elective surgical procedures generate much more revenue than the lengthy admission of a patient with severe chronic obstructive pulmonary disease or congestive heart failure. There are therefore significant financial incentives for hospitals to prioritize these elective admissions over medical patients who are boarding in the ED.

ADVERSE MORAL CONSEQUENCES

The consequences of ED crowding can be viewed from a variety of perspectives, including operations, quality control, risk management, and accounting. In this section, we will call attention to the significant moral implications of crowding. ED crowding undermines professional duties grounded in all 4 of the fundamental principles of bioethics elucidated by Beauchamp and Childress,[36] most notably beneficence, but also nonmaleficence, respect for patient autonomy, and justice.

The fundamental duty of beneficence obliges health care professionals to act for the good of patients by ameliorating suffering, reducing risks of harm, and promoting patient well-being. ED crowding impedes beneficial care in several ways. It is, for example, known to delay providers' initial assessment and reassessment of patients. In crowded circumstances, patients also experience delays in assessment and treatment of pain.[37,38] Moreover, multiple studies have found that definitive therapy for a variety of acute conditions, including myocardial infarction, is delayed in crowded EDs.[39,40] During times of crowding, patients experience longer stays in the ED before they can be discharged.[41]

In addition to providing beneficial care, clinicians embrace duties of nonmaleficence, pledging to keep patients safe and avoid treatment that is harmful. During periods of ED crowding, however, medication and other medical errors are increased, and these errors may inflict serious harm on patients.[42,43] Patients admitted to the hospital when the ED is crowded have poorer outcomes for certain conditions, higher mortality rates, longer hospital stays, and a higher probability of leaving against medical advice or before completing treatment.[44–46] In surveys, patients who experienced crowded ED conditions report decreased satisfaction with their ED and hospital stays.[47–49] From a moral perspective, this dissatisfaction may reflect a failure to respect patient dignity or to promote patient well-being.

ED crowding also compromises physical privacy, confidentiality, open communication, and informed consent. Patients in crowded EDs are often forced into ad hoc treatment areas such as hallway beds and other shared spaces, where they experience an obvious lack of privacy and control over their personal information.[50,51] Placement in such areas has been shown to compromise not only privacy but also the completeness of information revealed to health care providers and the thoroughness of physical examinations.[52,53] Obstacles to the exchange of sensitive personal health information can undermine both providers' ability to recommend effective treatment and patients' ability to provide adequately informed consent.

In response to severe ED crowding, hospitals may decide to implement ambulance diversion, which may be the only way to protect patient safety in these situations, but may also thwart patients' strong preferences to receive care at a particular hospital or prevent patients from realizing the value of continuing care at a "home" hospital. Diversion may exacerbate health disparities and inequities when its ill effects fall disproportionately on underserved populations or when it disadvantages patients whose extensive records are at a bypassed institution.[54,55]

A final moral consequence of ED crowding is that it can evoke moral distress, a term used to describe the painful psychological disequilibrium clinicians experience when external constraints prevent them from pursuing what they believe to be the morally correct course of action.[56] Emergency nurses have been shown to experience moral distress from providing care in suboptimal conditions tied to crowding, and it is likely that other ED providers are similarly affected.[57,58] In a crowded ED, for example, emergency physicians may feel unwelcome pressure not to admit patients to the hospital whose presentation would mandate admission at other times, or to truncate the initial evaluation of ED patients despite the increased risk to them.

In sum, empiric studies published during the past 10 years provide significant additional evidence of the adverse consequences of ED crowding, most notably delayed treatment, poorer-quality care, poorer patient outcomes, and moral distress of nurses.

PREVENTION AND MITIGATION STRATEGIES

Commonly cited strategies to prevent or alleviate ED crowding include increased resources, observation units, deferral of low-risk patients, streaming measures, point-of-care testing, and nursing-based initiatives.

Increased Resources

These resources can include the number of emergency physicians and ED or hospital beds. Increases in ED bed capacity have been shown not to affect ambulance diversion, and total ED and admission-hold length of stay were increased.[59] Studies report successful deployment of resources on demand, but these are usually related to transient surges such as seasonal flu.[60] One study reported that doubling the physician workforce during the evening shift reduced the length of stay for discharged patients.[61] Increasing the number of ICU beds has been shown to decrease ED length of stay for ICU-bound patients, but there was no effect on overall ED length of stay, likely because only a minority of ED patients go to the ICU.[62]

ED-Based Observation Units

One study modeled that diverting a specific patient load to an ED load relief area produced a decrease in ED length of stay and wait time.[63] Another study showed that emergency medical wards effectively reduced both the length of stay during inpatient hospitalization and the avoidable medical admission rate. Emergency medical wards provide a setting not only for "treating and reviewing" but also for executing care plans and expediting investigations.[64] Several studies have been conducted on emergency medical ward cost-effectiveness. Goodacre and Dixon[65] reported that a short-stay unit improved patient outcomes at a cost lower than that of routine care.

Physician Triage, Streaming, and Redistribution of Patients

Using an emergency physician instead of traditional nurse triage with the ability to immediately discharge low-acuity patients who require no evaluation has been shown to decrease overall ED length of stay.[9] Physician intake models accompanied by streaming of patients to vertical and horizontal care paths within the ED further improve ED efficiency. Deferral of low-risk patients out of the ED to an adjacent acute care unit or to next-day care has been shown to be safe and to decrease ED length of stay and ambulance diversion.[66,67] Building walk-in clinics and strengthening primary care systems have also been suggested as ways to relieve the input burden. A recent UK article stated that "it is clear that unscheduled care pathways should be operating into the evenings, and over weekends and bank holidays. The crises affecting hospitals after weekends, Christmas, Easter and other bank holidays are unjustifiable when they are so amenable to intervention."[68] Because of the disparate ownership of health care facilities in the United States, however, this strategy may be harder to implement than it would be in the United Kingdom, where it is still only an aspiration. A strategy that does not require additional hospital resources is secondary disposition of patients according to local hospital capacity. It has been demonstrated that this redistribution, in which emergency physicians transfer admitted patients to surrounding area hospitals, reduces ED length of stay. Whereas traditional ambulance diversion may not be safe for patients, secondary disposition is a more controlled process, with patients' acute care administered before transfer to another facility.[69]

Point-of-Care Testing

Studies have found that point-of-care testing offers an up to 87% reduction in test turnaround time and that patients undergoing it had a significantly reduced length of stay. Point-of-care testing has a higher cost than laboratory testing on a test-for-test basis, but this increased cost may be outweighed by improvements in patient flow.[70]

Nursing-Based Initiatives

Other strategies to improve ED crowding have used waiting room nurses and increased the scope of practice of triage nurses. In one analysis, nurse-initiated analgesia had no effect on wait time to physician encounter or length of stay. This intervention did not increase adverse events, however, and it was associated with increased likelihood of receiving analgesia, achieving clinically relevant pain reduction, and better patient satisfaction.[71] Creation of a nurse "navigator" role that supports the ED team by facilitating efficient and timely patient flow through the ED has shown a statistically significant reduction in patient throughput times.[72]

In a 2018 mixed-methods study, Chang et al[18] identified specific interventions used to relieve crowding at hospitals with high performance, low performance, and major improvement in ED crowding during the study period. There was no obvious relationship between the specific interventions used to reduce ED crowding at the different institutions and actual reduction of crowding. Rather than specific strategies, successful control of ED crowding depended on 4 organizational factors: executive leadership commitment to addressing ED crowding as a top institutional priority, hospitalwide coordination of initiatives across disciplines and departments, collection and real-time dissemination of data to

identify and address crowding issues, and staff accountability for improving performance. This study lends support to the claim that effective control of ED crowding must be an institutionwide commitment.

INDIVIDUAL PRACTICE IMPLICATIONS

ED crowding makes it difficult for emergency physicians to meet their moral obligations to patients. When they confront crowded conditions, how should emergency physicians assess and manage their conflicts of obligation? A major challenge in a crowded ED is to balance respect for patient privacy and autonomy with efforts to find available space for urgently needed treatment.[49–51] Because delayed emergency care leads to increased morbidity and mortality, the best decision will often be to assess and treat patients as quickly as practicable in crowded conditions despite risks to their privacy and dignity.

Emergency physicians have little control over ED input or output, but they can try to make ED care processes (that is, throughput) more efficient and effective; for instance, by avoiding overtesting or overadmission.[73,74] By improving ED efficiency, emergency physicians can decrease the harm of delayed care. Increasingly, organizations are held to efficiency metrics (eg, door-to-physician time, left without treatment completion). When efficiency is considered "merely" an operational imperative, one might adopt short-sighted strategies that improve metrics without truly improving patient care. Rather, physicians and administrators should consider efficiency as both an operational and moral principle and develop strategies accordingly. Crowding creates competition for scarce resources, most notably private space and caregiver attention. To maximize overall patient benefit and minimize harm, those resources should be distributed according to need and with careful assessment.

In a crowded ED, risks of harm are omnipresent. Providers cannot know who will experience harm as a direct result of ED crowding, but some patients will indeed do so, and despite their best efforts, emergency physicians, nurses, and other staff will recognize that they failed to help, or positively harmed, those patients. The moral distress of caring for sick people with inadequate system resources can be debilitating, and this threat has prompted scholars to define and promote the virtue of "moral resilience" for professionals working in difficult circumstances.[75,76] Most critical, however, is the institutional imperative to improve the conditions under which professionals care for patients.

CONCLUSION AND RECOMMENDATIONS

We conclude that despite decades of attention, ED crowding remains a vexing problem with significant adverse moral consequences. In our view, it may be the most serious moral challenge in emergency medicine today. Given the complexity and persistence of the problem of ED crowding, we are convinced that collaborative efforts among multiple stakeholders will be required to identify and implement effective strategies to prevent and alleviate crowding. We offer the following recommendations for major stakeholders in the provision of emergency medical care:

Individual emergency physicians should call the attention of their colleagues and of institutional leaders to the continuing problem of ED crowding, should educate themselves on the ethical challenges posed by ED crowding, and should suggest institution-specific measures to prevent and alleviate it. Emergency physician investigators should study and report the adverse consequences of ED crowding.

ED, hospital, and health system leaders should understand crowding as a hospital problem, not simply an ED problem. They should work together to make alleviation of ED crowding an institutional priority, coordinate institutionwide responses to episodes of ED crowding, devote sufficient human and material resources to identifying and responding to crowding, and make alleviation of ED crowding a significant component of performance evaluation for key staff members across the institution. Leaders should take proactive steps to prevent ED crowding by giving ED patients institutional priority for imaging, laboratory testing, consultation, and admission.

Emergency medicine professional organizations should make relieving the problem of ED crowding an organizational priority. They can do this by reviewing and updating organizational policies on ED crowding and by collecting and disseminating information about effective strategies for alleviating crowding. Emergency medicine professional organizations should participate in development of reproducible and reliable ways of routinely measuring and reporting ED crowding. Professional association advocacy for these changes supports both patient benefit and alleviation of caregiver moral distress.

TJC should implement additional standards to require hospitals to respond effectively to ED crowding, such as requirements that hospitals identify when ED crowding occurs, cease elective admissions, and identify inpatients for discharge.

Legislators and government officials should enact and implement legislation to reward hospitals and health systems that demonstrate prevention or alleviation of ED crowding and to penalize systems that fail to control ED crowding. Other legislation could increase financial support

for outpatient clinics and provide health insurance that gives incentives to primary care to provide alternatives to the ED for nonemergency medical care. If patients have secure access to quality outpatient care, emergency physicians could accept a responsibility to direct patients who present to the ED with nonemergency conditions to appropriate outpatient services.

We recognize that these recommendations may be controversial and difficult to execute, but we maintain that concerted efforts such as these are essential to ensuring quality care for all ED patients.

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REFERENCES

1. American College of Emergency Physicians. Hospital and emergency department overcrowding. *Ann Emerg Med*. 1990;19:336.
2. Andrulis DP, Kellerman A, Hintz EA, et al. Emergency departments and crowding in United States teaching hospitals. *Ann Emerg Med*. 1991;20:980-986.
3. Moskop JC, Sklar DP, Geiderman JM, et al. Emergency department crowding, part 1—concept, causes, and moral consequences. *Ann Emerg Med*. 2009;53:605-611.
4. Moskop JC, Sklar DP, Geiderman JM, et al. Emergency department crowding, part 2—barriers to reform and strategies to overcome them. *Ann Emerg Med*. 2009;53:612-617.
5. 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 Academies Press; 2006. Available at: https://www.nap.edu/read/11621/chapter/1. Accessed October 16, 2018.
6. Government Accountability Office. Hospital emergency departments: crowding continues to occur, and some patients wait longer than recommended time frames. GAO-09-347. Available at: https://www.gao.gov/products/GAO-09-347. Accessed October 16, 2018.
7. Emergency Medical Treatment and Labor Act. Pub. L No. 99-272. 42 U. S.C. § 1395dd (1986).
8. Ossei-Owusu S. Code red: the essential yet neglected role of emergency care in the United States. *Am J Law Med*. 2017;43:344-387.
9. Wiler JL, Ozkaynak M, Bookman K, et al. Implementation of a front-end split-flow model to promote performance in an urban academic emergency department. *Jt Comm J Qual Patient Saf*. 2016;42:271-280.
10. Kellerman AL. Crisis in the emergency department. *N Engl J Med*. 2006;355:1300-1303.
11. American College of Emergency Physicians; Emergency Medicine Practice Committee. Emergency department crowding: high impact solutions. Available at: https://www.acep.org/content.aspx?id=32050#sm.00078uhkj12fhfqbzc727ek42rt6e. Accessed March 28, 2016.
12. Wang H, Robinson RD, Bunch K, et al. The inaccuracy of determining overcrowding status by using the National ED Overcrowding Study tool. *Am J Emerg Med*. 2014;32:1230-1236.
13. American College of Emergency Physicians. Crowding (policy statement). Available at: https://www.acep.org/Clinical—Practice-Management/Crowding/#sm.00078uhkj12fhfqbzc727ek42rt6e. Accessed February 11, 2018.
14. Asplin BR, Magid DJ, Rhodes KV, et al. A conceptual model of emergency department crowding. *Ann Emerg Med*. 2003;42:173-180.
15. McHugh M, Van Dyke K, McClelland M, et al. *Improving Patient Flow and Reducing Emergency Department Crowding: A Guide for Hospitals*. Rockville, MD: US Dept of Health & Human Services, Agency for Healthcare Research & Quality; 2011. Available at: https://www.ahrq.gov/sites/default/files/publications/files/ptflowguide.pdf. Accessed March 18, 2018.
16. US Department of Health and Human Services; Centers for Medicare & Medicaid Services. Clinical quality measures finalized for eligible hospitals and critical access hospitals beginning with FY 2014. Available at: https://www.cms.gov/regulations-and-guidance/legislation/ehrincentiveprograms/downloads/2014_cqm_eh_finalrule.pdf. Accessed May 30, 2018.
17. Joint Commission. Approved: standards revisions addressing patient flow through the emergency department. *Jt Comm Perspect*. 2012;32:1-5.
18. Chang AM, Cohen DJ, Lin A, et al. Hospital strategies for reducing emergency department crowding: a mixed-methods study. *Ann Emerg Med*. 2018;71:497-505.
19. Pines JM, Hilton JA, Weber EJ, et al. International perspectives on emergency department crowding. *Acad Emerg Med*. 2011;18:1358-1370.
20. Cooper RJ. NHAMCS: does it hold up to scrutiny? *Ann Emerg Med*. 2012;60:722-725.
21. Dresden SM, Powell ES, Kang R, et al. Increased emergency department use in Illinois after implementation of the Patient Protection and Affordable Care Act. *Ann Emerg Med*. 2017;69:172-180.

22. Nikpay S, Freedman S, Buchmueller T. Effect of the Affordable Care Act Medicaid expansion on emergency department visits: evidence from state-level emergency department databases. *Ann Emerg Med*. 2017;70:215-225.
23. Gindi RM, Black LI, Cohen RA. Reasons for emergency room use among US adults aged 18-64: National Health Interview Survey, 2013 and 2014. *Natl Health Stat Rep*. 2016;90:1-15.
24. Finkelstein AN, Taubman SL, Allen HL, et al. Effect of Medicaid coverage on ED use—further evidence from Oregon's experiment. *N Engl J Med*. 2016;375:1505-1507.
25. Durand AC, Palazzolo S, Tanti-Hardouin N, et al. Nonurgent patients in emergency departments: rational or irresponsible consumers? perceptions of professionals and patient. *BMC Res Notes*. 2012;5:525.
26. Balanced Budget Act: Public Law 105-33, Section 4704(b)(2)(C); 1997.
27. Katz MH. Editor's note: decreased admission rate from the emergency department with increased emergency department visits—the good and the bad. *JAMA Intern Med*. Available at: https://jamanetwork.com/journals/jamainternalmedicine/fullarticle/2706172. Published October 15, 2018. Accessed October 16, 2018.
28. Foo CL, Chan KC, Goh HK, et al. Profiling acute presenting symptoms of geriatric patients attending an urban hospital emergency department. *Ann Acad Med Singapore*. 2009;38:515-516.
29. Bullard MJ, Villa-Roel C, Bond K, et al. Tracking emergency department overcrowding in a tertiary care academic institution. *Healthc Q*. 2009;12:99-106.
30. Elder E, Johnston A, Crilly J. Systemic review of three key strategies designed to improve patient flow through the emergency department. *Emerg Med Australas*. 2015;27:394-404.
31. Kreindler S, Cui Y, Metge C, et al. Patient characteristics associated with longer emergency department stay: a rapid review. *Emerg Med J*. 2016;33:194-199.
32. Doupe MB, Chateau D, Chochinov A, et al. Comparing the effect of throughput and output factors on emergency department crowding: a retrospective observational cohort study. *Ann Emerg Med*. 2018;72:410-419.
33. Meisel Z, Pitts S, Pines J, et al. Emergency department boarding and hospital quality. *Acad Emerg Med*. 2014;21:570-573.
34. Schuur J. Overcrowded emergency departments: is sunlight enough of a disinfectant? *JAMA Intern Med*. 2014;174:1846-1847.
35. McHugh M, Regenstein M, Siegel B. The profitability of Medicare admissions based on source of admission. *Acad Emerg Med*. 2008;15:900-907.
36. Beauchamp TL, Childress JF. *Principles of Biomedical Ethics*. 7th ed. New York, NY: Oxford University Press; 2013.
37. Pines JM, Shofer FS, Isserman JA, et al. The effect of emergency department crowding on analgesia in patients with back pain in two hospitals. *Acad Emerg Med*. 2010;17:276-283.
38. Mills AM, Shofer FS, Chen EH, et al. The association between emergency department crowding and analgesia administration in acute abdominal pain patients. *Acad Emerg Med*. 2009;16:603-608.
39. Ward MJ, Baker O, Schuur JD. Association of emergency department LOS and crowding for patients with ST-elevation myocardial infarction. *West J Emerg Med*. 2015;16:1067-1072.
40. Kulstad EB, Kelley KM. Overcrowding is associated with delays in percutaneous coronary intervention for acute myocardial infarction. *Int J Emerg Med*. 2009;2:149-154.
41. White BA, Biddinger PD, Chang Y, et al. Boarding inpatients in the emergency department increases discharged patient LOS. *J Emerg Med*. 2013;44:230-235.
42. Epstein SK, Huckins DS, Liu SW, et al. Emergency department crowding and risk of preventable medical errors. *Intern Emerg Med*. 2012;7:173-180.
43. Kulstad EB, Sikka R, Sweis RT, et al. ED overcrowding is associated with an increased frequency of medication errors. *Am J Emerg Med*. 2010;28:304-309.
44. Bernstein SL, Aronsky D, Duseja R, et al. The effect of emergency department crowding on clinically oriented outcomes. *Acad Emerg Med*. 2009;16:1-10.
45. Pines JM, Pollack CV Jr, Diercks DB, et al. The association between emergency department crowding and adverse cardiovascular outcomes in patients with chest pain. *Acad Emerg Med*. 2009;16:617-625.
46. Singer AJ, Thode HC Jr, Viccellio P, et al. The association between length of emergency department boarding and mortality. *Acad Emerg Med*. 2011;18:1324-1329.
47. Wang H, Kline JA, Jackson BE, et al. The role of patient perception of crowding in the determination of real-time patient satisfaction at emergency department. *Int J Qual Health Care*. 2017;29:722-727.
48. Tekwani KL, Kerem Y, Mistry CD, et al. Emergency department crowding is associated with reduced satisfaction scores in patients discharged from the emergency department. *West J Emerg Med*. 2013;14:11-15.
49. Lin YK, Lin CJ. Factors predicting patients' perception of privacy and satisfaction for emergency care. *Emerg Med J*. 2011;28:604-608.
50. Lin YK, Lee WC, Kuo LC, et al. Building an ethical environment improves patient privacy and satisfaction in the crowded emergency department: a quasi-experimental study. *BMC Med Ethics*. 2013;14:8.
51. Stoklosa H, Scannell M, Ma Z, et al. Do EPs change their clinical behaviour in the hallway or when a companion is present? a cross-sectional survey. *Emerg Med J*. 2018;35:406-411.
52. Chang BP, Carter E, Suh EH, et al. Patient treatment in ED hallways and patient perception of clinician-patient communication. *Am J Emerg Med*. 2016;34:1163-1164.
53. Venkatesh AK, Pallin DJ, Kayden S, et al. Predictors of hand hygiene in the emergency department. *Infect Control Hosp Epidemiol*. 2011;32:1120-1123.
54. Geiderman JM, Marco CA, Moskop JC, et al. Ethics of ambulance diversion. *Am J Emerg Med*. 2015;33:822-827.
55. Hsia RY, Sarkar N, Shen YC. Impact of ambulance diversion: black patients with acute myocardial infarction had higher mortality than whites. *Health Aff (Millwood)*. 2017;36:1070-1077.
56. Jameton A. *Nursing Practice: The Ethical Issues*. Englewood Cliffs, NJ: Prentice-Hall; 1984:6.
57. Fernandez-Parsons R, Rodriguez L, Goyal D. Moral distress in emergency nurses. *J Emerg Nurs*. 2013;39:547-552.
58. Wolf LA, Perhats C, Delao AM, et al. "It's a burden you carry": describing moral distress in emergency nursing. *J Emerg Nurs*. 2016;42:37-46.
59. Han JH, Zhou C, France DJ, et al. The effect of emergency department expansion on emergency department overcrowding. *Acad Emerg Med*. 2007;14:338-343.
60. Hoot NR, Aronsky D. Systematic review of emergency department crowding: causes, effects, and solutions. *Ann Emerg Med*. 2008;52:126-136.
61. Bucheli B, Martina B. Reduced LOS in medical emergency department patients: a prospective controlled study on emergency physician staffing. *Eur J Emerg Med*. 2004;11:29-34.
62. McConnell KJ, Richards CF, Daya M, et al. Effect of increased ICU capacity on emergency department length of stay and ambulance diversion. *Ann Emerg Med*. 2005;45:471-478.
63. Farrukh R, Lee YH, Kim SH, et al. Development of emergency department load relief area—gauging benefits in empirical terms. *Simul Healthc*. 2012;7:343-352.
64. Lo SM, Choi KT, Wong EM, et al. Effectiveness of emergency medicine wards in reducing LOS and overcrowding in emergency departments. *Int Emerg Nurs*. 2014;22:116-120.
65. Goodacre S, Dixon S. Is a chest pain observation unit likely to be cost effective at my hospital? extrapolation of data from a randomised controlled trial. *Emerg Med J*. 2005;22:418-422.

66. Kelen GD, Scheulen JJ, Hill PM. Effect of an emergency department managed acute care unit on ED overcrowding and emergency medical services diversion. *Acad Emerg Med*. 2001;8:1095-1100.
67. Washington DL, Stevens CD, Shekelle PG, et al. Next-day care for emergency department users with nonacute conditions. A randomized, controlled trial [published correction appears in *Ann Intern Med*. 2003;349:1299]. *Ann Intern Med*. 2002;137:707-714.
68. Higginson I, Boyle A. What should we do about crowding in emergency departments? *Br J Hosp Med*. 2018;79:500-503.
69. Cha WC, Shin SD, Song KJ, et al. Effect of an independent-capacity protocol on overcrowding in an urban emergency department. *Acad Emerg Med*. 2009;16:1277-1283.
70. Asha SE, Chan AC, Walter E, et al. Impact from point-of-care devices on emergency department patient processing times compared with central laboratory testing of blood samples: a randomised controlled trial and cost-effectiveness analysis. *Emerg Med J*. 2014;31:714-719.
71. Cabin CJ, Boyde M. A systematic review of the impact of nurse-initiated medications in the emergency department. *Australas Emerg Nurs J*. 2017;20:53-62.
72. Fulbrook P, Jessup M, Kinnear F. Implementation and evaluation of a "navigator" role to improve emergency department throughput. *Australas Emerg Nurs J*. 2017;20:114-121.
73. Bookman K, West D, Ginde A, et al. Embedded clinical decision support in electronic health record decreases use of high-cost imaging in the emergency department: EmbED study. *Acad Emerg Med*. 2017;24:839-845.
74. Melnick ER, Szlezak CM, Bentley SK, et al. CT overuse for mild traumatic brain injury. *Jt Comm J Qual Patient Saf*. 2012;38:483-489.
75. Rushton CH. Moral resilience: a capacity for navigating moral distress in critical care. *AACN Adv Crit Care*. 2016;27:111-119.
76. Monteverde S. Caring for tomorrow's workforce: moral resilience and healthcare ethics education. *Nurs Ethics*. 2016;23:104-116.

IMAGES IN EMERGENCY MEDICINE

(continued from p. 333)

DIAGNOSIS:

Millipede staining. Millipedes lack fangs but have lateral glands that secrete a fluid containing cyanides and quinones, with the resulting injury to humans typically being a painless hyperpigmentation.[1] Contact with the toxic fluids can cause an acute inflammatory reaction and various forms of pigmentation or discoloration.[2] Injuries most often occur when victims put on their shoes, and the lesions may persist for months without sequalae.[1] The immediate use of alcohol or ether on the skin should be encouraged because it can dissolve toxins.[1] Treatment includes the use of soap and water, as well as application of tape to remove any leftover millipede hairs, and steroids with diphenhydramine for systemic symptoms.[3]

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REFERENCES

1. Haddad C, Lupi T. Tropical dermatology: venomous arthropods and human skin. *J Am Acad Dermatol*. 2012;67:331.e1-331.e14.
2. Fracaroli T, Miranda L, Maceira J, et al. Exogenous pigmentation after Diplopoda exposure leading to a dermatoscopic parallel ridge pattern on the plantar region. *J Dermatol Case Rep*. 2015;9:85-86.
3. Sierwald B. Current status of the myriapod class Diplopoda (millipedes): taxonomic diversity and phylogeny. *Annu Rev Entomol*. 2007;52:401-420.