MAJOR ARTICLE

Reasons Why Emergency Department Providers Do Not Rely on the Pneumonia Severity Index to Determine the Initial Site of Treatment for Patients with Pneumonia

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Background. Many emergency department (ED) providers do not follow guideline recommendations for the use of the pneumonia severity index (PSI) to determine the initial site of treatment for patients with community-acquired pneumonia (CAP). We identified the reasons why ED providers hospitalize low-risk patients or manage higher-risk patients as outpatients.

Methods. As a part of a trial to implement a PSI-based guideline for the initial site of treatment of patients with CAP, we analyzed data for patients managed at 12 EDs allocated to a high-intensity guideline implementation strategy study arm. The guideline recommended outpatient care for low-risk patients (nonhypoxemic patients with a PSI risk classification of I, II, or III) and hospitalization for higher-risk patients (hypoxemic patients or patients with a PSI risk classification of IV or V). We asked providers who made guideline-discordant decisions on site of treatment to detail the reasons for nonadherence to guideline recommendations.

Results. There were 1,306 patients with CAP (689 low-risk patients and 617 higher-risk patients). Among these patients, physicians admitted 258 (37.4%) of 689 low-risk patients and treated 20 (3.2%) of 617 higher-risk patients as outpatients. The most commonly reported reasons for admitting low-risk patients were the presence of a comorbid illness (178 [71.5%] of 249 patients); a laboratory value, vital sign, or symptom that precluded ED discharge (73 patients [29.3%]); or a recommendation from a primary care or a consulting physician (48 patients [19.3%]). Higher-risk patients were most often treated as outpatients because of a recommendation by a primary care or consulting physician (6 [40.0%] of 15 patients).

Conclusion. ED providers hospitalize many low-risk patients with CAP, most frequently for a comorbid illness. Although higher-risk patients are infrequently treated as outpatients, this decision is often based on the request of an involved physician.

Community-acquired pneumonia (CAP) causes 4 million episodes of illness and results in more than 1 million hospital admissions in the United states each year [1]. Evidence suggests that physicians tend to overestimate the risk of death among patients with CAP, and these overestimates are associated with the decision to hospitalize patients at low risk [2]. Hospital admission of low-risk patients with CAP is far more costly and often less desirable for such patients [3, 4].

The pneumonia severity index (PSI) is a clinical prediction rule for prognosis designed to help physicians objectively determine the initial site of treatment for patients with this illness [5]. Several randomized trials and nonrandomized prospective studies have demonstrated the effectiveness and safety of using the PSI to reduce the proportion of low-risk patients hospitalized from the emergency department (ED) [6–10], and to

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ensure that higher risk patients are not inappropriately discharged to the outpatient setting [9].

Despite guideline recommendations to treat low-risk patients with CAP (those in PSI risk classes I–III) as outpatients and to hospitalize higher-risk patients, medical providers in the ED hospitalize 38%–62% of low-risk patients [6, 7, 9–11] and discharge 3%–13% of higher risk patients to the outpatient setting [7, 9, 10]. It has been argued that, when used to determine the initial site of treatment, the PSI may not address certain patient psychosocial (eg, homelessness, substance abuse, and/or inadequate home support) or medical conditions (eg, suspected tuberculosis or endocarditis, exacerbations of chronic obstructive pulmonary disease or asthma, acute coronary syndrome, acute heart failure, and/or inability to maintain oral intake) that preclude outpatient treatment [12–14].

Most prior studies of the initial site of treatment for CAP relied on medical record reviews to identify the patient and system factors associated with the admission decision [12, 15–18] and did not directly elucidate the reasons why physicians treated low-risk patients as inpatients or higher-risk patients in the outpatient setting. As part of the EDCAP trial to use the PSI to determine the initial site of treatment of patients with CAP [9], we asked all ED providers who made guideline-discordant decisions on site of treatment to explain the reasons for nonadherence to guideline recommendations. The specific aims of this project were to describe the reasons why medical providers treated patients classified as (1) low risk by the PSI as inpatients and (2) patients classified as higher risk by the PSI as outpatients.

METHODS

Study design. This study was conducted as part of the EDCAP trial, a 32-site cluster-randomized controlled clinical trial designed to compare the effectiveness and safety of 3 guideline implementation strategies of increasing intensity (low, moderate, and high) to determine the initial site of treatment for patients with CAP presenting to an ED [9]. Using a practice guideline based on PSI risk stratification and arterial oxygenation, ED providers identified patients at low risk and higher risk of 30-day mortality. The practice guideline recommended treatment at home for patients defined as low risk (ie, PSI risk class of I, II, or III without arterial hypoxemia) and treatment in the hospital for higher-risk patients (ie, PSI risk class of IV or V and/or arterial hypoxemia).

The low-intensity strategy (used by 8 EDs) included the development of a voluntary quality-improvement plan that addressed the initial site of treatment for low-risk patients, with a practice guideline and supporting literature mailed to all medical providers at these EDs. The moderate-intensity strategy (used by 12 EDs) included all of the low-intensity strategies plus the state-specific quality-improvement organizations (for Pennsylvania and Connecticut) requesting each participating hospital to develop a plan addressing the initial site of treatment for patients with pneumonia. At all moderate-intensity sites, the research team also conducted a one-time, on-site educational session to teach medical providers how to use the PSI to determine the initial site of treatment. The high-intensity strategy (used by 12 EDs) included all low-intensity and moderate-intensity strategies, plus real-time provider reminders and audit and feedback, combined with continuous quality-improvement activities to increase the proportion of low-risk patients treated as outpatients. For the present study, we focus exclusively on patients managed at the 12 high-intensity EDs, where we asked all providers who managed enrolled patients to detail the reasons for nonadherence to guideline recommendations. We decided to focus on high-intensity EDs, because physicians at these EDs were well informed of the guideline recommendations to treat low-risk patients in the outpatient setting and higher-risk patients in the hospital. Thus, guideline-discordant site-of-treatment decisions would most likely be a consequence of disagreement with the guideline recommendations and not a simple lack of guideline awareness.

The EDCAP trial was approved by the institutional review boards at all study sites, and we obtained informed consent from all study participants. The methods, design, guideline implementation strategies, and description of study outcomes are described in detail elsewhere [9, 19].

Study population. Physicians from 12 EDs (6 in Connecticut and 6 in Pennsylvania) recruited patients 24 hours a day, 7 days a week during the period from January through December 2001. Patient eligibility criteria were the detection of a new pulmonary infiltrate on a chest radiograph and a clinical diagnosis of pneumonia for a patient older than 18 years of age. We excluded patients with cases of hospital-acquired pneumonia, with immunosuppression, and/or with specific comorbid conditions (such as cystic fibrosis or pulmonary tuberculosis) that were distinguishable from pneumonia, patients with a serology test positive for human immunodeficiency virus, patients who were pregnant, or patients with substance abuse problems or psychosocial conditions incompatible with outpatient treatment, enrollment, or follow-up (eg, homelessness or incarceration). For this analysis, we also excluded patients without a prospectively calculated PSI risk class (ie, 19 patients), which precluded a determination of the concordance of the actual site of treatment with the guideline-recommended site of treatment, and patients who were mistakenly classified as low-risk patients despite the presence of arterial hypoxemia at the time of presentation (ie, 11 patients).

Data collection. Trained research nurses collected data on the characteristics of participating EDs and surveyed all in-

volved ED medical providers to determine their demographic and professional characteristics. They also performed medical record reviews, to collect data on the demographic characteristics, comorbid conditions, vital sign and physical examination findings, and pertinent laboratory and radiographic findings from presentation of each enrolled patient. ED providers prospectively documented all of the demographic and clinical data (eg, medical history, results of physical examinations, and laboratory and radiographic findings) that comprise the PSI on a form with instructions for the calculation of a risk score, assignment to a PSI risk class, and a recommendation for the site of treatment based on the PSI risk class and level of arterial oxygenation. This form also included a disclaimer that the ultimate decision should be consistent with the provider's clinical judgment. We classified patients as low risk or higher risk on the basis of data recorded by the ED provider at the time of the initial site-of-treatment decision. Low-risk patients were defined as patients in the PSI risk class of I, II, or III without arterial hypoxemia, and higher-risk patients were defined as patients in PSI risk class of IV or V with or without arterial hypoxemia (defined as a PaO_2 <60 mm Hg or an oxygen saturation <90%).

Research nurses administered patient-specific surveys (within 1 week of patient enrollment) to all ED medical providers who made an initial site-of-treatment decision that was discordant with the guideline recommendations, to elicit the reasons why the providers deviated from these recommendations. The survey included a set of a priori categories delineating reasons for not adhering to the guideline recommendations. ED providers also had the opportunity to add open-ended responses. A panel of 3 investigators reviewed each of these open-ended responses and used majority consensus to assign them to a unique category. The panel established 8 final, consensus-based categories explaining why low-risk patients were hospitalized and 6 categories explaining why higher-risk patients were treated as outpatients.

Analyses. We compared baseline characteristics of low-risk patients who received outpatient or inpatient care and higher-risk patients who received outpatient or inpatient care. We used the χ^2 test or the Fisher exact test to compare categorical variables and the nonparametric Wilcoxon rank-sum test to compare continuous variables. We used 2-sided P values of <.05 to define statistical significance. We expressed as proportions the reasons for the providers' guideline-discordant site-of-treatment decisions.

RESULTS

Characteristics of study sites and medical providers. The 12 participating EDs had a median volume of 25,899 patients per year, and 6 EDs were in teaching hospitals (Table 1). We surveyed 109 (70.8%) of 154 ED providers who enrolled study patients at these sites and who made ⩾1 site-of-treatment decisions discordant with guideline recommendations. Most of the providers were male (88 [80.7%] of 109 providers) and identified themselves as ED physicians (94 [86.2%] of 109 providers) and as white (91 of 108 providers [84.3%]).

Table 1. Characteristics of Emergency Department (ED) Medical Providers Who Treated Patients with Community-Acquired Pneumonia (January–December 2001)

Characteristic	ED providers (n = 109)
Median age (IQR), years	43.0 (38.2–48.0)
Male	80.7
Race[a]	
White, not Hispanic	84.3
Black, not Hispanic	2.8
Hispanic	0.0
Asian or Pacific Islander	9.3
Other	3.7
Years since medical school graduation	
<10 years	33.9
10–20 years	42.2
>20 years	23.9
Practice specialty	
Emergency physician, director	8.3
Emergency physician	78.0
Other specialty[b]	12.8
Nurse practitioner or physician assistant	0.9
No. of ED shifts per month	
1–4	16.4
5–11	20.9
>12	62.7

NOTE. Data are percentage of patients, unless otherwise indicated. The 12 participating EDs had a median volume of 25,899 patients per year (range, (17,619–58,000 patients per year), and 6 EDs were in teaching hospitals. IQR, interquartile range.

[a] Information on race was missing for 1 ED provider. The calculation of percentages for this variable was based on 108 ED providers.

[b] Other provider specialties were internal medicine and family practice.

Study population. Providers enrolled 1336 (75.1%) of the 1779 eligible patients who were diagnosed with CAP at the 12 participating high-intensity EDs. After excluding 19 patients without a prospectively calculated PSI and 11 patients who were mistakenly classified as low-risk despite arterial hypoxemia, 1306 patients were in the final study population (Figure 1). Overall, providers made 278 site-of-treatment decisions that were discordant with guideline recommendations, hospitalizing 258 (37.4%) of 689 low-risk patients and discharging 20 (3.2%) of 617 higher-risk patients. Providers completed surveys with regard to the reasons why they made guideline-discordant decisions for 249 (96.5%) of 258 low-risk inpatients and 15 (75.0%) of 20 higher-risk outpatients.

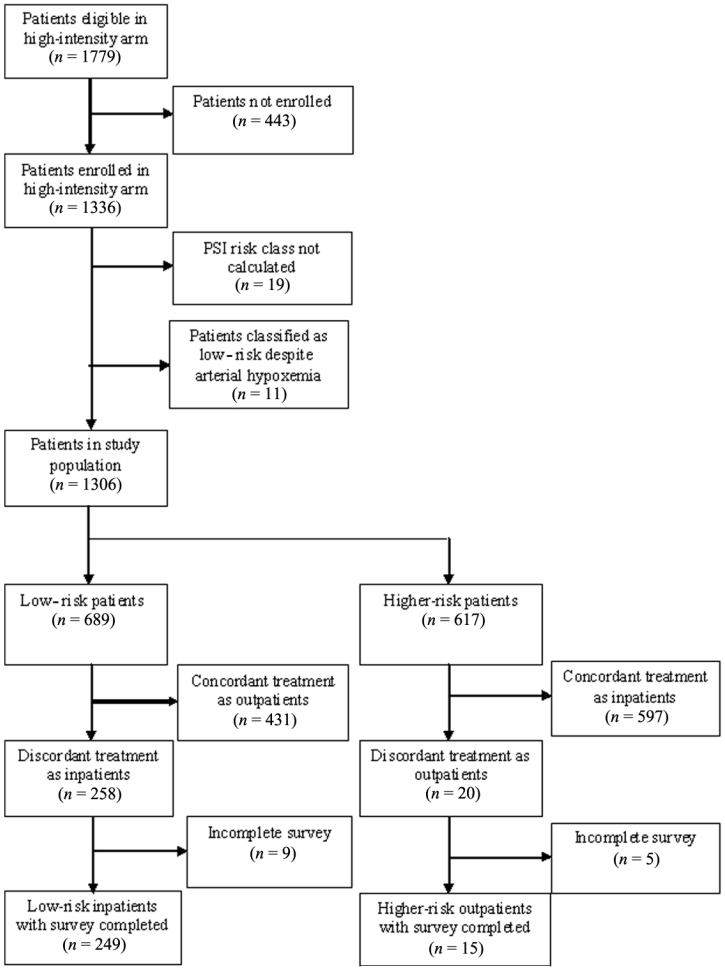

Figure 1. Identification of the final study sample. PSI, pneumonia severity index.

Compared with the 431 low-risk patients treated as outpatients, the 258 low-risk patients treated as inpatients were older, and a higher percentage were insured with a fee-for-service healthcare plan and were nursing home residents (Table 2). The low-risk inpatients were also more likely to have congestive heart failure, cerebrovascular disease, renal disease, and abnormal vitals signs (tachycardia, fever or hypothermia, and tachypnea) and pleural effusion detected by radiography. Because of these characteristics, low-risk inpatients were more likely than low-risk outpatients to be classified in the PSI risk class of II or III. Compared with the 597 higher-risk patients who were treated as inpatients, the 20 higher-risk outpatients were less likely to have heart failure and more likely to be classified in the PSI risk class of I, II, or III, with a low level of arterial oxygenation as the sole determinant of a high-risk designation.

Reasons why ED medical providers made discordant site-of-treatment decisions. For the 249 low-risk patients who were hospitalized and whose reasons for admission were documented, ED providers indicated 1 reason for 130 patients (52.2%), 2 reasons for 81 patients (32.5%), and ⩾3 reasons for 37 patients (15.7%). ED providers cited concomitant comorbid illnesses precluding outpatient treatment for 178 patients (71.5%); the illnesses most frequently identified were pulmonary (36 patients), cardiac (34 patients), and neurological diseases (31 patients) (Table 3). In addition, they reported that 73 (29.3%) patients had vital signs, symptoms, oxygen saturation levels, or laboratory values that they believed were incompatible with outpatient care. For 48 (19.3%) patients, the patient's primary care physician or a consultant specifically requested hospitalization.

Medical providers completed the survey for 15 (75.0%) of 20 higher-risk outpatients. These 15 patients were most often treated as outpatients because of the request of the primary

Table 2. Comparison of Baseline Characteristics of Low-Risk Patients and Those of Higher-Risk Patients, by Severity of Illness and Initial Site of Treatment

Characteristic	Low-risk patients[a]				Higher-risk patients[b]			
	Outpatient (n = 431)	Inpatient (n = 258)	All (n = 689)	P	Outpatient (n = 20)	Inpatient (n = 597)	All (n = 617)	P
Median age (IQR), years	45 (34–60)	65.5 (51–75)	53 (37–69)	<.001	76 (48–89.5)	78 (72–84)	78 (71–84)	.42
Female sex	55.5	57.0	56.0	.70	50.0	48.4	48.5	.89
White, not Hispanic	76.0	81.4	78.1	.11	95.0	89.8	89.9	.79
Health insurance status								
Health maintenance organization	29.7	32.8	30.9	.007	15.0	22.4	22.1	.53
Fee for service	53.6	59.0	55.6		80.0	75.4	75.5	
Uninsured or unknown	16.7	8.2	13.5		5.0	2.2	2.3	
Nursing home resident	0.5	2.7	1.3	.031	15.0	13.4	13.4	.74
Comorbid illnesses								
Congestive heart failure	1.4	10.9	4.9	<.001	10.0	30.7	30.0	.047
Cerebrovascular disease	1.6	5.0	2.9	.010	5.0	14.2	13.9	.34
Renal disease	0.5	3.9	1.7	.001	20.0	12.6	12.8	.31
Neoplastic disease	0.7	0.8	0.7	>.99	10.0	9.2	9.2	.71
Liver disease	0.2	0.4	0.3	>.99	5.0	1.2	1.3	.23
Physical examination findings								
Pulse rate >125 beats/min	4.4	11.6	7.1	<.001	0.0	15.9	15.4	.06
Temperature <35°C or ⩾40°C	2.8	6.2	4.1	.028	0.0	10.2	9.9	.25
Respiratory rate >30 breaths/min	0.7	5.0	2.3	<.001	5.0	24.3	23.7	.06
Systolic blood pressure <90 mm Hg	0.7	1.9	1.2	.16	0.0	5.2	5.0	.62
Altered mental status	0.5	0.8	0.6	.63	5.0	17.8	17.3	.23
Laboratory and radiographic results								
Detection of pleural effusion radiography	1.4	4.3	2.5	.019	10.0	9.5	9.6	>.99
Glucose level ⩾250 mg/dL	1.4	3.5	2.2	.07	0.0	5.4	5.2	.62
BUN level ⩾30 mg/dL	0.7	1.6	1.0	.43	20.0	22.4	22.4	>.99
PaO_2 <60 mm Hg or O_2 saturation <90%	…	…	…	…	45.0	54.8	54.5	.39
Hematocrit <30%	0.2	1.7	1.6	.07	0.0	6.5	6.3	.63
Sodium level <130 mmol/L	0.0	0.0	0.0	…	5.0	6.0	6.0	>.99
Arterial pH <7.35	0.0	0.0	0.0	…	0.0	4.4	4.2	>.99
PSI risk class								
Class I, no hypoxemia	55.5	14.7	40.2	<.001				
Class II, no hypoxemia	32.7	43.0	36.6					
Class III, no hypoxemia	11.8	42.2	23.2					
Classes I–III, with hypoxemia					45.0	18.6	19.4	.025
Class IV					40.0	63.8	63.0	
Class V					15.0	17.6	17.5	

NOTE. Data are percentage of patients, unless otherwise indicated. IQR, interquartile range; PSI, pneumonia severity index.

[a] Low-risk patients were defined as those in risk class I, II, or III who did not have arterial oxygen desaturation at presentation.

[b] Higher-risk patients were defined as those in risk class IV or V, or with arterial oxygen desaturation at presentation.

care physician or a consultant (6 patients [40.0%]), because of rapid improvement in the patient's condition or a change in the diagnosis in the ED (5 patients [33.3%]), or because of discharge from the ED back to a nursing home (3 patients [20.0%]) (Table 4).

DISCUSSION

As part of the EDCAP trial designed to assess the effectiveness and safety of implementing a PSI-based practice guideline, we found that 37% of low-risk patients were hospitalized and 3% of higher-risk patients were treated as outpatients, even within the 12 EDs that received the most intensive strategies to implement the guideline recommendations. The ED medical providers responsible for hospitalizing low-risk patients most frequently attributed their decisions to the presence of concomitant medical illnesses or abnormal vital signs, symptoms, or laboratory values precluding outpatient care. Other frequently identified reasons for overriding the guideline recommendation to manage low-risk patients in the outpatient setting included the following: request for hospitalization made by other treating physician, the patient, or the patient's family; provider's perception that the case of pneumonia was more

Table 3. Emergency Department Medical Provider Reasons for Treating Low-Risk Patients in the Hospital

Reason for hospitalization	No. (%) of low-risk patients (n = 249)
Comorbid illnesses precluding outpatient treatment	178 (71.5)
Pulmonary diseases[a]	36 (14.5)
Cardiac diseases[b]	34 (13.7)
Neurologic diseases[c]	31 (12.4)
Infectious diseases or complications[d]	8 (3.2)
Diabetes mellitus	3 (1.2)
Renal failure	3 (1.2)
Miscellaneous medical problems	19 (7.6)
Abnormal symptoms, vital signs, or laboratory findings	73 (29.3)
Abnormal symptoms or vital signs[e]	48 (19.3)
Arterial oxygen desaturation[f]	22 (8.8)
Abnormal laboratory findings[g]	13 (5.2)
Primary care physician or consultant requested hospitalization	48 (19.3)
Pneumonia more severe than indicated by PSI	30 (12.0)
Problems with outpatient therapy[h]	28 (11.2)
Patient or family requested hospitalization	24 (9.6)
Psychosocial issues[i]	16 (6.4)
Required hospital services[j]	12 (4.8)

NOTE. The sum of percentages exceeds 100% because medical providers could indicate >1 reason for each patient. PSI, pneumonia severity index.

[a] There were 16 patients with chronic obstructive pulmonary disease or asthma; 8 patients with multilobar pneumonia detected by chest radiography; 8 patients with pleural effusion; 6 patients with a pulmonary mass; and 1 patient with some other type of pulmonary disease.

[b] There were 15 patients with acute coronary syndrome; 11 patients with arrhythmia; 9 patients with heart failure; and 3 patients with some other type of cardiac disease.

[c] There were 16 patients who were frail or had a serious neuromuscular disorder; 7 patients who were in a stupor or coma, or had severe dementia or a psychiatric illness; 5 patients with syncope; and 3 patients with some other type of neurologic disease.

[d] There were 2 patients with a suppurative infection and 6 patients with some other type of infectious disease or complication.

[e] There were 23 patients with wheezing or dyspnea; 11 patients with fever; 6 patients who were dehydrated; 4 patients with pleuritic chest pain; 6 patients with tachycardia; 4 patients with arterial hypotension; and 4 patients with some other abnormal symptom or vital sign.

[f] Physician-reported PaO_2 <60 mm Hg, oxygen saturation <90%, or other abnormality in arterial oxygenation.

[g] There were 4 patients with an abnormal white blood cell count; 3 patients with hyperglycemia; 2 patients with hypokalemia; and 5 patients some other abnormal laboratory finding.

[h] Outpatient treatment previously failed, or patient was unable to take oral antibiotics or maintain oral intake.

[i] Patient was either judged unreliable for outpatient treatment or required placement.

[j] For parenteral fluids, antibiotics, or blood transfusion; for pain control; or for pulmonary toilet or cardiac monitoring.

severe than indicated by the PSI; and prior or anticipated failure of outpatient treatment.

Our results suggest that, for many providers, knowing that a patient is at low risk of death based on PSI risk class may not be enough to consider outpatient care if they have ⩾1 prognostic marker associated with an increased risk of mortality or adverse outcomes. A prior study found that certain medical conditions such as cardiac (eg, arrhythmia or heart failure) and neurological diseases (eg, Parkinson disease or multiple sclerosis) are common immediate and underlying causes of death among patients with CAP [20]. Other comorbid diseases (eg, coronary artery disease or asplenia), laboratory findings (eg, leukopenia or elevated C-reactive protein), and radiographic abnormalities (multilobar infiltrates) that are not included in the PSI have been associated with an increased risk of death among patients with CAP [21].

The presence of severe derangements in a physical sign or laboratory value may also play a key role in a provider's decision to hospitalize a low-risk patient. The PSI was constructed with dichotomous predictor variables (abnormal vs normal) to facilitate its use in clinical practice and may oversimplify the way physicians interpret the predictor variables. For example, a phy-

Table 4. Emergency Department (ED) Medical Provider Reasons for Treating Higher-Risk Patients in the Outpatient Setting

Reason for outpatient treatment	No. (%) of higher-risk patients (n = 15)
Primary care physician or consultant requested discharge[a]	6 (40.0)
Patient improved, diagnosis changed in ED, or pneumonia less severe than indicated by PSI[b]	5 (33.3)
Discharged to nursing home from ED	3 (20.0)
Physician judged patient "not sick enough" to admit[c]	2 (13.3)
Patient or family refused hospitalization or requested discharge[d]	2 (13.3)
Physician disagreed with guideline recommendation to admit[e]	2 (13.3)

NOTE. The sum of percentages exceeds 100% because providers could indicate >1 reason for each patient. PSI, pneumonia severity index.

[a] There was 1 patient from a nursing home; 1 patient with good home support; and 1 patient who was discharged for some other reason.

[b] There were 2 patients whose oxygen desaturation improved with treatment; 2 patients whose diagnosis changed; and 1 patients whose pneumonia was less severe than indicated by the PSI.

[c] There was 1 patient who rapidly improved and 1 patient whose physician refused admission because the patient had no insurance.

[d] There was 1 patient who had no insurance and refused admission, and 1 patient who had good home support.

[e] Both patients were from a nursing home.

sician would be unlikely to discharge a previously healthy 20-year-old patient with severe systolic hypotension, despite the absence of other prognostic variables and a risk class II designation based on the PSI. Moreover, patients designated as low risk on the basis of the PSI may have important medical and psychosocial contraindications to outpatient care. For example, administering oral antibiotics to patients with intractable vomiting in an outpatient setting is not an option. Likewise, patients who use intravenous drugs, abuse alcohol, or have severe psychiatric conditions or severely impaired cognitive dysfunction may require hospitalization to ensure compliance with treatment, regardless of the severity of illness. Finally, patients with rare comorbid conditions (eg, neuromuscular disease) who were systematically excluded from studies validating the PSI may also require hospitalization. In such circumstances, the PSI should not supersede a physician's judgment [5]. Our findings confirm that physicians apply their clinical judgment to appropriately override the guideline site-of-treatment recommendations.

In our study, only 3.2% of higher-risk patients were discharged against guideline recommendation, mostly for the following reasons: the patient's family physician or a consultant requested discharge, the patient's initial hypoxemia rapidly improved or the admission diagnosis changed, or the patient was discharged to a nursing home. In a prior study, the most common explanation for discharge of higher-risk patients from the ED was patient or family preference, despite the physician's recommendation for admission [7]. Although the EDCAP study was not designed to examine clinically meaningful differences in mortality across the 3 study arms for higher-risk patients, this study demonstrated that, for higher-risk patients, mortality was nearly identical across the 3 study arms, despite a frequency of outpatient treatment that ranged 3-fold from 2.4% to 9.6% [9].

Few prior studies directly asked ED physicians why they treated individual low-risk patients with CAP in the hospital [2, 22]. Our findings are consistent with the results of a prior study that directly surveyed 47 ED physicians to determine the reasons for admitting patients despite guideline recommendations for outpatient care [22]. In this survey, the most frequent reasons given for nonadherence to guideline recommendations were coexisting medical problems, preference for admission by the primary physician, physician belief that the pneumonia severity was more acute than indicated by the PSI, patient or family preferences for admission, lack of adequate home or social support, and failure of outpatient therapy [22]. An earlier study that asked 292 medical practitioners to describe the patient characteristics that influence the admission of low-risk patients found, in general, that coexisting medical illnesses, a "very sick" clinical appearance, detection of multilobar lung involvement on chest radiograph, arterial hypoxemia, and lack of patient reliability were strongly associated with hospitalization [2].

Several prior studies used chart reviews rather than direct physician surveys to identify patient and/or site characteristics associated with the admission of low-risk patients with CAP [12, 15–18, 23, 24]. In these studies, the factors found to be associated with hospital admission of low-risk patients included comorbid conditions that are not contained in the PSI (cognitive impairment, history of coronary disease, diabetes mellitus, or pulmonary disease), large or complicated pleural effusions, lack of response to previous antibiotic therapy, detection of multilobar pneumonia on chest radiograph, infection with a high-risk pathogen, noncompliance with or failure to respond to previous outpatient therapy, home therapy with oxygen or corticosteroids, and a variety of psychosocial characteristics (eg, living home

alone, homelessness, or substance abuse) [12, 15–18, 23, 24]. A study of 845 low-risk patients with CAP who were treated as inpatients found that 79.9% of patients had ⩾1 contraindication to outpatient treatment or ⩾1 significant comorbid condition or treatment that precluded outpatient care [18]. The remaining 20.1% of patients may have been treated as inpatients at the discretion of the managing medical provider because of patient or family preferences, the provider's aversion to risk, or the provider's judgment that the patient's severity of illness warranted hospitalization despite their low-risk classification and the absence of medical or psychosocial contraindications to outpatient care [18].

The goal of our study was to elucidate the reasons why ED providers made guideline-discordant site-of-treatment decisions and not to compare the medical outcomes of patients managed concordant versus discordant with guideline recommendations. Nevertheless, a prior study using data from 1493 low-risk patients without a contraindication to outpatient care from the EDCAP trial found a higher unadjusted 30-day mortality among low-risk inpatients than among low-risk outpatients (2.6% vs 0.1%; $P < .01$), but this mortality difference disappeared after adjusting the propensity score for the site of treatment [25]. In this observational study, although satisfaction with the site of treatment was not different between low-risk outpatients and low-risk inpatients, the low-risk outpatients were more likely than the low-risk inpatients to return to work or usual activities [25]. Another study that randomized 224 patients with CAP (PSI risk class II or III) to receive outpatient or inpatient treatment did not find any differences in overall mortality or in outcome measures other than mortality [8].

Our study has several limitations. First, this study was performed within the randomized, controlled EDCAP trial to compare 3 different guideline implementation strategies for CAP. This trial excluded patients who were considered to have hospital-acquired pneumonia, immunosuppression, specific comorbid conditions (such as cystic fibrosis and tuberculosis), or psychosocial conditions (eg, homelessness) or substance abuse problems that were incompatible with outpatient care. Therefore, this study could not identify these conditions as potential reasons to override guideline recommendations. Second, because providers were surveyed up to 1 week after patient enrollment, recall bias could have affected the accuracy of our data. Furthermore, we did not objectively verify the extent to which the reported reason for overriding the guideline recommendations was truly present. Finally, the small number of higher-risk patients for whom ED providers made guideline-discordant site-of-treatment decisions may have diminished our ability to fully determine the reasons why providers decided to manage higher-risk patients as outpatients.

In summary, despite intense efforts to implement a PSI-based guideline to identify low-risk patients with CAP for outpatient treatment, ED providers used their clinical judgment to hospitalize nearly 40% of such patients. In most cases, providers reported that concomitant comorbid illnesses warranted hospitalization of low-risk patients. In contrast, higher-risk patients with CAP were infrequently treated in the outpatient setting, most often because of requests by comanaging physicians. Although ED providers reported that, in most instances, they overrode guideline recommendations because of specific clinical factors, many guideline-discordant decisions were based on patient, family, or physician requests, or because physicians subjectively judged the case of CAP to be more or less severe than suggested by the PSI. Additional educational efforts and/or alternative guideline implementation strategies may be able to further safely reduce the proportion of guideline-discordant site-of-treatment decisions for patients with CAP.

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