

ORIGINAL ARTICLE

Patients with community acquired pneumonia discharged from the emergency department according to a clinical practice guideline

S G Campbell, W Patrick, D G Urquhart, D M Maxwell, S A Ackroyd-Stolarz, D D Murray, A Hawass

See end of article for authors' affiliations

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Correspondence to:
Dr S G Campbell,
Department of Emergency
Medicine, QEII Health
Sciences Centre, 1796
Summer Street, HI 3021,
Halifax, Nova Scotia,
Canada B3H 3A7;
samuel.campbell@
cdha.nshealth.ca

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Objectives: To assess the safety of discharging patients with community acquired pneumonia (CAP) according to a clinical practice guideline.

Methods: A systematic retrospective review of medical records of 867 adult patients discharged from an emergency department (ED) with CAP between 3 January 1999 and 3 January 2001. Readmission or death rates within 30 days of discharge were evaluated, using data from all local hospitals and from the provincial coroner.

Results: Of 685 patients with pneumonia severity index (PSI) scores of <91 , 13 (1.9%) were readmitted and five (0.76%) died within 30 days of the ED visit. Thirty day readmission and death rates for patients with PSI >90 were 7.14% (13 of 182) and 9.34% (17 of 182), respectively.

Conclusion: Adult patients with CAP discharged from the ED according to the recommendations of a clinical practice guideline based on the PSI have low readmission and death rates, and are generally safely managed as outpatients.

Clinical practice guidelines have been shown to decrease admission rates and length of hospital stays for community acquired pneumonia (CAP).¹⁻³ They have also improved process of care factors that have been associated with improved outcomes⁴⁻⁶ and have been well accepted by physicians.⁷ Most contemporary guidelines base decisions for admission to, or discharge from, the emergency department (ED) on the pneumonia severity index (PSI) proposed by Fine *et al.*⁸ Although the PSI scores were designed as prognostic tools, they have been adapted to guiding the decision as to whether patients with CAP should be admitted to hospital or not. A guideline based on the PSI score has been prospectively evaluated, and found to decrease admission rates and length of stay for admitted patients.⁴ The safety of these decreased admissions in non-study settings remains unclear.

In January 1999, a clinical practice guideline (CPG) for the treatment of CAP (appendix 1, available on the journal web site <http://www.emjonline.com/supplemental>), drawn up by a multidisciplinary committee was introduced into our institution, a 978 bed adult teaching hospital with 70 000 emergency department visits a year. Criteria for treatment according to the CPG were: Clinical signs of pneumonia with evidence of consolidation on physical examination (crackles, dullness to percussion, or egophony), new pulmonary infiltrate in chest radiograph compatible with pneumonia AND at least two of: fever, cough, pleuritic chest pain or shortness of breath. Exclusion criteria included HIV/AIDS with a CD4 count ≤ 200 , a history of transplantation (solid organ or bone marrow), immunosuppressive drugs (including prednisone ≥ 10 mg/day for ≥ 2 months), haematological malignancy, suspicion or diagnosis of tuberculosis, cystic fibrosis, hospitalisation within the past 14 days or ICU admission. The CPG recommended that patients with a pneumonia severity index (PSI) of ≤ 90 , (Fine groups I to III)⁸ and who meet each of four additional discharge criteria, are discharged.

An audit conducted 18 months after the implementation of the guideline showed that the average bed days per patient managed (average length of stay multiplied by the percentage of patients admitted) decreased from 8.35 before implementation of the guideline to 3.06 thereafter.⁹

The objective of this study was to assess the safety of using the CPG to guide the discharge of patients with CAP.

METHODS

A systematic retrospective review was performed on the charts of all patients identified as having been discharged with a diagnosis of CAP, or possible CAP, during the period 3 January 1999 to 3 January 2001. Patients were excluded if the visit was for pneumonia currently under treatment, and in whom no change in medication was prescribed ("resolving pneumonia").

To reduce the incidence of transcription errors, data were entered concurrent with abstraction directly onto a computerised data abstraction form developed by the Dalhousie Emergency Medicine Database Manager. A standardised audit protocol was designed to guide abstractors as to the way in which data should be gathered.

Before the data collection process started, three data abstractors (SGC, DDM, AH) each applied the audit procedure to 30 medical records of CAP patients discharged before the study period to ensure that there was no variability in the quality or interpretation of data obtained by each abstractor. After every 10 records, results were compared for variation, and reasons for the variation addressed. By the last 30 records, no differences occurred in the data collected from each record. During the audit, periodic meetings were held with the abstractors and study coordinator to review abstraction rules and to identify aspects of data that were not

Abbreviations: CAP, community acquired pneumonia; ED, emergency department; PSI, pneumonia severity index; CPG, clinical practice guideline

clearly addressed in the audit protocol. Reported data that did not fit into the standard, predefined definitions were defined by consensus. PSI scores were calculated according to information supplied on the hospital chart. In cases where the treating physician had recorded a score, and this differed from the calculation, the physician's score was used, because we wanted to assess the effectiveness of the CPG as applied in the "real world" where physician errors are a reality. Data on readmission rates or death within 30 days of the ED visit were gathered from data from the only two hospitals in the area with inpatient facilities and from the provincial coroner, respectively.

RESULTS

Eight hundred and eighty eight cases were identified for audit. Of these, 21 (2.4%) were excluded, 18 for "resolving" pneumonia, and three in whom the charts could not be found.

Of the 867 remaining patients, the discharge diagnosis was pneumonia in 714 (82.4%) and "possible" pneumonia in 153 (17.6%). Seventy one (8.2%) patients were discharged to nursing homes; 26 (3%) patients were readmitted within 30 days, of whom eight (0.9%) died (table 1). A total of 22 (2.5%) patients died within 30 days. Altogether 685 (79%) of patients were discharged in concordance with the guideline (with PSI scores of <91, and all of the additional discharge criteria). Table 2 shows patient details. Of these, 13 (1.9%) were readmitted and five (0.73%) died within 30 days of the ED visit. Table 1 shows the mortality rates according to PSI score.

One hundred and eighty two of 867 (21.0%) patients with PSI scores >90 (and, therefore, discharged against the recommendations of the protocol), had 30 day readmission rates of 7.14% (13 of 182) and death rates of 9.34% (17 of 182). In the group of 17 (9.34%) of these patients who died within 30 days of ED discharge, the average age was 83.2 (range 56–98, SD 12.1), and average PSI score was 127.7. Nine of 17 (52.9%) had been discharged to nursing homes. Of 13 patients readmitted within 30 days of the ED discharge, initial PSI scores averaged 123. Of these, five subsequently died. On further review of the patients who died within 30 days of being discharged with PSI scores exceeding 90, it was found that in 47% (8 of 17), there was evidence on the chart that the patient was not expected to survive (referral in the chart to discussion with the next of kin regarding the poor prognosis for recovery, and the intention to make comfort care the main objective).

DISCUSSION

In the current era of concern for dangerous nosocomial infections and pressure to reduce healthcare spending clinicians face considerable pressure to admit patients only when essential. Although authors have shown that physicians tend to over-estimate the risk of death from CAP,^{8,10} making decisions as to the site of care is often based on inconsistent, subjective impressions,⁸ and the objective scoring system described by Fine *et al* can make the decision a lot

Table 2 Breakdown of age, PSI, and ED diagnosis for patients discharged with PSI <91

685 Patients	Number	Mean	Median
Age (total)	685	55.7	57
PSI score (total)	685	68.9	58
Age (pneumonia)	573	54.62	46
PSI (pneumonia)	573	67.76	57
Age (possible pneumonia)	112	60.51	52
PSI (possible pneumonia)	112	74.38	60

simpler. We provide further reassurance that this system identifies patients in whom discharge is safe.

In this study, patients with CAP discharged in accordance with the CPG tended to do well, while death rates increased by a factor of 12 in the group discharged against the recommendations. Of the five patients who died within 30 days of being discharged according to the recommendations of the guidelines (table 3), four had only tentative ED diagnoses of pneumonia, while one was diagnosed with pneumonia not responding to an initial course of antimicrobial treatment. Four patients seem to have died of occlusive vascular disease, although one developed sepsis after angioplasty that may have been related to pneumonia. The other patient was readmitted in respiratory failure, but the cause of her death seems to have been multifactorial, and the accuracy of the diagnosis of pneumonia could be questioned. No patients underwent necropsy.

The retrospective nature of our audit leaves our results with all of the limitations of such methodology. We attempted to mitigate these weaknesses by strict standardisation of our audit methods.

One hundred and fifty three of 867 (17.6%) patients audited, and 112 of 685 (16.4%) of those discharged according to the CPG (including four of the five that subsequently died), had diagnoses of "possible" pneumonia. In the vast majority of these cases, the uncertainty was based on the fact that radiological evidence of consolidation was equivocal (another 22 patients had the diagnosis made without radiographs). This suggests that the actual diagnosis may have been something other than pneumonia in some patients. All patients were prescribed antimicrobial medication aimed at treating CAP, and this group again reflects the reality of ambulatory ED CAP treatment and thus were included as an "intent to treat" group. We have no way of saying how many of the more definite "pneumonia" diagnoses were in fact correct.

The implementation of guidelines is fraught with difficulty,^{11,12} and on the introduction of the guideline, it was emphasised that the guideline was intended as a guide and was in no way designed to supercede clinical judgment. We were not surprised, therefore, that 182 (21%) patients were discharged with PSI scores in excess of 90. This is not to suggest that all of these discharges were inappropriate. In fact palliative treatment (the apparent aim in almost half of these patients,) might often be appropriately carried out at home or in a nursing home.

The study was designed to assess the safety of the guideline for making the decision to discharge patients with CAP from the ED. Because we only looked at patients who had been discharged, our mortality results cannot be directly compared with those of Fine *et al*⁸ who included both admitted and discharged patients in their results. Because this study focused only on discharged patients, we did not obtain the proportion of patients with PSI scores <91 and who did meet the additional discharge criteria who were admitted. Theoretically, this could result in a false sense of security, and

Table 1 Mortality according to PSI score⁸

Class	Points	Mortality
Class I and II	<71	1/482–0.21%
Class III	71–90	4/203–2.03%
Class IV	91–130	9/159–5.66%
Class V	>130	8/23–34.78%

Table 3 Details of patients with PSI < 91 who died within 30 days of ED discharge

Visit date	Age	PSI	Clinical details
19/6/00	62	82	62 year old man with a history of COPD and NIDDM. Discharged with a diagnosis of "possible lingular pneumonia", Admitted three days later in cardiogenic shock. Developed sepsis and DIC after angioplasty.
8/4/00	21	41	21 year old female nursing home resident with spina bifida, hydrocephalus, morbid obesity, decubitus ulcers, an ileal conduit and asthma. Radiograph "sub-optimal due to body habitus, but ? atelectasis vs consolidation" Discharged on doxycycline. Readmitted two days later in "respiratory failure and hypercapnoic narcosis secondary to restrictive lung disease". ICU course complicated by renal failure and the inability to obtain vascular access for dialysis. Died 12 days after admission after a decision to withdraw active support.
23/1/00	57	77	56 year old man with a history of CVA at age 46 and trigeminal neuralgia. Presented with "persistent pneumonia" after 10 days of treatment with cefuroxime. Discharged on erythromycin. Collapsed suddenly at home 29 days later. Death certified as "sudden cardiac death"
17/11/99	78	78	78 year old woman with a history of coronary artery disease, congestive heart failure, pneumonia and rheumatoid arthritis, discharged as "? early pneumonia". Discharged on azithromycin. Collapsed suddenly 23 days later while riding in a taxi. Death certified as "Sudden cardiac death"
26/12/99	81	81*	81 year old male nursing home resident with a prior history of pneumonia and Congestive heart failure, diagnosed as "? RML pneumonia" Discharged on azithromycin. Admitted the following day with hemiplegia. Admitted to the stroke unit, died three days after admission. Death certified as "cerebro-vascular accident"
Average	59.8	71.8	None of the above patients underwent necropsy.

*In view of the history of congestive heart failure his PSI should have been calculated at 91. He was included in this category because of the ad hoc decision to use the PSI calculated in the ED.

people applying the guideline blindly might send home types of patients who were actually admitted during our study period. In the current situation of inpatient bed shortages and pressure to treat patients as outpatients, together with the fact that 21% of patients in whom the guideline suggested admission, yet were treated as outpatients, we believe strongly that admission of patients not clearly too sick to be discharged occurs very rarely and usually only for social reasons.

PSI scores were calculated from data available on the chart. Where calculated PSI scores differed from scores entered on the chart by physicians, the score on the chart was used, because it was the one that the physician would have used to decide disposition, and, if incorrect, reflects the reality of using clinical scoring systems; if the calculation is incorrect, it is still used to make a clinical decision. Missing data may have allowed us to underestimate scores, resulting in patients being placed in lower PSI groups than they actually should have been. This would actually strengthen our conclusions about the safety of outpatient treatment of CAP.

Finally, we were only able to follow up readmission rates for the two sole hospitals in the region with inpatient facilities. It is possible that patients were admitted to hospitals in neighbouring regions or, in the case of visitors to the region, to remote sites. Similarly, in using the Nova Scotia coroner to access data on deaths, we may have missed deaths that occurred out of the province.

In conclusion, the use of a clinical practice guideline to guide the discharge of adult patients from the ED seems to be associated with a low mortality and a low re-admission rate. Prognosis for adults discharged from the ED with CAP is generally good.



The clinical practice guideline for community acquired pneumonia is available on the journal web site (<http://www.emjonline.com/supplemental>).

Authors' affiliations

S G Campbell, D G Urquhart, D M Maxwell, S A Ackroyd-Stolarz, D D Murray, A Hawass, Department of Emergency Medicine, Dalhousie University, Halifax, Nova Scotia, Canada
W Patrick, Department of Medicine, Dalhousie University

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PNEUMONIA SEVERITY SCORE	
Demographic Factors:	Score
Male	Age
Female	Age -10
Nursing home resident	+10
Coexisting Illnesses: (see definitions)	
Neoplastic disease	+30
Liver disease	+20
Congestive heart disease	+10
Cerebrovascular disease	+10
Renal disease	+10
Physical Examination Findings:	
Altered mental status	+20
Respiratory rate ≥ 30 /min	+20
Systolic blood pressure < 90 mmHg	+20
Temperature $< 35^{\circ}\text{C}$ or $\geq 40^{\circ}\text{C}$	+15
Pulse ≥ 125 /min	+10
Laboratory and Radiographic Findings:	
Arterial pH < 7.35 (do ABG if hypoxic or COPD)	+30
Urea ≥ 11 mmol/L	+20
Sodium < 130	+20
Glucose ≥ 14 mmol/L	+10
PaO ₂ < 60 mmHg or O ₂ Sat $< 90\%$	+10
Pleural effusion	+10

Adapted from Fine MJ, Auble TE, Yealy DM et.al. A prediction rule to identify low risk patients with CAP. NEJM 1997;336:243-50.

Definitions of Co-Existing Illness

Neoplastic Disease: cancer; (except basal or squamous cell carcinoma of the skin), active at presentation or within one year of presentation for CAP.

Liver Disease: clinical or histologic diagnosis of cirrhosis or chronic active hepatitis

Congestive Heart Failure: systolic or diastolic dysfunction documented by history, physical exam or prior investigations

Cerebrovascular Disease: diagnosis of stroke or TIA, clinically or as suggested by imaging

Renal Disease: chronic renal disease or abnormal urea/creatinine documented

Altered Mental Status: stupor, coma, or disorientation as to person, place or time that is known not to be chronic

Appendix 1 (a)



CLINICAL PRACTICE GUIDELINES FOR ADULT COMMUNITY-ACQUIRED PNEUMONIA (CAP)

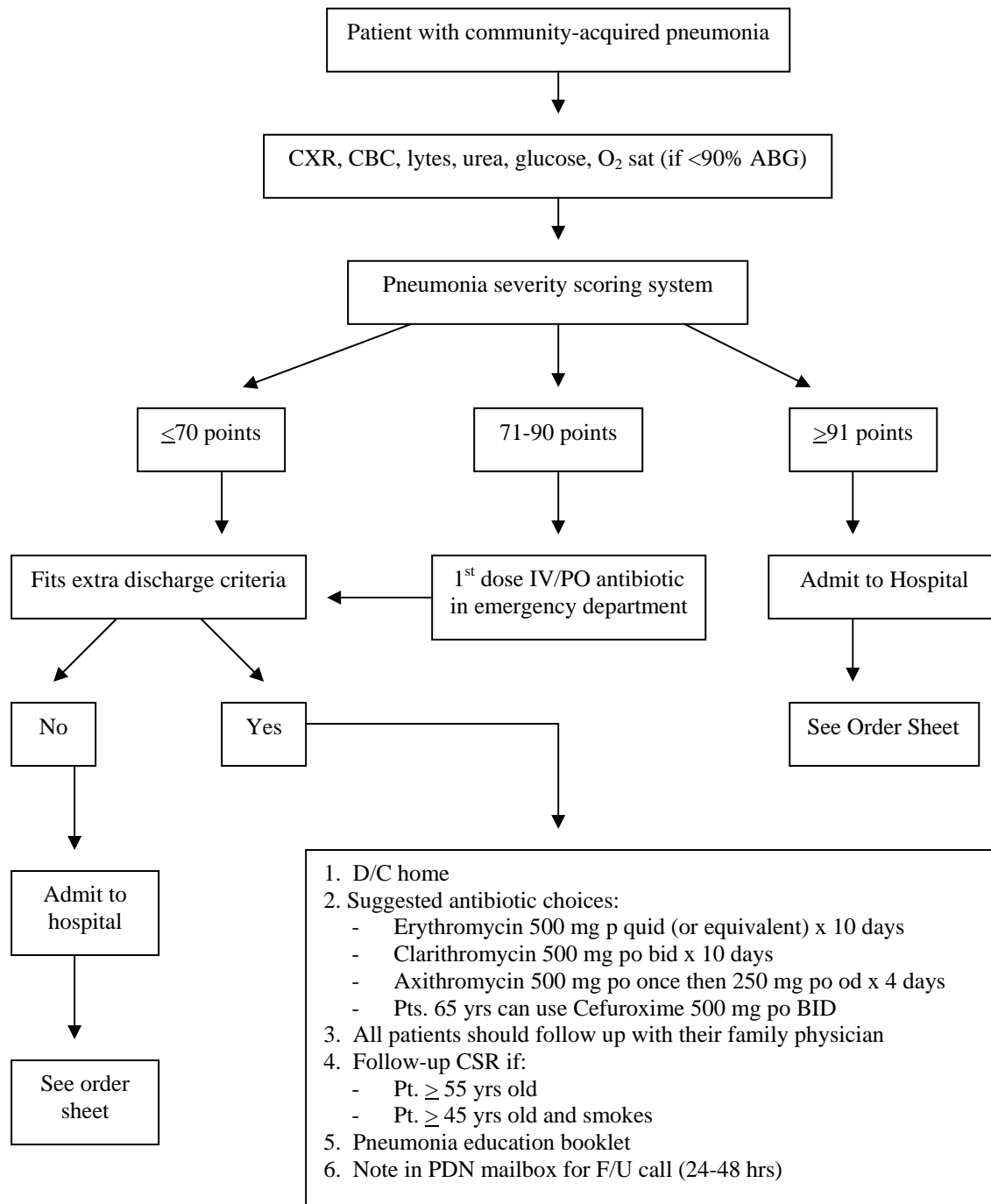
Criteria for Pneumonia Pathway (at least two)

- Clinical signs of pneumonia with evidence of consolidation on physical examination (crackles, dullness to percussion, egophony)
- New pulmonary infiltrate in CXR compatible with pneumonia
- At least two of:
 - fever
 - cough
 - pleuritic chest pain
 - shortness of breath
 -

Exclusion Criteria for CAP Pathway

- HIV/AIDS with a CD4 count ≤ 200
- Transplantation (solid organ or bone marrow)
- Immunosuppressive drugs (including prednisone ≥ 10 mg/day for ≥ 2 months)
- Hematological malignancy
- Suspicion or diagnosis of tuberculosis
- Cystic fibrosis
- Hospitalization within the last 14 days
- ICU admission

Appendix 1(b).



Extra Discharge Criteria		
1. The patient's O ₂ sat >90% on R/A (or if COPD paO ₂ >55)	Yes	No
2. Will the patient tolerate oral medications?	Yes	No
3. Will the patient likely be compliant?	Yes	No
4. Are home supports sufficient?	Yes	No

If you have answered NO to any of the questions, consider admission