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

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Accepted for publication 2 February 2004

Clinical practice guidelines have been shown to decrease admission rates and length of hospital stays for community acquired pneumonia (CAP). They have also improved process of care factors that have been associated with improved outcomes and have been well accepted by physicians. 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. 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. 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 II) 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.

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 (9.0%) 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 inpatient facilities, and from the provincial coroner, respectively.

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, making decisions as to the site of care is often based on inconsistent, subjective impressions, and the objective scoring system described by Fine et al can make the decision a lot 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 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. 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, 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 supersede 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 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 2 Breakdown of age, PSI, and ED diagnosis for patients discharged with PSI <91 |
|-----------------|-----------------|-----------------|
| 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 1 Mortality according to PSI score

<table>
<thead>
<tr>
<th>Class</th>
<th>Points</th>
<th>Mortality</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class I and II</td>
<td>&lt;71</td>
<td>1/482-0.21%</td>
</tr>
<tr>
<td>Class III</td>
<td>71–90</td>
<td>4/203-2.03%</td>
</tr>
<tr>
<td>Class IV</td>
<td>91–130</td>
<td>9/159-5.66%</td>
</tr>
<tr>
<td>Class V</td>
<td>&gt;130</td>
<td>8/23-34.78%</td>
</tr>
</tbody>
</table>
reasons. to be discharged occurs very rarely and usually only for social

With the fact that 21% of patients in whom the guideline

and pressure to treat patients as outpatients, together

in period. In the current situation of inpatient bed shortages

people applying the guideline blindly might send home types

have been. This would actually strengthen our conclusions

about the safely 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 hos-

pitals 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

generally good.

The clinical practice guideline for community acquired

pneumonia is available on the journal web site

[http://www.emjonline.com/supplemental].

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

<table>
<thead>
<tr>
<th>Visit date</th>
<th>Age</th>
<th>PSI</th>
<th>Clinical details</th>
</tr>
</thead>
<tbody>
<tr>
<td>19/4/00</td>
<td>62</td>
<td>82</td>
<td>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.</td>
</tr>
<tr>
<td>8/4/00</td>
<td>21</td>
<td>41</td>
<td>21 year old female nursing home resident with spine 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 hypcapnoeic 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.</td>
</tr>
<tr>
<td>23/1/00</td>
<td>57</td>
<td>77</td>
<td>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”.</td>
</tr>
<tr>
<td>17/11/99</td>
<td>78</td>
<td>78</td>
<td>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”.</td>
</tr>
<tr>
<td>26/12/99</td>
<td>81</td>
<td>81*</td>
<td>81 year old male nursing home resident with a prior history of pneumonia and Congestive heart failure, diagnosed as “? RMS 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”</td>
</tr>
</tbody>
</table>

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.

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Funding: none.

Conflicts of interest: none declared.

**REFERENCES**


**PNEUMONIA SEVERITY SCORE**

<table>
<thead>
<tr>
<th>Demographic Factors:</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>Age</td>
</tr>
<tr>
<td>Female</td>
<td>Age +10</td>
</tr>
<tr>
<td>Nursing home resident</td>
<td>+10</td>
</tr>
</tbody>
</table>

**Coexisting Illnesses: (see definitions)**

<table>
<thead>
<tr>
<th>Illness</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Neoplastic disease</td>
<td>+30</td>
</tr>
<tr>
<td>Liver disease</td>
<td>+20</td>
</tr>
<tr>
<td>Congestive heart disease</td>
<td>+10</td>
</tr>
<tr>
<td>Cerebrovascular disease</td>
<td>+10</td>
</tr>
<tr>
<td>Renal disease</td>
<td>+10</td>
</tr>
</tbody>
</table>

**Physical Examination Findings:***

<table>
<thead>
<tr>
<th>Finding</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Altered mental status</td>
<td>+20</td>
</tr>
<tr>
<td>Respiratory rate ≥30/min</td>
<td>+20</td>
</tr>
<tr>
<td>Systolic blood pressure &lt;90 mmHg</td>
<td>+20</td>
</tr>
<tr>
<td>Temperature &lt;35°C or ≥40°C</td>
<td>+15</td>
</tr>
<tr>
<td>Pulse ≥125/min</td>
<td>+10</td>
</tr>
</tbody>
</table>

**Laboratory and Radiographic Findings:**

<table>
<thead>
<tr>
<th>Test</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arterial pH ≤7.35 (do ABG if hypoxic or COPD)</td>
<td>+30</td>
</tr>
<tr>
<td>Urea ≥11 mmol/L</td>
<td>+20</td>
</tr>
<tr>
<td>Sodium &lt;130</td>
<td>+20</td>
</tr>
<tr>
<td>Glucose ≥14 mmol/L</td>
<td>+10</td>
</tr>
<tr>
<td>PaO2 &lt;60 mmHg or O2 Sat &lt;90%</td>
<td>+10</td>
</tr>
<tr>
<td>Pleural effusion</td>
<td>+10</td>
</tr>
</tbody>
</table>

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**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

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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.

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**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).

Patient with community-acquired pneumonia

CXR, CBC, lytes, urea, glucose, O₂ sat (if <90% ABG)

Pneumonia severity scoring system

≤70 points

Fits extra discharge criteria

Admit to hospital

See order sheet

≥91 points

1st dose IV/PO antibiotic in emergency department

Admit to Hospital

See Order Sheet

71-90 points

Yes

1. D/C home
2. Suggested antibiotic choices:
   - Erythromycin 500 mg p quid (or equivalent) x 10 days
   - Clarithromycin 500 mg po bid x 10 days
   - Axithromycin 500 mg po once then 250 mg po od x 4 days
   - Pts. 65 yrs can use Cefuroxime 500 mg po BID
3. All patients should follow up with their family physician
4. Follow-up CSR if:
   - Pt. ≥ 55 yrs old
   - Pt. ≥ 45 yrs old and smokes
5. Pneumonia education booklet
6. Note in PDN mailbox for F/U call (24-48 hrs)

Extra Discharge Criteria

1. The patient’s O₂ sat >90% on R/A (or if COPD paO₂>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