

Care plan for community-acquired pneumonia

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This paper presents a critical pathway for the treatment of pneumonia that has been shown to be effective in a randomized clinical trial. The pathway uses a pneumonia-specific severity of illness score to guide the admission decision. Early administration of antibiotics (within 8 h of arrival at the emergency room) is stressed.

Key Words: *Critical pathway; Pneumonia; Processes of Care*

Plan de soins pour la pneumonie extra-hospitalière

RÉSUMÉ : Cet article présente un plan de traitement de la pneumonie qui s'est révélé efficace dans le cadre d'un essai clinique randomisé. Ce plan repose sur un indice de gravité de la maladie spécifique à la pneumonie pour guider la décision d'hospitaliser ou non. On souligne l'importance d'administrer les antibiotiques sans délai, c'est-à-dire dans les huit heures qui suivent l'arrivée au service des urgences.

Community-acquired pneumonia (CAP) is a serious and common infection. The overall attack rate is 12/1000 population/year, and 20% to 50% of all adults with pneumonia are admitted to hospital. The hospitalization rate for CAP increases with age; for example, in the 35- to 44-year-old age group living in Halifax County, 0.54/1000 population/year were hospitalized, while for those older than 75 years, 11.6/1000 population/year required hospitalization for the treatment of pneumonia (1). The mortality rate from pneumonia requiring hospitalization can be as high as 21% (2). Fortunately, mortal-

ity is rare among those who are not hospitalized (3). The major reason for the high mortality among hospitalized patients is that these individuals frequently have severe comorbidities (chronic obstructive pulmonary disease, ischemic heart disease, cerebrovascular disease, dementia) that predispose a person to pneumonia or are made worse by pneumonia. However, the mortality rate from pneumonia is low, 4% or less in some centres where less seriously ill patients predominate. Thus, to compare data among different institutions, adjustment for the severity of illness is necessary.

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TABLE 1
Severity of illness scoring system for community-acquired pneumonia

Patient characteristics	Points assigned
Demographics	
Age – Male	Age (in years)
Age – Female	Age (in years) – 10
Nursing home resident	+10
Comorbid illness	
Neoplastic disease	+30
Liver disease	+20
Congestive heart failure	+10
Cerebrovascular disease	+10
Renal disease	+10
Physical examination findings	
Altered mental status	+20
Respiratory rate >30 breaths/min	+20
Systolic blood pressure <90 mmHg	+20
Temperature <35°C or >40°C	+15
Pulse >125 beats/min	+10
Laboratory findings	
pH ≤7.35	+30
Blood urea nitrogen >10 mM/L	+20
Sodium concentration <130 mM/L	+20
Glucose concentration >13.9 mM/L	+10
Hematocrit <30%	+10
Partial pressure of oxygen <60 mmHg or oxygen saturation <90%	+10
Pleural effusion	+10

Information taken from reference 9

Many microbiological agents can cause pneumonia, and there may be considerable difficulty in arriving at an etiological diagnosis (1). The antimicrobial treatment of pneumonia of an unknown etiology often has to be empirical. Guidelines for the empirical treatment of CAP have been issued by Canadian (3), British (4) and American (5) expert committees. These guidelines, however, only deal with initial therapy, and no recommendations were made regarding the duration of therapy. Indeed, most sources avoid dealing with this issue.

Fine et al (6), in a study of the length of stay for pneumonia at one Boston, USA and three Pittsburgh, USA facilities, found the unadjusted mean lengths of stay to be 9.3, 12.1, 9.1 and 6.6 days, respectively. There were no differences in outcome as measured by mortality rates at six weeks. Severity of illness accounted for only 7% of the variation in the length of stay. Nine independent variables (pneumonia risk class [three classes], age, nursing home residence, more than one comorbid illness, bacteremia, hyponatremia, anemia and renal impairment) accounted for another 14% of the variation. Thus, most of the variation was unexplained by disease-specific factors (6,7). Weingarten et al (8) carried out a retrospective study of 503 patients hospitalized with CAP and found 166 patients (33%) who fit their study's low risk category. They noted that if these patients had been discharged on day 4, then 619 bed days would have been saved. The average length of stay for low risk patients was 7.73 days, with a standard deviation of 6.12 days.

Another major source of variation in processes of care is

TABLE 2
Strata used to classify patients with community-acquired pneumonia

Class	Description	Outpatients		Inpatients	
		Patients studied (n)	Patients dying (%)	Patients studied (n)	Patients dying (%)
I	<50 years old, no comorbidity	587	0	185	0.5
II	≤70 points, >50 years old	244	0.4	233	0.9
III	71 to 90 points, >50 years old	72	0	254	1.2
IV	91 to 130 points, >50 years old	40	12.5	446	9.0
V	≥131 points, >50 years old	1	0	225	27.1
Total		944	0.6	1343	8

the admission rate for pneumonia. This rate can vary severalfold from one country to another or within the same province or state. Fine et al (9) developed a simple severity of illness scoring system for pneumonia. Using this system, points are assigned to various features that have been associated with a poor outcome in pneumonia (Table 1). This scoring can be used easily to classify patients with CAP into five strata. Table 2 gives the number of points used per strata and the mortality rates for each strata. This system is easy to apply and should reduce variation in admission rates for pneumonia if it is used to help in the admission decision. In general, patients in risk classes I and II can be treated at home. Patients in risk class III may need a period of observation in the emergency room. Those who are improving can be sent home, and those who are not should be admitted. Patients in risk classes IV and V should be admitted. This severity of illness scoring system has now been validated as a tool to help in the admission decision (10). However, there are always factors that cannot be captured in any scoring system; thus, the physician's judgement must still be used.

Why do such variations in the treatment of pneumonia exist? Such variations are not unique to pneumonia, and indeed, almost any condition that has been studied documents variations in hospital admission rates (11,12), surgical procedure rates (13,14) and length of hospital stay (15,16). The reasons for these variations are complex and, as previously indicated, are only partially accounted for by severity of illness. It is likely that local (small area) practice patterns and physician factors account for most of this variation. To reduce the variation, utilization management (a set of techniques to manage health care costs by influencing patient care decision-making through case-by-case assessments) (17) has been a growing trend in the United States (18). Utilization management is used to some extent in Canada, but because of a single payer system, there has been no incentive for private insurance companies to become involved in this aspect of health care in Canada. Instead, most utilization management programs are initiatives by individual hospitals, often targeting conditions

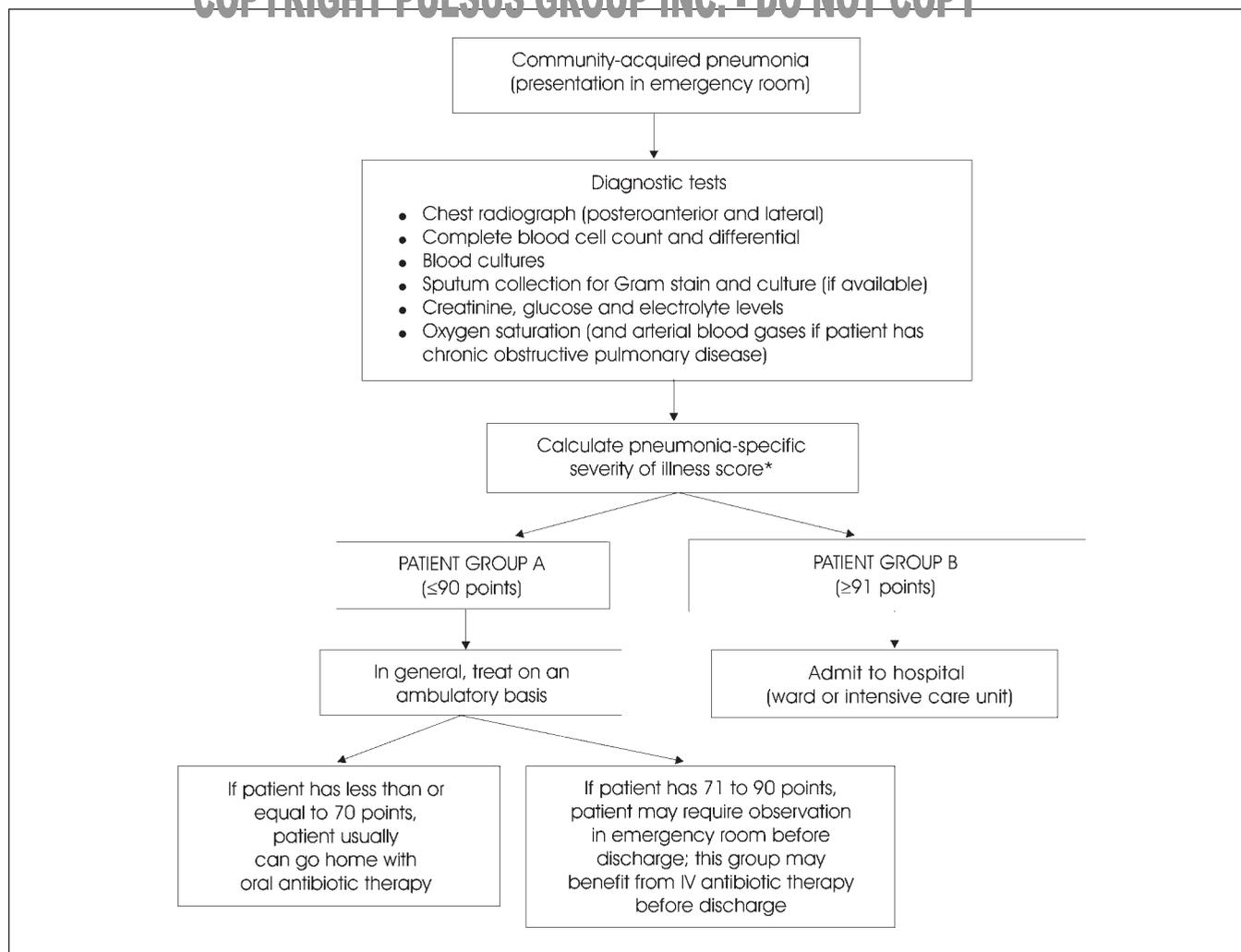


Figure 1) Adult treatment care plan for community-acquired pneumonia. *Information taken from reference 9. IV Intravenous

that have been identified as outliers by national or local quality of care reviews.

Another method to reduce variations in medical care has been the development of practice guidelines (19-21). Tunis et al (22) found that the source of the guidelines was important in physician compliance. In the United States, physicians tended to distrust guidelines issued by general insurance companies, whereas they had confidence in guidelines issued by their specialty or subspecialty society. Moreover, they felt that colleagues and review articles had a greater effect on their clinical practice than guidelines, original research or texts. This is supported by the observation that physician opinion leaders (those who adopt and disseminate new medical technologies or clinical management strategies more readily than their colleagues) affect practice change on a local level (23-25).

ANTIBIOTIC THERAPY

In most instances, the treatment of CAP is empirical. Indeed, an etiological diagnosis is established in only 60% of patients, even in research studies (2). Guidelines for the empirical antimicrobial treatment of pneumonia are based on the severity of

illness and the site of treatment (outpatient or inpatient in ward or intensive care unit) (3,5). Currently, most patients who are admitted to hospital receive two antibiotics, usually erythromycin and cefuroxime (3). The emergence of penicillin-resistant *Streptococcus pneumoniae* has added to the clinician's difficulty in choosing an antibiotic therapy. The guidelines that were recently issued by the Infectious Diseases Society of America (26) for the empirical antibiotic treatment of CAP recognize the importance of penicillin-resistant *S pneumoniae* and suggest treatment with a fluoroquinolone with enhanced activity against *S pneumoniae* (levofloxacin, sparfloxacin) in this setting.

Recently, in an effort to conserve scarce resources, there has been emphasis on 'step-down' antibiotic therapy, defined as an early switch from an intravenous antibiotic to an oral antibiotic of the same class (27,28). In a randomized trial of early conversion to oral antibiotics compared with usual care in 82 patients with CAP (53 cases and 29 controls), Ehrekrantz et al (26) found that if physicians were provided with the recommendations of a nurse-interventionist on a patient-specific basis, the average length of stay was reduced by 2.4 days and average costs were reduced by US\$884 per patient among the

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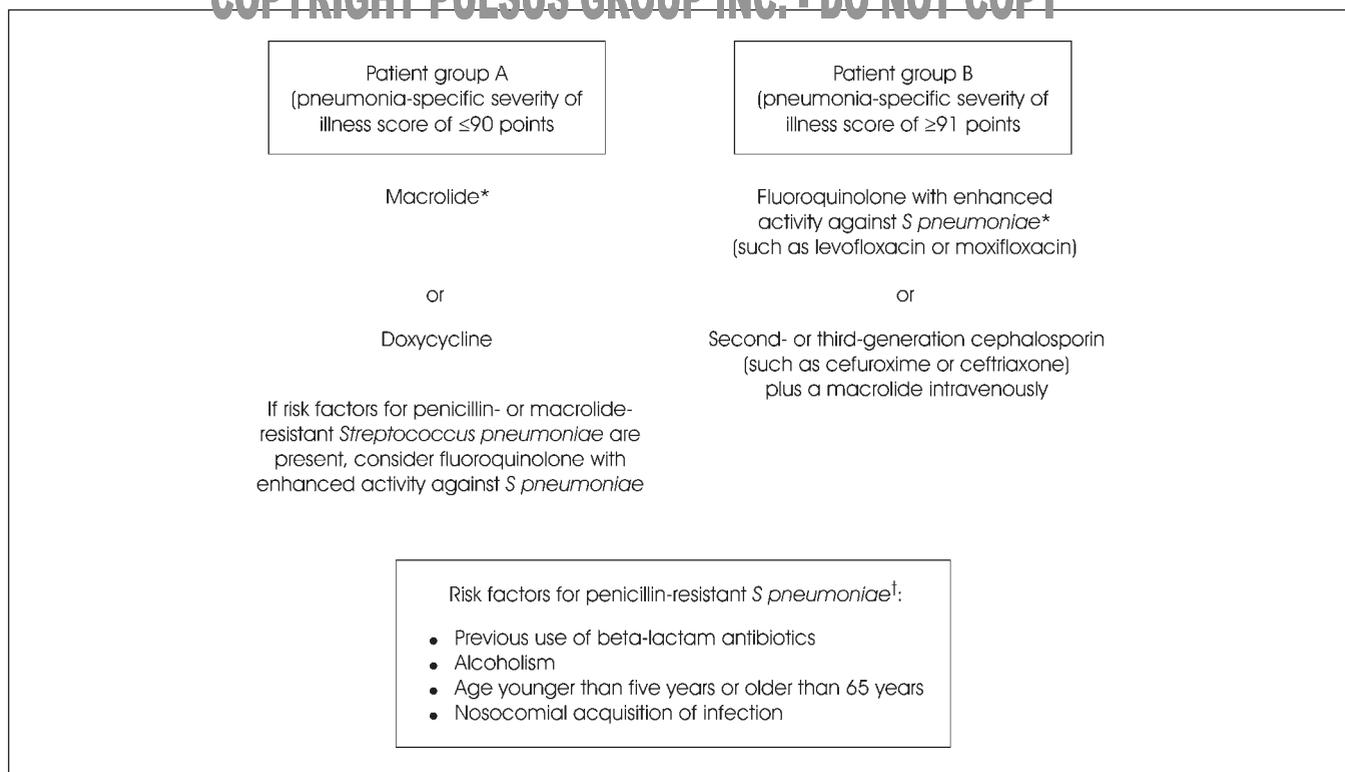


Figure 2) Antibiotic treatment for patients with community-acquired pneumonia. *Information taken from reference 29. [†]Information taken from reference 30

79% of patients whose physicians agreed to follow the nurse-interventionist recommendation.

Marrie et al have studied various aspects of CAP at the Victoria General Hospital in Halifax since 1977. On the basis of experience with over 1600 patients (studied and reported) with CAP, the patients can be assessed on the third hospital day and a decision can be made regarding a switch to oral antibiotic therapy and early discharge. However, it is recognized that delays in discharge can occur because of delays in test scheduling, physician decision-making, discharge planning and procedure scheduling. Indeed, in one study, delays could be classified as one of nine major categories or one of 166 sub-categories. Nevertheless, by the third hospital day, it is usually evident who is doing well and who is not.

The pneumonia care plan that appears in Figures 1 to 3 is based on the best currently available data. Data from a randomized clinical trial indicate that a pathway such as outlined here can result in an 18% reduction in the admission rate for patients in risk classes I to III ($P=0.01$), 1.7 fewer days of intravenous antibiotic treatment and an increased probability of receiving only one class of antimicrobial treatment (64% compared with 27%, $P<0.001$) (10). The flow chart in the care plan does provide references to many aspects of this care; however, in other aspects, such as the recommendation to observe risk group III patients in the emergency room and to give one or more doses of intravenous antibiotics in this setting, the evidence is expert opinion. It is apparent that ongoing studies are needed to improve the care of patients with CAP.

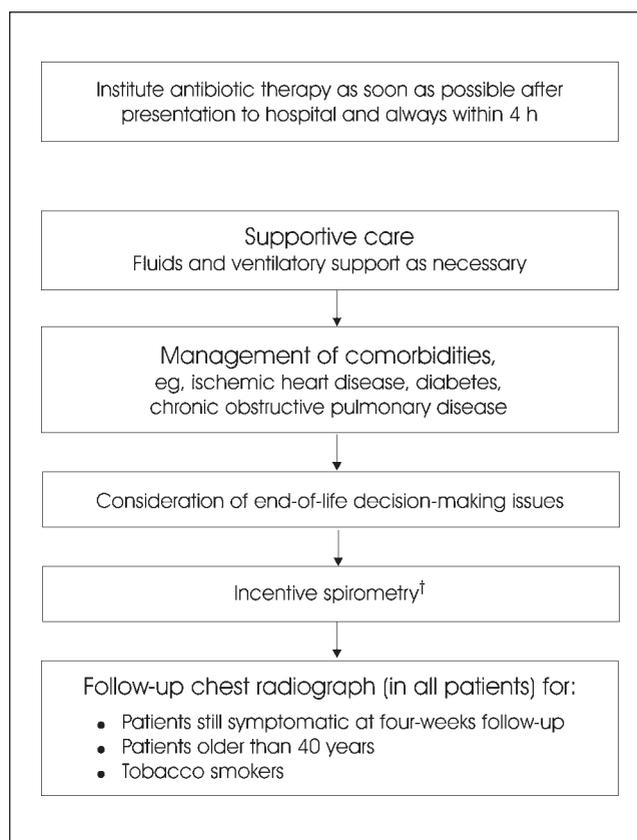


Figure 3) General aspects of treatment of community-acquired pneumonia requiring hospitalization. *Information taken from reference 31. [†]Information taken from reference 32

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