

## Evaluation of an Assessment System for the JRS 2005: A-DROP for the Management of CAP in Adults

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### Abstract

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**Objective** The Japanese Respiratory Society (JRS) last revised the guidelines for community-acquired pneumonia (CAP) in adults in 2005. These guidelines proposed new criteria (A-DROP) to assess the severity of pneumonia and to differentiate between typical bacterial pneumonia and atypical pneumonia. The goal of the present study was to evaluate the utility of the A-DROP criteria for these described purposes.

**Methods** An observational survey was conducted between July 2006 and March 2007, and patients with CAP were prospectively surveyed using consecutive enrollment methods.

**Patients** In total, 1,875 patients from 200 medical facilities throughout Japan were analyzed.

**Results** The JRS 2005 A-DROP system was a good indicator of mortality in the patient population, and these results were significantly correlated with the Pneumonia Severity Index (PSI) of the Infectious Disease Society of America (IDSA). Among the various factors characterized, ‘SpO<sub>2</sub> of 90% or less (PaO<sub>2</sub> of 60 Torr or less)’ was the strongest predictor of mortality. In terms of the differential diagnosis between typical bacterial and atypical pneumonia, five of six JRS 2005 items were strongly and significantly correlated with a diagnosis of atypical pneumonia.

**Conclusion** The JRS 2005 A-DROP system was accurate and clinically useful for the assessment of the severity of pneumonia and for the differentiation between typical bacterial pneumonia and atypical pneumonia.

**Key words:** A-DROP system, bacterial pneumonia, atypical pneumonia, The Japanese Respiratory Society, guidelines, community-acquired pneumonia

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### Introduction

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Community-acquired pneumonia (CAP) is a common and clinically important infectious disease that affects adults worldwide. The clinical symptoms and consequences of CAP may vary with patient age, severity of the underlying disease, and causal microorganisms, which can sometimes confound clinical assessment, patient triage, and determination of the prognosis at initial presentation (1-4).

Medical care guidelines for CAP were sequentially published and revised in Europe and the USA in the 1990s (3-5). The Japanese Respiratory Society (JRS) also released their “Basic Concepts in the Medical Care of CAP in Adults” (JRS 2000) (6), with subsequent revision under

the title, “Guidelines for the Management of CAP in Adults” (JRS 2005) (7). These guidelines were designed to apply to the general population and are now regularly used by physicians specializing in medical fields other than pulmonology.

The JRS proposed relatively simple criteria to assess the severity of CAP. This strategy, known as the “A-DROP system” (7), was a modified version of the “CURB-65” system of the British Thoracic Society (BTS) and was intended to help predict patient mortality and to help select the appropriate venue for ongoing care; i.e., outpatient treatment or consideration of hospitalization for mild to moderate cases versus admission to the intensive care unit for moderate to severe cases (7, 8). Indeed, several publications showed that CURB-65 was handier than IDSA/PSI and provided suffi-

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cient data for clinical use (9).

The JRS also regards the differential diagnosis of typical bacterial pneumonia versus atypical pneumonia to be important, especially because macrolide-resistant pneumococcus is highly prevalent in the Japan, making macrolides a poor first-line therapy for bacterial pneumonia (6, 7, 10-12) and because respiratory fluoroquinolones are not given via the intravenous route in Japan (7, 8). Therefore, the JRS has proposed diagnostic criteria to differentiate between typical bacterial and atypical pneumonia and has recommended penicillins or macrolides as first-line therapy for typical bacterial pneumonia or atypical pneumonia, respectively (7).

Despite the widespread use of these guidelines, there has been no definitive examination of the correlation between JRS A-DROP assessed severity of pneumonia and patient outcomes or of the utility of JRS differentiation of typical bacterial pneumonia versus atypical pneumonia. Therefore, the goal of the present study was to show some conclusive or confirming result to evaluate the accuracy and clinical utility of the JRS A-DROP system to assess the severity of pneumonia and the differential diagnosis between typical bacterial pneumonia and atypical pneumonia.

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## Materials and Methods

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### Subjects

Subjects were adult patients with CAP treated by physicians specializing in respiratory diseases among 200 medical facilities throughout Japan between July 2006 and March 2007. A prospective observation approach was used in this cohort study.

Patients were older than 16 years and had clinical symptoms of cough, sputum production, and fever. In all cases, chest X-ray examination or computed tomograph (CT) scans of the chest revealed shadows corresponding with acute infiltrates. Patients who had developed pneumonia more than 48 hours after admission (hospital-acquired pneumonia) and those who showed signs of improvement due to previous antimicrobial treatment were not included. This trial was approved by the institutional review board of each participating medical facility, including Nagasaki University and Tohoku University, and all patients were given an explanation of this observational study in advance and provided full written informed consent to participate in this study.

A continuous enrollment system was adopted to minimize treating physician bias. All patients meeting the inclusion criteria after initiation of the survey were enrolled in this study until a predetermined number was reached at each medical facility.

### **Assessment of severity according to JRS 2005, and stratification of risk according to Infectious Disease of America (IDSA) guidelines**

The assessment of severity by the JRS 2005 A-DROP system is based on five clinical features: age (A), dehydra-

tion (D), respiration (R), orientation (O) and blood pressure (P). In this study, cases were regarded as “mild” with none of the five criteria met, as “moderate” with one or two of the criteria met, as “severe” with three of the criteria met, and as “extremely severe” with four or five of the criteria met (7). Any patient showing signs of shock or altered mental status was deemed to have extremely severe pneumonia, regardless of the number of criteria fulfilled.

Risk stratification was performed according to IDSA guidelines by calculating the Pneumonia Severity Index (PSI) as follows (4): a score of zero = low-risk class I; a score  $\leq 70$  points = low-risk class II; a score between 71 and 90 points = low-risk class III; a score between 91 and 130 points = intermediate-risk; a scores  $>130$  points = high-risk. In some cases, particular observations and examinations were not conducted, such as scores for these items were counted as zero for the calculations.

In order to compare the degree of severity as categorized by JRS 2005 A-DROP with the risk classes specified by IDSA, the “mild” designation was paired with the low-risk classes I-III, the “moderate” designation was paired with the intermediate-risk class, and the “severe” and “extremely severe” designations were paired with the high-risk class. For scoring, mild, moderate, severe and extremely severe corresponded to one, two, three and four points, respectively.

Outcomes were evaluated 30 days after initiation of the first-line therapy, and the survival rate was estimated.

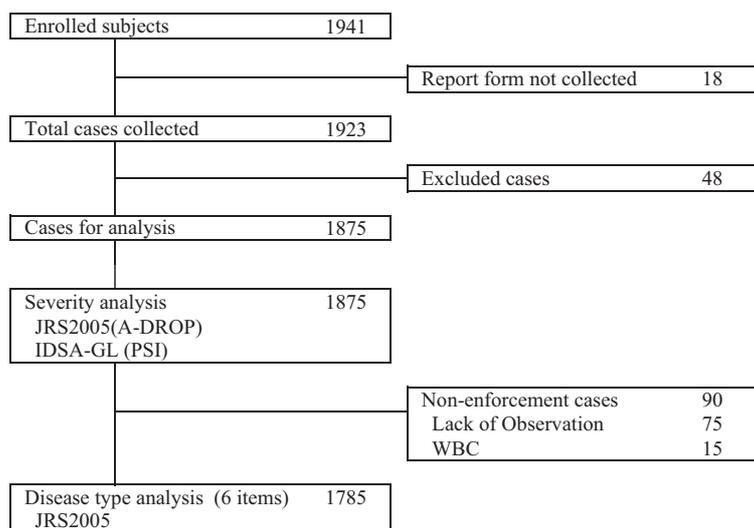
### **Microbiological data analysis**

Sputum samples were obtained for bacterial testing prior to initiating first-line therapy. Causative organisms were identified by taking into account the number of viable cells and known pathogenicity (7, 8). Moreover, the pathogens of atypical pneumonia were identified by acute-phase serologic test (complement fixation and particle agglutination methods), ‘IMMUNOCARD test’ (serum enzyme immunoassay methods) (Nihon TFB Co., Ltd., Tokyo, Japan).

### **Differential diagnosis between typical bacterial pneumonia and atypical pneumonia**

Criteria used to assess for the presence of atypical pneumonia in patients with unknown causal microorganisms included: under 60 years of age, no or minor underlying disease, stubborn cough, poor chest auscultatory findings, no sputum or no identified aetiological agent by rapid diagnosis, and a peripheral white blood cell count below 10,000/ $\mu\text{L}$  (7). The patients were classified as having either “suspected atypical pneumonia”, when four or more of the six criteria were met, or having “suspected typical bacterial pneumonia” when less than four of the criteria were met.

An earlier version of the JRS guidelines (JRS 2000) also included three other factors (cluster of pneumonia among family members or close associates, absence of tachycardia in the context of fever, and ground glass opacity or skip lesion on chest X-ray), which were also assessed in the present study (6).



**Figure 1.** Case breakdown.

**Table 1.** Patient Characteristics according to Severity Classification

Indicators (A-DROP)	No	Yes	Severity classification			
			Total (%)	Mild	Moderate	Severe
Male aged 70 years or older female aged 75 years or older	1080 (57.6)	795 (42.4)	0	598	154	43
BUN of 21mg/dL or more, or presence of dehydration	1448 (77.2)	427 (22.8)	0	236	148	43
SpO <sub>2</sub> of 90% or less(PaO <sub>2</sub> of 60 Torr or less)	1441 (76.9)	434 (23.1)	0	245	146	43
Disturbance of consciousness	1780 (94.9)	95 (5.1)	0	22	35	38
Blood pressure (systolic) of 90 mmHg or less	1836 (97.9)	39 (2.1)	0	13	9	17
Total (%)		1875	857 (45.7)	808 (43.1)	164 (8.7)	46 (2.5)

### Statistical analysis

Relative coefficients were used for all statistical analyses, which were conducted using the SAS software program (SAS, version 9.1; SAS Institute Inc., Cary, NC). Comparisons between severity and the mortality risk were assessed using Receiver Operating Characteristic (ROC) analysis. Relationships between items were assessed using multiple logistic regression analysis.  $p < 0.05$  was considered statistically significant.

## Results

### Patient population

In total, 1,941 patients treated among 200 medical facilities throughout Japan were enrolled in this survey, and 1,923 responses were collected. The respondents included two patients who were younger than 16 years, 14 who did not undergo a chest X-ray examination or had no infiltrates on chest X-ray films at the time of initial consultation, and 32 with diseases other than the target infection. Therefore, 1,875 patients were analyzed for severity (Fig. 1). In addition, 90 cases were excluded from the differential diagnosis analysis (i.e. typical bacterial pneumonia versus atypical pneumonia) due to lack of appropriate data.

Use of the JRS 2005 A-DROP system to assess disease

severity resulted in designation of 857 (45.7%) cases as mild, 808 (43.1%) cases as moderate, 164 (8.7%) cases as severe, and 46 (2.5%) cases as extremely severe (Table 1). Mortalities of these groups were 0%, 3.1%, 9.9% and 19.6%, respectively (data not shown).

In the assessment system for the differential diagnosis between typical bacterial pneumonia and atypical pneumonia, 1,213 (68.3%) were suspected to have typical bacterial pneumonia, and 562 (31.7%) cases were suspected to have atypical pneumonia (Table 2).

### Comparison of pneumonia severity classifications by JRS 2005 A-DROP and IDSA PSI

Using the PSI, 1,338 (71.4%), 425 (22.7%) and 112 (6.0%) of the total 1,875 patients were assessed as having mild, moderate and severe pneumonia, respectively (Table 3). Mortalities of these groups were 0.4%, 5.9% and 18.0%, respectively (data not shown).

Nearly all cases of pneumonia assessed as mild by the A-DROP were also assessed as mild by the PSI (99.6%). Among the 808 cases of pneumonia assessed as moderate by the A-DROP, 482 (59.6%) were assessed as mild, 310 (38.4%) were assessed as moderate, and 16 (2.0%) were assessed as severe by the PSI. Among the total 164 cases of pneumonia assessed as severe by the A-DROP, one (0.6%) was assessed as mild, 105 (64.0%) were assessed as moderate, and 58 (35.4%) were assessed as severe by the PSI.

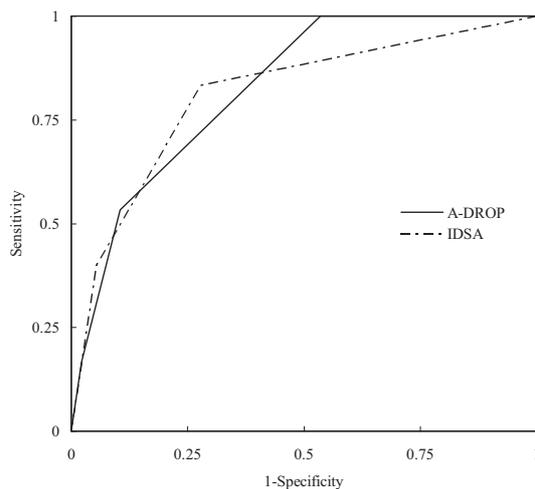
**Table 2. Characteristics of Patients according to Suspected Type of Pneumonia**

Items used to differentiate	Atypical pneumonia suspected	Bacteria pneumonia suspected	Total
Under 60 years of age	440 (66.0%)	227 (34.0%)	667 (100%)
No or minor underlying disease	549 (40.8%)	798 (59.2%)	1347 (100%)
Stubborn cough	377 (68.8%)	171 (31.2%)	548 (100%)
Poor chest auscultatory findings	462 (62.2%)	281 (37.8%)	743 (100%)
No sputum or no identified aetiological agent by rapid diagnosis	422 (55.4%)	340 (44.6%)	762 (100%)
A peripheral white blood cell count below 10,000/ $\mu$ L	452 (53.1%)	399 (46.9%)	851 (100%)
Cluster of pneumonia among family members or close associates	19 (67.9%)	9 (32.1%)	28 (100%)
Absence of tachycardia in the context of fever	10 (43.5%)	13 (56.5%)	23 (100%)
Ground glass opacity or skip lesion on chest X-ray	124 (57.9%)	90 (42.1%)	214 (100%)
Total	562 (31.7%)	1213 (68.3%)	1775 (100%) *

\*10 cases with positive Legionella urinary antigen testing were excluded

**Table 3. Comparison of Pneumonia Severity Classification by JRS 2005 (A-DROP) and IDSA (PSI)**

Severity		JRS2005 (A-DROP)				Total (%)
		Mild	Moderate	Severe	Extremely severe	
IDSA (PSI)	Mild I-III	854 (99.6%)	482 (59.6%)	1 (0.6%)	1 (2.2%)	1338 (71.4%)
	Moderate IV	3 (0.4%)	310 (38.4%)	105 (64.0%)	7 (15.2%)	425 (22.7%)
	Severe V	0 (0%)	16 (2.0%)	58 (35.4%)	38 (82.6%)	112 (6.0%)
Total (%)		857 (100%)	808 (100%)	164 (100%)	46 (100%)	1875 (100%)



**Figure 2.** The ROC curve for 30-days mortality for A-DROP and PSI. The area under the ROC curves was 0.824 [95% confidence intervals (CI): 0.822-0.827,  $p < 0.001$ ] for A-DROP and 0.811 [95% confidence intervals (CI): 0.807-0.814,  $p < 0.001$ ] for PSI.

Among the 46 cases of pneumonia assessed as extremely severe by the A-DROP, 38 (82.6%) were assessed as severe by the PSI. Assessment of disease severity by A-DROP correlated significantly with that by PSI ( $r = 0.6781$ ,  $p < 0.0001$ ; Fig. 2).

#### **Relationship between mortality and JRS 2005 A-DROP pneumonia severity indicators**

The relationship between the five A-DROP indicators and mortality was characterized. Logistic regression ‘SpO<sub>2</sub> of 90% or less (PaO<sub>2</sub> of 60 Torr or less)’ as the strongest predictor of mortality [adjusted odds ratio (OR), 7.034; 95% confidence interval (CI), 2.689-18.400;  $p < 0.0001$ , Fig. 3]. In

fact, this indicator was associated with 5.6% (24 cases) of all deaths.

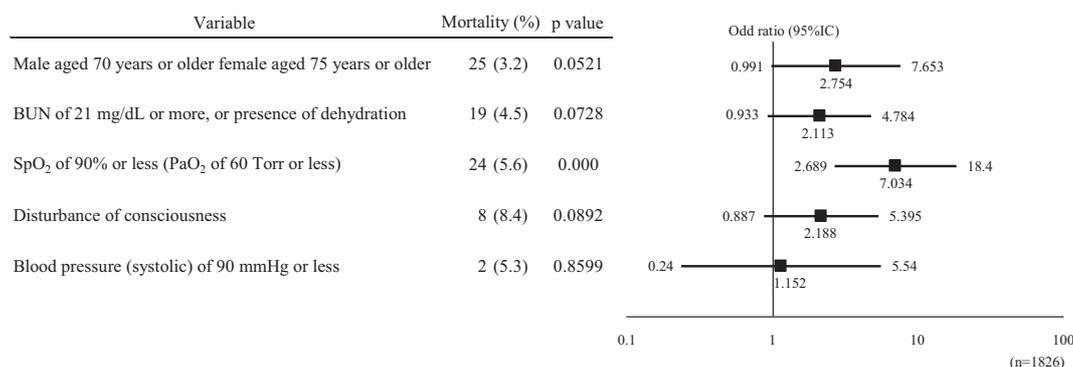
The other four indicators also tended to be associated with mortality, with ‘Disturbance of consciousness’ accounting for the greatest proportion there of (8.4%), and ‘male aged 70 years or older, female aged 75 years or older’ for the least (3.2%).

#### **JRS 2005 A-DROP system and differential diagnosis between typical bacterial pneumonia and atypical pneumonia**

Finally, correlations between JRS 2005 A-DROP system and a diagnosis of typical bacterial pneumonia or atypical pneumonia were characterized by logistic regression. The incidence of pathogens was as follows; *S. pneumoniae*, 36.5% (323 isolates); *M. pneumoniae*, 24.2% (214 isolates); *C. pneumoniae*, 11.9% (105 isolates); *H. influenzae*, 11.6% (103 isolates); *M. catarrhalis*, 3.7% (33 isolates), and *Legionella* spp., 1.1% (10 isolates) (Table 4). The atypical pneumonia of pathogens was as follows; *Mycoplasma* inspection positivity 214 patients; *Chlamydia* examination positivity 105 patients (Table 4). The bacteria unidentified cases was 58.1% (1,089 patients). Six of nine items were significantly correlated with the differential diagnosis between atypical and bacterial pneumonia (Fig. 4). However, ‘cluster of pneumonia among family members or close associates’ and ‘absence of tachycardia in the context of fever’ were not significantly related to the differential diagnosis ( $p = 0.2967$  and 0.4115, respectively).

## **Discussion**

The JRS revised criteria assessed severity of pneumonia, published as the JRS 2005, are routinely used by general



**Figure 3.** Multiple logistic regression analysis of the relationship between mortality and factors predicting severity of pneumonia severity according to JRS2005 (A-DROP). The 1,826 patients, which 49 cases with unknown outcome were excluded from the 1,875 patients, were analyzed.

**Table 4.** Details of Causative Organisms

	Causative organism	Isolates
Gram positive	<i>Staphylococcus aureus</i>	22 (2.5%)
	<i>Streptococcus pneumoniae</i>	323 (36.5%)
	<i>Streptococcus anginosus</i> group	1 (0.1%)
	<i>Streptococcus</i> spp.	12 (1.4%)
	<i>Corynebacterium</i> spp.	2 (0.2%)
Gram negative	<i>Moraxella catarrhalis</i>	33 (3.7%)
	<i>Escherichia coli</i>	5 (0.6%)
	<i>Klebsiella</i> spp.	25 (2.8%)
	<i>Enterobacter aerogenes</i>	2 (0.2%)
	<i>Morganella morganii</i>	1 (0.1%)
	<i>Haemophilus influenzae</i>	103 (11.6%)
	<i>Pseudomonas aeruginosa</i>	25 (2.8%)
	<i>Acinetobacter baumannii</i>	1 (0.1%)
	<i>Legionella</i> spp.	10 (1.1%)
Anaerobic bacterium	1 (0.1%)	
Atypical bacterium	<i>Chlamydia pneumoniae</i>	105 (11.9%)
	<i>Mycoplasma pneumoniae</i>	214 (24.2%)
Total		885 (100.0%)

clinicians, and the scores obtained by these simple calculations appear to accurately reflect prognosis. Rather than using the complicated calculations associated with the IDSA PSI, the JRS composed their A-DROP criteria through modification of the simple BTS CURB-65 system.

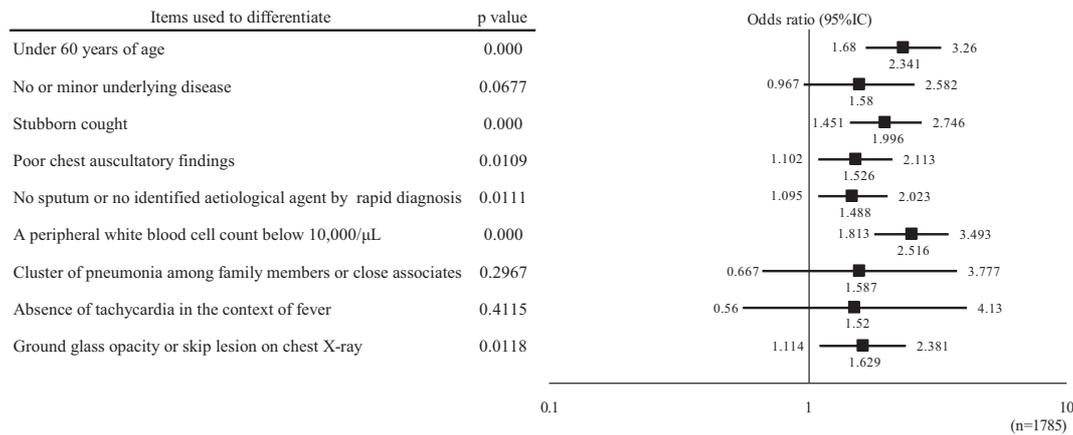
In this study, 45.7% of CAP patients were designated as mild cases, 43.1% were designated as moderate cases, 8.7% were designated as severe cases, and 2.5% were designated as extremely severe cases. By contrast, Usui et al reported that 22.8%, 53.5%, 17.2%, and 6.5% of their 523 CAP patients were categorized as mild, moderate, severe, and extremely severe cases, respectively (13). In addition, Tashiro et al reported that 25%, 48%, 18%, and 9% of their 293 CAP patients were categorized as mild, moderate, severe, and extremely severe cases, respectively (14). The data from these two studies, which were conducted among local populations, were consistent with data from the present study, which drew patients from a nationwide population, and were thought to be representative of the Japanese population.

In confirming the validity of JRS 2005, we found a significant correlation between the severity assessment according to the A-DROP and the PSI, the reliability of which had

already been established (4, 15). Mortality also showed a good correlation with assessment by the A-DROP, and the correlation coefficient was higher with the A-DROP than with the PSI. These results suggested that the well-selected characteristics employed in the A-DROP constitute an excellent system to assess prognosis.

Gomi et al reported that the classification of severity by A-DROP was correlated with that assessed by PSI and that the results of the two systems were comparable (16). However, while the PSI requires laboratory data to arrive at a score, the A-DROP requires only clinical criteria and is thus more practical for use and immediate application by clinicians.

The BTS CURB-65 system is similar to the A-DROP and is widely used. Several groups of investigators reported that this system is comparatively simple and it could identify severely ill individuals (1, 15, 17). By contrast, the pH value and blood glucose levels needed to calculate the PSI were not measured in 74.0% and 31.0% of the cases in the present study, respectively (data not shown), indicating that this index may not be practical for routine clinical use. This notion was supported by Usui et al and Aujesky et al, who



**Figure 4.** Multiple logistic regression analysis of the relationship between specific indicators and a suspected diagnosis of typical bacterial pneumonia versus atypical pneumonia.

suggested that the PSI was not well suited for typical daily clinical practice (13, 18). Although the use of pocket cards, personal electronic devices, or Internet support could facilitate the use of the PSI, data from the present study suggested that the A-DROP was more practical than the PSI.

Respiratory status, including such criteria as low PaO<sub>2</sub>, low P/F ratio, high respiratory rate, and the need for mechanical ventilation, were included among several major severity scores, such as the PSI (4), CURB-65 (1), SMART-COP (19), IDSA/ATS severity criteria 2007 (2), Espana et al criteria (20), SOAR criteria (21), ICU admission criteria in IDSA/ATS 2007 (2), and the I-ROAD scoring system for hospital-acquired pneumonia in JRS 2008 (8, 22). Data supporting the utility of respiratory status within those severity scores (12, 23), therefore, might also support the accuracy and utility of the A-DROP, which also incorporated respiratory status. Indeed, among the five indicators used in the A-DROP, 'male aged 70 years or older, female aged 75 years or older' was most frequent, but 'SpO<sub>2</sub> of 90% or less (PaO<sub>2</sub> of 60 Torr or less)' was the strongest predictor of mortality.

The present study also demonstrated a correlation between severity scores and sites-of-care. For example, treatment as an outpatient occurred in 48.1% of patients with mild pneumonia, 15.7% of patients with moderate pneumonia, 0.6% of patients with severe pneumonia, and 0% of patients with extremely severe pneumonia as classified by the A-DROP system (data not shown). Similarly, treatment as an inpatient occurred in 51.9% of patients with mild pneumonia, 84.2% of patients with moderate pneumonia, 99.4% of patients with severe pneumonia, and in 100% of patients with extremely severe pneumonia, as classified by the A-DROP system (data not shown). We confirmed disease severity in A-DROP, but as a result many mild cases treated as outpatients in JRS 2005 were admitted for hospitalization. Because the Japanese insurance regime was more substantial than those of Western countries, it was speculated that most of the Japanese patients selected were not reluctant to be treated by hospitalization (24, 25). These data suggested that the A-DROP system provides a useful strategy to triage pa-

tients to appropriate venues for ongoing care.

The correlation between mortality and chest X-ray findings and C-reactive protein (CRP) levels was also characterized but there were no significant correlations between these parameters (mortality versus chest X-ray findings, R=0.184; mortality versus CRP value, R=0.06). However, we categorized CRP/chest X-ray infiltrations and analyzed the differences in prognosis in each category by Fisher's test. As a result, we found a significantly poorer prognosis in CRP  $\geq$  15 mg/dL and chest X-ray infiltrations  $\geq$  2/3 (Table 5, 6). These results suggested that the prognoses were not clearly related to either CRP or chest X-ray infiltrations, but might be significantly worse in the category of high CRP and marked chest X-ray infiltrations. Therefore, we confirmed the relationship between mortality and 'five new items' that replaced 'Disturbance of consciousness' and 'Blood pressure' of A-DROP (Fig. 3) with CRP  $\geq$  15 mg/dL and chest X-ray infiltrations  $\geq$  2/3. As a result, we found that the area under the ROC curve for five new items was 0.842, which was also very good, however, not much higher than A-DROP (0.824) (Fig. 2).

This study represented the first assessment of the accuracy and validity of the JRS 2005 A-DROP criteria for the differential diagnosis between typical bacterial pneumonia and atypical pneumonia in the Japanese population. This protocol designated 562 cases (31.7%) of suspected atypical pneumonia and 1,213 cases (68.3%) of suspected bacterial pneumonia. Among the nine items assessed in this study (under 60 years of age; no or minor underlying disease; stubborn cough; poor chest auscultatory findings; no sputum or no identified aetiological agent by rapid diagnosis; a peripheral white blood cell count below 10,000/ $\mu$ L; cluster of pneumonia among family members or close associates; absence of tachycardia in the context of fever, and ground glass opacity or skip lesion on chest X-ray), six were significant predictors of differentiating between typical bacterial pneumonia and atypical pneumonia, and five of these six items were employed for differential diagnosis in JRS 2005. These data strongly supported the utility of the JRS

**Table 5. Fisher's Test of the Relationship between CRP and Mortality**

CRP (mg/dL)	Mortality	Fisher's test
<5	0.4% (2/485)	p = 0.006
≥5, <10	1.6% (8/493)	
≥10, <15	1.2% (4/329)	
≥15, <20	2.8% (6/218)	
≥20, <25	3.5% (4/113)	
≥25	2.8% (5/178)	
unknown	1.7% (1/59)	

**Table 6. Fisher's Test of the Relationship between X ray Infiltrations and Mortality**

X ray infiltrations	Mortality	Fisher's test
< 1/3	0.8% (10/1219)	p = 0.000
≥ 1/3, < 2/3	1.2% (6/500)	
≥ 2/3	9.7% (13/134)	
unknown	4.5% (1/22)	

2005 criteria for the differential diagnosis between typical bacterial pneumonia and atypical pneumonia.

In this study, bacteria unidentified cases was determined to be 58.1% (1,089/1,875 patients). This result was similar to data of Saito et al (11), Ishida et al (26), Shindo et al (27). It was reflected in the detection rate of CAP in Japan.

The recent trend of increasing prevalence of macrolide-resistant pneumococci in Japan prompted the JRS 2000 to develop JRS 2005 (7, 10-12, 28, 29). In the present study, the antimicrobial treatments selected were generally appropriate for diagnoses of typical bacterial pneumonia and atypical pneumonia, and clinical efficacy of greater than 80% was achieved (data not shown). Therefore, these results suggested that selection of antimicrobial treatments based on the differential diagnosis of the type of pneumonia might promote more proper use of antimicrobials (7, 8) and that any strategy to increase the accuracy of the differential diagnosis would be of benefit. Additional investigation is needed to clarify the optimal microbial regimen for patients with combined infection (i.e., both typical and atypical causative organisms).

In conclusion, the present study demonstrated that the JRS 2005 A-DROP system was accurate and clinically useful for the assessment of the severity of pneumonia and for the differentiation between typical and atypical pneumonia. Further, the JRS 2005 A-DROP system was simpler and clinically more practical than the PSI system, while maintaining comparable accuracy. This system may help promote proper and successful use of antimicrobials in the Japanese population.

**The authors state that they have no Conflict of Interest (COI).**

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