

## AUDIT UPDATE

## British Thoracic Society adult community acquired pneumonia audit 2009/10

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## ABSTRACT

**Background** The updated British Thoracic Society (BTS) Guidelines for the management of Community Acquired Pneumonia (CAP) in adults was published in October 2009. In conjunction with the Guidelines, the first national BTS audit of adult CAP was conducted.

**Methods** An audit tool was developed as part of the Guidelines. Members of the BTS were invited to participate in the audit capturing data relating to acutely ill adults admitted to hospitals in the UK and treated for CAP within the period 1 December 2009 and 31 January 2010. Data entry using the web-based audit tool closed in May 2010.

**Results** Of 2749 submissions from 64 institutions; 8 were excluded due to inconsistent data. The mean age of patients was 71 years (range 16–105 years). The CURB65 score was 0 to 1 in 40% of patients, 2 in 30% and 3 to 5 in 30%. Five hundred and three (18.3%) patients died in hospital within 30 days, 101 (20.1%) within 1 day of admission. Initial empirical antibiotics were in accordance with local CAP guidelines in 1478 (55.5%) patients and were administered intravenously in 712 (65%), 603 (74%) and 743 (90%) patients with CURB65 scores 0 to 1, 2 and 3 to 5 respectively. Within 4 hours of admission, a chest x-ray was obtained in 83% of patients and the first dose of antibiotics was administered in 58%.

**Conclusions** The burden of CAP is high. Efforts should be directed at improving adherence to local CAP guidelines and specific processes of care.

## INTRODUCTION

In conjunction with the updated British Thoracic Society (BTS) guidelines for the management of community acquired pneumonia (CAP) in adults,<sup>1</sup> the first national BTS audit of adult CAP was conducted as part of the BTS Audit Programme.

## METHODS

An audit tool was developed as part of the BTS CAP guidelines. In autumn 2009, BTS members and registered users of the BTS Audit System were invited to participate in the audit which sought to capture data relating to acutely ill adults admitted to hospitals in the UK and treated for CAP within the period 1 December 2009 and 31 January 2010. Inclusion criteria were immunocompetent adults aged >16 years, new infiltrates on chest x-ray, symptoms and signs of a lower respiratory tract infection and no hospital admissions in the previous 10 days. Data entry using the web-based audit tool closed in May 2010.

Data were analysed using SPSS Version 16.  $\chi^2$  or Fisher exact tests were used to assess differences in proportions. Where applicable, logistic regression was performed to identify factors associated with clinical outcome measures such as inpatient (IP) mortality, and multivariable regression was applied to adjust for disease severity (using the CURB65 score).

## RESULTS

A total of 2749 submissions were received from 64 institutions; 8 submissions were excluded due to inconsistent data, leaving 2741 cases for analysis. The median age of patients was 76 years (range 16–105), one-third were aged <65 years and 25% (n=687) were aged  $\geq$ 85 years. Details of comorbid illnesses are shown in table w1 in the online supplement. The CURB65 score was 0–1 in 40% of patients, 2 in 30% and 3–5 in 30%.

Median length of stay was 5 days and median time to death was 5 days. Of 503 (18.3%) patients who died in hospital within 30 days, 101 (20.1%) died within 1 day of admission and 62.5% died within 7 days. The 30-day IP mortality in patients aged  $\geq$ 85 years was 30.6% (210/686 patients) (see table w2 in online supplement). Of 192 (7%) patients admitted to intensive care, 97 (51%) had CURB65 scores of  $\geq$ 3, 53% were aged 65–84 years and 8% were aged  $\geq$ 85 years.

## Initial antibiotic use and processes of care

Adherence to local antibiotic guidelines was poor but increased significantly as the CURB65 score increased (OR 1.2, 95% CI 1.1 to 1.3; table 1). There was no association between adherence to local antibiotic guidelines and 30-day IP mortality after adjusting for disease severity (OR 0.9, 95% CI 0.8 to 1.2).

Intravenous antibiotics were administered in 712 (65%), 603 (74%) and 743 (90%) patients with CURB65 scores 0–1, 2 and 3–5, respectively. A  $\beta$ -lactam was given in 2060 (75%) patients and a macrolide in 1641 (60%) patients (see table w3 in online supplement). A macrolide/ $\beta$ -lactam combination was given in 557 (51%) patients with CURB65 scores 0–1, while a  $\beta$ -lactam alone was given in 176 (21%) and 154 (19%) patients with CURB65 scores 2 and 3–5, respectively.

A chest x-ray was performed within 4 h of admission in 2115 (83%) of 2543 patients (see table w4 in online supplement), which was reviewed in 80% of 2531 patients prior to administration of antibiotics. Of 472 patients who died in hospital within 30 days, 283 (60%) received antibiotics

**Table 1** Adherence to local CAP antibiotic guidelines

CURB65 score	No. of patients	Initial antibiotics in line with local CAP guidelines, n (%)
0–1	1059	522 (49)
2	800	443 (55)
3–5	809	517 (64)
All	2668	1482 (56)

within 4 h of admission. Overall, 58% of patients received the first dose of antibiotics within 4 h of admission (Table 2).

#### Use of CPAP and NIV

Of 52 patients who received continuous positive airways pressure (CPAP) support, 30-day IP mortality was 46% and 38 (73%) were admitted to an intensive care unit (ICU). Non-invasive ventilation (NIV) was applied in 179 patients; 30-day IP mortality was 43% and 77 (43%) patients were admitted to ICU. The proportion of patients on NIV with underlying chronic obstructive pulmonary disease was similar regardless of ICU admission status; 43% (33/77) were admitted to the ICU and 47% were not admitted to the ICU.

#### DISCUSSION

This is the largest UK audit of the management of CAP in adults and thus provides a description of the current management of CAP in the UK. The proportions of patients in low, moderate and high severity groups were similar to UK cohort studies.<sup>2</sup> However, mortality was higher. This difference may be due to the older age profile of patients in the audit.

Most units have local CAP guidelines which are based on BTS guidelines. However, adherence to local CAP guidelines was poor (50–70% depending on CAP severity), and only 58% of patients received their first antibiotic within 4 h of hospital admission despite over 80% of patients having had a chest x-ray within 4 h. Both the time to first antibiotic and adherence to CAP guidelines have been associated with clinical outcomes.<sup>3–4</sup> Efforts to improve these aspects of care are therefore warranted.

Intravenous antibiotics and dual therapy were overused in patients who did not have high severity CAP. Broad spectrum intravenous antibiotics have been implicated as drivers of nosocomial infections. Efforts to reduce the time to first antibiotic should not be at the expense of the appropriate choice (and route) of antibiotics.

A surprising number of patients received NIV and CPAP support outside an ICU setting. There are no robust data to

**Table 2** Time from admission to first dose of antibiotics (n=2477)

CURB65 score	Time to first antibiotics		
	<4 h	4–8 h	>8 h
0–1	566 (58)	201 (21)	210 (21)
2	390 (52)	182 (24)	177 (24)
3–5	478 (63)	144 (19)	129 (17)
All	1434 (58)	527 (21)	516 (21)

Values are n (%) of patients.

indicate that NIV or CPAP are effective in CAP, while some data—particularly in relation to CPAP—suggest potential harm.<sup>5</sup> These forms of support should be used with care in patients with CAP.

Limitations included no measure of completeness of or potential bias in case ascertainment during the audit period and absence of data on frequency of nursing home residence and ‘do not resuscitate’ orders.

#### Conclusion

The burden of CAP is high. Efforts should be directed at improving specific processes of care including adherence to local CAP guidelines.

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**Competing interests** None.

**Provenance and peer review** Not commissioned; internally peer reviewed.

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Table w2: Association of age with 30-day in-patient mortality

<i>Age (years)</i>	<i>Total (n)</i>	<i>Died (n)</i>	<i>%</i>
16 to 44	315	8	2.54
45 to 64	510	41	8.04
65 to 84	1221	243	19.90
85 and above	686	210	30.61
All	2732	502	18.37

Table w3 : Empirical antibiotics administered (n=2742)

<b><i>Antibiotics</i></b>	<b><i>n</i></b>	<b><i>%</i></b>
<b><i><u>Beta-lactam</u></i></b>	2060	75.16
Amoxicillin, oral	367	13.39
Amoxicillin, IV	284	10.36
Penicillin V, oral	11	0.40
Benzympenicillin, IV	338	12.33
Cephalosporin, oral	7	0.26
Cephalosporin, IV	104	3.79
Co-amoxiclav, oral	151	5.51
Co-amoxiclav, IV	798	29.11
<b><i><u>Macrolide</u></i></b>	1641	59.87
Clarithromycin, oral	657	23.97
Clarithromycini, IV	905	33.02
Erythromycin, oral	65	2.37
Erythromycin, IV	14	0.51
<b><i><u>Others</u></i></b>		
Tazocin	332	12.11
Ertapenem	35*	1.28
Meropenem	27	0.99
Quinolone	52	1.90
Doxycycline	229	8.35

Total exceeds number of patients as some received more than 1 antibiotic.

IV = intravenous.

\* All given at a single centre

Table w4: Time from admission to chest x-ray (n=2543)

<i>CURB65 score</i>	<i>Time from admission to CXR</i>	
	<i>&lt; 4 hrs</i>	<i>≥ 4hrs</i>
0 – 1	852 (84)	161 (16)
2	616 (79)	159 (21)
≥3	647 (86)	108 (14)
<b>All</b>	<b>2115 (83)</b>	<b>428 (17)</b>

Values are n (%) of patients.

Table w1: Demographics and clinical characteristics of the study cohort (n=2741)

<b><i>Clinical characteristic</i></b>	<b><i>n</i></b>	<b><i>%</i></b>
Age, mean (years)	71	-
Age, median (years)	76	-
Congestive cardiac failure	236	8.6
Other chronic heart disease, excluding hypertension	629	22.9
Stroke	295	10.8
Liver disease	46	1.7
Renal disease	199	7.3
Active malignancy	228	8.3
COPD	615	22.4
Other chronic lung disease	334	12.2
Dementia	148	5.4
Diabetes mellitus	303	11.1
Other illnesses	428	15.6
No co-morbid illnesses	690	25.1
Three or more co-morbid illnesses	369	13.5
CURB65 score 0 – 1	1095	40
CURB65 score 2	825	30
CURB65 score 3 – 5	822	30
30-day in-patient mortality	503	18.3

Values are numbers (%) of patients unless otherwise stated.