Audit of a multidisciplinary approach to improve management of community-acquired pneumonia

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ABSTRACT

Background Community-acquired pneumonia (CAP) is a frequent cause of morbidity, mortality and hospital admission worldwide. An adequate choice of empirical antibiotic treatment and appropriate severity assessment of the disease are key aspects in the management of CAP.

Objective To audit the adherence to standards of care, such as empirical prescribing of antibiotics, and evaluate the current multidisciplinary approach to the management of CAP.

Method Records of patients with CAP were identified and examined for CURB65 score documentation, discussion notes with microbiology and prescribed antibiotic treatments.

Results Out of the 62 patients identified, 32 had a CURB65 score documented in their medical notes and 59 had documented chest X-ray findings. 85.5% of cases were compliant with antibiotic prescribing guidelines.

Conclusion The multidisciplinary approach has considerably improved compliance with most of the standards, especially adherence to empirical antibiotic guidelines, and ultimately the standard of care for patients with CAP.

into local hospital guidelines⁶ to improve patient clinical outcomes, as recent data indicate that the mortality from CAP in the UK is surprisingly high.¹

The British Thoracic Society (BTS) proposes the use of CURB65 scores.⁷ This is a five-point scoring system with three risk categories: 0–1 (low risk of mortality), 2 (intermediate risk of mortality) and ≥3 (high risk of mortality).

At James Paget University Hospitals NHS Trust, Gorleston, UK, the local guidelines⁶ recommend assessing and documenting the CURB65 score for all patients admitted with suspected CAP and prescribing empirical antibiotic treatment according to the documented CURB65 score as follows:

- ▶ 0–1 (mild): PO amoxicillin (7 days) (allergic to penicillin: doxycycline or clarithromycin),
- ▶ 2 (moderate): PO/IV clarithromycin (7 days) OR doxycycline,
- ▶ ≥3 (severe): IV benzyl penicillin 2.4g four times a day (7–10 days) (allergic to penicillin: IV vancomycin) + IV clarithromycin and consider intensive care assessment.

However, previous hospital internal audits (unpublished data) identified that these guidelines were not being followed for all patients admitted with CAP.

Aims

The purpose of this study was to audit the adherence to the standards of care and evaluate the multidisciplinary approach to the management of CAP in a medium-sized district general hospital in the UK. A comparison with the previous year's results will also be presented.

METHODS

Audit standards

The audit standards were derived from the BTS and hospital pneumonia guidelines.^{6,7} In summary, the following standards of care should be met for 90% of the patients admitted to hospital for suspected pneumonia, if indicated:

1. The severity of pneumonia should be documented using the CURB65 score.
2. A chest radiograph should be performed within the first 4 hours to confirm or refute the diagnosis and these findings should be recorded in patient notes.
3. If the CURB65 score is ≥2:
 - At least one set of blood cultures should be taken, preferably before antibiotic therapy is commenced.
 - Sputum should be taken for culture if the patient is productive of sputum.

INTRODUCTION

Community-acquired pneumonia (CAP) is a common disease and a frequent cause of morbidity, mortality and hospital admission worldwide,¹ especially among those aged 65 years and over in the UK and other European countries.² CAP is the leading cause of death from infectious diseases in the developed world and is a major strain and burden on healthcare resources.³

The bacterial aetiology of CAP is well established and dictates the choice of empirical antibiotic therapy. The most common causative agent, responsible for almost 50% of cases, is *Streptococcus pneumoniae*. Other common causes are respiratory viruses (mainly influenza A) and atypical bacteria such as *Mycoplasma pneumoniae* and *Chlamydia pneumoniae*.¹

Empirical antibiotic treatment of CAP must take into account the likely aetiology and the increasing prevalence of resistance among these major respiratory tract pathogens.⁴ Microorganisms resistant to commonly used antibiotics have been increasing in Western Europe in recent years.⁴ In the UK, a Department of Health report confirmed that the resistance rates to macrolides and tetracyclines are increasing.⁵

Antibiotic prescribing and appropriate disease severity assessment are two of the key aspects in the management of CAP. These have been incorporated

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Table 1 Comparison of performance against standards between 2014 and 2015

Standard number	Description	2014 compliance (%)	2015 Results		
			Compliance (%)	95% CI	Number of patients
1	CURB65 score documented	35.4	58.1	57.7 to 58.5	36
2	Chest X-ray findings documented	95.8	95.2	95.0 to 95.3	59
3a	Bloods cultures if CURB65 ≥ 2	37.9	84.2	83.7 to 84.7	32
3b	Sputum sent if CURB65 ≥ 2	6.9	21.1	20.8 to 21.3	8
3c	Pneumococcal antigen if CURB65 ≥ 2	6.9	15.8	15.65 to 16.0	6
3c'	Legionella if CURB65 ≥ 2	0	18.4	18.2 to 18.7	7
3d	Atypical serology if CURB65 ≥ 2	6.9	7.9	7.7 to 8.1	3
3e	Viral PCR if CURB65 ≥ 2	0	13.2	12.9 to 13.4	5
4	Empirical antibiotics prescribed correctly	56.3	85.5	85.2 to 85.8	53
5	First antibiotic dose given within 4 hours	–	69.4	69.0 to 69.7	43
6	Appropriate oral step-down	95.0	96.8	96.7 to 96.9	60
7	Appropriate duration of antibiotics prescribed	88.9	83.9	83.6 to 84.2	52
8	Vaccination plan documented in inpatient notes	0	0	0	0

- Urine should be taken to test for pneumococcal and Legionella antigens.
 - Clotted blood should be taken for atypical serology.
 - A throat swab should be performed for viral PCR.
4. Empirical antibiotic treatment should be prescribed in accordance with local guidelines.
 5. The initial dose of empirical antibiotic treatment should be administered within the first 4 hours.
 6. Antibiotic treatment should be stepped-down to oral formulations if the patient is on parenteral antibiotics in accordance with local guidelines.
 7. The total duration of treatment should be determined in accordance with local guidelines.
 8. A vaccination plan should be administered to patients who are unvaccinated and in an at-risk group.

Data collection and setting

A retrospective audit of patient records was undertaken at the James Paget University Hospital in Gorleston, UK. This hospital has 440 beds and serves a catchment population of approximately 230 000 local residents. Patients admitted during the month of January 2015 were identified through the hospital coding system to allow comparison with the January 2014 results. All adult patients with a primary diagnosis of CAP, pneumonia, lower respiratory tract infection (LRTI) or chest infection were included in the audit. Patients with infective exacerbation of chronic obstructive pulmonary disease (COPD), bronchiectasis, aspiration pneumonia or hospital-acquired pneumonia were excluded.

After the patients were identified, their electronic health records were accessed for CURB65 score documentation. Copies of prescription charts were obtained to verify the antibiotics used, times of administration and duration of treatment. Accident and Emergency files were examined for the exact time of

the first dose of antibiotics and documentation of elements such as blood pressure and respiratory rate to confirm or calculate the corresponding CURB65 scores. The Sectra PACS system (X-ray software) was also searched to determine whether a chest radiograph had been obtained and its exact time (within 4 hours of admission). Patient case notes were examined for management plans, differential diagnoses and discussion notes with microbiology. Finally, the e-discharge summaries were also reviewed to confirm the oral step-down antibiotics and their duration, as well as vaccination plans.

All data were collected by pharmacists and a consultant microbiologist. The data were entered into an Excel spreadsheet and analysed using descriptive statistics.

Ethics approval

As this was an audit, no ethics approval was required.

RESULTS

In total, 74 patients fulfilled the criteria but only 62 had all data available for extraction. Of these, 32 patients were female and the median age was 82 years (minimum: 26, maximum: 94).

Only 36 patients had a CURB65 score documented in their medical notes (standard 1). Chest X-ray findings were documented in the notes of 59 patients (standard 2). In less than half of the cases where microbiological tests were indicated (CURB65 score of ≥ 2), was at least one of the six recommended microbiological tests performed (standard 3). In total, 85.5% of the prescribed antibiotic treatments were compliant with the local empirical antibiotic guidelines (standard 4) and in 60 cases, the step-down to oral therapy was appropriate. A comparison between the results for 2014 and 2015 is illustrated in [table 1](#). This analysis reveals an improvement in all standards with the

Table 2 Comparison of compliance with standards relating to antibiotics prescribing guidelines between cases without a documented CURB65 score and those with different CURB65 scores documented

Standard number	Description	No CURB65 score documented (%)	CURB65 score 0–1 (%)	CURB65 score 2 (%)	CURB65 score 3–5 (%)
4	Empirical antibiotics prescribed correctly	33.33	79.2	96.7	55.6
6	Appropriate oral step-down	39.68	100.0	100	66.7
7	Appropriate duration of antibiotics prescribed	33.33	79.2	86.7	77.8

exception of chest X-ray results and appropriate duration of antibiotic treatment.

Table 2 compares the levels of compliance with antibiotic prescribing guidelines between those patients without a CURB65 score documented and those with one of the three different levels documented.

Clinical outcome

The 30-day post-discharge all-cause mortality rate was 6.45% (4 patients) and the 30-day readmission rate was 6.45% (4 patients).

DISCUSSION

Only one of the three standards relating to antibiotic prescribing achieved the target of 90% compliance, namely, the appropriate step-down to oral therapy (standard 6). The levels of compliance with the other standards were well below the target of 90%. However, an overall improvement was observed compared with the audit results from 2014. Some standards exhibited a significant improvement. For example, compliance with empirical antibiotic guidelines (standard 4), which is associated with an improved clinical outcome for CAP patients,⁸ increased from 56.3% to 85.5%, and other standards increased from 0% compliance to attain rates above the national average.⁹ An exception was the standard relating to documentation of vaccination plans, for which compliance remained at 0% for two consecutive years. Vaccination is associated with a decline of 23% for some *S. pneumoniae* infections⁵; however, it is not clear whether the non-compliance with this standard was due to lack of awareness by junior medical staff or the lack of recommendations and plans from the previous audit report, or both.

The overall improvement may partially be a consequence of the recently introduced multidisciplinary team meetings and microbiology board rounds in the hospital admissions unit and the implementation of new antibiotic guidelines, including a summarised one-page and mobile/tablet app versions. These initiatives, which were part of the actioning and monitoring of the recommendations from previous audits that identified poor compliance with the standards, were undertaken to improve compliance with the guidelines; enhance coordination between acute admission clinicians, microbiology and pharmacy; and provide support to junior doctors to streamline antimicrobial therapies and avoid the unnecessary use of broad-spectrum antibiotics on admission. Nevertheless, 67% of the cases of non-compliance with the empirical antibiotic guidelines were due to the unjustified use of the broad-spectrum combination agent piperacillin/tazobactam.

The audit covered admissions during the winter period, when respiratory viral infections such as influenza are more common. In spite of this, only two patients with a CURB65 score ≥ 2 were investigated for respiratory viruses (viral PCR) and the indicated microbiological investigations were not performed in over 50% of the cases with CURB65 ≥ 2 . This failure to perform the appropriate microbiological tests and tailor the prescribed antibiotics to the antibiogram results is of concern, considering that over 40% of the patients received clarithromycin as monotherapy and around 20% received combinations of clarithromycin and

a beta lactam antibiotic while the resistance rate to macrolides is increasing both in the UK and locally.⁵

The BTS national audit⁹ was used to benchmark our results because of the limited local experience and the lack of published data from similar studies, making comparison with other hospitals difficult. Further work is needed to improve compliance with standards relating to antibiotic prescribing and microbiological investigation and to evaluate whether documenting the CURB65 score had any impact on the clinical outcome.

CONCLUSION

The multidisciplinary approach has considerably improved compliance with most of the standards, especially adherence to empirical antibiotic guidelines, and ultimately the standard of care for patients with CAP.

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