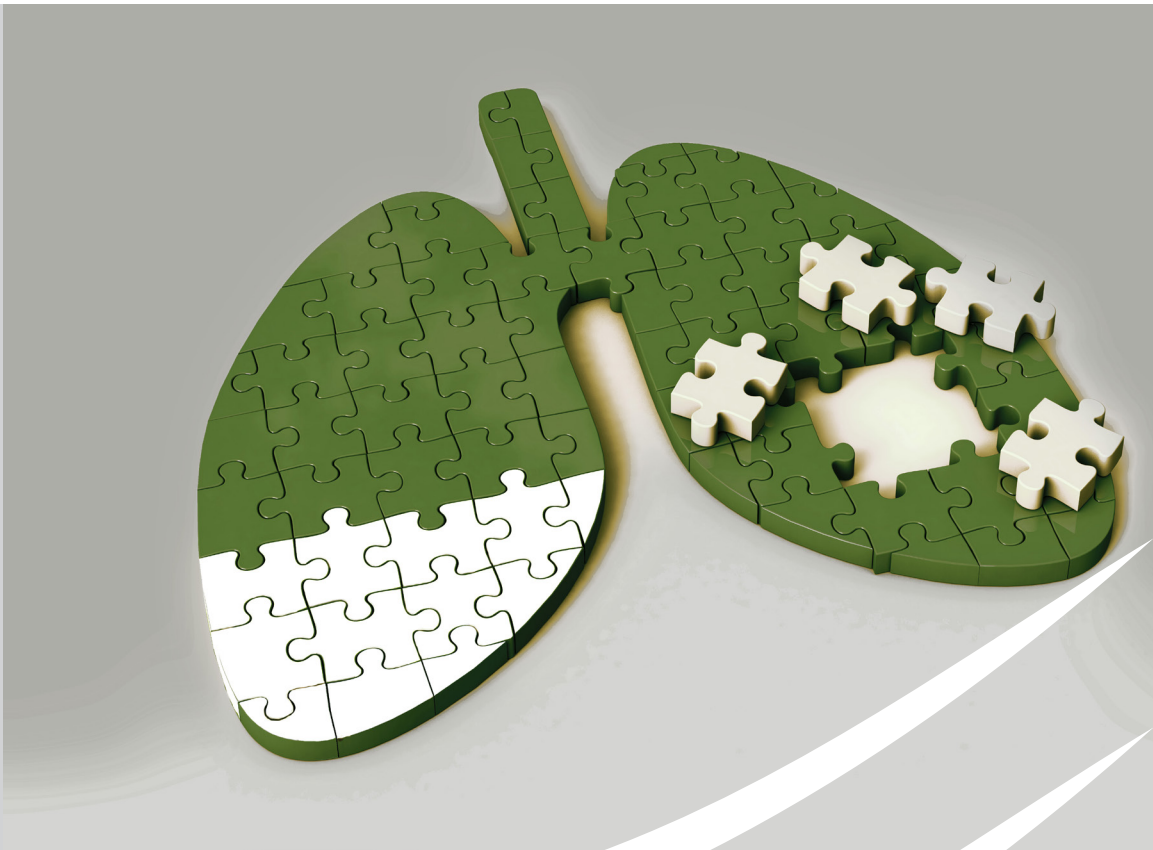
Consolidation Required

A review of the care provided to adults presenting to hospital with a diagnosis of community-acquired pneumonia



NCEPOD

Improving the quality of healthcare

CONSOLIDATION REQUIRED

A review of the care provided to adults presenting to hospital with a diagnosis of community-acquired pneumonia.

A report published by the National Confidential Enquiry into Patient Outcome and Death (2023)

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Topic Proposed by the British Thoracic Society and Intensive Care Society

Cohort: 1st October 2021 to 31st December 2021 inclusive

The Medical and Surgical Clinical Outcome Review Programme is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing, and National Voices. Its aim is to promote quality improvement in patient outcomes. The Clinical Outcome Review Programmes, which encompass confidential enquiries, are designed to help assess the quality of healthcare, and stimulate improvement in safety and effectiveness by systematically enabling clinicians, managers, and policy makers to learn from adverse events and other relevant data. HQIP holds the contract to commission, manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical, and mental health conditions. The programme is funded by NHS England, the Welsh Government and, with some individual projects, other devolved administrations, and crown dependencies www.hqip.org.uk/national-programmes.

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EXECUTIVE SUMMARY

Community-acquired pneumonia (CAP) is one of the most common infectious diseases seen in clinical practice. It results in many hospital admissions and has a high mortality, primarily as the patient group is often frail and older with multimorbidity. The diagnosis of CAP is not always apparent at the time of first clinical assessment, and in many hospitals, there is no specialist team that takes overall responsibility for the care of patients with CAP. Clinical teams need to be more accurate in making the diagnosis of CAP, assessing its severity and ensuring appropriate antibiotic therapy. Local leadership is key in developing an infrastructure to ensure the care of patients with pneumonia is organised appropriately and a programme of ongoing monitoring and improvement is introduced.

IN THIS STUDY

The quality of care provided to patients aged 18 years and over, who had a diagnosis of CAP during the sampling period of 1st October 2021 to 31st December 2021, was assessed by analysing data from 767 clinician questionnaires, 149 organisational questionnaires and the output from the peer review of 401 sets of case notes.

1. ACCURATE DIAGNOSIS (INVESTIGATIONS)

Consider CAP as a possible diagnosis when patients present with new onset confusion without a clear cause or typical symptoms.

Confusion was common in the patients included in this study, being documented in 136/767 (17.7%) patients.

Patients most often presented with: cough (526/767; 68.6%), dyspnoea (432/767; 56.3%), and fever (235/767; 30.6%).

88/767 (11.5%) patients had no typical features of CAP at arrival.

2. CLINICAL DECISION-MAKING

Severity scores aid clinical decision-making, treatment options and escalation planning.

A CURB65 score was documented for 204/767 (26.6%) patients and a NEWS2 score was documented for 602/767 (78.5%) patients as part of the first hospital review.

47/129 (36.4%) patients with a CURB65 score of 0 received same day emergency care while 117/119 (98.3%) patients with a CURB65 score of ≥3 were treated as inpatients.

3. ANTIBIOTIC MANAGEMENT

Antibiotics should be started within 4 hours and reviewed within 48-72 hours, adjusting as needed for the severity of CAP.

There were 100/687 (14.6%) patients where the clinician considered that antibiotic guidance in their own hospital had not been followed.

Antibiotics were started after more than 4 hours in 110/400 (27.5%) and there was room for improvement in the use of antibiotics in 123/354 (34.7%) of the cases reviewed.

4. FOLLOW-UP ARRANGEMENTS

Clear information about pneumonia should be given, and follow-up x-rays, should be arranged at discharge.

Written information about CAP was provided to 113/338 (33.4%) patients, although not documented for a further 203 patients.

A chest X-ray was requested in 261/505 (51.7%) patients at discharge, of which 49/261 (18.8%) were requested but not undertaken. Arrangements were inconsistent for those aged over 50 years and current or ex-smokers for whom chest X-rays are recommended.

5. SERVICE ORGANISATION

Many specialties are involved in caring for people with CAP. Strong clinical leadership is needed.

56/149 (37.6%) hospitals had a lead clinician for pneumonia.

96/130 (73.8%) hospitals had at least four whole time equivalent respiratory specialist nurses.

81/110 (73.6%) hospitals self-identified areas where improvement was needed in their pneumonia service.

FOREWORD

Community-acquired pneumonia (CAP) is common. It predominantly affects older people, and those with co-existing medical conditions. It accounts for a high number of hospital admissions and deaths. It also has a considerable socio-economic impact. Unlike other common conditions with a lower mortality rate such as heart attack and stroke, care is not well organised. CAP has been the subject of numerous reports, most recently the 2021 Getting It Right First Time (GIRFT) report on respiratory medicine.[1]

CAP is a major health concern, yet this NCEPOD report indicates that there is much that can be improved in the care provided to this group of patients once admitted to hospital.

A number of tools have been used to help guide clinicians who provide care to these patients. The pneumonia severity index uses 20 parameters and is therefore impractical for use in clinical practice. A simple group of four interventions organised into a 'care bundle' has been designed to make the delivery of care more consistent. In many hospitals, this is not used at all, and care therefore remains inconsistent.

The specialties and personnel involved in the care of patients with CAP vary from hospital to hospital. This appears to result in a lack of leadership. The approach to investigations, use of decision-making tools such as CURB65, and the choice and timing of antibiotic administration all vary. In many cases the parameters required to calculate a CURB65 score were available in the patient's notes, but the simple calculation and recording of the score was not undertaken. In the digital age where we use electronic records and test results can even be sent to the individual patient via the NHS App, surely it should be possible to calculate severity scores automatically and record the results in IT systems?

The use of broad-spectrum antibiotics has wider implications for society as a whole.[2] While their use is sometimes appropriate, it must be critically reviewed in the light of clinical investigations and when not indicated they should be discontinued promptly to minimise the development of further antibiotic-resistant organisms.

In such a vulnerable patient group, it is also important that appropriate holistic assessment is made. The wishes of patients and carers are of paramount importance and, where appropriate, end of life care should be considered. Again this report identifies inconsistencies of approach.

Given that the care of these patients is provided by professionals from many differing disciplines, not just respiratory medicine, I do hope that this report will be widely distributed, and its recommendations carefully considered to support improvements in care.

As ever the Trustees and I are immensely grateful to all those the study advisory group, case reviewers, our clinical co-ordinators and research staff for all the care and effort that has gone into the production of this important study report.

Ian C Martin, NCEPOD Chair

RECOMMENDATIONS

These recommendations have been formed by a consensus exercise involving all those listed in the acknowledgements. The recommendations have been independently edited by medical editors experienced in developing recommendations for healthcare audiences to act on.

The recommendations highlight areas that are suitable for regular local clinical audit and quality improvement initiatives by those providing care to this group of patients. The results of such work should be presented at quality or governance meetings and action plans to improve care should be shared with executive boards. Quality Improvement tools provided with this report are provided to support you in doing this.

The recommendations in this report support those previously by other organisations, so for added value should be read alongside:

NICE: Clinical Guideline 191 - Pneumonia in adults: diagnosis and management
NICE: Quality standard 110 - Pneumonia in adults
BTS: Guidelines for the management of community acquired pneumonia
GIRFT: Respiratory report

	Executive boards are ultimately responsible for supporting the implementation of these recommendations. Suggested target audiences to action recommendations are listed in italics under each recommendation.
1	Consider community-acquired pneumonia as a possible diagnosis when patients present with new onset confusion without a clear cause, even in the absence of typical symptoms, such as a cough, fever, and breathlessness. This is particularly important for older patients and those who are frail. ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in emergency medicine, respiratory medicine, medicine for the care of older people, general medicine, and nursing leads*
2	Undertake a chest X-ray in patients with suspected community-acquired pneumonia: ▪ Within four-hours of arrival at hospital* ▪ Provide a formal report within 12 hours of the X-ray.** **This supports NICE QS110 Quality Statement 3* *** This supports Diagnostic Imaging Reporting Turnaround Times* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia, and radiologists* ***Supported by:*** *Clinical directors in radiology, and emergency medicine*
3	Use clinical support tools such as CURB65* and NEWS2, in combination with clinical judgement to determine: ▪ The most appropriate pathway of care for patients with community-acquired pneumonia – ambulatory or inpatient

	▪ Which investigations are needed ▪ Antibiotics to use as initial treatment ▪ Treatment escalation decisions **This supports NICE QS 110 Quality Statement 4* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in emergency medicine, respiratory medicine, medicine for the care of older people, general medicine, and nursing leads*
4	Use the results of essential investigations (e.g. chest X-ray or blood results) to review the provisional diagnosis and severity of community-acquired pneumonia for patients admitted to hospital who have started treatment to change/adjust antibiotics as necessary. *N.B. A tool such as Start Smart then Focus for antimicrobial stewardship may help* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in emergency medicine, respiratory medicine, medicine for the care of older people, general medicine, and nursing leads*
5	Arrange microbiological investigations according to the level of community-acquired pneumonia severity. *This support NICE CG191 and British Thoracic Society guidelines for the management of community acquired pneumonia (2009)* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in emergency medicine, respiratory medicine, medicine for the care of older people, general medicine, microbiology, and nursing leads*
6	Prescribe antibiotics for pneumonia according to the level of clinical severity, using the narrowest spectrum of activity, and follow your hospital antibiotic guidelines. Review the antibiotic to ensure it is the most appropriate and is the best mode of delivery. *N.B. A tool such as Start Smart then Focus for antimicrobial stewardship may help* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in emergency medicine, respiratory medicine, medicine for the care of older people, general medicine, pharmacy, and nursing leads*
7	Ensure a treatment escalation plan is in place following diagnosis of community-acquired pneumonia. This should be agreed in discussion with the patient and their family, considering a combination of factors such as age, frailty, and comorbidities. ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in respiratory medicine, medicine for the care of older people, general medicine, and nursing leads*
8	Record smoking status in patients admitted with community-acquired pneumonia. Offer brief advice, nicotine replacement therapy, and referral to a tobacco dependency specialist to support the group of patients who smoke, while they are in hospital and, after discharge.* **This supports NICE Guideline 209 1.14.13* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in respiratory medicine, medicine for the care of older people, general medicine, and nursing leads*

9	Use admission to hospital with community-acquired pneumonia as an opportunity to address a patient's general health and wellbeing.* **This supports NICE Guideline 16 and Making Every Contact Count* ***Primary target audience:*** *All healthcare professionals who review patients with pneumonia* ***Supported by:*** *Clinical directors in respiratory medicine, medicine for the care of older people, general medicine, and nursing leads*
10	At discharge from hospital after an episode of community-acquired pneumonia: ▪ Provide patients with written information about pneumonia ▪ Provide patients with a clear plan for clinical follow-up. ▪ Arrange a chest X-ray at six-weeks for patients who smoke, those over 50 years of age or where symptoms persist.* If the chest X-ray is not undertaken document the reason why. **This supports the British Thoracic Society guidelines for the management of community acquired pneumonia (2009)* ***Primary target audience:*** *All healthcare professionals who treat patients with pneumonia* ***Supported by:*** *Clinical directors in respiratory medicine, radiology, medicine for the care of older people, general medicine, and nursing leads*
11	Review the infrastructure for, and leadership of, hospital pneumonia services. Aim for one specialist pneumonia nurse per 400 admissions and a clinical lead with responsibility for the pneumonia service.* **This supports the GIRFT (Getting it Right First Time) respiratory report (published March 2021)* ***Primary target audience:*** *Chief medical and nursing officers, clinical directors in respiratory medicine, respiratory nursing and, radiology*
12	Differentiate community-acquired pneumonia from hospital-acquired pneumonia by including the ICD-10 code for nosocomial infections (Y95) in addition to the pneumonia code for hospital-acquired pneumonia. ***Primary target audience:*** *Clinical coders in hospitals*

INTRODUCTION

Community-acquired pneumonia (CAP) is very common, affecting between 0.5% and 1% of adults in the UK each year.[3] CAP is diagnosed in 5 to 12% of all adult patients seeing their general practitioner for lower respiratory tract infection symptoms, and around 42% of these patients are admitted to hospital. CAP accounts for more than 100,000 admissions per year, a figure that was seen to be rising even before the COVID-19 pandemic.[3] The number of admissions due to CAP, and average length of stay (5.4 to 10.9 days) have been reported to vary across regions, even when corrected for catchment population,[1] highlighting the absence of a standardised approach to the care of patients with CAP.

CAP is more common in older people, who often have other medical conditions. For younger patients under 65 years of age, both death and readmission are also known to be associated with greater social deprivation.[4] In 2019, pneumonia and other lower respiratory infections were the deadliest group of communicable diseases ranked as the fourth leading cause of death by the World Health Organization,[5] with 30,000 deaths each year in the UK.[1] British Thoracic Society (BTS) audit data from 2018/19 have shown an overall in-hospital mortality of 10.4%.[6] The only European countries with higher CAP mortality than the UK are Slovakia and Romania.[3]

Readmission to hospital after an episode of CAP is common and is associated with a more than two-fold increased risk of mortality compared with readmission for other causes.[7] The Getting It Right First Time (GIRFT) respiratory medicine report published in 2021 showed that readmissions were not related to a short initial length of stay and 38% were due to pneumonia while 21% were due to other respiratory disorders.[1] BTS audit data have also shown that readmission rates are rising,[6] further adding to the pressure on the healthcare system. The GIRFT report noted that '*there was surprisingly little infrastructure to support pneumonia care*' in place in hospitals compared with the infrastructure in place for other respiratory conditions that result in fewer hospital admissions.[1]

There are established guidelines for the care of people with CAP, from admission through to discharge and follow-up.[1,6,8-11] The BTS also have a template care bundle that describes four high-impact actions to ensure the best clinical outcome for patients admitted with CAP, comprising timely prescribing and administration of oxygen followed by timely antibiotics administered after assessment with a chest X-ray and CURB65 risk score.[11,12] At admission, low-risk patients with CAP who may be suitable for ambulatory care should be identified. Use of a risk score can aid this and adds to the accuracy of clinical decision-making, the strategy for investigation and, for initial antibiotic treatment.[6,8] A treatment escalation plan and monitoring for signs of deterioration in hospital are also important.[13] Signs of deterioration influence both the location where care is delivered and the continuing antibiotic strategy. On discharge, clearly defined arrangements for follow-up need to be in place.

This study was proposed in 2019 by the BTS and the Intensive Care Society (ICS) to explore the perceived absence of a standardised approach to care. The beginning of this project coincided with the onset of the COVID-19 pandemic. Identification of patients to be included in the study was therefore deliberately delayed avoiding the peak of COVID-19 admissions.

WHAT PATIENTS SAID

WHAT SHOULD HAPPEN

"I felt extremely well supported, the communication, care and knowledge was just outstanding."

"The medical team took the time to understand my personal situation which included two rare and difficult to manage auto immune conditions."

"[I am] Supported by a physiotherapist that visits me at home and contacts me weekly to check in and see how my exercise plan is going."

"Since discharge, I have had a weekly call with the Critical Care Recovery Team which has been invaluable."

"[I] Feel that anytime I need support the GP surgery gives me very quick and priority access to my GP."

WHAT SHOULD NOT HAPPEN

"I do not think they adequately explained all the procedures that I had in hospital, or how I came to have pneumonia."

"Nothing about community-acquired pneumonia was explained to me at hospital."

"No plan on how to cope and what to do in terms of accessing support the first few weeks after discharge."

"Lack of information. No one explained why I had to have repeat chest X-ray."

"Discharged home directly from ICU which was a real shock to the system."

CHAPTER 1: METHOD AND DATA RETURNS

Study Advisory Group

A multidisciplinary group of clinicians was convened to define the objectives of the study and advise on the key questions. The Study Advisory Group (SAG) comprised healthcare professionals in respiratory medicine, acute medicine, critical care, specialist respiratory nursing, specialist respiratory physiotherapy, pharmacy, and lay/patient representatives. This group steered the study from design to completion.

Aim

To identify avoidable and modifiable factors in the care of adults presenting to hospital with a diagnosis of community-acquired pneumonia (CAP).

Objectives

The SAG identified the following areas to address:

- The care delivered from presentation to hospital through to discharge or death
- Factors determining an ambulatory care or ward-based approach including severity
- Appropriateness of care including risk stratification, antibiotic usage/duration of usage, escalation decisions and discharge location
- Sharing of treatment escalation plans
- Available services, access to investigations, and antibiotic formularies; first and second choices according to pneumonia severity
- Use of guidelines, audit, and protocols

Study population and case ascertainment

Inclusion criteria

All patients aged 18 or over who presented to hospital between 1st October 2021 and 31st December 2021 with a primary admission diagnosis of CAP.

Exclusion criteria

Patients presenting to hospital within 10 days of being discharged from hospital where the discharge diagnosis of the previous admission was not CAP.

Sampling

A maximum of eight patients were selected from each hospital. Sampling was deliberately biased towards more severe cases of CAP, based on increased length of stay, admission to critical care and death, to ensure the inpatient pathway could be assessed. A sample of ambulatory/same day discharges were also included while minimising sampling patients with a length of stay of less than three days. Critical care admission was not specifically excluded but was not a focus of the study. Sampling for the study was delayed until after the peak of the COVID-19 pandemic.

Hospital participation

Data were included from hospitals in England, Wales, Northern Ireland, and Jersey.

Data collection: peer review

Identification of a sample population

A pre-set spreadsheet was provided to every local reporter to identify all patients meeting the study criteria during the defined time period. From this initial cohort, the sampling for inclusion in the study took place.

Questionnaires

Two questionnaires were used to collect data for this study: a clinician questionnaire for each patient and an organisational questionnaire for each participating hospital.

Clinician questionnaire

This questionnaire was sent electronically to the consultant responsible for the care of the patient at the time of their admission to hospital/emergency department episode.

Organisational questionnaire

This questionnaire was sent electronically to the local reporter to pass on to relevant people who could provide information on the services provided, guidelines and policies relevant to the care of patients presenting to hospital with CAP.

Case notes

Copies of the case notes were requested for peer review:

- GP related notes and referral
- Ambulance notes/ambulance service patient report form (PRF)/emergency department clerking proforma/records/ same day emergency care notes
- Inpatient notes from all healthcare professionals
- Radiology, haematology, biochemistry and, microbiology reports
- Datix or other incident reports
- Post mortem report if applicable
- Discharge letter/summary
- Out-patient follow-up clinic notes and letters for 6 months post discharge

Peer review of the case notes and questionnaire data

A multidisciplinary group of case reviewers comprising consultants, trainees and clinical nurse specialists, physiotherapists, speech and language therapists from: respiratory medicine, acute medicine, emergency medicine, critical care, and general medicine were recruited to peer review the case notes and associated clinician questionnaires.

All patient identifiers were removed by the non-clinical staff at NCEPOD before the case notes or questionnaires were presented to the group. Using a semi-structured electronic questionnaire, each set of case notes was reviewed by at least one reviewer within a multidisciplinary meeting. At regular intervals discussion took place, allowing each reviewer to summarise their cases and ask for opinions from other specialties or raise aspects of the case for further discussion.

Data collection: patient online survey

An open-access, anonymous survey was circulated online to allow patients who had experienced CAP to provide their views on the care they had received. This survey was designed with the help of the SAG and a patient focus group. A survey link was sent to a wide group of stakeholders to disseminate via local patient participation groups and promote using social media.

Information governance

All data received and handled by NCEPOD comply with all relevant national requirements, including the General Data Protection Regulation 2016 (Z5442652), Section 251 of the NHS Act 2006 (PIAG 4-08(b)/2003, App No 007), and the Code of Practice on Confidential Information. Each patient included was given a unique NCEPOD number. All electronic questionnaires were submitted through a dedicated online application.

Data analysis

Following cleaning of the quantitative data, descriptive data summaries were produced.
Qualitative data collected from the reviewers' opinions and free text answers in the clinician questionnaires were themed, where possible to allow additional quantitative analysis.

As the general method adopted in this study provides a snapshot of care over a set point in time, with data collected from several sources to build a picture of care across the UK, denominators in the report will change depending on the data source. This deep dive uses a qualitative method of peer review from which anonymised case studies have been created and used throughout the report to illustrate themes. The sampling method of this enquiry, unlike an audit, means that data cannot be displayed at a hospital/trust/health board/regional level.

Data analysis rules

- Small numbers have been suppressed if they risked identifying an individual.
- Any percentage under 1% has been presented in the report as <1%.
- Percentages were not calculated if the denominator was less than 100 so as not to inflate the findings.
- There is variation in the denominator for different data sources and for each individual question as it is based on the number of answers given.

The findings of the report were reviewed prior to publication by the SAG, case reviewers and the NCEPOD Steering Group which included clinical co-ordinators, trustees, and lay representatives.

Data returns

Clinical data

During the three-month study period, patient identification spreadsheet data recorded 53,667 hospital admissions (including same day emergency care) coded as pneumonia in 46,974 different patients. The average age of this population was 73.8 years. There were 35,640/46,974 (75.6%) patients aged 65 years or over and 6,727/46,974 (14.3%) patients died. Figure 1.1 show the sampling for inclusion in the study.

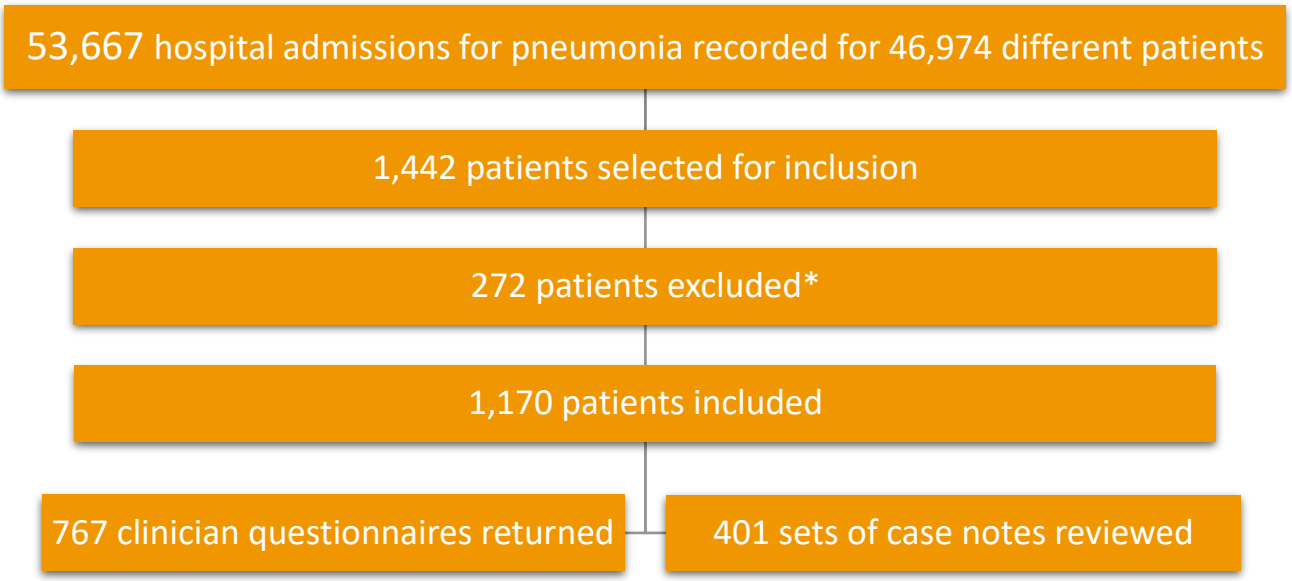

Figure 1.1 Data returns

*The most common reasons for exclusion were that the pneumonia was acquired in hospital rather than in the community or patient did not have pneumonia.

Organisational data

Data were available from the organisational questionnaire for 149 hospitals.

CHAPTER 2: STUDY POPULATION

Age

The age distribution of the study population is compared with the larger dataset in Figure 2.1. In the study sample, 387/767 (50.5%) patients were male and 380/767 (49.5%) were female. The median age for all was 74 years (mean 70.2 years). Being aged 65 years or older is one of the criteria used when assessing the severity of community-acquired pneumonia (CAP). In this study 525/767 (68.4%) patients were aged 65 years or older.

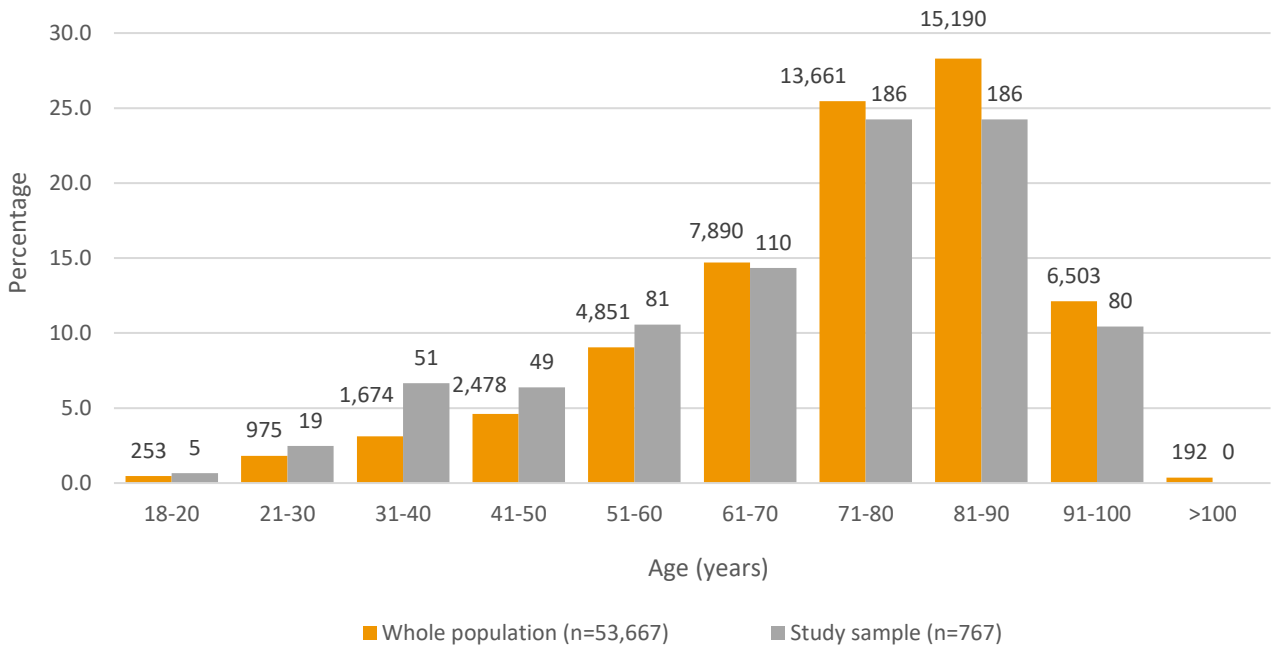

Figure 2.1 Age of the whole study and study sample populations
Patient identifier spreadsheet data and clinician questionnaire data

This shows that the patients included in the study were slightly younger than those presenting to hospitals in general, despite the sampled group being enhanced for increased disease severity. Although age is strongly associated with severity it is possible this was affected by including patients who went to critical care (older persons are less likely to be admitted to ICU).

Length of stay

For the patients in the sampled cohort, and who survived to hospital discharge, the median length of stay was four days (mean 8.4 days). For the patients who died, the median length of stay was six days (mean 10.2 days).

Data for treatment in same day emergency care (SDEC) was not specifically provided but 4,449/52,311 (8.5%) patients had a length of stay of less than one day and were discharged to their usual place of residence.

Comorbidities

Comorbid medical conditions were common, with at least one comorbidity present in 695/767 (90.6%) patients (Figure 2.2). There were 15/767 (2.0%) patients with a learning disability in the study population, two of whom died. Pneumonia has been shown to be a leading cause of death in people with a learning disability.[14]

Multimorbidity (the presence of two or more comorbid conditions) has a prevalence globally of 30%.[15] Its identification represents an opportunity to co-ordinate subsequent care, to focus on other medical conditions and to improve quality of life and outcomes including readmission (see chapter 9). Multimorbidity was present in 386/520 (74.2%) patients (unknown for 247).

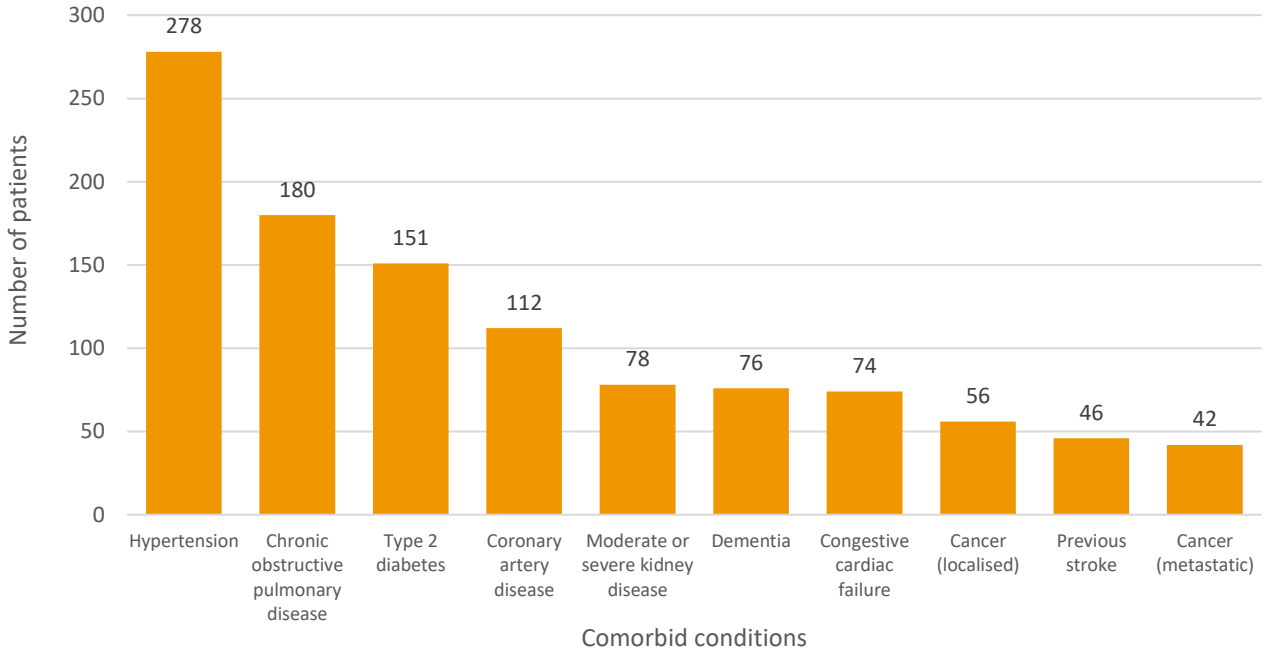

Figure 2.2 Most common comorbidities
Answers may be multiple; n=520
Clinician questionnaire data

Smoking

Tobacco smoking is both a risk factor for the development of CAP and is also associated with a worse outcome.[16] The GIRFT respiratory report found that smoking cessation infrastructures were poor.[1] and BTS audits have shown that only 5% of patients who smoked tobacco were prescribed the most effective treatment to help them quit.[6]

There were 123/581 (21.2%) patients in the study who were recorded as current smokers and 204/581 (35.1%) who were ex-smokers of at least three-months. Of note was the fact that smoking status was not recorded in 186/767 (24.3%) patients. Failure to record smoking status was not related to the presence of acute confusion or severity of CAP (84/136; 61.8% patients with confusion had their smoking status recorded). The recording of smoking status did not appear to be strongly related to the age of the patient. In older patients, smoking cessation might have less impact on the development of long-term smoking-related complications, but it may reduce the risk of readmission following an episode of CAP.[17]

Of the 123 patients who were current smokers, it was not known if smoking cessation advice was offered to 41/123 (33.3%). Advice was offered to 38 patients and ten were prescribed nicotine replacement during the admission. Of the 85 patients who were either not offered advice, or where this information was not known, 19 died. The omission of advice and treatment for tobacco dependency was therefore not explained by this group dying before this intervention was possible.

Both the failure to record smoking status and, where it was recorded, to offer advice, support and nicotine replacement therapy represent missed opportunities to address this important modifiable risk factor for future CAP episodes and for other smoking related diseases.

CASE STUDY 1

An older patient who smoked was admitted with community-acquired pneumonia. On admission 'very brief advice' was documented, a structured review template outlining the smoking history and interventions provided was filed in the patient's records. Nicotine replacement therapy was prescribed and administered on admission. The patient was offered ongoing support by a smoking cessation advisor and follow-up arrangements were included on the discharge summary.

The reviewers considered that this was an example of excellent practice, including a structured review process, service organisation and access.

Frailty

The Rockwood clinical frailty scale was developed to describe the overall functional status of patients.[18] It was originally developed to describe this in people aged 65 years or older.

There were 380/728 (52.2%) patients with a clinical frailty score of 1-4 (average age 61.2 years) and 348/728 (47.8%) who were considered at least mildly frail with a score of 5-9 (average age 81.0 years) (not determined for 39; Figure 2.3 and Table 2.1).

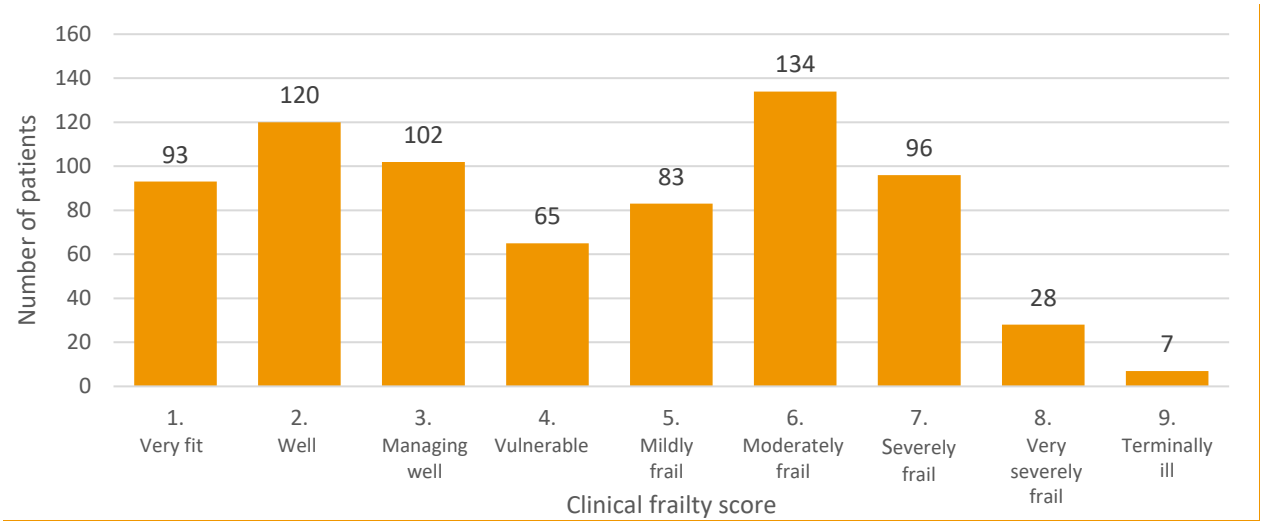

Figure 2.3 Clinical frailty scores (n=728)

Clinician questionnaire data

Table 2.1 The average age of patients by clinical frailty score

Clinical frailty scale	1	2	3	4	5	6	7	8	9
Average age (years)	45.7	58.4	68.5	71.3	78.3	82.1	81.8	82.1	79.0

Clinician questionnaire data

The presence of frailty reduced the opportunity for patients to be treated on an ambulatory care pathway. Ambulatory care was used in 84/315 (26.7%) patients with a clinical frailty score of 1-3, and only 4/131 (3.1%) patients with a score of 7-9 (unknown for 38).

CHAPTER 3: PRESENTING FEATURES AND OUTCOME

Presenting features

The typical features associated with acute respiratory illness such as community-acquired pneumonia (CAP) include cough, dyspnoea, wheeze, pleuritic pain, haemoptysis, and fever. The most common presenting features of patients in this study were cough (526/767; 68.6%), dyspnoea (432/767; 56.3%), and fever (235/767; 30.6%).

Atypical features

Notably, 88/767 (11.5%) patients had none of these typical features, and instead presented with the atypical features listed in Table 3.1. Diagnostic uncertainty has previously been identified as a cause of delay in appropriate treatment for CAP.[19] The absence of typical features of CAP (or infection in general) emphasises the importance of rapid and thorough investigation on admission to hospital to ensure an accurate diagnosis and initiation of appropriate treatment.

Table 3.1 Atypical features of community-acquired pneumonia that patients presented with

	Number of patients
Confusion	35
Fall	31
Fatigue	15
Vomiting	8
Abdominal pain	6
Diarrhoea	3
Rigors	2
None of these	8

Answers may be multiple; n=88

Clinician questionnaire data

Confusion

Confusion is common in older patients admitted to hospital and is important as delirium is a risk factor for death and for the future development of dementia. It can also result in an increased length of stay in hospital. Guidelines are available for the prevention, diagnosis and management of delirium in hospital.[20]

Confusion was common in the patients included in this study, being documented in 136/767 (17.7%) patients. Of the 651 patients treated as inpatients, there were 130/651 (20.0%) patients with new onset confusion. Of the 109 patients treated on a same day emergency care pathway, 6/108 (5.6%) had new onset confusion.

There was a clear relationship between both clinical frailty and age with new onset confusion as a presenting feature (Figures 3.1 and 3.2). Acute confusion affected 23/374 (6.1%) patients with a clinical frailty score of 0-4

compared with 106/325 (32.6%) with a score of 5-9. There were 14/238 (5.9%) patients under the age of 65 and 122/497 (24.5%) aged 65 and over with new onset confusion (data not shown).

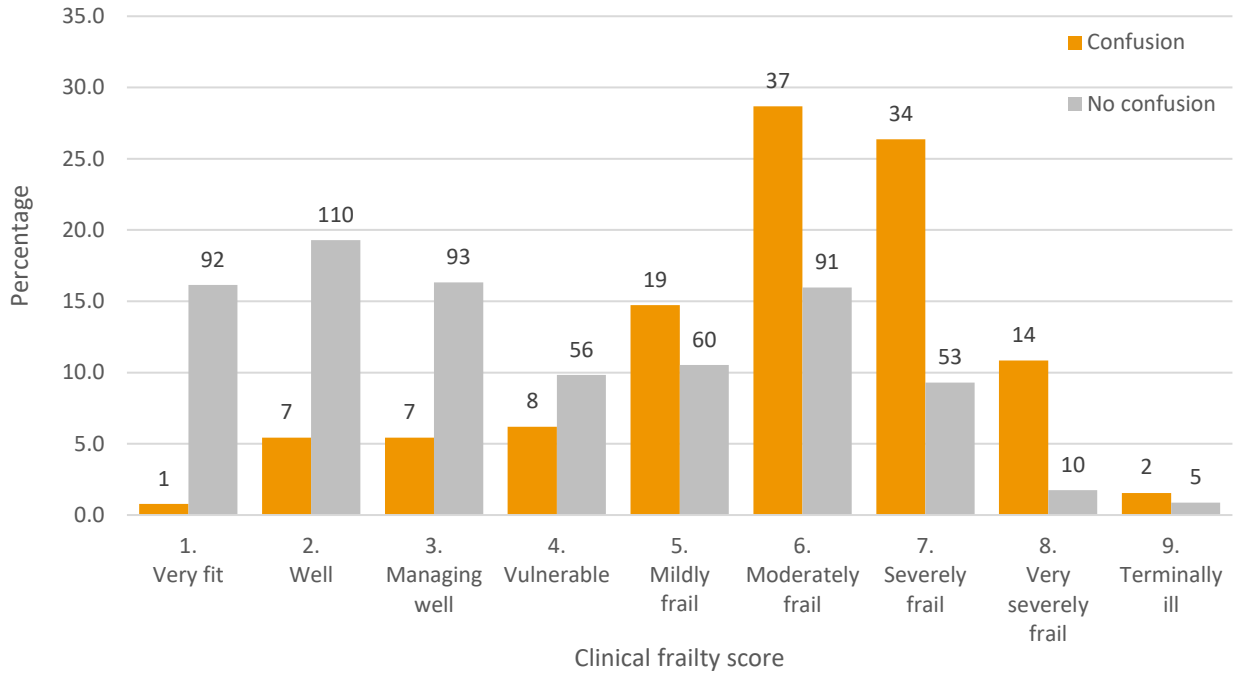

Figure 3.1 Clinical frailty scale and new onset confusion (n=699; unknown for 68)
Clinician questionnaire data

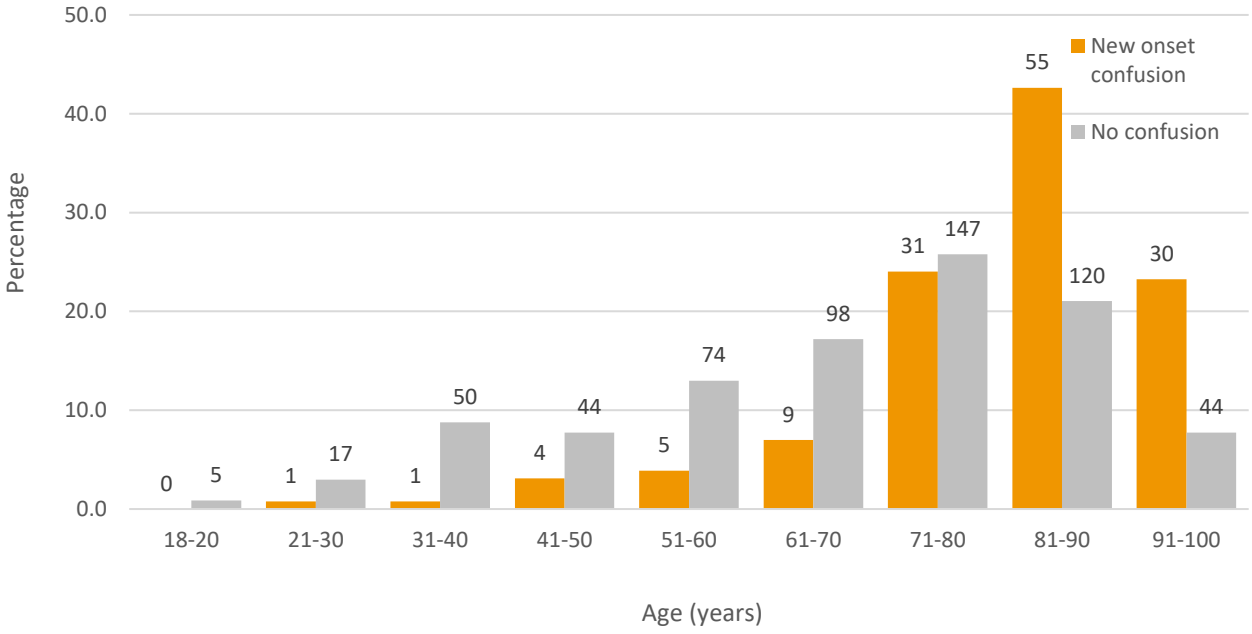

Figure 3.2 Age and new onset confusion (n=735; unknown for 32)
Clinician questionnaire data

CASE STUDY 2

An older person was admitted with confusion with no obvious cause. They were treated initially with trimethoprim for a urinary tract infection (UTI). On developing abdominal pain 24 hours later an abdominal CT was undertaken which revealed right basal community-acquired pneumonia. Antibiotics were changed in line with pneumonia guidelines and the patient slowly improved.

The reviewers thought that there was no evidence for a UTI. Including a chest X-ray in the initial investigations would have achieved a more rapid diagnosis and so that appropriate antibiotics could have been started sooner.

Fever

A high temperature is listed in public-facing information as one of the main symptoms of CAP.[21] Although fever is common, high temperature is not a constant feature. At the time of presentation to hospital, there were 333/673 (49.5%) patients with a temperature in the normal range (unknown for 94; Figure 3.3). It is important to note that a normal temperature measurement cannot be used to rule out a diagnosis of CAP.

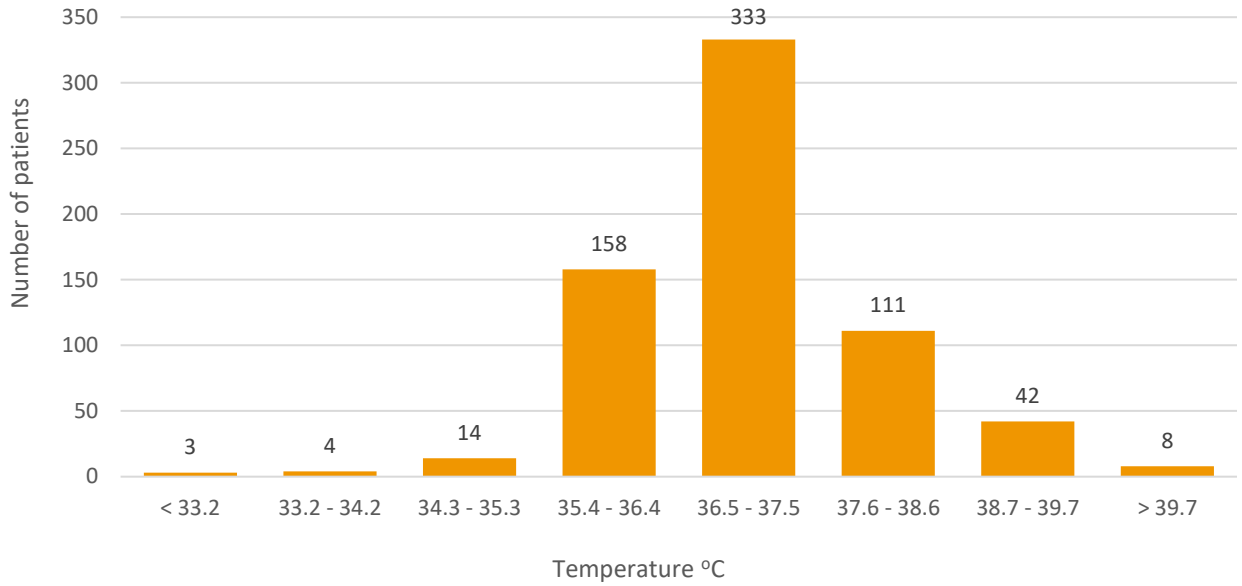

Figure 3.3 Patient temperature at the time of presentation (n=673)
Clinician questionnaire data

Outcome of the study population

Of the patients who were admitted to hospital with CAP, 383/648 (59.1%) returned to their own home. Other options included a number of patients who were discharged to other hospitals, mental health facilities or rehabilitation units. Three patients self-discharged (Table 3.2).

Table 3.2 Discharge destination - inpatients only

	Number of patients	%
Own home	383	59.1
Died	196	30.2
Nursing home	29	4.5
Residential home	16	2.5
Other	24	3.7
Subtotal	**648**	
Unknown	3	
Total	**651**	

Clinician questionnaire data

Mortality

The mortality of the 46,974 patients identified to NCEPOD over the three-month study period was 14.3%. The mortality in the latest national British Thoracic Society audit was 10.4%.[6] The patients included in this study (selected by several factors that included length of stay), had an overall mortality of 25.8% (198/767). Of those who were treated as inpatients, 196/648 (30.2%) died.

Clinical frailty and age

Clinical frailty and age are both factors that influence mortality from major medical conditions. The mortality increased with both increasing frailty (Figure 3.4) and increasing age (Figure 3.5).

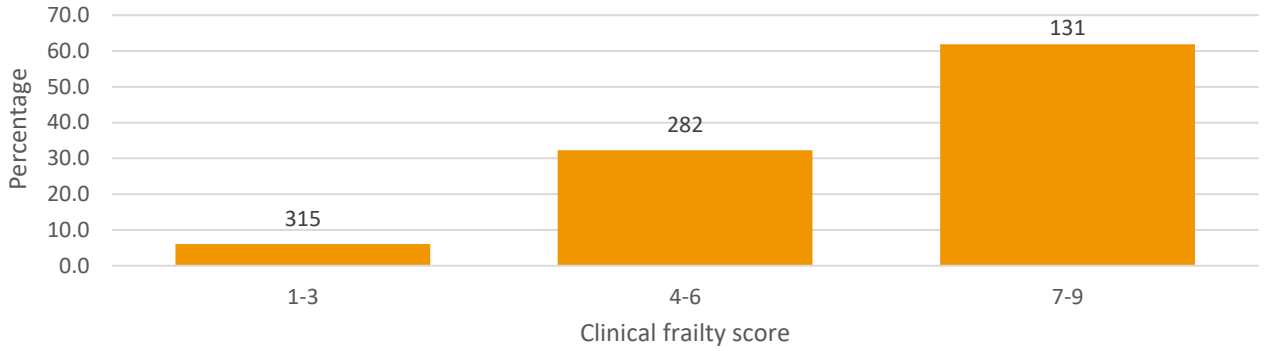

Figure 3.4 Mortality by clinical frailty score (n=728; unknown for 39)

Clinician questionnaire data

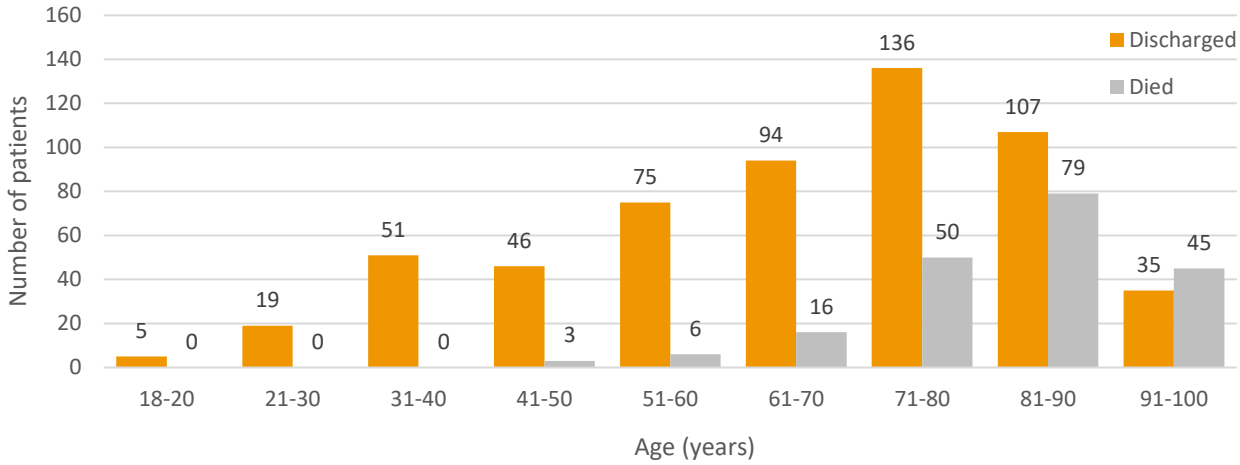

Figure 3.5 Outcome by age (n=767)

Clinician questionnaire data

Severity

The CURB65 tool has been validated for predicting severity in community-acquired pneumonia to guide its management, and provides a score based on a measure of confusion, urea, respiratory rate, blood pressure and age.[22] NEWS2 observations, for identifying deterioration, also overlap in some of these parameters, and include respiratory rate, oxygen saturation, systolic blood pressure, pulse rate, confusion and temperature.

The CURB65 score was rarely recorded, so data provided in the clinician questionnaire were used to calculate the score for 575/767 patients where the variables were available (Table 3.3). This score has been used in this report to evaluate the management of CAP based on its severity.

Table 3.3 CURB65 score calculated from clinician questionnaire data

	Number of patients	%
0	129	22.4
1	149	25.9
2	178	31.0
3	91	15.8
4	24	4.2
5	4	0.7
Subtotal	**575**	
Missing parameters	192	
Total	**767**	

Clinician questionnaire data

Using the calculated CURB65 score there was a clear relationship between CURB65 and mortality. Noting that this was a selected population of patients with CAP, of those with severe CAP (CURB65 score of 3-5), 62/119 (52.1%) died, and of those patients considered to be low risk (CURB65 score of 0 or 1),21/278 (7.6%) died (Table 3.4). The data presented support the use of CURB65 as a tool for decision-aid in guiding the treatment and assessing the risk of severity, in patients with CAP (see chapter 6).

Table 3.4 Outcome of hospital admission by calculated CURB65 score

CURB65 score	Discharged	Died	Total	
	Number of patients	Number of patients	Number of patients	% mortality
0	124	5	129	3.9
1	133	16	149	10.7
2	122	56	178	31.5
3-5	57	62	119	52.1
Subtotal	**436**	**139**	**575**	**24.2**
Could not calculate	132	60	192	31.3
Total	**568**	**199**	**767**	**25.9**

Clinician questionnaire data

There is also evidence that higher National Early Warning Score (NEWS2) scores were associated with poorer outcomes for all patients.[23,24] A high NEWS2 score recorded as part of the initial assessment was associated with a high mortality. Of those patients with a NEWS2 score of 5-6, 32/105 (30.5%) died and of those with a score of ≥7, 60/118 (50.8%) died. Of those with a lower NEWS2 score of 0-4 on initial assessment, 55/346 (15.9%) died (Table 3.5).

Table 3.5 Overall outcome of hospital admission by NEWS2 score

NEWS2 score	Discharged	Died	Total	
	Number of patients	Number of patients	Number of patients	% mortality
0-2	191	24	215	11.2
3-4	100	31	131	23.7
5-6	73	32	105	30.5
7+	58	60	118	50.8
Total	**422**	**147**	**569**	**25.8**

Clinician questionnaire data

Patients with a low NEWS2 score on arrival still have the potential to deteriorate. Reviewer data included both the initial and highest NEWS2 scores for patients. A low initial NEWS2 score (0-2) remained low in 46/74 (62.2%) patients, however, several patients in each of the initial NEWS2 groups increased to a higher category during the admission. Of those who had a low initial NEWS2 score (0-4) and died (55 patients) 47/55 were over the age of 70 years and 44/55 had a frailty score of 5-9. This reinforces the importance of track and trigger systems to help identify deterioration and the impact of frailty and age on outcome.

CHAPTER 4: SERVICES AND CLINICAL PATHWAY

Patients with community-acquired pneumonia (CAP) with mild disease are usually cared for by primary or community care services. If hospital treatment is required, the care pathway flows through emergency departments or acute medical units and then on to medical wards. Care is therefore provided by emergency physicians and, for inpatients, by acute medical, and/or general medical teams.

Once the severity of illness has been assessed for those patients who have been seen in hospital, an ambulatory care pathway is encouraged for those with milder disease (see chapter 6).[25] For more severely affected patients or those with comorbid conditions or clinical frailty, hospital admission is usually required. Respiratory virtual wards were developed during the COVID-19 pandemic to care for large numbers of patients with COVID-19 who were at risk of deterioration. The expansion of these wards to include treatment for other acute respiratory infections is being explored but there is currently no evidence that this approach is appropriate for patients with CAP.[26]

Table 4.1 shows the variation in services for CAP provided by hospitals. Of the hospitals with a virtual ward in place, 76/82 were able to offer vital signs monitoring in that environment and 57/82 stated that they would accept patients with CAP. It is important for these hospitals to ensure that good governance arrangements are in place for the safe treatment of patients with CAP, and ideally to provide the evidence that care for these patients is safe, effective and uses resources efficiently.

Table 4.1 Community-acquired pneumonia services provided by each hospital

Service	Yes		No		Subtotal	Unknown	Total
	Number of hospitals	%	Number of hospitals	%		Number of hospitals	Number of hospitals
Urgent care centre assessment hub	92	69.2	41	30.8	**133**	16	**149**
Oximetry at home service	69	51.5	65	48.5	**134**	15	**149**
Respiratory virtual ward	82	56.9	62	43.1	**144**	5	**149**
Designated ambulatory care centre or SDEC facility	138	92.6	11	7.4	**149**	0	**149**
Ambulatory care pathway for CAP	58	41.7	81	58.3	**139**	10	**149**
Single point of access for medical patients referred by their GP	100	73.5	36	26.5	**136**	13	**149**

Organisational questionnaire data

Many local systems have been reorganised in recent years to simplify the care pathway for hospital-based acute services using a 'single point of access'. There were 100/136 (73.5%) hospitals reporting a single point of access for patients referred by their GP and 138/149 (92.6%) had a designated ambulatory care centre or same day emergency care (SDEC) facility. There were 54 hospitals with a specific ambulatory care pathway

for patients with CAP. Of these, 44/54 used specific criteria to select patients for ambulatory care management.

Patients had commonly been in contact with healthcare services about the episode of CAP prior to the hospital attendance (Table 4.2). Of these, 257/651 (39.5%) patients with previous contact, the majority (163/257; 63.4%) had seen a GP. There were 61/257 (23.7%) patients who had attended an emergency department. These prior contacts meant that many patients were already on antibiotics for CAP before their hospital admission (see chapter 8).

Table 4.2 Patient contacted/engaged with healthcare services prior to hospital for this episode of CAP

	Number of patients	%
Yes	257	39.5
No	394	60.5
Subtotal	**651**	
Unknown	116	
Total	**767**	

Clinician questionnaire data

Patients with CAP are not always seen by a respiratory specialist. There is some evidence (observed prior to the establishment of SDEC services) that patients with mild disease who are seen by a respiratory specialist have a shorter length of stay.[27] Those with complications of CAP (e.g. lung abscess or pleural infection) also benefit from specialist respiratory care.

On arrival at the hospital, most patients (630/767: 82.1%) were initially assessed in the emergency department. There were 63/767 (8.2%) patients assessed in a medical assessment unit and 48/767 (6.3%) in a SDEC facility. Following admission, care was provided on an acute medical ward for 433/651 (66.5%) inpatients.

A ward transfer to optimise treatment was required for 206/651 (31.6%) patients. Overall, only 114/651 (17.5%) patients received any of their care on a specialist respiratory ward. For 30 patients the first ward providing care was an intensive care unit or a high dependency unit; an additional 14 patients were transferred to critical care during the admission. Overall 44/767 (5.7%) patients received at least some of their care in a critical care unit. Nine received some of their care in a respiratory support unit (Table 4.3).

Table 4.3 Type of ward the patient was transferred to

	Number of patients	%
Acute medical	54	26.2
Respiratory	51	24.8
Non-respiratory	44	21.4
Care of the elderly	12	5.8
Other medicine including haematology	12	5.8
Level 3 - ICU	11	5.3
Level 2 - HDU	10	4.9
Respiratory support unit	9	4.4
Total	**206**	

Clinician questionnaire data

The first review was most frequently by one of the emergency department clinical team (416/767: 54.2%) or by an acute or general physician 241/767 (31.4%). There were 622/767 (81.1%) patients who were reviewed by a consultant: acute medicine (303/622; 48.7%), general medicine or care of the elderly (180/622; 28.9%) and respiratory medicine (58/622; 9.3%) (organisational data showed that there were

52/134 (38.8%) hospitals that had a separate respiratory on call rota). In addition, 12/622 (1.9%) patients were reviewed initially by a consultant in critical care (other specialty for 69). There was no consistency in the type of clinician undertaking the first review of a patient with CAP, and many patients were reviewed by generalists rather than specialists.

The reviewers considered that during the hospital admission, 259/273 (94.9%) patients who survived to discharge received the specialist input required to manage their condition (Table 4.4). They also considered that 235/246 (95.5%) received appropriate input from allied health professionals (Table 4.5). In the remaining cases, additional specialist review would have been appropriate. It is important to ensure that high quality, co-ordinated care is provided for this common medical condition. The following chapters explore in more detail areas of clinical practice where improvements are needed.

Table 4.4 Appropriate input from specialist clinicians prior to discharge

	Number of patients	%
Yes	259	94.9
No	14	5.1
Subtotal	**273**	
Unknown	22	
Total	**295**	

Reviewer assessment form data

Table 4.5 Appropriate input from allied health professionals prior to discharge

	Number of patients	%
Yes	235	95.5
No	11	4.5
Subtotal	**246**	
Unknown	49	
Total	**295**	

Reviewer assessment form data

Leadership

To deliver the improvements highlighted in this report and support the best outcomes for patients with CAP, it is important to have identified leadership for pneumonia care in hospitals.

In addition, audit of practice has the potential to identify future areas for improvement to local leadership and service organisation.

The GIRFT report recommends that all hospitals in England have a respiratory consultant appointed as a clinical lead for pneumonia.[1] In this study, 56/149 (37.6%) hospitals reported they had a lead clinician for pneumonia.

Five hospitals had no respiratory specialist nurses. In 96/130 (73.8%) hospitals there were at least four whole time equivalent respiratory specialist nurses (unknown for 19). There were 34/127 (26.8%) hospitals where respiratory nurses (unknown for 22) were involved in the care of patients with CAP, but the extent of this involvement varied considerably.

There is evidence to show that hospitals which have developed a specialist nurse-led pneumonia service have improved adherence to published guidelines and overall outcomes for patients.[19] Introducing such a service represents an opportunity for the 93/127 (73.2%) hospitals without this to re-organise their services for the benefit of patients.

Data had been submitted to the most recent British Thoracic Society (BTS) audit in 2019 by 110/123 (89.4%) hospitals (unknown for 26). In addition, 82/124 (66.1%) hospitals had undertaken a local audit in the previous five years (unknown for 25). The value of audit is highlighted by the fact that in 52/78 hospitals, improvement actions were identified following the BTS audit (Figure 4.1). Improvement actions were also identified in 56/66 hospitals following local audit.

Embedding improvement actions in practice occurs more rapidly if they are monitored using a continuous performance measurement process. This is the approach used in the National Respiratory Audit Programme (NRAP). Inclusion of data collection on CAP in NRAP would help to deliver improvements in CAP care.

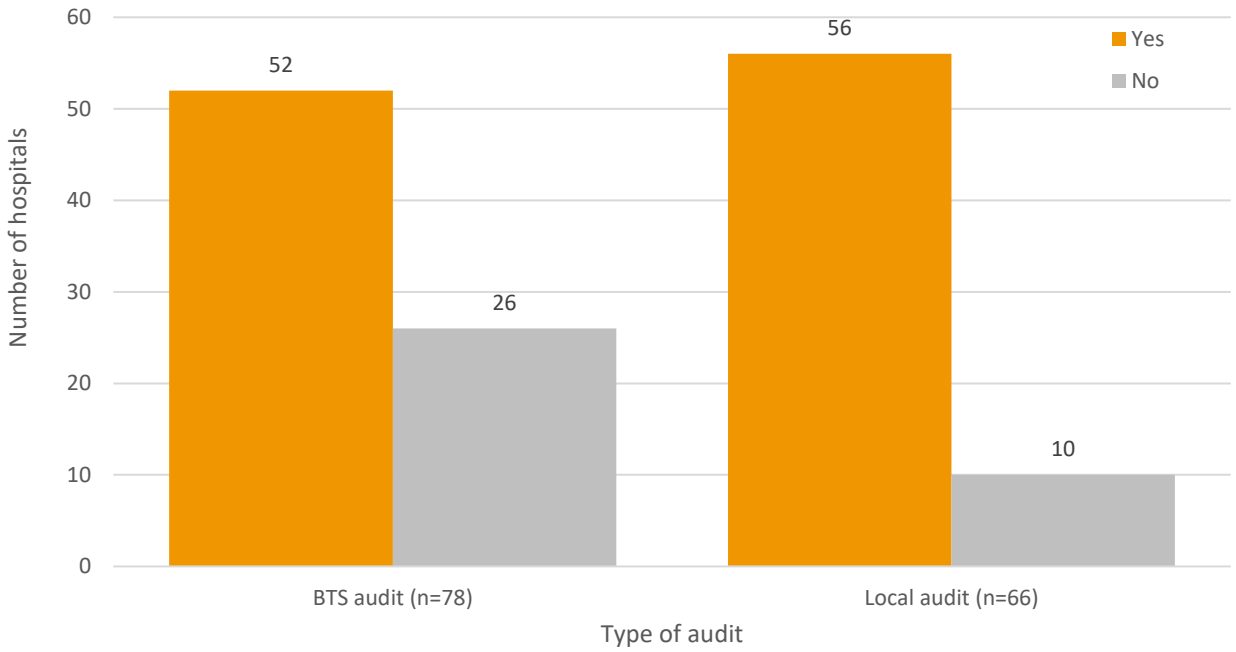

Figure 4.1 Improvement actions from the British Thoracic Society and local audits
Organisational questionnaire data

In the context of local and national audit responses, 81/110 (73.6%) hospitals self-identified as having areas where improvement was needed in their pneumonia service (unknown for 39).

CHAPTER 5: IN-HOSPITAL CARE

Initial care

Data from the British Thoracic Society (BTS) audit show that community-acquired pneumonia (CAP) is often mis-coded,[6] and this was also noted in the exclusions for this study. Improving the speed and accuracy of diagnosis after hospital admission is important to ensure that patients are treated appropriately. Appropriate treatment is likely to improve outcomes.

The reviewers found that an initial management plan was documented in the case notes in 388/401 (96.8%) patients. The elements of the documented management plan are shown in Table 5.1.

Table 5.1 Initial management plan

	Number of patients	%
Intravenous antibiotics	267	68.8
Intravenous fluids	163	42.0
Oxygen administration	156	40.2
Oral antibiotics	96	24.7
Thromboprophylaxis	85	21.9
Ceilings of treatment	74	19.1
Nebulisers	61	15.7
Steroids	59	15.2
Referral for specialist review	55	14.2
Escalation requirements	52	13.4
Frequency of vital signs	15	3.9

Note oral and/or IV antibiotics for 344 (344/388 = 88.7%) different patients

Answers may be multiple; n=388

Reviewer assessment form data

For 44/388 (11.3%) patients the initial management plan did not include antibiotics. There was no particular feature that related to the presentation of these patients that distinguished them from those who were given antibiotics. While it is important to have the results of investigations to confirm the diagnosis of CAP, treatment of infection should not be delayed unnecessarily while waiting for results. This is particularly important where there is a suspicion of sepsis.

There were 156/388 (40.2%) patients for whom oxygen administration was part of the initial management plan.

The reviewers considered that the initial management plan was not appropriate for 45/388 (11.6%) patients. The areas for improvement in initial management included severity scoring, use of inappropriate antibiotics and route of antibiotic delivery, and failure to do all necessary investigations (see chapter 7).

Initial diagnostic investigations, in particular a chest X-ray showing consolidation (increased density of the lung) are key to making the diagnosis of CAP. At the time of the initial management plan, the results of all relevant investigations were not known in 125/350 (35.7%) patients (Table 5.2).

Table 5.2 Results of all relevant investigations were known at the time of the initial management plan

	Number of patients	%
Yes	225	64.3
No	125	35.7
Subtotal	**350**	
Unknown	38	
Total	**388**	

Reviewer assessment form data

CASE STUDY 3

An older patient was admitted with cough and breathlessness. On examination, basal crackles were heard in their chest. The post take ward round was undertaken before the chest X-ray or blood results were available. The working diagnosis was heart failure and initial management included diuretics. The X-ray showed lobar pneumonia and blood tests revealed an acute kidney injury.

The reviewers thought that this illustrated why a post take ward round should only be undertaken when results are available. In this case delay led to the inappropriate use of diuretics which probably made the acute kidney injury worse. The initial antibiotic dose was also delayed for several hours.

In instances where the results of all relevant investigations were not known at the time of the initial management plan, the reviewers considered that the plan was not appropriate for 25/125 (20.0%) patients compared with 16/225 (7.1%) when the results were available.

The severity of an episode of CAP has a major impact on how it is managed (see chapter 4). Assessment at presentation can help to define the pathway of care. Ongoing assessment of physiological measurements help to guide decisions about treatment, including escalation of care. The NEWS2 is recommended for physiological monitoring in hospital.[13] A monitoring plan was specifically documented in 156/388 (40.2%) cases reviewed. In the remaining patients it is possible that an automated process was in place for documenting NEWS2 and escalating when trigger thresholds were reached.

These data show that improving the availability of investigation results is a clear area for improvement in the initial care of patients with CAP on arrival at the hospital.

CHAPTER 6: CLINICAL DECISION-MAKING

Assessment of the severity of community-acquired pneumonia (CAP) influences the location where treatment is provided, the number and type of investigations required and the initial choice of antibiotics. Clinical judgement alone has been shown to underestimate the severity of CAP,[28,29] but can be supported by decision tools such as pneumonia-specific severity assessments (CURB65) or non-specific severity assessments (NEWS2). Guidelines recommend use of the CURB65 score (combined with clinical judgement) to assess CAP severity.[6,8-11] The BTS recommends that '*there should be a regular assessment for all patients following hospital admission' and that 'disease severity assessment should form part of the clinical review*.'[10]

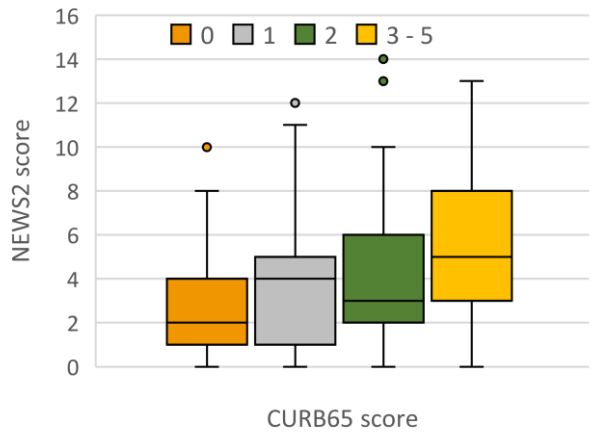

Figure 6.1 shows that for patients with a calculated CURB65 score of 0 the NEWS2 score ranged from 1-4 with one patient having a NEWS2 score of 10. A similar wide range of NEWS2 scores was seen for patients who had calculated CURB65 scores of 1, 2 and 3 to 5. This highlights the importance of clinical judgement when applying the NEWS2 or CURB65 score. And that both scores add value in different ways.

Figure 6.1 Calculated CURB65 score and NEWS2 score. *The median, interquartile range, range are shown by each box and whisker. Outliers, where present are indicated by the dots.*

The National Institute for Health and Care Excellence (NICE) and the British Thoracic Society (BTS) also recommend that CRB65 should be used in primary care to assess 30-day mortality risk in adults with CAP.[6,8] This is similar to the CURB65 score but does not include urea.

All hospitals participating in the study reported the use of both CURB65 and NEWS2. However, clinical data returned showed that a CURB65 score was documented for 204/767 (26.6%) patients and a NEWS2 score was documented for 602/767 (78.5%) patients as part of the first hospital review. Better use of both scores has the potential to improve clinical decision-making.

Data from the calculated CURB65 scores (n=575) showed that there was a slightly greater proportion of mild/low severity CAP which was present in 278/575 (48.3%) patients and a lower proportion of severe/high severity CAP which was present in 119/575 (20.7%). When patients treated in same day emergency care were excluded, the number of patients with severe CAP based on the CURB65 score was 117/493 (23.7%). These data align with the last BTS audit.[6]

Organisational data showed that patients with particular categories of CAP were specifically cared for by respiratory teams in 64/149 (43.0%) organisations. This included patients with more severe CAP. Data

returned showed that patients with more severe CAP (based on the calculated CURB65 score) were no more likely to be looked after by respiratory teams but clinicians reported that respiratory teams looked after the more complex patients who had additional needs such as chest drains or respiratory support.

CASE STUDY 4

An older patient was admitted with breathing problems and signs of community-acquired pneumonia. Vital signs were measured and showed a respiratory rate of 26 breaths per minute, a heart rate of 96 beats per minute, blood pressure of 135/55 mmHg, temperature of 37.6°C, alert, and oxygen saturation of 92% on air. The CURB65 was not recorded and treatment with amoxicillin was started while the results of blood investigations were awaited. A few hours later, treatment escalation was required, and broad-spectrum antibiotics were started. Blood results had shown a urea of 10 mmol/L and a chest X-ray showed bilateral pneumonia, but neither were available at the time of the first assessment.

The reviewers stated that this illustrated the importance of ensuring results of investigations are available rapidly (and reviewed to confirm the diagnosis), and the value of CURB65 to guide treatment decisions.

There was a relationship between CURB65 and where a patient received care: 47/129 (36.4%) patients with a CURB65 score of 0 received same day emergency care while 117/119 (98.3%) patients with a CURB65 score of ≥3 were treated as inpatients (Table 6.1). This highlights that those with high CURB65 scores were appropriately cared for as an inpatient rather than on an ambulatory pathway. There were only 14 patients identified by in-depth case note review where the reviewer considered that a different pathway should have been used.

Table 6.1 Calculated CURB65 score and patient pathway

CURB65 score	Inpatient	SDEC	Total	% SDEC
	Number of patients	Number of patients	Number of patients	
0	82	47	129	36.4
1	126	22	148	14.9
2	168	10	178	5.6
3	89	2	91	2.2
4	24	0	24	0.0
5	4	0	4	0.0
Subtotal	**493**	**81**	**574**	**14.1**
Could not calculate	158	28	186	15.1
Total	**651**	**109**	**760**	

Clinician questionnaire data

There was a similar pattern seen when the pathway was assessed against the use of NEWS2. Patients with higher NEWS2 scores were more likely to be treated as an inpatient (Table 6.2).

Table 6.2 NEWS2 score and patient pathway

NEWS2 Score	Inpatient	SDEC	Total	% SDEC
	Number of patients	Number of patients	Number of patients	
0-2	153	60	213	28.2
3-4	117	13	130	10.0
5-6	99	6	105	5.7
7+	116	2	118	1.7
Subtotal	**485**	**81**	**566**	**14.3**
Not undertaken	166	28	194	14.4
Total	**651**	**109**	**760**	**14.3**

Clinician questionnaire data

CHAPTER 7: INVESTIGATIONS

Radiology

In order to ensure patients receive prompt and appropriate treatment on admission to hospital, assessment should include timely and thorough investigation to achieve an accurate diagnosis. Guidelines recommend that facilities are in place to ensure a chest X-ray (CXR) is undertaken promptly and in time for antibiotics to be administered within four hours of presentation to hospital.[6,8]

The Royal College of Radiologists' reporting standards focus on the content of a report and not the timeframe within which images should be reported.[30] The respiratory GIRFT report recommends that CXRs should be '*formally reported for patients not managed by respiratory physicians to prevent underlying diagnoses being missed and reduce the likelihood of readmission*'.[1] In addition, in 2018 the Care Quality Commission reported that boards should assess any risks related to radiology reporting and ensure that resources including staffing were in place for reporting in an appropriate timeframe.[31]

At an organisational level, 58/149 (38.9%) hospitals reported there was no process in place to ensure that a CXR was carried out within four hours of admission. In addition, in 52/149 (34.9%) hospitals the CXR was not routinely reported by a radiologist.

At a clinical level a CXR was carried out in 749/767 (97.7%) patients. Of the 18 patients who did not have a CXR, seven had a CT scan.

There were 389/767 (50.7%) patients who had additional radiological investigations (Table 7.1). In this group 47/389 (12.1%) patients were considered to have had unnecessary investigations. Furthermore, for 45/767 (5.9%) patients the clinician completing the questionnaire reflected that additional investigations should have been carried out.

Table 7.1 Additional investigations undertaken

	Number of patients	% of all patients
Repeat chest X-ray	139	18.1
CT pulmonary angiogram	135	17.6
CT thorax	97	12.6
Point of care ultrasound	8	1.0
Ultrasound thorax	6	0.8
Bronchoscopy	4	0.5
Subtotal	**389**	
None apply	378	
Total	**767**	

Answers may be multiple; n=389

Clinician questionnaire data

The clinical questionnaire showed that for 394 patients where both times were known, 182/394 (46.2%) had a CXR within two hours and 292/394 (74.1%) within four hours of arrival at the hospital. For 21 patients the CXR was not undertaken until more than 24 hours after admission (Figure 7.1).

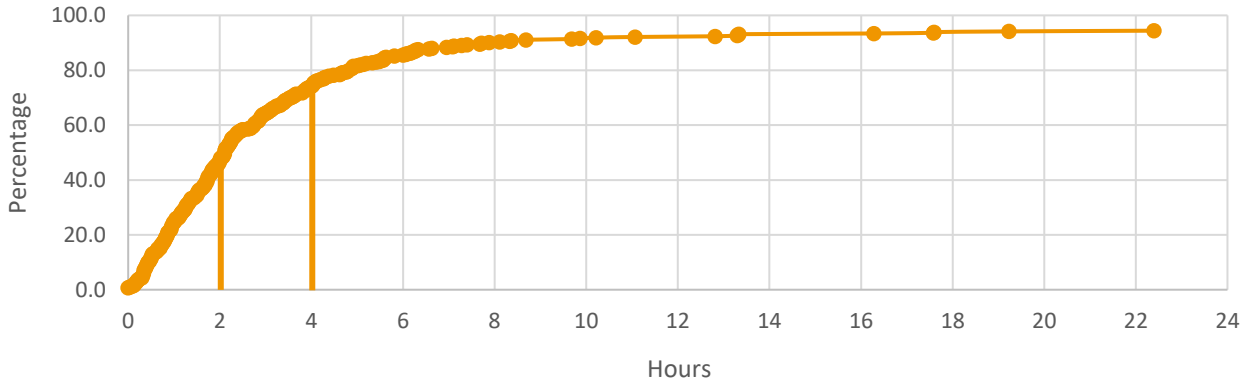

Figure 7.1 Time from arrival at hospital to chest X-ray (n=394)
Clinician questionnaire data

The case reviewers commented that there was a delay in the patient receiving a CXR in 21/288 (7.3%) patients. There were however, 101 patients where they did not have enough information to comment. The clinicians who reviewed the records in their own hospital considered that there was a delay in 67/722 (9.3%) patients (Table 7.2).

Table 7.2 Delay in the patient having the chest X-ray

	Clinicians		Reviewers	
	Number of patients	%	Number of patients	%
Yes	67	9.3	21	7.3
No	655	90.7	267	92.7
Subtotal	**722**		**288**	
Unknown	45		101	
Total	**767**		**389**	

Clinician questionnaire and reviewer assessment form data

The time from the CXR to reporting is shown in Figure 7.2. For the 526 patients where this time was recorded, a report was available within 12 hours of the CXR for 125/526 (23.8%) patients. For 30 patients, production of the report took more than 41 days.

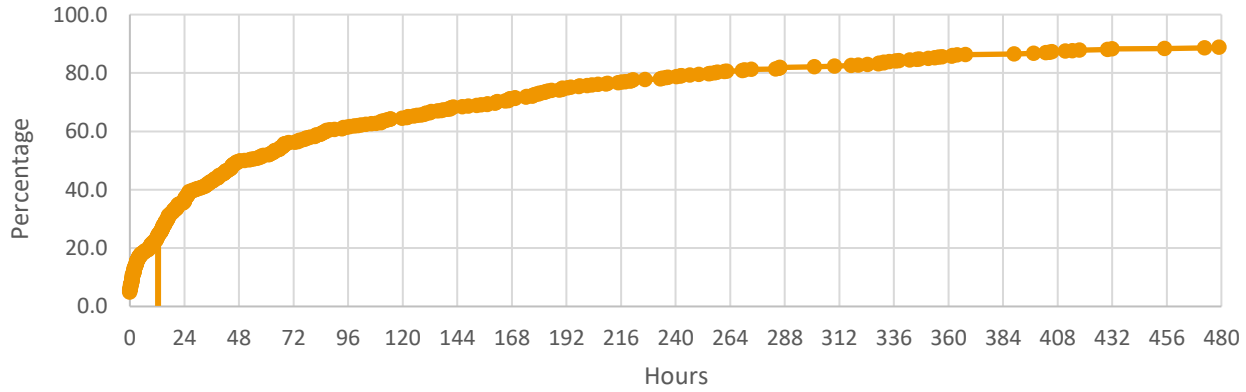

Figure 7.2 Time from chest X-ray to report (n= 526)
Clinician questionnaire data

The clinical team responsible for the care of the patient documented their interpretation of the CXR findings in 665/733 (90.7%) patients who had a CXR (n=749) (unknown for 16; Table 7.3). Of the 49 patients where the clinical team reported a normal CXR, half had additional radiological investigations (19 had a CT scan and

five had a repeat CXR). Of the remaining 25 patients, ten had a report that showed CAP which had not been noted by the clinical team.

Table 7.3 Chest X-ray findings documented by the clinical team

	Number of patients	%
Unilateral lobar consolidation/pneumonia	234	35.2
Unilateral patchy consolidation/bronchopneumonia	164	24.7
Bilateral lobar consolidation/pneumonia	82	12.3
Pleural effusion	49	7.4
Suspicion of lung cancer	8	1.2
Multilobar consolidation/pneumonia	25	3.8
Normal X-ray	49	7.4
Other (specified)	125	18.8

Answers may be multiple; n=665

Clinician questionnaire data

Importantly, the CXR report differed from the findings noted by the clinical team in 205/665 (30.8%) patients. The most important difference was the possibility of lung cancer, which was raised in an additional 30 patients. This means that lung cancer was suspected in a total of 38/767 (5.0%) patients. There were also eight patients identified on the CXR report with suspected interstitial lung disease. This underlines the importance of the CQC[31]and GIRFT.[1] recommendations that providing a timely CXR report has the potential to support the identification of other conditions and influence ongoing patient management beyond the treatment of CAP.

CASE STUDY 5

An older patient who was an ex-smoker was admitted with cough, fever, and breathlessness. The chest X-ray showed dense consolidation. They were treated appropriately for community-acquired pneumonia on the acute medical ward for four days and discharged home. The X-ray report recommended a CT scan of the chest as there were changes suggestive of lung cancer. The X-ray was reported after the patient had been discharged from hospital.

The reviewers thought that this case illustrated the importance of rapid access to a formal X-ray report.

Both the reviewers and the clinicians who provided care to the patient thought that there was considerable room for improvement in CXR reporting. The reviewers only had access to the CXR report in 149 patients. They identified room for improvement in reporting in 58/141 (41.1%) patients. The clinicians in their own hospital would have had access to all available information and identified room for improvement in CXR reporting in 163/673 (24.2%) (Table 7.4).

Table 7.4 The X-ray reporting could have been improved

	Clinicians		Reviewers	
	Number of patients	%	Number of patients	%
Yes	163	24.2	58	41.1
No	510	75.8	83	58.9
Subtotal	**673**		**141**	
Unknown	76		8	
Total	**749**		**149**	

Clinician questionnaire and reviewer assessment form data

There is room to improve both how rapidly the CXR is undertaken, and how rapidly it is reported. This will support both the rapid, accurate diagnosis of CAP as well as helping to identify CAP complications such as pleural infection and co-existing conditions such as lung cancer. In those patients with suspected CAP but

whose symptoms are the result of a different condition (and therefore not included in this study population), it will also improve the diagnostic process.

Haematology and biochemistry tests

There is no single test that establishes a diagnosis of CAP and blood tests should be interpreted alongside the clinical presentation and the CXR.

A normal white cell count does not exclude a diagnosis of CAP – this is illustrated by the data showing that the white cell count was within the normal range in 332/751 (44.2%) patients at presentation (Table 7.5). It was also notable that in 222/687 (32.3%) patients, liver function tests were abnormal on admission (unknown for 80, data not shown).

Table 7.5 White cell count

	Number of patients	%
0 to 4.0	23	3.1
4.1 to 11.0	332	44.2
> 11.0	396	52.7
Subtotal	**751**	
Unknown	16	
Total	**767**	

Clinician questionnaire data

C-reactive protein (CRP)

CRP is an 'acute phase protein', made by the liver in response to inflammation. Levels can change rapidly (over hours) in response to inflammatory triggers such as bacterial infection. CRP is not a marker of illness severity. Levels generally rise more in response to bacterial infection and bacterial CAP tends to be more severe. CRP on admission can therefore be useful in the diagnostic process (bacterial vs viral pneumonia) rather than as a prognostic tool. It is not a diagnostic tool when used alone,[32] and should be used in combination with clinical assessment and other investigations. Serial measurement of CRP is the most useful approach as it can be used to help assess treatment response.

Guidelines recommend point of care CRP testing in primary care to support a diagnosis of CAP where this is not clear on clinical grounds. Antibiotics are recommended if the CRP level is above 100 mg/L, and should be considered if symptoms worsen and CRP is between 20 and 100 mg/L.[8]

In the context of hospital admission where additional tests including a CXR are available, CRP will be of less value in making a diagnosis of CAP. Table 7.6 confirms that there was no relationship between the calculated CURB65 score and the level of CRP (i.e. it was not of prognostic value).

Table 7.6 Patients' C-reactive protein level by calculated CURB65 severity score

C-reactive protein	0	1	2	3-5	Could not calculate	Total
	Number of patients	Number of patients	Number of patients	Number of patients	Number of patients	Number of patients
0 to 20	22	24	27	8	26	**107**
20.1 to 100	38	50	70	38	77	**273**
>100	66	74	79	71	75	**365**
Subtotal	**126**	**148**	**176**	**117**	**178**	**745**
Unknown	3	1	2	2	14	**22**
Total	**129**	**149**	**178**	**119**	**192**	**767**

Clinician questionnaire data

Table 7.7 shows that in this selected group of patients, the mortality was higher in those with a CRP>100 mg/L but that this relationship was not as strong as the relationship between other factors such as age, frailty and CURB65 score and outcome (see chapter 3).

Table 7.7 C-reactive protein level and outcome

C-reactive protein	Discharged	Died	% mortality	Total
	Number of patients	Number of patients	%	Number of patients
0-20	93	14	13.1	107
20.1-100	209	64	23.4	273
>100	253	112	30.7	365
Subtotal	**555**	**190**	25.5	745
Unknown	13	9	40.9	22
Total	**568**	**199**	25.9	767

Clinician questionnaire data

HIV testing

The 2020 British HIV Association guideline recommends HIV testing for all patients with CAP.[33] This is based on European data which show an undiagnosed HIV prevalence of >1/1000 in patients aged 16-65 with pneumonia.[34] Of the 725 patients where it was possible to provide an answer, 86/725 (11.9%) had an HIV test. In patients who were 65 years of age or younger, 58/184 (31.5%) had an HIV test. There were 28 patients over the age of 65 who were tested for HIV.

Additional blood tests

The clinicians who reviewed the case notes in their own hospital believed additional blood tests should have been undertaken in 119/745 (16.0%) patients. Similarly, the peer reviewers considered that this was the case in 62/356 (17.4%) patients (Table 7.8). Most commonly this was arterial blood gas, HIV testing, followed by lactate, urea, liver function tests and CRP.

Table 7.8 Additional blood tests should have been undertaken

	Clinicians		Reviewers	
	Number of patients	%	Number of patients	%
Yes	119	16.0	62	17.4
No	626	84.0	294	82.6
Subtotal	**745**		**356**	
Unknown	22		45	
Total	**767**		**401**	

Clinician questionnaire and reviewer assessment form data

Microbiology

Cultures of relevant specimens (in particular, sputum and blood) as well as tests for the detection of urinary antigens and viral swabs were almost universally available (Table 7.9). There were only 3/149 (2.0%) hospitals where microbiology advice was not available 24/7.

Table 7.9 Available investigations

	Number of hospitals	%
Microbiology cultures	149	100
Urinary antigens	147	98.7
Viral swabs	147	98.7
Bronchoscopy	147	98.7
Procalcitonin	117	78.5

Answers may be multiple; n=149, Organisational data

Microbiology ward rounds are increasingly used in hospitals to provide advice and support (about culture results, antibiotic choices, and intravenous to oral switching of antibiotics) to clinical teams caring for patients with infections. There were 26/149 (17.4%) hospitals where microbiology ward rounds did not take place.

Microbiology ward rounds mostly took place in the critical care unit in 105/115 (91.3%) hospitals and with a greater frequency than on other wards (Table 7.10).

Table 7.10 Areas in which microbiology ward rounds took place

	Number of hospitals	%
Critical care	105	91.3
Acute medical ward	40	34.8
Respiratory ward	34	29.6
General medical ward	30	26.1
Respiratory support unit	18	15.7
Other	34	29.6

Answers may be multiple; n=115
Organisational data

There were 35/102 (34.3%) hospitals where specific criteria were used to select patients with CAP for microbiology review (unknown for 47).

The results of microbiology cultures can guide appropriate antibiotic prescribing (in particular antibiotic changes). Guidelines therefore recommend sputum cultures and in more severe CAP, blood cultures to guide treatment choices. In addition to cultures, antigens related to some organisms that cause CAP can be detected in the urine. Testing for these, in particular for pneumococcal disease, is also recommended.[6]

Positive culture results also add value beyond the treatment of an individual patient. The results can be used to identify changes in the pattern of organisms (and antibiotic sensitivities) circulating in the community. This helps to inform changes to first choice antibiotics and the serotypes included in pneumococcal vaccination programmes.

Sputum

Sputum cultures were performed in 133/767 (17.3%) patients and were positive in 31/133 (23.3%). A common presenting feature of CAP is non-productive cough, and this affected 163/767 (21.3%) patients. Clearly it would not be possible to culture sputum in these patients. However, there were 363 patients with a productive cough, and data showing whether sputum was cultured were available for 330. A culture was sent in 91/330 (27.6%) of these patients.

Increasing the number of sputum samples sent for culture has the potential to improve the identification of infecting organisms and the prescription of appropriate antibiotics.

Blood

Blood cultures were sent in 342/767(44.6%) patients and were positive in 28/342 (8.2%). Although they were sent more frequently in patients with more severe CAP (based on CURB65 score), there was room for improvement in the investigation of blood cultures in patients with moderate and severe CAP. Blood cultures were undertaken in 144/281 (51.2%) patients who had a CURB65 score of two or more (Figure 7.3).

Of the 28 patients with positive blood cultures, five had a calculated CURB65 score of 0-1, seven had a score of 2 and ten a score of 3-5.

Pneumococcal urinary antigen

Pneumococcal urinary antigen testing was carried out in 108 patients and was positive in 13/108 (12%). Of the patients with positive samples, four had a calculated CURB65 score of 0-1, one had a score of 2 and four had a score of 3-5 (in four it was not possible to calculate the CURB65).

Legionella

There were no cases of Legionella identified in this study. Testing for Legionella early antigen was undertaken in 121/767 (15.8%) patients.

Figure 7.3 shows the data on microbiology investigations for those treated as inpatients, by their calculated CURB65 severity score (including the group of 158 patients where it was not possible to calculate a CURB65 score). Guidelines suggest that microbiological tests are not offered routinely to patients with low severity CAP and that additional investigations are undertaken for those with a more severe CAP.[6,8]

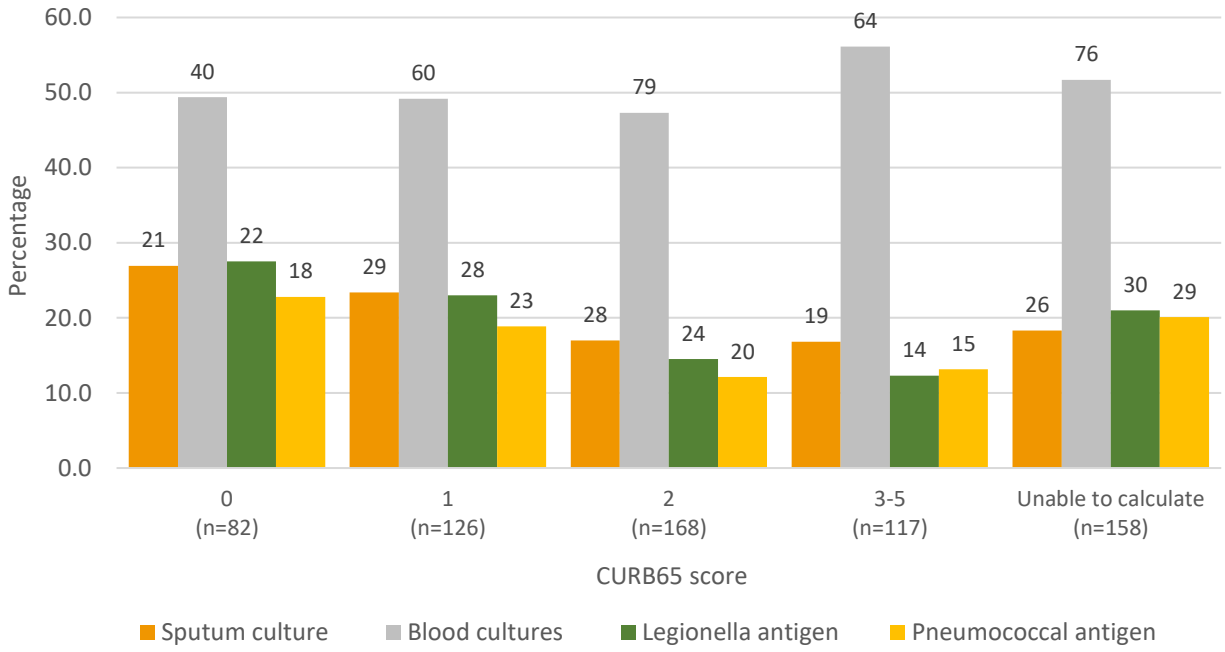

Figure 7.3 Percentage of inpatients in each CURB65 category who had microbiological investigations undertaken
Clinician questionnaire data

These data show that guidelines are not being followed. This emphasises the importance of stratification of patients by severity, as already highlighted in chapter 6. This in turn should help to identify those with moderate or severe disease who will benefit most from microbiological investigation.

The considerable room for improvement in the microbiological investigation of these patients was identified by clinicians in their own hospitals. They thought that additional microbiological investigation should have been undertaken in 217/730 (29.7%) patients (Table 7.11). Detailed peer review also found that in 139/344 (40.4%) patients, appropriate microbiological investigations were not undertaken (Table 7.12).

Table 7.11 Additional microbiological investigations should have been undertaken

	Number of patients	%
Yes	217	29.7
No	513	70.3
Subtotal	**730**	
Unknown	37	
Total	**767**	

Clinician questionnaire data

Table 7.12 Microbiological investigations were appropriate for the patient

	Number of patients	%
Yes	205	59.6
No	139	40.4
Subtotal	**344**	
Unknown	57	
Total	**401**	

Reviewer assessment form data

Free text comments were analysed to determine what additional microbiology investigations should have been undertaken. These are summarised in Table 7.13.

Table 7.13 Microbiology investigations that should have been undertaken

	Urine pneumococcal antigen	Urine legionella antigen	Atypical organism screen	Blood culture	Sputum culture	Viral swab/screen
Clinicians (n=170)	49	49	35	20	67	24
Reviewers (n=139)	37	41	22	31	51	29

Clinician questionnaire and reviewer assessment form data

CASE STUDY 6

A young patient was admitted with severe community-acquired pneumonia which was confirmed on chest X-ray. Their CURB65 score was 4. No microbiological investigations were undertaken on admission. The patient deteriorated on day four, was admitted to the critical care unit and antibiotics were changed to cover resistant organisms.

The reviewers thought that more thorough microbiological investigation, in particular blood and sputum cultures at the time of admission was indicated. This could have helped guide antibiotic changes at the time of deterioration.

The need for additional microbiological investigations was not related to the severity of CAP. Patients with a CURB65 score of zero had the least requirement for additional investigations but these were still considered necessary (30/125; 24.0%) (Figure 7.4). There were 38/118 (32.2%) patients with severe CAP (CURB65 score of 3-5) who required additional microbiological investigations.

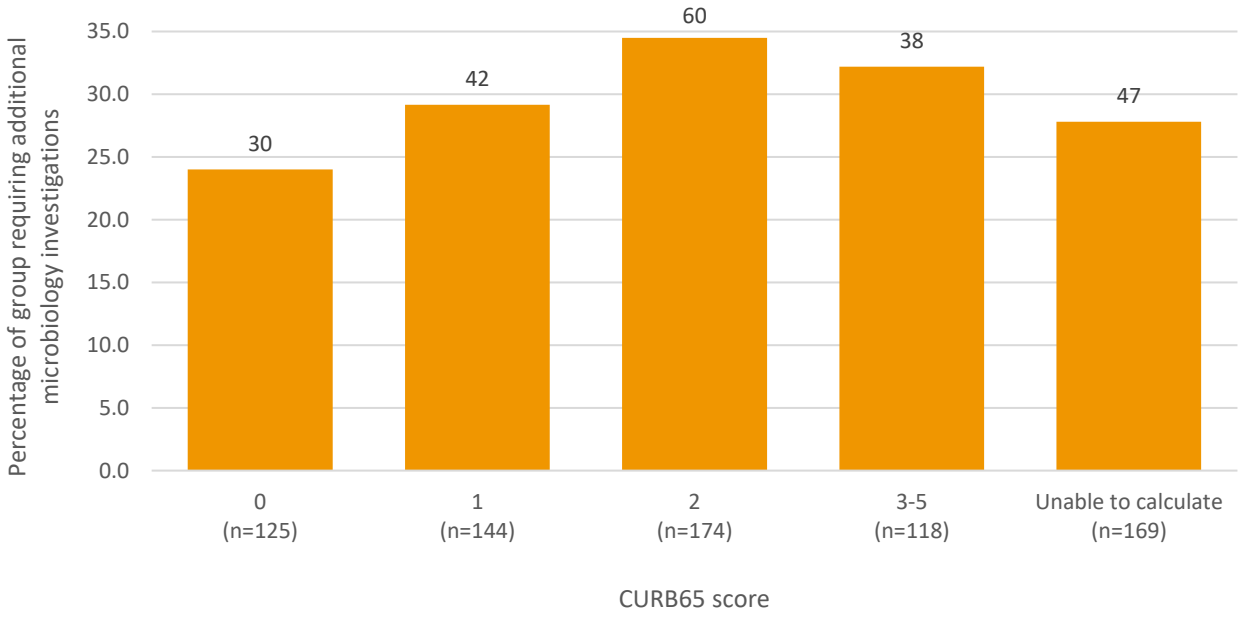

Figure 7.4 Requirement for further microbiological investigation by calculated CURB65 score

Clinician questionnaire data

CHAPTER 8: TREATMENT AND ESCALATION

Antibiotics

Antibiotics are the standard treatment for most patients with community-acquired pneumonia (CAP). Prescribing should follow local guidelines which consider the likely pathogens and resistance profiles. NICE guidelines have set out an antimicrobial prescribing strategy for CAP.[35] These aim to optimise antibiotic use and to reduce antibiotic resistance, and the UK Health Security Agency describes best practice for antibiotic stewardship for English hospitals in the 'Start Smart, then Focus' toolkit.[36] Guidelines are also in place to promote systems and processes that deliver effective antimicrobial use.[37]

A total of 145/147 (98.6%) hospitals had guidance in place recommending the choice of antibiotics depending on the severity of CAP (Table 8.1). Most of these guidelines also included recommendations on intravenous (IV) to oral switching of antibiotics and duration of the course. Figure 8.1 shows the number of times different antibiotics were included in hospital guidelines based on the severity of CAP.

Table 8.1 Details of the antibiotic guidance for community-acquired pneumonia

	Yes		No		Unknown	Total
	Number of hospitals	%	Number of hospitals	%	Number of hospitals	Number of hospitals
First and second choices based on severity	145	**98.6**	2	1.4	2	**149**
Switch from IV to oral	127	**87.0**	19	13	3	**149**
Duration	139	**94.6**	8	5.4	2	**149**

Organisational data

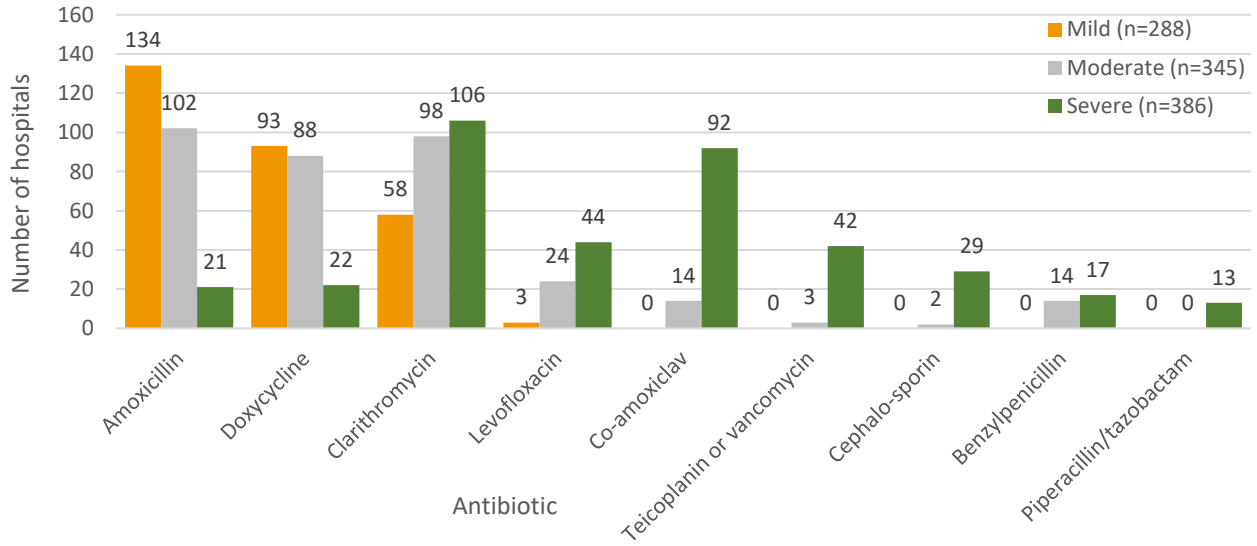

Figure 8.1 Number of times different antibiotics were included in hospital guidelines

Data from 145 hospitals; drugs only listed if recommended in more than 10 hospitals Organisational questionnaire data

There were five hospitals from which it was reported that they did not list specific antibiotic options for moderate severity CAP. The antibiotics listed included options for use in patients who had an allergy to penicillin and those where intravenous treatment was required due to reasons other than CAP severity (e.g. unsafe swallow).

The antibiotic options listed increased with the severity of CAP. Options for moderate CAP were similar to those for mild disease, but more commonly with both amoxicillin given together with one of clarithromycin or doxycycline. For severe CAP, the most frequent recommendation was a combination of co-amoxiclav and clarithromycin. These local guideline recommendations were therefore broadly in line with guideline recommended antibiotic choices for CAP.[37]

Antibiotics used in clinical practice

There were 145/703 (20.6%) patients had been treated with antibiotics before the admission (unknown for 64). In 96/145 (66.2%) patients the pre-hospital antibiotics were prescribed by a primary care clinician and in 26/145 (17.9%) patients they were prescribed in the emergency department.

Data from the clinician questionnaire showed that co-amoxiclav was the most commonly prescribed empiric antibiotic either intra venously or orally (295/767; 38.5%). Co-amoxiclav is a broad-spectrum antibiotic and although it is first choice for severe CAP, its widespread use for less severe infections is not generally recommended. This is due in part to its association with *Clostridioides difficile* infection, and the fact that broad-spectrum antibiotics will not cover some of the more atypical organisms. Its frequent use is also of concern as the proportion of co-amoxiclav resistant blood stream infections for Gram negative pathogens is over 40% and inappropriate use of co-amoxiclav increases this risk.[38]

However, in this study, the frequent use of co-amoxiclav was not due to the severity of CAP. There was no relationship between its use and the calculated CURB65 score for severity (Table 8.2). It is also possible that co-amoxiclav was prescribed for an infection of unknown cause or before the results of investigation were known.

Table 8.2 Calculated CURB65 score of patients receiving co-amoxiclav

	Number of patients	%
0	48	22.3
1	52	24.2
2	68	31.6
3-5	47	21.9
Subtotal	**215**	
Unable to calculate	74	
Total	**289**	

Clinician questionnaire data

This highlights the importance of initially using the narrowest spectrum antibiotic appropriate to the patient's condition. and where broad-spectrum antibiotics are used, once the diagnosis of CAP is confirmed, the antibiotic choice should be adjusted to cover the likely infecting organism and based on the severity of illness.

There were 100/687 (14.6%) patients where the clinician considered that antibiotic guidance in their own hospital had not been followed (unknown for 80). The most commonly cited antibiotics were co-amoxiclav (45), clarithromycin (30) and piperacillin/tazobactam (19). Using the calculated CURB65 score as a measure of severity showed that there was no relationship between clinical acuity and the failure to follow local formulary guidance.

CASE STUDY 7

A young patient was admitted with mild community-acquired pneumonia (CURB65 score 0). They were treated for five days with intravenous antibiotics and discharged home.

The reviewers thought that the route of antibiotics was inappropriate. There was the potential for management of the CAP via an ambulatory care pathway. The unnecessary use of intravenous antibiotics resulted in a longer hospital stay than necessary.

CASE STUDY 8

An older patient was admitted with new onset confusion without a clear cause. The patient was initially treated with piperacillin/tazobactam for an infection of unknown origin. A chest X-ray confirmed consolidation (increased density of the lung) in the lungs and supported a diagnosis of community-acquired pneumonia. The antibiotics were changed to oral amoxicillin and clarithromycin following both formulary and NICE guidance for moderate severity pneumonia.

The reviewers considered that there was appropriate use of broad-spectrum antibiotics initially and that a 'Start Smart – then Focus' approach had been used.

Time to first antibiotic

Analysis of national audit data from England and Wales has shown a statistically better 30-day inpatient mortality from CAP in patients where the time to first antibiotic was four hours or less compared with those with a time to first antibiotic of greater than four hours.[39] Guidelines also recommend that the first dose of antibiotics should be given within four hours of arrival at hospital.[6,8] Data from the latest BTS audit showed that 74.4% of patients with CAP were given their first dose of antibiotics within four hours.[6]

Where it was possible to calculate the time to antibiotics from the data available in this study (400 patients), 256/400 (64.0%) were given antibiotics within four hours (Figure 8.2). There was no obvious relationship between atypical presentations, CURB65 severity score or age and delay in antibiotics.

There were 20/400 (5.0%) patients who waited over 48 hours for antibiotics. In this small group of patients, there were no obvious characteristics such as dementia linked to the delay and there was no apparent difference in outcome. However, pneumonia has a high overall mortality and a wait of over 24 hours is of concern in any patient with an infection, particularly in view of the national audit data above showing higher mortality when antibiotic treatment was delayed.

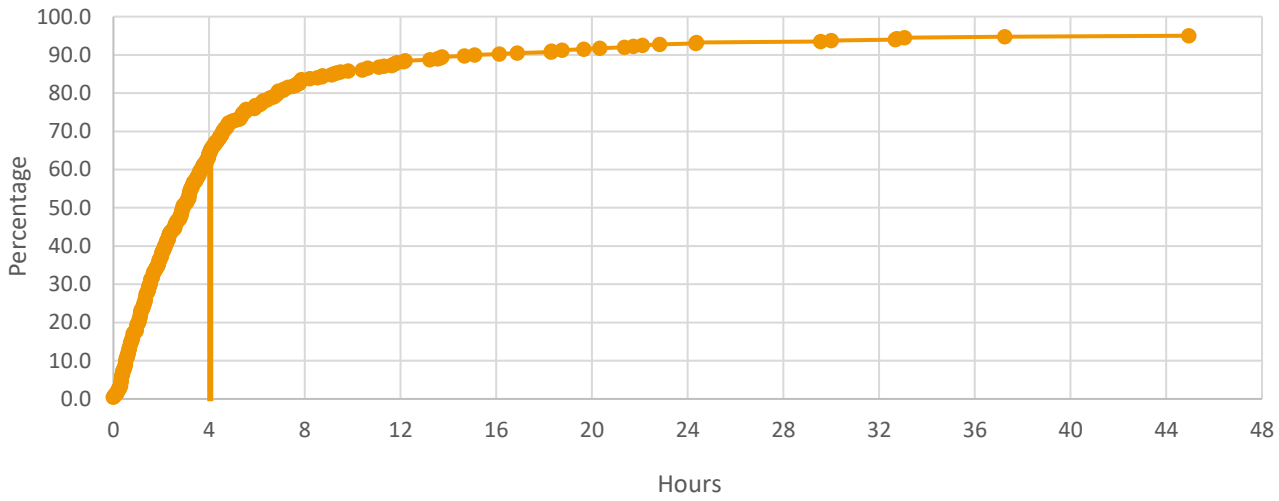

Figure 8.2 Time to administration of antibiotics from arrival at hospital (n=400)
Clinician questionnaire data

Change of antibiotics

The case reviewers noted that 267/388 (68.8%) patients were treated initially with intravenous antibiotics, a greater number than would have been expected. There were 327/657 (49.8%) patients who had a change of antibiotic during the course of hospital treatment (Table 8.3). This suggests that some patients initiated on intravenous antibiotics did not have these changed until the course was completed.

Table 8.3 Antibiotics were changed during the hospital admission

	Number of patients	%
Yes	327	49.8
No	330	50.2
Subtotal	**657**	
Unknown	110	
Total	**767**	

Clinician questionnaire data

The most common reason for a change of antibiotics was due to clinical improvement (127/327; 38.8% patients). For 64/327 (19.6%) patients the change was due to a poor clinical response and for 40/327 (12.2%) it was because their CAP had actively worsened (Table 8.4).

Table 8.4 Reason for the change in antibiotic

	Number of patients	%
Patient improvement	127	38.8
Poor clinical response	64	19.6
Worsening community-acquired pneumonia severity	40	12.2
Microbiology advice	26	8.0
Culture results	12	3.7
Other	115	35.2

Answers may be multiple; n=327

Clinician questionnaire data

The frequency with which antibiotics are changed (in particular due to poor response or worsening CAP) highlights the need to improve microbiology investigation to guide changes of antimicrobial therapy.

There were a small number of patients where antibiotics were changed on microbiology advice (26/327; 8.0%) or in response to culture results (12/327; 3.7%). It is worth noting that cultures were frequently not sent so there is greater potential for these results to guide treatment changes.

Clinicians were also able to record “other” reasons for a change in antibiotic in 31 patients the change was to follow hospital guidance and in 15 it was following a consultant review. In another 12 patients it was not possible to determine why antibiotics had been changed.

Assessment of antibiotic use

Clinicians considered that the antibiotics prescribed for 587/727 (80.7%) patients were appropriate based on local guidelines (unknown for 40). The reviewers considered that appropriate antibiotics were prescribed in 279/362 (77.1%) patients (unknown for 39).

Targeting antibiotics is a priority and involves regular review of antibiotic prescriptions. The reviewers considered that antibiotics were reviewed at appropriate time intervals in 302/325 (92.9%) patients (Table 8.5).

Table 8.5 Antibiotics were reviewed at appropriate time intervals

	Number of patients	%
Yes	302	92.9
No	23	7.1
Subtotal	**325**	
Unknown	52	
Did not have antibiotics	24	
Total	**401**	

Reviewer assessment form data

However, clinicians identified room for improvement in the use of antibiotics in their own hospitals in 148/718 (20.6%) patients as did the case note reviewers in 123/354 (34.7%) cases reviewed (Table 8.6).

Table 8.6 There was room for improvement in the usage of antibiotics

	Clinicians		Reviewers	
	Number of patients	%	Number of patients	%
Yes	148	20.6	123	34.7
No	570	79.4	231	65.3
Subtotal	**718**		**354**	
Unknown	49		47	
Total	**767**		**401**	

Clinician questionnaire and reviewer assessment form data

Clinicians reviewing records in their own hospitals identified the most common area for improvement as the failure to adhere to local guidance (40/139 comments). This was similar to the case note reviewers, who also suggested that different antibiotics would have been more appropriate (56/123 comments). Both groups noted that CURB65 scoring was not used to support prescribing decisions as an area for improvement.

Allergies

Clinicians reported that there were 174/740 (23.5%) patients with a recorded allergy to an antibiotic (Table 8.7). Of these, 97/174 (55.7%) had an allergy specifically documented as one of penicillin, amoxicillin, co-amoxiclav or flucloxacillin. The recorded prevalence of penicillin allergy of 13.1% (97/740) in this patient cohort, was higher than that of the general population.[40]

Table 8.7 Allergies to antibiotics were documented

	Number of patients	%
Yes	174	23.5
No	566	76.5
Subtotal	**740**	
Unknown	27	
Total	**767**	

Clinician questionnaire data

CASE STUDY 9

An older patient was admitted with CAP, which was low severity (CURB65 score of 1 due to age). Allergies to ciprofloxacin, flucloxacillin and doxycycline were recorded in the case notes. This had the potential to limit antibiotic options. On discussion the patient had developed diarrhoea with previous antibiotics and treatment with a standard course of amoxicillin was given with a good outcome.

The reviewers noted that this was an antibiotic intolerance and that the recorded drug allergy was inaccurate and had the potential to reduce the effectiveness of treatment.

Treatment escalation

As CAP occurs in a patient population that is often frail, older and with multimorbidity and therefore a high mortality, conversations about treatment escalation are relevant in a large proportion of patients. Many documents have provided guidance on treatment escalation decisions and discussions. It has been recommended that 'all healthcare professionals reviewing patients with chronic conditions, multiple comorbidities or terminal illness should initiate and encourage shared decision-making, including advance planning of care in line with patient preferences' and that 'all specialties treat and care for people who may be sick enough to die; therefore, it is the responsibility of all physicians to drive improvements in end of life care'.[41]

In clinical practice, patients are assumed to be for escalation of treatment including cardiopulmonary resuscitation, unless an active decision to the contrary has been documented. Treatment escalation decisions are therefore made more frequently when treatment limitation is considered to be appropriate.

In this study, case note review showed that treatment escalation decisions were made in 196/401 (48.9%) patients.

A treatment escalation decision was more likely to be made in patients with increasing frailty (Figure 8.3). Treatment escalation decisions were also more likely to be made in older patients. They were made in 20/108 (18.5%) patients aged 60 or below and in 176/293 (60.1%) aged 61 or more.

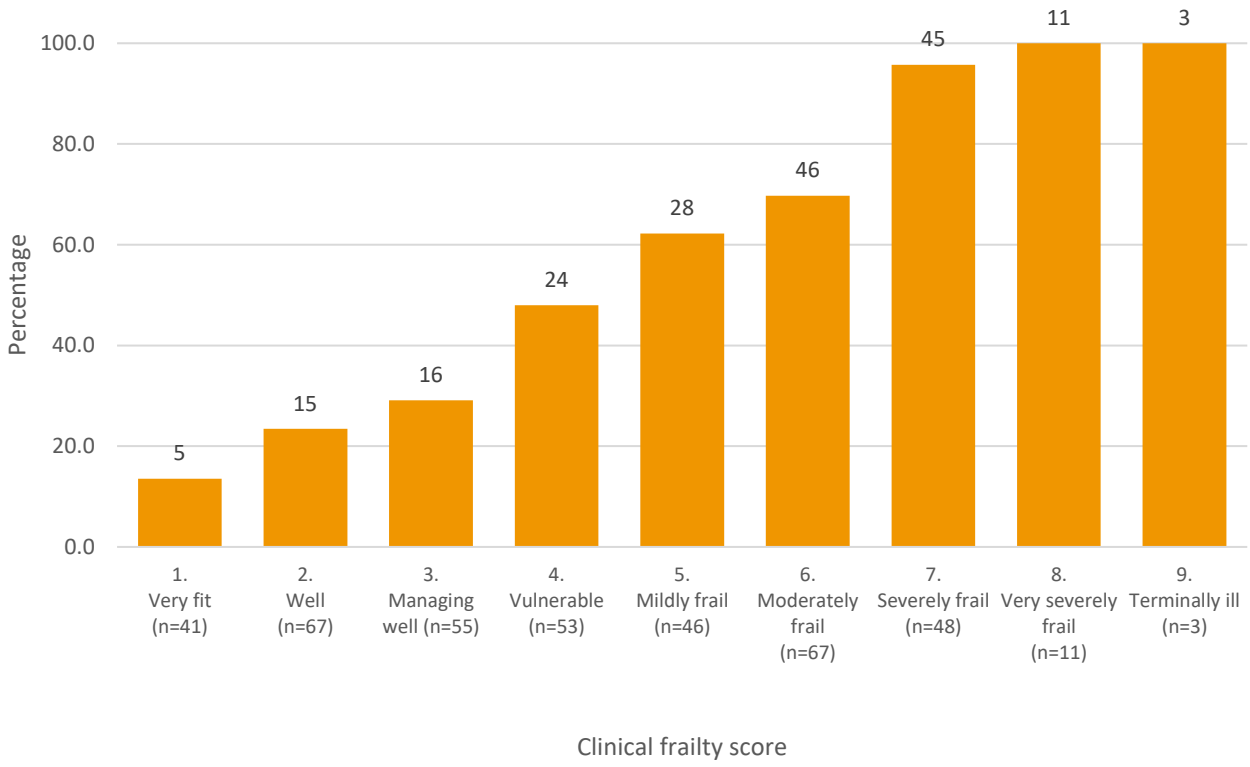

Figure 8.3 Ceilings of treatment decision by clinical frailty scale (n=391; unknown for 10)
Reviewer assessment form data

Data from the clinician questionnaire show some of the specific decisions made when a treatment escalation decision was specified in the records, with 251/419 (59.9%) patients who had a DNACPR order in place (Table 8.8). Of the patients listed as 'other', 76/419 (18.1%) were specifically listed as being for full escalation of treatment including critical care support if needed. As this is the default position unless otherwise specified, the number of patients for full escalation would have been greater than this.

Table 8.8 Documents used to aid escalation of treatment decisions

	Number of patients	%
Do not attempt cardiopulmonary resuscitation	251	59.9
Ward base care	134	32.0
Treatment escalation plan	124	29.6
ReSPECT form	65	15.5
Limited critical care	17	4.1
Other	76	18.1

Answers may be multiple; n= 419

Clinician questionnaire data

The reviewers were of the opinion that, where a decision was made, it could have been improved in 24/195 (12.3%) cases reviewed (Table 8.9). It was their view that improvements could have been made around earlier decision-making rather than at a time of crisis and better documentation.

Table 8.9 Escalation in decision-making could have been improved

	Number of patients	%
Yes	24	12.3
No	171	87.7
Subtotal	**195**	
Unknown	1	
Total	**196**	

Reviewer assessment form data

There was also some room for improvement in the documentation of discussions with family and carers. These were not documented in the records of 60/349 (17.2%) patients. There were 52 patients where the reviewers considered discussion was not applicable.

There were 190 patients for whom a decision on ceilings of treatment was not made. Of these, where the reviewer was able to comment, they felt that a decision should have been made in 46/187 (24.6%). Therefore, a total of 242/386 (62.7%) patients either had or should have had a treatment escalation decision made (Table 8.10). The reviewers commented that a combination of age, significant frailty and comorbidity meant that treatment escalation would not have been appropriate and therefore should have been discussed.

Table 8.10 Decisions on ceilings of treatment should have been made

	Number of patients	%
Yes	46	24.6
No	141	75.4
Subtotal	**187**	
Unknown	3	
Total	**190**	

Reviewer assessment form data

CASE STUDY 10

A frail older patient (Rockwood score 7, three times per day care package), was admitted with community-acquired pneumonia. They were treated appropriately, slowly improved, and were discharged home after a two-week admission. A treatment escalation plan was not discussed during the admission.

The reviewers thought that this was a missed opportunity to discuss treatment escalation. An escalation plan would have been helpful if the patient had deteriorated and also at the time of future admissions.

CHAPTER 9: DISCHARGE, FOLLOW-UP, AND OVERALL QUALITY OF CARE

Patient information

Guidelines recommend that at discharge or follow-up patients should be offered access to information about CAP such as a patient information leaflet.[6,8] However, this was only available at 28/149 (18.8%) hospitals. Improving access to patient information is an opportunity improve care and to enable patients to know when to represent if they do not improve or have new symptoms of concern as well as sharing preventative information such as advice regarding smoking cessation or vaccination.

Clinicians reported that in practice, written information about CAP was provided to 113/338 (33.4%) patients who were discharged to own home/residential home or nursing home, although this information was not known in a further 203 patients (Table 9.1).

Table 9.1 Written information was provided to the patient about community-acquired pneumonia

	Number of patients	%
Yes	113	33.4
No	225	66.6
Subtotal	**338**	
Unknown	203	
Total	**541**	

Clinician questionnaire data

Follow-up

Guidance recommends that all patients who have been admitted with CAP should have a clinical follow-up at six-weeks either with their GP or in a hospital clinic.[6] All patients admitted to hospital should have access to follow-up in primary care or a hospital outpatient clinic when needed. Guidelines recommend targeting chest X-ray (CXR) follow-up after about 6 weeks for patients who have persistence of symptoms or physical signs or who are at higher risk of underlying malignancy (specifically patients who smoke and those aged >50 years).[6]

Organisational data showed that arrangements for hospital follow-up were variable (Table 9.2). There were 22/149 (14.8%) hospitals in which follow-up was offered to all patients and 55/149 (36.9%) used no specific criteria for follow-up.

Table 9.2 How patients were selected for hospital follow-up

	Number of hospitals	%
No specific criteria	55	36.9
Severity of community-acquired pneumonia/complications	85	57.0
Smoking status	17	11.4
Age >50 years	12	8.1
All patients given hospital follow-up	22	14.8
Other (specified)	27	18.1

Answers may be multiple; n=149

Organisational questionnaire data

Most hospitals (85/149; 57.0%) offered follow-up depending on the severity of CAP or complications. The guideline recommendations were given lower priority. Only 12/149 (8.1%) hospitals used age >50 to select patients for follow-up and only 17/149 (11.4%) used smoking status.

CXR findings also influenced hospital follow-up decisions and additional reasons for selecting patients for follow-up included radiological findings and/or a possible malignancy.
Reviewers highlighted in discussion that follow-up arrangements depended on whether a patient was being looked after by a respiratory team.

In clinical practice the data showed that a CXR was requested in 261/505 (51.7%) patients who survived to discharge from hospital, of which 212/261 (81.2%) were undertaken and 49/261 (18.8%) were requested but not undertaken. The request was more common in those aged over 50 years. Although smoking status did not appear to impact on this. Similarly, there also appeared to be no relationship between requesting a follow-up CXR and the severity of CAP.

Chest X-ray follow-up therefore represented a missed opportunity to identify underlying pathology following an episode of CAP. Many of those at greatest risk of respiratory diseases are not being offered this relatively simple investigation.

Reviewers considered follow-up arrangements to be appropriate for 209/269 (77.7%) patients (Table 9.3).

Table 9.3 Appropriate follow-up arranged for the patient

	Number of patients	%
Yes	209	77.7
No	60	22.3
Subtotal	**269**	
Unknown	26	
Total	**295**	

Reviewer assessment form data

CASE STUDY 11

An older patient and ex-smoker was admitted to hospital with 10 days of worsening breathlessness. The patient had marked weight loss noted in the previous four months. A diagnosis of community-acquired pneumonia was made with right-sided consolidation on CXR. No follow-up was arranged on discharge.

The reviewers thought that this was a potential missed diagnosis of lung cancer and that hospital follow-up and a CXR were indicated.

Readmission

Readmission after an episode of CAP is common. Recently published data showed that readmission is related to CAP in approximately 40% of patients, that hospital acquired infections occur more frequently in

this group and that they have a significantly higher inpatient mortality.[7] Data from the BTS audit showed that rates of readmission are rising; the latest audit in 2019 revealed a readmission rate of 14.3%.[6] In this study, 78/561 (13.9%) patients who were discharged were readmitted within 30 days (Table 9.4). Readmission was related to CAP in 32/72 patients.

Table 9.4 The patient was readmitted within 30 days

	Number of patients	%
Yes	78	13.9
No	483	86.1
Subtotal	**561**	
Unknown	7	
Total	**568**	

Clinician questionnaire data

Overall quality of care

The grading system below was used by the reviewers to grade the overall care each patient received:

Good practice: A standard that you would accept from yourself, your trainees and your institution
Room for improvement: Aspects of **clinical** care that could have been better
Room for improvement: Aspects of **organisational** care that could have been better
Room for improvement: Aspects of both **clinical and organisational** care that could have been better
Less than satisfactory: Several aspects of clinical and/or organisational care that were well below that you would accept from yourself, your trainees and your institution
Insufficient data: Insufficient information submitted to NCEPOD to assess the quality of care

Figure 9.1 shows that the overall quality of care was reported as good practice for 194/385 (50.4%) patients. The room for improvement identified was clinical in 156/385 (40.5%) patients.

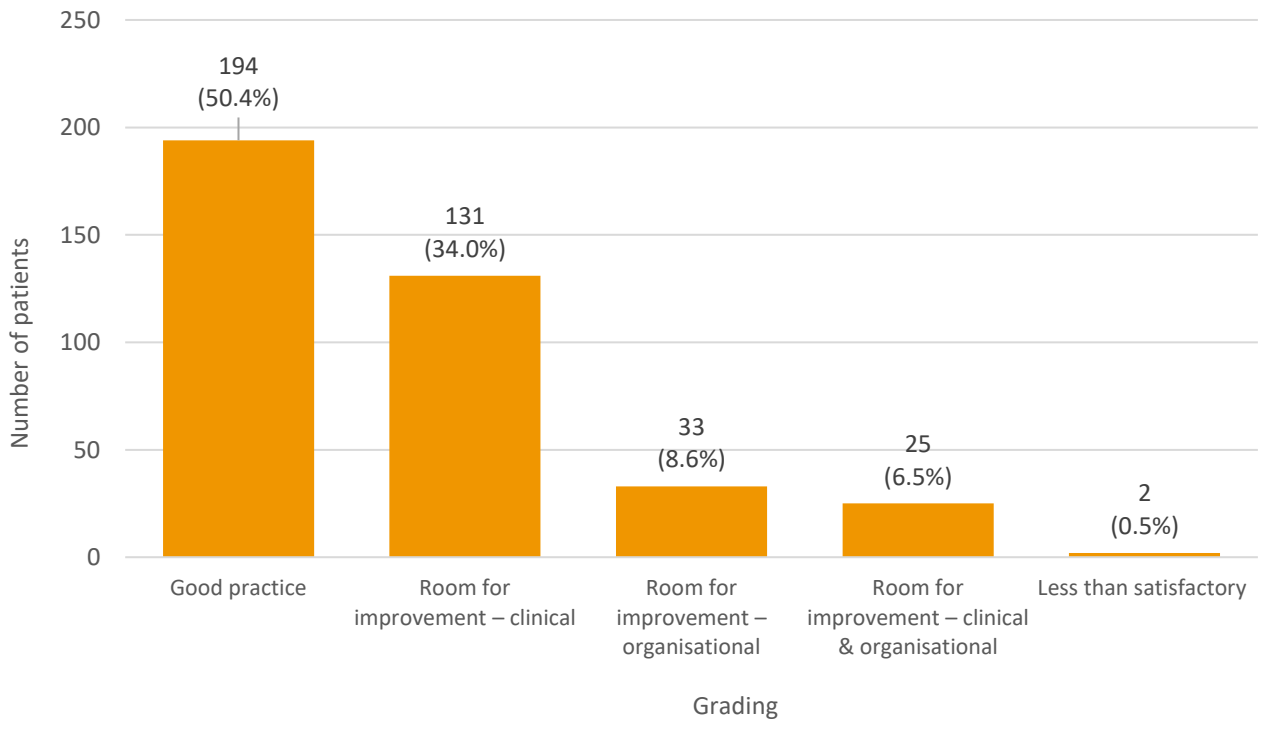

Figure 9.1 Overall quality of care (n=385; unable to assess for 16)
Reviewer assessment form data

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GLOSSARY

Clostridioides difficile	Also known as *Clostridium difficile* or *C. difficile*, it is a bacterium that causes diarrhoea and colitis (an inflammation of the colon).
Consolidation	This is when the air in the small air spaces of the lungs is replaced with a fluid, solid, or other material such as pus, blood, water, or cells.
CURB65	This uses the person's age, symptoms, blood pressure and a blood test (urea) to help decide how serious the risks are for that person, whether they need to stay in hospital and what treatment they should have.
CRB65	This is similar to CURB65 but is used in primary care and does not include the urea blood test.
Dyspnoea	This is also known shortness of breath or breathlessness, is a subjective awareness of the sensation of uncomfortable breathing.
Haemoptysis	This means coughing up blood from the lungs or bronchial tubes.
Legionella	This is a bacterium that causes Legionnaires' disease, a severe form of pneumonia.
NEWS2	The National Early Warning Score (NEWS2) is a system for scoring the physiological measurements (respiration rate, oxygen saturation, systolic blood pressure, pulse rate, level of consciousness or new-onset confusion and temperature) that are routinely recorded at the patient's bedside. Its purpose is to identify acutely ill patients. A score of 0, 1, 2 or 3 is allocated to each parameter. A higher score means the parameter is further from the normal range. Appropriate clinical responses are given for threshold (trigger) scores, with a recommendation to review and agree these locally.
Pleurisy/pleuritic pain	This is inflammation of the thin layers or membranes that cover the surface of the lungs (the pleura). The most common symptom of pleurisy is a sharp chest pain when taking a breath in. Sometimes the pain is also felt in the shoulder.
Pneumococcal urinary antigen	A test to help diagnose pneumonia which detects a molecule from one of the bacteria that causes pneumonia (pneumococcus) in urine.
Start smart then focus	'Start Smart' is the term used to describe the initial prescribing of antibiotics for suspected infections. 'Focus' is the term used to describe the re-assessment of the patient and antibiotic prescribed once results of tests and investigations are available. The 'Start Smart then Focus' campaign aims to reduce antibiotic resistance by using this approach.

USEFUL LINKS

GIRFT GETTING IT RIGHT FIRST TIME	RESPIRATORY MEDICINE
British Thoracic Society	COMMUNITY ACQUIRED PNEUMONIA
NICE National Institute for Health and Care Excellence	PNEUMONIA IN ADULTS: DIAGNOSIS AND MANAGEMENT - CLINICAL GUIDELINE [CG191] PNEUMONIA IN ADULTS QUALITY STANDARD [QS110]
DALHOUSIE UNIVERSITY	ROCKWOOD CLINICAL FRAILTY SCALE
Royal College of Physicians	NEWS2

CURB65 score is calculated by giving 1 point for each of the following prognostic features:

- confusion (abbreviated Mental Test score 8 or less, or new disorientation in person, place or time).
- raised blood urea nitrogen (over 7 mmol/litre)
- raised respiratory rate (30 breaths per minute or more)
- low blood pressure (diastolic 60 mmHg or less, or systolic less than 90 mmHg)
- age 65 years or more.

Patients are stratified for risk of death as follows:

- 0 or 1: low risk (less than 3% mortality risk)
- 2: intermediate risk (3-15% mortality risk)
- 3 to 5: high risk (more than 15% mortality risk).

Source: *Lim et al. (2003) Defining community-acquired pneumonia severity on presentation to hospital: an international derivation and validation study. Thorax 58: 377–82.*

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APPENDIX 1: SEPSIS IN COMMUNITY-ACQUIRED PNEUMONIA

Identification (and suspicion) of sepsis

The presence of sepsis in patients with infections including pneumonia is associated with worse outcomes. Systems have been put in place to ensure that antibiotics are given rapidly to patients with suspected sepsis. Blood lactate levels are commonly checked on admission to hospital as part of a sepsis screen. In an appropriate clinical context, a level above 2 mmol/l is used to support a diagnosis of sepsis. Lactate levels were checked in 481/767 (62.7%) patients and were elevated above 2 mmol/L in 120/481 (25.0%).

Reviewers identified a suspicion of sepsis in 123/379 (32.5%) patients. Where the lactate level was known in this group, it was normal (<2 mmol/l) in 53/92 (57.6%). In those where there was not considered to be a suspicion of sepsis, the lactate was raised (>2 mmol/L) in 33/144 (22.9%) (Table A1.1).

Table A1.1 Suspicion of sepsis by lactate level

	Yes	No	% Yes	Subtotal	Unknown	Total
Lactate	Number of patients	Number of patients	% Yes	Number of patients	Number of patients	Number of patients
0 - 1.0	16	38	29.6	54	1	55
1.1 - 2.0	37	73	33.6	110	5	115
2.1 - 3.0	20	22	47.6	42	2	44
3.1 - 4.0	11	8	57.9	19		19
4.1 -5.0	3	3	50.0	6		6
5.1 - 6.0	2		100.0	2	1	3
> 6.0	3		100.0	3		3
Subtotal	**92**	**144**		**236**	**9**	**245**
Unknown	31	112		143	13	156
Total	**123**	**256**		**379**	**22**	**401**

Reviewer assessment form data

The CURB65 and NEWS2 scores in those with a suspicion of sepsis showed that a greater proportion of patients with higher scores had a suspicion of sepsis. This emphasises the importance of screening for sepsis in patients with more severe pneumonia and therefore assessment of severity.

APPENDIX 2: OXYGEN THERAPY, RESPIRATORY SUPPORT, AND CRITICAL CARE

Patients with community acquired pneumonia (CAP) can develop respiratory failure, requiring supplemental oxygen. Higher levels of care are sometimes needed, and respiratory support used in these areas to improve oxygenation includes continuous positive airways pressure and nasal high flow oxygen. In recent years and in particular since the onset of the COVID-19 pandemic, higher levels of respiratory support have been provided outside the critical care environment. Recent guidelines have been published outlining provision of care in respiratory support units and enhanced care units.[a,b] There were 64 hospitals that reported that they had a respiratory support unit. The levels of support available in the areas that provide care for pneumonia patients are summarised in Table A2.1.

Table A2.1 Locations of where different types of support were provided

Ward	Nasal high flow O_2	CPAP delivering high oxygen concentration	CPAP for obstructive sleep apnoea	NIV pre-mixed O_2	NIV with O_2 entrained into ventilator circuit	Tracheostomy care	Tracheostomy ventilation
Critical care	125	129	93	115	118	128	131
Respiratory support unit	57	50	60	53	50	48	25
Respiratory ward	79	63	115	75	72	84	10
Acute medical unit	45	29	69	34	30	17	2
General medical ward	29	2	46	4	3	4	1
Other	25	33	26	25	18	37	1

Organisational questionnaire data

In this study only 59/767 (7.7%) patients required respiratory support. There were only 15 patients who required invasive ventilation. There were 31 patients treated with non-invasive ventilation (NIV) and 11 were treated with continuous positive airways pressure (CPAP). It should be noted that national guidelines state that NIV is not indicated in pneumonia and that there is limited evidence for the effectiveness of CPAP in pneumonia.[c]

An arterial blood gas (ABG) test is used to measure oxygen and carbon dioxide levels, as well as the pH balance in a patient's blood. In the view of the reviewers, 179 patients required blood gas analysis, and in 27/179 (15.1%), this was not carried out when indicated. For 16 of these 27 patients, the reviewer commented that a blood gas analysis should have been done in the context of either a new or increasing oxygen requirement (Table A2.2).

Table A2.2 Blood gas analysis was undertaken appropriately when indicated

	Number of patients	%
Yes	152	84.9
No	27	15.1
Subtotal	**179**	
Not applicable	133	
Unknown	45	
Total	**357**	

Reviewer assessment form data

There were 85/273 (31.1%) patients with a raised CO_2 level greater than 6 kPa. There were 112/250 (44.8%) patients with an oxygen level lower than 8 kPa. No data were collected on oxygen administration at the time of blood gas analysis.

A pH of less than 7.35 is associated with a higher mortality. In this study, of the patients who had a blood gas undertaken, there were 166/302 (55.0%) where the pH value was in the normal range. This group had a mortality of 25.9%. Of the patients with a pH below the normal range (<7.35), 38/66 (57.6%) died (Table A2.3).

Table A2.3 Blood pH and outcome

	Discharged	Died	Total	
ABG Blood pH level	Number of patients	Number of patients	Number of patients	% mortality
<7.35	28	38	66	57.6
7.35 - 7.45	123	43	166	25.9
>7.45	46	24	70	34.3
Not done/not	371	94	465	20.2
Total	**568**	**199**	**767**	

Clinician questionnaire data

There were 94/199 (47.2%) patients who died and did not have a blood gas done. Where data were recorded, this did not appear to relate to frailty (Table A2.4). Of the 94 patients who did not have a blood gas done, 93 had a ceiling of treatment decision made and 74 had a DNACPR order in place.

Table A2.4 ABG recorded and frailty in patients who died

	No ABG		ABG recorded	
Rockwood clinical frailty score	Number of patients	%	Number of patients	%
1. Very fit		0	1	1.0
2. Well	2	2.2	2	2.0
3. Managing well	4	4.4	10	9.9
4. Vulnerable	6	6.7	9	8.9
5. Mildly frail	10	11.1	10	9.9
6. Moderately frail	23	25.6	33	32.7
7. Severely frail	31	34.4	26	25.7
8. Very severely frail	9	10.0	8	7.9
9. Terminally ill	5	5.6	2	2.0
Subtotal	**90**		**101**	
Unknown	4		4	
Total	**94**		**105**	

Clinician questionnaire data

There were 422/739 (57.1%) patients who received oxygen as part of their treatment. The main device used to deliver oxygen was nasal cannulae. There were 117/422 (27.7%) patients where controlled oxygen via a venturi device was used (Table A2.5).

Table A2.5 Which devices for the delivery of oxygen were used

	Number of patients	%
Nasal cannulae	300	71.1
HUDSON oxygen mask	29	6.9
Venturi device	117	27.7
Nasal high flow system	29	6.9
Other	26	6.2
Device not documented	32	7.6

Clinician questionnaire data

Answers may be multiple; n=422

The target saturation was achieved in 216/240 (90%) patients although the reviewers were not able to comment on the target saturation in 117/422 (27.7%) patients.

Previous audits have shown that when oxygen is administered to patients up to 46% of the time this is without a prescription.[d] When oxygen was administered to patients in this study, it was prescribed in 303/375 (80.8%) patients. This suggests there may have been improvement in prescribing rates but that these can still improve.

Table A2.5 Oxygen administration and whether it was prescribed

	Oxygen therapy administered				
	Yes	No	Subtotal	Unknown	Total
Oxygen prescribed	Number of patients	Number of patients	Number of patients	Number of patients	Number of patients
Yes	303	28	**331**	0	**331**
No	72	261	**333**	3	**336**
Subtotal	**375**	**289**	**664**	**3**	**667**
Unknown	47	28	**75**	25	**100**
Total	**422**	**317**	**739**	**28**	**767**

Clinician questionnaire data

The reviewers thought that there was room for improvement in the use of oxygen in 80/357 (22.4%) cases reviewed. Of the 80 comments on what could have been improved, 35 related to the lack of a prescription, 16 related to the lack of a target saturation and 17 to an inappropriate target saturation being set (usually too high and therefore causing a risk of oxygen toxicity). This was another area identified for improvement in previous national audits.[d]

Although a large number of the patients in this study required supplemental oxygen as part of their treatment, additional respiratory support was not needed frequently. Clinical data from the larger study cohort showed that 44/767 (5.7%) received at least some of their care in a critical care unit. Of the peer reviewed cases, 25/401 (6.2%) patients were admitted to a level 2 or 3 ward at any stage of the admission. There were only four patients who were not admitted to a ward providing escalated care, where the reviewers considered that they should have been.

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APPENDIX 3: ANTIBIOTICS AND ALLERGIES

Antibiotics

Table A3.1 lists the first hospital antibiotic course that was given and when it was not based on local guidance

Table A3.1 First hospital antibiotic course and it when it was not based on local guidance

	Number of patients	%	Not based on local guidance
Co-amoxiclav (intravenous)	240	32.7	45
Clarithromycin (oral)	208	28.4	30
Piperacillin/tazobactam (intravenous)	105	14.3	19
Doxycycline (oral)	104	14.2	12
Amoxicillin (oral)	100	13.6	5
Amoxicillin (intravenous)	99	13.5	7
Clarithromycin (intravenous)	93	12.7	11
Other (specified)	83	11.3	0
Co-amoxiclav (oral)	57	7.8	13
Gentamicin (intravenous)	30	4.1	7
Benzylpenicillin (intravenous)	24	3.3	0
Cephalosporin (intravenous)	21	2.9	7
Levofloxacin (intravenous)	21	2.9	3
Levofloxacin (oral)	17	2.3	2
Meropenem (intravenous)	11	1.5	1
Co-trimoxazole (intravenous)	7	1.0	1
Co-trimoxazole (oral)	2	<1	0
Clinician questionnaire data	*Answers may be multiple; n=733*		*Answers may be multiple; n= 100*

Allergies

The 'Start Smart then Focus' approach to antibiotic use highlights the importance of a thorough allergy history. Documented allergies are also important as they increase risk. Population based studies have shown that people with community acquired pneumonia (CAP) who are labelled as having an allergy are at increased risk of hospitalisation, acute respiratory failure, requirement for intensive care and death. It is not the actual penicillin allergy which increases these risks but the limitation of therapeutic options which leads to the use of alternative antibiotics.[e]

Analysis of general practice database data for 2.3 million patients in the NHS in England showed that the prevalence of penicillin allergy was 5.9%. Those with a recorded allergy were at increased risk of a re-prescription of antibiotics after a first course and had an increased risk of death over a 12-month period.[f]

Penicillin allergy increases the risk of healthcare-associated infections such as methicillin resistant *Staphylococcus aureus* and *Clostridioides difficile*.[g] Accurate recording of allergy status is important.

Clinical experience suggests that allergy recording is often inaccurate. A documented allergy often describes a patient's drug intolerance rather than a true allergy. A number of small studies suggest that this might be the case for as many as 20% of patients who have a recorded allergy.[h,i] Table A3.2 shows the outcome of the patients in the study and whether they had a documented antibiotic allergy.

Table A3.2 Overall outcome of hospital admission and documentation of an allergy to antibiotics

	Discharged	Died	Total	
Documented allergies	**Number of patients**	**Number of patients**	**Number of patients**	**% mortality**
Yes	124	50	174	28.7
No	430	136	566	24.0
Subtotal	**554**	**186**	**740**	**25.1**
Unknown	14	13	27	
Total	**568**	**199**	**767**	**25.9**

Clinician questionnaire data

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