Introduction

- Community acquired pneumonia (CAP) is an acute infection of the pulmonary parenchyma in a patient with no regular exposure to the healthcare system or a recent hospital admission .
  - ✓*Frequent*
  - ✓*Treatable*

❖ Musher DM, Thorner AR. Community-acquired pneumonia. N Engl J Med.2014;371:1619–28. PMID:25337751,

Introduction

CAP is considered as a diagnosis:

- When patients presenting with the CAP syndrome, comprises of two or more of the following symptoms or signs:
  1. *fever, new or increased cough, sputum production, dyspnoea, pleuritic chest pain, confusion,*
  2. *crackles or signs of consolidation on chest auscultation,*
  3. *and a leukocytosis.*
- A CXR with infiltrates compatible with acute pulmonary infection usually “clinches” the Dx of CAP in the attending clinician’s mind.

- Musher DM, Roig IL, Cazares G, Stager CE, Logan N, Safar H. Can an etiologic agent be identified in adults who are hospitalized for community acquired pneumonia: results of a 1-year study. J Infect. 2013;67:11–8. PMID:23523447,
- Metlay JP, Fine MJ. Testing strategies in the initial management ofpatients with community-acquired pneumonia. Ann Intern Med. 2003;138:109–18.

NONRESPONDING PNEUMONIA/ TREATMENT FAILURE

- **Two different clinical patterns of treatment failure in pneumonia:**
  1. ***progressive* pneumonia,** in which there is clinical deterioration, even to the point of respiratory failure or septic shock,
  2. ***nonresponding* pneumonia,** in which clinical improvement is not achieved (persistence of fever and clinical symptoms).

- **<u>The causes of nonresponding pneumonia:</u>**
  1. ***Infectious(40%),***
  2. ***Noninfectious(22%),***
  3. ***unknown origin.***

- *Broaddus V C et al, MURRAY & NADEL'S TEXTBOOK OF RESPIRATORY MEDICINE, ED 7, 2022.*
- *Menendez R, Torres A. Treatment failure in community-acquired pneumonia. Chest. 2007;132(4):1348–1355.*

INFECTIOUS

Resistant Microorganisms

Community-acquired pneumonia (e.g., *Streptococcus pneumoniae, Staphylococcus aureus*)

Nosocomial pneumonia (e.g., *Acinetobacter*, methicillin-resistant *Staphylococcus aureus, Pseudomonas aeruginosa*)

Uncommon microorganisms (e.g., *Mycobacterium tuberculosis, Nocardia* sp, fungi, *Pneumocystis jirovecii*)

Complications of Pneumonia

Empyema

Abscess or necrotizing pneumonia

Metastatic infection

NONINFECTIOUS

Neoplasms

Bronchial obstruction

Pulmonary hemorrhage

Pulmonary embolism

Sarcoidosis

Eosinophilic pneumonia

Pulmonary edema

Acute respiratory distress syndrome

Organizing pneumonia

Drug-induced pulmonary disease

Pulmonary vasculitis

The reasons for delay in diagnosis of mimicers

1. Nonspecific symptoms and signs of the CAP syndrome,
2. Similar CXR findings:
   - ✓Even with CXR compatible with acute pulmonary inflammation, 5–17 % (seems underrepresentation)of patients admitted to hospital with CAP may >>>***a non-infectious mimic of CAP.***
3. A further Dx challenge: Coexistence of CAP and the mimicers.

- Musher DM, Roig IL, Cazares G, Stager CE, Logan N, Safar H. Can an etiologic agent be identified in adults who are hospitalized for communityacquired pneumonia: results of a 1-year study. J Infect. 2013;67:11–8. PMID:23523447,
- Alves dos Santos JW, Torres A, Michel GT, de Figueiredo CW, Mileto JN, Foletto Jr VG, et al. Non-infectious and unusual infectious mimics ofcommunity-acquired pneumonia. Respir Med. 2004;98:488–94.
- Schleicher GK, Feldman C. Dual infection with Streptococcus pneumonia and Mycobacterium tuberculosis in HIV-seropositive patients with community acquired pneumonia. Int J Tuberc Lung Dis. 2003;7:1207–8.

RESEARCH AND GUIDELINE UPDATES

Adults miscoded and misdiagnosed as having pneumonia: results from the British Thoracic Society pneumonia audit

Priya Daniel,[1] Thomas Bewick,[2] Sally Welham,[3] Tricia M Mckeever,[4] Wei Shen Lim,[1] for the British Thoracic Society

[1]Department of Respiratory Medicine, Nottingham University Hospitals NHS Trust, Nottingham, UK
[2]Department of Respiratory Medicine, Derby Teaching Hospitals NHS Foundation Trust, Derby, UK
[3]British Thoracic Society, London, UK
[4]Division of Epidemiology, University of Nottingham, Nottingham, UK

Correspondence to
Dr Priya Daniel, Department of Respiratory Medicine, David Evans Building, City Hospital

ABSTRACT
A key objective of the British Thoracic Society national community-acquired pneumonia (CAP) audit was to determine the clinical characteristics and outcomes of hospitalised adults given a primary discharge code of pneumonia but who did not fulfil accepted diagnostic criteria for pneumonia. Adults miscoded as having pneumonia (n=1251) were older compared with adults with CAP (n=6660) (median 80 vs 78 years, p<0.001) and had more comorbid disease, significantly fewer respiratory symptoms (fever, cough, dyspnoea, pleuritic pain), more constitutional symptoms (general deterioration, falls) and significantly lower 30-day inpatient mortality (14.3% vs 17.0%, adjusted OR 0.75, p=0.003).

were reviewed by investigators at each participating site and entered into either one of two groups within the audit. Eligibility criteria for entry to the CAP group were the following: (1) age ≥16 years with new infiltrates on chest radiograph (determined by the auditing team), (2) the presence of signs and symptoms of a lower respiratory tract infection (LRTI), (3) no hospital discharge within the preceding 10 days of index admission and (4) not immunocompromised. All cases ineligible for inclusion to the CAP group were included in the non-CAP group. Demographic and clinical data were extracted using a standardised pro-forma and entered onto a secure website. The BTS Quality Improvement Committee determined that ethical

Thorax: first published as 10.1136/thoraxjnl-2016-209405 on 20 January 201

❑We found that such patients:

1. *were older,*
2. *had more comorbid illnesses,*
3. *fewer symptoms consistent with an acute respiratory infection*
4. *more non-specific constitutional symptoms at presentation compared with patients with clinicoradiographic evidence of CAP,*
5. *significantly lower 30-day inpatient mortality.*

❖ *Daniel P, et al. Thorax 2017;**72**:376–379.*

The reasons for delay in diagnosis of mimicers

- Infectious biomarkers (hCRP and PCT),
  - ✓ as complement of the diagnostic process, while suggestive of an infection,
  - ✓ may be raised in many of the mimics of CAP
  - ✓ no sufficient sensitivity or specificity to R/I CAP or to R/O the non- infectious mimics.

- Investigations to determine a causative agent and confirm the infectious aetiology of the CAP syndrome yield low results and are often not done.

- While there is a wide DDx for the CAP syndrome, the high incidence of CAP and the relatively low incidence of CAP mimics makes it appropriate to begin early guideline-directed empiric AB therapy for CAP, as early AB improves CAP outcomes.

- Müller B, Harbarth S, Stolz D, Bingisser R, Mueller C, Leuppi J, et al. Diagnostic and prognostic accuracy of clinical and laboratory parameters in community-acquired pneumonia. BMC Infect Dis. 2007;7:10.
- Niederman MS, Mandell LA, Anzueto A, Bass JB, Broughton WA, Campbell GD, et al. Guidelines for the management of adults with community acquired pneumonia. Diagnosis, assessment of severity, antimicrobialtherapy, and prevention. Am J Respir Crit Care Med. 2001;163:1730–54.
- Mandell LA, Wunderink RG, Anzueto A, Bartlett JG, Campbell GD, Dean NC, et al. Infectious Diseases Society of America/American Thoracic Society consensus guidelines on the management of community-acquired pneumonia in adults. Clin Infect Dis. 2007;44 Suppl 2:S27–72.

Reasons of treatment failure

- Host factors: advanced age, smoking, habits,…..
- Underlying diseases: CHF, hepatic disease, DM, renal diseases, Ca,… .
- Illicit drugs and alcohol abuse.
- Epidemiology (travel, occupational or animal exposures), & environmental factors.

- ***The most common causes:***
  1. *infection with an antibiotic resistant*
  2. *or an unusual organism*
  3. *or an infectious complication of CAP such as an empyema.*

❖ Sialer S, Liapikou A, Torres A. What is the best approach to the nonresponding patient with community-acquired pneumonia? Infect DisClin North Am. 2013;27:189–203.

So, mimics of CAP require specific attention and management.

Misdiagnosis then leads to:

1-excessive and/or inappropriate interventions,
2-unnecessary costs,
3-the respective risks related to the untreated potentially life-threatening disease.

Table 1 Non-infectious mimics of community-acquired pneumonia

Cardiovascular
Pulmonary oedema
Pulmonary embolism
Neoplastic
Lung cancer
Endobronchial metastases
Lymphoma
Immunological disorders
Vasculitic diffuse alveolar haemorrhage
Wegener's granulomatosis
Cryptogenic organising pneumonia
Acute interstitial pneumonia
Sarcoidosis
Pulmonary alveolar proteinosis
Systemic lupus erythematosus
Polymyositis and dermatomyositis
Acute and chronic eosinophilic pneumonia
Drug toxicity
Radiation pneumonitis

- Su H, Winterbauer RH. Pneumonia mimics. In: Marrie, editor. Communityacquired pneumonia. New York: Kluwer Academic/Plenum Publishers; 2001.p 351–67.
- Andrew D. Black, Non-infectious mimics of community acquired pneumonia, Black Pneumonia (2016) 8:2

NONRESPONDING PNEUMONIA/ TREATMENT FAILURE

- **<u>Evaluation for clinical response</u>**: after 72 hours of antibiotic treatment.
- **<u>Biomarkers C/U:</u>**
  - ✓*PCT levels reduction after 3-4 days of treatment correlates with clinical response.*
  - ✓*Levels of certain biomarkers, in particular PCT, CRP, and IL-6, have also been found useful for predicting inadequate response.*
  - ✓*Elevated initial levels of PCT or CRP: independent predictors for inadequate response.*

- *Broaddus V C et al, MURRAY & NADEL'S TEXTBOOK OF RESPIRATORY MEDICINE, ED 7, 2022.*
- *Menendez R, Torres A. Treatment failure in community-acquired pneumonia. Chest. 2007;132(4):1348–1355.*
- *Menendez R, Cavalcanti M, Reyes S, et al. Markers of treatment failure in hospitalised community acquired pneumonia. Thorax. 2008;63(5):447–452.*

The initial management for alternative Dx of CAP

A very high index of suspicion is needed.

- Completely reevaluate the patient with a comprehensive Hx and PE with a full cardiac examination and cognisance of the non-infectious mimics of CAP.
- Repeat CXR, may show complications:pleural effusion, cavitation, or new opacities.,
- Escalate antibiotic therapy while reviewing any initial microbiological specimens, and sending further microbiological specimens looking for resistant or unusual organisms,
- Early test for HIV infection and TB in areas with high prevalence,
- HRCT, CT (with contrast) or CTPA; may provide a more detailed study & potentially suggesting specific microorganisms or alternative diagnoses.
- FOB with BAL & TBLB(if not contraindicated),
- Aspirate of trachea, pleural fluid or….
- Surgical lung Bx.