AALBORG UNIVERSITET

CLINICAL IMPLICATIONS OF CHEST X-RAY IN ASSESMENT OF PNEUMONIA AND EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN CONJUNCTION WITH PRACTICE OF ANTIBIOTIC PRESCRIPTION IN THE EMERGENCY DEPARTMENT

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Abstract

Background:

Chest X-ray (CXR) is a frequently performed diagnostic imaging examination. It is commonly used as an early diagnostic tool in the emergency departments (ED) for suspected conditions such as pneumonia, pneumothorax, pleural effusion, or suspected cardiac decompensation. In clinical practice, the use of CXR does not always follow a systematic approach bases on clinical and paraclinical findings, which may lead to unnecessary examinations, increased resource use, and radiation exposure. In this context, the aim of this study was to investigate whether the final CXR report altered the initial antibiotic treatment in patients with pneumonia and exacerbation of chronic obstructive pulmonary disease (ECOPD).

Method:

This study was designed as a retrospective quality-assurance study based on review of medical records from 300 patients admitted to the ED at the North Regional Hospital during the period from January 1, 2022, to December 31, 2024. For each patient, data on clinical manifestations and radiological findings were extracted from medical records and systematically analyzed to determine the diagnostic contribution of CXR and its influence on antibiotic treatment decisions.

Results:

In 51 % of patients with pneumonia and 29 % of patients with ECOPD, the same antibiotic regimen initiated before CXR was continued after the results of the examination were available to the clinician. Radiographic infiltrates were identified in 32 % of patients for pneumonia and 14 % of patients with ECOPD. Furthermore, among patients with CXR-verified infiltrates, 92% of those with pneumonia and 90% of those with ECOPD continued their initial antibiotic treatment.

Conclusion:

This study demonstrated that the CXR report in the ED infrequently led to changes

in the antibiotic treatment already started prior to performance of the CXR based on the initial clinical assessment. It can be considered whether clear and consistent guidelines for use of CXR potentially can reduce unnecessary examinations and radiation exposure, while optimizing the use of healthcare resources without compromising the quality of patient care.

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Introduction

CXR is the most frequently performed imaging examination worldwide. In 2016, two billion CXRs were conducted, making it an essential part of clinical diagnostics (1). In Denmark, ED performs over 600,000 CXRs each year (2), of which approximately 10,820 are carried out at North Regional Hospital, Hjoerring. Of these 6,390 examinations per year are requested in the ED (3).

CXR is commonly indicated in suspicion of conditions such as pneumonia, ECOPD, pneumothorax, pleural effusion, or cardiac decompensation(4). Clinical symptoms including cough, dyspnea, chest pain, hemoptysis and fever may indicate the need for a CXR (5) However, in clinical practice, the use of CXR for diagnostic purposes does not always follow a systematic referral approach bases on clinical and paraclinical findings, which may lead to unnecessary CXR examinations.

An US study involving 545 patients who underwent CXR in the emergency room, found that 260 (38.6%) had a normal CXR. Only in 128 cases (23.5%) did the CXR contribute positively to diagnostic assessment and treatment. In 329 (60%) cases, there was neither a clinical indication for performing a CXR nor any abnormal thoracic findings. In this subgroup, the CXR contributed to patient management in only 12 cases (3.6%) (6) Another U.S. study found that emergency physicians and radiologists believe that too many medically unnecessary imaging examinations are ordered in their department (7). These studies suggest that routine CXR has limited diagnostic value, particularly in the absence of clinical signs and symptoms of cardiac or pulmonary disease (6,7). Some commonly cited reasons for the high number of CXR include defensive clinical practice, limited clinical experience among staff, easy access to imaging, time constraints, and patient expectations (7,8). The use of CXR is also associated with exposure to ionizing radiation and a potential long-term risk of cancer development. Although the risk is very low, the Danish Health Authority recommends that CXR should only be used when clinically necessary, ensuring the benefits surpass its potential harms (9).

In 2012, the American Board of Internal Medicine Foundation launches the *Choosing Wisely* campaign to reduce the overuse of diagnostic tests, procedures, and treatments through close dialogue between clinicians and patients (10). In 2020, the Danish organization *Vælg Klogt* is established, inspired by the *Choosing Wisely* initiative. The focus is an equal partnership where the patient´s perspective, combined with medical evidence, is used to improve the quality of care and reduce unnecessary interventions. Furthermore, the initiative seeks to strengthen trust in the decisions made by healthcare professionals, as fear of making mistakes is one of the main causes of unnecessary treatment (8).

According to guidelines from the Department of Radiology, Aalborg University, there is no indication for routine CXR in patients with clinical symptoms of suspected pneumonia. Partly because infiltrates tend to develop more slowly than the clinical symptoms and furthermore, early imaging rarely leads to a change in treatment. CXR is recommended only when patients fail to respond to the initiated treatment (11). In accordance with the National Danish pulmonology guidelines for hospitalized patients with pneumonia, the diagnosis requires a radiologically or ultrasonographical verified new infiltrate in combination with clinical symptoms of a lower respiratory tract infection. Likewise, the diagnostic assessment of ECOPD requires a CXR supported by symptoms consistent with the diagnosis (12). Hence, there seems to exist a discrepancy in recommendations for use of CXR between the two specialties.

It remains uncertain to what extent CXR contributes to additional diagnostic or treatment benefits for the patient or whether it rather leads to unnecessary radiation exposure and inappropriate use of healthcare resources. This study aimed to assess whether the CXR report alters clinical decision making compared to the initial antibiotic treatment, among patients with suspected pneumonia and ECOPD.

Patients and methods

Study design

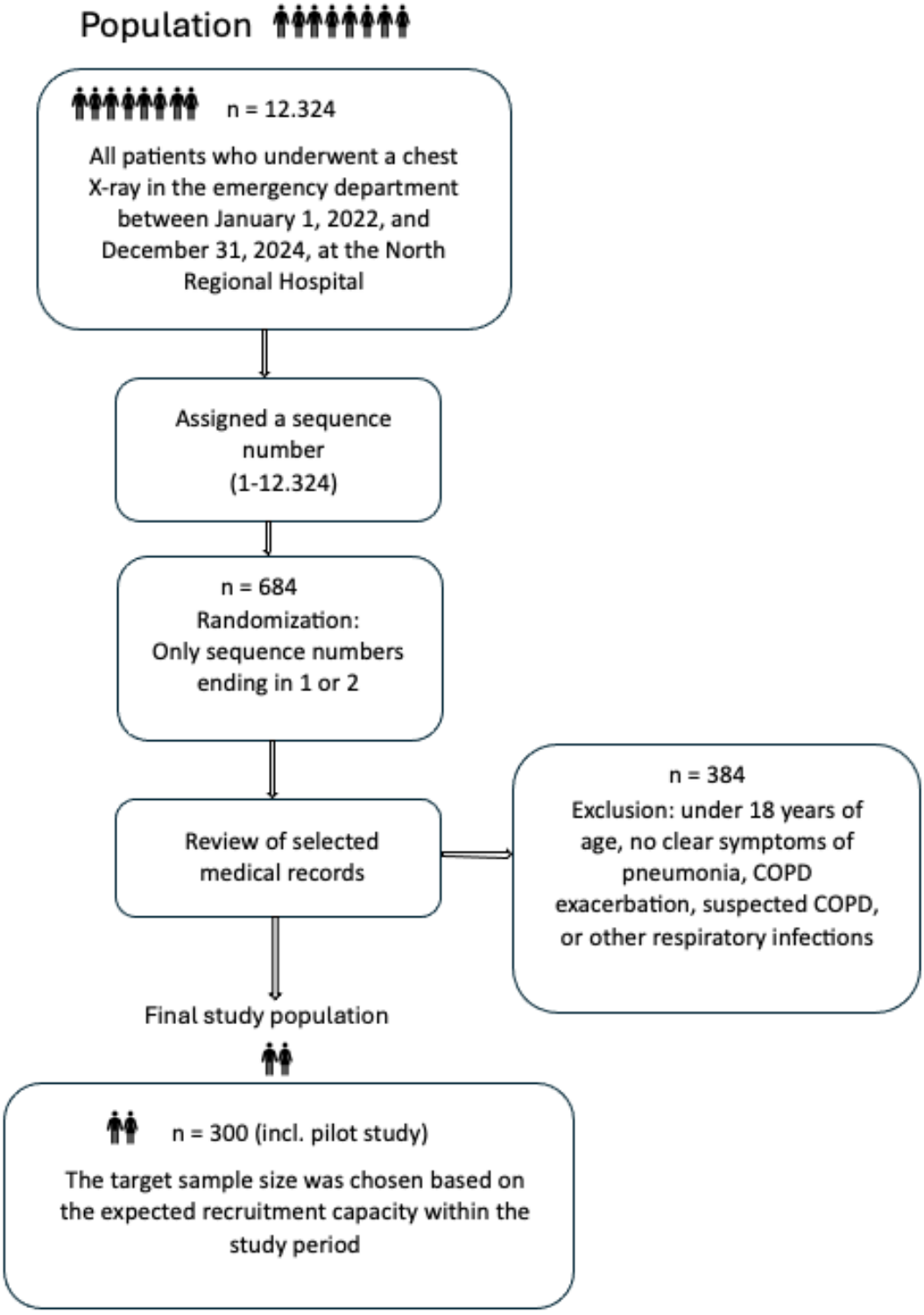
This study was designed as a retrospective, descriptive quality assurance study based on a systematic review of medical records of patients admitted to the ED at the North Denmark Regional Hospital.

Study population

The study targeted a population consisting of 300 patients. The sample size was chosen based on the expected recruitment capacity within the study period. Data were extracted from the North Denmark Region Business Intelligence and Analyses portal, identifying 12.324 patients who had undergone CXR at the ED during the period 01.01.2022 to 31.12.2024. We applied a clinically relevant definition of pneumonia and ECOPD, respectively, whereby patients presenting with respiratory symptoms such as cough, sputum, dyspnea, fever, crackles or rhonchi, along with supportive paraclinical findings (e.g. CRP, leukocytes, CURB-score).

Each patient was assigned a sequential case number ranging from 1 to 12.324 and randomized according to case numbers ending in the digits 1 or 2. Patients who met the following criteria were excluded: age under 18 years, absence of clinical manifestations suggestive of either pneumonia, ECOPD or other infectious illness.

As an initial step, a pilot study was conducted using a cohort of 50 randomly selected patients, based on case numbers, with only those ending in the digit 1 being retained. The pilot study aimed to characterize the structure of the dataset and identify key variables to guide the subsequent selection process. The result from this pilot study informed the further development and optimization of the REDCap database (13).



Flowchart of included patients with clinical indications for CXR due to suspected pneumonia, ECOPD, or other respiratory infections.

Study data

For the 300 included adult patients, relevant data were extracted from the electronic health records and entered in the REDCap data management system. All data were subsequently exported to Excel for organization and statistical analysis. Patients were assigned to predefined diagnostic groups: pneumonia, ECOPD, suspected COPD, fever of unknown origin (FUO), dyspnea, COVID-19, influenza, RSV infection and a broad other category that included remaining diagnosis with suspected respiratory disease. For analysis, these diagnoses were subsequently consolidated into four main categories: pneumonia, ECOPD and suspected COPD, FUO, and a final category containing all other infectious diseases and conditions not captured by the previous groups. As some patients were registered with up to three simultaneous diagnoses, overlap between groups occurred. For example, a patient diagnosed with pneumonia and ECOPD, was included in both groups and therefore counted twice. The same applied to symptoms, initial treatment, CXR findings, and treatment following imaging results based on the diagnostic groups described above. The primary focus of the analysis was on pneumonia and ECOPD. Initial treatment was categorized according to standard management of pneumonia and ECOPD (14,15). In the ED, antibiotics as initial treatment was frequently initiated before the final CXR report became available and were therefore guided primarily by initial clinical assessment of clinical manifestations and use of CURB-score (15). This distinction provided the rationale for analyzing antibiotic treatment both before and after availability of the final CXR report.

Antibiotic treatment, as the primary focus of this study, was further classified according to the point of initiation, distinguishing between prescriptions initiated by the patient´s general practitioner and those started in the ED. To evaluate potential changes following the final CXR report, subsequent treatment decisions were categorized as initiation, discontinuation, continuation, or change of treatment.

Ethical consideration

This study protocol was approved by the hospital management at the North Denmark Regional Hospital (ID number K2025-166). As a clinical quality study, informed consent from the patients was not deemed necessary in accordance with the Ethics Committee guidelines.

Statistical analysis

The data were compared based on treatment administered before and after receipt of the final CXR report, with a primary focus on antibiotic treatment.

Results

The 300 included patients had a median age of 77 years (IQR 67-84), ranging from 18 to 97 years, and comprised 140 women and 160 men (Table 1). The following results are presented with a primary focus on suspected/confirmed pneumonia and ECOPD diagnoses, respectively.

Infection and inflammation biomarkers

Biomarker analyses showed that 172 (57%) patients had leukocytosis (>10^9/L), of whom 94 (66%) had pneumonia and 49 (53%) ECOPD. Elevated CRP levels (>4 mg/L) were observed in 271 (91%) patients, including 140 (98%) with pneumonia and 79 (86%) with ECOPD.

Antibiotic treatment

In relation antibiotic treatment was initiated before CXR for 240 (80%) patients in the ED, including 132 (56%) with pneumonia and 69 (29%) with ECOPD. Only a limited proportion of patients started antibiotics by their general practitioner, and subsequently had their treatment adjusted in ED.

Table 1. Demographic and clinical characteristics in accordance with diagnosis

	Total	Pneumonia	ECOPD*	FUO**	Other
	n = 300				
Age (years), median (IQR)	77 (67-84)	77 (66-84)	77 (69-82)	81 (79-83)	75 (64-85)
Gender, n (%)					
Female	140 (47)	61 (43)	50 (54)	14 (32)	52 (48)
Male	160 (53)	82 (57)	42 (46)	30 (68)	56 (52)
Comorbidity, n (%)					
Chronic heart disease	102 (34)	47 (33)	31 (34)	19 (43)	34 (32)
Biomarker, n (%)					
Leukocytes, n (%)					
Normal (range 3.5-10 mia./L)	128 (43)	49 (34)	43 (47)	14 (32)	64 (59)
Increased (>10 mia./L)	172 (57)	94 (66)	49 (53)	30 (68)	44 (41)
CRP, n (%)					
Normal (<4mg/L)	27 (9)	3 (2)	13 (14)	0 (0)	14 (13)
Increased (>4 mg/L)	271 (91)	140 (98)	79 (86)	44 (100)	94 (87)
Median	65	89	46	100	50
CURB-65, n (%)					
0	-	28 (9)	-	-	-
1-2	-	77 (26)	-	-	-
3-4	-	36 (12)	-	-	-
5	-	2 (1)	-	-	-
Clinical manifestations, n (%)					
Dyspnea					
Subj. dyspnea	209 (70)	98 (69)	84 (91)	15 (34)	129 (119)
Obj. dyspnea (D,RD,DOE,SLD)*	126 (42)	47 (33)	62 (67)	10 (23)	42 (39)
Cough	179 (60)	97 (68)	56 (63)	16 (36)	61 (57)
Expectoration	108 (36)	56 (39)	45 (51)	6 (14)	34 (32)
Fever	95 (32)	59 (41)	10 (11)	22 (50)	33 (31
Chest pain	27 (9)	11 (8)	9 (10)	3 (7)	10 (9)
Rhonchi	85 (28)	30 (21)	52 (58)	2 (5)	27 (25)
Crackles	129 (43)	74 (52)	43 (48)	10 (23)	44 (41)
Prolonged expiration	53 (18)	15 (11)	35 (39)	1 (2)	20 (19)
Wheezing	19 (6)	5 (4)	8 (9)	2 (5)	10 (9)
Other	199 (66)	86 (60)	67 (75)	30 (68)	80 (74)
Antibiotic, n (%)					
Initial ED	240 (80)	132 (56)	69 (29)	36 (15)	59 (25)

Diagnoses: *ECOPD includes COPD in exacerbation and suspected COPD. **Fever of unknown origin. Other includes COVID-19, RS-infection, influenza, dyspnea and all other infectious diseases and conditions not captured by the previous groups. **Clinical manifestations:** D = dyspnea, RD = resting dyspnea, DOE = dyspnea on exertion, SLD = speech-limiting dyspnea. Other includes pain on deep inspiration, sputum, rattling respiration, use of accessory respiratory muscles, bronchospasm and reduced exchange. Due to overlap between the diagnosis, several patients appear in more than

one group. For example, a patient diagnosed with ECOPD and pneumonia or covid and pneumonia are included in both groups and therefore counts twice.

Table 2 shows that 94 (31%) patients had a normal CXR, including 28 (9%) with pneumonia and 27 (9%) with ECOPD. An infiltrate was observed in 143 (48%) patients, of whom 96 (32%) were diagnosed with pneumonia and 41 (14%) with ECOPD.

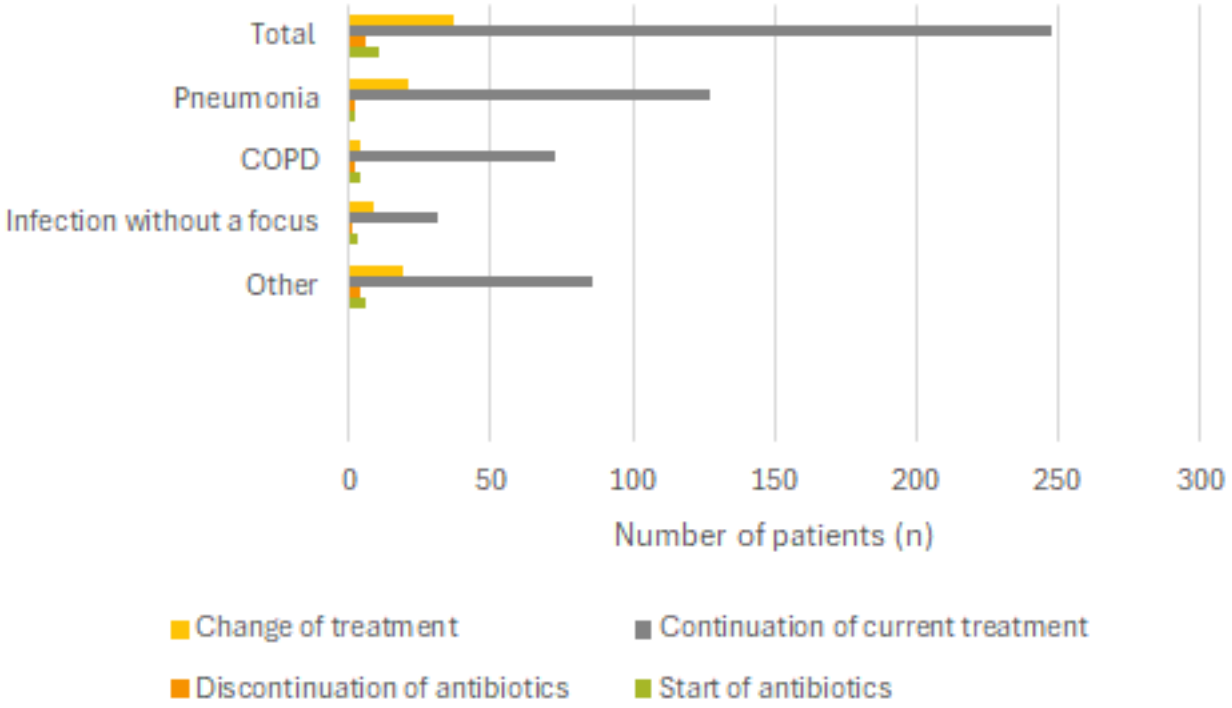
Table 2. CXR findings (percentages refer to the total study population n = 300)

	Total	**Pneumonia**	**ECOPD***	****FUO**	**Other**
	n = 300				
CXR finding, n (%)					
Normal	94 (31)	28 (9)	27 (9)	24 (8)	33 (11)
Infiltrate/infiltrate uncertain	143 (48)	96 (32)	41(14)	9 (3)	51 (17)
Pleura effusion	41 (14)	25 (8)	16 (5)	1 (0)	23 (8)
Chronic changes/emphysema/fibrosis	47 (16)	16 (5)	19 (6)	3 (1)	21 (7)
Increased cardiothoracic ratio	35 (12)	15 (5)	9 (3)	5 (2)	13 (4)
Increased basal density	24 (8)	15 (5)	5 (2)	5 (2)	10 (3)
Other	40 (13)	9 (3)	10 (3)	0 (0)	6 (2)

Diagnoses: *ECOPD includes COPD in exacerbation and suspected COPD. **Fever of unknown origin. Other includes findings such as pneumothorax, malignancy, and pulmonary congestion. Due to overlap between the diagnosis, several patients appear in more than one group. For example, a patient diagnosed with ECOPD and pneumonia or covid and pneumonia are included in both groups and therefore counts twice.

Figure 2 shows that out of the study population of 300 patients, 248 (83%) continued their initial antibiotic treatment following the final CXR report, including 127 (51%) patients with pneumonia and 73 (29%) with ECOPD. Only 11 (4%) patients started antibiotics after the final CXR report of whom 2 (18%) had pneumonia and 4 (36%) ECOPD. Changes in treatment were observed in 37 (12%), 21 (57%) with pneumonia and 4 (11%) with ECOPD. Discontinuation of antibiotics occurred in only 6 (2%) patients, 2 (33%) with pneumonia and 2 (33%) with ECOPD.

Figure 2. Treatment distribution across the four groups



Diagnoses: ECOPD includes COPD in exacerbation and suspected COPD. Other includes COVID-19, RS-infection, influenza, dyspnea and all other infectious diseases and conditions not captured by the previous groups. Due to overlap between the diagnosis, several patients appear in more than one group. For example, a patient diagnosed with ECOPD and pneumonia or covid and pneumonia are included in both groups and therefore counts twice.

Figures 3 and 4 present patients with isolated pneumonia and ECOPD. This approach aims to provide a clearer and more straightforward representation of CXR findings and subsequent antibiotic management for each diagnosis.

Figure 3 (pneumonia) shows that CXR findings had limited impact on antibiotic treatment. Among the 28 patients (30%) with a normal CXR, 24 (86%) continued their initial antibiotic treatment, 3 (11%) had a change in treatment, and 1 (4%) started antibiotics. Of the 96 patients (67%) with CXR-verified infiltrates, 88 (92%) continued initial treatment, 14 (15%) had a change in treatment, 2 (2%) discontinued antibiotics, and 1 (1%) started antibiotics. Overall, 112 (90%) of

124 patients with pneumonia and either normal or infiltrative CXR findings continued their initial antibiotic regimen.

Figure 3. CXR findings in pneumonia related to treatment

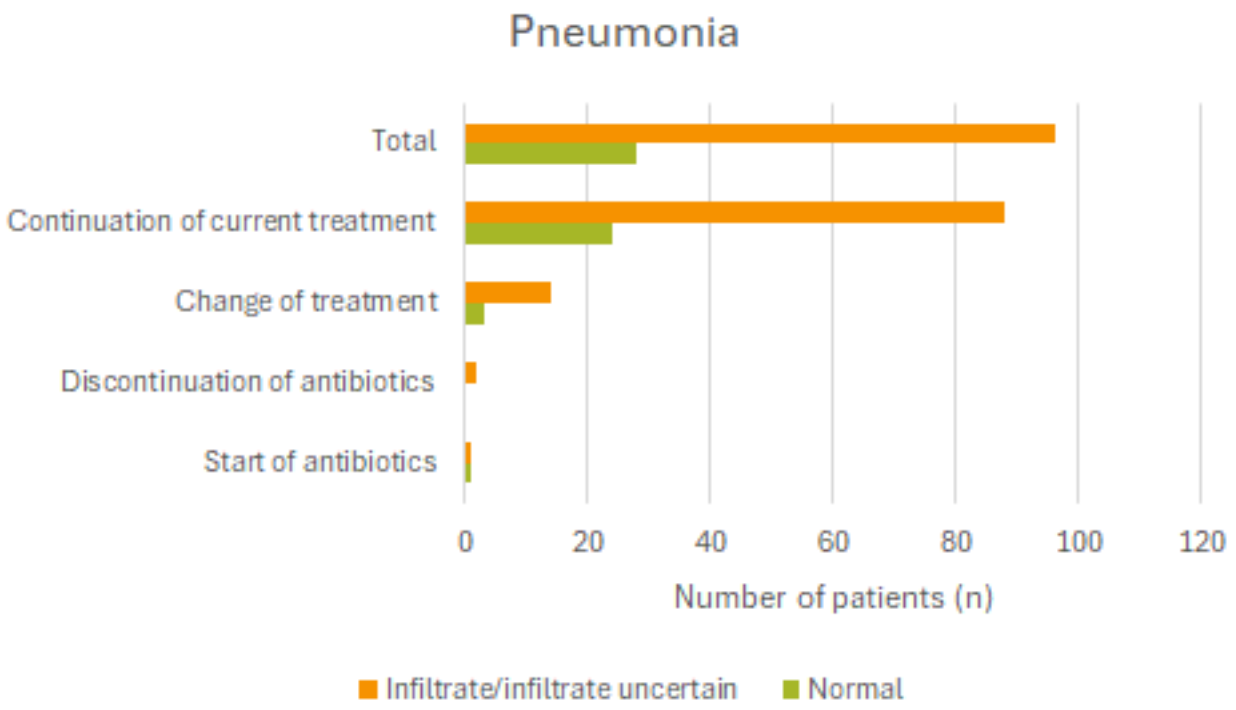
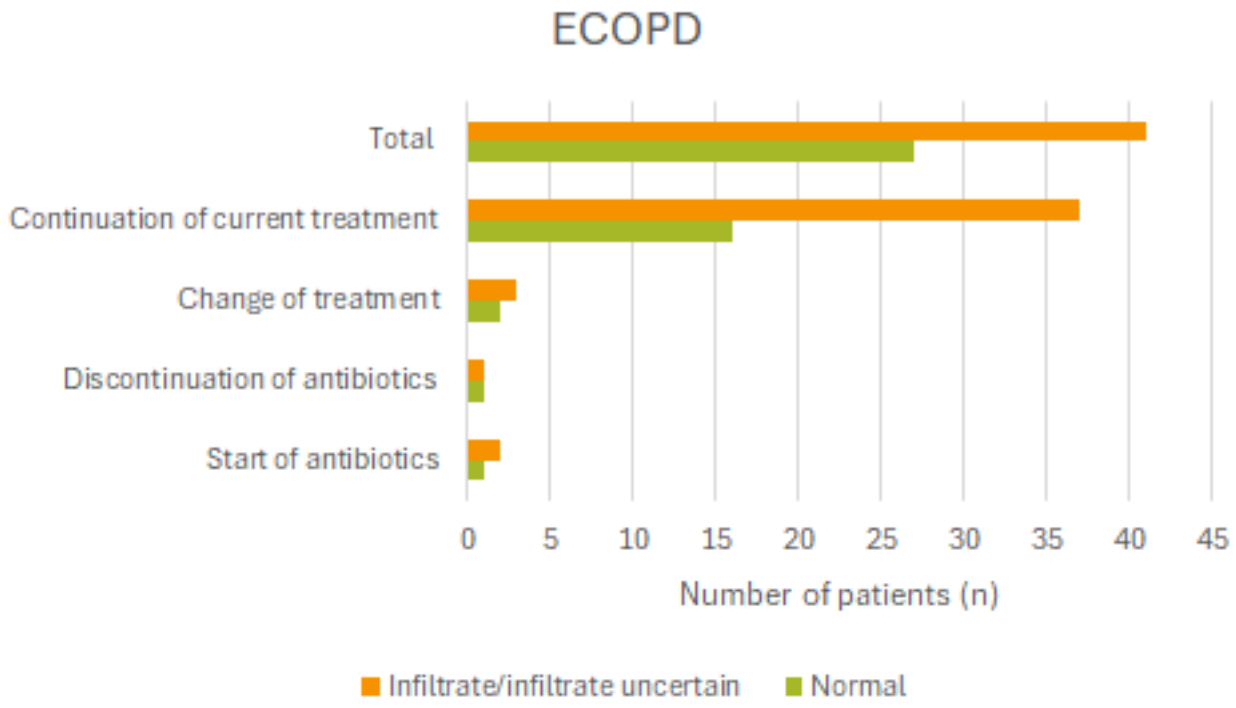


Figure 4 (ECOPD) shows a similar pattern according to CXR findings. Among 27 (29%) patients with a normal CXR, 16 (59%) continued their initial treatment, 2 (7%) had a change in treatment, 1 (4%) discontinued antibiotic, and 1 (4%) started antibiotic. Of the 41 (29%) patients with CXR-confirmed infiltrates, 37 (90%) continued their initial antibiotic treatment, 3 (7%) had a change in treatment, 2 (5%) started antibiotics, and 1 (2%) discontinued antibiotic. Summary, 53 (78%) of 68 patients continued their antibiotics regardless of CXR results.

Figure 4. CXR findings in ECOPD related to treatment



Discussion

This study suggests that the final CXR report only infrequently leads to changes in the initial antibiotic treatment for pneumonia and ECOPD. These findings indicate that clinical evaluation, together with paraclinical parameters, is generally weighted more heavily than the final CXR result and is therefore central to treatment decisions. Although the study focuses on pneumonia and ECOPD, the discussion will primarily focus on pneumonia, as there is a higher proportion of patients in this group.

The limited clinical significance of CXR may be explained by its diagnostically documented limitations, including a relatively low sensitivity of 70–85% and a specificity of 80–90% in patients with pneumonia. Furthermore, CXR may have difficulty detecting early and small pathological changes and may, in overweight patients and those with chronic lung disease, fail to identify consolidations or interstitial infiltrates (16). This is consistent with guidelines from the Department

of Radiology, which describe a frequently significant discrepancy between radiographic findings and clinical symptoms early in the course of the disease, as infiltrates often develop more slowly than clinical manifestations. Therefore, routine CXR is not recommended, as the examination rarely alters treatment decisions (11,17).

This study demonstrates that the majority of patients with pneumonia (90%) and ECOPD (78%) continued the initial antibiotic treatment regardless of whether the CXR appeared normal or showed infiltrates. Notably, infiltrates were detected in 143 patients (48%), including 96 (32%) with pneumonia and 41 (14%) with ECOPD. However, antibiotic therapy was initiated in 240 patients (80%), comprising 132 (56%) with pneumonia and 69 (29%) with ECOPD. This discrepancy raises important questions as to whether CXR are performed too early in the disease course, potentially missing some infiltrates, and whether a proportion of patients receive unnecessary antibiotic treatment. Moreover, 28 (9%) patients had a normal CXR despite clinical symptoms compatible with pneumonia, suggesting that when clinicians are confident in their diagnosis, the CXR is not considered decisive. Instead, the overall clinical presentation is given greater weight and regarded as a sufficient diagnostic tool to guide treatment initiation (17). In line with this, higher diagnostic certainty on the part of the clinician is associated with a higher prevalence of CXR-confirmed pneumonia (18), and evidence further indicates that the probability of pneumonia increases proportionally with the intensity of symptoms(19). Taken together, these findings highlight the central role of clinical judgement in guiding treatment decisions over reliance on CXR results.

Although the evidence presented above originates from primary care and may not be directly transferable to the ED, the findings of this study indicate that a comparable pattern is observed in the ED, with most patients continuing their initial treatment. This emphasizes the central role of clinical evaluation and suggests that the principles of selective CXR use applied in primary care can also

be relevant in the ED. Nevertheless, CXR remains useful in situations of diagnostic uncertainty or when there is an inadequate response to treatment.

According to the National Danish pulmonology guidelines, the diagnosis of pneumonia requires a radiologically or sonographically verified newly developed infiltrate, as well as symptoms of a lower respiratory tract infection (12). However, these symptoms can be nonspecific and difficult to distinguish, as they occur in several infectious conditions (20). Detection of an infiltrate using CXR can therefore confirm or refute a clinical suspicion (19). Because infiltrates often become visible after symptom onset, it can, in some cases, be difficult to diagnose pneumonia in the early stage using the National Danish pulmonology definition in early diagnostics (11). This highlights the importance of balancing clinical assessment with selective CXR use. Our study indicates that clinical practice more closely reflects the recommendations of radiologists rather than the requirements of pulmonologists in acute evaluation. This is demonstrated by the high proportion of patients (80%), including 56% with pneumonia, who were initiated on antibiotic therapy before the final CXR report was available.

Overall, the above reflects the lack of clearly defined guidelines across radiology and pulmonology specialties, regarding the indication for CXR in patients with suspected pneumonia. Moreover, the findings allow for discussion of CXR use in acute evaluation according to *Choosing Wisely* principles. It encourages dialogue between clinicians and patients regarding the need for diagnostic tests, therapeutic interventions, and procedures through five key questions: Do I really need this test or procedure? What are the risks and side effects? Are there simpler, safer options? What happens if I don´t do anything? How much does it cost and will my insurance pay for it?(10).

In relation to the first question, this study shows that the answer is often no, as treatment in most of the cases is not changed based on the final CXR report. This indicates that the examination frequently provides no additional diagnostic

information that significantly influences the acute treatment regimen. Another central question of particular relevance is “What happens if I don´t do anything”? where the results of this study indicate that in many cases, not performing a CXR does not impact treatment decisions.
Taken together with the principles of *Choosing Wisely*, this study demonstrates that a thorough clinical assessment in combination with paraclinical tests often represents a simpler and safer approach, which in practice is weighted more heavily than CXR. This supports the assumption, that routine CXR can be omitted in certain patients without negatively affecting the overall course of treatment.

A notable aspect of the use of routine CXR is that it can reveal other pathological conditions of clinical significance, which may justify the use. In this study, we found that CXR raises suspicion of malignancy in ten patients. Two of these were already known to have cancer, so the findings did not provide new diagnostic information. Five patients underwent further investigation, of whom one entered a cancer pathway. No malignancy was detected in the remaining four patients. Furthermore, three patients choose not to undergo further tests.

These aspects raise the question of whether CXR truly benefits patients in some of the above cases, or whether the examination rather causes unnecessary anxiety without providing subsequent clinical benefit for the patient’s ongoing treatment course.

Overall, these findings indicate that, although routine CXR in some cases can detect incidental or previously known pathological findings of clinical significance, it only rarely leads to further diagnostic. This underscores the need to balance the potential diagnostic benefit against the risk of causing unnecessary anxiety for the patient.

Based on the limited clinical relevance of routine CXR, and the desire to reduce unnecessary imaging, it gives rise to the need to investigate which alternative methods can be used and still maintain high diagnostic quality for the patient. Several studies show that the use of lung ultrasound (LUS) can be an alternative to CXR for detecting pneumonia in the ED, as it can provide a more accurate diagnosis (21,22).

The advantage of LUS is that the examination provides rapid results, has lower financial costs, and do not use ionizing radiation (22,23). This avoids exposing the patient to radiation risks and is therefore in accordance with the radiological principle of "as low as reasonably achievable" (ALARA).The ALARA principle states that if two imaging methods are considered equivalent, the method that results in the fewest harmful side effects for the patient shall be used (24).

Although LUS has several diagnostic advantages, clinicians do not systematically use the method in practice. Research indicates that several factors underlie its limited use, including restricted access to equipment, lack of time and resources for necessary training, and uncertainty regarding the use of LUS as a diagnostic tool(25). In this study, LUS was included as part of data collection but was not analyzed further. Therefore, it could be of interest in a follow-up study to investigate the use of LUS in the ED in relation to diagnostic decision-making.

In this context, recent research points out that artificial intelligence (AI) can support LUS (26,27). Recent studies show that AI is capable of interpreting LUS scans and, with high diagnostic accuracy and sensitivity, identifying pathological findings such as pleural effusion, consolidation, and atelectasis (27,28). A collaboration between AI and LUS can therefore contribute to a safer and more consistent assessment of lung status, regardless of the clinician's level of expertise (27). This can optimize acute diagnostics through rapid, precise, and reliable identification, without the use of ionizing radiation (27,28).

Limitations

This study has several limitations which should be considered when interpreting the results. Given the study is retrospective and relies on existing medical records, there is a risk of incomplete, inaccurate, or inconsistent documentation. In addition, the data are depended on accurate and comprehensive recording in the patient records, which, if lacking, could contribute to information bias. As the study is descriptive, no conclusions can be drawn about cause and effect. Changes in antibiotic treatment might not be entirely due to the final CXR report, as other factors could have influenced clinical decision making. Because data were entered into REDCap by two master's students, some variability in the interpretation of patient records cannot be excluded.

Due to diagnostic overlap, the number of patients in the dataset appears larger than the 300 originally included, which may cause confusion for the reader and raise questions regarding the validity of the data material.

Finally, the results are based on data from a single hospital in a limited period, and the number of participants was relatively small, which may limit the generalizability of the findings to other hospitals or regions.

Conclusion

This study clearly demonstrates that clinical assessment based on symptoms, paraclinical findings, and the CURB-65 score (specifically applied in pneumonia) forms the primary basis for initial antibiotic treatment in both pneumonia and COPD. The results also indicate that the final CXR report seldom leads to changes in treatment, with the majority of patients continuing their initial antibiotic regimen. In practice, the study aligns with the protocols of radiology departments, which, unlike pulmonologists, do not require a confirmed infiltrate but instead place greater emphasis on clinical symptoms. It should be considered whether the establishment of clear guidelines for the use of CXR could reduce unnecessary utilization and radiation exposure, as well as optimize healthcare resource

allocation, through a precise definition of the patient groups for whom radiography is indicated, without compromising the quality of patient care.

Use of Generative AI:

In the preparation of this master's thesis, generative artificial intelligence (ChatGPT, OpenAI) was used as a support tool for language editing, improvement of clarity, and translation between Danish and English. The AI tool was not used to generate academic content, analyses, results, or conclusions. The author is solely responsible for the final content and all academic interpretations presented in the thesis.

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