

# Antibiotic use for Treatment of Pneumonia in Department of Internal Medicine

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Master thesis in Medicine

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# **Abstract**

## **Background**

Pneumonia is a common diagnosis in every hospital department. Misuse of antibiotics, too much broad-spectrum agents and too long duration of therapy, in the treatment of pneumonia has impact on the evolving trend of antibiotic resistance.

Reports from a national quality register for pneumonia (NQRP11) of 5334 patients, 2011 show that there are shortcomings in the use of antibiotics for pneumonia treated in different infectious disease departments. Swedish Society of Infectious Diseases has put forward quality measures in the in-hospital treatment of community-acquired pneumonia. There is a lack of information about the quality of care for pneumonia in departments of internal medicine.

The purpose of the present study is to compare the antibiotic use for treatment of pneumonia in internal medicine wards and infectious disease wards.

## **Methods and results**

Review of the medical records of 80 patients who were treated for community- acquired pneumonia during 2011 in internal medicine wards in Skaraborg hospital, Skövde. Different quality parameters were studied during case review. For example: initial antibiotic treatment, antibiotic therapy after day 3, treatment duration, diagnostic use of respiratory tract culture.

Cases were chosen randomly with equal gender presentation accordingly 40 male and 40 female patients.

The results were compared with NQRP11. The patients in the study were older and suffered from more comorbid illnesses but the percentage with severe pneumonia were equal to the national cohort in infectious disease wards. Broad-spectrum antibiotics were used more often both empirically and as follow-up therapy. More patients received inappropriate long duration of therapy and a higher

proportion was not subject to respiratory tract culture.

## **Conclusions**

Patients with pneumonia cared for in various departments are not treated in the same way.

This could be due to differences in age, concomitant diseases and disease severity.

Patients in medical wards had higher median age and more comorbid illnesses but disease severity was equal. Overall antibiotic use for therapy of pneumonia had lower quality in medical wards than infectious disease wards. More studies are needed to elucidate the reasons for this. Educational efforts and increased awareness are needed in order to increase penicillin use, to reduce duration of antibiotic treatment, and to increase diagnostic procedures.

**Key words: Pneumonia, Community acquired pneumonia, Antibiotic, Internal medicine wards, Infectious disease wards, Broad-spectrum antibiotics, Respiratory tract culture**

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## Background and aims

Community-acquired pneumonia (CAP) remains a considerable problem in terms of morbidity, mortality and use of hospital resources. Annually nearly 41 000 patients are cared for pneumonia (as main diagnosis or secondary to a bacteremia diagnosis) in hospitals in Sweden. (1) Patients admitted to a hospital with a diagnosis of pneumonia are mostly cared for in internal medicine wards in Sweden.

There is a scarcity of information on the antibiotic use in these patients, in opposite for patients treated in infectious disease departments.

Since 2009 all patients treated for community-acquired pneumonia in infectious disease departments in Sweden may be reported to a national quality register for pneumonia. (2)

National guidelines for the in-hospital treatment of community-acquired pneumonia published by Swedish Society of Infectious Disease recommend penicillin V/G for treatment of patients with non-severe pneumonia. Antibiotic treatment for 7 days is recommended in cases of non-severe pneumonia and severe pneumonia with no complication. (3)

Over- and misuse of antibiotics contributes to antibiotic resistance, increased health care costs and side effects for patients. To counteract this trend there is a need to evaluate quality and adherence to current guidelines of antibiotic use.

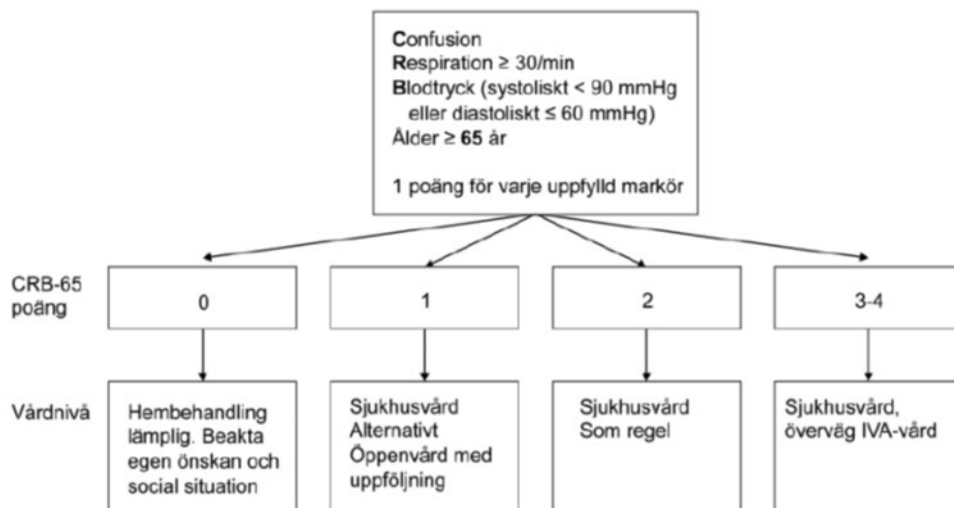
Swedish Society of Infectious Diseases has put forward quality measures in the in-hospital treatment of community-acquired pneumonia. (2)

These quality measures are as following:

- 1) 100% of patients should be subject to respiratory tract culture.

2) 75% of patients with the CRB (Confusion, Respiratory rate, Blood pressure, age)-65 system 0-2 points (mild to moderate pneumonia) should have penicillin G / V as primary treatment. Figure 1 explains CRB-65 system.

Figur 1. CRB-65 för allvarlighetsbedömning och stöd i beslut om vårdnivå (A-).



3) CRB-65 sum shall be calculated and commented on registration of 100% patients.

Reports from the NQRP11 show that there are shortcomings in the use of antibiotics for pneumonia treated in infectious disease departments.

Analyses reveal that 75% of the patients were subject to respiratory tract culture compared with 67% in 2010. 52% of patients with CRB-65 score between 0-2 received penicillin G / W as initial treatment and in only 5% cases CRB-65 score were commented and calculated at admission records. Microbiological agents were identified in only 41% of the patients. Respiratory rate registration was missing in 10%. Too long treatment duration was noted, 77 % of the patients were treated for more than 7 days, and median length of hospital stay was 4 days.

How the quality of pneumonia care in medical wards fulfills these criteria is unclear.

The likelihood is that antibiotic use against CAP is of lower quality in medical wards compared with infectious disease departments.

In a previous study of patients treated for pneumonia in internal medicine wards in Sweden, respiratory rate were registered in only 31% cases, mean length of hospital stay was 6.4 days and in only 23% cases a microbiological etiology was determined. (4)

A study of 498 patients treated for CAP in internal and respiratory medical wards in 8 different hospitals in Netherlands showed that blood samples were collected in only 57% cases and in 39% cases sputum samples had been obtained before the start of antibiotic therapy. (5)

Reduction of broad-spectrum antibiotics and shorter duration of therapy will probably have an impact on the rate of antibiotic resistance.

Knowledge of the current process of care is a basic requirement for improving the quality of medical treatment for patients cared for CAP. (6)

The main purpose of this study was to compare the quality of antibiotic use for treatment of pneumonia between internal medicine ward and infectious disease department. This study will highlight differences in antibiotic usage against pneumonia between internal medicine ward and infectious disease ward through studying a number of different quality variables. The most important parameters to find out are: the most common empirical antibiotic therapy, choice of follow-up therapy, duration of the antibiotic therapy and frequency of respiratory tract culturing.



## Methods

80 patient's medical records that were treated for community acquired pneumonia in medical ward were reviewed retrospectively. All the patients were treated in medical ward in Skaraborg hospital, Skövde during the period from 1 January to 31 December 2011.

Every patient's medical record was reviewed from the emergency ward until patients were discharged from hospital. Information's were gathered from several data sources as medical record Melior, Labsvar, Ambulink, and Västfolket (population register).

Inclusion criteria's in our study were as following:

- 1: The principle discharge diagnosis should be pneumonia according to International Classification of Disease, 10th edition (ICD-10) diagnosis code in patient discharge summary.
- 2: The principal discharge diagnosis can be pneumonia as bi-diagnosis to sepsis.
- 3: Patients should be treated for pneumonia and discharged from an internal medicine ward with no stay in an infectious disease department.
- 4: Patients must not been hospitalized during last 7 days before admission.

Skaraborg hospitals administrative department presented us with a list of 138 patients with principle discharge diagnosis pneumonia or pneumonia secondary to bacteraemia (5pat). These principle discharge diagnosis included: 108 patients with J15.9 unspecified bacterial pneumonia, 10 patients with J15.7 Pneumonia due to Mycoplasma pneumonia, 1 patient with J15.5 Pneumonia due to Escherichia coli, 1 patient with J15.1 Pneumonia due to Pseudomonas, 5 patients with J14.9 Pneumonia due to Haemophilus influenza, 5 patients with J13.9 Pneumonia due to Streptococcus pneumonia and one patient with J16.8 Pneumonia due to other specified infectious organisms. Pneumonia secondary to bacteremia diagnosis included A403, A415, A415, and A490 among female patients and A403 among male patients.

First we choose patients with even number in the list and if patient was not fulfilling any of the inclusion criteria, the patient was left out and we continued to the next patient with even number in

the list. In the same way we completed with the patients with odd number from the bottom of the list. In this way 80 patients, 40 male patients and 40 female patients were selected. 5 patients with J13.9, 4 patients with J14.9, 6 patients with J15.7, 63 patients with J15.9, 1 patient with A40.3, 1 patient with A41.5 were selected.

Patients were excluded if they were younger than 18 year, treated in infectious disease department or did not fulfil any of the inclusion criteria.

As the main purpose of our study was to compare our report with NQRP11 a questionnaire consisted of around 42 questions similar to the one used in the NQRP11 were designed and made.

(Attachment1: The questionnaire in Swedish)

The questionnaire included questions regarding smoking, age, sex, antimicrobial therapy, comorbid conditions, physical examination findings, intensive care, laboratory and microbiological test results. Results were compared with the national quality register for pneumonia report of patients treated for pneumonia in infectious department during 2011 (n= 5334).

## Ethics

The patients' data were treated confidentially and with care. All results is presented as aggregated data, no individual participant could be identified. We could not discern any ethical inconvenience for the patients.

## Result

The study's main results show that patients in the study were older and had more comorbid conditions but the percentage with severe pneumonia CRB-65  $\geq 2$  were equal to the national cohort in infectious disease wards. Broad-spectrum antibiotics were used more often both empirically and as follow-up therapy. More patients received inappropriate long duration of therapy, and higher proportion was not subject to respiratory tract culture.

### **Patient characteristics**

The median age of the 80 patients in the study was 78 years (range 23-100 years) with equal gender presentation 40 male (50%) and 40 female (50%). 74% of patients were 65 years or older. The most common comorbid condition was heart disease 43% followed by neurological disorder 25%. 74% of the patients had one or more of the predefined comorbid conditions. Patient characteristics and predefined comorbid condition of the patients are summarized in table 1.

**Table 1**

<b>Variables</b>	<b>Percentage</b>	<b>No. of patients(80)</b>
<b>Chronic pulmonary disease</b>	23	18
Male	18	7
Female	28	11
<b>Chronic heart disease</b>	43	34
Male	48	19
Female	38	15
<b>Neurological disorder</b>	25	20
Male	20	8
Female	30	12
<b>Immunosuppressive disease</b>	20	16
Male	15	6

Female	25	10
<b>Smoking</b>	15	12
Male	8	3
Female	23	9
<b>Malignancy</b>	13	10
Male	18	7
Female	8	3
<b>Chronic kidney disease</b>	6	5
Male	8	3
Female	5	2
<b>Chronic liver failure</b>	0	0
Male	0	0
Female	0	0
<b>Median age</b>	78 years	
Male	78 years	
Female	79 years	

### **Physical examination and severity of illness**

Findings of the physical examination on admission are summarized in table 2. Pox (Pulse Oximetry) had been measured in 100% of the patients. Respiratory rate registration was missing in 8% patients cases and 28% patients had tachypnea (respiratory rate  $\geq 30$  breaths per minute).

8% patients had diastolic blood pressure  $\leq 60$  mmHg and 6% patients were confused. According to the CRB-65 system the proportion of patients classified as severe pneumonia (CRB-65  $\geq 2$ ) was 25% (25% male, 25% female)

**Table 2**

<b>Variables</b>	<b>Percent (80 pat)</b>	<b>No. of patients</b>
<b>Respiration rate <math>\geq 30</math>/min</b>	28	22

<b>Systolic blood pressure &lt;90mmHg</b>	1	1
<b>Diastolic blood pressure ≤60mmHg</b>	8	6
<b>Confusion</b>	6	5
<b>Pox (oxygen saturation) measured</b>	100	80
<b>Severe pneumonia CRB 65≥2</b>	25	20
<b>CRB-65 =0</b>	14	11
<b>CRB-65=1</b>	61	49
<b>CRB-65=2</b>	20	16
<b>CRB-65=3</b>	4	3
<b>CRB-65=4</b>	1	1

### **Etiological diagnosis**

Blood cultures were obtained from 65/80 (81%) of the patients. 56% (45/80) of the patients were subject to respiratory tract culturing whereof 40 patients were subject to nasopharyngeal culturing, 9 patients were subject to sputum culture and 5 patients were subject to both of them. The infecting microbiological organisms were identified in 38% (30/80) patients. The most common microbiological etiology was Haemophilus influenza 14% (11/80) followed by Streptococcus pneumonia 8% (6/80) and Mycoplasma pneumonia 6% (5/80). Among 11 cases with Haemophilus influenza, 9 cases were discovered in nasopharyngeal culture, 1 case in blood culture and 1 case in sputum culture. Only 1 (1/11) case was beta-lactam-positive as the remaining (10/11) were ampicillin-sensitive. Among 6 patient's cases with streptococcus pneumonia, 3 cases were discovered in blood culture, 2 cases in nasopharyngeal culture and 1 case in both sputum and nasopharyngeal culture.

## **Antibiotic therapy**

91% patients received antibiotic treatment for a period greater than 7 days. Median total antibiotics treatment period in the study was 11 days, 10 days male and 11 days female (range 4-42 days). Median per oral antibiotic treatment period was 10 days (range 0-27 days). Median intravenous antibiotic treatment days were 2 days (range 0-24 days). Average time from arrival to the initial antibiotic treatment was 240 minutes (range 25 min-2103 min). 68% patients' received antibiotics in less than 240 minutes. The most common initial antibiotic treatment was cephalosporin 45% (36/80), followed by penicillin 36% (29/80). Among patients with CRB-65  $\leq$  2, 43% (33/76) were treated initially with cephalosporin and 37% (28/76) with penicillin V/G.

The most common follow up antibiotic treatment (3 days after admission) was penicillin V/G 36% (29/80) followed by tetracycline 20 % ( 16/80) and amoxicillin 19% (15/80).

4% (3/80) of the patients were not initially treated with antibiotics.

44% (35/80) were initially treated with antibiotics with pneumonia as primary diagnosis, 39% (31/80) were initially treated with antibiotic with pneumonia as a possible diagnosis. 14% (11/80) patients were initially treated with antibiotics without pneumonia suspicion.

Table 3 summarizes initial and follow up antibiotic treatment.

**Table 3**

<b><u>Antibiotics</u></b>	<b><u>Initial treatment %</u></b>	<b><u>Follow-up treatment%</u></b>
<b>Cephalosporin</b>	45	16
<b>Tetracycline</b>	9	20
<b>Penicillin V/G</b>	36	36
<b>Amoxicillin</b>	3	19
<b>Piperacillin/tazobactam</b>	3	1
<b>Quinolone</b>	0	1

<b>Clindamycin</b>	3	5
<b>Macrolides</b>	1	4
<b>Aminoglycosides</b>	24	1
<b>Others</b>	1	1

### **Outcome variables**

6% (5/80) patients were treated in intensive care unit, all of them (5/80) were treated with CPAP/BPAP and 4% (3/80) of them were treated with ventilator. Among intensive cared patients 1 patient died during treatment. Case fatality rate was 5% (4/80) during hospital stay and 9% (7/80) during 28 days after diagnosis. The median length of hospital stay was 5 days (range 1-18 days) whereas mean length of hospital stay was 6 days (76 patients). Mean length of hospital stay for male patients was 5 days and for female patients was 7 days. Mean length of stay was 6 days among patients who received antibiotics treatment in less than 240 min and 5 days among patients who received antibiotics treatment greater than 240 min.

Mean length of hospital stay was 7 days (range 1-18 days) among patients who initially received cephalosporin and 6 days among patients who initially received penicillin, although this difference is statistically not significant. Average time from arrival to the first antibiotic administration among patients who initially treated with cephalosporin was 177 minutes and 235 minute for patients initially treated with penicillin.

48% (19/40) male patients were initially treated with cephalosporin and 35% (14/40) were treated with penicillin. 43 % ( 17/40) female patients were treated initially with cephalosporin and 38% (15/40) with penicillin



## Comparison between the cohort from internal medicine, 80 patients and National quality register for pneumonia 2011, 5334 patients

Patients in the study had higher median age but disease severity was equal. Patients with severe pneumonia or CRB-65  $\geq 2$  were 23% in NQRP11 and 25% in the study. Median age was 78 years in the study and 66, 5 years in NQRP11.

Comorbid conditions among patients in the study (80pat) were more common than in NQRP11 (2813 pat). Chronic heart disease was the most common condition 43% (34/80) in the study and 21% (592/2813) in the NQRP11.

Broad-spectrum antibiotics were used more often both empirically and as follow-up therapy.

Cephalosporin as initial treatment was used 45% in the study and 27% in the NQRP11. Penicillin as initial treatment was used 36% in the study and 50% in the NQRP11.

More patients received inappropriate long duration of therapy, and higher proportion was not subject to respiratory tract culture. Patients were treated with antibiotics for greater or equal to 7 days 77% in NQRP11 and 92% in the study. 75% patients in the NQRP11 and 56% patients in the study were subject to respiratory tract culture. Penicillin/amoxicillin as follow up treatment were used 51% in NQRP11 and 39% in the study.

Mortality rate during hospital treatment was the same, 5% in the study and 4% in the NQRP11.

Patients treated in medical intensive care unit were 6, 5 % in NQRP11 and 6, 3% in the study. Table 5 summarizes comparison between this study and NQRP11.

**Table 5**

<b>Variables</b>	<b>NQRP11 (5334 pat)</b>	<b>Internal medicine (80pat)</b>	<b>P-value</b>
<b>Median age, years</b>	<b>67</b>	<b>78</b>	
<b>Median length of hospital stay, days</b>	<b>4</b>	<b>5</b>	

Identified etiology	41%	38%	n.s
Pneumococcus	13%	8%	n.s
Mycoplasma	12%	6%	n.s
Respiratory tract culture	75%	56%	<0,001
Blood culture	93%	81%	<0,001
Follow up treatment Amox/PcV	51%	39%	0,03
AB treatment > 7 days	77%	91%	0,003
CRB-65 0-2 initial AB treatment PcG/PcV	51%	37%	0,007
Cephalosporin as initial AB treatment	27%	45%	<0,001
PcG/PcV as initial AB treatment	50%	36%	0.015
CRb-65 ≥2	23%	25%	n.s
Respiration rate missing	10%	8%	
Tachypnea	20%	28%	n.s.
Mortality during hospital treatment	4%	5%	n.s
Intensive care admissions	7%	6%	n.s

<u>Comorbidity</u>	<u>National cohort (2813pat)</u>	<u>Internal medicine (80 pat)</u>	<u>P-value</u>
Neurologic disorder	14%	25%	0,004
Chronic pulmonary disease	17%	23%	n.s
Smoking	13%	15%	n.s
Immunosuppressive disease	10%	20%	0,002

<b>Malignancy</b>	<b>6%</b>	<b>13%</b>	<b>0,021</b>
<b>Chronic liver disease</b>	<b>1%</b>	<b>0%</b>	<b>n.s</b>
<b>Chronic kidney disease</b>	<b>4%</b>	<b>6%</b>	<b>n.s</b>
<b>Chronic heart disease</b>	<b>21%</b>	<b>43%</b>	<b>&lt;0,001</b>

**Comparison between the cohort from internal medicine (KSS), 80 patients and National Board of Health and Welfares inpatient care register (Nation and Västra Gotland region)**

There are no statistically significant differences in patients mean age and mean length of hospital stay (MLHS) between cohort from internal medicine and National board of health and welfare inpatient care register on national level and Västra Gotland region (VGR).

Since all 95% confidence intervals for "difference between means" contains "1" then this represents that no statistical differences exist between KSS and kingdom and VG-region. This represents the p-value > 0.05.

Table 1 summarizes differences between cohorts from internal medicine and National board of health and welfares inpatient care register (NBHW).

<b>Variables</b>	<b>Internal medicine</b>	<b>Nation(n)</b>	<b>95% confidence interval</b>
Mean age men	71, 8(40)	71, 3(20811)	(-4,898 to 5,898)
Mean age women	75, 6(40)	71, 9(19088)	(-1,977 to 9,377)
MLHS men days	6, 9(40)	6, 2(20811)	(-1,225 to 2,625)
MLHS women days	5, 5(40)	6, 4(19088)	(-2,885 to 1,085)

<b>Variables</b>	<b>Internal medicine</b>	<b>VGR(n)</b>	<b>95% confidence interval</b>
Mean age men	71, 8(40)	71, 1(3363)	(-4,727 to 6,127)
Mean age women	75, 6(40)	71, 7(3206)	(-1,742 to 9,542)
MLHS men days	6, 9(40)	6, 3(3363)	(-1,377 to 2,577)
MLHS women days	5, 5(40)	6, 5(3206)	(-3,145 to 1,145)

## Discussion

Patients admitted to a hospital with a diagnosis of pneumonia are mostly cared for in internal medicine wards in Sweden. There is a scarcity of information on the antibiotic use in these patients, in opposite for patients treated in infectious disease departments.

The treatment differs for pneumonia in various departments. Is this due to differences in severity of illness, in age or in the rate of comorbid diseases? Or is it due to differences in the process of care?

The patients in this study were older and had more comorbid illnesses than a cohort treated in infectious disease department, but the severity, defined by the percentage with CRB-65 2 or higher, were the same. Length of hospital stay, the percentage admitted to the ICU, and mortality were equal in both groups but, the quality of diagnostic and antibiotic use was lower.

Physicians in internal medicine wards ordered less blood cultures and less respiratory cultures. The rate of a proven microbiological diagnosis was 38%. In order to narrow empirical therapy and de-escalate initial broad-spectrum antibiotics it is essential to be guided by culture and resistance results. More broad-spectrum antibiotics were used as empirical therapy, and as follow-up therapy. In this study only 36% of the patients with CRB-65 less or equal to 2, 95% of the cohort, were initially treated with penicillin V/G, the recommendation is that 75% should receive penicillin.

The duration of antibiotic therapy was longer, more than 90 % of the patients received therapy for more than seven days. The national guidelines for treatment of community-acquired pneumonia in hospitals, issued by the Swedish Society of Infectious Diseases states seven days treatment for both non-severe and severe pneumonia without complications. The comparison between the cohort cared for in internal medicine wards and in infectious disease departments, shows that less broad-spectrum antibiotics and shorter duration of treatment can safely be used. Annually nearly 41 000 patients are cared for pneumonia in hospitals in Sweden. Reduction of broad-spectrum antibiotics and shorter duration of therapy will have a major impact on the rate of antibiotic resistance.

Although this study was carried out in only one hospital, results are in accordance with studies carried out in major hospitals in Sweden. In a previous study of patient treated for pneumonia in medical ward in Sweden, mean length of hospital stay was 6 days and overall mortality rate was 3, 5 %.

There are no statistically significant difference in terms of mean age and mean length of hospital stay between this study (80) and National board of health and welfare inpatient care register on national level and Västra Götaland region. This shows that this study is more representative than the National Quality Registry for Pneumonia 2011.

In this study mean length of hospital stay was 6 days and mortality rate was 5%.

There are no remarkable differences in antibiotic treatment of female and male patients.

The present study has several strengths. The cohort of patients was equal in gender and not restricted to a specific microbiological etiology. The findings are also less prone to seasonal biases because patients were studied during one calendar year, 2011.

The major limitations of the present study are the retrospective design, patient's selection method; only one hospital was included and limited amount of patients (80 patients). The retrospective design and patient's selection method may be subject to confounding and bias.

Knowledge of the current process of care is a basic requirement for improving the quality of treatment for patients cared for community-acquired pneumonia.

More studies are needed to elucidate the reasons for low quality of antibiotic use in internal medicine wards. Educational efforts and increased awareness are needed in order to increase penicillin use, to reduce duration of antibiotic treatment, and to increase diagnostic procedures in medical ward.

## Conclusions and Implications

Patients with pneumonia cared for in various departments are not treated in the same way. This could be due to differences in age, concomitant diseases, disease severity, or differences in the process of care. Overall antibiotic use against pneumonia has lower quality in internal medicine wards compared to infectious disease departments. Patients in this study were older and had more comorbid illnesses than a cohort treated in infectious disease department, but the severity, defined by the percentage with CRB-65  $\geq 2$ , were the same. Broad spectrum antibiotics were used too often both as initial and follow up therapy. Patients were subject to longer antibiotic treatment period and less diagnostic procedures.

Knowledge of the current process of care is a basic requirement for improving the quality of medical treatment for patients cared for CAP.

More studies are needed to elucidate the reasons for the low quality of antibiotic use in internal medicine wards. Educational efforts and increased awareness are needed in order to increase penicillin use, to reduce duration of antibiotic treatment, and to increase use of diagnostic procedures.

Commitment to higher quality in the care of pneumonia patients will have major impact on the rate of antibiotic resistance, side effects for the patients and health care cost.

## Populärvetenskaplig sammanfattning (svenska)

Fel- och överanvändning av antibiotika leder till antibiotikaresistens, ökade vårdkostnader och biverkningar för patienterna. En majoritet av vårdtillfällen för lunginflammation sker på medicinkliniker i Sverige. Det finns inga samlade data avseende kvaliteten i antibiotikaanvändningen för dessa patienter. I denna studie studerade vi 80 patientjournaler vårdade för lunginflammation under 2011 vid medicinkliniken, Skaraborg sjukhus, Skövde. Resultaten jämfördes med uppgifter ur kvalitetsregistret för patienter vårdade för lunginflammation på infektionsklinik.

Enligt den här studiens resultat är användningen av antibiotika och diagnostiska åtgärder på medicinklinik vid lunginflammation av lägre kvalitet jämfört med infektionsklinik. Patienterna vårdade vid medicinavdelning hade högre ålder och mera bakomliggande sjukdomar men sjukdomens svårighetsgrad var densamma.

Patienter på medicinavdelningar behandlades oftare med bredspektrumantibiotika och färre patienter luftväg och blododlades. Behandlingstiden var längre.

Enligt rekommendationerna från Svenska Infektionsläkarföreningen bör 75 % av patienter med icke allvarlig lunginflammation behandlas med penicillinpreparat. Bara 36 % av dessa patienter behandlades till en början med penicillin jämfört med 51 % vid infektionsklinik.

56 % av patienterna luftvägsodlades jämfört med 75 % vid infektionsklinik.

90 % patienterna fick antibiotika behandling längre än 7 dagar jämför med 77 % . 7 dagar är rekommenderad behandlingstid för såväl lindrig som allvarlig (utan komplikation) lunginflammation.

Denna studie belyser kvaliteten i antibiotikaanvändning vid lunginflammation vårdad på medicinklinik och kan användas som en grund för framtida utvecklings- och förbättringsarbete avseende antibiotikabehandling vid lunginflammation vårdad på medicinklinik.



Fler studier behövs för att belysa orsakerna till sämre kvalitet av antibiotikaanvändning för lunginflammation vid medicinklinik. Utbildningsinsatser och ökad medvetenhet krävs för att öka penicillinanvändning, öka diagnostiska åtgärder och för att minska behandlingstiden för patienter vårdade för lunginflammation vid medicinklinik.

## Acknowledgements

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## Attachment1: The questionnaire in Swedish

Ålder:..... Vårdtid (dygn):..... Kön.....

ICD-10 diagnos (pneumoni):.....

Avliden under vårdtiden Ja Nej

Övertagen från annan klinik Ja Nej

Antibioka inom 240 min efter ankomst Ja Nej

### **Bakomliggande sjukdomar (enligt inskrivningsjournalen)**

Kronisk hjärtsjukdom (hjärtsvikt, ischemisk hjärtsjukdom) Ja Nej Vet ej

Kronisk lungsjukdom (måttlig-svår KOL/astma e.dyl) Ja Nej Vet ej

Neurologisk sjukdom Ja Nej Vet ej

Kronisk njursvikt Ja Nej Vet ej

Kronisk leversjukdom Ja Nej Vet ej

Aktiv tumörsjukdom Ja Nej Vet ej

Immunkomprometterande sjukdom (aktiv tumörsjukdom, HIV, immunsuppressiv behandling) Ja Nej Vet ej

Rökare Ja Nej Vet ej

Finns uppgift om rökning i inskrivningsjournalen Ja Nej

### **Misstanke om pneumoni vid inläggningen (enl inskrivningsjournalen)**

Primär inläggningsdiagnos En av flera differentialdiagnoser Pneumoni omnämns ej

### **CRB-65 vid ankomst till sjukhus (första värdet inom 24 timmar)**

C: Nyttillkommen konfusion/sänkt medvetandegrad Ja Nej Ej registrerat

R: Respiration  $\geq$  30/min Ja Nej Ej registrerat

B: Blodtryck, systoliskt < 90 mm Hg eller diastoliskt  $\leq$  60 mm Hg Ja Nej Ej registrerat

Nämns CRB-65 summan i inskrivningsjournalen Ja Nej

Syrgasmättnad tagen vid ankomst (ingår ej i CRB-65) Ja Nej

### **Diagnos och etiologi**

Blododling tagen Ja Nej

Luftvägsodling på sputum tagen Ja Nej

Luftvägsodling på nasofarynxsekret tagen Ja Nej

Mikrobiologiskt agens påvisat Ja Nej

Om ja; vilket

Pneumokockker	H. Influenzae	Mykoplasma	C. Pneumoniae	Legionella
S. aureus	Annan bakterie	Influensavirus	Annat virus	

**Initialt antibiotikaval på sjukhuset (ett eller flera val)**

Penicillin V eller G	Amoxicillin	Amoxi/clav	Cefalosporin	Kinolon	Makrolid
Doxycyklin	Klindamycin	Aminoglykosid	Pip/tazo	Antiviral beh mot influensa	Annat

**Antibiotikaval dag 3 på sjukhuset (ett eller flera val)**

Penicillin V eller G	Amoxicillin	Amoxi/clav	Cefalosporin	Kinolon	Makrolid
Doxycyklin	Klindamycin	Aminoglykosid	Pip/tazo	Antiviral beh mot influensa	Annat

**Utskriven med/avslutande behandling**

Penicillin V	Amoxicillin	Amoxi/clav	Kinolon	Makrolid	Doxycykl
Klindamycin	Antiviral beh	Annat			

**Antalet behandlingsdygn med antibiotika inkl poliklinisk**

$\leq 7$                       8-10                      11-14                      > 14

**Intensivvård**

IVA-vård	Ja	Nej
CPAP/BiPAP	Ja	Nej
Respiratorvård	Ja	Nej

