



98實證醫學月會報告-2

檢驗醫學部

主治醫師 林宜靜

2010.07.26 (一)



前情提要 (2009.12)

- 檢驗醫學部接到一份由急診部送來的簽呈，內容概要如下：
- 主旨：
 - 擬請同意進用PCT(procalcitonin)檢驗項目之設備及試劑
- 說明：
 - PCT在臨床上對細菌感染的高敏感度及特異性，可協助醫師進行正確的投藥療程(問題1).....透過偵測病人PCT濃度，可幫助臨床減少抗生素用量及治療時間，有效降低醫療費用(問題2).....



Clinical Questions

- **(問題1):** Procalcitonin在診斷細菌性感染的能力如何?是否比其他指標更好?
 - CRP (a another objective marker of infection)
 - Bacterial culture (gold standard)



PICO

| | |
|-----------------------------|--|
| P Patient/Problem | A patient is suspected bacterial infection in emergency department |
| I Intervention | PCT (procalcitonin) |
| C Comparison | CRP (C-reactive protein) Bacterial culture (gold standard) |
| O Outcome | Diagnosis accuracy for bacterial infection |



前次文獻搜尋的結果

| 資料庫 | 搜尋到的篇數 | 符合PICO的篇數 |
|---|------------------------------------|-----------|
|  | 1 | 0 |
|  | 1+7 | 1 (文獻1) |
| Clinical queries  | 57 (6 reviews; 17 full text) | 1 (文獻2) |

17. [Procalcitonin as a marker of bacterial infection in the emergency department: an observational study.](#)
Chan YL, Tseng CP, Tsay PK, Chang SS, Chiu TF, Chen JC.
Crit Care. 2004 Feb;8(1):R12-20. Epub 2003 Nov 20.
PMID: 14975050 [PubMed - indexed for MEDLINE]
[Related articles](#) [Free article](#)



前次搜尋到的文章 (1)

- Title:
 - Serum procalcitonin and C-reactive protein levels as markers of bacterial infection: a systematic review and meta-analysis
- Journal:
 - *Clinical Infectious Diseases*.2004;39(2):206-217.
- Year: 2004



前次搜尋到的文章 (2)

- Title:
 - Procalcitonin as a marker of bacterial infection in the emergency department: an observational study.
- Journal:
 - Crit Care. 2004 Feb;8(1):R12-20. Epub 2003 Nov 20
- Year: 2004 (Taiwan)



總結前次兩篇文獻的摘要

- Serum procalcitonin and C-reactive protein levels as markers of bacterial infection: a systematic review and meta-analysis (2004)
 - PCT level was more sensitive and more specific than CRP level for differentiating bacterial from non-infective causes of inflammation. (level: 1a)
- Procalcitonin as a marker of bacterial infection in the emergency department: an observational study (2004, Taiwan)
 - PCT is not a better marker of bacterial infection than CRP for adult emergency department patients, but it is a useful marker of the severity of infection. (level: 1b)



應用到臨床上

- 在細菌性感染的檢驗指標中，PCT比CRP有更高的敏感度及特異性。
- 高濃度的PCT，在診斷嚴重感染或菌血症的病人上，比CRP有更高的特異性。



新增PCT檢驗項目應有助於提高細菌性感染的
確診率及提早預估嚴重感染的可能性 (Grade
A)



檢驗醫學部已於2010.04.01新增PCT檢驗項目



(下一個問題)

(問題2): 使用PCT作輔助診斷後，真能降低醫療成本?



影響因素

- PCT健保給付 (健保給付: PCT: 1000 (點); CRP: 275 (點))
- 減少抗生素使用
- 病人預後 (adverse effects)
- 整體醫療成本



PICO

| | |
|-----------------------------|--|
| P Patient/Problem | A patient is suspected bacterial infection |
| I Intervention | Decision making <u>with</u> PCT test |
| C Comparison | Decision making <u>without</u> PCT test |
| O Outcome | Cost effectiveness |



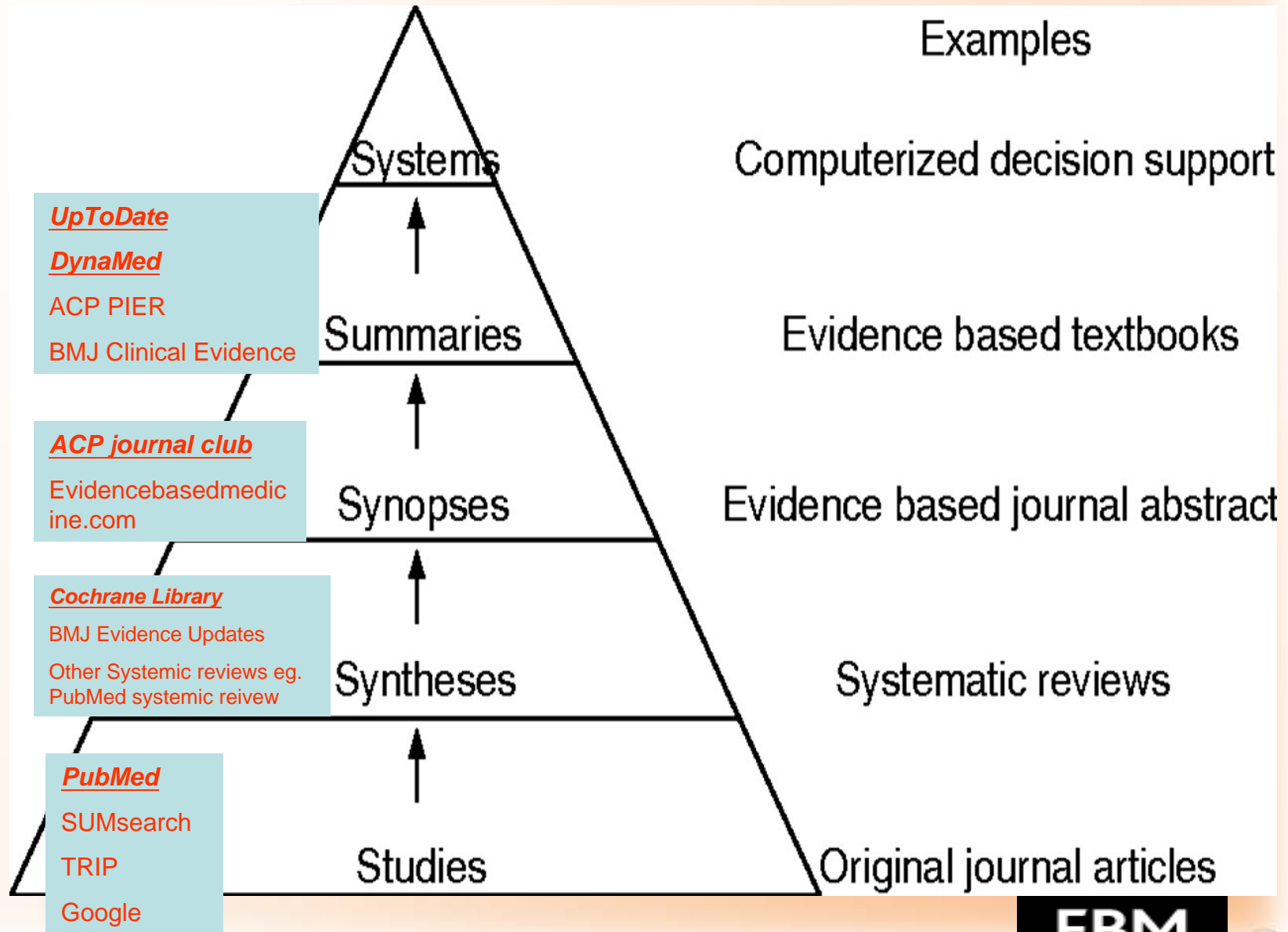
Keywords from PICO item
MeSH database to identify every term

“Procalcitonin”
“Cost effectiveness”



The "5S" levels of organisation of evidence from healthcare research

Brian Haynes, R Evid Based Med 2006;11:162-164





"Cost-Benefit Analysis"[Mesh] AND "procalcitonin "[Substance Name] - PubMed result - Windows Internet Explorer

http://www.ncbi.nlm.nih.gov/pubmed?term=%22Cost-Benefit+Analysis%22%5BMesh%5D+AND+%22procalcitonin+%22%5BSubstance+Name%5D

Enhanced by Google 搜尋 hp Total Care hp 商店 郵件 AIM AIM 新聞

Norton 已到期

我的最愛 建議的網站 網頁快訊圖庫

"Cost-Benefit Analysis"[Mesh] AND "procalcito...

NCBI Resources How To

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U.S. National Library of Medicine
National Institutes of Health

Search: PubMed

RSS Save search Limits Advanced search Help

"Cost-Benefit Analysis"[Mesh] AND "procalcitonin "[Substance Name] Search Clear

Display Settings: Summary, Sorted by Recently Added

Results: 2

- [Procalcitonin-based guidelines and lower respiratory tract infections.](#)
- 1. Cals JW, Metlay JP.
JAMA. 2010 Feb 3;303(5):418; author reply 419-20. No abstract available.
PMID: 20124534 [PubMed - indexed for MEDLINE]
[Related citations](#)
- [\[Procalcitonin and bacterial infections\]](#)
- 2. Höffler D.
Dtsch Med Wochenschr. 1998 Mar 6;123(10):304. German. No abstract available.
PMID: 9528649 [PubMed - indexed for MEDLINE]
[Related citations](#)

Procalcitonin-based
guidelines and lower
respiratory tract
infection (JAMA
2010)



搜尋到的文章

- Title:
 - Procalcitonin-Based Guidelines and Lower Respiratory Tract Infections (Letters)
- Journal:
 - *JAMA*. 2010;303(5):418
- Year: 2010
- 討論 Schuetz P, Christ-Crain M, Thomann R, et al; ProHOSP Study Group. **Effect of procalcitonin-based guidelines vs standard guidelines on antibiotic use in lower respiratory tract infections: the ProHOSP randomized controlled trial.** *JAMA*. 2009; 302(10):1059-1066.

Effect of Procalcitonin-Based Guidelines vs Standard Guidelines on Antibiotic Use in Lower Respiratory Tract Infections

The ProHOSP Randomized Controlled Trial

Context In previous smaller trials, a procalcitonin (PCT) algorithm reduced antibiotic use in patients with lower respiratory tract infections (LRTIs).

Objective To examine whether a PCT algorithm can reduce antibiotic exposure without increasing the risk for serious adverse outcomes.

Design, Setting, and Patients A multicenter, noninferiority, randomized controlled trial in emergency departments of 6 tertiary care hospitals in Switzerland with an open intervention of 1359 patients with mostly severe LRTIs randomized between October 2006 and March 2008.

Intervention Patients were randomized to administration of antibiotics based on a PCT algorithm with predefined cutoff ranges for initiating or stopping antibiotics (PCT group) or according to standard guidelines (control group). Serum PCT was measured locally in each hospital and instructions were Web-based.

Main Outcome Measures Noninferiority of the composite adverse outcomes of death, intensive care unit admission, disease-specific complications, or recurrent infection requiring antibiotic treatment within 30 days, with a predefined noninferiority boundary of 7.5%; and antibiotic exposure and adverse effects from antibiotics.

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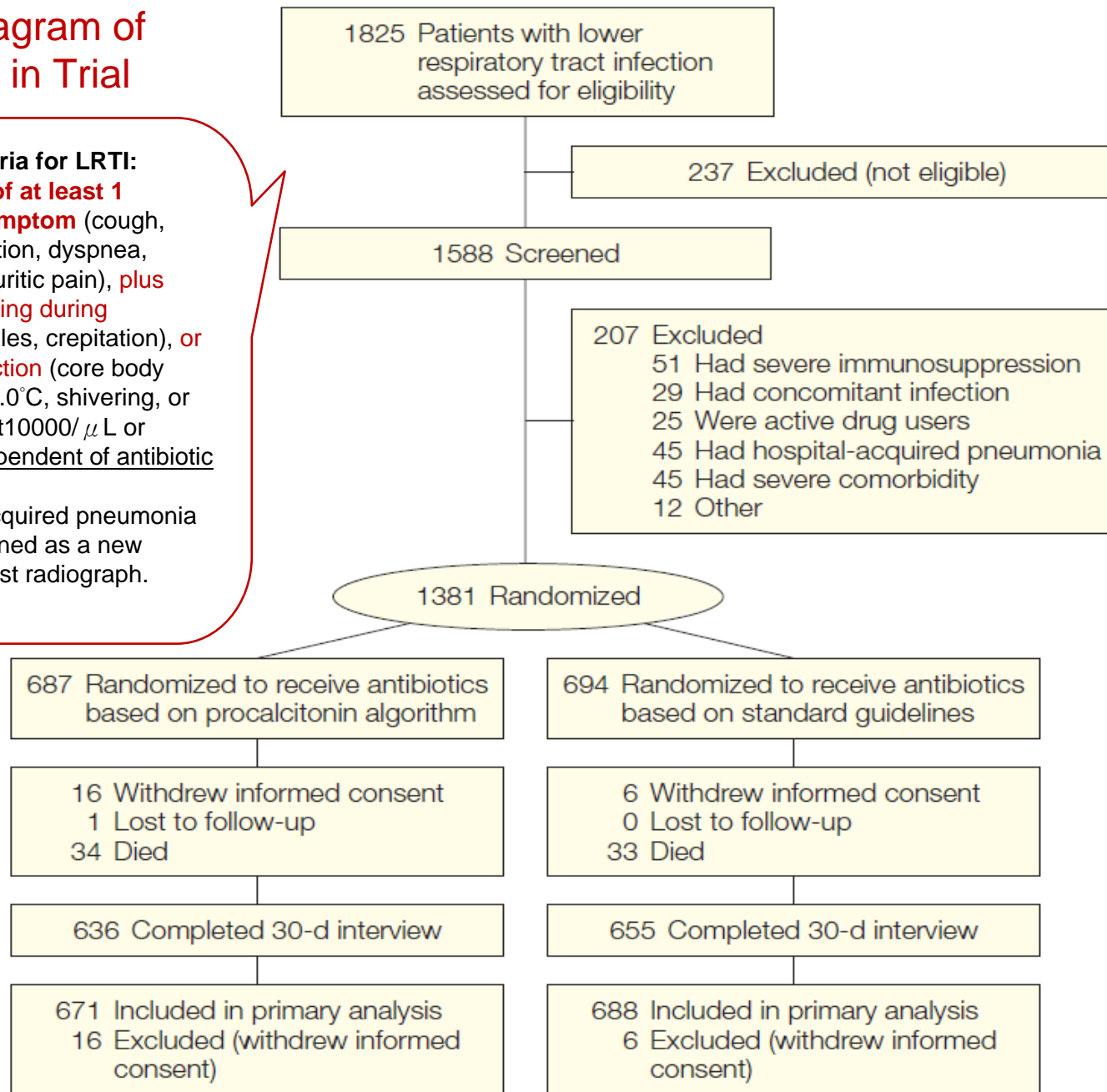
Results The rate of overall adverse outcomes was similar in the PCT and control groups (15.4% [n=103] vs 18.9% [n=130]; difference, -3.5%; 95% CI, -7.6% to 0.4%). The mean duration of antibiotics exposure in the PCT vs control groups was lower in all patients (5.7 vs 8.7 days; relative change, -34.8%; 95% CI, -40.3% to -28.7%) and in the subgroups of patients with community-acquired pneumonia (n=925, 7.2 vs 10.7 days; -32.4%; 95% CI, -37.6% to -26.9%), exacerbation of chronic obstructive pulmonary disease (n=228, 2.5 vs 5.1 days; -50.4%; 95% CI, -64.0% to -34.0%), and acute bronchitis (n=151, 1.0 vs 2.8 days; -65.0%; 95% CI, -84.7% to -37.5%). Antibiotic-associated adverse effects were less frequent in the PCT group (19.8% [n=133] vs 28.1% [n=193]; difference, -8.2%; 95% CI, -12.7% to -3.7%).

Conclusion In patients with LRTIs, a strategy of PCT guidance compared with standard guidelines resulted in similar rates of adverse outcomes, as well as lower rates of antibiotic exposure and antibiotic-associated adverse effects.

Trial Registration isrctn.org Identifier: ISRCTN95122877

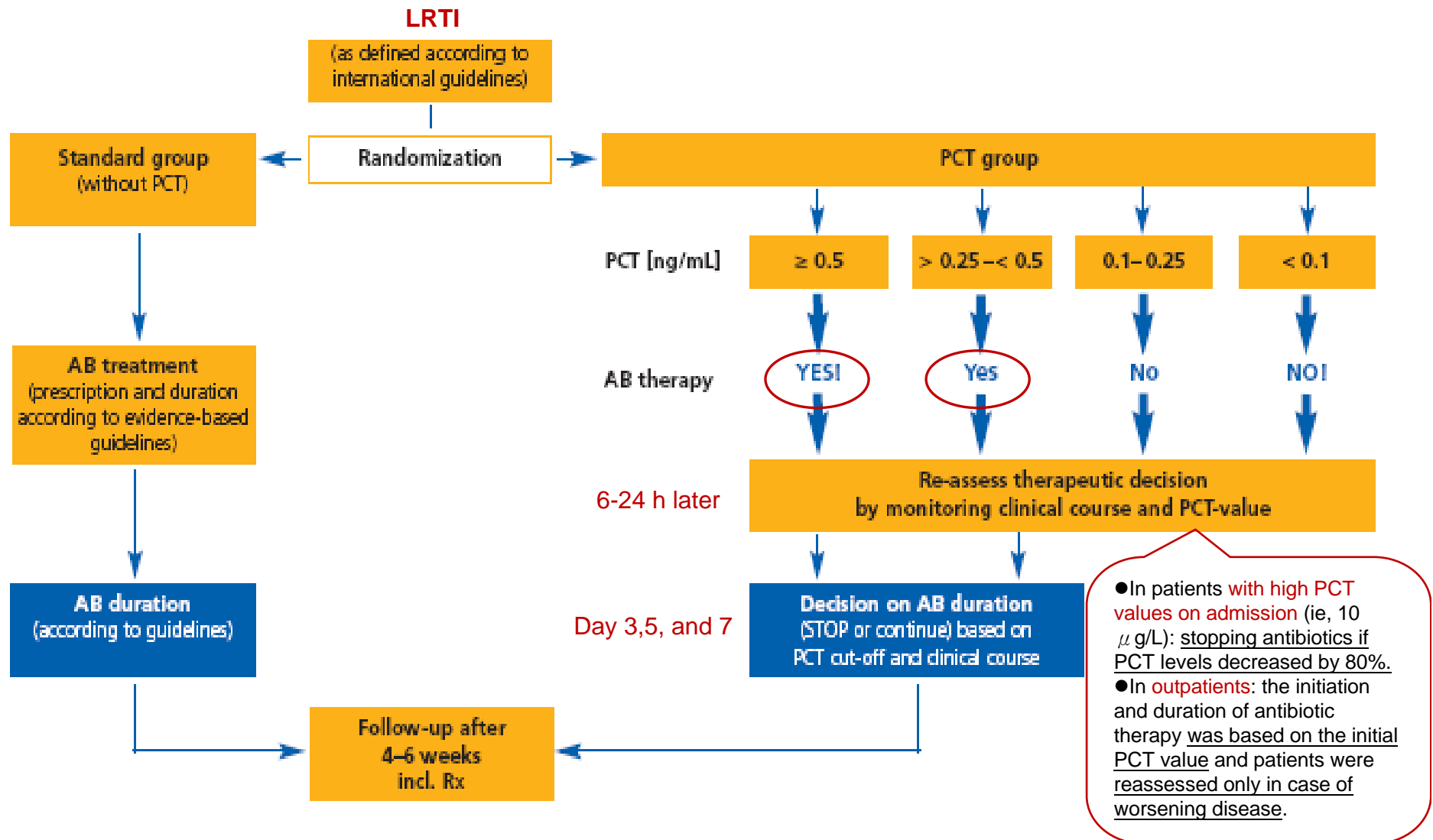
Flow Diagram of Patients in Trial

Inclusion criteria for LRTI:
 The presence **of at least 1 respiratory symptom** (cough, sputum production, dyspnea, tachypnea, pleuritic pain), **plus**
 ● **At least 1 finding during auscultation** (rales, crepitation), **or**
 ● **1 sign of infection** (core body temperature 38.0°C, shivering, or leukocyte count 10000/μL or 4000/μL) independent of antibiotic pretreatment.
 *Community-acquired pneumonia (CAP) was defined as a new infiltrate on chest radiograph.





The PCT Algorithm





Overruling of the PCT algorithm

- In patients with immediate need for
 - intensive care unit (ICU) admission,
 - with respiratory or hemodynamic instability,
 - with positive antigen test for *Legionella pneumophila*, or
 - *after consulting with the study center.*
- In patients with
 - severe CAP (pneumonia severity index [PSI] IV or V) and PCT values less than $0.1 \mu\text{g/L}$ or
 - COPD(GOLD23 IV or III) and PCT values less than $0.25 \mu\text{g/L}$

In case of overruling, a repeated PCT measurement and early discontinuation of antibiotic therapy after 3, 5, or 7 days was strongly suggested.

Table 1. Baseline Characteristics Overall and by Randomization Group^a (分佈平均)

| Characteristics | All (N = 1359) | PCT Group (n = 671) | Control Group (n = 688) |
|---|-------------------|------------------------|----------------------------|
| Demographics | | | |
| Age, median (IQR), y | 73 (59-82) | 73 (59-82) | 72 (59-82) |
| Male sex, No. (%) | 782 (57.5) | 402 (59.9) | 380 (55.2) |
| Coexisting illnesses, No. (%) | | | |
| Coronary heart disease | 282 (20.8) | 146 (21.8) | 136 (19.8) |
| Cerebrovascular disease | 110 (8.1) | 54 (8.1) | 56 (8.1) |
| Renal dysfunction | 302 (22.2) | 156 (23.3) | 146 (21.2) |
| COPD | 533 (39.2) | 265 (39.5) | 268 (39.0) |
| Neoplastic disease | 167 (12.3) | 69 (10.3) | 98 (14.2) |
| Diabetes | 231 (17.0) | 118 (17.0) | 113 (16.4) |
| Clinical history, No. (%) | | | |
| Antibiotics before presentation | 362 (26.8) | 187 (28.0) | 175 (25.8) |
| Corticosteroids pretreatment | 151 (11.4) | 76 (11.6) | 75 (11.2) |
| Cough | 1164 (88.7) | 572 (87.9) | 592 (89.4) |
| Sputum production | 678 (50.9) | 332 (50.1) | 346 (51.8) |
| Dyspnea | 1009 (77.0) | 496 (76.2) | 513 (77.7) |
| Fever | 782 (57.9) | 374 (55.8) | 408 (59.9) |
| Chills | 362 (32.0) | 182 (32.1) | 180 (32.0) |
| Clinical findings | | | |
| Confusion, No. (%) | 84 (6.8) | 41 (6.7) | 43 (7.0) |
| Respiratory rate, median (IQR), breaths/min | 20 (16-25) | 20 (16-26) | 20 (16-25) |
| Systolic blood pressure, median (IQR), mm Hg | 134 (120-150) | 134 (120-150) | 134 (120-150) |
| Heart rate, median (IQR), beats/min | 93 (80-106) | 93 (80-106) | 93 (81-106) |
| Body temperature, median (IQR), °C | 37.8 (37.0-38.6) | 37.8 (37.0-38.7) | 37.8 (37.0-38.5) |
| Rales, No. (%) | 832 (64.1) | 418 (64.9) | 414 (63.3) |

Table 1. Baseline Characteristics Overall and by Randomization Group^a (continued)

| Characteristics | All (N = 1359) | PCT Group (n = 671) | Control Group (n = 688) |
|--|----------------------|------------------------|----------------------------|
| Laboratory findings, median (IQR) | | | |
| PCT, µg/L | 0.24 (0.11-1.36) | 0.24 (0.12-1.18) | 0.24 (0.11-1.60) |
| C-reactive protein, mg/L | 114 (41-220) | 115 (38-212) | 114 (41-220) |
| Leukocyte count, cells/µL | 11 400 (8400-15 300) | 11 600 (8500-15 400) | 11 200 (8400-15 200) |
| Final diagnosis, No. (%) | | | |
| CAP | 925 (68.1) | 460 (68.6) | 465 (67.6) |
| Exacerbation of COPD | 228 (16.8) | 115 (17.1) | 113 (16.4) |
| Acute bronchitis | 151 (11.1) | 69 (10.3) | 82 (11.9) |
| Other final diagnosis | 55 (4.0) | 27 (4.0) | 28 (4.0) |
| Risk assessment in patients with CAP | (n = 925) | (n = 460) | (n = 465) |
| PSI points overall, median (IQR) | 91 (66-115) | 91 (67-117) | 91 (66-114) |
| PSI class, No. (%) | | | |
| I | 90 (9.7) | 76 (11.0) | 63 (9.3) |
| II | 173 (18.7) | 138 (20.1) | 124 (18.4) |
| III | 189 (20.4) | 147 (21.4) | 152 (22.7) |
| IV | 349 (37.7) | 243 (35.3) | 252 (37.6) |
| V | 124 (13.4) | 84 (12.2) | 80 (11.9) |
| Hospitalized patients, No. (%) | 1257 (92.5) | 628 (93.7) | 629 (91.4) |
| Initial prescription of antibiotics ^b | 1060 (84.3) | 492 (78.3) | 568 (90.3) |
| Outpatients, No. (%) | 102 (7.5) | 43 (6.4) | 59 (8.6) |
| Initial prescription of antibiotics ^c | 49 (48.0) | 14 (32.6) | 35 (59.3) |

Abbreviations: CAP, community-acquired pneumonia; COPD, chronic obstructive pulmonary disease; IQR, interquartile range; PCT, procalcitonin; PSI, pneumonia severity index.

^aSee the "Results" section for definition of other final diagnosis. Higher PSI class refers to higher risk for mortality.

^b $P < .01$.

^c $P < .001$.

Table 2. Rates of Combined Adverse Outcomes and Mortality by Randomization Group

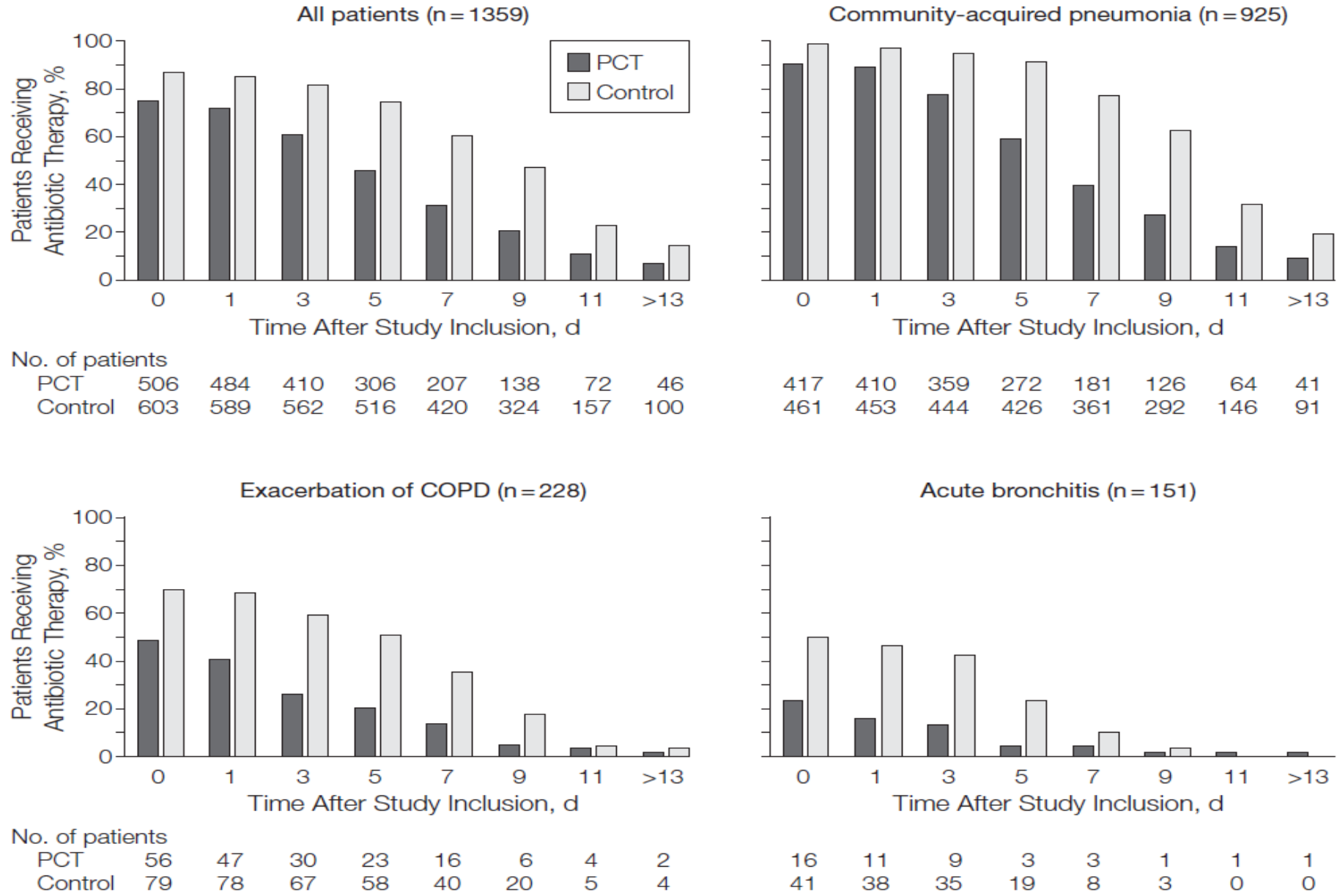
| | No. (%) of Patients | | Risk Difference, % (95% CI) |
|--|---------------------|------------------|--------------------------------|
| | PCT Group | Control Group | |
| All patients (intention-to-treat) ^a | (n = 671) | (n = 688) | |
| Overall adverse outcome | 103 (15.4) | 130 (18.9) | -3.5 (-7.6 to 0.4) |
| Death | 34 (5.1) | 33 (4.8) | 0.3 (-2.1 to 2.5) |
| ICU admission | 43 (6.4) | 60 (8.7) | -2.3 (-5.2 to 0.4) |
| Recurrence/rehospitalization | 25 (3.7) | 45 (6.5) | -2.8 (-5.1 to -0.4) |
| Disease-specific complication | 17 (2.5) | 14 (2.0) | 0.5 (-1.1 to 2.0) |
| Per-protocol population | (n = 633) | (n = 650) | |
| Overall adverse outcome | 95 (15.0) | 123 (18.9) | -3.9 (-8.2 to 0.03) |
| Death | 29 (4.6) | 31 (4.8) | -0.2 (-2.6 to 2.0) |
| Community-acquired pneumonia | (n = 460) | (n = 465) | |
| Overall adverse outcome | 74 (16.1) | 94 (20.2) | -4.1 (-9.1 to 0.9) |
| Death | 24 (5.2) | 26 (5.6) | -0.4 (-3.3 to 2.6) |
| Exacerbation of COPD ^a | (n = 115) | (n = 113) | |
| Overall adverse outcome | 15 (13.0) | 21 (18.6) | -5.3 (-14.8 to 4.4) |
| Death | 4 (3.5) | 5 (4.4) | -0.9 (-6.4 to 4.5) |
| Acute bronchitis | (n = 69) | (n = 82) | |
| Overall adverse outcome | 6 (8.7) | 8 (9.8) | -1.1 (-10.4 to 8.7) |
| Death | 1 (1.4) | 0 | 1.4 (-2.9 to 6.1) |
| Other diagnoses | (n = 27) | (n = 28) | |
| Overall adverse outcome | 8 (29.6) | 7 (25.0) | 4.6 (-18.7 to 27.5) |
| Death | 5 (18.5) | 2 (7.1) | 11.4 (-7.5 to 28.9) |

Abbreviations: CI, confidence interval; COPD, chronic obstructive pulmonary disease; ICU, intensive care unit; PCT, procalcitonin.

^aOutcome was missing for 1 patient with exacerbation of COPD. For the calculation of the risk (n and %) in each group, this patient was treated as being without adverse outcome, but estimates for the risk difference are based on multiple imputation of the missing outcome.

Adverse outcomes and mortality 無顯著差異

Figure 2. Antibiotic Exposure in Patients Receiving Antibiotic Therapy



PCT indicates procalcitonin; COPD, chronic obstructive pulmonary disease.

Antibiotic exposure, adverse effects from antibiotics, and length of hospital stay

Table 3. Antibiotic Exposure, Adverse Effects, and Length of Hospital Stay

| | PCT Group | Control Group | Relative Mean Change or Rate Difference % (95% CI) |
|--|------------------|------------------|--|
| All patients | (n = 671) | (n = 688) | |
| Antibiotic exposure, mean (median [IQR]), d | 5.7 (5 [1-8]) | 8.7 (9 [6-11]) | -34.8 (-40.3 to -28.7) |
| Antibiotic prescription rate, No. (%) | 506 (75.4) | 603 (87.7) | -12.2 (-16.3 to -8.1) |
| Adverse effect rate from antibiotics, No. (%) | 133 (19.8) | 193 (28.1) | -8.2 (-12.7 to -3.7) |
| Duration in patients with adverse effects, median (IQR), d | 3 (1-7) | 4 (2-10) | |
| Length of hospital stay, mean (median [IQR]), d | 9.4 (8 [4-12]) | 9.2 (8 [4-12]) | 1.8 (-6.9 to 11.0) |
| Community-acquired pneumonia | (n = 460) | (n = 465) | |
| Antibiotic exposure, mean (median [IQR]), d | 7.2 (7 [4-10]) | 10.7 (10 [8-12]) | -32.4 (-37.6 to -26.9) |
| Antibiotic prescription rate, No. (%) | 417 (90.7) | 461 (99.1) | -8.5 (-11.3 to -5.6) |
| Adverse effect rate from antibiotics, No. (%) | 108 (23.5) | 154 (33.1) | -9.6 (-15.4 to -3.8) |
| Duration in patients with adverse effects, median (IQR), d | 3 (2-7) | 5 (2-10) | |
| Length of hospital stay, mean (median [IQR]), d | 10.0 (8 [5-13]) | 9.5 (8 [4-12]) | 5.3 (-5.1 to 16.8) |



Antibiotic exposure, adverse effects, and length of hospital stay (continued)

| | | | |
|--|------------------|------------------|------------------------|
| Exacerbation of COPD | (n = 115) | (n = 113) | |
| Antibiotic exposure, mean (median [IQR]), d | 2.5 (0 [0-4]) | 5.1 (6 [0-8]) | -50.4 (-64.0 to -34.0) |
| Antibiotic prescription rate, No. (%) | 56 (48.7) | 79 (69.9) | -21.2 (-33.2 to -8.5) |
| Adverse effect rate from antibiotics, No. (%) | 14 (12.2) | 18 (15.9) | -3.8 (-12.8 to 5.4) |
| Duration in patients with adverse effects, median (IQR), d | 1.5 (1-4) | 2 (1-3.5) | |
| Length of hospital stay, mean (median [IQR]), d | 8.8 (8 [5-11]) | 9.2 (8 [5-13]) | -4.4 (-19.1 to 12.9) |
| Acute bronchitis | (n = 69) | (n = 82) | |
| Antibiotic exposure, mean (median [IQR]), d | 1 (0) | 2.8 (1 [0-5]) | -65.0 (-84.7 to -37.5) |
| Antibiotic prescription rate, No. (%) | 16 (23.2) | 41 (50.0) | -26.8 (-40.7 to -11.5) |
| Adverse effect rate from antibiotics, No. (%) | 7 (10.1) | 11 (13.4) | -3.3 (-13.5 to 7.5) |
| Duration in patients with adverse effects, median (IQR), d | 1 (1-2) | 1.5 (1-5.8) | |
| Length of hospital stay, mean (median [IQR]), d | 5.4 (4 [1-7]) | 6.1 (4 [0-9]) | -10.3 (-37.1 to 27.0) |
| Other diagnoses | (n = 27) | (n = 28) | |
| Antibiotic exposure, mean (median [IQR]), d | 4.9 (3 [0-8]) | 7.7 (4 [1-11]) | -36.1 (-68.3 to 23.2) |
| Antibiotic prescription rate, No. (%) | 63.0 (17) | 78.6 (22) | -15.6 (-37.9 to 8.7) |
| Adverse effect rate from antibiotics, No. (%) | 4 (14.8) | 10 (35.7) | -20.9 (-41.5 to 2.6) |
| Duration in patients with adverse effects, median (IQR), d | 5.5 (4.3-6.8) | 3.5 (1.0-8.5) | |
| Length of hospital stay, mean (median [IQR]), d | 10.9 (9 [6-14]) | 13.4 (11 [5-21]) | -19.0 (-42.3 to 15.4) |

Abbreviations: CI, confidence interval; COPD, chronic obstructive pulmonary disease; IQR, interquartile range; PCT, procalcitonin.



Conclusion

- In conclusion, particularly in countries with higher antibiotic prescription rates than Switzerland, **PCT guidance** will have substantial clinical and public health implications to reduce antibiotic exposure and associated risks of adverse effects and antibiotic resistance.

Effect of procalcitonin-guided treatment on antibiotic use and outcome in lower respiratory tract infections: cluster-randomised, single-blinded intervention trial

Lancet 2004; 363:600-07

Mirjam Christ-Crain, Daiana Jaccard-Stolz, Roland Bingisser, Mikael M Gencay, Peter R Huber, Michael Tamm, Beat Müller

(同一個團隊做的研究結果)

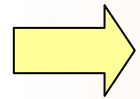
| | Standard group (n=119) | | Procalcitonin group (n=124) | | p* |
|---|------------------------|-----------------|-----------------------------|-----------------|---------|
| | Initial | Final | Initial | Final | |
| Quality-of-life score (mean [SD]) | 39.3 (13.2) | 22.9 (15.1) | 41.3 (14.3) | 21.9 (14.7) | 0.60 |
| Visual analogue scale (mean [SD], %) | 43.1 (21.0) | 64.1 (21.5) | 42.5 (20.4) | 65.1 (21.8) | 0.78 |
| Body temperature (mean [SD], °C) | 37.7 (1.1) | 37.0 (0.4) | 37.8 (1.0) | 36.9 (0.3) | 0.06 |
| White-blood-cell count (mean [SD], ×10 ⁹ /L) | 12.4 (6.7) | 10.3 (5.1) | 11.7 (6.5) | 9.7 (4.4) | 0.26 |
| C-reactive protein (mean [SD], mg/L) | 97.8 (106.1) | 25.8 (43.7) | 82.8 (93.9) | 18.2 (33.3) | 0.24 |
| Procalcitonin (mean [SD], µg/L) | 1.6 (4.2) | 0.12 (0.2) | 1.6 (7.7) | 0.12 (0.4) | 0.10 |
| Admitted | 88 (74%) | | 101 (81%) | | 0.16 |
| Number of days admitted (mean [SD]) | 11.2 (10.6) | | 10.7 (8.9) | | 0.89 |
| Need for stay in intensive care unit | 6 (5%) | | 5 (4%) | | 0.71 |
| Died | 4 (3%) | | 4 (3%) | | 0.95 |
| Follow-up | 110 (92%) | | 112 (90%) | | 0.56 |
| Follow-up of survivors | 110/115 (96%) | | 112/120 (93%) | | 0.44 |
| Antibiotic prescription foreseen | 99 (83%) | | 99 (80%) | | 0.50 |
| Antibiotics prescribed | 99 (83%) | | 55 (44%) | | <0.0001 |
| Duration of antibiotic treatment (mean [SD], days) | 12.8 (5.5) | 6480 (8019) NTD | 10.9 (3.6) | 3082 (5530) NTD | 0.03 |
| Antibiotic use per 1000 days of follow-up (mean [SD]) | 661 (398) | | 332 (433) | | <0.0001 |
| Antibiotic costs per patient (mean [SD], US\$) | 202.5 (250.6) | | 96.3 (172.8) | | <0.0001 |

Data are mean (SD) or number of patients (%). *If initial and final data are given, p values denote comparisons between final data of patients in the standard group and final data in the procalcitonin group.

Table 5: Clinical outcome in all patients with lower respiratory tract infections according to treatment algorithm



Grades of Recommendation



| | |
|----------|--|
| A | consistent level 1 studies |
| B | consistent level 2 or 3 studies or extrapolations from level 1 studies |
| C | level 4 studies or extrapolations from level 2 or 3 studies |
| D | level 5 evidence or troublingly inconsistent or inconclusive studies of any level |



應用在臨床上

- 使用PCT來輔助診斷下呼吸道感染:
 - 能減少抗生素的使用，且減少因抗生素所引發的不良反應。
 - 疾病併發症發生比例並無明顯增加。
 - 雖然PCT給付較昂貴(健保給付: PCT: 1000 (點); CRP: 275 (點))，但若能因此減少抗生素使用，且不影響治療預後，仍可望降低整體醫療成本。
- 在其他感染疾病的情形還需要進一步查證。



謝謝聆聽