Cortico-stéroïdes inhalés et risque de pneumonie

2018

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Plan

Pneumonie: définition et épidémiologie

Corticostéroïdes inhalés et risque de pneumonie, 4 études
1 étude de cohorte, 1 méta-analyse, 2 étude cas contrôles)

Diagnostic de la pneumonie: définitions

- Infection aigue des voies respiratoires inférieures avec invasion du parenchyme pulmonaire par un ou plusieurs pathogènes

- Suspected community-acquired pneumonia (CAP): an acute illness with cough and at least one of new focal chest signs, fever > 4 days or dyspnoea/tachypnoea, and without other obvious cause.

- Definite CAP: as above, but supported by chest radiograph findings of lung shadowing that is likely to be new

- In the elderly, the presence of chest radiograph shadowing accompanied by acute clinical illness (unspecified) without other obvious cause.

Slide: Dr Nicolas Garin

ERS/ESCIMD guidelines, CMI 2011

The diagnosis of pneumonia is challenging!

TABLE 3 Clinician's estimates of the probability of pneumonia in 200 patients before and after low-dose computed tomography (LDCT) chest scans

	Clinician's estimates of the probability of pneumonia after LDCT					
	Low	Intermediate	High	Total	Change of probability	
					n	% (95% CI)
Clinician's estimates of the probability of pneumonia before LDCT						
Low	10	3	4	17	7	41 (18–24)
Intermediate	*34*	13	23	70	57	81 (72–90)
High	*13*	*13*	87	113	26	23 (15–31)
Total	57	29	114	200	90	45 (38–52)

Low Dose CT results changed the probability of a diagnosis of pneumonia in a high proportion of patients (45%), upgrading the probability in 15% of cases and downgrading it in 30%

Prendki V, Scheffler M, Huttner B, N Garin, et al. Low-dose computed tomography for the diagnosis of pneumonia in elderly patients: a prospective, interventional cohort study. Eur Respir J 2018

Incidence and mortality of pneumonia

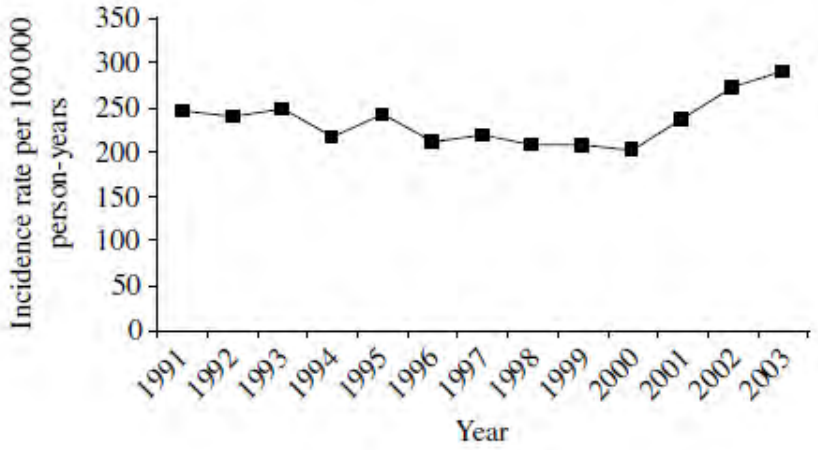
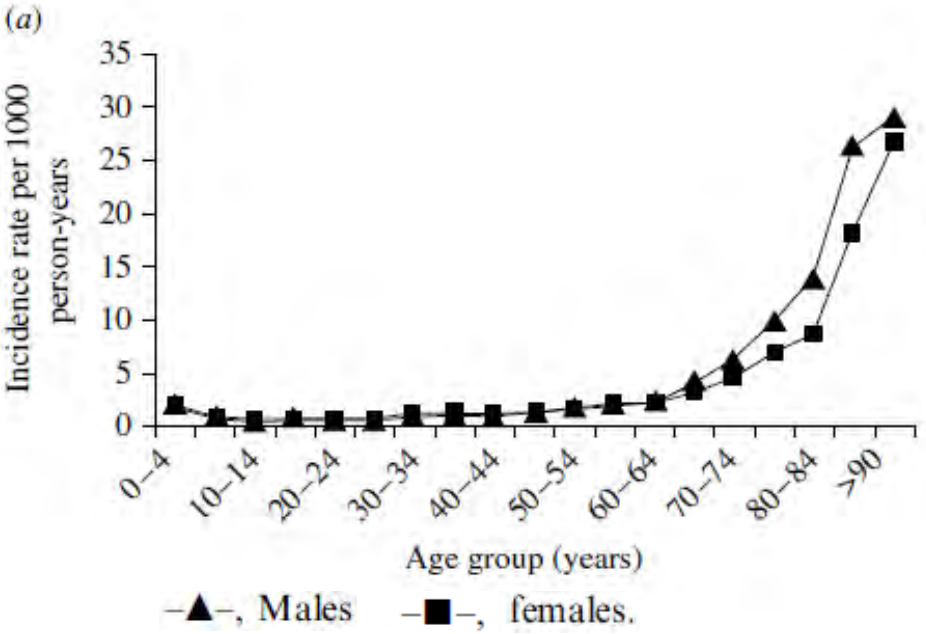


Fig. 1. Trends in pneumonia incidence, 1991–2003.



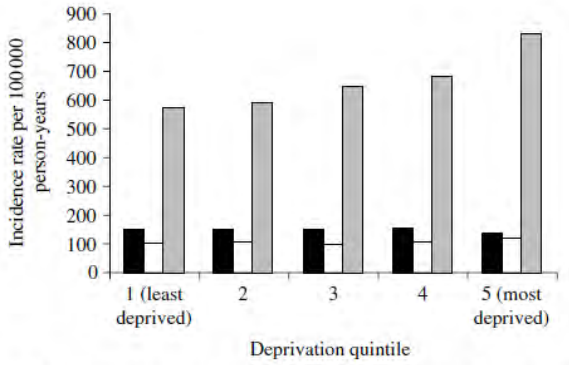


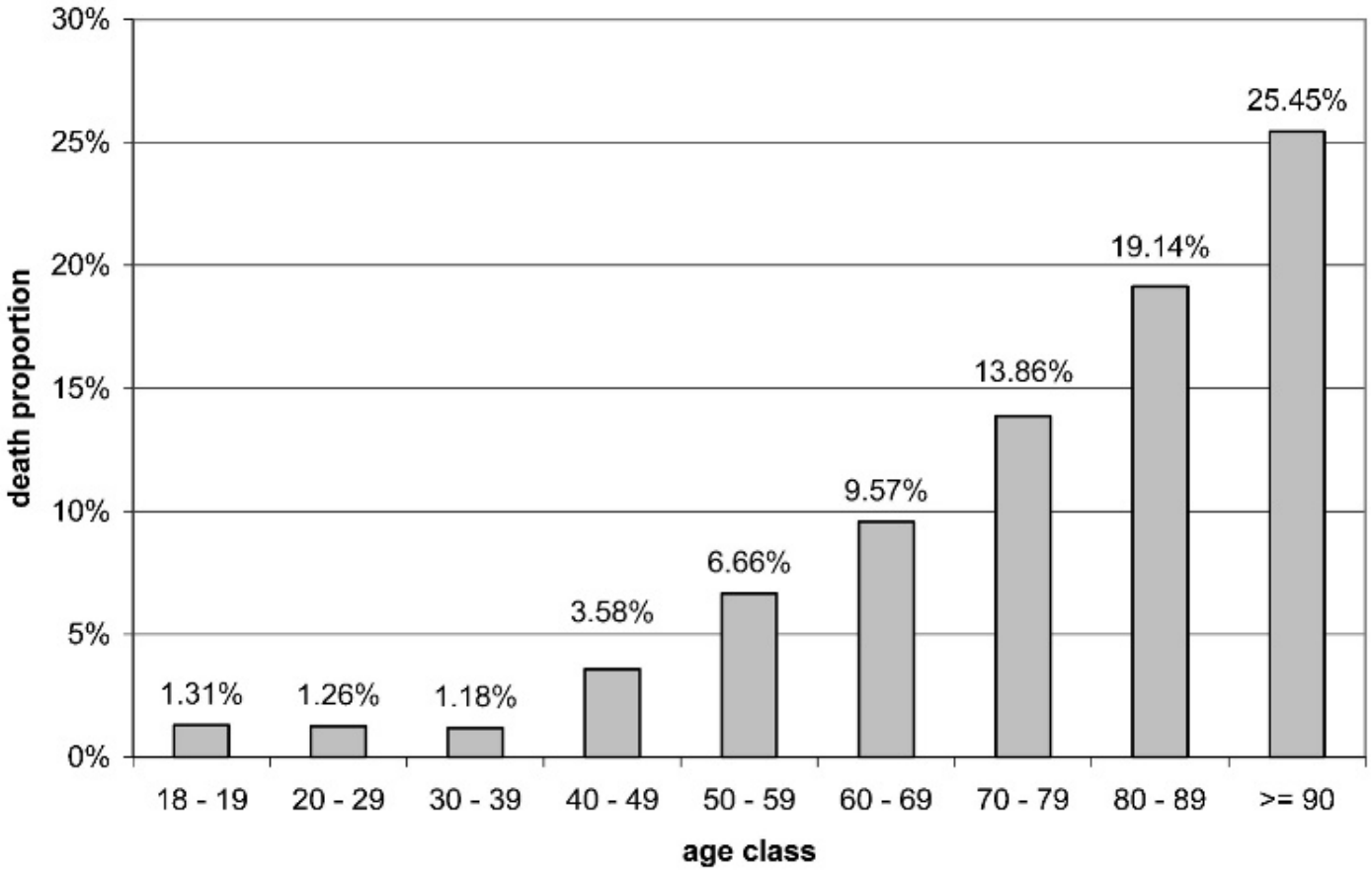
Fig. 3. Pneumonia incidence by deprivation quintile and age group, 1991–2003. ■, 0–10 years; □, 11–59 years; ▨, ⩾60 years.

- 233 pneumonia /100'000 py, lower rate in females, higher incidence in children, older and deprived individuals
- 30-day mortality 8.2% for all and 16.1% > 80 yo patients

Townsend score: house & car ownership, overcrowding, employement status

The incidence of pneumonia using data from a computerized general practice database P. R. MYLES, et al ; Epidemiol Infect 2009
.The impact of age and comorbidities on the mortality of patients of different age groups admitted CAP. Luna CM, Palma I, Niederman MS, et al , Ann Am Thorac Soc 2016; 13: 1519–1526

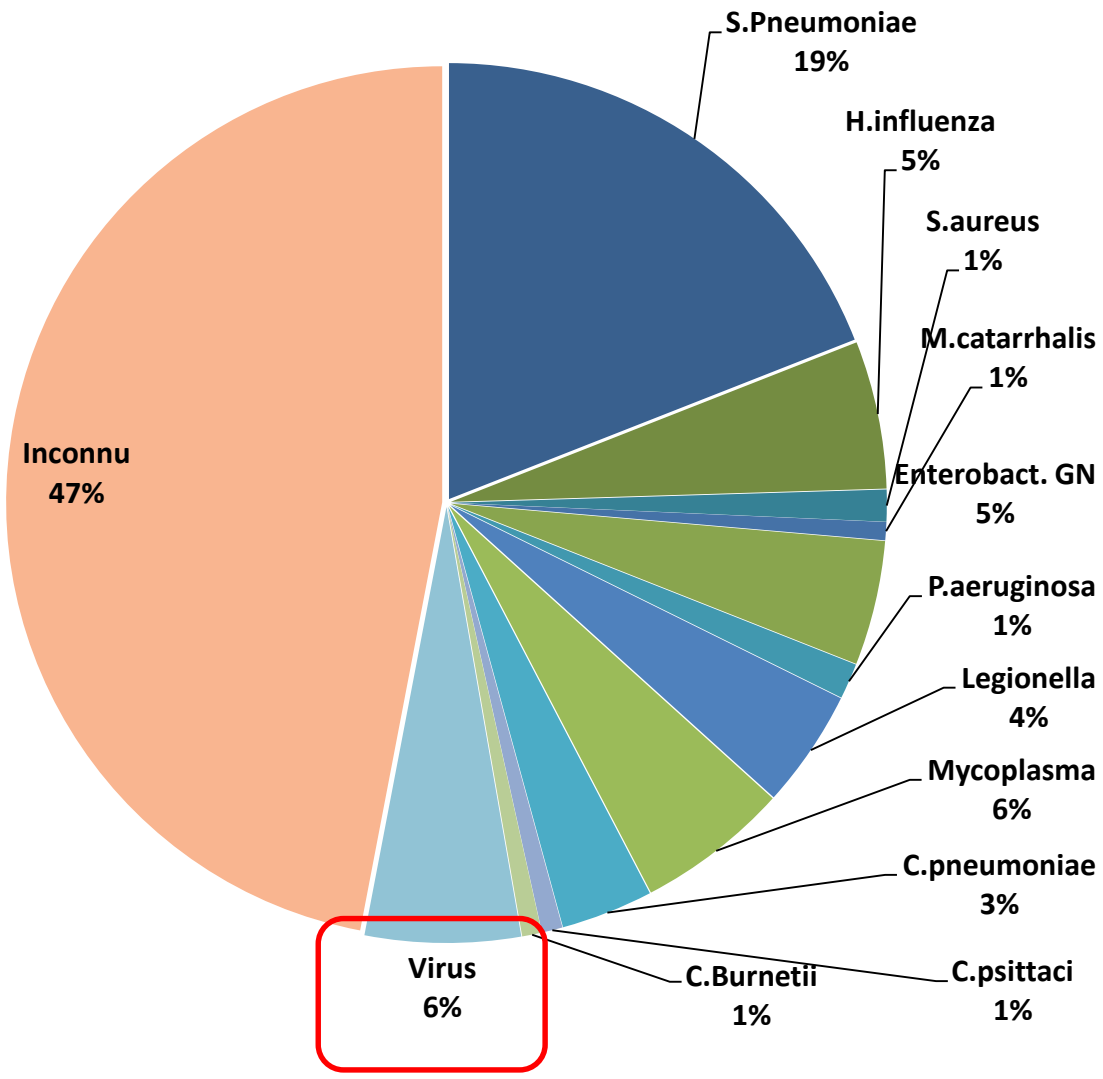
Mortalité hospitalière



Mortalité globale: 14 %
Mortalité c/o patients en provenance d'EMS: 25%

Slide: Dr Nicolas Garin

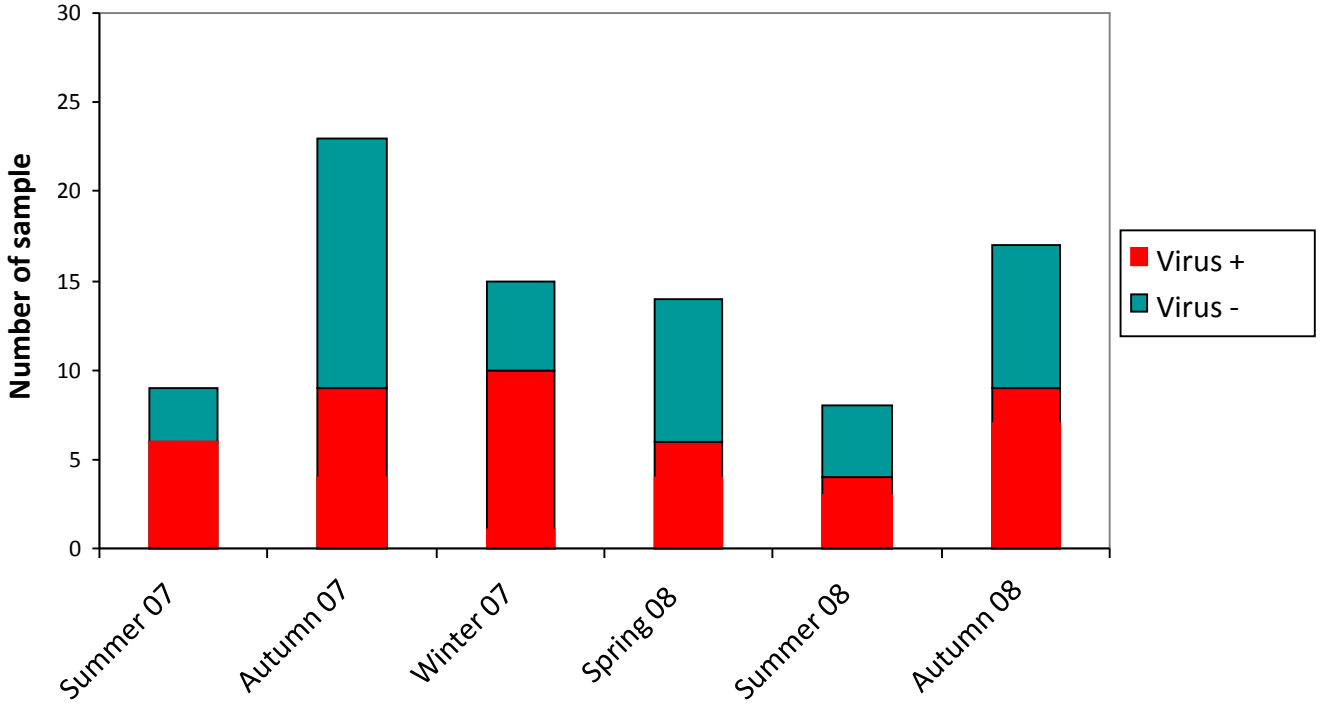
Pathogènes responsables de pneumonie en Europe



Garin, thèse de doctorat 10812 UNIGE 2016
Woodhead CMI 2011

Upper viral respiratory infection, biomarkers and COPD exacerbations

n= 86 patients avec exacerbation de BPCO



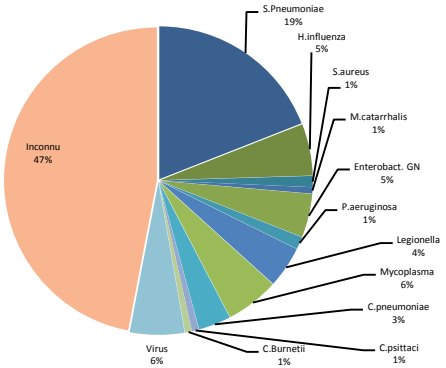
51% des patients (n=44) sont infectés par des virus respiratoires

Omar Kherad, Laurent Kaiser, Pierre-Olivier Bridevaux, François Sarasin Yves Thomas, Jean-Paul Janssens, Olivier T. Rutschmann
Upper viral respiratory infection, biomarkers and (COPD) exacerbations
Chest 2010

Microbiologie de la CAP - Résumé

- Avant l'ère des ATB: Streptococcus Pneumoniae 95%
- USA actuellement: 10 à 15% vs Europe 20%. USA:
  - Vaccination anti-pneumococcique généralisée
  - prévalence tabagîsme plus basse
- c/o COPD:
  - H influenzae et Moraxella Catharralis
  - Pseudomonas Aeruginosa en cas d'exposition aux CSI
  - Virus retrouvé dans 50% des cas

    Influenza, Respiratory Syncitial Virus, human Metapneumovirus, coronavirus, rhinovirus, etc



Musher et Thorner, NEJM 2014

Upper-Respiratory Viral Infection, Biomarkers, and COPD Exacerbations, Kherad, Kaiser, Bridevaux, Janssens, Rutschmann et al, Chest 2010

Garin, thèse de doctorat 10812 UNIGE 2016

Woodhead CMI 2011

Inhaled cortico-steroids and chronic lung disease

Inhaled corticosteroids (ICSs)

- Mainstay of asthma therapy
- Limited role in COPD (<20% of patients) (Eosinophils + exacerbations + low lung function)
- Inhibitory effects on innate and acquired immune function
- Oral CS increase the risk of systemic infection
- ICSs might increase susceptibility to pulmonary infections

Cortico-stéroïdes inhalés et risque de pneumonie c/o BPCO

Une étude de cohorte Suissa et al 2013

ORIGINAL ARTICLE

Inhaled corticosteroids in COPD and the risk of serious pneumonia

Samy Suissa, Valérie Patenaude, Francesco Lapi, Pierre Ernst

Table 2 Characteristics of controls selected from cohort of patients with COPD, according to current use of fluticasone and budesonide

	Non-use	Fluticasone	Budesonide
Number of subjects	120 890	24 198	9542
Age (years), mean±SD	78.5±7.7	78.1±7.9	76.9±7.4
Follow-up (years), mean±SD	4.3±3.6	4.5±3.7	4.2±3.5
Sex, % men	44.9	47.5	47.6
Hospitalisation for pneumonia in year prior to cohort entry, %	2.9	3.5	2.1
Hospitalisation for COPD in year prior to index date, %	2.1	9.4	4.7
Number of hospitalisations for COPD in year prior to index date (mean±SD)	0.0±0.2	0.1±0.4	0.1±0.3

Suissa S, Patenaude V, Lapi F, et al. Thorax 2013;68: 1029–1036.

ORIGINAL ARTICLE

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Table 3 Crude and adjusted rate ratios of serious pneumonia associated with current use, dose and past use of inhaled corticosteroids among patients with COPD

Inhaled corticosteroid exposure	Crude rate ratio	Adjusted* rate ratio	95% CI
Number of subjects			
No use in the year prior to index date, %	1.00	1.00	Reference
Current use, %†	2.30	1.69	1.63 to 1.75
Low dose‡	1.50	1.24	1.13 to 1.36
Medium dose	2.15	1.66	1.59 to 1.74
High dose	2.73	1.86	1.77 to 1.94
Past use, %	1.28	1.15	1.10 to 1.20
Time since stopping, %			
61–180 days	1.35	1.19	1.13 to 1.26
181–270 days	1.17	1.08	0.99 to 1.17
271–365 days	1.19	1.08	0.99 to 1.18

*Adjusted for all of the factors listed in table 1.

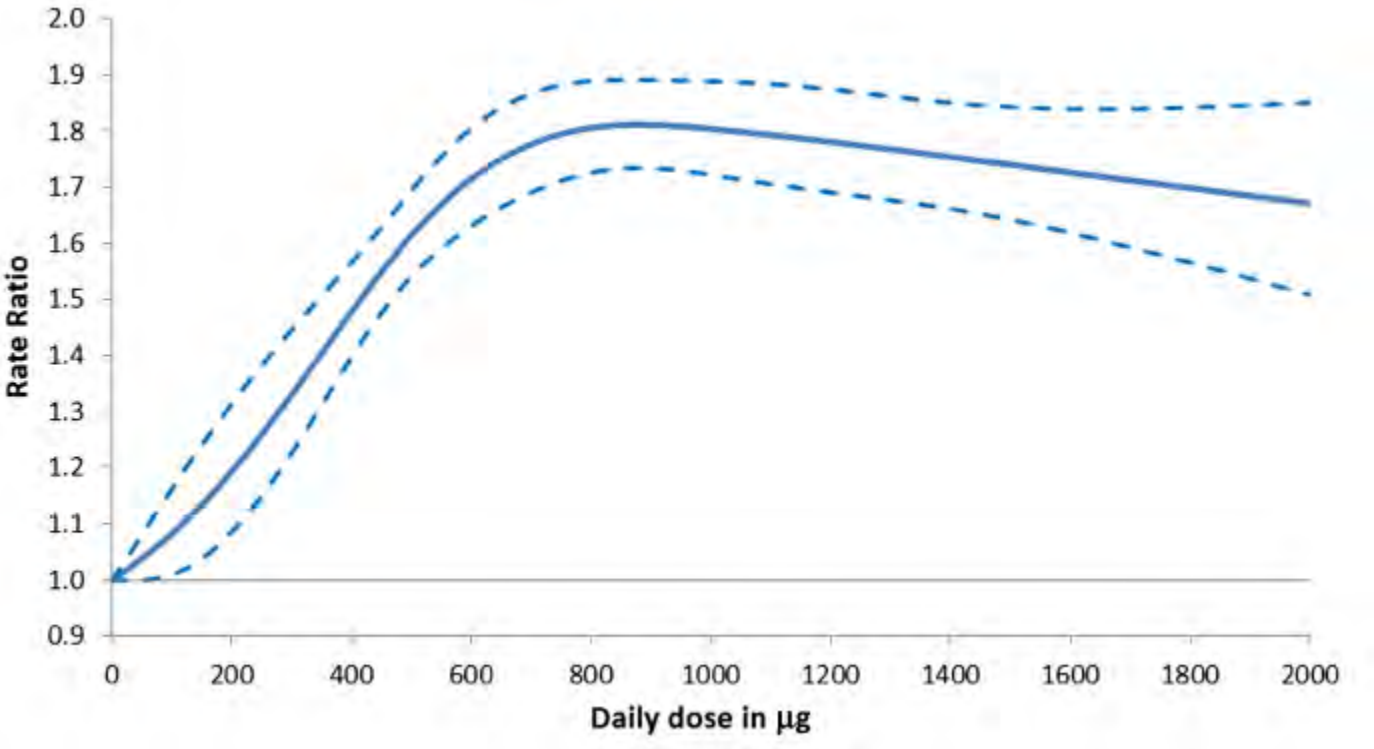
Suissa S, Patenaude V, Lapi F, et al. Thorax 2013;68: 1029–1036.

ORIGINAL ARTICLE

Inhaled corticosteroids in COPD and the risk of serious pneumonia

Samy Suissa, Valérie Patenaude, Francesco Lapi, Pierre Ernst

Rate ratio of pneumonia as a function of ICS daily dose (fluticasone equivalent)



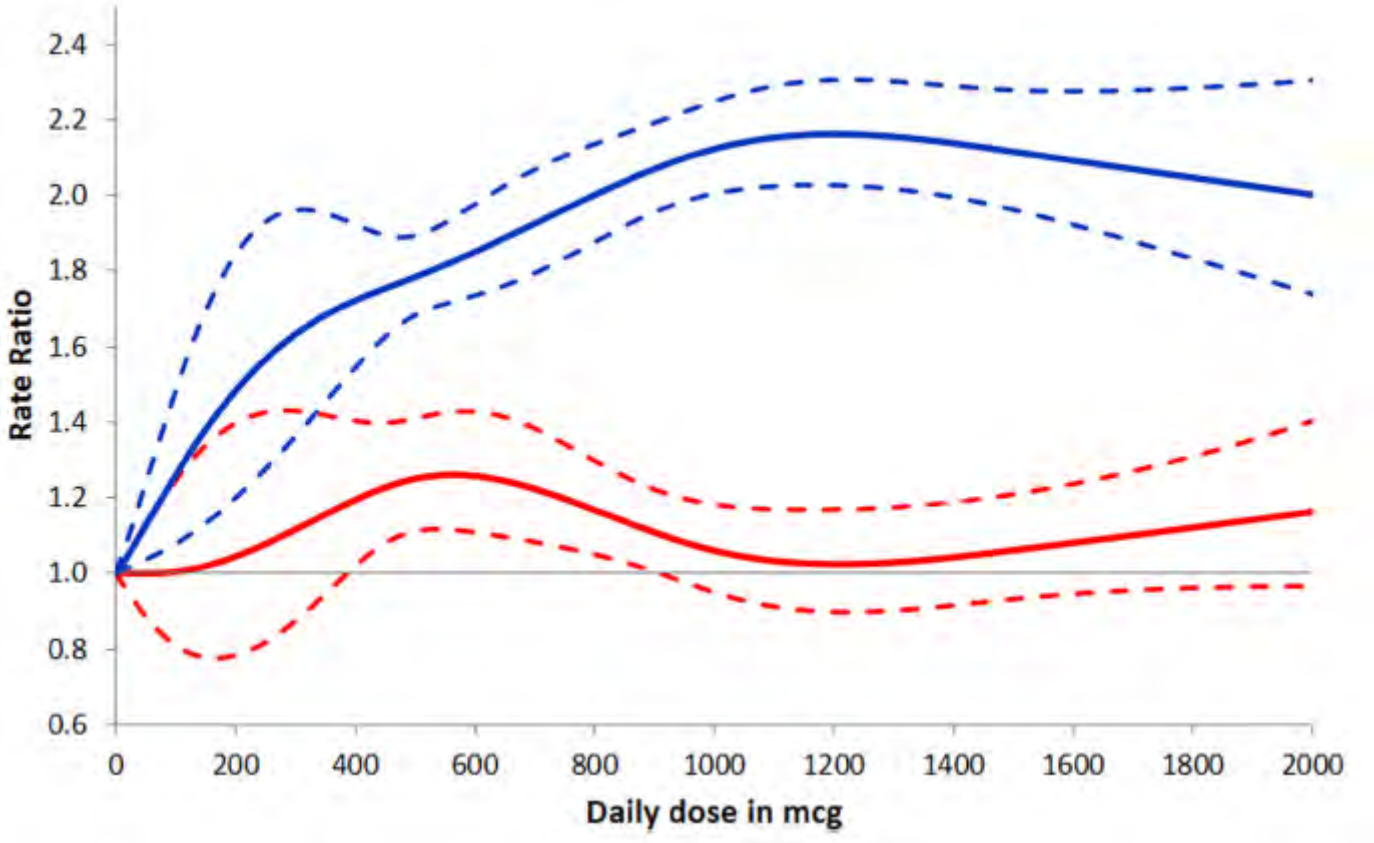
Suissa S, Patenaude V, Lapi F, et al. Thorax 2013;68: 1029–1036.

ORIGINAL ARTICLE

Inhaled corticosteroids in COPD and the risk of serious pneumonia

Samy Suissa, Valérie Patenaude, Francesco Lapi, Pierre Ernst

Rate ratio of pneumonia as a function of fluticasone (blue line) or budesonide (red line) (fluticasone equivalent)



Suissa S, Patenaude V, Lapi F, et al. Thorax 2013;68: 1029–1036.

ORIGINAL ARTICLE

Inhaled corticosteroids in COPD and the risk of serious pneumonia

Samy Suissa, Valérie Patenaude, Francesco Lapi, Pierre Ernst

Conclusions: Increased risk of pneumonia in COPD patients treated with ICS

↑ 69%
↑ with higher dosage, dose dependent
↓when ICS are stopped
↑ ↑ with fluticasone (RR 2.01 CI [1.93 2.10])
↑ with budesonide (RR 1.17 CI [1.09 1.26])

Suissa S, Patenaude V, Lapi F, et al. Thorax 2013;68: 1029–1036.

Cortico-stéroïdes inhalés et risque de pneumonie c/o BPCO

Une méta-analyse des essais randomisés

Kew et al Cochrane collaboration mars 2014

Inhaled steroids and risk of pneumonia for COPD

Objective: To assess the risk of pneumonia associated with the use of fluticasone and budesonide for COPD

Design: Meta-analysis of 43 RCTs (fluticasone n=21,247; budesonide n=10,150)

Outcome: Pneumonia

Exposure: ICS, fluticasone, budesonide, placebo, LABA

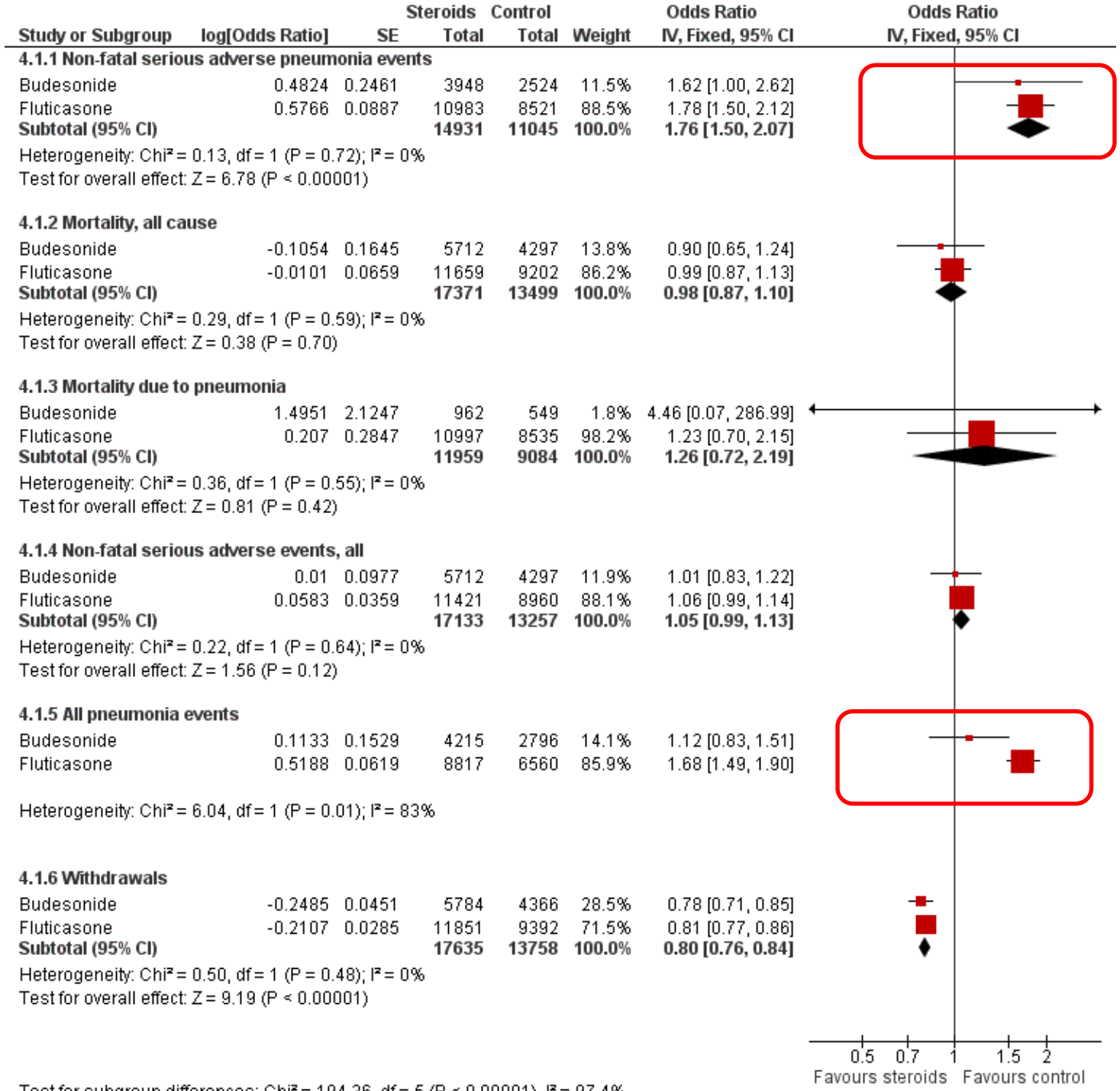
K Kew, A Seniukovich, Cochrane Collaboration March 2014

Inhaled steroids and risk of pneumonia for COPD

43 RCTs (fluticasone n=21,247; budesonide n=10,150)

Outcome (ICS vs controls [LABA or placebo]	**OR with CI95**
Non-fatal, serious adverse pneumonia events (requiring hospital admission) for fluticasone vs LABA	OR 1.78 (1.50 to 2.12)
Non-fatal, serious adverse pneumonia events (requiring hospital admission) for budesonide	OR 1.62 (1.00 to 2.62)

K Kew, A Seniukovich, Cochrane Collaboration March 2014


Steroids Control Odds Ratio Odds Ratio
Study or Subgroup log[Odds Ratio] SE Total Total Weight IV, Fixed, 95% CI IV, Fixed, 95% CI
4.1.1 Non-fatal serious adverse pneumonia events
Budesonide 0.4824 0.2461 3948 2524 11.5% 1.62 [1.00, 2.62]
Fluticasone 0.5766 0.0887 10983 8521 88.5% 1.78 [1.50, 2.12]
Subtotal (95% CI) 14931 11045 100.0% 1.76 [1.50, 2.07]
Heterogeneity: Chi² = 0.13, df = 1 (P = 0.72); I² = 0%
Test for overall effect: Z = 6.78 (P < 0.00001)
4.1.2 Mortality, all cause
Budesonide -0.1054 0.1645 5712 4297 13.8% 0.90 [0.65, 1.24]
Fluticasone -0.0101 0.0659 11659 9202 86.2% 0.99 [0.87, 1.13]
Subtotal (95% CI) 17371 13499 100.0% 0.98 [0.87, 1.10]
Heterogeneity: Chi² = 0.29, df = 1 (P = 0.59); I² = 0%
Test for overall effect: Z = 0.38 (P = 0.70)
4.1.3 Mortality due to pneumonia
Budesonide 1.4951 2.1247 962 549 1.8% 4.46 [0.07, 286.99]
Fluticasone 0.207 0.2847 10997 8535 98.2% 1.23 [0.70, 2.15]
Subtotal (95% CI) 11959 9084 100.0% 1.26 [0.72, 2.19]
Heterogeneity: Chi² = 0.36, df = 1 (P = 0.55); I² = 0%
Test for overall effect: Z = 0.81 (P = 0.42)
4.1.4 Non-fatal serious adverse events, all
Budesonide 0.01 0.0977 5712 4297 11.9% 1.01 [0.83, 1.22]
Fluticasone 0.0583 0.0359 11421 8960 88.1% 1.06 [0.99, 1.14]
Subtotal (95% CI) 17133 13257 100.0% 1.05 [0.99, 1.13]
Heterogeneity: Chi² = 0.22, df = 1 (P = 0.64); I² = 0%
Test for overall effect: Z = 1.56 (P = 0.12)
4.1.5 All pneumonia events
Budesonide 0.1133 0.1529 4215 2796 14.1% 1.12 [0.83, 1.51]
Fluticasone 0.5188 0.0619 8817 6560 85.9% 1.68 [1.49, 1.90]
Heterogeneity: Chi² = 6.04, df = 1 (P = 0.01); I² = 83%
4.1.6 Withdrawals
Budesonide -0.2485 0.0451 5784 4366 28.5% 0.78 [0.71, 0.85]
Fluticasone -0.2107 0.0285 11851 9392 71.5% 0.81 [0.77, 0.86]
Subtotal (95% CI) 17635 13758 100.0% 0.80 [0.76, 0.84]
Heterogeneity: Chi² = 0.50, df = 1 (P = 0.48); I² = 0%
Test for overall effect: Z = 9.19 (P < 0.00001)
0.5 0.7 1 1.5 2
Favours steroids Favours control
Test for subgroup differences: Chi² = 194.36, df = 5 (P < 0.00001), I² = 97.4%

Inhaled steroids and risk of pneumonia for COPD

Authors' Conclusions

In RCTs, risk of serious pneumonia is…

- Increased by ICS (+78% for fluticasone, + 62% for budesonide)
- Not reduced by LABA (combination therapy)
- No differences between drugs (indirect comparison)

Risk of any pneumonia is higher with fluticasone (+86% for fluticasone)

No mortality increase with either ICS

K Kew, A Seniukovich, Cochrane Collaboration March 2014

Cortico-stéroïdes inhalés et risque de pneumonie c/o asthmatiques

Une étude cas contrôle

McKeever et al Chest 2013

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma

Objective: to examine the association btw ICS and pneumonia in asthmatics

Design: Nested case control study in UK

Cases: 6857 asthmatics with pneumonia, 36’312 controls

Controls: 36’312 asthmatics without pneumonia matched for age and sex

Exposure: ICS dose, fluticasone, budesonide, beclométasone

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma A Case-Control Study Tricia McKeever CHEST 2013; 144(6):1788–1794

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma

Table 1—*Demographic Data for Patients and Control Subjects*

Characteristic	Patients (n = 6,857)	Control Subjects (n = 36,312)	Univariate OR (95% CI)
Sex			
Male	2,683 (39.1)	13,682 (37.7)	…
Female	4,174 (60.9)	22,630 (62.3)	…
Age (mean ± SD), y	55.5 ± 17.8	53.7 ± 17.9	…
Smoking status			
Never	2,824 (41.2)	17,784 (49.0)	1.00
Ex	2,071 (30.2)	8,967 (24.7)	1.39 (1.31-1.48)
Current	1,621 (23.6)	6,890 (19.0)	1.55 (1.45-1.66)
Unknown	341 (5.0)	2,671 (7.4)	0.81 (0.72-0.91)
Charlson Comorbidity Index score			
0	3,132 (45.7)	21,822 (60.1)	1.00
1	2,598 (37.9)	11,375 (31.3)	1.67 (1.57-1.77)
2	717 (10.5)	2,235 (6.2)	2.46 (2.22-2.72)
3	277 (4.0)	662 (1.8)	3.19 (2.73-3.73)
4	103 (1.5)	169 (0.5)	4.81 (3.73-6.22)
≥5	30 (0.4)	49 (0.1)	5.13 (3.23-8.15)

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma A Case-Control Study Tricia McKeever CHEST 2013; 144(6):1788–1794

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma

Medication Use	Patients (n = 6,857)	Control Subjects (n = 36,312)
Reliever use in the past year		
0	2,002 (29.2)	16,547 (45.6)
1-2	1,248 (18.2)	7,387 (20.3)
3-6	1,338 (19.5)	5,938 (16.4)
7-12	1,194 (17.4)	3,888 (10.7)
≥13	1,075 (15.7)	2,552 (7.0)
Oral steroid courses in the past year		
0	5,061 (73.8)	32,324 (89.0)
1	554 (8.1)	1,499 (4.1)
2-3	494 (7.2)	1,181 (3.3)
4-8	388 (5.7)	737 (2.0)
≥9	360 (5.3)	571 (1.6)
Most recent ICSs in the past 90 d		
No steroids	3,432 (50.1)	24,143 (66.5)
Beclomethasone	1,214 (17.7)	5,743 (15.8)
Budesonide	536 (7.8)	2,065 (5.7)
Ciclesonide/mometasone	6 (0.1)	44 (0.1)
Fluticasone propionate	1,669 (24.3)	4317 (11.9)
ICS dose,[a] μg		
0	3,432 (50.1)	24,143 (66.5)
<200	1,227 (17.9)	5,592 (15.4)
200-249	591 (8.6)	2,400 (6.6)
250-399	569 (8.3)	1,896 (5.2)
400-499	132 (1.9)	441 (1.2)
500-999	778 (11.4)	1,626 (4.5)
≥1,000	117 (1.7)	200 (0.6)

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma A Case-Control Study Tricia McKeever CHEST 2013; 144(6):1788–1794

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma

ICS Dose and Type	OR	Adjusted OR[a]	95% CI	Adjusted OR[b]	95% CI
Any ICS use in the past 90 d					
No	1.00	…	…	1.00	…
Yes	1.96	1.24	1.15-1.33	1.24	1.07-1.44
ICS use in the past 90 d					
No steroids	1.00	1.00	…	1.00	…
Beclomethasone	1.46	1.09	1.00-1.18	1.13	0.95-1.34
Budesonide	1.82	1.20	1.06-1.35	1.13	0.87-1.47
Ciclesonide/mometasone	0.95	0.71	0.30-1.69	…	…
Fluticasone	2.71	1.64	1.50-1.79	1.58	1.29-1.93
ICS dose,[c] µg					
0	1.00	1.00	…	1.00	…
<200	1.53	1.11	1.02-1.21	1.07	0.98-1.38
200-249	1.71	1.16	1.04-1.30	1.02	0.80-1.30
250-399	2.07	1.32	1.18-1.49	1.43	1.09-1.89
400-499	2.07	1.16	0.93-1.43	1.18	0.62-1.94
500-999	3.36	1.83	1.63-2.05	2.00	1.52-2.64
>1,000	4.19	2.04	1.59-2.63	2.51	1.05-5.99

[a]Adjusted for number of relievers in the past year, Charlson Comorbidity Index score, smoking, social class, and use of oral steroids in the past year.

[b]Restricted to individuals aged <40 y who did not have bronchiectasis and did not change steroid in the previous 90 d and adjusted for number of relievers in the past year, Charlson Comorbidity Index score, smoking, social class, and use of oral steroids in the past year.

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma A Case-Control Study Tricia McKeever CHEST 2013; 144(6):1788–1794

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma

Conclusions

Positive association between ICS and risk of pneumonia in asthmatics

- Fluticasone OR 1.64 (CI 1.50 to 1.79)
- Budesonide OR 1.20 (CI 1.06 to 1.35)
- Dose effect OR 2.04 (CI 1.59-2.63) for higher daily dosage (bud eq.)

Inhaled Corticosteroids and the Risk of Pneumonia in People With Asthma A Case-Control Study Tricia McKeever CHEST 2013; 144(6):1788–1794

Cortico-stéroïdes inhalés et risque d'infection mycobactérienne
Une étude cas contrôle
Brode et al, ERJ 2017

The risk of mycobacterial infections associated with inhaled corticosteroid use

Objective: To examine the risk of nontuberculous mycobacterial pulmonary disease (NTM) infections associated with ICS use

Design: Nested case control study in Ontario (Canada)

Cases: 2966 NTM pulmonary infections in COPD or asthma

Controls: 11’851 patients with obstructive lung disease matched for age and sex

Exposure: ICS dose, fluticasone, budesonide, beclométasone

Brode SK, Campitelli MA, Kwong JC, et al. The risk of mycobacterial infections associated with inhaled corticosteroid use. Eur Respir J 2017; 50: 1700037

The risk of mycobacterial infections associated with inhaled corticosteroid use

TABLE 1 Baseline characteristics on the index date for nontuberculous mycobacterial pulmonary disease (NTM-PD) cases and matched controls

	NTM-PD cases	Controls	p-value
Subjects	2966	11851	
Female	1341 (45.2)	5360 (45.2)	0.99
Age	76.6±6.36	76.6±6.35	0.943
Comorbidities			
Bronchiectasis	483 (16.3)	559 (4.7)	<0.001
Chronic kidney disease	297 (10.0)	1444 (12.2)	0.001
Diabetes mellitus	723 (24.4)	3608 (30.4)	<0.001
GORD	704 (23.7)	2818 (23.8)	0.961
HIV¶	⩽5	⩽5	0.264
Interstitial lung disease	277 (9.3)	504 (4.3)	<0.001
Rheumatoid arthritis	121 (4.1)	412 (3.5)	0.115
Prior TB	22 (0.7)	8 (0.1)	<0.001

Brode SK, Campitelli MA, Kwong JC, et al. The risk of mycobacterial infections associated with inhaled corticosteroid use. Eur Respir J 2017; 50: 1700037

The risk of mycobacterial infections associated with inhaled corticosteroid use

TABLE 1 Baseline characteristics on the index date for nontuberculous mycobacterial pulmonary disease (NTM-PD) cases and matched controls

	NTM-PD cases	Controls	p-value
OLD drug exposure within 1 year			
SABA	1977 (66.7)	7314 (61.7)	<0.001
LABA[+]	1828 (61.6)	4949 (41.8)	<0.001
SAMA	928 (31.3)	3132 (26.4)	<0.001
LAMA	1348 (45.4)	4006 (33.8)	<0.001
Methylxanthine	301 (10.1)	597 (5.0)	<0.001
Oral corticosteroid	990 (33.4)	2807 (23.7)	<0.001
Other drug exposure within 1 year			
TNF-α antagonist	6 (0.2)	17 (0.1)	0.467
Other immunosuppressant[§]	149 (5.0)	343 (2.9)	<0.001
PPI	1102 (37.2)	4335 (36.6)	0.561

>65 yo OLD patients NTM in requiring 2 antibiotics

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TABLE 2 Odds ratios for nontuberculous mycobacterial pulmonary disease (NTM-PD) according to inhaled corticosteroid (ICS) exposure

	NTM-PD cases[#]	Controls[¶]	Crude OR (95% CI)	p-value	Adjusted OR[+] (95% CI)	p-value
All OLD						
No ICS use	592 (20.0)	4175 (35.2)	1.0 (reference)		1.0 (reference)	
Prior ICS use	469 (15.8)	2647 (22.3)	1.30 (1.14–1.48)	0.001	0.94 (0.80–1.11)	0.465
Current ICS use	1905 (64.2)	5029 (42.4)	2.87 (2.59–3.19)	<0.001	1.86 (1.60–2.15)	<0.001
Fluticasone	1576 (53.1)	3779 (31.9)	3.18 (2.85–3.54)	<0.001	2.09 (1.80–2.43)	<0.001
Budesonide	291 (9.8)	1070 (9.0)	2.05 (1.75–2.40)	<0.001	1.19 (0.97–1.45)	0.089
Other ICS[¶]	38 (1.28)	180 (1.5)	1.59 (1.11–2.28)	0.012	1.29 (0.86–1.93)	0.223
ICS cumulative dose in 1 year						
No use	592 (20.0)	4175 (35.2)	1.0 (reference)		1.0 (reference)	
Low dose	546 (18.4)	2769 (23.4)	1.43 (1.26–1.63)	<0.001	1.06 (0.90–1.24)	0.486
Moderate dose	781 (26.3)	2615 (22.1)	2.27 (2.01–2.56)	<0.001	1.48 (1.27–1.74)	<0.001
High dose	1047 (35.3)	2292 (19.3)	3.58 (3.17–4.03)	<0.001	2.28 (1.94–2.68)	<0.001
Asthma only	219	872				
No ICS use	81 (37.0)	398 (45.6)	1.0 (reference)		1.0 (reference)	
Prior ICS use	55 (25.1)	236 (27.1)	1.18 (0.80–1.74)	0.406	1.23 (0.74–2.03)	0.428
Current ICS use	83 (37.9)	238 (27.3)	1.76 (1.23–2.51)	0.002	1.56 (0.93–2.62)	0.095
ACOS	910	3633				
No ICS use	146 (16.0)	1033 (28.4)	1.0 (reference)		1.0 (reference)	
Prior ICS use	135 (14.8)	837 (23.0)	1.16 (0.90–1.48)	0.261	0.83 (0.61–1.12)	0.228
Current ICS use	629 (69.1)	1763 (48.5)	2.60 (2.13–3.18)	<0.001	1.74 (1.32–2.28)	<0.001
COPD only	1837	7346				
No ICS use	365 (19.9)	2744 (37.3)	1.0 (reference)		1.0 (reference)	
Prior ICS use	279 (15.2)	1574 (21.4)	1.40 (1.18–1.65)	<0.001	0.98 (0.79–1.20)	0.827
Current ICS use	1193 (64.9)	3028 (41.2)	3.20 (2.79–3.66)	<0.001	1.96 (1.62–2.36)	<0.001

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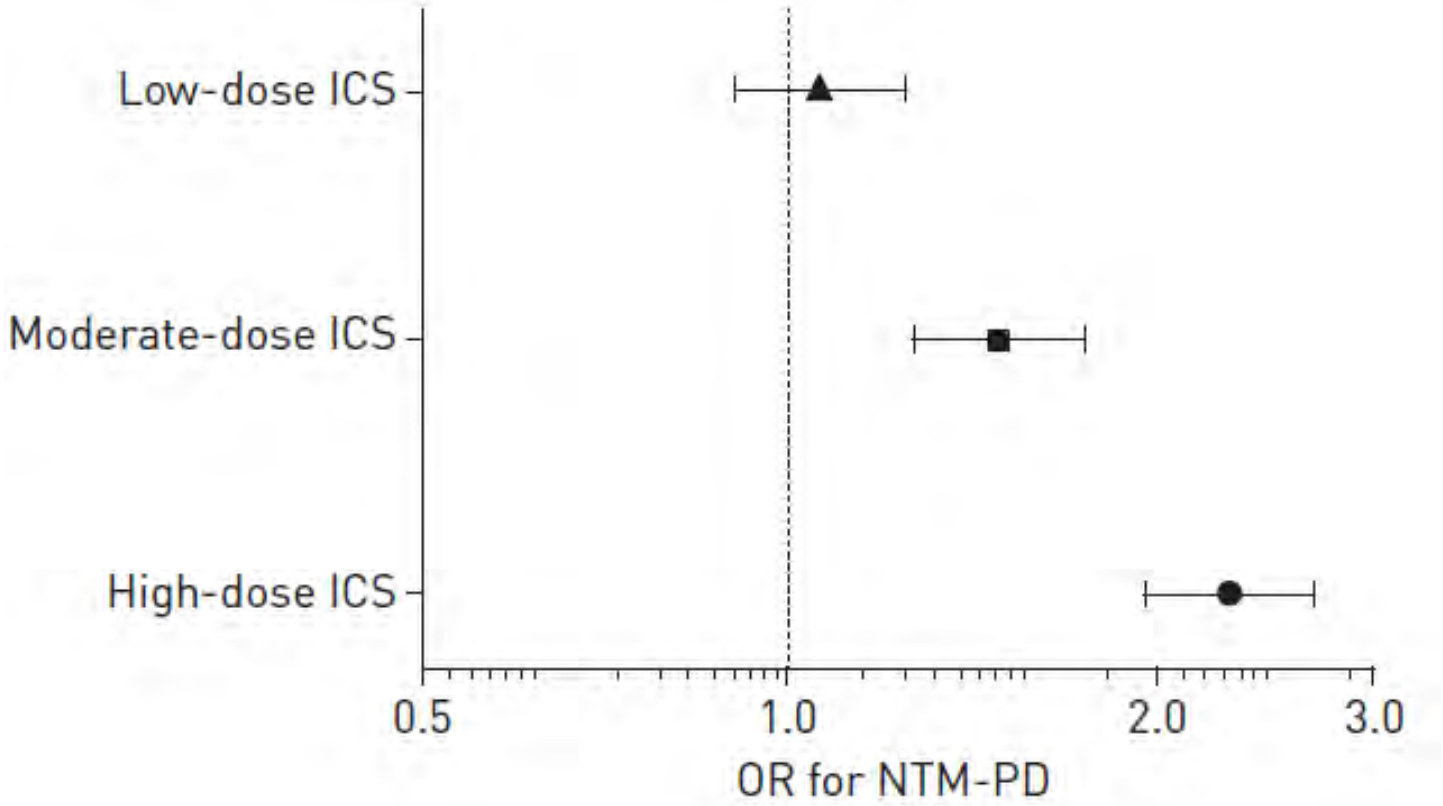

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TABLE 4 Distribution of nontuberculous mycobacterial species causing pulmonary disease (NTM-PD) and odds ratios comparing current inhaled corticosteroid (ICS) use with no ICS use

	NTM-PD cases[#]	Controls[¶]	Adjusted OR[+] (95% CI)	p-value
MAC	1877 (63.3)	7495	1.87 (1.55–2.55)	<0.001
Mycobacterium xenopi	811 (27.3)	3244	2.04 (1.54–2.70)	<0.001
Other NTM	278 (9.4)	1112	1.55 (0.95–2.52)	0.077

Data are presented as n (%), unless otherwise stated. MAC: *Mycobacterium avium* complex comprised of *Mycobacterium avium* and *Mycobacterium intracellulare*.

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Conclusions

In patients with asthma or COPD current ICS use is associated with significantly increased risk of NTM-PD compared with nonuse.

- Dose–response relationship between NTM-PD
- The association between ICS use and NTM-PD was only found with fluticasone.
- The risk of NTM infection should be considered by clinicians:
  - Lowest dosage of ICS if needed
  - Alternative therapy

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Inhaled cortico-steroids and chronic lung disease Conclusions

- ✓ ↑ risk of pneumonia in COPD → patient selection (Eosinophils + exacerbations + low lung function), switch for LABA/LAMA, Vaccines (Flu, Pneumococcus), smoking cessation
- ✓ ↑ risk of pneumonia in asthma → reconsider diagnosis, lower the dosage
- ✓ ↑ risk with fluticasone → consider alternative (budesonide, mometasone)
- ✓ ↑ risk with higher ICS dosage → lower the dosage
- ✓ ↑ risk of mycobacterial infection (NTM) → order microbiological (NTM) culture in patients with bronchiectasis

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Merci pour votre attention

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