

# COPD exacerbation





## Definition according to GOLD report:

- «An acute event...
- ...characterized by a worsening of the patients' respiratory symptoms...
- ...that is beyond normal day-to-day variations...
- ...and leads to a change in medication»

- No biomarker and no diagnostic test to prove this diagnosis

## → **Clinical diagnosis of exclusion**

- Lead to acceleration of lung function decline!
- Underreported / underrecognized
- Seasonality



## Cardinal symptoms (one or more fulfilled)

- More dyspnea – key symptom
- More cough
- More sputum
- Changed sputum character / purulence



# Classification

- Mild: intensified inhalation only
- Moderate: + corticosteroids (antibiotics)
- Severe: hospitalisation





## Risk factors

- Age
- Productive cough / chronic bronchitis
- Duration of COPD
- History of antibiotic therapy
- COPD-related hospitalization previous year
- Chronic mucous hypersecretion
- Eosinophils  $> 0.34 \times 10^9$  cells per liter
- Comorbidities
- Low FEV1
- GERD - probably
  
- **Strongest predictor: history of prior exacerbations**

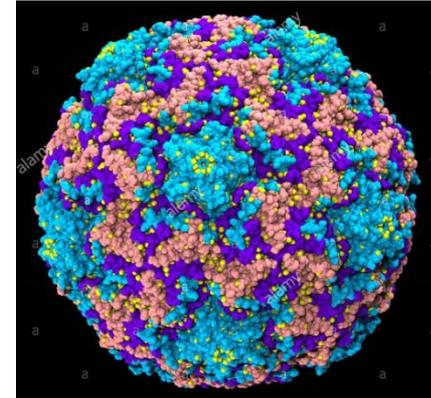
## Triggers/etiology

- 70% respiratory tract infections: mostly viral and bacterial, atypical bacteria uncommon
- 30% environmental pollution or unknown etiology



## Triggers/etiology – viruses

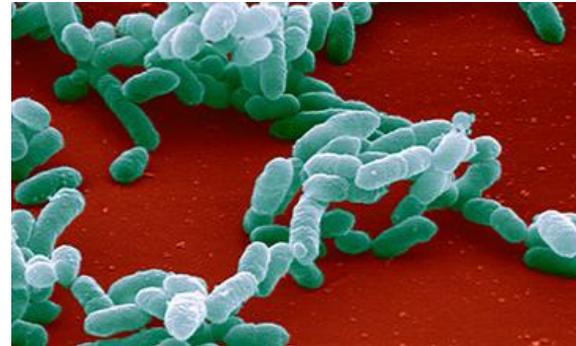
- Detected in up to 2/3 of exacerbations
- Rhinovirus most common
- Other: Influenza, parainfluenza, coronavirus, adenovirus, RSV, human metapneumovirus
- Identification not proving cause (15% in stable COPD), except Influenza





## Triggers/etiology – bacteria

- 33-50% cause of exacerbation



*Haemophilus influenzae*

13 to 50

*Moraxella catarrhalis*

9 to 21

*Streptococcus pneumoniae*

7 to 26

*Pseudomonas aeruginosa*

1 to 13

- Exacerbations: strongly associated with acquisition of new strain!

## Triggers/etiology – atypical bacteria

- *Chlamydia pneumoniae*
- *Mycoplasma pneumoniae*
- *Legionella* spp

→ rare causes!

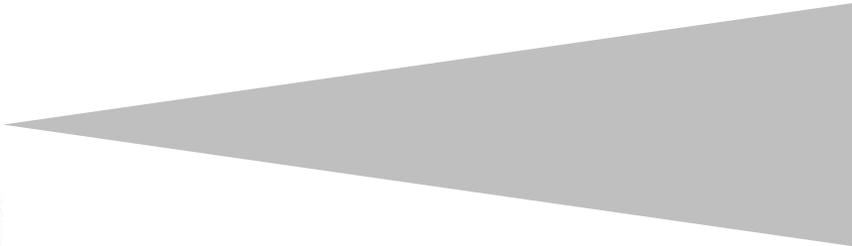


## Triggers/etiology – viral and bacterial coinfection

- Common
- Increases severity
- «Sequential infection» = bacterial infection after preceding viral infection

## Clinical manifestations

- Extremely broad spectrum!
- Mild increase of symptoms - respiratory failure





## Physical examination

- Wheezing
- Tachypnea
- Difficulty speaking
- Use of accessory respiratory muscles
- Paradoxical chest wall/abdominal movements
- Decreased mental status → hypercapnia/hypoxemia?



## Goals of initial evaluation

- Confirm diagnosis (exclude DD)
- Identify cause (when possible)
- Assess severity
- Respect comorbidities



## Initial evaluation

Mild exacerbation (no ED admission): clinical assessment, maybe SpO<sub>2</sub>

ED admission:



- SpO<sub>2</sub>
- Chest radiograph (pneumonia? pneumothorax? pulmonary edema? pleural effusion?)
- Laboratory studies
- ABGA
- Additional tests depend. on clinical evaluation, e.g. ECG, troponin, BNP, D-dimer



## Initial evaluation for infection

### Clinical indicators of bacterial infection:

- More severe COPD
- Sputum purulence

### Sputum studies (Gram stain, culture) – when?

- Risk factors for *Pseudomonas*
- Failure to improve on initial empiric antibiotics
- Acute respiratory failure



## Initial evaluation for infection

### Detection of viruses:

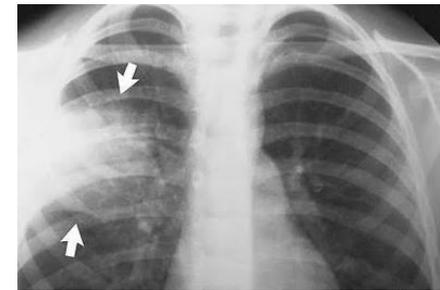
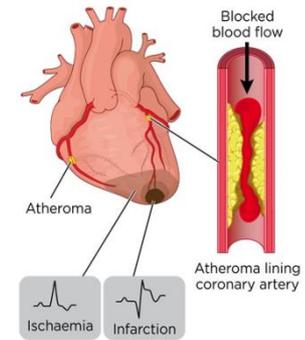
- Goal: detect influenza during season
- Use of detection of other viruses not clear – no specific treatment

### Procalcitonin (PCT) and CRP:

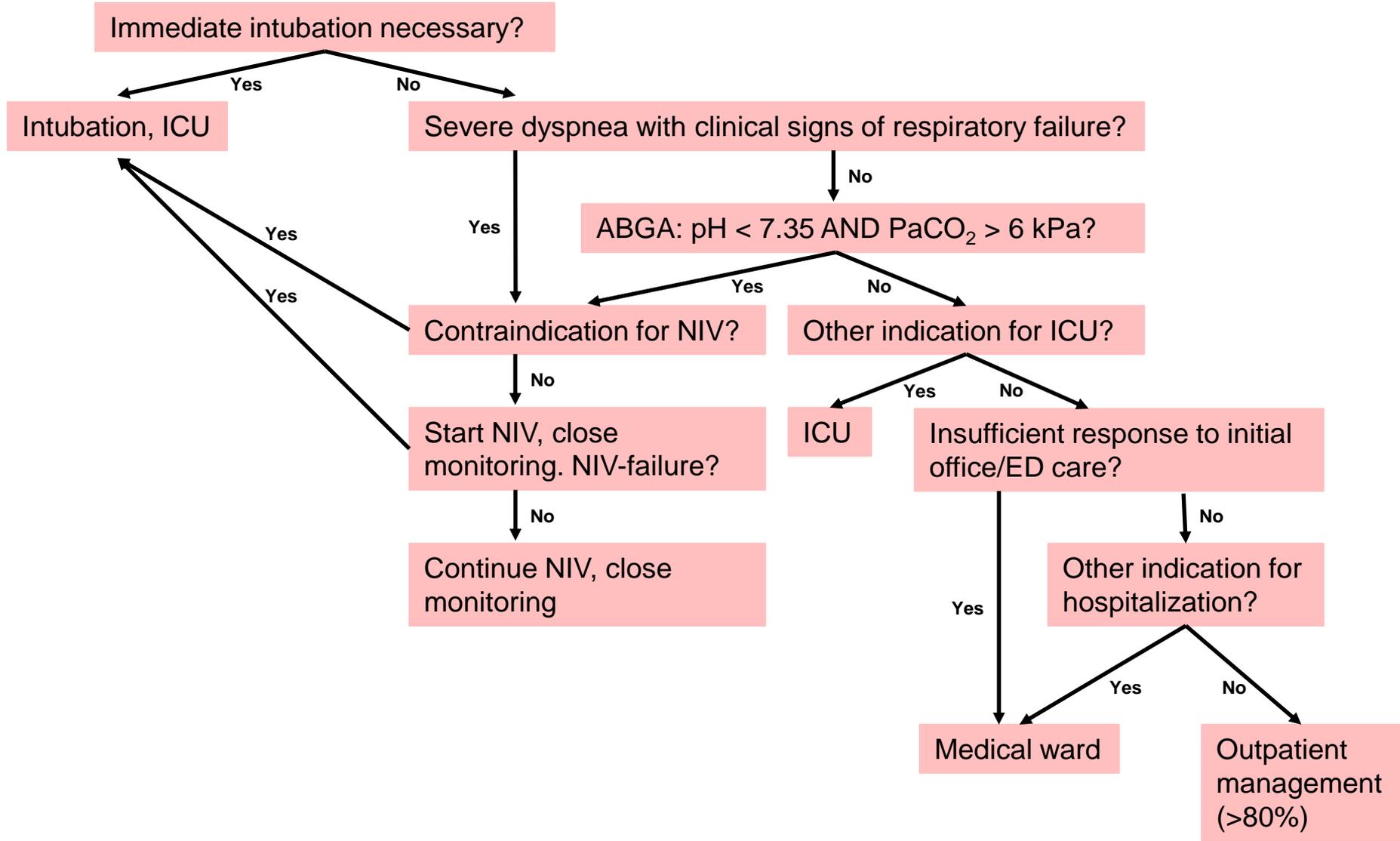
- CRP: not recommended to differentiate between viral and bacterial etiology
- PCT:
  - more specific for bacterial infection
  - still expensive and not readily available (globally)
  - PCT-guidance: reduces antibiotic exposure and side effects, same clinical efficacy

## Differential diagnosis (main)

- Heart failure
- Acute coronary syndrome
- Pulmonary embolism
- Pneumonia
- Pneumothorax



# Triage



## Goals of treatment

1. Minimize the negative impact of current exacerbation
2. Prevent subsequent events

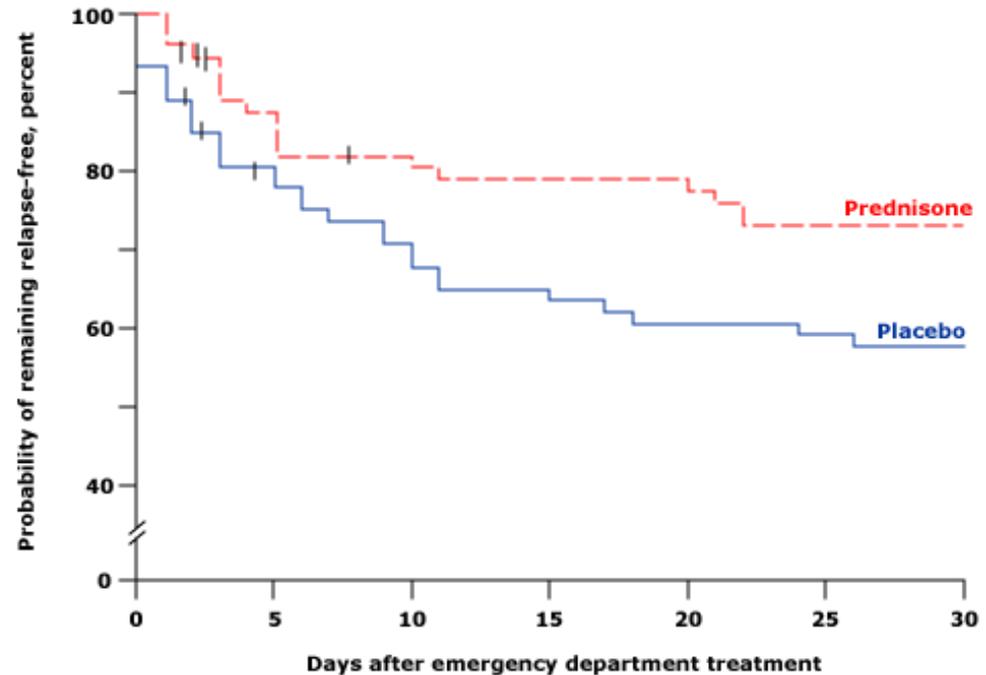


# Outpatient management

1. Intensification of bronchodilator therapy (SABA/SAMA; nebulized or MDI)

# Outpatient management

1. Intensification of bronchodilator therapy (SABA/SAMA; nebulized or MDI)
2. Oral glucocorticoid therapy
  - Less dyspnea
  - Greater improvement of FEV1



Data from: *N Engl J Med* 2003; 348:2623.



# Outpatient management

## 3. Antibiotics?



# Hospital management

1. Same measures as outpatient +
2. ABGA
3. Supplemental oxygen: target SpO<sub>2</sub> 88-92%
4. Close monitoring (respiratory rate/effort, wheezing, SpO<sub>2</sub>, HR, fluid status)
5. Maybe mechanical ventilation
6. Prevent complications of immobility (thromboembolism, deconditioning)
7. Improve nutritional status
8. Smokers: aid with smoking cessation



## Hospital management – systemic glucocorticoids

- Improve symptoms
- Improve lung function
- Improve oxygenation
- Decrease LOS
- Reduce treatment failure
- Reduce relapse

## Hospital management – systemic glucocorticoids

Main side effect: hyperglycemia

Route: mostly oral

Dose: optimal dose unknown; GOLD: 40 mg prednisone equivalent/d; clinical practice: higher doses/i.v. in more severe cases (data limited)



## Hospital management – systemic glucocorticoids

### Duration:

- Optimal duration not known
- Depends on severity and response to therapy
- GOLD: 5 days (→ REDUCE trial, Leuppi et al., JAMA 2013)
- ERS/ATS: 5-14 days
- Tapering not necessary if  $< 2$  weeks



# Antibacterial therapy

## When? Recommendation of GOLD:



- All 3 cardinal symptoms fulfilled (more dyspnea, more sputum, increased sputum purulence) **or**
- 2 cardinal symptoms incl. increased sputum purulence **or**
- Procalcitonin-guided **or**
- Respiratory failure (NIV or IV)



# Antibacterial therapy

## Choice of antibiotic:

### ▼ Empirische Therapie

#### **ambulant:**

- Trimethoprim/Sulfamethoxazol F alle 12 h p.o.
- Doxycyclin 100 mg alle 12 h p.o.
- Amoxicillin/Clavulansäure 625 mg alle 8 h p.o.
- Dauer: 5-7 d

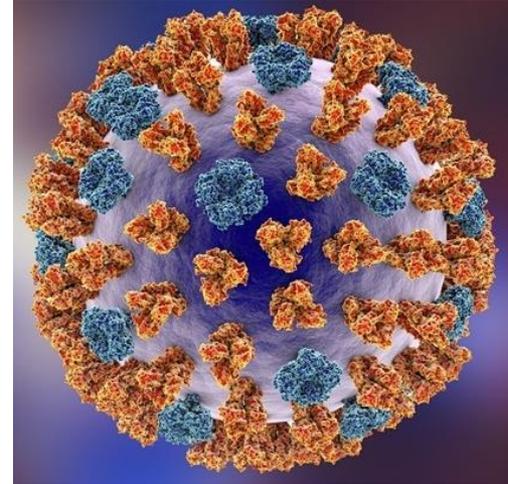
#### **hospitalisiert:**

- Amoxicillin/Clavulansäure 2.2 g alle 8 h i.v.
- Ceftriaxon 2 g alle 24 h i.v.
- Dauer: 5-7 d



# Antiviral therapy

- Influenza should be treated



## Prognosis – poor!

- In-hospital mortality: 3-24%
- 1-year mortality: 22-43%
- 5-year mortality: 50-55%



## Prognosis – poor!

- Persisting impact on health status, contribution to disease progression
- Usual duration of symptoms 7-10 d
- At 8 weeks, 20% not recovered to pre-exacerbation state
- Re-admission:      24% within 30 d  
                             43% within 90 d



## «Frequent exacerbator»

- 2 or more exacerbations in past 12 months
- Worse health status
- Higher mortality
- Faster decline in lung function

# Follow-up

**Table 5.7. Discharge criteria and recommendations for follow-up**

- Full review of all clinical and laboratory data.
- Check maintenance therapy and understanding.
- Reassess inhaler technique.
- Ensure understanding of withdrawal of acute medications (steroids and/or antibiotics).
- Assess need for continuing any oxygen therapy.
- Provide management plan for comorbidities and follow-up.
- Ensure follow-up arrangements: early follow-up < 4 weeks, and late follow-up < 12 weeks
- All clinical or investigational abnormalities have been identified.

1–4 Weeks Follow-Up

- Evaluate ability to cope in his/her usual environment.
- Review and understanding treatment regimen.
- Reassessment of inhaler techniques.
- Reassess need for long-term oxygen.
- Document the capacity to do physical activity and activities of daily living.
- Document symptoms: CAT or mMRC.
- Determine status of comorbidities.

# Prevention

**Table 5.8. Interventions that reduce the frequency of COPD exacerbations**

Intervention class	Intervention
Bronchodilators	LABAs LAMAs LABA + LAMA
Corticosteroid-containing regimens	LABA + ICS LABA + LAMA + ICS
Anti-inflammatory (non-steroid)	Roflumilast
Anti-infectives	Vaccines Long term macrolides
Mucoregulators	N-acetylcysteine Carbocysteine
Various others	Smoking cessation Rehabilitation Lung volume reduction



# Early detection – unmet goal!

# Early detection – unmet goal! → Telemedicine as possible aid?

## Clinical Investigations

Respiration

Respiration  
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# Telehealthcare for Chronic Obstructive Pulmonary Disease in Switzerland Is Feasible and Appreciated by Patients

Frank Rassouli   Maurus Pfister   Sandra Widmer   Florent Baty   Barbara Burger  
Martin H. Brutsche

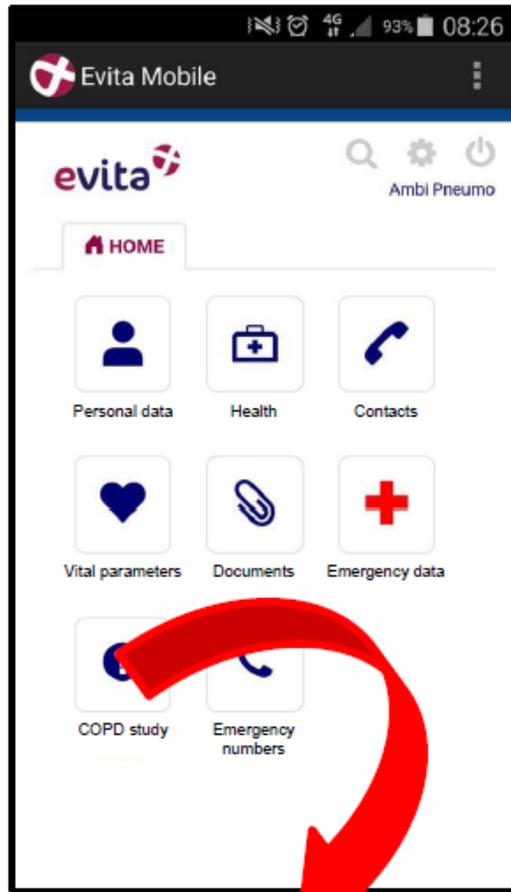
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# Goal: to test feasibility and patient acceptance

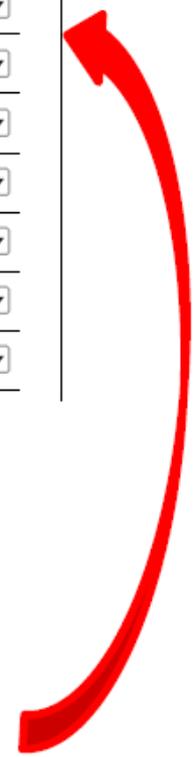
## Methods

- Daily entry of symptoms via Internet
- Daily check by study team (pulmonologist and study nurse)
- Phone call, when exacerbation suspected
- Further measures according to phone call



Place of residence	Date of birth	Date of study inclusion	Weekly status	Status today
Thundorf	30.06.1955	19. March 2015	4 4 4 4 4 4 4 4	4
Widnau	08.08.1942	11. March 2015	3 4 2 3 3 3 3 3	3
Lichtensteig	27.08.1942	28. November 2016	0 0 0 0 0 0 0 2	2
Grabs	12.03.1958	19. August 2015	2 2 2 2 2 2 2 2	2
St Margreten	02.02.1946	6. July 2015	2 2 2 2 2 2 2 2	2
<b>Oberuzwil</b>	11.04.1942	12. July 2017	2 2 2 2 2 2 2 2	2
Heerbrugg	05.08.1965	30. May 2017	2 2 2 2 2 2 2 2	2
Oberuzwil	16.03.1946	16. September 2016	1 1 1 1 1 1 2 1	2
St Gallen	12.09.1938	8. September 2016	1 1 1 1 1 1 1 1	1
Wil	01.05.1938	30. May 2016	1 0 2 1 1 1 1 1	2
Bühler	25.12.1932	13. October 2016	1 1 1 1 1 1 1 1	1

- [My account](#)
- [COPD status](#)
- [Access protocol](#)
- [Start file/invite person](#)



- |   |     |
|---|-----|
| 1. Do you have more dyspnea today, exceeding your usual variation?                                      | Yes |
| 2. Do you have more sputum today, exceeding your usual variation?                                       | No  |
| 3. Is your sputum today different regarding colour or consistency?                                      | No  |
| 4. Do you have more cough today, exceeding your usual variation?  | No  |
| 5. Do you feel like having fever today?   | No  |
| 6. Do you feel like having a common cold today?   | Yes |
| 7. Do you feel sick in general today?   | No  |
| 8. Did you start taking your emergency medication (steroid and/or antibiotic) within the last 24 hours? | No  |
| Score   | 2   |



## Results

- Data completeness: 88%
- Patient acceptance: 94%
- Improved satisfaction with care
- 60/63 exacerbations early detected
- Out of these, none hospitalised

# Longitudinal change of COPD assessment test (CAT) in a telehealthcare cohort is associated with exacerbation risk

**Results:** The median CAT at inclusion was 17 (interquartile range 13–22) points. During the study, 25% of patients had a significant negative slope (median  $-7$  points per year [ppy]), 38% were stable (median  $+0$  ppy) and 38% had a significant positive slope (median  $+6$  ppy). The median slope of the CAT in the overall cohort was  $+1$  (interquartile range  $-3$  to  $+6$ ) ppy.

A significant positive association was found between the change in CAT scores and the risk of exacerbations (hazard ratio =  $1.08$ , 95% CI:  $1.03$ – $1.13$ ;  $p < 0.001$ ). There was an 8% increase of the risk of exacerbation per unit increase in CAT. We detected a significant learning effect in filling out the CAT in 18.4% of patients with a median learning phase of five filled questionnaires.

**Conclusion:** Sixty-three percent of the COPD patients monitored by THC experienced a stable or improved CAT during 1-year follow-up. We found a significant positive association between the evolution of the CAT over time and the risk of exacerbations. In about one-fifth of patients, there was a significant learning effect in filling out the CAT, before reliable results could be obtained. The evolution of the CAT could help to assess the risk for future exacerbations.



## Telehealth care vs. standard care in COPD – an international randomised controlled trial (interim analysis)

Frank Rassouli<sup>1</sup>, Florent Baty<sup>1</sup>, Daiana Stolz<sup>2</sup>, Malcolm Kohler<sup>3</sup>, Robert Thurnheer<sup>4</sup>, Thomas Brack<sup>5</sup>, Christian Kähler<sup>6</sup>, Michael Tamm<sup>2</sup>, Sandra Widmer<sup>1</sup>, Ursina Tschirren<sup>1</sup>, Martin Brutsche<sup>1</sup>

<sup>1</sup>Clinic for Pulmonology & Sleep Medicine, Cantonal Hospital St. Gallen, Switzerland; <sup>2</sup>Clinic for Pulmonology, University Hospital Basel, Switzerland; <sup>3</sup>Clinic for Pulmonology, University Hospital Zürich, Switzerland;

<sup>4</sup>Clinic for Internal Medicine, Cantonal Hospital Münsterlingen, Switzerland; <sup>5</sup>Clinic for Internal Medicine, Cantonal Hospital Glarus, Switzerland; <sup>6</sup>Clinic for Pulmonology, Waldburg-Zeil-Kliniken, Wangen, Germany

### Results (2)

- ▶ Satisfaction with COPD care (visual analogue scale) tended to be better after the intervention as compared to the control (mean 8.8 vs. 8.4 points,  $p = 0.460$ ). Hospitalisation rate due to AECOPD was 0.18 per patient-year (py) during the intervention vs. 0.25 per py during the control.
- ▶ COPD-related costs were 4,619 CHF per py during the intervention vs. 8,230 CHF per py during the control.



# Summary (1)

- Important but underrecognized events
- Persisting impact on health status, contribution to disease progression
- Lead to acceleration of lung function decline
- Strongest predictor of future events: history of prior exacerbations
- Main etiology: LRTI, rather viral than bacterial
- Broad clinical spectrum: mild increase of symptoms - respiratory failure



## Summary (2)

- Exclusion of DDs and correct triage important
- Mainstay of therapy: corticosteroids
- Antibiotics: clinically- (Anthonisen) or PCT-guided
- Prognosis: poor (high mortality, high readmission)
- Prevention = important goal
- Early recognition = major challenge
- Telemedicine as possible aid – studies ongoing – CAT as longitudinal risk marker





**Thank you for your attention!**