


## Pulmonary abnormalities and relevance after asymptomatic or mild COVID-19

focus on SCUBA


**K Tournoy**  
kurt.tournoy@olvz-aalst.be  
Oct, 16<sup>th</sup> 2021



1

## What's on the menu ?

- What is asymptomatic and mild COVID ?
- Focus on the pulmonary manifestations
- Characterisation of PACS and 'long-COVID'
- Relevance for FT-Dive assessments



2

## Information sources



Different databases - search terms were (not limited to MESH terms) amongst others COVID-19, out-patient-clinic, ambulatory care, pulmonary manifestations, post-acute COVID syndrome, long-COVID, SCUBA. References of all manuscripts were screened to detect useful cross-references.


e.g. Search: ("COVID-19"[Mesh]) AND ( "Ambulatory Care"[Mesh] OR "Outpatient Clinics, Hospital[Mesh] ) n=350 sept 29<sup>th</sup> 2021



3

## COVID classification(s)

Category 0	Category 1	Category 2	Category 3
Asymptomatic COVID	Mild COVID	Moderate COVID	Severe COVID
PCR + No symptoms	PCR + With symptoms	PCR + With symptoms	PCR + With symptoms
	No or nl X-ray and Out-pt care	Abno X-ray In-pt care Oxygen needed No ICU	Abno X-ray In-pt care Oxygen needed ICU
	+/- 50-60%	+/- 40-50%	
Prevalence :	<b>80-95%</b>	<b>5-15%</b>	<b>1-5%</b>

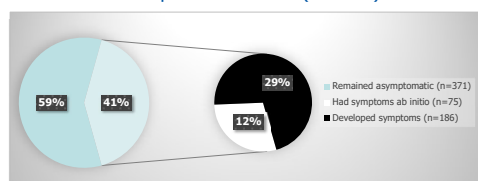


4


## Clinical course of asymptomatic and mildly symptomatic patients with COVID-19

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 26, No. 10, October 2020  
Yong-Hoon Lee,<sup>1</sup> Chae Moon Hong,<sup>1</sup> Dae Hyun Kim, Taek Hoo Lee, Jaetae Lee

- n = 632 PCR + patients isolated (S Korea)



- n = 19 (3%) was transferred to a hospital



5

## Virologic remission rates category 0-1 patients

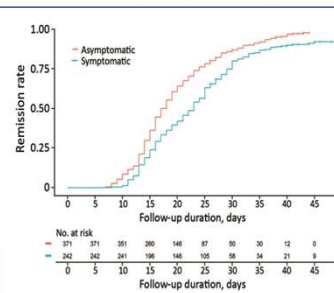



Figure 3. Virologic remission of coronavirus disease patients in South Korea according to symptoms. We noted a significant difference in virologic remission period between the asymptomatic and mildly symptomatic patients (p<0.0001).

Follow-up duration, days	Asymptomatic	Symptomatic
0	371	242
5	371	242
10	351	241
15	280	196
20	146	106
25	87	58
30	50	34
35	30	21
40	12	9
45	0	0

Emerging Infectious Diseases • www.cdc.gov/eid • Vol. 26, No. 10, October 2020



6

### Covid-19 in asymptomatic or mild disease : association between viral load and pneumonia

PLOS ONE | <https://doi.org/10.1371/journal.pone.0250358> April 21, 2021

Cherry Kim<sup>1</sup>, Wooll Kim<sup>2</sup>, Ji Hoon Jeon<sup>3</sup>, Hyeri Seok<sup>3</sup>, Sun Beon Kim<sup>4</sup>, Hee Kyoung Choi<sup>5</sup>, Young Kyung Yoon<sup>6</sup>, Joon Young Song<sup>7</sup>, Dae Won Park<sup>8</sup>, Jang Wook Sohn<sup>9</sup>, Won Suk Choi<sup>10</sup>\*

n = 106 (retrospective):  
1/ can we see structural lung disease in mild COVID ? and  
2/ is there a relation with Ct values (Viral loads) ?

○ pneumonia (n=48)  
■ no pneumonia (n=58)

55% 45%

olv  
Top in Zang

7

### X-ray/CT acute abnormalities

Patients with asymptomatic infection may have objective clinical abnormalities  
50% had typical GGO-CT abnormalities

Clinical characteristics of 24 asymptomatic infections with COVID-19 screened among close contacts in Nanjing, China. ALI Hu Z, Song C, Xu C, Jin G, Chen Y, Xu X, Ma H, Chen W, Lin Y, Zheng Y, Wang J, Hu Z, Yi Y, Shen H. *SO Sci China Life Sci.* 2020;63(5):706.

olv  
Top in Zang

8

### How are those with 'asymptomatic or mild' pneumonia then characterized ?

Table 3. Comparisons of clinical course, viral load, symptoms, and continents of travel between young COVID-19 patients with and without radiologically proven pneumonia and asymptomatic or mild disease severity.

	Without pneumonia (n = 58)	With pneumonia (n = 48)	P-value
Age, years (median, interquartile range)	26.7±7.9 (25.0, 22.8–29.3)	28.5±10.7 (28.0, 22.3–31.5)	0.130
Male sex, n (%)	25 (43.1)	21 (43.8)	0.540
The Ct value obtained at the time of entering (CTC) (median, interquartile range)	35.1±5.0 (35.3, 30.4–38.5)	31.9±5.5 (33.3, 27.4–32.8)	0.001
Days from initial symptoms to diagnosis (median, interquartile range)	15.1±11.7 (13.0, 7–19.5)	9.3±9.2 (8.0, 3.0–13.0)	0.008
Days from diagnosis to two consecutive negative rRT-PCR (median, interquartile range)	18.6±9.7 (17.0, 8.5–26.8)	22.8±7.1 (23.5, 17.8–26.3)	0.040
Two consecutive negative rRT-PCR within a week (%) (median, interquartile range)	11 (19.0)	0	0.001

→ So, those with pneumonia on X-ray have a higher viral load, and a slower clearance. The correlation with 'symptoms severity' is weak.

PLOS ONE | <https://doi.org/10.1371/journal.pone.0250358> April 21, 2021

olv  
Top in Zang

9

### Mild COVID illness in adult outpatients : focus on the evolution of respiratory symptoms

Blair et al. *Medicine* (2021) 100:24

■ Illness Onset (N=423)  
■ Week 1 (N=167)  
■ Week 2 (N=156)  
■ Week 3 (N=155)  
■ Week 4 (N=166)

n = 458  
After 4 weeks :  
4,7% remained symptomatic

olv  
Top in Zang

10

### Asymptomatic & Mild COVID : summary

- 80-95% of the positive PCRs is in asymptomatic or mildly symptomatic pts
- Even asymptomatic pts can have objective pulmonary abnormalities (ground glass) – detected in up to 50%
- Symptoms and the presence of (mild) pneumonia correlate with a higher viral load (lower Ct value) and a slower clearance
- Some (5-10%) of category 1-2 pts have 'long term' (>4wks) symptoms

olv  
Top in Zang

11

### PACS/PASC or Long-COVID : what does this mean ?

Post acute covid symptoms / sequelae of covid

Acute COVID-19: SARS-CoV-2 exposure, Infectious, PCR positive, Viral resolution from quantitative tests.

Post-acute COVID-19: Subacute/ongoing COVID-19, Chronic/post-COVID-19.

Symptoms: Fatigue, Decline in quality of life, Muscle weakness, Joint pain, Dyspnea, Cough, Persistent oxygen measurement, Anxiety/depression, Sleep disturbances, PTSD, Cognitive disturbances (brain fog), Headaches, Palpitations, Chest pain, Thrombotic/embolic, Chronic kidney disease, Hair loss.

Post-acute COVID-19 syndrome  
NATURE MEDICINE | VOL 27 | APRIL 2021 | 601-615 | www.nature.com/naturemedicine

olv  
Top in Zang

12

### Focus on PACS symptom set : >50 identified

- Fatigue
- Headache
- Attention deficits
- Hair loss
- Dyspnea

*Cave : selection bias in the published reports (only people with complaints fill in the questionnaires).*

Scientific Reports | (2021) 11:16544 | https://doi.org/10.1038/s41598-021-95565-8

13

### Wat are the mechanisms of long-covid ?

Unknown, but

- Consequences from organ damage (cardio-vasc/pulmonary/nervous etc)
- Persistent reservoirs of SARS-CoV2
- Re-activation of neurotrophic pathogens (eg herpes)
- Interaction of SARS-CoV2 with the host microbiome
- Interference with the clotting system
- Defective 'shut down' of the immune system and auto-immunity

frontiers in Microbiology

14

### Risk factors for PACS – matter of debate

NATURE MEDICINE | VOL 27 | APRIL 2021 | 601-615 | www.nature.com/naturemedicine

- Severity of initial illness
- Pre-existing respiratory disease
- Higher BMI
- Older age
- Females (1 Chinese study)

*Mainly for pt with moderate-severe covid*

15

### Risk factors for PACS – matter of debate

Persistent Poor Health after COVID-19 Is Not Associated with Respiratory Complications or Initial Disease Severity  
Ann Am Thorac Soc. Vol 18, No 6, pp 997–1003, June 2021

Appointment **75d** after diagnosis  
74 (hosp) + 79 (amb) = 153 pts  
Abno chest X-ray at 6wks  
- Hospitalized pts at 6 wks: 14/74 (19%) → 12 wks (4%)  
- Ambulatory pts at 6 wks : 0/79 (0%)

6MWD and fatigue : not correlated with initial disease severity

*The interpretation of data has to be done with caution, data de suffer selection bias  
Anyway - even asymptomatic mild COVIDs can present with new or long lasting abnormalities  
reports go up to 8 months)*

16

### State of the art review

## Respiratory follow-up of patients with COVID-19 pneumonia

George PM, et al. Thorax 2020;75:1009-1016. doi:10.1136/thoraxjnl-2020-215314

Mild to moderate pneumonia – typically cared for on ward or in community\*

Discharge: Send template letter with advice to see GP for assessment if experiencing persistent, new or progressive respiratory symptoms

12 weeks after discharge - Step 1  
Pre-order Chest X-Ray - virtual clinic  
If diagnosed with PE, combine follow up Chest X-Ray with post-PE† follow up\*\*

If abnormal CXR† pre-order full PFTs†

Evidence of interstitial lung disease → High Resolution CT scan† and CTFA† Consider walk test Consider echocardiogram

Evidence of PVD† → Consider referral to specialist PVP service

If no significant ILD† or PVD† to account for any disability consider other diagnoses, manage accordingly +/- discharge

17

### Long covid or PACS : summary

- Long covid/PACS = ss >4wks after positive PCR
- Might be related to some risk factors
- Also mild COVID can (infrequently) result in PACS
- Respiratory effects are chronic dyspnea, chest pain and chronic cough
- In case of mild pneumonia → a FU X-ray is advised
- Challenge : evolving or *new (!)* pulm diseases
  - pulm embolism,
  - bronch hyperresponsiveness,
  - scarring/fibrosis/interstitial pneumonia
  - secondary infections

*Highly relevant for the SCUBA community*

18

### What does this mean for divers ?

Do asymptomatic and mild COVID represent an increased risk for barotrauma (eg due to fibrosis and bleb formation) or for arterialisation of mini-bubbles (eg due to interference with the vasculature) – this all besides the effects of a decreased exercise capacities ?

276 Diving and Hyperbaric Medicine Volume 54 No. 3 September 2020  
Diving after SARS-CoV-2 (COVID-19) infection: Fitness to dive assessment and medical guidance  
Charlotte Butler\*, Michael Aronow, Willem\*, Karen Van Heesvel\*, Jan Grooten\*, Michael Lopez\*

19

### What does this mean for divers ?

Category 0	Category 1	Category 2	Category 3
Asymptomatic COVID	Mild COVID	Moderate COVID	Severe COVID
No testing	Assess fitness to dive  X-ray Spirometry (ergometry)  !! New ss - PE - BHR - ILD - Infection		

276 Diving and Hyperbaric Medicine Volume 54 No. 3 September 2020  
Diving after SARS-CoV-2 (COVID-19) infection: Fitness to dive assessment and medical guidance  
Charlotte Butler\*, Michael Aronow, Willem\*, Karen Van Heesvel\*, Jan Grooten\*, Michael Lopez\*

Conservative viewpoint  
Not nuanced  
Not up-to-date  
Expert opinion based  
Quid recourses ?  
Compares to DAN advice

20

### What did NELOS/LIFRAS/VVW advice ?



276 Diving and Hyperbaric Medicine Volume 54 No. 3 September 2020  
Diving after SARS-CoV-2 (COVID-19) infection: Fitness to dive assessment and medical guidance  
Charlotte Butler\*, Michael Aronow, Willem\*, Karen Van Heesvel\*, Jan Grooten\*, Michael Lopez\*

- Group 1 : severe ss or diminished ex tolerance  
→ no diving at least 3 months after recovery  
→ (thorough) test fitness to dive (PFT, imaging, cardiac)
- Group 2 : mildly sick or asymptomatic and completely recovered  
→ no testing, provided all ss disappeared

GHENT UNIVERSITY o/v Top in Zorg

21

### Asymptomatic & Mild COVID : what is advisable for the diver ? Some additional nuances

ss burden	time to full recovery	FTD assessment
asymptomatic	N.A.	Not indicated
mild (minor ss)	<21-28d	Not indicated*
mild (minor ss)	>21-28d or persistent	Test !

- Nuance : 'very sick' but stayed at home is defined as 'mild' but could be considered for testing (HRCT / spirometry / cardiac) cfr NELOS/VVW
- Vigilance for chronic disease / new disease related to COVID
  - Pulm embolism
  - Secondary infection
  - Interstitial pneumonia
  - Bronchial hyperresponsiveness
  - Cardiac issues

GHENT UNIVERSITY o/v Top in Zorg

22

### Conclusions

- Asymptomatic and mild COVIDs represent the majority of the infections
- The majority of both groups have a very prosperous outcome and do not need FTD\* tests
- A minority did have short lived but more severe ss, or do develop 'long COVID'. In these reassessment FTD\* should be considered.

\* Fitness to dive (SCUBA)

GHENT UNIVERSITY o/v Top in Zorg

23