WAT ZIJN DE AUSCULTATIE BEVINDINGEN BIJ DE COVID-19 PNEUMONIE?

Best Evidence Topic Report

Title	Wat zijn de auscultatie bevindingen bij de COVID-19 pneumonie?
Report by	Smeets Toon
Search checked by	Prof. Dr. B. Aertgeerts
Clinical scenario	Sinds december 2019 wordt de wereld geteisterd door het nieuwe COVID-19 virus. Symptomatische patiënten presenteren zich meest frequent met koorts, hoest en kortademigheid i.k.v. COVID-19 pneumonie, maar wat zijn de auscultatie bevindingen bij deze virale longontsteking?
Answerable question (PICO/PIRT/PEO/…)	**PICO:** - **P**: Patiënt met bewezen COVID-19 pneumonie (of probleem:) COVID-19 pneumonie)) - **I:** Long auscultatie - **C**: Geen auscultatie, aanwezigheid van andere anamnestische kenmerken/klachten/symptomen en/of klinische tekens - **O**: Auscultatie bevindingen **PIPOH:** - **P**: Patiënt met bewezen COVID-19 pneumonie (of probleem:) COVID-19 pneumonie)) - **I**: Long Auscultatie - (**C**): Geen auscultatie, aanwezigheid van andere anamnestische kenmerken/klachten/symptomen en/of klinische tekens - **P**: Huisarts of spoedarts (1e lijnszorg) (Of health professionals active in primary care) - **O**: Auscultatie bevindingen - **H**: huisartspraktijk of ziekenhuis (Primary care practice)
Search terms	- COVID-19: cfr. infra, appendix figuur 3 - SARS: cfr. infra, appendix figuur 3
Search date	18 t.e.m. 20 maart 2020
Search outcome (number of hits)	- COVID-19: 180 artikels, gevonden in 5 databanken (Medline (MeSH, Pubmed), Embase, Cochrane Library, UpToDate, Google Scholar) - SARS: 187 artikels, gevonden in 2 databanken (Medline (MeSH, Pubmed), Google Scholar)
Relevant papers (number of final inclusions)	- COVID-19: 22 artikels werden geïncludeerd a.d.h.v. selectiecriteria (cfr. infra) - SARS: 2 artikels werden geïncludeerd a.d.h.v. selectiecriteria (cfr. infra)
Flow chart	- COVID-19: cfr. infra, appendix figuur 4 - SARS: cfr. infra, appendix figuur 5
Inclusion and exclusion criteria	Geen antwoord op PICO/geen relevante informatie (info over klinische symptomen, maar geen auscultatie bevindingen/KO; info over bloedwaarden; …), volledige tekst niet beschikbaar, niet Engelstalig artikel, beperkte evidentie, beperkte studie power.

EVIDENCE TABLES

COVID – 19

COVID-19							
Author, date and country	**Study type**	**Main risk of bias**	**Patient characteristics**	**Intervention/Index test**	**Comparator**	**Outcome**	**Key results: RR, AR, NNT, Sens/Spec, LR+/LR-, HR, OR, other**
							Abnormal lung auscultation (0 = absent; 1 = present)
Bo Wang, 28/02/2020, China	Cross-sectional, observational study	Present cross-sectional design did not allow a comprehensive characterization of the study population and final clinical outcomes. Due to the same reason, correlations between abnormal breath sounds and changes in laboratory measurements for each patient were not addressed. Also, although the assessment of the recordings was performed by physicians blinded to clinical information, the characterization of the sounds were subjective.	57 patients admitted to Wuhan Red-cross Hospital during the period form January 27 to February 12 2020, all patients with COVID-19 enrolled in this study were diagnosed according to the criteria based on WHO recommendation	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	High-quality auscultation recordings (98.8%) were obtained and coarse breath sounds, wheezes, medium-coarse crackles, fine crackles and Velcro crackles were identified. The distribution of coarse breath sounds was equivalent, while crackles occurred more frequently in basal lungs. Most cases had normal breath sounds in upper lungs, but the proportions of abnormal breath sounds increased in the basal fields where Velcro crackles were more commonly identified at the posterior chest.	1
Liu Lei, 23/02/2020, China	Case series	The sample size is small, especially in severe patients. Second, the majority of discharged patients are non-severe patients. Severe and critically ill patients often have more complications and may require longer hospital stays. Most are still in hospital. Third, there are four COVID-19 treatment centers in Chongqing, and there is still no relevant comparative analysis.	51 patiënts, admitted to the Chongqing University Three Gorges Hospital from January 20 to february 3, 2020. All of them were confirmed COVID-19 cases.	lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	16 cases (31.4%) were found to have enlarged breath sounds in both lungs, and 4 cases (7.8%) could hear moist rales in both lungs	1
Jeagyun Lim, 14/02/2020, Korea	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	54-year old male	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Clear lung sounds	0
Tianzhu Liu, 13/02/2020, Canada	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	43-year old woman; history of fever, cough, sputum production and dyspnea	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Coarse breath sounds	1
Sufang Tian, 28/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	84-year old woman	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Wheezing on the right side	1
Kai-qian Kam, 28/02/2020, Singapore	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	6-month old boy	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Clear lung sounds	0
Hussin A. Rothan, 26/02/2020, USA	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	33-year old woman; history of fever and cough	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Coarse breath sounds	1

Takeshi Arashiro, 3/02/2020, Japan	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	35-year old woman; throat dryness and slight cough	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Clear lung auscultation	0
Takeshi Arashiro, 3/02/2020, Japan	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	27-year old man; fever, sore throat and cough	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Clear lung auscultation	0
Irani Thevarajan, 16/03/2020, Australia	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	47-year old woman; lethargy, sore throat, dry cough, pleuritic chest pain, mild dyspnea en subjective fevers	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Bi-basal ronchi	1
Limin Song, 26/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	30-year old female; G5P1 admittend at 36 weeks and 3 days of het twin gestation; history of fever, cough and generalized myalgia	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Decreased breath sounds and rales	1
Le Van Cuong, 18/02/2020, Vietnam	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	25-year old woman; history of coughing, sneezing, fever and chest pain	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	No crackles or bronchi rales	1
Li-Na Ji, 16/03/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	15-year old boy; history of fever	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Breath sounds were normal	0
Li-Na Ji, 16/03/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	9-year old boy; history of diarrhea	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Physical examination was unremarkable	0
Bin Tang, 12/03/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	50-year old male; maitenance hemodialysis; history of non-productive cough	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Bilateral normal lung respiratory sounds	0
Yilin HU, 24/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	28-year old male; history of fever, rhinorrhea	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	No rale was noted in both lungs on auscultation	0
Yilin HU, 24/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	25-year old male; history of itchy throat, cough and fever	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	No dry or wet rale in both lungs	0
Yilin HU, 24/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	32-year old male; history of mild fever and cough	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Clear breathing sounds in both lungs	0

Pilailuk Okada, 27/02/2020, Thailand	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	60-year old woman; history of sore throat and headache	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	inconspicuous lung sounds	0
Ken J Goh, 2020, Singapore	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	64-year old man; history of disziness, fever and dyspnoea	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Lungs were clear to auscultation	0
Xiaotong Wang, 7/03/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	28-year old female; 30 weeks pregnant; history of fever	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Little ronchi over the left lower lung field	1
Weijong Liu, 25/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	34-year old woman (G2P0); history of fever	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Chest auscultation was normal	0
Ziang Gao, 8/03/20202, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	49-year old female; history of cough, expectoration and chest congestion	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Coarse breath sounds of both lungs with wet rales distributed at the bases of both lungs	1
Yang Li, 5/03/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	30-year old woman; pregant at 35 weeks' gestation; history of dry cough without fever, chills of shortness of breath	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Chest auscultation was slightly thicker in the right lung but not the left lung	1
Ya-Ni Duan, 12/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	46-year old woman; history of fever without chills and rigor, nasal discharge, cough and myalgia	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Normal pulmonary auscultation	0
Peikai Huang, 12/02/2020, China	Case report	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	36-year old man; history of fever, sore throat and fatigue	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	Pulmonary auscultation was normal	0

SARS

SARS							
Author, date and country	**Study type**	**Main risk of bias**	**Patient characteristics**	**Intervention/Index test**	**Comparator**	**Outcome**	**Key results: RR, AR, NNT, Sens/Spec, LR+/LR-, HR, OR, other**
							Abnormal lung auscultation (0 = absent; 1 = present)
Manocha, Sanjay, 2003, Canada	Systematic review	No mention of inclusion and exclusion criteria, no flow chart of study selection, no list of in/excluded studies, no characteristics of the individual studies	Recent case series	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	The most common physical examination finding was the presence of inspiratory crackles.	1
Lu PX, 09/2003, China	Case series	Lack of ability to generalize, no possibility to establish cause-effect relationship, danger of over-interpretation, publication bias, retrospective design, and distraction of reader when focusing on the unusual	One boy, four firls at the age 4 to 13 years	Lung auscultation	No lung auscultation, presence of other anamnestic of clinical signs	both moist and dry rales could be heard in 3 out of the 5 cases.	1 (bij 60% van de studiepopulatie (n = 5)

CONCLUSIONS OF OVERALL BODY OF EVIDENCE

COVID-19

Bij het overschouwen van de Evidence Table BestBET merken we binnen de “case reports” heterogene resultaten op. Binnen de “case reports” had 42% (n=11) van de patiënten (n=26) een afwijkende longauscultatie en 58% (n=15) van de patiënten had een “normale” longauscultatie. Bij een afwijkende longauscultatie waren de bevindingen eveneens uiteenlopend; “grove ademgeluiden”, “wheezing”, “grove crepitaties”, “(bibasale) ronchi”, “verminderd vesiculair ademgeruis (VAG)”en “vochtige ronchi”. Bijgevolg is het erg moeilijk om hier een eenduidig besluit uit te trekken. Aangezien het gaat om “case reports” is het niet mogelijk om te generaliseren, alsook bestaat er het risico op overinterpretatie, publicatie bias en ook het retospectieve design is minder gunstig. Een bijkomende limitatie is de kleine patiëntenpopulatie (n=26).

Een retrospectieve, single-center case series van Liu et al., die 51 gehospitaliseerde patiënten met bewezen COVID-19 infectie onderzocht, bevestigde eveneens de mogelijkheid van een “normale” longauscultatie (19). Bij klinisch onderzoek bij aanmelding werd bij 31,4% van de patiënten grove ademgeluiden waargenomen en bij 7,8% vochtige ronchi. Een niet te verwaarlozen fractie van de patiënten had aldus een “normale” longauscultatie.

In een cross-sectionele observationele studie van Bo Wang werden 57 patiënten tijdens hun hospitalisatie, met een bewezen COVID-19 infectie, gedurende twee weken opgevolgd (11). Wang et al. observeerden verschillende abnormale ademgeluiden; “grove ademgeluiden”, “wheezing”, “medium grove crepitaties”, “fijne crepitaties” en “velcro crepitaties”. Grove ademgeluiden waren de meest voorkomende verandering, gevolgd door fijne – en medium grove crepitaties *(cfr. Appendix: Tabel 1 en figuur 1).* Tevens concludeerden Wang et al. dat de distributie van abnormale ademgeluiden consistente kenmerken had; crepitaties kwamen vaker basaal voor, terwijl wheezing vooral apicaal werd gehoord *(cfr. Appendix: Figuur 2).* Daarnaast werd normaal ademgeruis meest frequent apicaal waargenomen en velcro crepitaties beschreef men meest frequent posterieur. Hoewel deze studie in vergelijking met de case reports meer power heeft, had ook dit onderzoek enkele limitaties. Zo geven Wang et al. zelf aan dat er

geen uitgebreide beschrijving van studie populatie en finale klinische uitkomsten was, alsook waren er geen correlaties tussen abnormale longgeluiden en laboratorium bevindingen en ontstond er bias door subjectieve interpretatie van longauscultatie (11). Zelf misten we het aantal patiënten met een “normale” longauscultatie tegenover het aantal patiënten met een “abnormale” longauscultatie.

Een belangrijke connotatie is de “setting” van bovenstaande artikels. Al deze patiënten werden immers geausculteerd in het ziekenhuis, en aldus niet bij een huisarts in de eerste lijnszorg.

SARS

Wegens de beperkte power van bovenstaande geselecteerde artikels over COVID-19 werd ook naar “indirecte evidence” gezocht. Bijgevolg zochten we ook naar de auscultatiebevindingen bij het SARS-virus.

Ondanks een uitgebreide Zoekstrategie vonden we ook bij SARS geen evidence over de diagnostische waarde (sensitiviteit, specificiteit, positief predictieve waarde en negatief predictieve waarde) van longauscultatie. Wederom vonden we, zij het gelimiteerd, enkel informatie over de auscultatiebevindingen; crepitaties, vochtige en droge ronchi. Aldus brengt deze zijsprong van COVID-19 naar de “indirecte evidence”, namelijk het SARS-virus ons helaas weinig extra informatie bij.

CLINICAL BOTTOM LINE

Door de beperkte evidence is het niet mogelijk om een eenduidig antwoord te geven op de klinische vraag “Wat zijn de auscultatie bevindingen bij de COVID-19 pneumonie?”. Aan de hand van de case reports, de case series en de cross-sectionele observationele studie durven we toch voorzichtig twee conclusies trekken. Vooreerst zal een niet te verwaarlozen fractie van de met bewezen COVID-19 infectie negatieve auscultatie bevindingen hebben. Een negatieve auscultatie sluit COVID-19 infectie aldus niet uit. Auscultatoire afwijkingen, maar ook een normale longauscultatie behoort tot de mogelijke bevindingen bij de COVID-19 pneumonie. Ten tweede zal men, naarmate men lager (meer basaal) ausculteert, meer abnormale longgeluiden waarnemen. Dit geldt zowel voor anterieure als posterieure auscultatie. Echter, nieuwe en meer kwalitatieve studies zijn nodig om meer onderbouwde conclusies te vormen.

APPENDIX

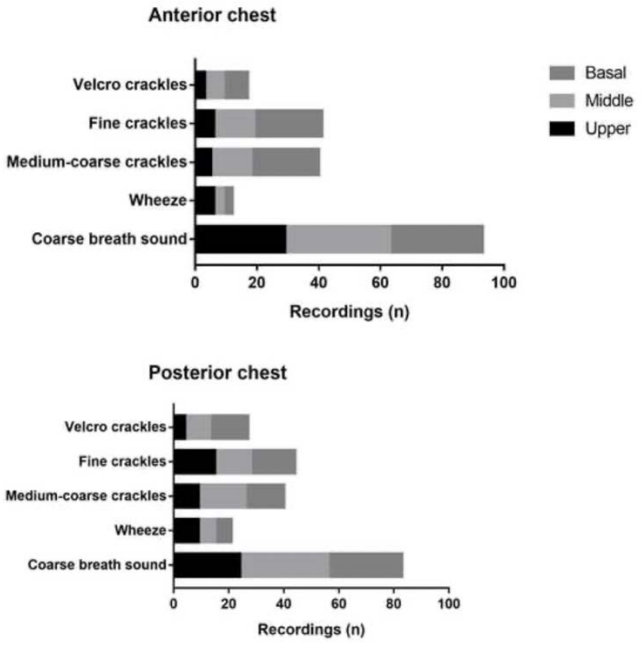
TABEL 1

Table2. Distribution of breath sounds in patients infected with COVID-19

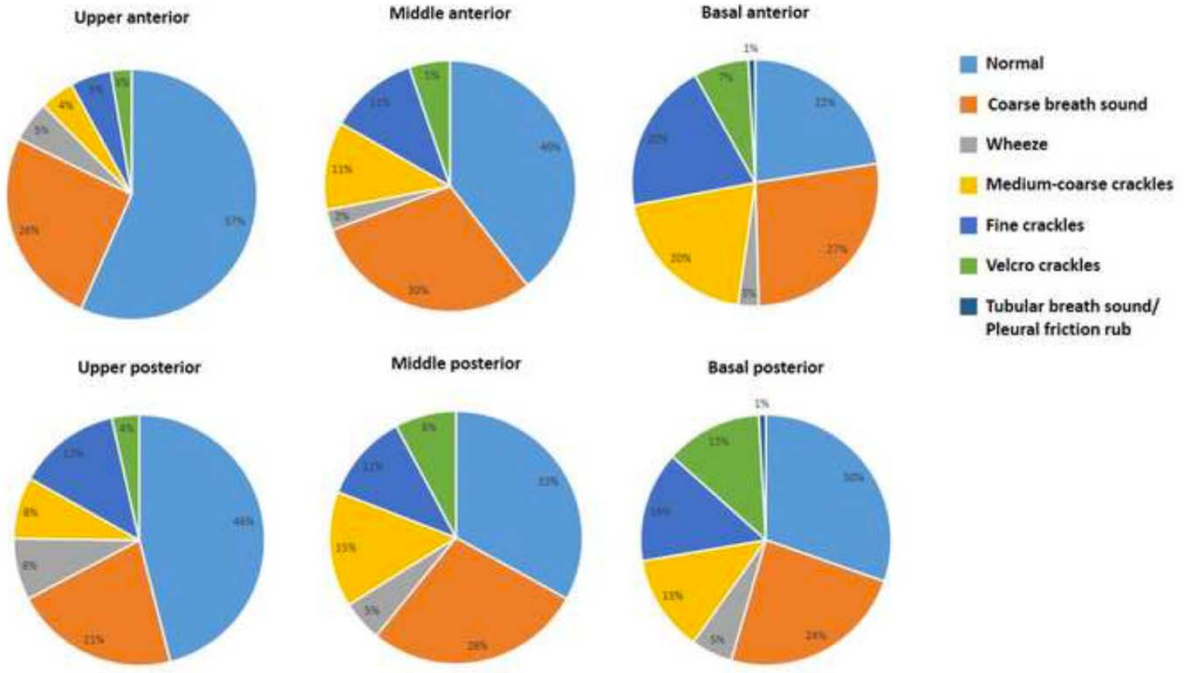
	Anterior chest						Posterior chest					
Breath sounds	**Left upper (n=57)**	**Right upper (n=56)**	**Left middle (n=57)**	**Right middle (n=57)**	**Left basal (n=57)**	**Right basal (n=54)**	**Left upper (n=57)**	**Right upper (n=56)**	**Left middle (n=57)**	**Right middle (n=56)**	**Left basal (n=56)**	**Right basal (n=56)**
Normal	33 (57.9)	31 (55.4)	22 (38.6)	23 (40.4)	12 (21)	13 (24.1)	23 (40.4)	29 (51.8)	14 (24.6)	24 (42.9)	14 (25)	20 (35.7)
Coarse breath sound	15 (26.3)	14 (25)	17 (29.8)	17 (29.8)	19 (33.3)	11 (20.4)	14 (24.6)	10 (17.9)	18 (31.6)	14 (25)	13 (23.2)	14 (25)
Tubular breath sound	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.8)	0 (0)	0 (0)	1 (1.8)	0 (0)	0 (0)	0 (0)	0 (0)
Wheeze	2 (3.5)	4 (7.1)	1 (1.8)	2 (3.5)	1 (1.8)	2 (3.7)	4 (7)	5 (8.9)	3 (5.3)	3 (5.4)	4 (7.1)	2 (3.6)
Medium-coarse crackles	2 (3.5)	3 (5.3)	7 (12.3)	6 (10.5)	9 (15.8)	13 (24.1)	4 (7)	5 (8.9)	11 (19.3)	6 (10.7)	7 (12.5)	7 (12.5)
Fine crackles	4 (7)	2 (3.6)	8 (14)	5 (8.8)	10 (17.5)	12 (22.2)	10 (17.5)	5 (8.9)	5 (8.8)	8 (14.3)	9 (16.1)	7 (12.5)
Velcro crackles	1 (1.8)	2 (3.6)	2 (3.5)	4 (7)	5 (8.8)	3 (5.6)	3 (5.3)	1 (1.8)	8 (14)	1 (1.8)	9 (16.1)	5 (8.9)
Pleural friction rub	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (1.8)

Data are presented as n (%)

FIGUUR 1



FIGUUR 2



FIGUUR 3 – ZOEKSTRATEGIE

COVID-19

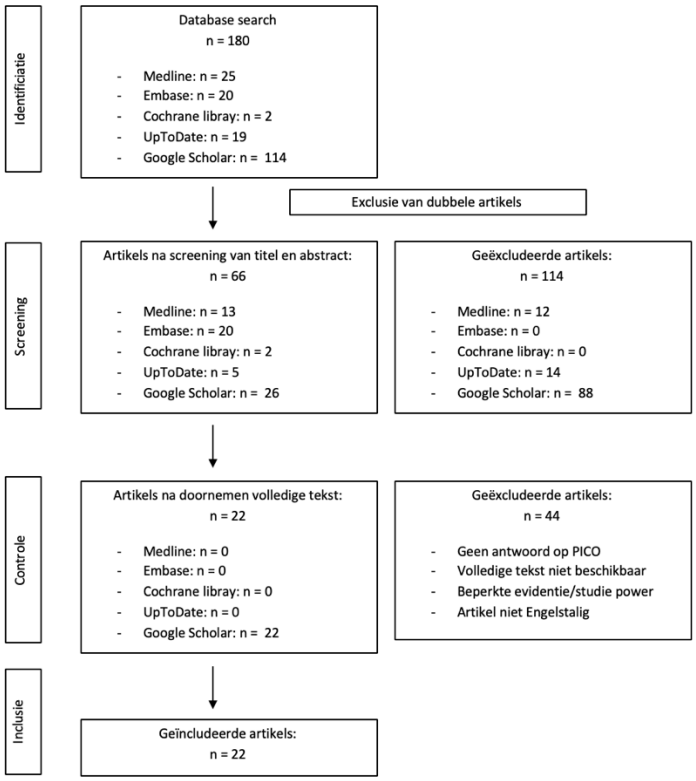
- Op “Medline” werd gezocht met de volgende zoektermen:
  - MeSH-termen: “COVID-19” AND “Auscultation”
  - MeSH-termen: “COVID-19” AND “Signs and Symptoms”
  - MeSH-termen: “COVID-19” AND “Physical examination”
  - MeSH-termen: “Severe acute respiratory syndrome coronavirus 2” AND “auscultation”
  - MeSH-termen: “Severe acute respiratory syndrome coronavirus 2” AND “Signs and Symptoms”
  - MeSH-termen: “Severe acute respiratory syndrome coronavirus 2” AND “Physical examination”
  - PubMed: “Covid-19” -> Systematic Review
- Op “Embase” werd gezocht met de volgende zoektemern:
  - “COVID-19” AND “lung auscultation”
  - “COVID-19” AND “pulmonary auscultation”
  - “COVID-19” AND “auscultation”
  - “COVID-19” AND “clinical examination”
  - “COVID-19” AND “virus pneumonia”
- In de “Cochrane Library” werd gezocht met de volgende zoektermen:
  - “COVID-19 Pulmonary auscultation”
  - “COVID-19 Lung auscultation”
  - “COVID-19 Lung sounds”
  - “COVID-19”
- Op “UpToDate” werd gezocht met de volgende zoektermen:
  - “COVID-19 lung auscultation”

  - "COVID-19"
- In "Google Scholar" werd gezocht met de volgende zoekterm:
  - "Covid-19 AND lung auscultation"

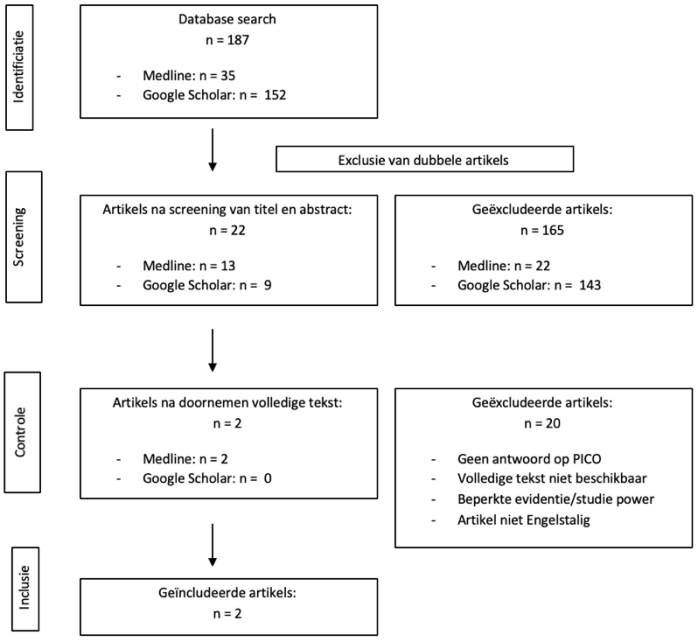
SARS

- Geen toegang tot Dynamed.
- Op "Medline" werd gezocht met de volgende zoektermen:
  - MeSH-termen: "SARS-virus" AND "Auscultation" AND "Sensitivity and Specificity"
  - MeSH-termen: "SARS-virus" AND "Auscultation"
  - MeSH-termen: "SARS-virus" AND "Signs and symptoms" AND ""Sensitivity and Specificity"
  - MeSH-termen: "SARS-virus" AND "Signs and symptoms"
  - PubMed: "SARS virus sensitivity lung-auscultation" -> Systematic review
  - PubMed: "SARS virus sensitivity lung-auscultation" -> Review
  - PubMed: "SARS virus lung auscultation"
  - PubMed: "SARS virus signs and symptoms" -> Systematic review
  - PubMed: "SARS virus signs and symptoms" -> Review
- In "Google Scholar" werd gezocht met de volgende zoekterm:
  - "SARS sensitivity/specificity lung auscultation"

FIGUUR 4 – FLOWCHART COVID-19



FIGUUR 5 – FLOWCHART SARS



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