university of groningen

University Medical Center Groningen

University of Groningen

How Typical Is the Spectrum of COVID-19 in Nursing Home Residents?

Janus, Sarah I M; Schepel, Angelique A M; Zuidema, Sytse U; de Haas, Esther C

Published in:
Journal of the American Medical Directors Association

DOI:
10.1016/j.jamda.2020.12.028

IMPORTANT NOTE: You are advised to consult the publisher's version (publisher's PDF) if you wish to cite from it. Please check the document version below.

Document Version
Publisher's PDF, also known as Version of record

Publication date:
2021

Link to publication in University of Groningen/UMCG research database

Citation for published version (APA):
Janus, S. I. M., Schepel, A. A. M., Zuidema, S. U., & de Haas, E. C. (2021). How Typical Is the Spectrum of COVID-19 in Nursing Home Residents? *Journal of the American Medical Directors Association*, *22*(3), 511-513.e3. https://doi.org/10.1016/j.jamda.2020.12.028

Copyright
Other than for strictly personal use, it is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), unless the work is under an open content license (like Creative Commons).

The publication may also be distributed here under the terms of Article 25fa of the Dutch Copyright Act, indicated by the “Taverne” license. More information can be found on the University of Groningen website: https://www.rug.nl/library/open-access/self-archiving-pure/taverne-amendment.

Take-down policy
If you believe that this document breaches copyright please contact us providing details, and we will remove access to the work immediately and investigate your claim.

Downloaded from the University of Groningen/UMCG research database (Pure): http://www.rug.nl/research/portal. For technical reasons the number of authors shown on this cover page is limited to 10 maximum.

Download date: 12-10-2022

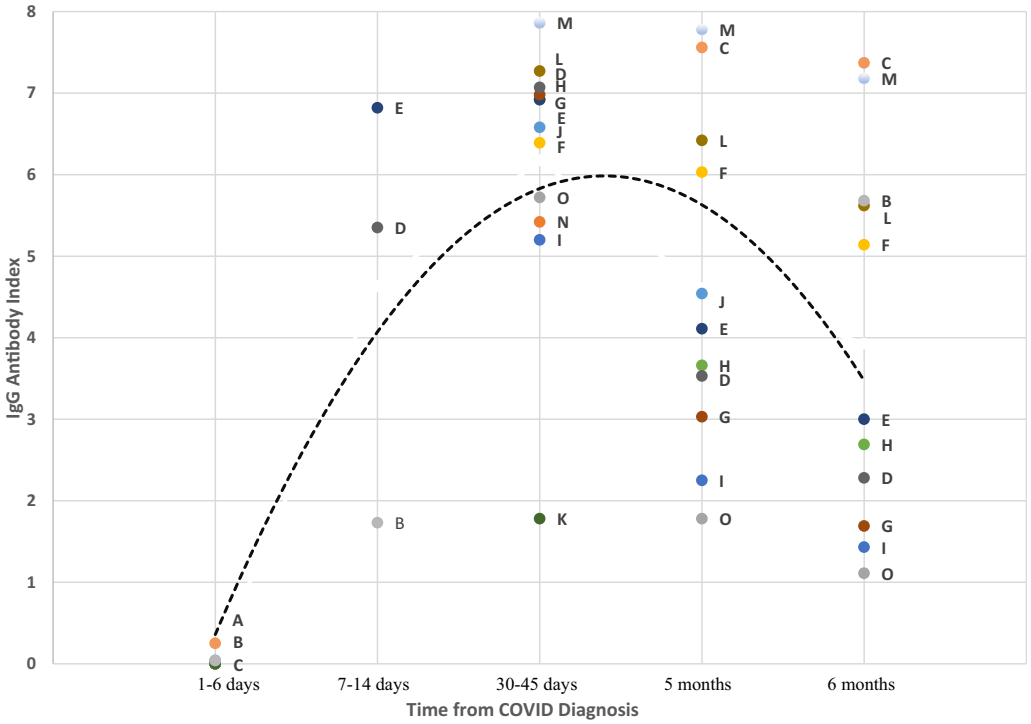

Fig. 1. Durability of SARS-CoV-2 IgG antibody response in 15 COVID-19–positive long-term care patients over 6 months. Black dashed line represents the average SARS-CoV-2 IgG antibody response. Each patient is represented by a unique colored point and letter combination across the figure. The IgG antibody index to SARS-CoV-2 is determined by comparing the chemiluminescent relative light unit (RLU) in the reaction to the calibrator RLU. The assay is an automated, 2-step immunoassay for the qualitative detection of IgG antibodies to SARS-CoV-2 in human serum and plasma using chemiluminescent microparticle immunoassay technology.

3. Isho B, Abe KT, Zuo M, et al. Persistence of serum and saliva antibody responses to SARS-CoV-2 spike antigens in COVID-19 patients. Sci Immunol 2020;5:eabe5511.
4. Iyer AS, Jones FK, Nodoushani A, et al. Persistence and decay of human antibody responses to the receptor binding domain of SARS-CoV-2 spike protein in COVID-19 patients. Sci Immunol 2020;5:eabe0367.
5. Patel MM, Thornburg NJ, Stubblefield WB, et al. Change in antibodies to SARS-CoV-2 over 60 days among health care personnel in Nashville, Tennessee. JAMA 2020;324:1781–1782.
6. Ladhani SN, Jeffery-Smith A, Patel M, et al. High prevalence of SARS-CoV-2 antibodies in care homes affected by COVID-19: Prospective cohort study, England. SSRN Electron J 2020;28:100597.
7. Graham NSN, Junghans C, McLaren R, et al. High rates of SARS-CoV-2 seropositivity in nursing home residents. J Infect 2020 [Epub ahead of print].
8. Bryan A, Pepper G, Wener MH, et al. Performance characteristics of the Abbott architect Sars-Cov-2 IgG assay and seroprevalence in Boise, Idaho. J Clin Microbiol 2020;58:e00941–20.
9. Long QX, Tang XJ, Shi QL, et al. Clinical and immunological assessment of asymptomatic SARS-CoV-2 infections. Nat Med 2020;26:1200–1204.

Marcus D. Ruopp, MD
Judith Strymish, MD
Veterans Affairs Boston Healthcare System
Boston, MA, USA

Harvard Medical School
Boston, MA, USA

Jonathan Dryjowicz-Burek, BS
Katie Creedon, MSN, APRN, NP-C
Veterans Affairs Boston Healthcare System
Boston, MA, USA

Kalpana Gupta, MD
Veterans Affairs Boston Healthcare System
Boston, MA, USA

Boston University School of Medicine
Boston, MA, USA

https://doi.org/10.1016/j.jamda.2021.01.066

How Typical is the Spectrum of COVID-19 in Nursing Home Residents?

To the Editor:

Older persons living in long-term care facilities are underrepresented in studies on the clinical spectrum of Coronavirus Disease 2019 (COVID-19), especially regarding the broad range of COVID-19 signs/symptoms and course over time. In the context of advance care planning and, in the Netherlands, older care physicians providing nursing home care, diagnostics, and optimal supportive care are mostly provided within the nursing home. In this setting, COVID-19 testing is dependent on either signaling signs/symptoms

The authors declare no conflicts of interest.
This research project was performed within the University Network of Elderly Care – UMCG, which is financially supported by the Dutch Ministry of Health, Welfare and Sport. The sponsor has had no other role in this study than offering financial support.

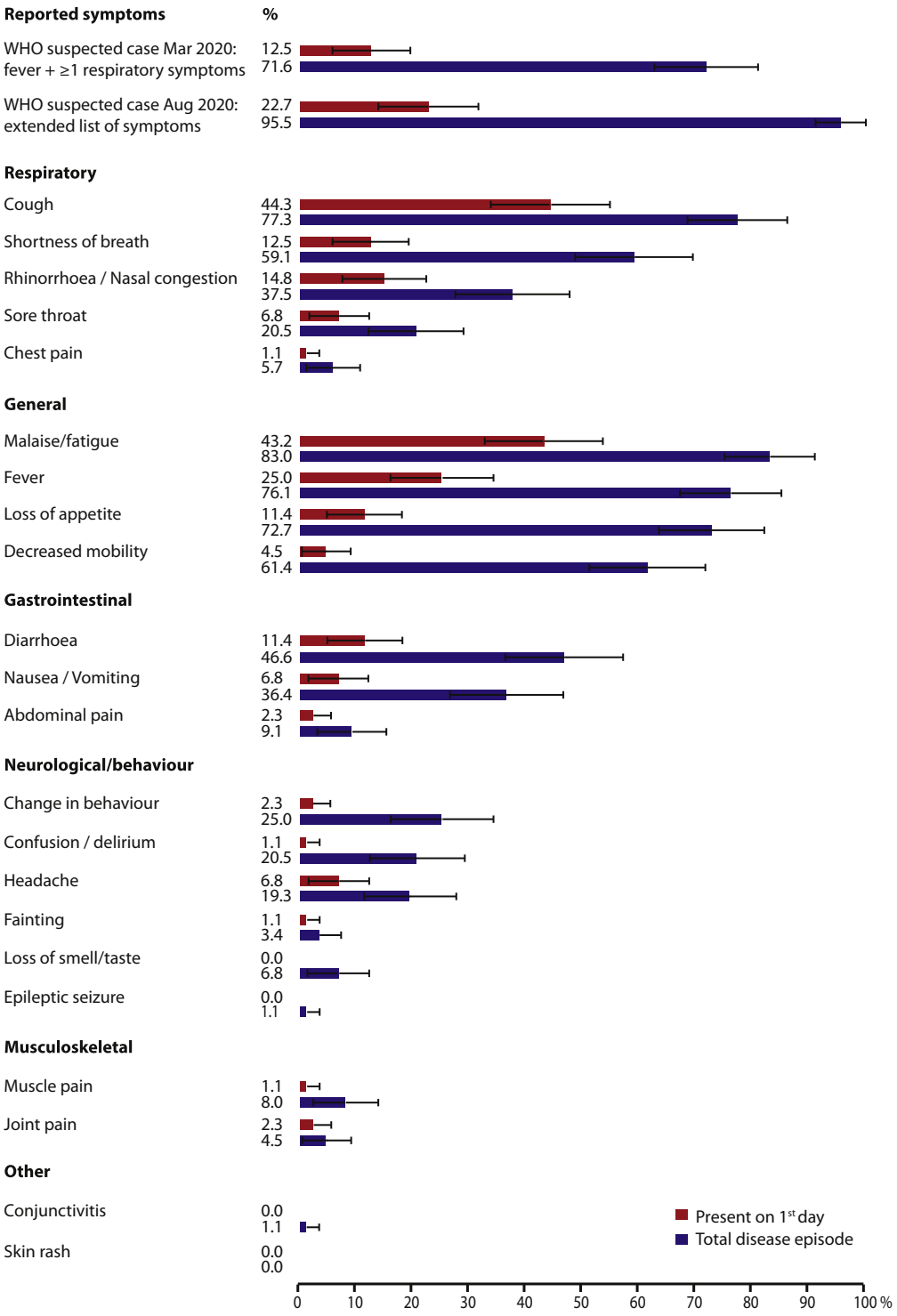

Fig. 1. Frequency of reported symptoms on the first day and over the course of COVID-19, that is, the period prevalence. The error bars represent the 95% confidence intervals.

via medical history, observation, and physical examination, or known contact with a confirmed case. However, an atypical disease presentation and course, as signaled by initial studies in hospitalized older persons, may hamper identification of COVID-19 cases.[1–3] Our aim was to gain insight into the broad spectrum of signs/symptoms, disease course, and outcome in nursing home residents with COVID-19.

Methods

We performed a retrospective cohort study among residents with confirmed COVID-19 in the period March to April 2020 at 4 long-term care organizations in the Netherlands (see Supplementary Methods). Electronic health records were searched for demographics; comorbidity; 22 signs/symptoms, including

clinical criteria of the World Health Organization (WHO) case definitions from March and August 2020;[4,5] dates on first registration; decrease in or full recovery from signs/symptoms; and disease outcome. For registered signs/symptoms, we assessed prevalence at presentation; period prevalence; and time to onset, decrease, and full recovery. We explored differences in characteristics between deceased and recovered residents.

Results

In total, 88 of 94 eligible residents were included (see Supplementary Table 1).

Spectrum of Signs/Symptoms

Fever and respiratory symptoms, especially cough and shortness of breath, were the most frequently registered signs/symptoms, at presentation as well as over the disease course. Nevertheless, only up to 63 residents [71.6%, 95% confidence interval (CI) 62.6%–81.0%] fulfilled the clinical criteria of the initial WHO case definition (March 2020). Using the current definition (August 2020), up to 84 residents (95.5%, 95% CI 91.1%–99.8%) would have fulfilled the criteria (Figure 1). Frequently reported signs/symptoms from this list are of a more general nature (up to 83.0% malaise/fatigue; 72.7% loss of appetite/decreased intake) or related to the gastrointestinal tract (46.6% diarrhea; 36.4% nausea/vomiting) or altered mental status (20.5% confusion/delirium; 25.0% behavioral change). Behavioral change includes agitation/wandering (13.6%), mood changes/anxiety (5.7%), and apathy (4.5%). In addition, 61.4% of the residents experienced reduced mobility (20.5% unstable walking and/or falling; 40.9% becoming bedridden).

Clinical Course

Cough and malaise/fatigue were mostly present at presentation, that is, after median 0 days [interquartile range (IQR) 0–4] (see Supplementary Table 2). Fever developed mostly within 1 day (IQR 0–4), peaked with median 38.7°C (IQR 38.4–39.2°C, maximum 41.6°C) after 1 day (IQR 0–5) and disappeared after 3 days (IQR 1–9). Other respiratory and general symptoms were observed after median 2 to 3 days and mostly disappeared after 2 to 3 weeks. Gastrointestinal complaints appeared to occur later, after median 4 to 5 days, and to disappear within a week.

Oxygen therapy was started in 49 (55.7%) residents after median 5 days (IQR 3–8), for a period of 9 days (IQR 1–24) and with maximum supplementation after 1.5 days (IQR 0–5). Lowest oxygen saturation during supplementation was median 89% (IQR 84–93).

Disease Outcome

At data collection 32 residents (36.4%, 95% CI 26.3%–46.4%) had died at median 10.5 days (range 6–96) after first signs/symptoms; 30 died of COVID-19 after 6 to 23 days, and 2 from general health decline afterward. Full recovery was registered in 47 (53.4%) residents after median 26 days (range 4–47) and partial recovery in 9 (10.2%) after 50 days (range 39–128) follow-up.

Several signs/symptoms were associated with death, including higher fever and lower oxygen saturations during supplementation: median 38.9°C (IQR 38.4–39.6°C) versus 38.5°C (38.2–38.8°C) and 85% (79%–88%) versus 91% (88%–93%) (see Supplementary Table 3). Male residents and residents with dementia or another chronic neurological disorder were at increased risk for 4-week mortality, with the following hazard ratios in multivariable Cox regression analysis: 2.02 (95% CI 0.93–4.40), 2.22 (95% CI 0.97–5.08), and 1.97 (95% CI 0.89–4.39).

Conclusions

Our findings underline the importance of awareness of the broad spectrum of signs/symptoms to identify nursing home residents with COVID-19. A large proportion of these residents (28.4%) did not develop fever with ≥1 respiratory symptoms, thereby not fulfilling the initial WHO case definition. The observed spectrum of signs/symptoms includes atypical symptoms and geriatric syndromes (eg, gastrointestinal symptoms, confusion/delirium, behavioral change, and decreased mobility). Therefore, the current, extended WHO case definition covers our cases better (95.5%). Because we actively searched for this broad range of signs/symptoms (at presentation as well as over the disease course), our results complement studies on symptomatology in nursing home residents.[6–9]

The observed mortality rate (36.4%) and the increased 4-week mortality risk in male residents and residents with dementia are confirmed by recently published studies.[7–9] These findings may serve as point of departure for future studies on prognostic factors.

Acknowledgments

We thank the following health professionals for their assistance in the study set-up and data collection: Coran Ongering and Michelle Nijhuis-Geerdink from TriviumMeulenbeltZorg and Wanda Rietkerk from Zorggroep Noorderboog; and the following for their assistance in data collection: Martin Ketellapper from Noorderbreedte and Christine de Boer from Meriant.

References

1. Lithander FE, Neumann S, Tenison E, et al. COVID-19 in older people: A rapid clinical review. Age Ageing 2020;49:501–515.
2. Knopp P, Miles A, Webb TE, et al. Presenting features of COVID-19 in older people: Relationships with frailty, inflammation and mortality. Eur Geriatr Med 2020;11:1089–1094.
3. Niu S, Tian S, Lou J, et al. Clinical characteristics of older patients infected with COVID-19: A descriptive study. Arch Gerontol Geriatr 2020;89:104058.
4. World Health Organization. Global surveillance for COVID-19 caused by human infection with COVID-19 virus: Interim guidance, 2020. Available at: https://apps.who.int/iris/handle/10665/331506. Accessed March 20, 2020.
5. World Health Organization. Public health surveillance for COVID-19: Interim guidance, 2020. Available at: https://apps.who.int/iris/handle/10665/333752. Accessed August 7, 2020.
6. Shi SM, Bakaev I, Chen H, et al. Risk factors, presentation and course of coronavirus disease 2019 in a large, academic long-term care facility. J Am Med Dir Assoc 2020;21:1378–1383.
7. Livingston G, Rostamipour H, Gallagher P, et al. Prevalence, management, and outcomes of SARS-CoV-2 infections in older people and those with dementia in mental health wards in London, UK: A retrospective observational study. Lancet Psychiatry 2020;7:1054–1063.
8. Rutten JJS, van Loon AM, van Kooten J, et al. Clinical suspicion of COVID-19 in nursing home residents: Symptoms and mortality risk factors. J Am Med Dir Assoc 2020;21:1791–1797.
9. Bielza R, Sanz J, Zambrana F, et al. Clinical characteristics, frailty and mortality of residents with COVID-19 in nursing homes of a region of Madrid. J Am Med Dir Assoc 2020;11:33417840.

Sarah I.M. Janus, PhD
Angelique A.M. Schepel, MD
Sytse U. Zuidema, MD, PhD
Esther C. de Haas, PhD*
Department of General Practice and Elderly Care Medicine & University Network of Elderly Care – UMCG
University of Groningen
University Medical Centre Groningen
Groningen, The Netherlands

SUPPLEMENT – To Research Letter "Clinical presentation and course of COVID-19 in nursing home residents: a retrospective cohort study"

Supplementary Methods

Study Design and Setting

We performed a retrospective cohort study in nursing home residents with COVID-19 during the first COVID-19 wave in the Netherlands (March–April 2020). Five health professionals from 4 long-term care organizations in the north and east of the Netherlands, all members of University Network of Elderly Care, collected data from electronic health records.

Exemption from full medical ethical review was received from the Medical Ethics Review Board of University Medical Centre Groningen, because the research falls outside the scope of the Dutch Medical Research with Human Subjects Law. The health professionals obtained informed consents from the residents or legal representatives if necessary and possible, in accordance with the Dutch Medical Treatment Agreement Act. The researchers had no access to health records, encryption keys, and other directly identifiable data.

Study Population

Nursing home residents were eligible if they (1) stayed at a ward for long-term stay or geriatric rehabilitation in the period March to April 2020, and (2) had confirmed COVID-19, that is, a positive reverse transcriptase–polymerase chain reaction test for severe acute respiratory syndrome coronavirus 2 on nasopharyngeal swab.

Data Collection

Participating health professionals extracted data from the electronic health records with a standardized electronic data collection form, which had been developed in collaboration.

Collected data consisted of the following: demographics (age, sex); type of stay (long-term, geriatric rehabilitation); comorbidity (chronic conditions, mobility, body mass index, actual smoking); dates and results of COVID-19 tests; date of first registered sign/symptom (ie, day of presentation); a prespecified list of 22 signs/symptoms based on the WHO case record form; dates on first registration, decrease or full recovery of signs/symptoms; related physical parameters (eg, highest body temperature, lowest oxygen saturation); received supportive care (eg, oxygen therapy); and disease outcome (hospitalization, death, partial or full recovery).

Outcomes

For each sign/symptom, the prevalence was calculated for the day of disease presentation and for the total period (ie, period prevalence). In addition, we estimated how many residents fulfilled the clinical criteria of the WHO suspected case definition: (1) the definition from March 2020, that is, fever combined with $\geq$1 respiratory symptoms (cough, shortness of breath, rhinorrhoea/nasal congestion, sore throat), and (2) the definition from August 2020, that is, either the combination of fever and cough, or $\geq$3 of the following signs/symptoms: fever, cough, general weakness/fatigue, headache, myalgia, sore throat, rhinorrhea/nasal congestion, dyspnea, anorexia/nausea/vomiting, diarrhea, altered mental status (combination of our categories confusion/delirium and behavioral change).[7]

To describe the clinical course of the disease, we estimated the rates of death and partial or full recovery, total disease duration, and for individual signs/symptoms time from presentation to onset and, if applicable, time from onset to decrease and full recovery, as noted in the health record.

Analyses

Descriptive statistics were used to describe the following: the baseline characteristics; the prevalence of signs/symptoms and the time to onset, decrease, and full recovery; and disease outcome. Categorical variables are presented with their absolute frequency and frequency in %. Continuous variables, which were not normally distributed, are presented with median and IQR or full range. Differences in baseline characteristics and signs/symptoms between deceased and recovered residents were tested with the χ^2 test for categorical variables and the Mann-Whitney *U* test for continuous variables. Subsequently, baseline characteristics that were potentially associated with time to death were tested in a Cox regression model; first in a univariable model and then combined, together with age, in a multivariable model. All analyses were performed in IBM SPSS Statistics 23 (IBM Corp, Armonk, NY).

SUPPLEMENTARY TABLES TO THE RESULTS SECTION

Supplementary Table 1
Characteristics of the Included COVID-19–Positive Nursing Home Residents (n = 88) and Disease Outcome

Characteristic	All	Recovered (Fully or Partially)	Deceased
	(n = 88)	(n = 56)	(n = 32)
Age (y), median (min. – max.)	83.5 (65 – 97)	83.5 (65 – 97)	83.5 (69 – 97)
Sex (male), n (%)*	24 (27.3)	11 (19.6)	13 (40.6)
BMI, median (min. – max.)	25.1 (17.8 – 43.5)	25.3 (17.8 – 43.5)	24.7 (20.1 – 33.4)
Obesity (BMI ≥ 30 kg/m^2), n (%)	12 (19.7)	10 (25.0)	2 (9.1)
Type of stay, n (%)			
Long-term stay	74 (84.1)	46 (82.1)	28 (87.5)
Geriatric rehabilitation	14 (15.9)	10 (17.9)	4 (12.5)
Chronic conditions, n (%)			
COPD	13 (14.8)	7 (12.5)	6 (18.8)
Asthma	3 (3.4)	2 (3.6)	1 (3.1)
Coronary heart disease	44 (50.0)	24 (42.9)	20 (62.5)
Heart failure	17 (19.3)	12 (21.4)	5 (15.6)
Stroke	20 (22.7)	13 (23.2)	7 (21.9)
Hypertension	51 (58.0)	33 (58.9)	18 (56.3)
Diabetes mellitus	20 (22.7)	13 (23.2)	7 (21.9)
Cancer, excluding nonmelanoma skin cancer	15 (17.0)	12 (21.4)	3 (9.4)
Chronic liver disease	2 (2.3)	2 (3.6)	–
Chronic kidney disease	17 (19.3)	12 (21.4)	5 (15.6)
Dementia*	50 (56.8)	27 (48.2)	23 (71.9)
Chronic neurological disorder, excluding dementia*	20 (22.7)	8 (14.3)	12 (37.5)
Current smoking (yes), n (%)†	7 (10.0)	6 (13.0)	1 (4.2)
Mobility before COVID-19, n (%)			
Bedridden	1 (1.1)	1 (1.8)	–
In wheelchair	29 (33.0)	17 (30.4)	12 (37.5)
Walking with physical help or supervision	19 (21.6)	10 (17.9)	9 (28.1)
Independent with or without mobility aid	39 (44.3)	28 (50.0)	11 (34.4)

BMI, body mass index; COPD, chronic obstructive pulmonary disease.
*Statistically significant difference between deceased residents and fully or partially recovered residents in χ^2-test ($P < .05$).
†Values based on the number of residents with available data: data are missing on body mass index for 26 residents and on smoking for 18 residents.

Supplementary Table 2
The Course of the 12 Most Frequently (≥20%) Reported Signs and Symptoms, Per Tract*

Sign/symptom	Day Start		Duration Until Decrease (d)		Duration Until Full Recovery (d)	
	n	Median (IQR)	n	Median (IQR)	n	Median (IQR)
Respiratory						
Cough	68	0 (0–4)	38	9 (2–16)	34	18 (7–26)
Shortness of breath	52	3 (1–5)	26	7 (1–12)	18	15 (5–21)
Rhinorrhea/nasal congestion	33	2 (0–9)	8	5 (1–8)	8	6 (1–15)
Sore throat	18	2 (0–7)	3	3 (–)†	4	12 (–)†
General						
Malaise/fatigue	73	0 (0–4)	34	12 (6–20)	28	17 (10–25)
Fever	67	1 (0–4)	–	Not applicable	51	3 (1–9)
Loss of appetite/decreased intake	64	3 (1–7)	28	8 (3–13)	27	13 (7–19)
Decreased mobility	54	3 (1–6)	17	12 (4–17)	11	17 (3–22)
Gastrointestinal						
Diarrhea	41	4 (1–7)	24	3 (1–13)	22	7 (1–19)
Nausea/vomiting	32	5 (2–8)	21	1 (1–12)	19	1 (1–16)
Neurological/behavior						
Change in behavior	22	3 (1–5)	10	5 (3–8)	9	8 (4–11)
Confusion/delirium	18	8 (4–10)	8	5 (3–19)	6	11 (3–24)

*The durations until decrease and full recovery of signs and symptoms are based on a smaller group of residents, because a group of residents died before decrease and/or full recovery.
†No IQR available because of the small number of observations.

Supplementary Table 3
Comparison of the 12 Most Frequently Reported Symptoms and Related Signs During the Course of COVID-19 Between Recovered and Deceased Residents

Symptoms and Signs*	Recovered (Fully or Partially) (n = 56)	Deceased (n = 32)	*P* Value†
Clinical criteria suspected COVID-19 case (WHO)	52 (92.9)	32 (100)	.12
Respiratory symptoms and signs			
Cough	47 (83.9)	21 (65.6)	.05
Shortness of breath‡	29 (51.8)	23 (71.9)	.07
Highest respiratory rate (/min), median (IQR)	28 (24–31)	33 (24–46)	.04
Lowest oxygen saturation on room air (%), median (IQR)	89 (85–93)	85 (80–89)	.01
Supplemental oxygen therapy	20 (69.0)	17 (73.9)	.70
Lowest oxygen saturation on supplemental oxygen (%), median (IQR)	91 (88–93)	85 (79–88)	.02
Rhinorrhea/nasal congestion	21 (37.5)	12 (37.5)	1.00
Sore throat	13 (23.2)	5 (15.6)	.40
General symptoms and signs			
Malaise/fatigue	43 (76.8)	30 (93.8)	.04
Fever‡	39 (69.6)	28 (87.5)	.06
Highest body temperature (°C), median (IQR)	38.5 (38.2–38.8)	38.9 (38.4–39.6)	<.01
Loss of appetite/decreased intake	32 (57.1)	32 (100.0)	<.01
Decreased mobility	24 (42.9)	30 (93.8)	<.01
Gastrointestinal symptoms			
Diarrhea	26 (46.4)	15 (46.9)	.97
Nausea/vomiting	16 (28.6)	16 (50.0)	.04
Neurological/behavioral symptoms			
Change in behavior	12 (21.4)	10 (31.3)	.31
Confusion/delirium	8 (14.3)	10 (31.3)	.06

*Variables are presented as frequencies, n (%), unless indicated otherwise.
†χ^2-test for categorical variables and Mann-Whitney *U* test for continuous variables.
‡Related variables are presented for the group of individuals with the sign/symptom concerned, that is, shortness of breath or fever.