A COVID-19 outbreak in a long-term care facility in Massachusetts: Rapidity and extent of spread, resident symptoms, and mortality

Nicholas Whitcomb¹, Maureen Monteleone, DNP², Paul Johansen, MA³, Mark Matthews, PhD⁴, Paula Aucoin, MD², Donald Burt, MD² and Winthrop Whitcomb, MD⁵

Abstract
In the spring of 2020, COVID-19 spread rapidly through a long-term care facility in Massachusetts. 74 (of 134 total) residents tested positive, with 72 testing positive in the first three weeks of the outbreak. Fatigue, anorexia, myalgia, and confusion were the most common symptoms. 21 residents (28%) testing positive subsequently died.

Keywords
Covid-19, outbreak, symptoms, mortality, long term care facility

Introduction
On March 24, 2020, a long-term care (LTC) facility in Massachusetts received its first positive COVID-19 test result. The facility immediately required staff to wear personal protective equipment, cohorted patients based on suspected or confirmed COVID-19 status, and implemented other infection control measures based on guidance from the Massachusetts Department of Public Health, the Centers for Disease Control, and Centers for Medicare and Medicaid Services (Centers for Medicare and Medicaid Services, 2020a, 2020b). Doors were closed to visitors on March 14 in accordance with state and federal recommendations. Two weeks after the first positive result, over half the residents had tested positive for COVID-19. This report describes resident and staff COVID-19 testing status and dates of positivity, resident symptoms, and mortality over the course of the outbreak.

Case report
Late on March 18, a resident presented with fatigue, anorexia, cough, and shortness of breath. Exam revealed use of accessory muscles of respiration, diminished lung sounds, oxygen saturation of 95% on 2 L of oxygen, and a temperature of 99.7°F. After a negative influenza test, the resident received a nasopharyngeal swab on March 19 to test for SARS-CoV-2 by real-time reverse-transcriptase polymerase chain reaction (RT-PCR). On March 24, the facility received a positive result. The resident remained afebrile with respiratory difficulties throughout the symptomatic period and ultimately recovered.

Methods
The Berkshire Medical Center Institutional Review Board determined this study to be exempt research.

Setting
A 145-bed LTC facility with three nursing units: LTC, post-acute short-term care, and memory care. The study period encompasses the recognized start of the outbreak defined as the date of the first positive result, March 24, to the date of clinical resolution of the final case representing the outbreak, June 18.

Laboratory testing
SARS-CoV-2 RT-PCR: A nasopharyngeal swab submitted in a viral transport tube to Quest Diagnostics Laboratory or Massachusetts State Laboratory Institute.

Corresponding author:
Winthrop Whitcomb, MD, Department of Medicine, University of Massachusetts Medical School. Worcester, MA, USA.
Email: wfwit@comcast.net
Results

Table 1. Age, sex, and testing status of residents and employees.

| Characteristic | Residents (N = 134) | Employees (N = 160) | Total (N = 294) |
|----------------|---------------------|---------------------|-----------------|
| Age (mean ± SD)| 82 ± 12.3           | 44 ± 14.1           | 61 ± 23.1       |
| Sex—no. (%)    |                     |                     |                 |
| Female         | 92 (68.7)           | n/a                 | n/a             |
| Male           | 42 (31.3)           | n/a                 | n/a             |
| RT-PCR—no. (%) |                     |                     |                 |
| Negative       | 53 (39.6)           | 134 (83.8)          | 187 (63.6)      |
| Positive       | 74 (55.2)           | 20 (12.5)           | 94 (32.0)       |
| Not tested     | 7 (5.2)             | 6 (3.8)             | 13 (4.4)        |

Table 2. Symptoms and mortality of COVID-19 residents.

| Characteristic     | Confirmed COVID-19 residents (N = 74) |
|--------------------|---------------------------------------|
| Symptomatic—no. (%)|                                       |
| No                 | 28 (37.8)                             |
| Yes                | 46 (62.2)                             |
| Fatigue            | 30 (41.1)                             |
| Anorexia           | 18 (24.3)                             |
| Myalgia            | 13 (17.6)                             |
| Confusion          | 11 (15.0)                             |
| Cough              | 9 (12.2)                              |
| Fever ≥100.3 °F    | 8 (11.0)                              |
| Headache           | 7 (10.1)                              |
| Increased tremor   | 5 (7.1)                               |
| Sore throat        | 5 (7.1)                               |
| Shortness of breath| 4 (5.5)                               |
| Died—no. (%)       |                                       |
| No                 | 53 (71.6)                             |
| Yes                | 21 (28.4)                             |

Data collection

Residents were included in the study if they resided in the facility at the start of the outbreak. Employees were included if they were employed by the facility at any point during the study period. Subsequent retrospective medical record review was completed for residents meeting inclusion criteria. We recorded resident age, sex, RT-PCR test date and results, symptoms, and survival status. Age and RT-PCR test results were also recorded for employees meeting inclusion criteria. The RT-PCR testing data collected represent a combination of individual and surveillance testing. Individual tests were conducted throughout the study period on the basis of clinical judgment for symptomatic residents. On April 6 and May 22, surveillance testing of all residents was performed. Employees were surveillance tested on April 15 and May 22.

Discussion

This report of a COVID-19 outbreak demonstrates the rapidity, extent of spread, and mortality among residents of an LTC facility. Within the first 19 days of the outbreak, 72 of the 74 resident cases were identified. 28% of infected residents died. Potential factors contributing to rapid spread include limited availability and narrow criteria for testing, pre-/ asymptomatic spread, and prolonged turnaround time of test results (CDC, 2020a; Kimball et al., 2020). On March 16, three days before the index case was tested, symptoms appeared in several residents displaying poor oral intake, confusion, weakness, body aches, syncope, falls, sore throat, and headache. None of these residents met testing criteria, so no tests were administered (CDC, 2020a). In addition, best practices for isolating and cohorting residents and for limiting staff-resident exposure were not yet well-established, leading to the potential for spread (CDC, 2020b, 2020c).

While the percentage of employees with COVID-19 was comparatively small (12.5%), we include their test results here to illuminate disease prevalence in this group. Previous research has demonstrated a link between community spread and LTC resident mortality (Barnette et al., 2020). The first positive COVID-19 case in Massachusetts was confirmed on March 7 in a community-dwelling individual in the same county as the LTC facility studied here (Allen et al., 2020). While analysis of community spread is outside the report’s scope, it was felt initial introduction of the virus into the facility by an employee is likely.

This investigation is the first we are aware of reporting symptoms of LTC residents with COVID-19. Previously identified common signs and symptoms in the general population include fever, cough, and shortness of breath (Zhu et al., 2020). In this study, fatigue, anorexia, myalgia,
and confusion were observed more frequently than the aforementioned common symptoms. It is possible that COVID-19 manifests differently in the elderly (Ward et al., 2020). Such disease features of COVID-19 in geriatric populations have implications for evaluation, for example, modifying testing criteria; and for treatment, for example, managing anorexia with IV fluids or addressing confusion with medication deprescribing. Further research with structured symptom scoring in LTC facilities might add to the current state of knowledge.

The study had several limitations. Limited availability of testing and the imperfect performance of the tests presented difficulties in depicting the exact dynamics and rapidity of the disease spread. The study relied on retrospective record review, so symptoms may have been under- or misreported, especially for residents with cognitive impairment. The focus was narrow; thus comorbidities, other patient-level factors, and mechanisms of spread into and within the facility were not analyzed.

Declaration of conflicting interests
The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding
The author(s) received no financial support for the research, authorship, and/or publication of this article.

ORCID iD
Paula Aucoin https://orcid.org/0000-0002-7335-6193

References
Allen E, Hohler B, Swidley N (2020, May 30). The virus’s tale. Boston Globe, https://apps.bostonglobe.com/metro/graphics/2020/05/coronavirus-tale/ (accessed September 2, 2020).

Barnett ML, Hu L, Martin T, et al. (2020) Mortality, admissions, and patient census at SNFs in 3 US cities during the Covid-19 pandemic. Journal of the American Medical Association 324: 507–509.

CDC (2020a) Evaluating and Testing Persons for Coronavirus Disease 2019 (COVID-19). Atlanta, GA: US Department of Health and Human Services, CDC. https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-criteria.html (accessed 13 September 2020).

CDC (2020b). Infection Control: Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2): Interim Infection Prevention and Control Recommendations for Patients with Suspected or Confirmed Coronavirus Disease 2019 (COVID-19) in Healthcare Settings. Atlanta, GA: US Department of Health and Human Services, CDC. https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html (accessed September 13, 2020).

CDC (2020c) Preparing for Covid-19 in Nursing Homes. Atlanta, GA: US Department of Health and Human Services, CDC. https://www.cdc.gov/ coronavirus/2019-ncov/hcp/long-term-care.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhealthcare-facilities%2Fprevent-spread-in-long-term-care-facilities.html (accessed 13 September 2020).

Centers for Medicare and Medicaid Services (2020a) Press Release. CMS Announces New Measures to Protect Nursing Home Residents from COVID-19. Washington, DC: US Department of Health and Human Services, Centers for Medicare and & Medicaid Services. https://www.cms.gov/newsroom/press-releases/cms-announces-new-measures-protect-nursing-home-residents-covid-19 (accessed 13 September 2020).

Centers for Medicare and Medicaid Services (2020b) COVID-19 Long-Term Care Facility Guidance. Washington, DC: US Department of Health and Human Services, Centers for Medicare and Medicaid Services. https://www.cms.gov/files/document/4220-covid-19-long-term-care-facility-guidance.pdf (accessed 13 September 2020).

Kimball A, Hatfield KM, Arons M, et al. (2020) Asymptomatic and presymptomatic SARS-CoV-2 infections in residents of a long-term care skilled nursing facility - King County, Washington. MMWR. Morbidity and Mortality Weekly Report 69(13): 377–381.

Ward CF, Figiel GS and McDonald WM (2020) Altered mental status as a novel clinical presentation for Covid-19 infection in the elderly. The American Journal of Geriatric Psychiatry 28(8): 808–811.

Zhu N, Zhang D, Wang W, et al. (2019) A novel coronavirus from patients with pneumonia in China, 2019. The New England Journal of Medicine 382: 727–733.