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Discharge characteristics and care transitions of hospitalized patients with COVID-19

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ABSTRACT
Little is known about the follow-up healthcare needs of patients hospitalized with coronavirus disease 2019 (COVID-19) after hospital discharge. Due to the unique circumstances of providing transitional care in a pandemic, post-discharge providers must adapt to specific needs and limitations identified for the care of COVID-19 patients. In this study, we conducted a retrospective chart review of all hospitalized COVID-19 patients discharged from an Emory Healthcare Hospital in Atlanta, GA from March 26 to April 21, 2020 to characterize their post-discharge care plans. A total of 310 patients were included in the study (median age 58, range: 23–99; 51.0% female; 69.0% African American). The most common presenting comorbidities were hypertension (200, 64.5%), obesity (BMI ≥ 30) (138, 44.5%), and diabetes mellitus (112, 36.1%). The median length of hospitalization was 5 days (range: 0–33). Sixty-seven patients (21.6%) were admitted to the intensive care unit and 42 patients (13.5%) received invasive mechanical ventilation. The most common complications recorded at discharge were electrolyte abnormalities (124, 40.0%), acute kidney injury (86, 27.7%) and sepsis (55, 17.7%). The majority of patients were discharged directly home (281, 90.6%). Seventy-five patients (24.2%) required any home service including home health and home oxygen therapy. The most common follow-up need was an appointment with a primary care provider (258, 83.2%). Twenty-four patients (7.7%) had one or more visit to an ED after discharge and 16 patients (5.2%) were readmitted. To our knowledge, this is the first large study to report on post-discharge medical care for COVID-19 patients.

1. Introduction
Coronavirus disease 2019 (COVID-19) was officially declared a worldwide pandemic by the World Health Organization on March 11, 2020. As of October 25, there have been over 8.5 million cases and 220,000 deaths in the United States (US) alone, with a cumulative hospitalization rate of 193.7 per 100,000 persons. While the clinical characteristics and short-term outcomes of hospitalized patients with COVID-19 are well described in the literature, there have been little data published on the healthcare needs of these individuals after discharge. Patients who are discharged from the hospital often require follow-up for new conditions diagnosed during admission and for monitoring of the care plan formulated by the discharging hospital team. In light of ongoing isolation requirements, lack of in-person healthcare services, and scaled-down clinic schedules, COVID-19 patients may represent a population with unique post-discharge needs.

Post-discharge care for patients after acute-care hospitalization comprises a wide range of medical providers and caregivers and involves in-person and remote monitoring. Recommendations for care are determined by the discharging care team, with goals including rehabilitation and recovery, prevention of readmission, and monitoring of newly diagnosed or chronic conditions that may become unstable due to the hospitalization. In order to anticipate the specific needs of COVID-19 patients after hospital discharge and coordinate their post-discharge care with primary care providers (PCPs), it is necessary to describe the profiles of these individuals.

In this study, we describe the demographics, baseline comorbidities, hospital course, and post-discharge care plans of patients with COVID-19 discharged from hospitals within an academic healthcare system in Atlanta, Georgia.
2. Material and methods

Retrospective chart review was conducted for all patients at one of four Emory Healthcare affiliated hospitals using the electronic medical record (PowerChart; Cerner). The following inclusion criteria were applied: confirmed infection with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by polymerase chain reaction (PCR) testing or ICD-10 code for COVID-19 and discharged from the hospital between March 26 to April 21, 2020. Patients were predominantly admitted to general medicine services; however, all patients with confirmed COVID-19, regardless of admitting service, were reviewed. The following patients were excluded: (1) patients who died during their index hospital stay, (2) patients admitted for unrelated reasons and incidentally tested (at provider discretion) for COVID-19, (3) patients discharged to home for end-of-life care with no additional post-discharge needs, and (4) patients who were transferred from Emory to an outside facility for continued hospitalization.

Data were collected on patient demographics, baseline health status, hospital course, and outcomes (emergency department [ED] visits, readmissions, death, and hospice). Data from the hospital course included length of stay, treatments received, provider-documented complications, ongoing symptoms at discharge, new medications at discharge, and post-discharge needs (isolation requirements, oxygen therapy, home health, and follow-up referrals). These data were manually collected from physician discharge notes, discharge medication reconciliation, case management and registered nurse (RN) notes at time of discharge, and post-hospital transition care management (TCM) RN notes (standardized for all patients with COVID-19 discharged after April 13, 2020 within Emory Healthcare). Patients were stratified into groups for analysis based on 30 day outcomes following discharge: those with no ED visits or hospital readmission(s), those who returned to the ED with final disposition to home or facility (not admitted), and those who were readmitted to the hospital. Outcomes were determined to be COVID-19 related (either with ongoing symptoms or secondary complications) or non-COVID-19 related based on the ED and inpatient teams' assessments. Deaths and hospice placement were identified using documentation during readmission or follow-up TCM notes, respectively. Outcomes were limited to events that occurred at an Emory facility or with specific documentation in the Emory medical record of a visit at an outside hospital. Transfers from one in-system hospital to another were merged and considered a single visit. Data were analyzed using descriptive statistics in Excel.

This study was conducted as a primary care-based transitional care management quality improvement initiative and met criteria for determination of non-human subject research by the Emory University Institutional Review Board.

3. Results

3.1. Patient characteristics

A total of 385 patients diagnosed with COVID-19 and hospitalized at an Emory facility over the study period were reviewed. Of these, 10 were hospitalized for unrelated reasons and incidentally tested positive for COVID-19. Four patients were discharged formally on end-of-life care, five patients were transferred to an outside facility for continued hospitalization, and 56 patients died during their index hospital stay for a mortality rate of 14.5%. The remaining 310 patients met inclusion criteria and were included in data analysis. Complete data were available on all patients except one who left against medical advice on hospital day one. Analysis was stratified into four groups: (1) all patients who survived to discharge, (2) patients with no ED visit or readmission after discharge, (3) patients with ED treat and release after discharge, and (4) patients who were readmitted.

All patient characteristics are summarized in Table 1. Of the 310 patients included, 284 (91.6%) had no ED visit or readmission, 10 (3.2%) had an ED treat and release visit, and 16 (5.2%) were readmitted. The median age was 58 (range: 23–99), 158 patients (51.0%) were female, and the majority (214, 69.0%) were African American. The most common comorbid conditions were hypertension (200, 64.5%), obesity (BMI≥30) (138, 44.5%), and diabetes mellitus (112, 36.1%). Of the 16 readmitted patients, seven (43.8%) were female and 14 (87.5%) were African American. The most common comorbidities in this cohort were hypertension (9, 56.3%), chronic kidney disease (8, 50.0%), obesity (BMI≥30) (7, 43.8%), diabetes mellitus (7, 43.8%), and immunosuppression (3, 18.8%). Of all patients, 126 (40.6%) had private insurance, 113 (36.5%) had Medicare, 13 (4.2%) had Medicaid, 21 (6.8%) were uninsured, and 37 (11.9%) had miscellaneous or unknown coverage.

3.2. Hospital course

Hospital course for all cohorts is summarized in Table 2. The median length of hospitalization for all patients was five days (range: 0–99). The majority of patients (224, 72.3%) received any duration of antibiotic therapy prior to discharge and 216 patients (69.7%) received new

Table 1
Baseline characteristics of patients with COVID-19 who survived to discharge.

| Demographics | All patients | Patients with no ED visits or readmissions | Patients with ED treat and release | Patients readmitted |
|--------------|-------------|------------------------------------------|-----------------------------------|------------------|
| No. (%)      |             |                                          |                                   |                  |
| Total no.    | 310         | 284                                      | 10                                | 16               |
| Median age (range), years | 58 (23–99) | 58 (23–99)                               | 70 (35–84)                        | 51 (24–88)       |
| Sex          |             |                                          |                                   |                  |
| Female       | 158 (51)    | 146 (51.4)                               | 5 (50)                            | 7 (43.8)         |
| Male         | 152 (49)    | 138 (48.6)                               | 5 (50)                            | 9 (56.3)         |
| Race/ethnicity |          |                                          |                                   |                  |
| African American | 214 (69)  | 191 (67.3)                               | 9 (90)                            | 14 (87.5)        |
| White        | 57 (18.4)   | 55 (19.4)                                | 1 (10)                            | 1 (6.3)          |
| Hispanic     | 12 (3.9)    | 12 (4.2)                                 | 0 (0)                             | 0 (0)            |
| Other        | 27 (8.7)    | 26 (9.1)                                 | 0 (0)                             | 1 (6.3)          |
| Comorbid conditions |         |                                          |                                   |                  |
| Hypertension | 200 (64.5)  | 184 (64.8)                               | 7 (70)                            | 9 (56.3)         |
| Obesity (BMI≥30) | 138 (44.5) | 127 (44.7)                               | 4 (40)                            | 7 (43.8)         |
| Diabetes mellitus | 112 (36.1) | 101 (35.6)                               | 4 (40)                            | 7 (43.8)         |
| Chronic kidney disease | 58 (18.7) | 50 (17.6)                                | 0 (0)                             | 8 (50)           |
| Asthma       | 39 (12.6)   | 37 (12.3)                                | 0 (0)                             | 2 (12.5)         |
| Tobacco use (active) | 31 (10)   | 28 (9.9)                                 | 1 (10)                            | 2 (12.5)         |
| Heart failure | 28 (9.0)    | 26 (9.2)                                 | 1 (10)                            | 1 (6.3)          |
| Coronary artery disease | 25 (8.1) | 24 (8.5)                                 | 1 (10)                            | 0 (0)            |
| Cerebral vascular disease | 19 (6.1) | 18 (6.3)                                 | 1 (10)                            | 0 (0)            |
| COPD         | 16 (5.2)    | 14 (4.9)                                 | 1 (10)                            | 1 (6.3)          |
| Alcohol abuse (active) | 16 (5.2) | 15 (5.3)                                 | 0 (0)                             | 1 (6.3)          |
| Immunosuppression | 12 (3.8) | 9 (3.2)                                  | 0 (0)                             | 3 (18.8)         |
| Cancer (active) | 12 (3.9)  | 10 (3.5)                                 | 1 (10)                            | 1 (6.3)          |
| ADL dependent | 5 (1.6)    | 5 (1.8)                                  | 0 (0)                             | 0 (0)            |
| Other high risk | 8 (2.6)    | 7 (2.5)                                  | 0 (0)                             | 1 (6.3)          |
| No. of comorbid conditions |         |                                          |                                   |                  |
| None         | 22 (7.1)    | 19 (6.7)                                 | 1 (10)                            | 2 (12.5)         |
| 1            | 74 (23.9)   | 69 (24.3)                                | 2 (20)                            | 3 (18.8)         |
| 2            | 88 (28.4)   | 83 (29.2)                                | 2 (20)                            | 3 (18.8)         |
| 3            | 66 (21.3)   | 60 (21.1)                                | 4 (40)                            | 2 (12.5)         |
| ≥3           | 60 (19.4)   | 53 (18.7)                                | 1 (10)                            | 6 (37.5)         |
| Median (range) no. of comorbid conditions | 2 (0–7)    | 2 (0–7)                                  | 2.5 (0–4)                        | 2.5 (0–5)        |
| Baseline oxygen needs |         |                                          |                                   |                  |
| Prior oxygen therapy | 5 (1.6)    | 5 (1.8)                                  | 0 (0)                             | 0 (0)            |

Abbreviations: BMI, body mass index; COPD, chronic obstructive pulmonary disease; ADL, activities of daily living.
Seventy-five patients (24.2%) required any home service at discharge, with four (1.3%) patients (1.3%) were discharged to a Georgia Department of Public Health quarantine facility. Nine patients (2.9%) experienced placement issues including difficulty with SNF admissions and inability to return to independent living facilities due to COVID-19-status, with four (1.3%) resulting in prolonged hospitalization to finish a 14-day quarantine. Seventy-five patients (24.2%) required any home service at discharge, including physical or occupational therapy (42, 13.5%), nursing (16, 5.2%), case management (3, 1.0%), and social work (2, 0.6%).

### Table 2
Hospital course of patients with COVID-19 who survived to discharge.

| No. (%) | All patients survived to discharge | Patients with no ED visits or readmissions | Patients with ED treat and release | Patients readmitted |
|---------|-----------------------------------|------------------------------------------|-----------------------------------|--------------------|
| Total no. | 310 | 284 | 10 | 16 |
| Hospital course | | | | |
| Median (range) length of stay, days | 5 (0–33) | 5 (0–29) | 6 (2–17) | 6 (2–33) |
| Treatment | | | | |
| Antibiotics | 224 (72.3) | 205 (72.2) | 7 (70) | 12 (75) |
| New oxygen therapy | 216 (69.7) | 198 (69.7) | 7 (70) | 11 (68.8) |
| Hydrosolucortoquine | 81 (26.1) | 73 (25.7) | 1 (10) | 7 (43.8) |
| Remdesivir | 39 (12.6) | 35 (12.3) | 3 (30) | 1 (6.3) |
| Other experimental treatment | 7 (2.3) | 6 (2.1) | 1 (10) | 0 (0) |
| Complications | | | | |
| ICU | 67 (21.6) | 64 (22.5) | 1 (10) | 2 (12.5) |
| Intubation | 42 (13.5) | 39 (13.7) | 0 (0) | 3 (18.8) |
| Sepsis | 55 (17.7) | 51 (18) | 2 (20) | 0 (0) |
| Renal Electrolyte abnormalities | 124 (40) | 117 (41.2) | 3 (30) | 4 (25) |
| ATR | 86 (27.7) | 77 (27.2) | 3 (30) | 6 (37.5) |
| Cardiac | | | | |
| Atrial arrhythmia | 15 (4.8) | 15 (5.3) | 0 (0) | 0 (0) |
| Ventricular arrhythmia | 5 (1.6) | 5 (1.8) | 0 (0) | 0 (0) |
| Heart failure | 1 (0.3) | 1 (0.4) | 0 (0) | 0 (0) |
| Acute coronary syndrome | 1 (0.3) | 1 (0.4) | 0 (0) | 0 (0) |
| Neurologic | | | | |
| Delirium | 27 (8.7) | 24 (8.5) | 0 (0) | 3 (18.8) |
| CVA | 3 (0.9) | 3 (1.1) | 0 (0) | 0 (0) |
| Seizure | 1 (0.3) | 1 (0.4) | 0 (0) | 0 (0) |
| Infection | | | | |
| UTI | 16 (5.2) | 14 (4.9) | 1 (10) | 1 (6.3) |
| Wound | 4 (1.3) | 3 (1.1) | 0 (0) | 1 (6.3) |
| C. diff | 2 (0.6) | 2 (0.7) | 0 (0) | 0 (0) |
| Flu | 1 (0.3) | 1 (0.4) | 0 (0) | 0 (0) |
| DVT/PE | 8 (2.6) | 7 (2.5) | 1 (10) | 0 (0) |

Abbreviations: ICU, intensive care unit; ATR, acute kidney injury; CVA, cerebral vascular accident; UTI, urinary tract infection; C. diff, Clostridium difficile infection; flu, influenza virus infection; DVT, deep vein thrombosis; PE, pulmonary embolus.

### Table 3
Post-discharge needs of patients with COVID-19 who survived to discharge.

| No. (%) | All patients survived to discharge | Patients with no ED visits or readmissions | Patients with ED treat and release | Patients readmitted |
|---------|-----------------------------------|------------------------------------------|-----------------------------------|--------------------|
| Total no. | 310 | 284 | 10 | 16 |
| Hospital course | | | | |
| Median age (range), years | 74 (40–99) | 75 (40–99) | NA | 66 (66–66) |
| Treatment | | | | |
| Any home service | | | | |
| Pathage | 4 (1.3) | 4 (1.3) | 0 (0) | 0 (0) |
| Placement issues | 9 (2.9) | 7 (2.5) | 2 (20) | 0 (0) |
| Unstable housing | 5 (1.6) | 5 (1.8) | 0 (0) | 0 (0) |
| AMA | 1 (0.3) | 1 (0.4) | 0 (0) | 0 (0) |
| Home health and home oxygen therapy | | | | |
| No of home health services required | | | | |
| 1 | 55 (17.7) | 49 (17.3) | 1 (10) | 5 (31.3) |
| 2 | 16 (5.2) | 15 (5.3) | 1 (10) | 0 (0) |
| 3 | 4 (1.3) | 4 (1.4) | 0 (0) | 0 (0) |
| Median age (range), years | 64 (27–96) | 64 (27–96) | 75.5 | 61 (44–88) |

Recommended Follow-Up appointments
- Primary care appointment: 258 (83.2) 241 (84.9) 8 (80) 9 (56.3)
- PCP: 217 (70) 199 (70.1) 7 (70) 11 (68.8)
- Specialist appointment: 90 (29) 80 (28.2) 3 (30) 7 (43.8)

Isolation instructions
- Isolation duration: 225 (72.6) 208 (73.2) 6 (60) 11 (68.8)
- Isolation specified: 56 (18.1) 55 (19.4) 0 (0) 1 (6.3)
- Median (range) days isolation remaining: 14 (3–14) 14 (3–14) NA 7 (7–7)

### 3.3 Post-discharge healthcare needs

Post-discharge needs are summarized in Table 3. The majority of patients (281, 90.6%) were discharged directly home. Twenty-five patients (8.1%) were discharged to a skilled nursing facility (SNF) and four patients (1.3%) were discharged to a Georgia Department of Public Health quarantine facility. Nine patients (2.9%) experienced placement issues including difficulty with SNF admissions and inability to return to independent living facilities due to COVID-19-status, with four (1.3%) resulting in prolonged hospitalization to finish a 14-day quarantine. Seventy-five patients (24.2%) required any home service at discharge, including physical or occupational therapy (42, 13.5%), nursing (16, 5.2%), case management (3, 1.0%), and social work (2, 0.6%).
started on new medications to manage new severe kidney disease or antidiabetic medications (n = 1.6 (SD: 1.0) per patient, most commonly, antihypertensives (n = 2.5)). Due to Emory Healthcare COVID-19 algorithms, a high number were discharged on antibiotics (n = 52), and antipyretics (acetaminophen, n = 64). Due to Emory Healthcare COVID-19 algorithms, a high number were discharged on short-term anticoagulation (n = 21) and several on short-term statin for anti-inflammatory properties (n = 6). We observed a relatively small number discharged on antibiotics (n = 32). Seventy-two patients (23.2%) went home with new long-term medications, with an average of 1.6 (SD: 1.0) per patient, most commonly, antihypertensives (n = 46) and antidiabetic medications (n = 10). Small numbers of patients were started on new medications to manage new severe kidney disease or vascular events. Two hundred thirteen patients (68.7%) were documented to have at least one ongoing symptom at discharge with the most common being cough and shortness of breath (138 patients, 44.5%, and 137 patients, 44.2% respectively).

Table 3 (continued)

| No. (%) |
|------------------------|
| All patients survived to discharge | Patients with no ED visits or readmissions | Patients with ED treat and release | Patients readmitted |
| Weakness | 24 (7.7) | 20 (7) | 2 (20) | 2 (12.5) |
| Diarrhea | 23 (7.4) | 21 (7.4) | 2 (20) | 0 (0) |
| Fever | 16 (5.2) | 13 (4.6) | 1 (10) | 2 (12.5) |
| Headache | 15 (4.2) | 12 (4.2) | 0 (0) | 1 (12.5) |
| Loss of taste/smell | 11 (3.5) | 10 (3.5) | 0 (0) | 1 (12.5) |
| Myalgia | 10 (3.2) | 9 (3.2) | 0 (0) | 1 (12.5) |
| Chest pain/tightness | 9 (2.9) | 5 (1.8) | 0 (0) | 4 (25) |
| Total (≥3 symptom) | 213 (68.7) | 194 (68.3) | 10 (100) | 9 (56.3) |

Abbreviations: DPH, department of public health; AMA, against medical advice; PT, physical therapy; OT, occupational therapy; SD, standard deviation; SOB, shortness of breath.

4. Discussion

To our knowledge, this is the first cohort study aimed at describing transitions of care and post-discharge anticipatory guidance for ambulatory providers caring for COVID-19 patients. The majority were African American and 51.0% were female, both of which are consistent with the published report of COVID-19 cases from the state of Georgia. Our study demonstrates a greater proportion of females than other reports. Age and presenting comorbidities were consistent with other cohorts of hospitalized COVID-19 patients documented in the literature. Hospital course, including rates of ICU admission, AKI, and treatments received were similar to other reports. The readmission rate of 5.2% observed in our study is within the range of other reports.]

Table 4

| Post-discharge outcomes of patients with COVID-19 who survived to discharge |
|------------------------|
| No. (%) |
| ED visits |
| Total | 24 (7.7) |
| 1 visit | 20 (6.5) |
| 2 visits | 3 (1) |
| 3 visits | 1 (0.3) |
| COVID-related | 13 (54.2) |
| Median (range) days to 1st visit | 7.5 (0–28) |
| Readmissions |
| Total | 16 (5.2) |
| 1 readmission | 15 (4.8) |
| 2 readmissions | 1 (0.3) |
| COVID-related | 11 (68.8) |
| Pneumonia | 4 (1.3) |
| Sepsis | 3 (1) |
| Subjective dyspnea | 2 (0.6) |
| Pleurisy | 2 (0.6) |
| Median (range) days to 1st readmission | 7 (2–28) |
| Deaths post-discharge | 2 (0.6) |
| Hospice post-discharge | 1 (0.3) |

Abbreviations: ED, emergency department; COVID, coronavirus disease 2019.

a. Outcomes measured for 30-days post discharge that occurred at an Emory facility or with specific documentation in the medical record of an event that occurred at an outside facility.

b. COVID-relatability determined by ED or readmitting team’s clinical assessment documented in the medical record.
determine the number of new long-term prescriptions that represented a resumption of home medication or substitution for all patients (e.g. calcium channel blocker replacing other antihypertensive due to AKI or electrolyte abnormality). The new or altered medications recorded at discharge require reconciliation and monitoring, usually coordinated by the PCP.

4.2. Follow-up Services Needed and the Role of Telemedicine

Although most patients were instructed to follow-up with a PCP, a service typically provided within one or two weeks under current care transition payment models introduced by Centers for Medicare & Medicaid Services, three-quarters of patients were also instructed to continue isolation at home and only one-quarter had a PCP appointment scheduled prior to discharge. Additionally, 93 patients did not have a PCP identified at discharge, which is an important care gap to address when many offices are not open to new patients due to the pandemic. The isolation recommendations concurrent with the lack of scheduled follow-up care in a setting where clinics are being scaled back for social distancing may result in an increased burden on the patient. Fifty-two patients in our cohort were told to receive follow-up bloodwork or radiology after discharge, yet the majority of these services were not ordered at discharge and therefore require PCP involvement in order to be completed. Telemedicine, recently authorized by many insurers for patients in home isolation, was specifically recommended for follow-up of one-quarter of patients and is a potential solution for care that does not require in-person service. However, this does not address laboratory monitoring, which requires in-person contact. During isolation, phlebotomy may be provided by home health or specific laboratory facilities (e.g. within a respiratory clinic). Clear guidelines for discontinuation of isolation and “return to medical facilities” are needed to plan outpatient laboratory or radiology testing for post-discharge patients. These pathways, if not clarified, will increase demands on the patient in the context of already elevated psychosocial stress due to the pandemic. As an example, despite high rate of electrolyte abnormalities and AKI during hospitalization, only 31 patients were instructed to obtain follow-up bloodwork. Laboratory monitoring of renal function based on degree of AKI and renal recovery is an important area of consideration and follow-up for patients in isolation can be implemented with streamlined guidance for home health nurses in coordination with the PCP.

4.3. Home health and skilled nursing facility requirements

It has been previously recognized that many patients hospitalized with COVID-19 will require post-acute care. Inpatient rehabilitation facilities may not be capable of handling unpredictable volumes of patients with convalescent COVID-19 due to limited occupancy and changing infection-control measures, placing increased demands on hospital-at-home models. Post-acute care needs for our cohort, including placement in SNF and need for in-home services were overall lower than prior reports for community acquired pneumonia (CAP) with a higher proportion of home health (relative to SNF), which is expected based on a younger population and documented difficulty with SNF placement for our patients. Furthermore, patient preference to avoid SNF placement (due to restrictive visitor policies or other aspects unique to the pandemic) may have led to underutilization during the study period. For home health needs, a significant number of patients had new oxygen requirements at discharge and required two or more services. While the majority of patients in our cohort who required inpatient skilled services were admitted to SNF, a few were denied access due to COVID-19-status resulting in a prolonged hospital stay or home health services instead. A prior study of Medicare beneficiaries has shown an association of home health utilization with higher rates of readmission raising concerns about access to SNF services when recommended but not available in the setting of this pandemic. Utilization of inpatient beds for patients who cannot get admitted to SNF is also taxing an already overwhelmed medical system attempting to treat acute patients.

4.4. Readmission and emergency department visits

Despite a high prevalence of ongoing symptoms, post-discharge needs, and limited scheduling of appointments at the time of discharge in our cohort, the rates of ED visits and readmissions within our system were relatively low (7.7% and 5.2%, respectively). Our data may underestimate the actual number due to the limitation of the dataset to our network of hospitals and the non-integrated nature of the U.S. healthcare system. There were two deaths upon readmission and one post-discharge transition to hospice documented in the group. Despite low readmission rates, the scale of the global pandemic will inevitably create a high volume of COVID-19 patient discharges and, therefore, high absolute cases of readmission. Transitions of care interventions following hospitalization are intended to reduce ED visits and readmissions, and it is well documented that lapses in post-discharge care may contribute to complications. Studies in CAP have demonstrated a benefit to specific post-hospital care interventions such as telephone calls. We are not aware of any studies evaluating post-hospitalization care management specific to COVID-19 and further research is needed. Given the uncertainties regarding access to outpatient services in the setting of this pandemic as well as anticipated loss or change of insurance, patients who are discharged after COVID-19 hospitalization may benefit from streamlined transitions of care practices. Healthcare systems should study programs including nursing care management, standardized isolation instructions, and protocols for scheduling follow-up provider, phlebotomy, or radiology appointments. Telemedicine and remote monitoring programs may be utilized to provide virtual post-discharge needs.

4.5. Limitations

This study has several limitations. First, it was retrospective and conducted at a single academic center. This limits generalizability, as COVID-19 outbreaks have significant regional and temporal variation. We also are limited to the Emory-specific electronic medical record and therefore post-discharge visits and complications that occurred at outside facilities may have been missed. Second, with relatively low numbers of adverse outcomes, we are unable to assess risk factors for post-discharge complications. Further studies with larger sample sizes and integrated systems are needed to evaluate risk factors for ED visits and readmission after discharge in patients with COVID-19. Third, due to the nature of chart review, there is possible underreporting of symptoms at the time of discharge as well as other elements that are not mandatory in documentation such as the availability of a caregiver. Finally, because COVID-19 represents a novel disease for which the long-term care and recovery are not yet known, we cannot assess the actual need for post-discharge care, but instead used the recommended care by discharging providers as a surrogate for actual healthcare needs.

5. Conclusions

In a single center retrospective review of post-discharge care transition requirements of hospitalized patients with COVID-19, we have demonstrated that patients have significant recommended post-discharge care in the outpatient setting. There are specific transitions of care that must be anticipated and addressed by healthcare systems and the primary care community including post-hospital visits, home health supervision, monitoring of medications, discontinuation of isolation, and follow-up laboratory and radiology needs. In the context of increased psychosocial stress related to the pandemic and navigating an already complex medical system under duress, healthcare systems and patients may benefit from streamlined COVID-19 specific transitions.
of care practices.

Author contributions

Leah Loerinc and James O’Keefe had full access to all the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

- Leah Loerinc: conceptualization, data curation, formal analysis, methodology, writing – original draft, review & editing
- Amy Sheel: data curation, writing – review & editing
- Sean Evans: data curation, writing – review & editing
- Julie Shabto: data curation, writing – review & editing
- Ghazala O’Keefe: conceptualization, writing – original draft, review & editing
- James O’Keefe: conceptualization, data curation, formal analysis, methodology, supervision, writing – original draft, review & editing

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Declaration of competing interest

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