A Survey of Provider-Reported Use and Perceived Effectiveness of Medications for Symptom Management in Telemedicine and Outpatient Visits for Mild COVID-19

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ABSTRACT

Introduction: Many patients with mild coronavirus disease 2019 (COVID-19) have symptoms requiring acute and follow-up care. The aims of this study were to assess (1) provider-reported use of medications and their perceived effectiveness and (2) degree of difficulty managing specific symptoms at episodic COVID-19 care sites and in a longitudinal monitoring program. *Methods*: We sent an online survey to physicians, advanced practice providers, and registered nurses redeployed to COVID-19 care sites at an academic medical center from March to May 2020. We asked about the use of medications and perceived effectiveness of medications to treat symptoms of COVID-19 and the perceived challenge of symptom management. Comparison was made by provider type (episodic or longitudinal site of care).

Results: Responses from 64 providers were included. The most frequently used medications were acetaminophen (87.1% of respondents), benzonatate (83.9%), and albuterol metered dose inhalers (MDI) (80.6%). Therapies for lower respiratory tract symptoms were reported as more commonly used by longitudinal follow-up providers compared to episodic providers including guaifenesin (90.6% vs 60.0%, $p = 0.007$), benzonatate (93.8% vs 73.3%, $p = 0.04$), nebulized albuterol for patients with asthma (75.0% vs 43.3%, $p = 0.019$), and albuterol MDIs for patients without asthma (90.6% vs 66.7%, $p = 0.029$). Medications found to have the highest perceived efficacy by respondents using the therapy ($> 80\%$ reporting "very efficacious") included albuterol, acetaminophen for fever, non-sedating antihistamines, nasal steroid spray, and non-steroidal anti-inflammatory drugs (NSAIDs) for myalgia, arthralgia, or headache. Lower respiratory symptoms and anxiety were rated as the most challenging symptoms to manage.

Conclusions: Providers reported that clinical care of mild COVID-19 with medications in common use for other respiratory infections is effective, both at episodic care and longitudinal sites of care, but that specific symptoms are still challenging to manage.

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Key Summary Points

Why carry out this study?

Coronavirus disease 2019 (COVID-19) has required a new paradigm in the outpatient management of viral pneumonia through telemedicine and in-person encounters.

Treatment guidelines have focused on inpatient pharmacotherapy and not on outpatient symptom management despite high numbers of patients requesting advice.

This study asked if providers assigned to COVID-19 sites (March–May 2020) found specific therapies beneficial for patient symptoms and if the perceived benefit differed by the site of care (episodic providers versus longitudinal providers who called patients until symptoms improved).

What was learned from the study?

Many therapies used for nonspecific acute respiratory infections are perceived as beneficial by medical providers for the respiratory and systemic symptoms of COVID-19.

Longitudinal providers who call patients until symptom resolution report higher use of medications for lower respiratory tract symptoms and high perceived efficacy of antitussives and inhaled albuterol, findings which merit future investigation.

DIGITAL FEATURES

This article is published with digital features, including a summary slide, to facilitate understanding of the article. To view digital features for this article go to https://doi.org/10.6084/m9.figshare.14160761.

INTRODUCTION

In March 2020, healthcare systems in the USA rapidly shifted care structures to treat large numbers of patients with coronavirus disease 2019 (COVID-19) [1]. Early clinical guidelines addressed the supportive care of hospitalized patients [2, 3] and subsequent treatment guidelines [4, 5] have evolved with evidence about specific therapies in this patient population. While many patients require inpatient care, most patients are well enough to receive care at home for a broad range of symptoms [2]. Few therapeutic options exist for the outpatient management of COVID-19 and considerable variation in treatment guidelines and clinical practice have been reported [1, 6, 7].

For ambulatory patients with COVID-19, our institution created a telemedicine virtual outpatient management clinic (VOMC) and an in-person acute respiratory clinic (ARC). The purpose of this study was to assess healthcare provider perceptions regarding the care of ambulatory patients with COVID-19 as supported by institutional guidelines. The specific objectives of this study were (1) to characterize perceptions of difficulty in the outpatient management of symptoms associated with COVID-19, (2) to characterize the perceived efficacy of therapeutic agents used in symptom management, and (3) to assess the impact of provider care experience (episodic or longitudinal care) on these perceptions. At our center, lower respiratory tract symptoms were the longest-lasting symptoms [8] and most common reason for hospitalization (unpublished data). Therefore, we theorized that lower respiratory symptoms and associated therapies would be perceived as more difficult to manage and less effective, respectively, by survey respondents providing longitudinal care to patients with COVID-19.

METHODS

Setting

The study was conducted at the COVID-19 outpatient sites (VOMC and ARC) at Emory Healthcare, the largest academic health system in Georgia including four acute care hospitals and 120 primary care locations. The VOMC was a telemedicine clinic staffed by primary care physicians and advanced practice providers (APPs), available to any patient at home with acute COVID-19 [8, 9]. The VOMC care included an intake visit (synchronous audio/video) for initial triage and symptom advice followed by regular phone calls by a "follow-up" longitudinal team of APPs and registered nurses (RNs) until improvement (Fig. 1). A typical duration of follow-up was 19 days from symptom onset [8]. Patients requiring in-person evaluation for confirmed or possible COVID-19 (including VOMC patients) could schedule a visit at the ARC site, staffed by primary care and infectious disease physicians [10] (Fig. 1). During the study period, the majority of patients seen in VOMC and ARC were tested for COVID-19 at two outpatient testing sites (one clinic and one drive-through), with a smaller proportion tested in the emergency departments. At the time of survey administration, 560 patients had been cared for by the VOMC and 473 patients had been seen in the ARC.

To standardize care at these outpatient sites, clinical guidelines summarizing the available data and protocols from journals, medical societies, and institutions were created (see supplementary material). Since limited resources for COVID-19 symptom management were available [11, 12], the institutional guidelines included recommendations for management of
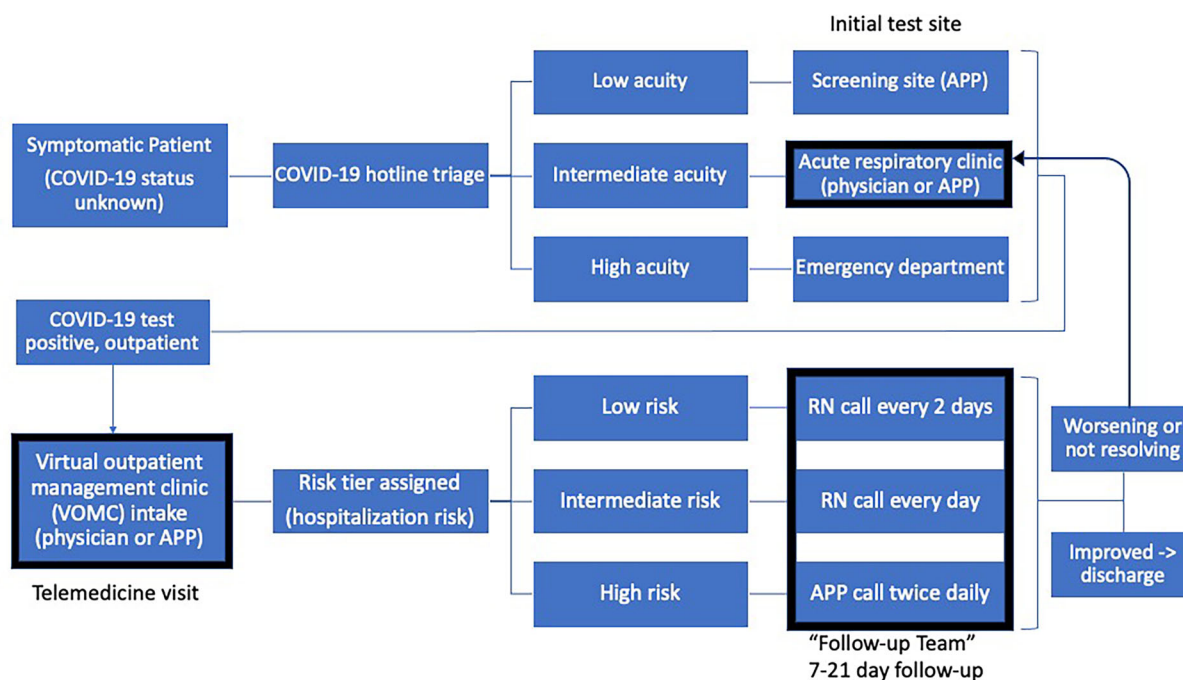

Fig. 1 Flowchart illustrating patient flow through outpatient COVID-19 care sites. Boxes in bold indicate the practice sites of the providers included in the survey including the ARC, VOMC telemedicine intake, and VOMC RN follow-up. Bold arrow indicates patient flow between the outpatient care sites. Not pictured: PCPs may refer patients with known COVID-19 to either the ARC in-person evaluation or VOMC for telemedicine intake. *APP* advanced practice provider, *ARC* acute respiratory clinic, *COVID-19* coronavirus disease 2019, *PCP* primary care physician, *RN* registered nurse, *VOMC* virtual outpatient management clinic

nonspecific systemic, upper respiratory, and lower respiratory tract symptoms. We disseminated the guideline document at our institution's COVID-19 care sites and posted it to a national physician resource [11].

This study was conducted as a quality improvement initiative and met criteria for determination of non-human subject research by the Emory University Institutional Review Board (IRB).

Survey Design

A survey was created to assess healthcare provider perceptions of the outpatient management of patients with COVID-19. A total of 21 symptoms and 19 therapeutic agents were assessed using multiple choice, free-response, and open-ended questions. The symptom-based survey questions included systemic, upper respiratory, lower respiratory, gastrointestinal, and other non-specific symptoms associated with COVID-19. Systemic symptoms were defined as fever, dizziness, fatigue, muscle aches, and joint pain. Upper respiratory symptoms were defined as sore throat, runny nose, postnasal drip, and nasal or sinus congestion or pain. Lower respiratory symptoms included shortness of breath at rest, shortness of breath on exertion, chest pressure, chest pain, and cough. Abdominal symptoms were defined as loss of appetite, nausea, diarrhea, and abdominal pain. Therapeutic-based survey questions assessed the perceived efficacy of medication and non-medication therapies for the management of systemic, upper respiratory, and lower respiratory symptoms in addition to sleep and anxiety. One open-ended question asked survey respondents to identify effective therapies used in the management of COVID-19-related symptoms to ensure the survey was comprehensive in the list of therapeutic agents provided. The survey was administered via SurveyMonkey (SurveyMonkey, Inc., San Mateo, California) from May 24, 2020 to June 4, 2020. Participants were identified from COVID-19 outpatient provider staff lists and were invited to complete the survey by email, with two additional reminder emails.

To assess the impact of patient care experience on perceptions, survey respondents were categorized as providing episodic or longitudinal care. Telemedicine VOMC intake providers and acute respiratory clinic providers were categorized as providing episodic care (single visit care). VOMC follow-up providers who contacted patients by telephone on a recurring basis for symptom management were categorized as longitudinal care providers. As the two licensed practical nurses (LPNs) in the study did not have a predefined care role, their responses were excluded from the symptom-based and therapeutic-based analyses.

Statistical Analysis

We computed descriptive statistics including inferential means, proportions, and standard deviations. We used multiple tests (Pearson chi-square and likelihood ratio) to compare data between provider groups (episodic vs longitudinal) and between provider license types (physician, APP, RN), between symptom categories, and to compare perceived difficulty of symptoms with perceived effectiveness of treatments. We applied a significance level $p < 0.05$ and performed analyses using IBM Statistical Package for the Social Sciences (SPSS, Armonk, NY).

RESULTS

A total of 106 healthcare providers (42 physicians, 34 APPs, and 28 RNs, 2 LPNs) were invited to participate in the study, 64 (60.4%) of which completed the survey. Table 1 provides demographics of the survey respondents; 52 respondents (81.3%) indicated that they read the institutional guidelines. Among the 18 physician respondents, nine (50%) indicated that they had seen 25 or more patients for COVID-19, while the other half reported seeing 1–25 patients.

The use of medications for the management of COVID-19-related symptoms by providers of episodic care and longitudinal care is described in Table 2. Over 80% of respondents indicated they used acetaminophen, benzonatate, and

Table 1 Demographics of healthcare providers and supporting personnel responding to survey about COVID-19 outpatient treatment ($n = 64$)

Characteristics	*n* (% respondents)
Professional role	
MD	18 (28.1)
APP	23 (35.9)
RN	20 (31.3)
LPN	2 (3.1)
Not reported	1 (1.6)
Practice specialty	
Primary care	28 (43.8)
Medical specialty	13 (20.3)
Surgical specialty	11 (17.2)
Other	7 (10.9)
Not reported	5 (7.8)
Location of care[a]	
ARC	21 (32.8)
VOMC	45 (70.3)
Screening site	10 (15.6)
Patient number	
0–50 patients	32 (50.0)
51–100 patients	12 (18.8)
> 100 patients	18 (28.1)
Not reported	2 (3.1)

APP advanced practice provider, *ARC* acute respiratory clinic, *LPN* licensed practical nurse, *MD* medical doctor, *RN* registered nurse, *VOMC* virtual outpatient management clinic

[a] Healthcare providers could practice in multiple locations

albuterol metered dose inhalers (MDI) for the management of COVID-19-related symptoms. Systemic symptoms were most commonly managed with acetaminophen. The management of upper respiratory symptoms was similar across both groups except for non-steroidal anti-inflammatory drug (NSAID) therapy, which was more likely to be used by episodic care providers for sinus pain (50.0% vs 21.9%, $p = 0.033$). Antitussive use was common across all survey respondents; however, guaifenesin and benzonatate use were more common in the longitudinal provider group compared to the episodic group (90.6% vs 60.0%, $p = 0.007$ and 93.8% vs 73.3%, $p = 0.04$, respectively). The majority of respondents reported use of albuterol for management of shortness of breath. Albuterol MDIs were used similarly in both provider groups in patients with a history of asthma. However, significantly more longitudinal care providers reported use of albuterol MDI in patients without a history of asthma ($p = 0.029$). Nebulized albuterol was also more commonly used by longitudinal care providers ($p = 0.019$). When medication use was analyzed by healthcare license type, no significant differences were found with the exception of honey for cough [$n = 5$ (27.8%), $n = 19$ (82.6%), and $n = 10$ (50.0%), for physician, APP, and RN, respectively; $p = 0.002$].

Perceived efficacy of therapeutic agents used in the management of COVID-19-related symptoms is described in Table 3. Albuterol, acetaminophen, non-sedating antihistamines, nasal steroid spray, and NSAIDs were perceived as very efficacious by 80% or more of survey respondents. Guaifenesin and nasal saline lavage were perceived as more effective by longitudinal care providers compared to those encountering patients episodically ($p = 0.011$ and $p = 0.024$, respectively).

Lower respiratory symptoms (such as shortness of breath and cough) in addition to anxiety were rated as most challenging to manage (Table 4). No significant differences ($p = 0.17–1.00$ across 21 symptoms) were found between provider groups in symptoms perceived as very challenging. When grouped into symptom categories, there were no significant differences ($p = 0.29–1.00$ across 4 systems) between provider groups in perceived difficulty of symptom management.

Responses to the open-ended question in the survey did not identify any additional medications used by more than one provider that were missing from the survey of therapeutics. The highest frequency medications reported for

Table 2 Therapy use and site of COVID-19 care

COVID-19-related symptoms	Therapy	All respondents (n = 62) n (%)	Episodic care[a] (n = 30) n (%)	Longitudinal care[b] (n = 32) n (%)	Chi-square test p value
Systemic					
Fever	Acetaminophen	54 (87.1)	24 (80.0)	30 (93.8)	0.14
	NSAIDs	24 (38.7)	15 (50.0)	9 (28.1)	0.12
Headache	Acetaminophen	54 (87.1)	24 (80.0)	30 (93.8)	0.14
	NSAIDs	30 (48.4)	17 (56.7)	13 (40.6)	0.31
	Fioricet	13 (21.0)	7 (23.3)	6 (18.8)	0.76
Myalgia, arthralgia	Acetaminophen	50 (80.6)	22 (73.3)	28 (87.5)	0.21
	NSAIDs	25 (40.3)	16 (53.3)	9 (28.1)	0.07
Upper respiratory					
Nasal or sinus pain	Acetaminophen	43 (69.4)	19 (63.3)	24 (75.0)	0.41
	NSAIDs	22 (35.5)	15 (50.0)	7 (21.9)	0.03*
Runny nose, postnasal drip	Nasal saline spray	44 (71.0)	21 (70.0)	23 (71.9)	1.00
	Nasal saline lavage	28 (45.2)	15 (50.0)	13 (40.6)	0.61
	Nasal steroid spray (no allergic rhinitis)	38 (61.3)	19 (63.3)	19 (59.4)	0.80
	Nasal steroid spray (history of allergic rhinitis)	41 (66.1)	20 (66.7)	21 (65.6)	1.00
	Non-sedating antihistamine (no history of allergic rhinitis)	47 (75.8)	20 (66.7)	27 (84.4)	0.14
	Non-sedating antihistamine (history of allergic rhinitis)	45 (72.6)	21 (70.0)	24 (75.0)	0.78
	Decongestant	40 (64.5)	19 (63.3)	21 (65.6)	1.00
	Sedating antihistamine	29 (46.8)	13 (43.3)	16 (50.0)	0.62
Lower respiratory					
Cough	Honey	33 (53.2)	12 (40.0)	21 (65.6)	0.07
	Dextromethorphan	46 (74.2)	21 (70.0)	25 (78.1)	0.57
	Guaifenesin	47 (75.8)	18 (60.0)	29 (90.6)	0.007*
	Benzonatate	52 (83.9)	22 (73.3)	30 (93.8)	0.04*
	Codeine, hydrocodone	31 (50.0)	15 (50.0)	16 (50.0)	1.00
	OTC lozenge	39 (62.9)	15 (50.0)	24 (75.0)	0.07

Table 2 continued

COVID-19-related symptoms	Therapy	All respondents (n = 62) n (%)	Episodic care[a] (n = 30) n (%)	Longitudinal care[b] (n = 32) n (%)	Chi-square test p value
Shortness of breath	Albuterol MDI (asthma history)	50 (80.6)	21 (70.0)	29 (90.6)	0.06
	Albuterol nebulized (asthma history)	37 (59.7)	13 (43.3)	24 (75.0)	0.02*
	Albuterol MDI (no asthma history)	49 (79.0)	20 (66.7)	29 (90.6)	0.03*
Other					
Sleep	Sedating antihistamine	31 (50.0)	16 (53.3)	15 (46.9)	0.80
	Melatonin	27 (43.5)	12 (40.0)	15 (46.9)	0.62
	Hypnotic	10 (16.1)	6 (20.0)	4 (12.5)	0.50
Anxiety	Benzodiazepines	12 (19.4)	6 (20.0)	6 (18.8)	1.00
Various	Systemic steroids	23 (37.1)	10 (33.3)	13 (40.6)	0.61

COVID-19 coronavirus disease 2019, *MDI* metered-dose inhaler, *NSAIDs* non-steroidal anti-inflammatory drugs, *OTC* over-the-counter

[a] Episodic care providers saw patients with COVID-19 for single visits by telemedicine or in-person

[b] Longitudinal care providers called patients regularly over time until symptom improvement

*Significant, $p < 0.05$

fever, cough, and shortness of breath were acetaminophen, benzonatate, and albuterol, respectively. Only two medications were reported by more than one respondent for an indication that we did not query in the structured portion of the survey: (1) guaifenesin for nasal or sinus congestion and (2) albuterol for cough. Additional responses by single providers included inhaled fluticasone and budesonide/formoterol, both used for cough.

DISCUSSION

Frequency of Use

To our knowledge, this is the first survey to explore the therapies used in the home management of COVID-19 as well as the perceived challenge of treating specific symptoms. As expected, we found high use of medications indicated for the treatment of upper respiratory infections, such as acetaminophen for fever and over-the-counter (OTC) antitussives for cough. The high level of albuterol use was remarkable, because this was not a first-line medication in our clinical guideline except for patients with history of asthma or obstructive lung disease. Reports of albuterol shortages in the USA during the first wave of the pandemic suggested that this agent was being used for COVID-19 management [13].

Interestingly, some additional therapies were perceived as very effective, but were used less frequently than other therapies. NSAIDs, for example, were considered effective by survey respondents for body aches and headaches but were subject to scrutiny early in the pandemic

Table 3 Therapies perceived as moderately or very effective in management of COVID-19-related symptoms and site of COVID-19-related patient care

	All respondents n (%)	Episodic care[a] n (%)	Longitudinal care[b] n (%)	p value
Albuterol MDI (history of asthma) (n = 50)	47 (94.0)	18 (85.7)	29 (100.0)	0.07
Acetaminophen for fever (n = 54)	50 (92.6)	21 (87.5)	29 (96.7)	0.31
Non-sedating antihistamine (no history of allergic rhinitis) (n = 47)	33 (89.2)	13 (65.0)	20 (74.1)	0.54
Albuterol, nebulized (history of asthma) (n = 37)	31 (83.8)	9 (69.2)	22 (91.7)	0.16
Nasal steroid spray (history of allergic rhinitis) (n = 41)	34 (82.9)	16 (80.0)	18 (85.7)	0.70
Albuterol MDI (no history of asthma) (n = 49)	40 (81.6)	14 (70.0)	26 (89.7)	0.13
Nasal steroid spray (no history of allergic rhinitis) (n = 38)	31 (81.6)	14 (73.7)	17 (89.5)	0.41
NSAIDs myalgia, arthralgia (n = 25)	20 (80.0)	13 (81.3)	7 (77.8)	1.00
NSAIDs for headache (n = 30)	24 (80.0)	14 (82.4)	10 (76.9)	1.00
Non-sedating antihistamine (history allergic rhinitis) (n = 45)	36 (80.0)	17 (81.0)	19 (79.2)	1.00
Acetaminophen for myalgia, arthralgia (n = 50)	39 (78.0)	17 (77.3)	22 (78.6)	1.00
Codeine, hydrocodone for cough (n = 31)	24 (77.4)	10 (66.7)	14 (87.5)	0.22
NSAIDs for nasal or sinus pain (n = 22)	16 (72.7)	11 (73.3)	5 (71.4)	1.00
Decongestant for nasal congestion or postnasal drip (n = 40)	29 (72.5)	13 (68.4)	16 (76.2)	0.72
Benzonatate for cough (n = 52)	37 (71.2)	13 (59.1)	24 (80.0)	0.13
Sedating antihistamine for sleep (n = 31)	22 (71.0)	9 (56.3)	13 (86.7)	0.11
NSAIDs for fever (n = 24)	17 (70.8)	9 (60.0)	8 (88.9)	0.19
Hypnotic for sleep (n = 10)	7 (70.0)	4 (66.7)	3 (75.0)	1.00
Fioricet for headache (n = 13)	9 (69.2)	5 (71.4)	4 (66.7)	1.00
Acetaminophen for headache (n = 54)	37 (68.5)	16 (66.7)	21 (70.0)	1.00
Dextromethorphan for cough (n = 46)	31 (67.4)	12 (57.1)	19 (76.0)	0.22
Benzodiazepine for anxiety (n = 12)	8 (66.7)	3 (50.0)	5 (83.3)	0.55
Guaifenesin for cough (n = 47)	30 (63.8)	7 (38.9)	23 (79.3)	0.01*
Nasal saline lavage (n = 28)	17 (60.8)	6 (40.0)	11 (84.6)	0.02*
Sedating antihistamine for nasal congestion or postnasal drip (n = 29)	17 (58.6)	7 (53.8)	10 (62.5)	0.72
Nasal saline spray (n = 44)	23 (52.3)	9 (42.9)	14 (60.9)	0.37
Systemic steroids (n = 23)	12 (52.2)	5 (50.0)	7 (53.8)	1.00
Melatonin for sleep (n = 27)	14 (51.9)	4 (33.3)	10 (66.7)	0.13
Honey for cough (n = 33)	17 (51.5)	6 (50.0)	11 (52.4)	1.00

Table 3 continued

	All respondents *n* (%)	Episodic care[a] *n* (%)	Longitudinal care[b] *n* (%)	*p* value
OTC lozenge for cough (*n* = 39)	20 (51.3)	7 (46.7)	13 (54.2)	0.75
Acetaminophen for nasal or sinus pain (*n* = 43)	21 (48.8)	10 (52.6)	11 (45.8)	0.76

COVID-19 coronavirus disease 2019, *MDI* metered-dose inhaler, *NSAIDs* non-steroidal anti-inflammatory drugs, *OTC* over-the-counter

[a] Episodic care providers saw patients with COVID-19 for single visits by telemedicine or in-person

[b] Longitudinal care providers called patients regularly over time until symptom improvement

*Significant, *p* < 0.05

from the World Health Organization as possibly increasing risk for severe COVID-19 [14]. Similarly, nebulized albuterol received negative attention with reported increase aerosol generation and risk for COVID-19 transmission [15] and was used less frequently than albuterol in an MDI formulation in this study. Note of this risk associated with nebulized albuterol was included in the institutional guidelines. Nasal steroid spray use may have been less frequent by survey respondents because of uncertain efficacy in other respiratory infections [16]. Finally, opiates were the least utilized antitussive agent in this study. While prominent in British treatment guidelines [17], opiates are considered high-risk prescriptions in the USA, potentially decreasing their use for COVID-19-related cough [18].

Differences by Phase of Care

The care structure for outpatient COVID-19 management (Fig. 1) presented a unique opportunity to compare the experience of providers practicing in a more traditional, episodic care role to a team of continuity providers that followed patients by telephone through the course of their acute illness. Our finding that longitudinal providers used therapies for lower respiratory tract symptoms (i.e., cough and shortness of breath) more than episodic providers may reflect a frequent need for add-on

therapies as lower respiratory tract symptoms develop later in the natural history of COVID-19 [8]. This finding should inform expectant symptom management advice given to patients early in their illness to include the possibility of needing additional treatments. Other notable differences between groups include reports of higher efficacy of guaifenesin and nasal saline lavage by the follow-up teams. The latter is remarkable because instructions for saline lavage were included in our clinical guideline related to evidence base [16] but usage is low, perhaps because of patient factors (i.e., hesitancy about technique or burden of making and using lavage solution) or provider factors (i.e., limited knowledge) [19]. The higher level of perceived effectiveness of these therapies noted by longitudinal providers should reassure episodic providers that these therapies may be recommended in the current management of COVID-19.

Lower Respiratory Symptom Management

The increased perceived difficulty of management of lower respiratory symptoms reported by all providers may explain the high reported usage of medications for lower respiratory symptoms such as cough and shortness of breath, particularly by follow-up providers. Despite reporting high efficacy of these medications (albuterol, opioid-containing cough

Table 4 Symptoms perceived as very challenging and site of COVID-19-related patient care

	All respondents n (%)	Episodic care[a] n (%)	Longitudinal care[b] n (%)	p value
Shortness of breath at rest ($n = 52$)	28 (53.8)	15 (65.2)	13 (44.8)	0.17
Constant chest pain or chest pressure ($n = 52$)	27 (51.9)	14 (60.9)	13 (44.8)	0.28
Chest tightness with breathing or coughing ($n = 53$)	27 (50.9)	13 (56.5)	14 (46.7)	0.58
Anxiety ($n = 54$)	26 (48.1)	11 (47.8)	15 (48.4)	1.00
Shortness of breath on exertion ($n = 54$)	23 (42.6)	13 (54.2)	10 (33.3)	0.17
Cough ($n = 54$)	21 (38.9)	12 (50.0)	9 (30.0)	0.17
Fatigue ($n = 52$)	11 (21.2)	5 (22.7)	6 (20.0)	1.00
Headache ($n = 53$)	11 (20.8)	4 (17.4)	7 (23.3)	0.74
Myalgia ($n = 53$)	7 (13.2)	3 (13.0)	4 (13.3)	1.00
Fever ($n = 43$)	5 (11.6)	3 (15.8)	2 (8.3)	0.64
Dizziness ($n = 46$)	5 (10.9)	2 (16.7)	2 (7.1)	0.37
Abdominal pain ($n = 46$)	2 (4.3)	1 (5.9)	1 (3.4)	1.00
Anosmia, ageusia ($n = 49$)	2 (4.1)	1 (4.3)	1 (3.8)	1.00
Joint pain ($n = 50$)	2 (4.0)	1 (4.8)	1 (3.4)	1.00
Loss of appetite ($n = 51$)	2 (3.9)	0 (0.0)	2 (6.7)	0.51
Sinus congestion or pain ($n = 53$)	2 (3.8)	1 (4.2)	1 (3.4)	1.00
Nausea ($n = 51$)	1 (2.0)	0 (0.0)	1 (3.4)	1.00
Sore throat ($n = 52$)	1 (1.9)	1 (4.2)	0 (0.0)	0.46
Diarrhea ($n = 52$)	1 (1.9)	0 (0.0)	1 (3.3)	1.00
Weakness ($n = 52$)	8 (15.4)	4 (17.4)	4 (13.8)	1.00
Runny nose, postnasal drip	0 (0.0)	0 (0.0)	0 (0.0)	–

[a] Episodic care providers saw patients with COVID-19 for single visits by telemedicine or in-person
[b] Longitudinal care providers called patients regularly over time until symptom improvement

medication, and benzonatate), respondents still reported high difficulty, highlighting the overall challenge of managing lower respiratory infections at home. With the rapid expansion of home monitoring programs, including remote physiologic monitoring technologies, it is likely that patients will continue to be monitored at home for dyspnea due to COVID-19 (and other diseases) [20]. Our center deployed home pulse oximetry devices for patients seen at the ARC site and our VOMC telephone team was given monitoring parameters, but we did not investigate the effect of physiologic monitoring on provider experience in this study. It is possible the remote patient monitoring technology eases the difficulty of management by providing clinical data, but also possible that it increases the provider burden by permitting home care of highly symptomatic patients who might otherwise be observed in a hospital setting.

For comparison, systemic symptoms are reported to be easier to manage with

acetaminophen and its use was reported as highly effective, making the need for additional antipyretic or analgesic treatment options appear less immediately necessary. It is notable that a prior survey of healthcare providers found a low percentage (21.6%) finding paracetamol effective, but this study was subject to bias as the comparison options included antiviral medications (not antipyretics) and less than 50% of respondents worked in dedicated COVID-19 settings [7].

Notably, anxiety is the only symptom that approaches the same difficulty as lower respiratory symptoms. This corresponds to a narrative report by a COVID-19-specific clinic that anxiety often produces dyspnea that can be difficult to differentiate from primary respiratory symptoms [21].

Limitations

The primary limitation of this study is the use of self-reported practice, a subjective measure, as an indicator of medication use and effectiveness. Directly observed practice data for medication advice for COVID-19 symptoms are not available at our center. Similarly, we report perceived effectiveness, which is subject to the placebo effect and multiple biases (e.g., patient response bias, provider confirmation bias). An additional limitation is the small sample size from a single institution and therefore external validation of our findings is necessary. The number of providers with experience in COVID-19 outpatient care was limited at the time of the study. The low response rate (e.g., 18 of 42 invited physicians) may be due to the variation in experience among providers; those who completed the survey reported high numbers of patient encounters and it is possible that volunteer physicians who were not scheduled for direct COVID-19 patient care would be less likely to complete a survey about treatment experience.

The use of a standard clinical guideline at our sites, introduced in late March 2020, provided the basis for similar medication and symptom terminology used for this survey, but also may have introduced bias towards our recommended treatments. As an additional consideration, nonpharmacologic treatments (e.g., prone position, relaxation, and breathing exercises) may have a role and were not assessed in this study.

Despite these limitations, this study provides early insight into the symptom management of COVID-19. We note that data are limited for the treatment of symptoms of respiratory infections in general, such as cough [22] and fever [23]. We are not aware of any clinical trials directed at cough or dyspnea symptom management. At the time of writing, 3009 studies are registered on ClinicalTrials.gov for COVID-19 treatment; we find trials of hypertonic saline lavage, but none testing albuterol or benzonatate.

CONCLUSIONS

This study provides information about the management of COVID-19 in ambulatory patients including the perceived difficulty of symptom management and the provider-reported use and perceived effectiveness of common medications. Leveraging the novel care structures created early in the pandemic, we compare the experience of providers who see patients for single encounters with a follow-up longitudinal care team. The results provide limited validation for our symptom management guideline used in COVID-19 care sites, while suggesting an increased role for specific therapies (e.g., nasal saline lavage, albuterol in patients without asthma) that may be best addressed in future studies.

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