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Clinical management decisions for adults with prolonged acute cough: Frequency and associated factors

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Abstract

Background: Uncomplicated episodes of prolonged acute cough are usually viral and self-limited, but despite evidence and recommendations to the contrary, they are often treated with antibiotics.

Methods: Mixed cross-sectional and prospective observational study of adults 18 years or older presenting to two urgent care centers with a cough of 7 to 56 days as their chief complaint. Factors associated with cough duration and clinical decisions were analyzed by univariate and multivariate logistic regression.

Results: Of the 125 enrolled patients, 118 (94%) received an antibiotic, 97 (78%) a cough suppressant, 87 (70%) a systemic corticosteroid, and 39 (31%) a chest X-ray (CXR). Longer duration of cough was associated with the presence of self-reported wheezing or noises (adjusted odds ratio 6.29, 95% CI 1.36–29.16) while the presence of both wheezing and crackles on a clinician chest exam was associated with shorter duration (aOR 0.03, 95% CI 0.00–0.27). A clinician was more likely to order a CXR in patients with dyspnea (aOR 3.01, 95% CI 1.21–7.49), less likely to prescribe a systemic corticosteroid in patients with crackles (aOR 0.27, 95% CI 0.09–0.82), and more likely to prescribe a cough suppressant to older patients (1.04 per additional year of age, 95% CI 1.01–1.07).

Conclusions: Systemic corticosteroids and cough suppressants are being prescribed at high rates in patients with uncomplicated acute cough in the urgent care setting. Additional studies to determine if similar rates are seen in other urgent care centers, or in other contemporary ambulatory settings are warranted.

Keywords

Cough; Clinical management; Urgent care; Corticosteroids

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Declarations of interest
None.

1. Introduction

Cough is a common reason for seeing an ambulatory physician in the United States; approximately 3% of all visits are due to a cough [1]. The most frequent diagnosis for a cough is upper respiratory tract infection, followed by acute bronchitis [2,3]. Only a small percentage of these episodes of cough, about 5%, are due to pneumonia [4]. A systematic review found that an acute cough lasts a mean duration of 18 days after onset (range of 15 to 28 days), while patient expectations for duration are much lower, between seven to nine days [5].

Antibiotics continue to be widely prescribed for uncomplicated episodes of acute cough, particularly in the outpatient setting [6–8]. Up to 75% of patients seen by outpatient clinicians and diagnosed with acute lower respiratory tract infections (LRTI) are given an antibiotic [6,9,10], despite guideline recommendations against it [11,12]. While a multi-center, placebo-controlled, randomized clinical trial showed no reduction in symptom duration or severity for oral corticosteroids in uncomplicated acute respiratory infections [13], informal observations in practice suggest that corticosteroids are increasingly prescribed for acute LRTI in the absence of asthma or chronic obstructive pulmonary disease (COPD) exacerbation. There is also little evidence that cough suppressants are beneficial, although few studies exist on the benefit of cough suppressants in otherwise healthy adults with acute LRTI [14,15].

There has been a significant increase in the utilization of urgent care centers in the last decade, attributed to decreasing numbers of primary care physicians, perceived urgency of the need for care by patients, and demands for convenience [16]. Management of patients with a cough in these settings is difficult; the expectation from a patient is to have a quick visit and many expect to receive a prescription for treatment. This may influence clinicians, as does the lack of an ongoing continuity relationship and reliance on patient satisfaction as a quality measure and as a component of compensation [17–21].

In the outpatient setting, treatment decisions are based mainly on the clinical presentation of the patient in the form of signs, symptoms, recorded vital signs, and rapid point of care tests for influenza and streptococcal pharyngitis. When community-acquired pneumonia (CAP) is suspected, a chest X-ray (CXR) may be ordered, but the frequency of ordering is unknown in urgent care centers.

As a result of the changing patterns in healthcare utilization, the clinical management of prolonged cough in the urgent care setting is understudied. The goal of this study was twofold: to determine the association between demographics, social factors, and clinical presentation with the likelihood of a cough lasting >14 days from onset, and the association between these same factors and treatment decisions.

2. Methods

2.1. Data collection

Adults 18 years and older with a main or chief complaint of a cough of 7 to 56 days duration were recruited at two urgent care centers in or near Athens, Georgia from February 8, 2017 to December 8, 2017. Patients with moderate or severe asthma, chronic obstructive pulmonary disease (COPD), or who were immunodeficient were excluded. The sites are staffed by a group of physicians and nurse practitioners (collectively described as “clinician” for this study) who rotate between several urgent care centers in the area. On a typical shift there were two to four clinicians staffing each urgent care center.

Enrolled participants were surveyed with questions about their demographic information and their baseline signs and symptoms. The clinician was given a form to document their assessment of the patient and treatment plan. The form included observations the clinician made during the chest exam, the diagnosis, any tests that were ordered (e.g. CXR, rapid flu), and prescriptions given to the patient.

Participants were also given a diary to take home to record their symptom duration and severity for up to 14 days after their visit to the urgent care center. The diary used a 5-point Likert-scale: 0-absent, 1-slightly a problem, 2-moderately bad, 3-bad, 4-very bad (with the exception of post-tussive vomiting and paroxysmal cough, which were simply yes or no). Participants were asked to record their symptoms daily for up to 14 days or until their symptoms resolved.

2.2. Statistical analysis

A univariate and multivariate logistic regression analysis was performed to determine the associations of demographics, social factors, signs, and symptoms with the odds of two different outcomes: 1. Cough >14 days from symptom onset, and 2. Type of clinical management the patient received (CXR, systemic corticosteroid, or cough suppressant). Antibiotic prescriptions were originally included in the analysis plan but ultimately could not be analyzed because 94% of our population received one.

We used univariate logistic regression to determine unadjusted odds ratios (OR) and 95% confidence intervals for each association. Student's *t*-test was used to compare means of continuous variables. Variables were described as statistically significant if the p-value was <0.05 and were noted as a “trend” towards significance if the p-value was between 0.05 and 0.1.

The Akaike Information Criterion (AIC) statistic was used to build a multivariate logistic model. Variables starting with a p-value <0.20 were added until additional variables did not improve the model, defined as a change in AIC of <10 [22–24]. We presented the adjusted odds ratios (aOR) and 95% confidence intervals. Logistic regression analysis was performed using SAS 9.4 (SAS Institute, Cary, NC, USA).

2.3. Ethics approval

The study was approved by the University of Georgia Institutional Review Board for Human Subjects Research (STUDY00003904). A letter of support and permission to recruit patients was received by the medical director of the urgent care centers. Patients provided written consent for inclusion in the study.

3. Results

One hundred and twenty-five patients were enrolled during the recruitment period with a mean age of 41.8 years; 87 (70%) were female, 96 (77%) responded as white, non-Hispanic, and 104 (83%) were diagnosed with acute bronchitis. The mean duration of cough from symptom onset until presenting to the clinic was 15.4 days (95% CI: 13.6–17.2). Ninety-one patients completed follow up and of these, 72 (79%) reported they stopped coughing within the 14 days of follow up.

Among the 72 patients who reported that they stopped coughing during the follow up period, the mean duration from symptom onset to when their cough resolved was 22.4 days (95% CI: 19.6–25.1). Antibiotics were given to 94% (118) of the patients. A CXR was given to 39 patients (31%), systemic corticosteroids were prescribed to 87 patients (70%), and 97 patients (78%) were given a cough suppressant.

3.1. Cough duration from symptom onset

A total of 106 patients were included in the univariate analysis for cough duration from symptom onset (Table 1). Nineteen were excluded due to them not returning at least one diary or survey. Patients that self-reported wheezing or noises when coughing were three times more likely to experience a cough that was longer than 14 days from symptom onset than those with it absent (OR 3.06, 95% CI 1.10–8.45). A respiratory rate of 20 or greater per minute (OR 0.22, 95% CI 0.07–0.70) and wheezes or crackles on a chest exam (OR 0.23, 95% CI 0.08–0.67) decreased likelihood of a prolonged cough when compared to those without.

3.2. Ordering a chest X-ray

The unadjusted analysis for predicting CXR, corticosteroid, or a cough suppressant is summarized in Table 2. Patients with a cough for over three weeks were more likely than patients with a shorter cough to have received a CXR (OR 3.03, 95% CI 1.20–7.67). However, when measured as a continuous variable, cough duration was not significantly associated with ordering a CXR. Difficulty breathing (OR 2.64, 95% CI 1.12–6.22) and chills or sweats (OR 2.37, 95% CI 1.08–5.17) increased the likelihood of receiving a CXR compared to when the symptoms were absent. White, non-Hispanic were significantly more likely to receive a CXR than other races and patients of Hispanic origin (OR 3.59, 95% CI 1.15–11.15).

3.3. Receiving a prescription

Tachycardia was significantly associated with an increased likelihood of a systemic corticosteroid prescription (OR 4.70, 95% CI 1.03–21.37) while the patient being white,

non-Hispanic was significantly associated with receiving a cough suppressant (OR 2.84, 95% CI 1.14–7.09). Patients that received a cough suppressant had a higher mean age of than those who did not (43.5 vs 35.8 years, $p = 0.026$).

3.4. Multivariate analysis

The multivariate analysis is summarized in Table 3. Patients with self-reported wheezing were significantly more likely to have a cough for longer than 14 days from onset (aOR 6.29, 95% CI 1.36–29.16). Patients were unlikely to experience a prolonged cough when both wheezing and crackles were heard on the chest exam (aOR 0.03, 95% CI 0.00–0.27). Age, heart rate, respiratory rate, and temperature were not associated with cough duration.

The odds that a CXR was ordered were significantly higher for patients with dyspnea (aOR 3.0, 95% CI 1.2–8.2). A cough duration greater than three weeks at the time of presentation (aOR 3.08, 95% CI 1.16–8.20) and being white, non-Hispanic (aOR 3.58, 95% CI 1.10–11.66) were also independent predictors for receiving a CXR. While significantly associated with obtaining a CXR in the univariate analysis, chills or sweats were not included in the multivariate model.

Patients with a heart rate 100 or greater were more likely to receive a systemic corticosteroid (aOR 6.10, 95% CI 1.22–30.64), while those with crackles on a chest exam were less likely to receive one (aOR 0.27, 95% CI 0.09–0.82). Presence of a headache was associated with a decreased likelihood of a cough suppressant (aOR 0.16, 95% CI 0.03–0.75). When any chest sounds were heard by a clinician (wheezing, crackles, or both), patients were more likely to receive a cough suppressant (aOR 2.74, 95% CI 1.01–7.40). Again, increasing age increased the likelihood that a cough suppressant was prescribed (aOR 1.04, 95% CI 1.01–1.07).

4. Discussion

To the best of our knowledge, this is the first study to describe the prognosis and management decisions of patients with prolonged cough in the urgent care setting. We found several factors associated with the duration of a cough and clinical symptoms that influenced the care the patient received.

Chest sounds, when reported by the patient or heard in the lungs by a clinician during a chest exam, were associated with cough duration. When experienced by a patient, likely as an audible upper respiratory noise (stridor), the likelihood of cough for >2 weeks was increased. When the presence of wheezes and crackles in the lungs was noted on a clinician chest exam, it was associated with a decreased likelihood of prolonged cough.

After performing a chest exam, it may therefore be helpful for physicians and nurse practitioners to ask the patient how they would describe their cough and whether they are experiencing any noises or chest sounds. In patients with acute cough (“acute bronchitis”), a clinician could use these two factors as part of their overall clinical impression, which can be as accurate as a clinical decision rule in diagnosing acute respiratory infections [25]. An experienced clinician would use their overall clinical impression to judge if the patient is

more likely to continue coughing, and could discuss with the patient the natural course and duration of a cough rather than immediately prescribing an antibiotic or corticosteroid.

A duration of cough greater than three weeks and dyspnea were both associated with an increased likelihood of receiving a CXR. The primary reasons to order a CXR are clinical suspicion of community-acquired pneumonia (CAP) or concern over malignancy, so this seems sensible. There was a trend for patients 60 years and older to be more likely to receive a CXR, which is also reasonable as the risk of both malignancy and CAP increase at this age.

Previous studies have shown that patients with acute LRTI but normal vital signs and a normal chest exam have a very low likelihood of CAP [26]. In our population, 58 patients had normal vital signs and a normal chest exam. While none had pneumonia, 14 received a chest radiograph, a rate only slightly lower than that of patients with abnormal vitals or lung exam.

We found a very high rate of systemic corticosteroid use, with 70% of all patients with a cough for one week or more receiving one. It is important to note that we excluded patients with asthma or COPD, and that of the 97 patients that had no wheezing on examination, 65 (67%) still received a systemic corticosteroid. A recent randomized trial found no benefit of corticosteroids for patients with uncomplicated acute bronchitis [13]. Current evidence supports corticosteroids to be limited to patients with wheezing from acute exacerbations of asthma [27] and selected patients with CAP [28]. This is therefore an important topic for further research to see if similarly high and inappropriate rates are seen in other urgent care centers, or in other contemporary ambulatory settings. It is also an important topic for continuing education, as physicians may not be familiar with recent negative studies on the topic.

Interestingly, increasing age was associated with receiving a cough suppressant in this population. Patients that were given a cough suppressant were a mean of 7.7 years older than those that did not. We were unable to find any literature addressing predictors of cough suppressant use in patients with prolonged cough. In general, there is insufficient evidence regarding the effectiveness of antitussive medication for the treatment of acute cough, and more generally of how acute respiratory tract infections (ARTI) are managed in the urgent care setting [14,15].

This study provides evidence that despite continued efforts to reduce antibiotic use in uncomplicated lower respiratory infections, they continue to be overprescribed. Approximately 95% of our population received an antibiotic, despite only four patients having CXR confirmed pneumonia. In addition, 70% received a systemic corticosteroid, which appears to represent a new trend in treatment of ARTI in the ambulatory setting. The implications of this are important, as a recent, population-based cohort study found an increased risk of adverse events from short courses of oral corticosteroids, including sepsis, venous thromboembolism and fractures [29].

The mean duration of cough (22 days) observed in this population of patients presenting with 7 or more days of cough was similar or slightly higher than that found in other studies

[30,31]. Even though our inclusion criteria of 7 or more days of cough likely biased the duration to be longer, it was still within the range of 15 to 28 days found in a systematic review and well above the number of days patients expect their cough to resolve [5].

Given the recent increase in patients using emergency and urgent care over a primary care practice [16], we encourage additional observational prospective studies to determine if our findings are trends occurring at other urgent care settings. We also advocate for additional education to promote the appropriate use of CXRs antibiotics corticosteroids, and cough suppressants and discussion with patients about the expectations for duration of illness.

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Table 1

Unadjusted odds of having a cough duration >14 days from onset (n = 106).

Variable	OR ^a	95% CI	p-Value
Demographics and social factors			
Sex			
Female	1.00	Reference	
Male	0.55	(0.19–1.56)	0.260
Race/ethnicity			
Other ^c	1.00	Reference	
White, non-Hispanic	0.95	(0.28–3.22)	0.940
Income			
>\$75k	1.00	Reference	
<\$25k	1.45	(0.14–15.16)	0.252
\$25k–\$49k	0.23 [*]	(0.06–0.94)	0.035
\$50k–\$74k	0.33	(0.07–1.55)	0.175
Education			
College graduate	1.00	Reference	
No education	0.24	(0.02–3.19)	0.687
High school graduate	0.23	(0.05–1.08)	0.406
Some college	0.27	(0.07–1.06)	0.550
Current smoker			
Never	1.00	Reference	
Current	1.30	(0.34–4.96)	0.706
Self-reported signs and symptoms ^b			
Wheezing	3.06 [*]	(1.10–8.45)	0.032
Post-tussive vomiting	1.97	(0.60–6.48)	0.262
Sputum	1.91	(0.69–5.32)	0.216
Paroxysmal cough	1.90	(0.63–5.72)	0.254
Dyspnea	1.47	(0.54–4.00)	0.448
Sneezing	1.38	(0.50–3.80)	0.531
Red or watery eyes	1.34	(0.49–3.63)	0.568
Chills or sweats	1.28	(0.47–3.50)	0.626
Trouble sleeping	0.91	(0.18–4.52)	0.904
Felt warm or feverish	0.54	(0.19–1.56)	0.256
Runny nose	0.35	(0.07–1.63)	0.180
Headache	0.37	(0.08–1.73)	0.207
Clinician recorded signs ^b			
Heart rate (< 100/min)	1.02	(0.26–3.98)	0.974
Chest sounds (any)	0.23 [*]	(0.08–0.67)	0.007

	OR ^a	95% CI	p-Value
Respiratory rate (< 20/min)	0.22 *	(0.07–0.70)	0.010
Temperature (>37.7 °C)	0.21	(0.01–3.50)	0.277
Chest exam			
Normal	1.00	Reference	
Wheezes	0.55	(0.12–2.45)	0.217
Crackles	0.16	(0.05–0.58)	0.245
Wheezes and crackles	0.07	(0.01–0.50)	0.052
Continuous variables			
Heart rate	1.01	(0.98–1.05)	0.507
Age, years	0.99	(0.96–1.02)	0.576
Respiratory rate	0.89	(0.71–1.11)	0.293
Temperature, Celsius	0.64	(0.19–2.14)	0.471

CI = confidence interval.

^a Unadjusted odds ratio: probability modeled patient received a chest x-ray, systemic corticosteroid or cough suppressant.

^b Reference value is not having sign or symptom.

^c African-American, Asian, White Hispanic, or Hispanic only (race not selected).

* Statistically significant p-value <0.05.

Table 2
Unadjusted odds of receiving a chest X-ray, or a prescription for a systemic corticosteroid or cough suppressant.

Variable	Chest X-ray			Systemic corticosteroid			Cough suppressant		
	OR ^a	95% CI	p-Value	OR ^a	95% CI	p-Value	OR ^a	95% CI	p-Value
Demographics and social factors									
Sex									
Female	1.00	Reference		1.00	Reference		1.00	Reference	
Male	1.71	(0.77–3.82)	0.189	1.11	(0.48–2.55)	0.816	1.81	(0.67–4.89)	0.246
Age									
<60 years old	1.00	Reference		1.00	Reference		1.00	Reference	
60 years old	2.35	(0.90–6.13)	0.080	1.11	(0.40–3.13)	0.842	3.17	(0.69–14.52)	0.138
Race									
Other ^c	1.00	Reference		1.00	Reference		1.00	Reference	
White, non-Hispanic	3.59 [*]	(1.15–11.15)	0.027	0.84	(0.33–2.11)	0.707	2.84 [*]	(1.14–7.09)	0.025
Ethnicity									
Non-Hispanic	1.00	Reference		1.00	Reference		1.00	Reference	
Hispanic	0.30	(0.04–2.50)	0.264	3.24	(0.38–27.27)	0.280	0.45	(0.10–2.03)	0.300
Income									
>\$75k	1.00	Reference		1.00	Reference		1.00	Reference	
<\$25k	1.04	(0.30–3.61)	0.586	1.40	(0.41–4.74)	0.679	0.38	(0.11–1.30)	0.114
\$25k–\$49k	1.18	(0.43–3.22)	0.763	1.23	(0.47–3.23)	0.895	0.97	(0.30–3.09)	0.392
\$50k–\$74k	2.36	(0.86–6.57)	0.076	1.11	(0.40–3.11)	0.872	0.69	(0.21–2.24)	0.941
Education									
College graduate	1.00	Reference		1.00	Reference		1.00	Reference	
No education	1.72	(0.26–11.62)	0.692	0.58	(0.09–3.92)	0.620	0.65	(0.06–6.84)	0.952
High school graduate	1.58	(0.58–4.31)	0.619	1.02	(0.36–2.91)	0.599	0.62	(0.18–2.16)	0.984
Some college	1.06	(0.43–2.65)	0.565	0.77	(0.32–1.90)	0.864	0.36	(0.12–1.03)	0.170
Current smoker									
Never or former	1.00	Reference		1.00	Reference		1.00	Reference	
Current	1.30	(0.54–3.16)	0.559	1.81	(0.67–4.89)	0.246	0.83	(0.31–2.21)	0.708

	Chest X-ray				Systemic corticosteroid				Cough suppressant			
	OR ^a	95% CI	p-Value		OR ^a	95% CI	p-Value		OR ^a	95% CI	p-Value	
Self-reported signs and symptoms ^b												
Trouble sleeping	6.62	(0.77–49.18)	0.086		1.02	(0.29–3.54)	0.976		0.26	(0.03–2.11)	0.209	
Cough >21 days	3.03*	(1.20–7.67)	0.019		0.62	(0.24–1.58)	0.316		1.46	(0.45–4.71)	0.526	
Dyspnea	2.64*	(1.12–6.22)	0.027		0.96	(0.43–2.10)	0.908		0.90	(0.38–2.16)	0.815	
Chills or sweats	2.37*	(1.08–5.17)	0.031		1.54	(0.72–3.33)	0.269		0.68	(0.29–1.58)	0.366	
Felt warm or feverish	2.21	(0.98–5.01)	0.056		0.79	(0.36–1.73)	0.552		0.62	(0.26–1.51)	0.293	
Wheezing or chest sounds	2.18	(0.92–5.52)	0.076		1.90	(0.86–4.17)	0.110		0.57	(0.22–1.46)	0.238	
Paroxysmal cough	1.77	(0.65–4.83)	0.260		0.76	(0.29–1.98)	0.569		0.54	(0.17–1.71)	0.291	
Headache	1.48	(0.57–3.84)	0.423		0.71	(0.27–1.85)	0.482		0.21*	(0.05–0.95)	0.042	
Sputum production	1.37	(0.57–3.29)	0.486		0.50	(0.20–1.28)	0.150		0.86	(0.33–2.27)	0.767	
Runny nose	1.15	(0.47–2.79)	0.764		0.59	(0.23–1.53)	0.279		0.76	(0.29–2.16)	0.640	
Post-tussive vomiting	1.09	(0.49–2.45)	0.830		1.23	(0.54–2.82)	0.629		1.23	(0.49–3.10)	0.659	
Red or watery eyes	0.92	(0.43–1.98)	0.838		1.35	(0.63–2.90)	0.440		0.62	(0.26–1.47)	0.275	
Sneezing	0.77	(0.35–1.68)	0.510		1.62	(0.74–3.53)	0.226		0.62	(0.25–1.55)	0.308	
Clinician recorded signs ^b												
Heart rate (100/min)	1.23	(0.45–3.37)	0.689		4.70*	(1.03–21.37)	0.046		0.84	(0.28–2.56)	0.761	
Chest sounds (any)	1.97	(0.91–4.26)	0.086		0.76	(0.35–1.67)	0.492		2.11	(0.82–5.42)	0.123	
Respiratory rate (20/min)	1.35	(0.49–3.74)	0.565		1.77	(0.55–5.74)	0.341		1.10	(0.33–3.62)	0.879	
Temperature (>37.7 °C)	7.08	(0.71–70.40)	0.095		1.32	(0.13–13.13)	0.812		0.27	(0.04–2.04)	0.206	
Chest sounds												
Normal	1.00	Reference			1.00	Reference			1.00	Reference		
Wheezes	2.66	(1.02–6.97)	0.388		2.62*	(0.71–9.70)	0.014		1.33	(0.44–4.02)	0.508	
Crackles	1.04	(0.33–3.24)	0.212		0.35	(0.13–0.99)	0.124		6.63	(0.83–52.81)	0.133	
Wheezes and crackles	4.35	(0.68–27.94)	0.230		0.26	(0.04–1.68)	0.168		1.47	(0.16–13.95)	0.776	
Continuous variables												
Age, years	1.02	(0.99–1.04)	0.178		1.01	(0.98–1.03)	0.553		1.03*	(1.00–1.06)	0.029	
Days coughing	1.03	(0.99–1.06)	0.160		0.99	(0.96–1.03)	0.575		1.01	(0.97–1.06)	0.609	
Heart rate per minute	1.01	(0.99–1.04)	0.454		1.02	(0.99–1.05)	0.149		0.98	(0.95–1.00)	0.095	

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	Chest X-ray			Systemic corticosteroid			Cough suppressant		
	OR ^a	95% CI	p-Value	OR ^a	95% CI	p-Value	OR ^a	95% CI	p-Value
Respiratory rate per minute	1.08	(0.91–1.29)	0.370	0.99	(0.83–1.19)	0.967	0.98	(0.80–1.12)	0.815
Temperature, Celsius	1.64	(0.66–4.06)	0.287	1.14	(0.44–2.95)	0.782	0.51	(0.19–1.35)	0.174

CI = confidence interval.

^aUnadjusted odds ratio: probability modeled patient received a chest X-ray, systemic corticosteroid or cough suppressant.

^bReference value is not having sign or symptom.

^cAfrican-American, Asian, White Hispanic, or Hispanic only (race not selected).

* Statistically significant p-value <0.05.

Table 3

Adjusted odds for a cough duration >14 days from onset, or patient was given a chest X-ray, systemic corticosteroid, or cough suppressant.

Variable	aOR ^a	95% CI	p-Value
Coughing > 14 days from onset			
Respiratory rate (< 20/min) ^b	0.20	(0.05–0.72)	0.014
Self-reported wheezes or noises while coughing	6.29	(1.36–29.16)	0.019
Clinician chest exam			
Normal	1.00	Reference	
Wheezes	0.18	(0.02–1.34)	0.797
Crackles	0.12	(0.03–0.50)	0.640
Wheezes and crackles	0.03	(0.00–0.27)	0.025
Chest X-ray ordered			
Dyspnea ^b	3.01	(1.21–7.49)	0.018
Cough >21 days ^b	3.08	(1.16–8.20)	0.024
Race			
Other ^c	1.00	Reference	
White, non-Hispanic	3.58	(1.10–11.66)	0.034
Prescribed a systemic corticosteroid			
Heart rate (< 100/min) ^b	6.10	(1.22–30.64)	0.028
Clinician chest exam			
Normal	1.00	Reference	
Wheezes	2.59	(0.69–9.73)	0.013
Crackles	0.27	(0.09–0.82)	0.051
Wheezes and crackles	0.31	(0.05–1.99)	0.273
Prescribed a cough suppressant			
Headache ^b	0.16	(0.03–0.75)	0.020
Age (continuous)	1.04	(1.01–1.07)	0.024
Clinician chest exam			
Normal	1.00	Reference	
Wheezes, crackles or both	2.74	(1.01–7.40)	0.047

CI = confidence interval.

^a Adjusted odds ratio: probability modeled patient had a cough greater than 14 days or was given a chest X-ray, systemic corticosteroid or cough suppressant.

^b Reference value is not having sign or symptom.

^c African-American, Asian, white Hispanic, or Hispanic only (race not selected).