

Influenza Management via Direct to Consumer Telemedicine: an Observational Study

Michael B. Rothberg, MD, MPH and Kathryn A. Martinez, PhD, MPH 



Cleveland Clinic Center for Value-Based Care Research, Cleveland, OH, USA.

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BACKGROUND

Oseltamivir can shorten duration of influenza symptoms, but only if administered within 48 h.¹ In primary care, only 20% of patients receive oseltamivir, due to false negative tests and patients presenting too late.² By connecting patients with physicians 24 h a day, direct to consumer (DTC) telemedicine could solve these problems, without exposing others to infection. Whether DTC telemedicine improves treatment rates or treatment appropriateness is unknown.

OBJECTIVE

The objective of this study was to characterize care seeking, diagnosis, and treatment for influenza in a large DTC telemedicine service.

METHODS AND FINDINGS

We describe encounters from a nationwide telemedicine platform,³ conducted between July 2016 and August 2018. Patients stated their call reason using free text and provided age, gender, and insurance information. To assess appropriateness, we described patterns of care by epidemic status and assessed patient, physician, and encounter characteristics associated with an influenza diagnosis and oseltamivir prescription. Epidemics were identified using the Center for Disease Control's Weekly U.S. Influenza Map,⁴ with encounters categorized as occurring during an epidemic or not. Oseltamivir prescriptions were identified via National Drug Codes. Using mixed effects logistic regression, we estimated the odds of oseltamivir prescription among patients seeking care for influenza, accounting for clustering by physician.

During the study period, 8112 patients called for “influenza.” Of these, 3104 (38%) received an influenza diagnosis (53% during epidemics versus 11% during non-epidemics).

Of all influenza diagnoses ($n = 8055$), 88% were during epidemics. Following diagnosis, oseltamivir prescription did not vary by epidemic status (80% during epidemics versus 78% during non-epidemics, $p = 0.157$). Table 1 describes sample characteristics and associations with diagnosis and treatment.

Thirty-five percent of patients seeking care for influenza received it during weekends or after hours. Median wait time was 4.6 min (interquartile range (IQR) 1.9–10.3) and median visit length was 4.9 min (IQR 3.5–7.4). Had they not used telemedicine, 87% said they would have gone to a doctor's office, urgent care, or the emergency room.

Among patients seeking care for influenza, calling during an epidemic was strongly associated with oseltamivir prescription (aOR 7.78; 95% CI 6.86–9.27) (Table 2), while not reporting insurance was negatively associated (aOR 0.68; 95% CI 0.57–0.82).

DISCUSSION

In this observational study of DTC telemedicine, patients frequently sought care for influenza and most diagnoses were made during epidemics. Early diagnosis is important both for treatment and to avoid spread of infection. During an epidemic, diagnosis can be made based on symptoms alone.^{5, 6} Rapid testing is not required and has a false negative rate of >40%.² Treatment is most effective if provided within 12 h of symptom onset,¹ yet 36% of primary care patients present after 48 h when treatment is no longer effective.² This problem may be overcome by the rapid access afforded by telemedicine. Indeed, one-third of our patients sought care after hours or on weekends, when doctor's offices aren't typically open, and completed their visits in <20 min. Without telemedicine, most patients would have sought care in public venues, likely delaying care and potentially infecting others. Approximately 40% of patients calling with “influenza” were prescribed oseltamivir, approximately double that observed in primary care.

During non-epidemics, when the pretest probability of influenza is low, diagnosis requires rapid testing, which is not available via telemedicine. Because oseltamivir is expensive and 10% of patients experience nausea, treatment should be

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Table 1 Sample Characteristics of Patients Seeking Care for Influenza, Association with Diagnosis and Oseltamivir Prescription

| | Call reason was influenza (N=8112) | | | Diagnosed with influenza (N=8055) | | p value* |
|--------------------------------|------------------------------------|-----------------|--------|-----------------------------------|------------------------------|----------|
| | Overall N (%) | N (%) diagnosed | | Overall N (%) | Prescribed oseltamivir N (%) | |
| Influenza season | | | | | | |
| Yes | 5344 (66) | 2806 (53) | <0.001 | 7113 (88) | 5683 (80) | 0.157 |
| No | 2768 (34) | 298 (11) | | 942 (12) | 734 (78) | |
| Weekend or after hours | | | | | | |
| No | 5274 (65) | 2009 (38) | 0.664 | 5195 (64) | 4113 (79) | 0.139 |
| Yes | 2838 (35) | 1095 (39) | | 2860 (36) | 2304 (81) | |
| Patient gender | | | | | | |
| Female | 4724 (58) | 1768 (37) | 0.067 | 4570 (57) | 3635 (80) | 0.750 |
| Male | 3388 (42) | 1336 (39) | | 3485 (43) | 2782 (80) | |
| Patient age | | | | | | |
| < 19 years | 967 (12) | 457 (47) | <0.001 | 1319 (16) | 1039 (79) | 0.297 |
| 19–39 years | 3816 (47) | 1395 (37) | | 3613 (45) | 2867 (79) | |
| 40–59 | 2959 (36) | 1109 (37) | | 2802 (35) | 2262 (81) | |
| 60 and older | 370 (5) | 143 (39) | | 321 (4) | 249 (78) | |
| Reported insurance information | | | | | | |
| Yes | 7124 (88) | 2814 (39) | <0.001 | 7371 (92) | 5881 (80) | 0.376 |
| No | 988 (12) | 290 (29) | | 684 (8) | 536 (78) | |
| Patient region† | | | | | | |
| Northeast | 1183 (15) | 383 (22) | <0.001 | 1023 (13) | 779 (76) | <0.001 |
| Midwest | 2017 (25) | 755 (37) | | 2166 (27) | 1706 (79) | |
| South | 3354 (41) | 1501 (45) | | 3652 (45) | 2984 (82) | |
| West | 1558 (19) | 465 (30) | | 1214 (15) | 948 (78) | |
| Physician specialty | | | | | | |
| Family Medicine | 5341 (66) | 1978 (37) | <0.001 | 5170 (64) | 4224 (82) | <0.001 |
| Internal Medicine | 1858 (23) | 768 (41) | | 1932 (24) | 1474 (76) | |
| Emergency Medicine | 615 (8) | 220 (36) | | 637 (8) | 483 (76) | |
| Pediatrics | 298 (4) | 138 (46) | | 316 (4) | 236 (75) | |
| Physician region† | | | | | | |
| Northeast | 1625 (20) | 501 (16) | <0.001 | 1323 (16) | 1041 (79) | 0.163 |
| Midwest | 1797 (22) | 790 (25) | | 2245 (28) | 1761 (78) | |
| South | 3252 (40) | 1361 (44) | | 3388 (42) | 2731 (81) | |
| West | 1438 (18) | 452 (15) | | 1099 (14) | 884 (80) | |

*p value from chi-square test

†Based on U.S. Census categories

Table 2 Adjusted Odds of Being Prescribed Oseltamivir Among Patients Stating Their Call Reason Was Influenza

| (N=8112) | aOR | 95% CI |
|--------------------------------|------|-----------|
| Influenza season | | |
| No | 1.00 | |
| Yes | 7.98 | 6.86–9.27 |
| Patient age (years) | | |
| 18 and under | 1.39 | 1.16–1.68 |
| 19–39 | 1.00 | |
| 40–59 | 0.91 | 0.80–1.02 |
| 60 and over | 0.86 | 0.67–1.12 |
| Patient gender | | |
| Female | 1.00 | |
| Male | 1.10 | 0.98–1.23 |
| Reported insurance information | | |
| Yes | 1.00 | |
| No | 0.68 | 0.57–0.82 |
| Patient region* | | |
| Northeast | 1.00 | |
| Midwest | 0.96 | 0.78–1.19 |
| South | 1.42 | 1.17–1.73 |
| West | 0.80 | 0.63–1.00 |
| Physician region* | | |
| Northeast | 1.00 | |
| Midwest | 1.23 | 0.60–1.12 |
| South | 1.09 | 0.49–1.21 |
| West | 1.10 | 0.72–1.66 |
| Physician specialty | | |
| Family Medicine | 1.00 | |
| Internal Medicine | 0.82 | 0.60–1.12 |
| Emergency Medicine | 0.77 | 0.49–1.21 |
| Pediatrics | 0.35 | 0.19–0.65 |

*Based on U.S. Census categories

reserved for patients with a high probability of infection. Most treatment in our study appeared guideline-concordant, but 12% of oseltamivir was prescribed out of season, exposing patients to expense and side effects with little chance of benefit. However, that patients who did not report insurance information were less likely to get it shows that telemedicine physicians are sensitive to patient costs.

Our study is limited by the data available. We did not have access to physician notes and so do not know specific symptoms, duration of illness, or co-morbidities. We also do not know whether patients filled the prescriptions.

In treating influenza, time is of the essence. During yearly epidemics, telemedicine allows for rapid, appropriate treatment, while limiting public exposure to infected individuals. Efforts should be made to increase use of telemedicine for this purpose.

Corresponding Author: Kathryn A. Martinez, PhD, MPH; Cleveland Clinic Center for Value-Based Care Research, 9500 Euclid Ave, G10, Cleveland, OH 99150, USA (e-mail: martink12@ccf.org).

Compliance with Ethical Standards:

Conflict of Interest: The authors have no conflicts of interest to disclose.

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