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The Role of Telemedicine in the Maintenance of IR Outpatient Evaluation and Management Volume During the COVID-19 Global Pandemic

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Editor:

Early in the course of the COVID-19 pandemic, state and local governments began to institute stay-at-home orders, effectively prohibiting nonurgent patient care. Prior studies performed at the beginning of the pandemic focused on quantifying the loss in interventional radiology (IR) volume by procedure category and modeling expected recovery (1,2). Telemedicine rapidly emerged as a viable alternative for IR consultations while in-person consultation volumes decreased (3). The purpose of this study was to assess the impact of COVID-19 on the volume of outpatient evaluation and management (E&M) encounters and to demonstrate the role of telehealth in offsetting the volume loss in evaluation and management caused by COVID-19.

This study does not qualify as human subject research and does not meet the criteria for institutional review board submission, as only retrospective data were reviewed in aggregate, containing no individually identifying items. A retrospective review of IR E&M in a large academic health system between January 6, 2020 and August 23, 2020 was performed, using the same time period in 2019 as a historical control. Encounters were collected by gathering the weekly volume of E&M current procedural technology codes from the IR division. Each encounter was classified as in-person or telehealth. E&M volume composition was defined as the percentage contribution of outpatient and telehealth encounters to the total outpatient E&M.

To examine the effects of COVID-19, data were divided into 3 periods: *before-surge* (January 6–March 15, 2020), *surge* (March 16–June 7, 2020), and *recovery* (June 8–August 23, 2020). The surge was defined as the period between the institutional pause on elective surgery and imaging (March 16, 2020) and the resumption of elective surgery and imaging (June 9, 2020).

The mean weekly encounters during the surge and recovery periods were compared to the before-surge baseline using a Welch t test, and the same comparison was made for 2019 data as a historical control. A P value $< .05$ (2-tailed) was considered statistically significant. Statistical analysis was performed using R version 3.6.3 (R Foundation for Statistical Computing, Vienna, Austria).

During the surge period, outpatient E&M volume fell by 55.8% relative to the before-surge baseline (**Table**, **Fig**). Although the volume grew steadily during the recovery period, it remained 10% below before-surge levels in the last week of the study. The surge and recovery mean weekly volume was significantly lower than the equivalent periods in 2019 ($P < .001$ and $P = .02$, respectively). In 2019 and during the before-surge period of 2020, IR did not offer any telemedicine visits. During the study period, telehealth consults increased from zero (period before the pandemic) to 22.8 mean weekly encounters (surge period) and 15.5 mean weekly encounters in the recovery period (**Fig**). Weekly telemedicine volume peaked at 34 visits during the week of May 11, 2020. Over the surge period, telemedicine comprised 44.6% of the total outpatient E&M. The contribution of telemedicine gradually fell over the recovery period, comprising 11.5% of outpatient E&M volume in the final week of the study and 16.7% of outpatient E&M volume during the recovery.

By the end of the study period, in-person E&M had recovered to 2019 levels, and, with the inclusion of telehealth, it nearly doubled E&M in 2019 for the same period, which reflected an increase of 93.3%. The recovery period demonstrated a gradual increase in outpatient E&M, with a decline in

Table. Mean Weekly Outpatient Encounters in 2020 and 2019

Weekly Mean (SD)	Jan 6–Mar 15	Mar 16–Jun 7	Jun 8–Aug 23
Outpatient total 2020	115.6 (25.1)	51.1 (11.7) [$P < .001$]	92.7 (13.8) [$P = .02$]
Outpatient in-person 2020	115.6 (25.1)	28.3 (14.9) [$P < .001$]	15.5 (7.7) [$P < .001$]
Outpatient telehealth 2020	0 (0)	22.8 (10.7) [$P < .001$]	15.5 (7.7) [$P < .001$]
Outpatient total 2019	110.6 (20.8)	102.3 (21.3) [$P < .36$]	107.2 (22.2) [$P < .72$]

Note–Mean weekly outpatient encounters before the surge (January 6–March 15; weeks 1–10), during the surge (March 16–June 7; weeks 11–23), and during recovery (June 8–August 23; weeks 24–33) periods of 2020. The mean weekly outpatient encounters are shown for the same weeks in 2019 as a historical comparison. Welch t test was performed comparing both surge and recovery periods to before-surge values with P values provided in square brackets. Standard deviations (SD) are provided in parentheses for mean weekly values.

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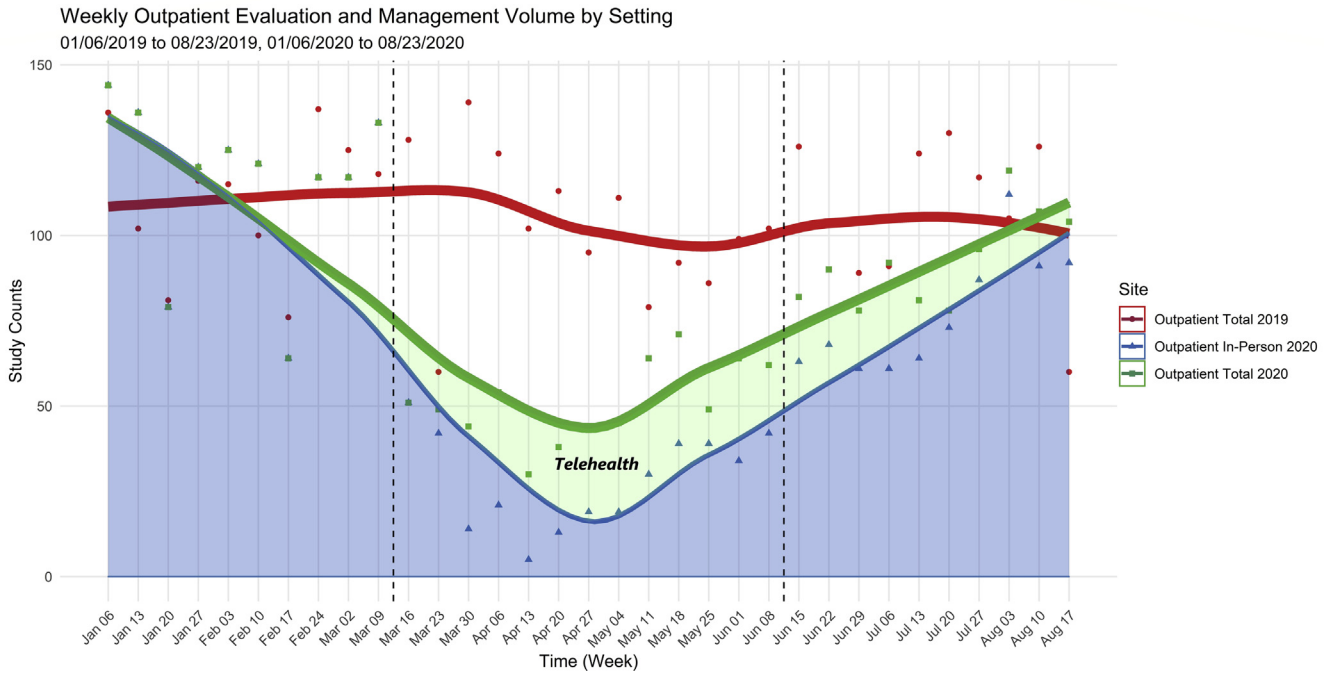

Figure. Data points correspond to weekly IR outpatient evaluation and management volume by setting. A locally estimated scatterplot smoothing (LOESS) regression was performed for each setting to illustrate general trends within each site. Telehealth visits were not available in 2019 and comprise an additional site other than in-person visits in 2020.

telehealth encounters balanced by the growth of in-person visits. Outpatient E&M volume fell by 50.0% overall compared with the same period in 2019, similar to prior studies, which have reported declines ranging from 42.6%–57.6% (1,2).

During the recovery period, outpatient E&M weekly mean volume grew by 81.4% relative to the surge period. However, it remained 13.5% below the same period in 2019, suggesting that volume recovery for outpatient encounters takes several months to normalize. Previously deferred consults steadily increased, presumably due to lingering constraints on travel, social distancing precautions, delays in the referral process, changes in insurance status, and the slow decline in patient or family fear of healthcare facilities.

Historically, E&M has been an important contribution to the overall IR revenue (4); however, during a pandemic, E&M assumes greater significance as an additional source of revenue. Telehealth is a means to maintain a revenue stream from E&M when procedures are prohibited and face-to-face visits are discouraged.

Various challenges were seen as typically encountered when implementing telemedicine: for example, identifying a Health Insurance Portability and Accountability Act compliant platform and addressing patient accessibility and computer literacy. These were limited by relying primarily on telephone visits and reserving televideo visits for necessary cases.

Because local effects of the COVID-19 pandemic are difficult to predict, planning for additional outbreaks should include the capacity to scale telehealth in the event of renewed restrictions on elective procedures. The results described in this study can provide IR departments across the country information for preparation, budgeting, and resource allocation during similar transition periods.

The primary limitation of this study is its retrospective single-system design, limiting the generalizability of findings across healthcare systems. Another limitation is the location of this particular healthcare institution at the epicenter of the pandemic. Subsequent regional responses to COVID-19 may differ in government guidance for safety precautions and in the response by healthcare institutions, which limits the applicability of these findings elsewhere. Further investigation of COVID-19 responses by IR departments across regions may be warranted to determine whether these trends are broadly applicable.

Telehealth can be rapidly phased in and out to maintain outpatient E&M volume in the event of a pandemic when social distancing and stay-at-home orders preclude face-to-face visits. Revenue from outpatient E&M may help bridge the gap until the resumption of elective procedures and recovery of procedural case volume.

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Response to "Pulmonary Embolism: Putting the Horse Back in Front of the Cart"

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Editor:

We would like to thank Dr. Vedantham for commenting (1) on our manuscript: "Large-Bore Aspiration Thrombectomy (LBAT) versus Catheter-Directed Thrombolysis (CDT) for Acute Pulmonary Embolism (PE): A Propensity Score–Matched Comparison" (2), published in the December issue of *JVIR*. Such feedback is what propels science forward, as it hones our research techniques and improves the level of evidence upon which we base the care we offer to our patients.

The specific goal of this study was to compare the effectiveness of "ideal" LBAT and CDT procedures in reducing pulmonary artery pressure (PAP) and thrombus burden. As such, including cases that involved a combination of both techniques, adjunctive endovascular therapy, and/or systemic thrombolysis, would insert many more variables into this analysis and thus invalidate the purpose of the paper. For this reason, the authors elected to exclude these cases, as has been done in several previous prospective and randomized trials looking at the endovascular treatment of PE (3–6). Indeed, if the goal of the study had been to compare the effectiveness of CDT and LBAT in a more global fashion, the intention-to-treat principle would have been applied, more outocme metrics would have been reported and the cases including adjunctive endovascular therapy and crossover cases would have been included, but this was not the case. Furthermore, evaluating PAP and thrombus burden at the conclusion of the cases eliminates some of the "anticoagulation effect" that can confound the evaluation of other frequently used metrics such as right ventricle/left ventricle ratio at 24–48 hours after the conclusion of the procedure. We believe that our approach allows a cleaner comparison of the 2 techniques.

As Dr. Vedantham points out, there is no absolute way for us to know that the change in PAP and thrombus burden was due to the endovascular techniques rather than anticoagulation or natural improvement. However, both LBAT and CDT achieved comparable results in regards to reducing PAP and thrombus burden, with CDT achieving this after approximately 21 hours (possibly less time, but there was no continuous measurement of PAP or short interval assessment of thrombus burden during lysis), while LBAT achieved this after approximately 108 minutes of therapy. It is possible that anticoagulation or natural improvement may be equally effective, although results of the ULTIMA trial (5) would suggest otherwise. Hopefully, this will be further investigated in the upcoming HI-PEITHO trial. In any event, the results of our study demonstrate, at the very least, that rapid improvement in PAP and thrombus burden can be achieved with LBAT.

One of the goals of early comparative studies between LBAT and CDT, however imperfect, is to add to the growing body of evidence guiding clinical practice and initiate discourse and help develop protocols for future, more definitive studies. For example, should the proposed PE-TRACT trial compare CDT or LBAT to anticoagulation? Or possibly evaluate both under the umbrella of endovascular therapy? As physicians and interventionalists, we often ask ourselves if we "can" rather than if we "should." It is indeed an unfortunate state that the endovascular therapy for PE has advanced ahead of the evidence at hand. Ideally, strong randomized controlled trials should precede any new intervention, but this is clearly not the case. Endovascular therapy for acute PE has been performed for more than 20 years, and besides the ULTIMA trial (5), there is no randomized evidence for the efficacy of such therapy. In lieu of efficacy data, we are left with effectiveness data, as reported in the current study. Both are crucial to the understanding and proper therapy of PE (7). Effectiveness studies should not be considered a replacement for well-designed randomized trials but stepping stones on a continuum of evidence toward a more definitive answer to the question: "Should we be treating acute PE patients with endovascular therapy? And if yes, whom and how?" (7).

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