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Conclusions: MR-guided microwave ablation with temperature monitoring is safe and feasible allowing greater visualization of microwave heating during the ablation.

Abstract No. 442

The role of telemedicine in the maintenance of interventional radiology outpatient evaluation and management volume during the COVID-19 global pandemic

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Purpose: To assess the impact of COVID-19 on the overall volume of IR outpatient-based evaluation and management encounters (E&M) and to demonstrate the role of telehealth in offsetting the loss of volume caused by COVID-19

Materials and Methods: A retrospective review of IR E&M in a large academic health system between January 6, 2020 and August 23, 2020, was conducted using the same time period in 2019 as a historical control. IR encounters were collected by gathering the weekly volume of submitted E&M current procedural technology (CPT) codes from the IR division. IR encounters were classified as outpatient or telehealth E&M. The E&M volume in 2019 was used as a historical control. Data were divided into three periods: pre-surge (January 6–March 15, 2020), surge (March 16–June 7, 2020), and recovery (June 8–August 23, 2020). The mean encounters per week during the surge and recovery periods were compared to the pre-surge baseline using a Welch *t* test for 2020 data, and the same comparison was made for 2019 data for a historical control.

Results: During the surge period, outpatient E&M volume, inclusive of telemedicine, fell by 55.8% relative to the pre-surge 2020 baseline. The volume grew steadily during the recovery period but remained 19.8% below pre-surge 2020 levels. The surge and recovery mean weekly E&M volume was significantly different from the equivalent periods in 2019 ($P < 0.001$ and $P = 0.02$, respectively). During the surge, telemedicine comprised 44.6% of the total outpatient E&M. The contribution of telemedicine gradually fell over the recovery period, comprising just 11.5% in the final week of the study, and 16.7% during the recovery. Outpatient E&M reached a nadir during the week of April 13th, reflecting a 70.6% decline relative to the same period in 2019. The recovery period demonstrated a gradual increase in outpatient E&M with a decline in telehealth encounters balanced by a growth of in-person visits. During the last week of the recovery period (week of 8/17), outpatient in-person E&M had recovered to 2019 levels, and with the inclusion of telehealth exceeded E&M in 2019 for the same period by 93.3%.

Conclusions: Telemedicine becomes an important way 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

resumption of elective procedures and recovery of procedural case volume.

Abstract No. 443

A proposed device for the prediction of a quantitative endpoint for transarterial embolization from real-time pressure measurements

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Purpose: We propose a device composed of a catheter to deliver embolic agent as well as a pressure sensor to monitor the extent of occlusion. By continually measuring intravascular pressure, this device allows for consistent, objective determination of a clinically relevant procedural endpoint; and prevention of anterograde reflux and off-target embolization.

Materials and Methods: To assess the functionality of our prototype, we used a vascular flow simulator, which included a vascular tree and mesh filters that simulate vascular beds, to simulate the use of the catheter in a hepatic cancer site. The model received a constant, pressure-controlled flow of water at 100 mmHg to simulate the gauge pressure of physiological blood. To measure intravascular pressure against the volume of embolic particles injected, tris-acryl gelatin embolic agents were injected in increments of 0.5 mL, providing an approximate 1-minute delay to ensure flow stasis. Pressure changes were measured in real time directly adjacent to the catheter, using the fiber optic pressure sensor integrated into our prototype. To quantify the reduction in flow through the model at each injection stage, we measured the outflow rate.

Results: A stepwise increase in pressure was noted for every 0.5 mL of embolic agents that was injected until a plateau was reached. Once this plateau was reached, repeated injections of embolic agents did not change the pressure. An exponential relationship was observed between pressure and volume of injected beads. The relationship between flow and volume of beads appeared linear until the flow plateaued at 18 mL of injected beads. A quadratic relationship between pressure and rate of flow of liquid through the vasculature was found, as indicated with a linear coefficient of determination of 0.996 between pressure and squared flow.

Conclusions: We observed a logistic relationship between pressure measured at the catheter tip and quantity of beads injected into the system, demonstrating that real-time catheter pressure measurements could be used as a surrogate marker for patient-specific vessel occlusion. These findings indicated that pressure could be used as a correlative metric for the cessation of flow during embolization procedures. A near-complete stop to flow indicates complete occlusion of the vessel and therefore, in theory, the end of “on target” embolization. Thus, through real-time pressure readings, physicians would know that they had achieved 100% embolization once a plateau was observed and over-embolization, with associated reflux and nontarget embolization, could be avoided.