Clinical, financial and academic implications of COVID-19 on a tertiary care interventional endoscopy programme

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MESSAGE

While there is consensus that the COVID-19 pandemic has negatively impacted delivery of routine clinical care and has put enormous stress on the financial status of healthcare systems, definitive data on the effect of this ongoing pandemic on individual subspecialties, such as interventional endoscopy, are lacking. In an audit, we projected a 7.3% decline in the annual procedural volume, 15.2% increase in anticipated procedure-related reimbursement and 22.6% loss in downstream revenue to the health system, per Medicare fee structure calculations. While lack of patient enrolment delayed conclusion of clinical trials, educational activities transitioned from inperson to online attendance with greater outreach and more delegate participation. Some changes, particularly pertaining to patient referrals and education, are likely permanent.

IN MORE DETAIL

The healthcare system has not experienced a pandemic crisis in several generations. When healthcare delivery is severely disrupted, screening and diagnostic evaluations can often be delayed without adversely affecting long-term health. However, for interventional endoscopy centres, where referrals are often for diagnosis of suspected malignancies or for minimally invasive treatment such as resection of early cancer, delay in medical care carries consequences. While an estimated 18 million GI endoscopic procedures are performed each year, before and after undergoing procedures, patients often require additional work-up that includes hospitalisations, diagnostic investigations and oncological or surgical treatment. These evaluations and interventions generate both direct and indirect downstream revenue for health systems.[1] While it is widely believed that healthcare institutions face unprecedented clinical workflow and financial pressures due to COVID-19,[2] its impact on the discipline of interventional endoscopy is unclear. Our objective was to examine the clinical, financial and academic implications of COVID-19 on a tertiary-level interventional endoscopy centre in the USA.

The Center for Interventional Endoscopy, instituted in the AdventHealth Orlando hospital in April 2013, is staffed by 5 full-time endoscopists and 62 support personnel that include nurses, technicians, and administrative and research staff. Only advanced endoscopies are undertaken, with 78% being performed on outpatients referred for procedures from a 1000-kilometres radius. Academic activities include live endoscopy courses, regional symposiums, clinical trials and publications in peer-reviewed journals. The impact of COVID-19 was measured by comparing procedural volume, anticipated direct and indirect downstream revenue per Medicare calculations, and academic productivity between 2019 and 2020. The procedural volumes for January 2019–September 2020 were extracted from the endoscopy database, except for the months of October–December 2020, which were based on monthly volumes during the same time period in 2019, with provision for projected increase, based on 2020 monthly trends. The cost data for January 2019–September 2020 were obtained from the hospital finance department; the financial data for October–December 2020 were extrapolated based on the same period in 2019, with provision for projected increase, based on 2020 monthly trends. As a surrogate indicator for revenue, cost to charge ratio was applied for all procedural and hospital-related downstream services, based on Medicare reimbursement fee structure.

COVID-19 organisation

During March through May 2020, public policy mandated that all elective procedures be deferred. During this period, procedural indications were categorised as urgent, semiurgent or non-urgent (online supplemental table 1), and only procedures deemed urgent or being requested on inpatients were performed. Two of five endoscopy suites were kept operational with two teams of nurses and technicians to perform urgent procedures. A dedicated team and suite were identified to perform procedures on COVID-19-positive patients. Two personnel were assigned to contact all referred patients to reassure that procedures would be undertaken once restrictions were eased. All referring physicians were informed that uninterrupted services would be provided based on clinical urgency. Two research nurses were assigned to collect follow-up data on eligible study subjects to facilitate statistical analysis.

Procedural volume

Figure 1 shows the total procedural volume from 2013 to 2020. While a year-to-year mean annual increase of 12% was observed until 2019, a 7.3% decrease is projected for 2020. Figure 2 shows that, when compared with 2019, the mean procedural

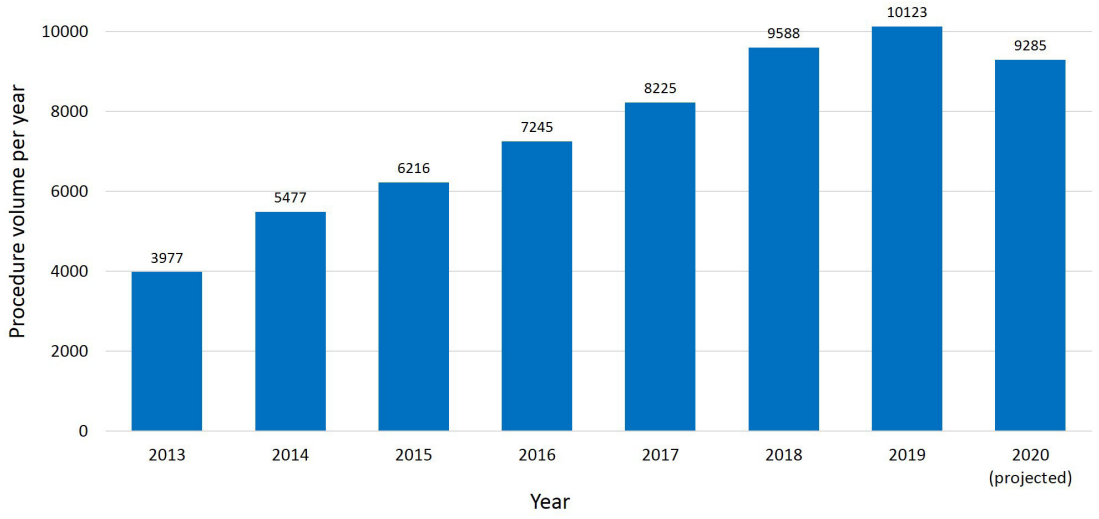

Figure 1 Interventional endoscopy procedural volume from 2013 to 2020.

volume increased in 2020, except for the months of March through May, with overall growth of 5.9%. Since June 2020, when restrictions were eased, after confirmation of COVID-19-negative status, procedures deemed semiurgent were performed first followed by non-urgent cases. Of the 916 patients categorised as semiurgent or non-urgent, 54 (5.9%) preferred to wait until a later time, 49 (5.3%) refused care, 86 (9.4%) declined procedures for fear of infection transmission, 50 (5.5%) had undergone procedures at other facilities, and 10 (1.1%) died due to underlying disease comorbidity. Of the remaining 667 patients, 532 (79.8%) had already undergone or are scheduled to undergo procedures at our facility and data on others are not available.

Direct and downstream costs

When compared with 2019, we project a 15.2% increase in reimbursement (based on Medicare calculation) for endoscopic procedures and 22.6% decrease in downstream revenue to the healthcare system for 2020. While no substantial difference was projected for the number of patients being transferred or admitted to the endoscopic service (660 in 2019 vs 676 in 2020), the overall downstream surgical referrals in 2020 is likely to be less by 27.5% (276 vs 200).

Academic productivity

As clinical trial enrolments were discontinued by institution-mandated policy for 7 months (March–September 2020), only two of five ongoing randomised trials could be concluded. However, the number of original research manuscripts accepted for publication was more in 2020 compared with 2019 (10 vs 6). While four symposiums that encompassed one live demonstration drew attendance of 640 delegates from 35 countries in 2019, all inperson conferences were cancelled in 2020 and converted to webinars. Five online webinars that incorporated live demonstrations drew a cumulative attendance of 11 724 delegates from 88 countries (figure 3). The median cost of webinar that incorporates live transmissions from four endoscopy suites was approximately US$4750 (IQR=2000–9850) as compared with nearly US$51 000 (IQR=36 000–274 500) for inperson symposiums (p=0.020).

Physician productivity

The fee for service rendered by a physician is measured by Medicare in relative value units (RVUs). Compared with 2019, a 7.6% decline in total pooled RVUs for the five endoscopists is projected for 2020 (69 652 vs 64 317). However, as the physician group met threshold RVU requirements (50 000 RVU/year), the base professional compensation was not negatively impacted.

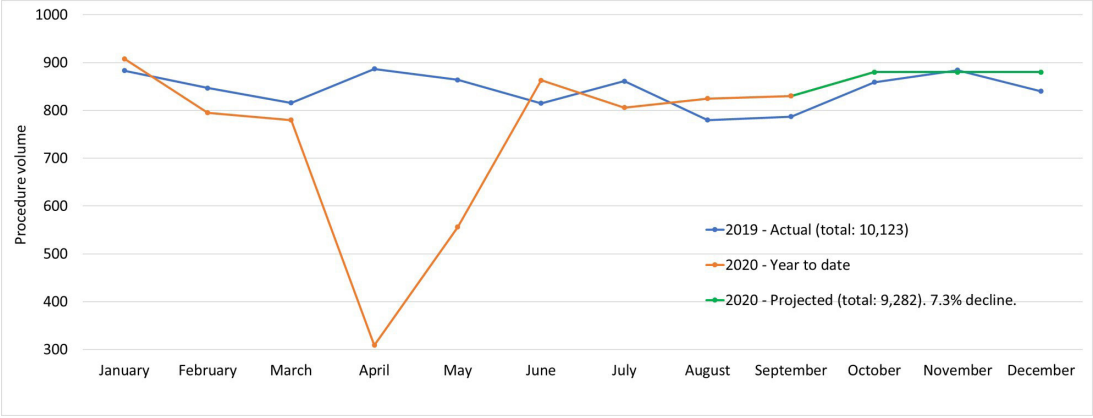

Figure 2 Monthly procedural volume trend in 2020 as compared with 2019.

Figure 3 International delegate participation for inperson symposiums (left panel) as compared with online symposiums (right panel).

Manpower utilisation

While 60% of the nursing staff rotated to other areas of the hospital requiring nursing support or took paid time off, other staff personnel worked remotely. None of the staff was furloughed or laid off and all 62 personnel resumed routine work from June 2020. Also, no member of the healthcare team contracted COVID-19.

COMMENTS

The COVID-19 pandemic has dramatically changed how patient care is delivered in health systems. At the peak of the pandemic, to decrease the risk of virus transmission to both patients and healthcare workers, elective and preventive procedures were deferred. For their part, many patients continue to avoid hospital visits to minimise risk of exposure. During this period, the American Hospital Association estimated a total 4-month financial impact of $202.6 billion in losses for hospitals and health systems, or an average of $50.7 billion per month.

Our study pertaining to interventional endoscopy projects that while COVID-19 may have resulted in 22.6% decrease in downstream revenue for the health system, there was no adverse impact on direct revenue from procedural services. While we speculate that a quick return to 5.9% sustained growth and higher payment, more recently, for complexity of therapeutic endoscopy services may have compensated for the financial loss due to brief decline in procedural volume, the projected decrease in downstream revenue was likely due to fewer surgical referrals. We observed that this was mainly because patients with suspected pancreatic or intraluminal mass lesions had locally advanced or metastatic cancer diagnosed on endoscopic ultrasound, likely due to delay in seeking care because of the desire to minimise exposure to COVID-19. Although fewer patients were enrolled in clinical trials, given the relatively light procedural schedule for 3 months, academic productivity as measured by peer-reviewed publications was higher in 2020. A major change in educational endeavours was the transformation from inperson live courses to web-based online transmissions. This transformation increased delegate attendance by nearly 20-fold and enabled outreach to majority of countries across all continents. More importantly, the administrative cost of organising symposiums decreased significantly by more than 90%.

While we have not seen the last of this pandemic yet, what are the long-term implications and what lessons can we learn from this experience? One, the pandemic may have negatively impacted long-term plans for expansion of clinical programmes or infrastructure as health systems require demonstration of increasing procedural volume or ongoing demand for services, particularly during financial duress. While our annual procedural volume demonstrated 5.8%–15% year-to-year growth for 7 consecutive years and a 5.9% increase since ease of state-mandated restrictions, there was still 7.3% overall decline in procedural volume for 2020. It is unclear whether this trend is temporary or permanent. In order to overcome these unanticipated setbacks, it is important for tertiary interventional endoscopy centres such as ours, which are inherently dependent on outside referrals, to periodically reassess service portfolio and make available innovative and critical services that are in demand. With this objective in mind, we intend to initiate a signature bariatric endoscopy programme in 2021. A comprehensive programme that can offer an array of expert services is more likely to draw newer referrals thereby maintaining procedural volume and withstand downturns. Two, this pandemic is unlikely to be the last that the endoscopy society will face. The experience, although difficult, has taught us how to prioritise procedural services, maintain communication with referring physicians and patients, regulate clinical flow, undertake safety measures, use modern technology (telehealth) to perform distant consultations, and receive payment for rendering these services. However, a lot more needs to be done. A streamlined contingency plan must be instituted in tertiary referral centres so that minimally invasive endoscopic interventions can be seamlessly delivered even in the midst of a global pandemic or emergency. While these contingencies may not resolve every challenge, they may ensure timely delivery of critically needed services, generate revenue to health systems when other departments experience large declines, and facilitate a faster path to recovery. Three, the present experience may have left a permanent impact on endoscopic education. While certain experiences such as one-on-one interaction in hands-on-labs may not be reproducible, most other features such as small group teaching, preceptorships and live demonstrations can still be undertaken. It is very likely that additional technical and technological iterations will further enhance this learning experience. These changes will help curtail conference budgets, obviate travel inconvenience, minimise personal and business expense, and reduce time away from work. A limitation of this report is that it pertains to one major, private, not-for-profit health system in the USA and the news presented herein may not be generalisable. Also, not all facets of financial implications, such as the cost of COVID-19 testing, mandatory use of personal protective equipment that has universally increased hospital costs for delivering clinical care and loss of revenue due to decrease in downstream referrals to radiology or oncology, were evaluated.

The three major tenets of an academic interventional endoscopy unit are delivery of high-end clinical services, world-class education and cutting-edge research. It is important that these goals are maintained even during difficult times so that when the unforeseen strikes, clinical care is not compromised, high impact research is still pursued, and the programme remains a beacon of resource for patients, referring physicians and the regional community.

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Competing interests JYB: consultant for Olympus America and Boston Scientific. SV: consultant for Boston Scientific, Olympus America, Covidien and Creo Medical. RH: consultant for Boston Scientific, Olympus America, Covidien, Creo Medical, Nine Point Medical and Cook Medical.

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Ethics approval Given that patient care was not involved, the institutional review board exempted the study protocol from review.

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REFERENCES

1 Maeng D, Wall B, Hassen D, *et al*. Upstream and downstream revenue of upper gastrointestinal endoscopic ultrasound determined with an episode-of-care approach. *Endosc Int Open* 2019;7:E1316–21.
2 Hospitals and health systems face unprecedented financial pressures due to COVID-19. Available: https://www.aha.org/guidesreports/2020-05-05

Supplemental Table 1: Categorization of procedures based on indications

Urgent

- Ascending cholangitis
- Bile leak
- Symptomatic bile duct stones
- Malignant obstructive jaundice with or without pruritis
- Drainage of symptomatic walled-off necrosis/pseudocyst
- Acute GI bleeding
- Dilation of symptomatic luminal strictures causing obstructive symptoms
- Feeding tube placement in patients unable to tolerate po intake
- ESD/EMR of carcinoma-in-situ lesions
- Suspected malignancy requiring biopsy of solid mass lesions (EUS-FNB)
- Lumen-apposing metal stent removal

Semi-urgent

- Ampullary neoplasia/nodular Barrett's with high-grade dysplasia
- Pancreatic duct stent removal
- EUS Staging of GI malignancies pending neoadjuvant/palliative therapy
- Scheduled biliary stent change in status-post liver transplantation

Routine

- All other indications

Abbreviations: EMR, endoscopic mucosal resection; ESD, endoscopic submucosal dissection; EUS-FNB, endoscopic ultrasound-guided fine needle biopsy

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