



Critical Review Two-Years Thereafter of the Effectiveness of the Revolutionary Changes in a Gastroenterology Division at A Medical School Teaching Hospital in Response to the COVID-19 Pandemic

Medical School, Residency, and Gastrointestinal Fellowship Education and Clinical Practice of Gastroenterology Attendings and Gastrointestinal Endoscopy

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KEYWORDS

- COVID-19 • Coronavirus • SARS • Pandemic • Gastroenterology fellowship
- Academic gastroenterology • Gastroenterology clinical service

KEY POINTS

- The effectiveness of the revolutionary changes during the COVID-19 pandemic in an academic gastroenterology division (William Beaumont Hospital at Royal Oak, the primary teaching hospital of Oakland University Medical School) were critically reviewed, from the perspective of two years thereafter, in two special articles. This article focuses on changes in GI physician clinical practice, physician emotional stress, GI graduate medical education, GI professional societies, and pandemic control. Most pandemic-induced revolutionary changes were advantageous, while some were not.

Continued

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- Beneficial changes during severe pandemic included: temporarily pulling GI fellows to supervise exclusively COVID-19 patient wards; endoscopies reduced to perform only emergent/urgent cases; change from “live” to “virtual” lectures and meetings; fellows promoted/graduated on time despite missing minor requirements due to pandemic; GI clinic reduced by 50%; GI fellowship program director contacted GI fellows biweekly to monitor their psychological stress; and ACGME cancelled annual fellowship survey in 2020.
- These profound, beneficial GI-Divisional changes maximized clinical resources devoted to pandemic and minimized risk of infection transmission.
- Disadvantageous changes: Huge, hospital revenue shortfall during pandemic exacerbated by Hospital’s paying \$84.5 million-fine to government for Stark-Law/anti-kickback violations; hospital employee terminations during pandemic; and reduced GI fellowship support staff. Replacement of long-term academic anesthesiology group by low-cost anesthesiology group and many resignations of GI nurses (after hospital prevented nursing unionization) caused severe personnel shortages causing about 50% reduction in GI endoscopies and severe endoscopy delays. Numerous highly respected, elderly, senior leaders (e.g, chief medical officer, department chairs) terminated without cause.
- Disadvantageous, massive, cost-cutting degraded this academic institution while offering hospital for sale to about 100 hospital suiters, until eventually “selling” hospital to Spectrum Health, without faculty input.

Abbreviations

COVID-19	Coronavirus disease 2019
PMC	PubMed Central
US	United States
mRNA	messenger ribonucleic acid
GI	gastrointestinal or gastroenterology
GME	Graduate Medical Education
FDA	Food and Drug Administration
ACGME	Accreditation Council for Graduate Medical Education
RRC	Residency Review Committee
ICU	intensive care unit
IRB	Institutional Review Board
VA	Veterans Administration

INTRODUCTION

The reader is hereby notified that there are two special critical review articles by the same author, Mitchell S. Cappell, MD, PhD, in this issue that have similar titles but discuss different topics that are related in that they both deal with the effectiveness of the revolutionary changes due to the pandemic at Oakland University William Beaumont School of Medicine and the affiliated teaching hospital, Beaumont Hospital at Royal Oak. The reader may want to review both articles together since they are closely related to each other.

The medical system throughout the world was “shocked” by an abrupt and unanticipated looming medical catastrophe, the coronavirus disease 2019 (COVID-19) pandemic in late 2019 to early 2020, unprecedented in modern medical history, that raised the specter of a medical catastrophe ranging from the medieval Black Death

(Bubonic Plague) that annihilated about one-third of the then-European population¹ to the “Spanish” flu 100 years ago that killed an estimated 50 million Americans and Europeans.² The COVID-19 pandemic proved to cause approximately 6 million documented deaths and several million more suspected but unproven deaths worldwide, including more than 1 million deaths in the United States during its first 2 years.³ The magnitude of the resultant COVID-19 pandemic locally at Beaumont Hospital, a local pandemic epicenter in metropolitan Detroit, was an unprecedentedly abrupt and prolonged surge of COVID-19 infections starting from 0 inpatients on March 9, 2020,⁴ to more than 300 inpatients (>25% of total inpatient census) in April 2020, and to more than 200 inpatients in April 2021,⁵ with a cumulative total of approximately 13,000 distinct patients admitted to this one Hospital with COVID-19 infection from March 2020 to April 2021.

Confronted by this exceedingly dangerous, potentially highly lethal, and unprecedented challenge in March 2020, the medical and scientific community mobilized explosively and en masse, such as an overwhelming immunologic cytokine storm combating an invading viral infection such as COVID-19. The enormous reaction is demonstrated by 309,558 published articles listed in Pub Med and 434,877 published articles listed in PMC on the pandemic from January 2020 to November 3, 2022,⁶ and by the astronomic total cumulative spending of US\$4,600,000,000,000.00 by the United States Government (!),⁷ excluding spending by the private sector in America and by the private and public sectors of other Western democratic economies.

This extraordinary investment led to 5 outstanding achievements in combating the pandemic: (1) diagnostic tests, (2) relatively effective vaccines using novel mRNA technologies to both prevent and mitigate the pandemic, (3) improved general therapy to reduce mortality (eg, improved management of respiratory decompensation), (4) reduced contagiousness by instituting effective infection control measures (eg, N95 face masks), and (5) moderately effective therapy to improve infection prognosis (eg, Plaxovid).

- Other notable achievements included elucidating its infectious pathophysiology, clinical presentation, and natural history. These summative achievements gloss over interim fitful and incremental advancements, typical of scientific progress, that even included some interim mishaps. Nonetheless, the cumulative progress has remarkably saved many millions of lives during the pandemic, such as the development of vaccines, which saved an estimated 14,600,000 lives from January 2020 to December 2021, excluding lives saved in the vast Chinese population. The cost of this benefit is crudely calculated by dividing US government expenditures per life saved as US\$328,571.43,⁸ or by a more precise mathematical model, using different costs and lives saved estimates, of a mean US\$40,800 (range: US\$7,400–\$81,500) per life saved.⁹ These cost estimates of US\$328,571 or US\$40,800 are comparable to that of lives saved from numerous universally accepted medical interventions, such as triaging critically ill patients to intensive care units.¹⁰ Moreover, the cost per life saved is reduced by factoring in the benefits of increasing worker productivity due to mitigation of workers’ COVID-19 infections. I salute these accomplishments by the American government, National Institutes of Health, American pharma and academia, in partnership with other Western democracies, international organizations, and institutions.

I personally modestly contributed to this plethora of research by contributing 10 articles on the effects of COVID-19 on clinical gastroenterology (GI) and by editing the current issue of the *Gastroenterology Clinics of North America* devoted to GI and hepatic manifestations of COVID-19 infection. In March 2020, at the pandemic onset, I

resolved to suddenly cease all my previous research and revolutionarily devote all my new research to the GI effects of this pandemic, like Abraham the patriarch who suddenly abandoned his birthplace to travel on a mission to the promised land. I began my crusade by publishing a report in early April 2020 about a COVID-19-infected-patient expiring from acute renal failure consequent to severe dehydration from moderately severe diarrhea.¹¹ This report published in the *Am J Gastroenterol* was one of the first 40 publications in the world on the pandemic; I believe this paper was notable in demonstrating that diarrhea from COVID-19 infection can contribute to patient mortality by causing acute renal failure from dehydration and electrolyte imbalances.

The pandemic dramatically changed the practice and work schedule of GIs, including me. The rate of performing GI endoscopy plummeted to less than 10% of baseline in 11 New York City hospitals¹² and to about 4% of baseline (!) at William Beaumont Hospital in suburban Detroit¹³ just after the pandemic onset. I witnessed, experienced, actively participated, and prospectively reported on the clinical, administrative, research, and financial responses of the Division at William Beaumont Hospital at Royal Oak, a very large (1200 bed), tertiary university hospital in my position as a full-time clinician in the Division, clinical educator as codirector of the preclinical GI course in the affiliated medical school, director of the GI fellowship, and as the former chief of GI. My clinical practice became significantly focused on COVID-19 infection with the inundation of COVID-19 infected patients at the Hospital. I wrote a comprehensive and detailed analysis of the changes brought about by the pandemic that was published nearly 2 years ago in *Dig Dis Sci*.¹⁴ The previous study was envisioned as a microcosm of the reorganization throughout academic and clinical GI and was proposed as a representative model for academic GI divisions in America. However, study of this flagship Hospital of the Beaumont Hospital network may magnify the pandemic effects because Beaumont Hospital is a tertiary referral center for very sick COVID-19-infected patients with complicated disease, in an intense metropolitan pandemic epicenter.

This earlier study may have benefited clinical and academic GIs, hospital administrators, governmental health-care regulators, medical ethicists, and medical historians in reporting the profound and pervasive effects of the pandemic on GI. Literature review revealed little, but still important, data published elsewhere on the pandemic impact on the clinical and academic missions of GI divisions.¹⁵⁻²⁰ My previous study was distinguished by its depth and comprehensiveness, including new, previously unreported data concerning the reorganization, some of which might otherwise have never been reported.

The current companion study critically analyzes the effectiveness of the previously published revolutionary changes of the GI division mostly enacted from March to September 2020, from the perspective of some 2 years later. This critical analysis is divided into two related but different works that critically analyze different aspects of the previously published revolutionary changes. The reader is referred to the companion work on the critical study of different aspects of the revolutionary changes in the Hospital and the Medical School in response to the pandemic (also published in this monograph in *Gastrointest Clin of N Am*. While the changes are mostly effective, some changes are questionably effective, and occasionally changes are ineffective.

METHODS

The previous work published in *Dig Dis Sci*¹⁴ continuously collected prospective data from March 2020 to May 2021 (mostly March-September 2020) that reported the revolutionary changes in GI at this clinical and academic institution, the primary teaching

hospital of Oakland-University-William-Beaumont-School-of-Medicine since the medical school was founded 12 years ago. The hospital employs more than 400 house officers in-training annually for more than 25 years and has continuously maintained an accredited GI fellowship since 1973. This study reported direct changes in the Division, and indirect effects on the Division from changes in the Department of Medicine, institutional Graduate Medical Education (GME) Department, Hospital administration, affiliated medical school, Accreditation Council for Graduate Medical Education (ACGME), professional GI/hepatology organizations, and governmental regulators.

This work is claimed as expert opinion based on the investigator's expertise in hospital administration from serving as Chief of GI at the Hospital, November 2006 to September 2019, just before the pandemic onset; as GI fellowship program director at various institutions for more than 21 years including GI fellowship program director at William Beaumont Hospital from 2006 to 2021; as medical school GI preclinical course codirector at Oakland University William Beaumont Hospital School of Medicine for more than 11 years; as a member of the Hospital GME Committee for more than 15 years, as a member of the Hospital Endoscopy Committee for more than 15 years, and as a member of the medical school Curriculum Committee for more than 11 years. The author also has considerable experience in academic GI research as a member of the Food and Drug Administration (FDA) Advisory Committee for GI drugs for 5 years²¹; and as author of more than peer-reviewed professional publications in GI, including several publications on academic GI divisions or fellowships., I can claim expertise on GI manifestations of COVID-19 infection, as author of 5 previously published articles on COVID-19 infection^{11,14,22-24} and 5 currently published articles in the present monograph.

The medical school and Hospital are nonprofit, private, institutions, unaffiliated with municipal or state governments. Medical students normally spend most of their pre-clinical years attending required courses on major bodily organ systems, such as cardiology or GI, aside from attending several basic science courses, such as biochemistry. Faculty delivering clinical lectures in bodily organ system courses are mostly physicians employed full-time at the Hospital but some physicians are in private practice affiliated with the Hospital, whereas the basic science faculty for these courses are full-time employees of the Graduate School of Medical Sciences at Oakland University.

The Division has a current complement of 6 GI fellows in total (2020–2021) and was fully accredited by ACGME without warnings or citations. The Division maintains a liver transplant service for more than 10 years accredited by United Network Organ Sharing. The Division maintains a large GI consultative and endoscopic clinical service, encompassing about 36 GIs in private practice primarily affiliated with the Hospital in 2020 to 2021, with a recent drastic decline to about 28 clinical faculty due to a large private GI group and another faculty member quitting the Hospital, and 3 full-time hospital-employed GIs; has a busy endoscopy suite performing more than 23,000 GI endoscopies annually before the pandemic with a large, recent, drastic, and sustained plunge by about 50% or more due to the pandemic and about 22% of the GI staff leaving the Hospital. The reader is directed to a closely related special article on the same subject in this monograph, but covering a set of different topics.

Review

The following critically reviews the effectiveness of the previously reported changes/reorganization of the clinical, teaching, research, and financial functions of this Division due to the pandemic from March 2020 to May 2021, from the perspective of two years afterward, as follows:

Changes in preclinical and clinical medical school education due to pandemic

Background: The medical school at Oakland University enrolls 125 medical students per year, for a full complement of 500 medical students for all 4 medical school years. The first 2 (preclinical) years were taught almost entirely at the Oakland University campus in Rochester, Michigan with basic science faculty supplied by the Graduate School of Oakland University and nearly all clinical faculty supplied by the William Beaumont Hospital at Royal Oak, an equal partner of the medical school. The last 2 (clinical) years are taught almost entirely at William Beaumont Hospital at Royal Oak, which is one of the 8 hospitals in the Beaumont Hospital system that are all located in the Greater metropolitan Detroit area. Occasional clinical rotations were held at William Beaumont Hospital at Troy, and rarely at other Beaumont network hospitals. Medical students rarely take clinical electives at other medical schools, outside the Hospital network, with approval required from medical school administration. Oakland University is in Rochester, MI, about 20 miles away, or 30 to 45 minutes by car, from Beaumont Hospital in Royal Oak.

1. In mid-March 2020, the medical school abruptly, emergently, and completely ceased operations due to the raging pandemic onset in the Detroit epicenter. After 96 hours of intense deliberations, the medical school reopened with medical school lectures for the first 2 years all changed in format from live lectures, presented in classrooms crowded with medical students exposing them to COVID-19 infection, to lectures presented virtually by tapes rebroadcast remotely by Internet through a private, secure, audiovisual connection.²⁵ These lectures had been originally audiovisually taped when delivered live during the prior academic year 2019 to 2020. Colleges and universities, similarly, used videotaped course lectures that were retransmitted in the same manner for the same reasons.

Opinion: As course codirector for the GI course, I was not invited to participate in these deliberations or decisions about the medical school. I was first officially notified on April 24, 2020, that the second-year medical school course in GI would start on schedule in September 2020 but use audiovisually taped lectures. The memo did not, at the time, specify whether the course lectures would be recycled lectures, that were taped from the prior year, as was occurring in the earlier courses running March to June 2020, or would use newly created audiovisually taped lectures. I, therefore, suspended preparation for the GI course from March to July 2020 including postponing the scheduling of lecture dates and times, recruiting clinical lecturers, revising the course curriculum, and meeting the course codirector for basic science until the medical school administration resolved this issue. First-year and second-year medical school Curriculum Committee meetings, with clinical and basic science course codirectors, medical school administrators, and student representatives, were held as usual monthly in April to July 2020 but were severely curtailed by partial medical school closure, by frequent sudden committee meeting cancelations without advance notice, and by holding them virtually by telephone or audiovisual conference through the Internet rather than live and face-to-face, to prevent exposure of committee members to COVID-19 infection by physically meeting in crowded classrooms.

2. As course codirector, I was first, and belatedly, informed in July 2020, just 1 month before the GI course was to begin, that the GI course, like all future medical school courses, would change from the recycled, previously taped, lectures, derived from the academic year 2019 to 2020 to newly created audiovisual lectures taped just before the upcoming 2020 to 2021 courses to avoid presenting 1-year-old lectures. Unfortunately, the course codirectors were provided little time to recruit faculty for

the upcoming course and for the recruited faculty to prepare new lectures. Lecture formats were changed to comply with new curriculum guidelines recommended in Spring 2020 by the Curriculum Committee. Taped questions posed by medical students attending the live lectures in 2019 to 2020 were eliminated; the newly taped audiovisual 2020 lectures were not videotaped before a live audience and, therefore, lacked questions asked by medical students.

Benefits: The 30 “live” clinical lectures for the 5-week-long GI course presented during September to October 2019 were replaced by newly created audiovisual tapes of lectures for September to October 2020, thereby eliminating the canned questions asked by medical students as recorded in the prior year’s lecture. This change was beneficial because the canned questions from the prior year came across as awkward and lame because the questions were not spontaneous. The new course format prevented medical students from being exposed to COVID-19 from previously sitting 1.3 m from each other in fixed chairs during physical lectures held face-to-face in traditional classrooms and theoretically thereby eliminated the risks of medical students contracting COVID-19 from each other. Moreover, canceling the previous format of live lectures freed-up lecturers from a nearly 2-hour round-trip commute from the Hospital to the medical school, with the travel time then becoming available for patient care. The newly created lectures were only about 1-month-old compared with the previously used lectures that were 1-year-old.

Opinion: Unfortunately, senior administrators rendered decisions on medical school courses without soliciting advice from course codirectors, including me, who could have offered sage advice based on direct teaching experience and should have been consulted if only as a courtesy. Course codirectors were ordered to recruit new lecturers abruptly and hastily and create a new course schedule on short notice. The medical school administration temporarily used WebEx and then another commercially available, remote access, Internet system to broadcast videotaped lectures but both formats proved cumbersome and impractical, and the administration then settled on audiovisual tapes using Microsoft Teams, which functioned excellently.

These changes answered well the prior criticisms but did not permit medical students to ask questions during the lectures. This perforce lacked a critical part of the classic Socratic method of teaching, which had evolved during 2.5 millennia, of students spontaneously asking questions during the lecture and relegated students to purely passive learning without being able to ask questions or interact with the lecturer whatsoever.

3. Three clinical lectures scheduled for the renal and urology course running in August 2020, just before the GI course, were abruptly canceled on the day of their lectures, without warning, because the lecturers made technical mistakes using the Internet lecture system due to their lack of training by information technologist (IT) personnel because IT personnel were cut by 20% and unavailable to supply routine technical support just when these personnel were needed most to set up virtual computerized technology during the pandemic onset. These cancellations left 125 medical students in the lurch because of waiting for a scheduled medical school lecture that did not occur. These lectures were then successfully taped audiovisually and rebroadcast several days later. Planning for the September to October 2020 GI course encountered similar setbacks because audiovisual taping was supervised by academicians, from the medical school, rather than IT personnel, with IT personnel only available for assistance remotely by telephone by special request due to the shortage of IT personnel. This arrangement caused

confusion and errors due to inadequately trained academicians supervising the taping of lectures. Only pretaped lectures were used because “live” broadcasting of virtual lectures through the Internet had caused many lecture cancelations due to computer glitches. Ironically, 3 lectures presented by computer-savvy GI attendings who thought they did not need IT technical support for taping their lectures had to cancel their lectures on the day of their scheduled broadcast because of computer glitches, whereas I, a rank IT amateur, delivered my 8 lectures without computer glitches because I arranged for and relied on IT assistance in advance.

4. *Modifications:* By January 2021, audiovisual recording of lectures improved with simplified, automated audiovisual Internet connections, rather than teleconferences made by the lecturer, and computer glitches became rare. Lectures were delivered “live” but virtually using Zoom or Microsoft Teams without audiovisual taping of lectures. In early 2021, Microsoft Teams became the official commercial channel for audiovisual conferences and lectures for the Medical School and Hospital.

Opinion: Such technology allowed students to ask questions virtually in “real” time. Microsoft Teams significantly improved interactions between teachers and students but still prevented face-to-face interactions that might have exposed students to contracting COVID-19 infection. Students and lecturers were unable to interact through gestures or other nonverbal cues due to the virtual connection. These lost interactions have undetermined the value of virtual lectures. Yet, Microsoft Teams and Zoom offer the best possible verisimilitude of physical lectures in the virtual world despite these minor quibbles.

5. The 6 laboratory sessions for the GI second-year medical school course, each lasting from 1.5 to 2 hours, covered upper GI anatomy and histology, lower GI anatomy and histology, and hepatobiliary and pancreatic anatomy and histology. These sessions were changed in 2020 from physical, “traditional” laboratories delivered face-to-face by proctors in classrooms using actual anatomic, pathologic, and histologic specimens to virtual sessions presented in real time by a preceptor using photographic images of specimens accompanied by oral explanations of the illustrated slides. Students could ask preceptors virtual questions in real time (March 2000–current). After presenting a slide, the preceptor asked students questions about the slide, which each student answered out loud. Students’ answers were followed by the preceptor presenting and explaining the correct answer virtually. Laboratory sessions ended with questions by medical students answered live and virtually by the laboratory preceptor.

Opinion: Laboratory sessions pose a special challenge for virtual reality. For example, how does a medical student virtually appreciate the nodularity and fibrosis of a cirrhotic liver? Verisimilitude for virtual laboratory sessions will require further technological breakthroughs.

6. Elective clinical rotations for fourth-year medical students in medical subspecialties, including GI, were canceled (March–December 2020), and resumed (January 2021–current). Clinical rotations at other institutions for third or fourth-year medical students were suspended (March 2020–February 2021) and resumed (March 2021–current). Similarly, clinical clerkships or rotations from medical students visiting from other medical schools were suspended (March 2020–February 2021), and resumed (March 2021–current). Elective clinical GI rotations for third-year or fourth-year medical students were canceled during the early pandemic

(March 2020–February 2021).²⁵ Substantial medical school closure for subspecialty clinical rotations freed-up subspecialty attendings from teaching responsibilities to medical students and permitted these clinicians to devote more time to the clinical care of COVID-19-infected patients.

Opinion: With decreasing threats to the health of patients or medical students after the first 9 months of the pandemic, clinical rotations of medical students did not need to be cancelled. The medical students were then allowed to do elective rotations in medical subspecialties. The absence of medical students earlier rotating in GI detracted from their medical education and harmed the GI consultative service because the very busy service depended on the medical students to help in performing GI consults.

7. All eligible fourth-year medical students graduated on time, as scheduled, and were awarded their diplomas in both May 2020 and May 2021, despite missing small parts of scheduled clinical rotations or electives due to the pandemic.²⁶
8. Medical students were exempted from evaluating and treating hospitalized patients with active COVID-19 infection but could waive this exemption (March 2020–current). These policies reduced risks of medical students contracting COVID-19 infection.
9. Clinical clerkships substantially modified (March–June 2020) by employing objective structured clinical examinations, which were disseminated virtually using commercial platforms such as WebEx. Substantial parts of the third-year clinical clerkships and fourth-year clinical electives used remote (virtual) teaching. For example, teaching sessions on performing phlebotomy were canceled.

Opinion: Graduation of medical students on time was essential. This graduation prevented unwarranted delays in their medical career. They missed small parts of the usually mandatory medical curriculum because of the pandemic.

10. The medical school granted all medical students (years I–IV), a US\$1,000.00 discount on tuition for the academic year 2020–2021 due to cost savings from substituting virtual for physical lectures and in recognition of the hardships endured by the medical students in attending classes during the pandemic.

Opinion: The medical students appreciated this nice gesture. Although it was likely only symbolic, it was likely all that the medical school could afford during the pandemic.

Changes in teaching and clinical supervision of medical residents and gastroenterology fellows in gastroenterology division due to the pandemic

1. The Division standardly had 5 face-to-face divisional lectures or conferences per week before the pandemic, which were uniformly canceled during the early pandemic to reduce pandemic transmission and to conserve physician manpower for clinical duties (March–August 2020). Lectures were resumed (September 2020–current) with audiovisual conferencing by Microsoft Teams with the speaker located remotely. To compensate for canceled divisional lectures, the Division periodically offered GI fellows and rotating medical residents complementary lectures delivered by national GI experts through the Internet, sponsored by the American College of Gastroenterology.
2. GI and medical grand rounds were canceled (March–August 2020) thereby freeing up 1 hour per lecture for each of the many voluntary GI and other clinical faculty and reduced their risks of contracting COVID-19 infection from attending these lectures

in crowded classrooms. GI and medical conferences were reinstated September 2020, with conferences held remotely (virtually) by Microsoft Teams, without live attendance by lecturers or attendees.

3. Medical resident rotations on GI electives (2 residents per month) were suspended, and these residents were pulled from the GI service to work on general medicine wards devoted exclusively to COVID-19-infected patients (March–July 2020). Residents reverted to their prepandemic GI clinical schedule in August 2020. Medical resident research rotations in GI electives were suspended (March–December 2020) to accommodate the heavy clinical burden to treat COVID-19-infected patients.

Opinion: Starting January 2021 medical residents were permitted to have GI research electives but were discouraged by the Hospital from doing so because of the heavy clinical burden of the pandemic.

4. Four GI fellows were deployed from GI service to act as medical attendings to supervise medical residents and physicians assistants in newly created medical wards exclusively for COVID-19-infected patients (April and May 2020). Before the pandemic, 3 GI teams manned 3 general GI teaching service teams per month performing GI consults, patient follow-ups, and GI endoscopies, with each team containing 1 GI fellow supervised by 1 GI attending; 1 further GI fellow was assigned to advanced endoscopy including diagnostic and therapeutic endoscopic retrograde cholangiopancreatography (ERCP) and endoscopic ultrasound (EUS) supervised by a GI attending certified in advanced and therapeutic endoscopy; 1 GI fellow was assigned to hepatology/liver transplant service supervised by an attending hepatologist; and 1 GI fellow was assigned to GI electives in GI research or special clinical rotations (such as, inflammatory bowel disease or GI motility). This reassignment as medical attendings supervising COVID-19 wards was legally permissible because all GI fellows were licensed to (independently) practice internal medicine as medical attendings after completing 3 years of medical residency before starting GI fellowship. One GI fellow covered the hepatology/liver transplant service under supervision by an attending hepatologist, and 1 GI fellow covered GI consults, follow-ups, and endoscopies exclusively for staff and private patients with COVID-19 infection under supervision by a GI attending. In summary, 4 GI fellows were reassigned in April to May 2020 from covering exclusively GI consults as GI fellows to supervise general medical wards as medical attendings for exclusively COVID-19 infected patients, and the 2 other GI fellows were assigned to cover the GI or hepatology consultative services treating mostly COVID-19-infected patients. The rotation of GI fellows on medical wards exclusively treating COVID-19 patients was rescinded June 1, 2020, at which time all GI fellows reverted to the prepandemic schedule of covering only GI wards. This change became possible because of the decreasing daily census of COVID-19-infected patients. A new wave of COVID-19 infection peaked in April 2021 with the census of COVID-19-infected hospitalized patients again reaching more than 200/d.⁵ Four GI fellows were transferred from GI service to serve as medical attendings to supervise medical residents and physician's assistants exclusively treating COVID-19-infected patients (April–May 2020). Resumed regular GI schedules (June 2020–current).
5. GI fellows excused from performing GI endoscopies on their patients (March–April 2020) forcing GI attendings to perform endoscopies alone on patients on the GI teaching service. This policy was rescinded (May 2020–June 2021) allowing GI fellows to assist in GI endoscopies performed on their patients.

Opinion: The original policy exempting GI fellows from GI endoscopies was ill conceived because it harmed their endoscopic training and exposed GI attendings, some of whom were relatively elderly and had risk factors for severe COVID-19 complications, to be exposed to COVID-19 infection during GI endoscopy. Nearly half of GI attendings are elderly.

6. Due to the reduction of endoscopies assigned to GI fellows (March–May 2020), the Division proportionally reduced the minimum threshold of specialized GI endoscopies (ERCP and EUS) required during the 3-year fellowship for certification for specialized endoscopies.
7. Before the pandemic, medical attendings and residents could schedule patients for GI clinic without GI fellow approval but with the pandemic onset, the GI service instituted in March 2020 prescreening of patients for upcoming GI clinics. GI fellows reviewed patients' medical records and briefly contacted patients by telephone to determine whether a patient should be seen in GI clinic. Patients with relatively urgent indications were scheduled for occurring relatively soon in GI clinics, whereas patients for elective indications had their GI clinic visits postponed for more than 8 weeks. Prescreening reduced the total number of GI clinic visits from about 36 to 18 patients per week to reduce the stress on the GI service from the overload of COVID-19-infected patients. Before the pandemic, GI patients were uniformly seen in person in GI clinic in private examining rooms. GI fellows had interviewed patients face-to-face, performed physical examinations on their patients, and returned with their supervisory GI attending to review the patients' GI condition and discuss their recommendations with patients. During the early COVID-19 surge (March– June 2020), all GI clinic visits became virtual via telemedicine: patients were contacted, interviewed, received recommendations, ordered to undergo tests, and prescribed medicines by videoconference or telephone. In person (live) GI clinic visits were reinstated starting July 2020 but GI telemedicine clinic visits were also continued. Currently, about half of GI clinic visits are live and in-person, and about half are virtual by telemedicine. Patients who are sicker and have more urgent indications for clinic visits are seen "live," whereas other patients are seen by telemedicine. Due to the pandemic, patients seen in person at clinic could not be accompanied by a companion unless medically necessary (eg, patient with dementia).

Opinion: GI clinic appointments were triaged according to severity of disease. This is a reasonable solution for allocating scarce medical resources. It is frequently done to determine the priority of seeing patients in busy emergency rooms.

8. National Board of Medical Examiners tests in certain medical specialties (eg, emergency medicine) postponed during the pandemic peak and offered later using remote proctoring.
9. GI fellowship applicant interviews changed in 2020 from physical interviews to virtual interviews via Internet to reduce applicants' exposure to COVID-19 infection during the pandemic. The virtual interview process closely simulated the physical interview process before the pandemic, by having individual interviews conducted virtually by Internet, by supplying a taped audiovisual tour of hospital facilities, by providing applicants a detailed list of the monthly GI fellowship schedules and listing employment conditions via the Internet, and by arranging for applicants to confidentially meet current GI fellows virtually via Microsoft Teams, with GI attendings excluded to ensure meeting confidentiality.²² The Alliance for Academic Internal Medicine recommended that the fellowship interview process should be entirely virtual in 2021.

Opinion: The Hospital received a record number of 400 applications for GI fellowship positions in 2020, possibly because of instituting virtual interviews attributed to the greatly reduced investment in time and money by interviewees for virtual interviews due to eliminating the time and cost involved in physical interviews, including airplane travel and overnight stay at a hotel for physical visits. This virtual interview process was set-up to closely resemble the previous physical face-to-face interview process.

Changes in clinical practice of gastroenterology attendings due to pandemic

1. One GI attending reassigned from general GI consultative services to GI services for exclusively COVID-19-infected patients due to clinical demand (April–May 2020). As aforementioned, in April–May 2020, the normal 3 GI consultative teams for general GI patients, each consisting of 1 GI fellow and 1 supervising GI attending per team, were disbanded and replaced by 1 GI consultative service designated exclusively for COVID-19-infected patients covered by 1 GI fellow and supervised by 1 GI attending. One additional GI consultative team for overflow staff GI patients, previously manned by a physician's assistant and supervised by a GI attending was maintained but also became substantially devoted to COVID-19-infected patients due to the pandemic surge. The hepatology consultative service was maintained with 1 GI fellow and 1 hepatology attending but also substantially became a consultative service for COVID-19-infected patients due to the pandemic. The GI schedule reverted to the prepandemic format for GI attendings in June 2020 as the volume of COVID-19-infected patients decreased.
2. Hospital Physician-in-Chief directed GI and other subspecialty consultants to obtain patient histories and advise patients after consultation through telemedicine (April 2020–May 2021) to maintain greater than 2 meters distance from patients with confirmed or suspected COVID-19 infection to minimize consultant risks. GI consultants could avoid physical examinations altogether by relying on physical examinations performed earlier on the same day by emergency room or medical ward attendings to avoid exposure to COVID-19-infected patients (starting April 2020).
3. The Centers for Medicare and Medicaid Services (CMS) established a new billing code in April 2020 to reimburse physicians for telemedicine.²⁷

Opinion: E-consults through telemedicine represented a significant advance in medical care in selected circumstances. E-consults are more convenient and less costly to patients, but e-consults have inherent limitations due to lack of physical examinations, and less forceful recommendations offered to patients when presented virtually. Physical face-to-face visits should still be offered to sicker and more complicated patients.

4. Due to a critical shortage of staff physicians during the pandemic surge, the Hospital requested full-time employed physicians to voluntarily relinquish planned vacations during April 2020.

Opinion: In response to this Hospital request, I voluntarily relinquished a 1-week vacation during the Spring holidays (April 2020), during which I had already planned to visit my family in Florida.

Changes in gastrointestinal endoscopy practice due to pandemic

1. All elective and semielective GI endoscopies, whether outpatient or inpatient, and regardless of patient COVID-19 status, were cancelled late March to June

1, 2020, and then postponed (June 2020–May 2021) due to insufficient hospital supplies of personal protective equipment, especially N95 masks, shortages of endoscopy nurses and anesthesiologists, and to reduce risks to endoscopy staff of contracting COVID-19 infection from infected patients during GI endoscopy. Patients with urgent or emergent indications still underwent GI endoscopy. Patients underwent mandatory prophylactic endotracheal intubation, and mechanical ventilation for EGD from mid-March until April 17, 2020 to reduce the risks to endoscopy personnel of contracting COVID-19 infection.²⁸ An association of COVID-19 infection with diarrhea and finding of infectious COVID-19 viral mRNA in stool²⁹ raised the possibility of transmitting COVID-19 infection to endoscopy personnel during colonoscopy and concern about whether prophylactic endotracheal intubation and artificial mechanical ventilation was warranted for COVID-19-infected patients undergoing colonoscopy. Mandatory intubation for EGD performed on inpatients was rescinded (April 2020)²⁸ and made voluntary after 4 national/international GI and hepatology professional societies declared in a joint statement that endotracheal intubation and mechanical ventilation in such situations should not be mandatory. GI endoscopies performed on COVID-19-infected patients were, if possible, scheduled as the last procedure of the day in an endoscopy room to minimize risks of viral contamination of endoscopy rooms, just as was practiced for many years for HIV-seropositive patients undergoing GI endoscopy.

Opinion: Change for all patients undergoing EGD from mandatory endotracheal intubation to elective intubation in selected patients was reasonable. Mandatory intubation exposed patients to risks of subsequent extubation failure after EGD, which could prove dangerous to patients with COVID-19 pneumonia. Subsequent data seem to show that the risk of contracting COVID-19 infection during GI endoscopy is manageable (but not nil) during the pandemic.

2. Endoscopy suite did not routinely screen patients for COVID-19 infection before performing endoscopy until July 2020, although patients undergoing elective surgery were screened for this infection beginning several months earlier.

Opinion: Screening patients scheduled for GI endoscopy was important to prevent COVID-19 exposure of endoscopy staff.

3. Hundreds of outpatient GI endoscopies (including both EGDs and colonoscopies) for GI clinic patients faced long delays (often amounting to many months) because of less inpatient endoscopy slots available due to a large decrease in number of endoscopy nurses, attending anesthesiologists, and nurse-anesthetists and longer turnaround times for disinfecting rooms between endoscopies due to the pandemic. The Hospital has encouraged private and hospital-employed GI attendings to perform extra GI endoscopy sessions to decrease the extremely long waiting times for ambulatory endoscopies of GI clinic patients. GI clinic patients now have a half-day endoscopy block per week in the hospital endoscopy suite to shorten the endoscopy waiting list for clinic endoscopies but this action has still left substantial delays.

Opinion: I thought delays in outpatient GI endoscopic procedures were primarily due to shortages in endoscopy nurses and anesthesiology attendings attributed to the hospital discouraging unionization of the nurses and the hospital replacing its affiliated anesthesiology group. The change of staff was foolishly timed to occur during the near pandemic peak.

US\$84.5 million settlement by Beaumont Hospital for claims against it by the United States Department of Justice for improper payments by the hospital to physicians in apparent violation of the antikickback or Stark Law

1. Beaumont Hospital in 2018 voluntarily agreed to pay US\$84.5 million to the Department of Justice (and to regulatory authorities of the State of Michigan) to settle allegations of violation of the antikickback statute (Stark Law) under the False Claims Act. The Hospital allegedly improperly paid 8 cardiologists and others in 2004 to 2012 to refer patients to the Hospital.³⁰

Opinion: The Hospital agreement to pay the United States Department of Justice US\$84.5 million in 2018 to settle alleged violations of the antikickback statute (Stark Law) in paying physicians affiliated with Beaumont for patient referrals does not formally constitute an admission of guilt. However, the settlement and payment of US\$84.5 million by the Hospital speaks for itself. In my opinion, this settlement has severely tarnished the Hospital's reputation and played a large role in the Hospital's reaction to the pandemic that began less than 2 years after the settlement (See Discussion).

DISCUSSION

The COVID-19 pandemic proved to be a cataclysmic threat to public health throughout the world. This threat was substantially mitigated by outstanding efforts by medical researchers, Pharma, clinical institutions, medical schools, research institutes, and regulatory authorities in America, Europe, and the rest of the world. Yet the pandemic still caused more than six million known deaths worldwide and likely caused several million more undocumented deaths despite all this mitigation. Perhaps the most important pandemic mitigation was the development of vaccines based on novel mRNA technology, as implemented for the Pfizer-BioNTech and other COVID-19 vaccines. This achievement has been a triumph of Pharma, especially of Pfizer, under the supervision of the Food and Drug Administration (FDA), the National Institutes of Health, and European regulatory institutions. This achievement has been widely documented. However, the overwhelming response by the medical community included numerous other scientific and clinical achievements, as enumerated in the Introduction, that also helped mitigate the pandemic and probably also saved many more millions of lives.

Another landmark achievement has been the flourishing of novel virtual technology that has so ubiquitously replaced physical meetings with virtual meetings throughout healthcare and society. This transformation is inexorably linked to the pandemic. Although this transformation would likely have evolved slowly over time, regardless of the pandemic, to render time management of meetings more efficient and less costly, this transformation occurred revolutionarily in terms of its speed and scope due to the pandemic. The primary driver for this transformation was the pandemic: physical meetings, which entail close physical contact and introduce significant risks of transmission of COVID-19 infection, are replaced by virtual meetings, which entail remote contact, with virtually no risks of transmitting COVID-19 infection. Virtual meetings have greatly reduced contagiousness by reducing the frequency and duration of interpersonal contacts at physical meetings during the pandemic. This effect has been pervasive throughout clinical medicine, including hospital visits, hospital admissions, outpatient clinic visits, and ambulatory office visits. Virtual teaching has also been adopted for medical education in medical schools, graduate school medical programs, postgraduate medical education, and medical research. The occurrence of virtual teaching and virtual GI care has been thoroughly documented in this and the accompanying article, as illustrated for residency and fellowship

lectures, hospital lectures, research symposia, and other functions. Virtual meetings have also revolutionized teaching in general at colleges, universities, high schools, and even primary schools. Virtual hearings have become ubiquitous in legal proceedings such as depositions and trials. Professional medical conventions, such as that of the American Gastroenterology Association or the American College of Gastroenterology changed from physical meetings planned in physical convention halls to virtual meetings during the height of the pandemic. Virtual meetings have also transformed the corporate workplace by allowing many employees to work from home. For example, a close family member of mine works mostly from home via virtual technology as a physician's assistant while performing medical research under contract at a prestigious United States Hospital. This allows her to work full-time while also raising five children.

This work documents the growing pains in developing and establishing virtual meetings. Despite the intense clinical need to quickly adapt virtual technology during the pandemic, this process evolved over many months during the early pandemic. For example, the first attempts at holding virtual meetings by the medical school curriculum committee involved conference calls which have since become obsolete for managing large committee meetings. The technology was far inferior to that available just one year later when Microsoft Teams and Zoom became commonplace and popular. Conference calls were also plagued by intermittent loss of communication, poor connectivity, variable sound volume and quality in a large conference room depending upon proximity to the speaker microphone, and people speaking up simultaneously on top of each other because of the lack of visual contact and cues. Moreover, large conference calls only partly eliminate the risk of contagiousness during the pandemic because many people are still present in a large conference room with some residual physical contact while listening to the conference call. The next iteration of virtual technology involved WebEx which also entailed problems.

Medical school lectures were initially transmitted via audiovisual tapes saved from videotapes of the previous year's lectures which had been standardly videotaped live during the presentation. This initial strategy was implemented easily because the previous year's lectures were standardly available.

The medical school then planned to improve the virtual technology to help mitigate the pandemic after a brief review process. This medical school badly planned and implemented this review process, as it was plagued by mistakes and bungling in its implementation and long delays. The medical school administration kept to themselves their planned modifications for too long. I checked biweekly in April through June with the medical school administration regarding revised plans for virtual transmission of the GI course which was scheduled to start at the end of August 2020 but was provided no information except that the administration was still working on its plans. Belatedly, in July 2020, just one month before the second-year medical school GI lectures which I codirected was set to begin, the medical school administration informed me that the schedule of course lectures would have to be created anew and a new roster of course lecturers would have to be recruited for the 2020 GI course. I as a GI course co-director, despite my many years of teaching experience at the medical school, was not consulted on how to arrange the new annual course, even if only as a courtesy. Course codirectors were abruptly ordered to hastily recruit new lecturers and create a new course schedule on exceedingly short notice. The course codirectors were provided little time to recruit faculty and the recruited faculty in turn were provided little time to prepare their new lectures. This caused great stress on the GI clinical faculty as if the clinical faculty were not under enough psychological pressure from the COVID-19 pandemic.

The Medical School made a serious mistake in cutting back across the board the number of information technologist (IT) personnel by 20% to save money during the early pandemic rather than preserving or even increasing the number of IT personnel that were essential to create the transition to virtual technology during the early pandemic. IT cutbacks directly led to cancelling six lectures, three lectures for the renal and urology course, and three lectures for the GI course with disastrous consequences. Each lecture cancellation caused 125 medical students to attend a one-hour scheduled lecture for naught. Cancellation of one lecture ended costing about \$15,000 in tuition money estimated at about \$125 per lecture per student multiplied by 125 medical students. Three clinical lectures scheduled for the renal and urology course running in August 2020, just before the GI course, were abruptly canceled on the day of their lectures, without warning, because the lecturers made technical mistakes using the Internet lecture system due to their inexperience with the virtual technology and the lack of supervision by IT personnel because of the IT personnel cutbacks. Planning for the September–October 2020 GI course encountered three cancelled lectures at the last minute because audio-visual taping was supervised by academicians, from the medical school, rather than IT personnel, with IT personnel only available remotely for assistance by telephone and only if arranged in advance by special request due to the shortage of IT personnel. IT was unavailable to supply routine technical support for the lecturers just when IT were needed most to set up and guide academicians about virtual computerized technology during the pandemic onset. These failed lectures were successfully retaped audio-visually and rebroadcast several days later. Only pre-taped lectures were used because “live” broadcasting of virtual lectures via the Internet had caused many lecture cancellations due to computer glitches. The lectures delivered in September 2020 used hybrid technology with the talk delivered by audiovisual tapes awkwardly controlled by computer. The newly created lectures thankfully eliminated the canned questions posed by medical students attending the live lectures previously in 2019–2020; the newly taped audiovisual 2020 lectures were not videotaped before a live audience and, therefore, lacked questions asked by medical students.

Four iterations during the next approximately eight months of the pandemic using various virtual technologies finally produced a practical, and efficient virtual technology. In early 2021, Microsoft Teams became the official commercial Website for audiovisual conferences and lectures for the Medical School and Hospital. Microsoft Teams was named as the official virtual technology website. Microsoft Teams functioned nearly flawlessly! Zoom is an equally capable alternative technology. Capitalism, I believe, stimulated the rapid progress to develop highly efficient virtual technology, just as capitalism stimulated Pharma to develop relatively effective modern vaccines that saved many millions of lives from the pandemic.

By January 2021, audiovisual recording of lectures improved with simplified, automated audiovisual Internet connections, rather than teleconferences made by the lecturer, and computer glitches became exceedingly rare. Lectures were delivered “live” but virtually using Microsoft Teams without the need to audio-visually tape the lectures. Such technology allowed students to ask questions virtually in “real” time. Microsoft Teams significantly improved interactions between teachers and students but still prevented face-to-face interactions that might have exposed students to contracting COVID-19 infection. However, Microsoft Teams still had limited interactions between students and lecturers due to their interacting virtually without gestures or other nonverbal cues. These lost interactions slightly undetermined the value of virtual lectures.

With gradually decreasing threats to the health of patients or medical students after the first nine months of the pandemic, clinical rotations of medical students did not need to be cancelled. Medical students were then allowed to do elective rotations in medical subspecialties. The absence of medical students in earlier GI rotations, due to the pandemic, detracted from their medical education and harmed the GI service because the very busy consultative service depended upon medical students to help in performing GI consults.

E-consults via telemedicine represent a significant advance in medical care in selected circumstances. It offers a convenient alternative to face-to-face medical care that are less costly, but e-consults have inherent limitations due to lack of physical examinations, and less forceful recommendations offered to patients when presented virtually rather than physically and in person. The convenience of e-consults is illustrated by a patient cancelling a scheduled physical consult with me because of the need to travel a long distance in a snowstorm to make the scheduled appointment. The patient was accommodated at the same time slot by converting his scheduled physical consult to an e-consult at the same time. E-consults were approved and adapted by the Centers for Medicare and Medicaid Services in response to the pandemic just after the pandemic onset. It represents an innovation in health care which was accelerated because of the dire need for it due to the pandemic. After using somewhat clumsy interim virtual technologies, the Hospital formally adopted Microsoft Teams about eight months thereafter as the standard for e-consults.

Notable mistakes on performing EGD early in the pandemic were excusing GI fellows from performing endoscopy and mandating endotracheal intubation for all patients undergoing EGD with suspected COVID-19 infection. The use of mandatory endotracheal intubation was unwarranted because of the significant risk of failure to extubate patients with severe COVID-19 associated pneumonia. Delays in outpatient GI endoscopic procedures were primarily due to shortages in endoscopy nurses and anesthesiology attendings attributed to the hospital discouraging unionization of the nurses and the Hospital abruptly dismissing its long-term affiliated, academic anesthesiology group.

Hospital payment to the United States Department of Justice of 84.5 million dollars in 2018 to settle alleged violations of the antikickback statute (Stark Law) played a critical role in the hospital's subpar response to the pandemic. The hospital was buffeted by severe economic losses early in 2020 from the COVID-19 pandemic just after paying this huge "penalty".³⁰ This huge penalty severely tarnished the Hospital's reputation and the Hospital lost potential patients due to its tarnished reputation. I felt the loss of the reputation of the Hospital every day after the settlement was announced. I think this monetary loss played a role in the disastrous termination of the 20-year-long affiliation with the academic anesthesiology group which proved disastrous to the Hospital being able to staff an adequate number of endoscopy rooms. The announced settlement greatly affected the morale of Beaumont Hospital's employed and voluntary physicians. The diminished Hospital finances and reputation inexorably led the Hospital to being offered to more than 100 other health institutions, two failed acquisitions or mergers, and finally its sale, or merger, to Spectrum Health in 2021-2022.³³ Dr. David Felten, the former Vice President of Research at the Hospital, was the main whistleblower against the Hospital in its settlement with the Department of Justice, is set to shortly receive his whistleblower award for reporting against the Hospital.³¹ Eric Starkman has written a series of exposes about the chaos in the GI endoscopy suite at Beaumont Hospital during the pandemic focusing on the acute shortage of endoscopy nurses.³²

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Dr M.S. Cappell initiated this article and wrote the entire article. The Hospital Institutional Review Board (IRB) approved the previous published study on April 14, 2020.¹⁴ The current study does not require IRB approval because it is solely a review article with no report of original patient data and provides expert opinion based only on previously published data. Dr M.S. Cappell is employed as a gastroenterologist at the Aleda E. Lutz Veterans Affairs Hospital at Saginaw in Michigan. The Veteran's Administration Hospital System and the federal government of the United States have no position or opinion on this publication written by Dr Cappell.

CONFLICTS OF INTEREST

The author declares no conflict of interest. In particular, Dr M.S. Cappell, as a member of the United States FDA Advisory Committee for Gastrointestinal Drugs, 2013 to 2018,²¹ affirms that this article does not discuss any proprietary, confidential, pharmaceutical data submitted to the FDA and reviewed by Dr M.S. Cappell. Dr M.S. Cappell was more than 3 years ago a member of the speaker's bureau for AstraZeneca and Daiichi Sankyo, comarketers of Movantik. Dr M.S. Cappell had one-time consultancies for Mallinckrodt and Shire more than 3 years ago. This study does not discuss any drug manufactured or marketed by AstraZeneca, Daiichi Sankyo, Shire, or Mallinckrodt.

Dr. M. S. Cappell dedicates these two related special critical review articles in this issue to Dr. Anthony Fauci, the Head of Infectious Diseases at the National Institutes of Health, who has served selflessly in this capacity or other positions as a public servant at the National Institutes of Health over a long career, and who despite this dedicated service was the subject of vitriol because of advocating vaccination for the pandemic that has been proven to have saved millions of lives throughout the world.

DISCLAIMER

Dr. M. S. Cappell is employed as a gastroenterologist at the Aleda E. Lutz Veterans Administration Hospital in Saginaw, MI and by the United States Government. These institutions do not have an opinion on the views expressed by Dr. Cappell herein.

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