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Surgery Clerkship Curriculum Changes at an Academic Institution during the COVID-19 Pandemic

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PROBLEM: The COVID-19 pandemic has suspended the surgery clinical clerkship for third-year medical students at numerous institutions across the world. As a result, educators and students have adapted rapidly. There is a paucity of precedents regarding urgent and brusque formal curricular changes for medical students enrolled in surgical clinical rotations.

APPROACH: The University of California, San Francisco Department of Surgery created a surgically focused extended mastery learning rotation (EMLR). The surgery clerkship leadership designed a curriculum consisting of multiple learning strategies compatible with virtual learning environments. The primary aims of the newly developed EMLR were to help students consolidate their foundational science knowledge before their return to clinical medicine in an altered learning environment. The EMLR is currently underway, and further studies are necessary to evaluate its effectiveness. (*J Surg Ed* 78:327–331. © 2020 Association of Program Directors in Surgery. Published by Elsevier Inc. All rights reserved.)

ABBREVIATIONS: COVID-19, coronavirus AAMC, American Association of Medical Colleges EMLR, Extended mastery learning rotation PPE, Protective patient equipment MS4s, Fourth-year medical students MS3s, Third-year medical students CSRS, Clinical science review sessions CBLS, case-based learning sessions OR operating room

KEY WORDS: near-peer learning, surgery, clerkship, COVID-19, medical education, curriculum design

COMPETENCIES: Patient Care, Medical Knowledge, Practice-Based Learning and Improvement, Systems-Based Practice

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The world is currently facing unprecedented times with the novel coronavirus (COVID-19) pandemic. For the first time in America's history, all 50 states, the U.S. Virgin Islands, the Northern Mariana Islands, the District of Columbia, Puerto Rico, and Guam are simultaneously under disaster declarations.¹ Recent literature has discussed the pandemic's impact on resident education², fellowship interview processes³, clinic flows, and operating room utilization.⁴ However, little is known about the specific adjustments that have been made at the undergraduate medical education level in light of COVID-19.

On March 17, 2020, the American Association of Medical Colleges published its strong support of medical institutions pausing all student rotations until at least March 31, 2020, with the hope of giving institutions time to prepare students for their return to the clinical environment amidst the pandemic.⁵ Additionally, they proposed that a temporary suspension would allow institutions to address concerns centered around the availability of personal protective equipment (PPE).⁵ Responses to the American Association of Medical Colleges's statement at the institutional level have ranged from complete closure of schools to continued clinical rotations for senior medical students.

The purpose of this article is to share a surgical department's strategy in redesigning its undergraduate medical education curriculum during the COVID-19 pandemic to optimize the learning experiences of medical students. We hope to provide a framework for continued education that educators can apply within their respective institutions during this unprecedented time.

The University of California, San Francisco, after consideration of the relatively flattened regional infection curve of COVID-19 and their educational mission⁶, decided to continue clinical rotations for fourth-year medical students (MS4s) as long as adequate patient care opportunities, personal protective equipment, and physician supervision existed. Clinical clerkships for third-

TABLE 1. EMLR Content

Content	Personnel	Location
Self-study	Third-year medical student	Home
Case-based learning sessions with virtual operating room component	MS3s and attendings	Video
Clinical science review sessions	MS3s, MS4s, and senior residents	Video
Remote check-in/interviews with outpatients awaiting elective surgery	MS3s, MS4s, and surgical faculty mentors	Telephone or video
Office hours	MS3s and clerkship directors	Telephone or video

MS3s, third-year medical students; MS4s, fourth-year medical students.

year medical students (MS3s) are temporarily suspended, and students were transitioned to clerkships based on extended mastery learning rotations (EMLRs). Surgery clerkship leaders and medical students designed a curriculum consisting of self-study, case-based learning sessions (CBLS), combined with the virtual operating room (OR), clinical science review sessions (CSRS), virtual patient contact, and office hours. EMLRs have facilitated interactions between the MS3s, MS4s, residents, faculty, and fellows through video-conferencing and online

modules (Table 1). The main aim of the new curriculum was to help students solidify their foundational science knowledge so that they are prepared to return to the clinical learning environment. The curriculum governance committee consisting of students, clerkship directors, and faculty members have created focus groups to develop a plan for transitioning students from the EMLR to clerkships when clinical opportunities arise. Once they return to the clinical rotation, the students will be fully immersed in clinical environments without

TABLE 2. Sample Illness Script

Illness	Epidemiology	Symptoms	Signs	Labs/Studies	Next Step in Management	Pathophysiology ⁸
Appendicitis	Varies	Acute onset periumbilical pain that radiates to the RLQ	Tenderness to palpation at RLQ	Leukocytosis	Appendectomy	Obstruction of the appendiceal lumen
		Nausea	±Rovsing sign	CT scan		Sources of obstruction: • Lymphoid tissue hyperplasia • Fecalith • Foreign body • Infection • Neoplasia Persistent appendiceal obstruction
		Vomiting	±Psoas sign	Ultrasound		↓ increased luminal pressure
		Anorexia	± Obturator sign	*Clinical diagnosis		↓ disrupted venous outflow ↓ edema with ischemia ↓ epithelial wall disruption ↓ bacterial invasion ↓ inflammatory response

LLQ, left lower quadrant pain; RLQ, right lower quadrant pain.

additional formal didactic lectures. Completion of the EMLR is required to advance to the clinical clerkship.

This article highlights the following components of the EMLR: CSRS and CBLs combined with virtual OR experiences. Content was developed by senior medical students, residents, and attendings and reviewed by clerkship leaders. The main course objectives are to cultivate an interest in surgical topics, prepare students for the surgery clerkship and future licensing exams, and provide a sense of community for the number of students who are separated from their academic and typical support systems.

These sessions are conducted over video-conferencing. The CSRS utilized near-peer learning and case-based learning as the primary pedagogical approaches. MS4s present a patient case in a way that encourages virtual audience participation. Participating MS3s utilize reasoning to develop a diagnostic schema. A diagnostic schema is an illustrative approach used to categorize a specific abnormality.⁷ For example, if a patient presents in shock, a potential schema would outline the different types of shock, such as hypovolemic, distributive, obstructive, and cardiogenic. After the MS3s arrive at a preliminary list of differential diagnoses, they are encouraged to think about illness scripts. An illness script is a table that essentially highlights disease presentations starting from common patient demographics, risk factors, symptoms, signs, studies, treatment, and pathophysiology in a quick

format (Table 2). After completion of the preliminary illness scripts, MS4 instructors highlight the distinguishing characteristics of different disease presentations to help arrive at the correct answer. Surgical residents provide examples of real-life experiences and evidence-based best practices to contextualize and enrich the patient presentations outlined by the MS4s (Fig. 1).

The formulation of diagnostic schemata and illness scripts falls under the category of clinical reasoning. Clinical reasoning is a process based on inferences developed from the gathering and synthesis of data that eventually lead to the creation of judgments and decisions about the diagnosis and management of patient conditions.^{9,10} The development and refinement of diagnostic schemata and illness scripts are lifelong processes that are dependent on solid clinical reasoning skills and accumulation of experience. Early exposure of medical students to clinical reasoning skills outside of the high-pressured clerkship environment can help develop a foundation for identifying common patient presentations and initial management steps.¹⁰

The CBLs, combined with the virtual OR, provided MS3s with the opportunity to interact with faculty. Sessions were enhanced with videos of prior operations. For example, an attending presented a case of a patient with end-stage liver disease. The students developed a diagnostic schema, an assessment, and plan. The

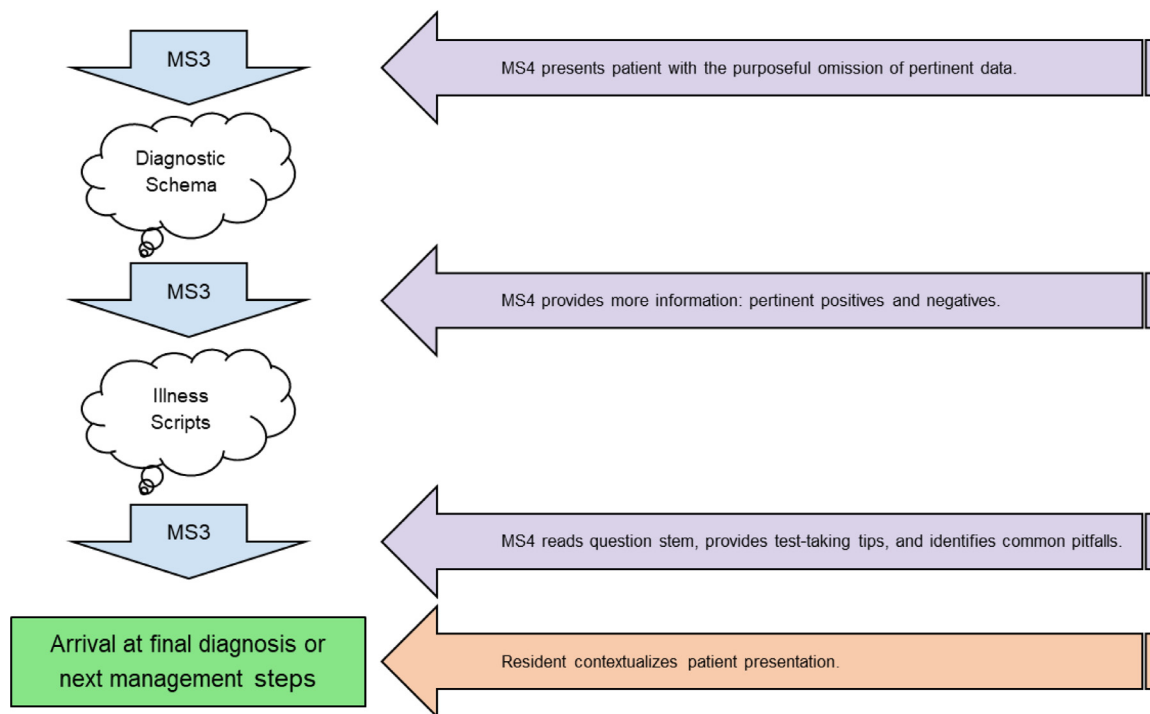


FIGURE 1. Clinical reasoning workflow during Clinical Science Review Sessions. *Okay if printed in greyscale. MS3s, third-year medical students; MS4s, fourth-year medical students.

attending created a virtual OR by showing a video of an orthotopic liver transplantation. The attending edited raw footage and utilized the video to familiarize students with the OR, illustrate key operative steps, highlight pertinent anatomy, and point out critical intraoperative physiological changes that were consistent with reperfusion syndrome. The detailed illustration of OR experiences is often omitted from clerkship didactics because students typically have a baseline understanding from their in-person OR experiences which enables didactics to simply name operations without delving into the operative details. However, in a virtual setting, students lack the benefit of these intraoperative experiences, and the virtual OR was created to fill the void usually occupied by in-person clerkship experiences (Fig. 2).

We believe the EMLR with layered content from senior medical students and surgical residents and attendings will provide students with essential basic

skills and help to accelerate the development of clinical reasoning skills upon their return to the clinical learning environment. The layered learning environment provides richness to stimulate interesting conversation, class participation, and engagement from all levels of the surgical department.

The virtual environment can be harnessed to create optimal educational communities. Recent literature has highlighted the important aspects of a successful virtual meeting: use of video, provision of audio dial-in connections (in case of internet connectivity issues), test-running technology before sessions, discussing meeting objectives, encouraging the visibility of the faces of participants, limiting didactic/presentation time, calling on people during the meeting for active engagement, and assigning a facilitator to move the session along.¹¹ We sparingly utilized Socratic methodology to facilitate student engagement and discourage online multitasking. The presence of additional instructors and facilitators was helpful because the

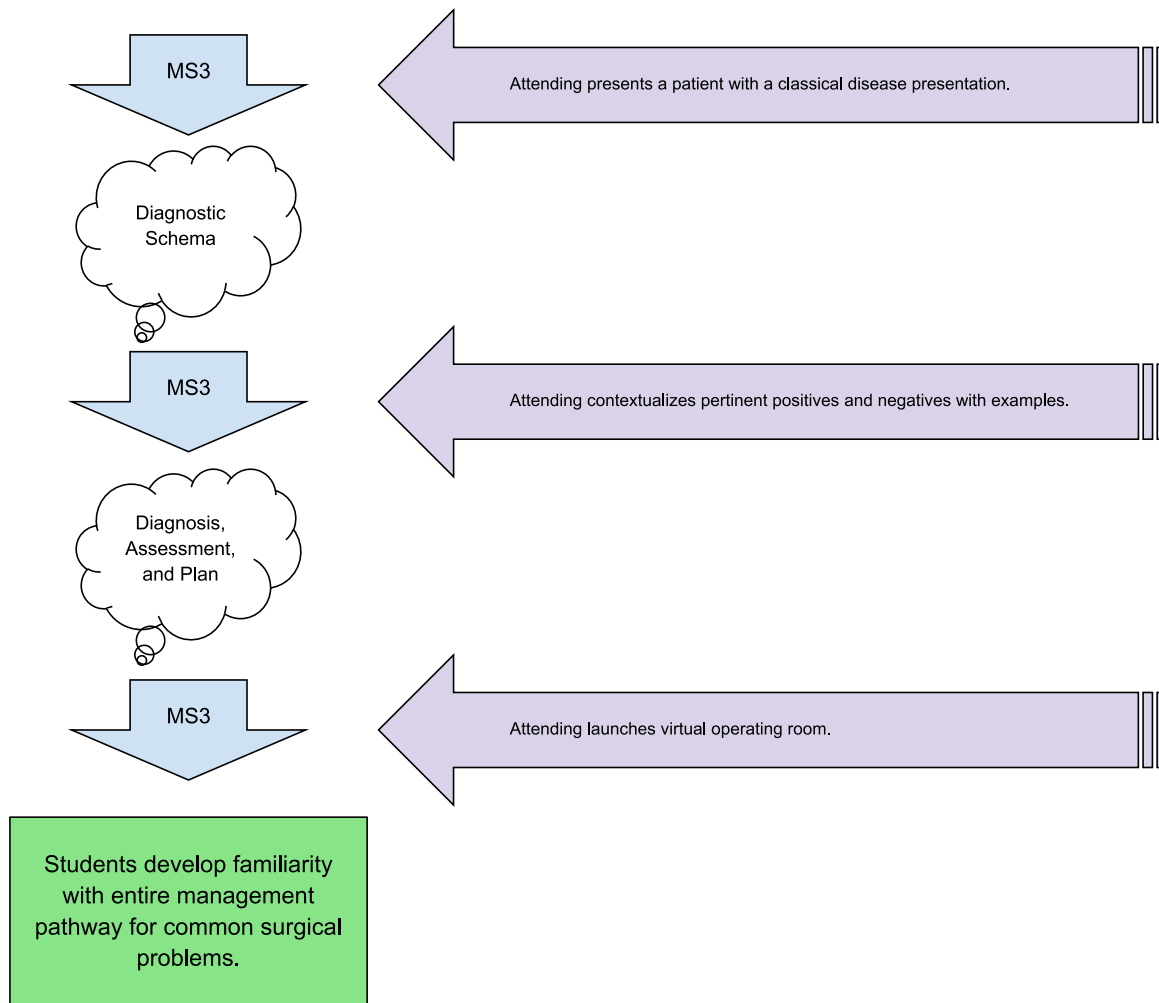


FIGURE 2. Case-based learning with virtual OR workflow. *Okay if printed in greyscale. MS3s, third-year medical students.

instructors who were not actively speaking could field questions from chat boxes and draft impromptu polling questions to increase student participation.

In summary, the curricular changes in response to COVID-19 have inspired the development of a virtually based innovative curriculum for surgery, a specialty that often necessitates experiential, hands-on learning. When these opportunities became unavailable, the EMLR helped supplement learning to prepare students for their return to clerkships and beyond. Kaplan's i-Human and Aquifer-Wise MD online modules supplemented the EMLR by providing additional opportunities for remote learning. Lastly, the abrupt disruption of the clinical learning environment provided a unique opportunity for medical students to provide instrumental ideas and feedback during the EMLR curricular design phase. Future studies should investigate the effect of EMLRs on clerkship and licensing examination performances. Lastly, retention of some components of the EMLR course after the resolution of the COVID-19 crisis should be considered.

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