

**Rapid Reorganization of an Academic Infectious Diseases Program During the COVID-19 Pandemic
in Detroit: A Novel Unit-Based Group Rounding Model**

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Summary: A novel unit-based consult model provided efficient and sustainable Infectious Diseases consultation during the surge of COVID-19 pandemic. This resulted in meaningful increase in front line provider knowledge and confidence in care of COVID-19 patients.

Abstract:

The surge of coronavirus disease 2019 (COVID-19) hospitalizations at our 877-bed quaternary care hospital in Detroit led to an emergent demand for Infectious Diseases (ID) consultations. The traditional one-on-one consultation model was untenable. Therefore, we rapidly restructured our ID division to provide effective consultative services. We implemented a novel unit-based group rounds model that focused on delivering key updates to teams and providing unit-wide consultations simultaneously to all team members. Effectiveness of the program was studied using Likert-scale survey data. The survey captured data from the first month of the Detroit COVID-19 pandemic. During this period there were approximately 950 patients hospitalized for treatment of COVID-19. The survey of trainees and faculty reported an overall 95% positive response to delivery of information, new knowledge acquisition, and provider confidence in the care of COVID-19 patients. This showed that the unit-based consult model is a sustainable effort to provide care during epidemics.

Keywords: COVID-19; Medical Education; Unit-Based Consultation; Epidemic Response; Detroit

Introduction

On March 10, 2020, Michigan reported the first case of coronavirus disease 2019 (COVID-19) caused by the novel Severe Acute Respiratory Syndrome coronavirus 2 (SARS-CoV-2). As of April 27, over 38,000 cases had been reported with the majority in the greater Detroit area (1). The first case of COVID-19 in Michigan was hospitalized at Henry Ford Hospital (HFH) on March 10, and within one week over 30 Infectious Diseases (ID) consultations were requested daily for the management of confirmed or suspected COVID-19 infection.

The rapid increase in the volume and complexity of COVID-19 patients made the traditional one-on-one consultation unsustainable. We emergently restructured the ID division consultation service to address this unprecedented demand by developing dedicated COVID-19 teams as an effective way to manage a hospital-wide crisis. We describe in detail the rationale for the COVID-19 teams, the composition of the team, its scope of work, the mechanics of its deployment, and the effectiveness of this strategy on the management of COVID-19 as reported by our frontline care providers.

Methods

Setting

This descriptive study was done at HFH, an 877-bed quaternary care teaching hospital located in Detroit and is part of a 5-hospital Health System that serves southeast Michigan. All inpatient ID services at HFH are provided by the Division of ID comprising of 15 faculty, 8 fellows and 2 advanced practitioners. During the early days of the outbreak, two faculty were assigned infection control leadership roles, while three other faculty were assigned to one of our four satellite hospitals to assist with the volume of consults seen outside of downtown Detroit. The consult teams of students, residents, fellows and faculty, provide consultations for the general hospital population as

well as cancer, transplant patients and HIV infected patients. The faculty also supervise residents on a 24-bed inpatient ID unit that houses patients with complicated infections and is also the special pathogens unit.

Rationale for Development of ID COVID-19 Consult Teams

The reasons for the development of the COVID-19 consult teams and new unit-based rounds model were a combination of administrative, provider and hospital-related factors (Table 1). The primary driver was the sudden surge of hospitalizations of COVID-19 patients (Figure 1) at HFH that resulted in a rapid increase in ID consultations that was unsustainable. In addition, the executive decision to minimize exposures and conserve use of personal protective equipment (PPE) restricted non-procedure consultative services such as ID from performing face-to-face encounters with COVID-19 patients. Another consideration was the rapidly evolving institutional clinical management and Infection Prevention guidelines for COVID-19, and the limited avenues for rapid communication of updated information to the frontline teams with the implementation of Accreditation Council for Graduate Medical Education (ACGME) Pandemic Emergency Status Guidance (2).

Development and Deployment of COVID-19 ID Consult Team

The primary objectives and scope of the ID COVID-19 consult teams was to optimize outcomes of COVID-19 patients by providing education, advice on clinical management, and rapid dissemination of updated information to physicians and nurses delivering patient care.

The physician-leads of the ID COVID-19 consult team included the ID fellows and the supervising ID faculty. These providers were assigned to manage all COVID-19 consultations throughout the hospital. The COVID-19 consult team began as a single team, but quickly expanded

to three teams which included one team to round with the intensive care units (ICU), one team to round with the general practice units (GPU) and Emergency Department (ED), and a “float team” to handle overflow COVID-19 cases and non-COVID-19 ID consults. The ICU and GPU teams were assigned to alternate in assisting the emergency department with consultative services and troubleshooting management issues. The COVID-19 team fellows and faculty were available anytime throughout the day for assistance via a hot-line.

Supporting the COVID-19 consult teams was a multidisciplinary team that met daily via video conference, referred to as the noon huddle. The composition and responsibilities of the COVID-19 team members are summarized in Table 2. The primary responsibility of this team was to develop and update management guidelines related to antiviral and adjunctive therapies for COVID-19 based on the available literature. The updated institutional treatment guidelines were posted on the hospital’s intranet and disseminated in paper copy by COVID-19 consult teams. A copy of updated guidelines is available in the supplemental material (Appendix Figure 1).

Figure 2 summarizes the day-to-day operations of the COVID-ID team. Prior to rounds, the ID fellows would review the records of all new COVID-19 admissions, deteriorating ICU and GPU COVID-19 patients, and special populations including pregnant women, patients with cancer, transplant recipients and persons with HIV. During the noon huddle, the rounding COVID-19 team members presented trends in management, commonly asked questions and concerns, and gaps in frontline provider knowledge to the COVID-19 group for review and resolution. Afternoon rounds were conducted using a unit-based group approach.

Unit-Based Group Rounds

To keep up with escalating demand for consultation and to provide the most current education and guidance to the clinical teams, the COVID-19 team participated in unit-based group rounds. This

hallmark innovation consisted of the ID COVID-19 consult teams visiting the COVID-19 units daily and conducting rounds with the entire team of house-staff in the each unit. The rounds were held in a spacious documentation room or conference room away from patient care areas. This approach was chosen with the following goals achieved:

- Minimize exposure risk among care team members.
- Provide education simultaneously to all house-staff within a unit to provide consistent messaging.
- Answer questions with all team members present to address common clinical problems.
- Distribute updated educational materials and institutional guidelines in hard copy format.
- Provide opportunities to address concerns about guidelines and practice patterns directly to the ID team. These were eventually communicated during the following daily noon huddle for discussion.
- Improve the house-staff and care-teams' confidence in diagnosing and managing COVID-19 patients and thereby minimize need for frequent ID consultations.
- Provide real-time consultations during unit-based rounds for all new COVID-19 admissions and patients who were not improving as expected.
- Provide on-the-spot advice and treatment recommendations in each unit for instant problem-solving.

The education addressed COVID-19 pathophysiology, natural history, diagnosis, stratification of severity, treatment and infection control guidance. The clinical recognition of the "COVID-19 syndrome" was emphasized given the delay in laboratory confirmation and possible "false-negative" test results. Care teams were trained to suspect COVID-19 in patients presenting with prototypical features of dyspnea, cough, fevers, lymphopenia, bilateral peripheral chest infiltrates on radiography, and elevated inflammatory markers (3).

The delivery of education and advice on the care of COVID-19 patients was done in a phased manner based on the experience of the managing teams. The phases were an induction phase for

early learners, consolidation phase for more experienced learners, and maintenance phase for advanced learners as shown in Figure 3. This approach was repeated with each turnover of teams or as new units were repurposed for the care of COVID-19 patients.

Measuring the impact of the COVID-19 team

The clinical utility, effectiveness, and accessibility of the ID COVID-19 team and its new style of rounding was assessed using a survey tool (Appendix Document) administered electronically and/or in paper format to residents, faculty, and mid-level providers. The survey was administered 4 weeks after the first COVID-19 patient was admitted to the hospital. Survey questions aimed to assess delivery of information, new knowledge acquisition, provider confidence in applying the knowledge, and perception of outcomes related to management of COVID-19. A four-point Likert scale was used to rate the responses.

Results

The study reports the period from March 10, 2020, when the first patient with COVID-19 was hospitalized, to April 10, 2020 when a survey was administered to assess the effectiveness of the program. During this period there were approximately 950 patients hospitalized for treatment of COVID-19; 31% needed ICU care and 22% were mechanically ventilated. The daily census of hospitalized patients, new admissions, discharges, and ID consultations and progress notes documented is shown in Figure 1. Of these, 664 patients (70%) were discharged alive with mean LOS of 6.6 days by the end of the follow up period. A total of 358 COVID-19 ID consultations were documented during this time including 239 initial consultations and 119 subsequent day evaluations (Figure 1).

A total of 111 respondents answered the survey assessing the impact of the ID COVID-19 consult teams. The majority of respondents were residents (59%) and faculty (20%) (Appendix Figure 2a). Sixty-eight percent of the respondents were primary medical or medical subspecialty providers, and 26% were surgical and critical care providers (Appendix Figure 2b). Overall, 95% of the respondents agreed or strongly agreed with the survey questions related to delivery of information, new knowledge acquisition, provider confidence in applying the knowledge and perception of outcomes related to management of COVID-19. Figure 4 shows the questionnaire responses. Provider confidence in discharging COVID-19 patients was the only element that 14% of the respondents disagreed with. The positive responses of the trainees and faculty were comparable (Appendix Figure 2c).

Discussion

Overall, the COVID-19 consult team at Henry Ford Hospital was a well-received, effective, and scalable initiative undertaken by the division of ID to meet the rapidly increasing demand for consultative services during the COVID-19 outbreak in Detroit, Michigan. The use of daily, unit-wide education and group rounds led to an overall increase in knowledge, expertise, and confidence amongst the front-line house-staff and faculty in taking care of COVID-19 patients. Additionally, the ID faculty and fellows invested time in one-on-one interactions with ED providers regularly to help address workflow concerns. This was a critical step in ensuring our treatment protocols were being disseminated quickly to front-line staff.

From the ID team's perspective, the use of the unit-based group rounds was a novel idea that proved beneficial in disseminating first-hand practical knowledge and up-to-date guidelines to

the teams immediately. This bolstered the primary teams' knowledge of the pathophysiology, natural history, diagnosis, treatment, and management of COVID-19 patients. Additionally, this model complied with physical distancing requirements to reduce healthcare workers (HCW) exposure to COVID-19 patients. The outbreak led to repurposing of non-medical ICU units for COVID-19 care. Non-internal medicine residents were redeployed to new COVID-19 units in ICU and GPU and were overseen by internal medicine faculty physicians. By spending an appropriate amount of face-to-face time with clinicians otherwise inexperienced in the care of complicated infectious diseases, including residents in disciplines such as orthopedics, vascular surgery, ophthalmology, dermatology, endocrinology, and others quickly became confident managing COVID-19 patients.

The satisfaction of the primary services with the ID team is reflected in the strongly positive responses on survey, affirming the COVID-19 team's utility during the outbreak (Figure 4). It is notable that the responses were comparable among multiple disciplines and by both trainees and faculty alike. The effectiveness of this approach is demonstrated by the fact that the number of ID consults stayed relatively consistent despite the surging rate of COVID-19 admissions. 14% of survey respondents did not feel comfortable discharging COVID patients early in the epidemic. The time to discharge from the hospital improved over the course of the epidemic. The initial lack of confidence by survey responders was primarily due to evolving Institutional and State Health department guidelines for the discharge of patients safely back to the community. Moreover, the increasing confidence in discharging COVID-19 patients over time validates the unit based ID consult model. (Figure 1).

The clinical efficacy of the reorganization was reflected in improved COVID-19 mortality rates. The average all-cause in-hospital 28-day mortality decreased from 32.4% for the period March 10th-25th to 15.4% for the period March 26th – April 10th. This improvement was likely multifactorial including the implementation of the dedicated ID COVID-19 teams.

There are scant reports of similar reorganization of the delivery of care during the COVID-19 pandemic. Two reports describe the restructuring strategies of a surgical department and a

gynecological and obstetrics department to triage surgeries during the COVID-19 pandemic (4, 5). Another report describes the approach to maintaining neurosurgery resident education and safety during the COVID-19 pandemic (6). A report from Seattle described the restructuring of surgical care teams during the COVID-19 outbreak to comply with physical distancing requirements, decrease resident exposure to direct patient contact, optimize work-force well-being and provide resident reserves (7).

Our strategy has shortcomings, notably the administrative decision to minimize direct COVID-19 patient contact to reduce HCW exposure and conserve use of PPE resulted in the restriction of access to COVID-19 patients by consultative teams including ID. The inability to obtain history directly from the patient and perform physical examinations could have adversely affected patient care. However, phone interviews with the admitted patients, the review of patient records and face-to-face discussion with the care-teams helped mitigate this possibility. This approach streamlined the management plans for all new admissions, complicated and high-risk COVID-19 patients. The number of documented consultations is an underestimate of the actual service provided, as this number does not include the daily review of the records of all COVID-19 patients and on-the spot consultations that were provided by the COVID-19 teams. Full documented ID consultations focused only on complicated COVID-19 patients and special populations including pregnant patients and organ transplant recipients. The lack of a face-to-face patient encounter and physical examination may have affected the level of service for purposes of billing and reimbursement for the ID service. Finally, the electronic survey was distributed as a blast email to the all departments and hence it was not possible to determine percentage of COVID-19 providers that responded to the survey. However the 111 responses received was representative of multiple disciplines and job categories that manned the COVID-19 units. While it is possible that dissatisfied HCW may not have responded, we tried to mitigate this by ensuring that all of responses were anonymous.

In conclusion, our novel unit-based group rounds model of delivering ID consultative service was effective in responding to an unprecedented demand during the COVID-19 surge at our hospital

and might serve as a useful model for other academic programs dealing with this current pandemic or future epidemics.

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NOTES

Acknowledgements:

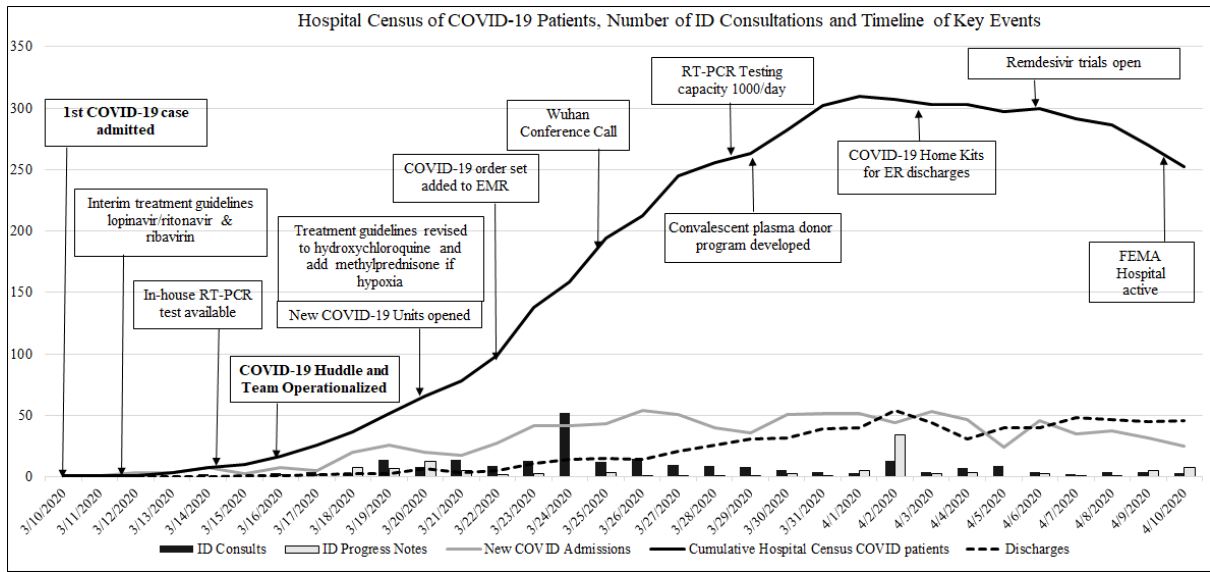
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Conflicts of Interest: None of the authors have any financial or institutional conflicts of interest related to this manuscript preparation or related academic work.

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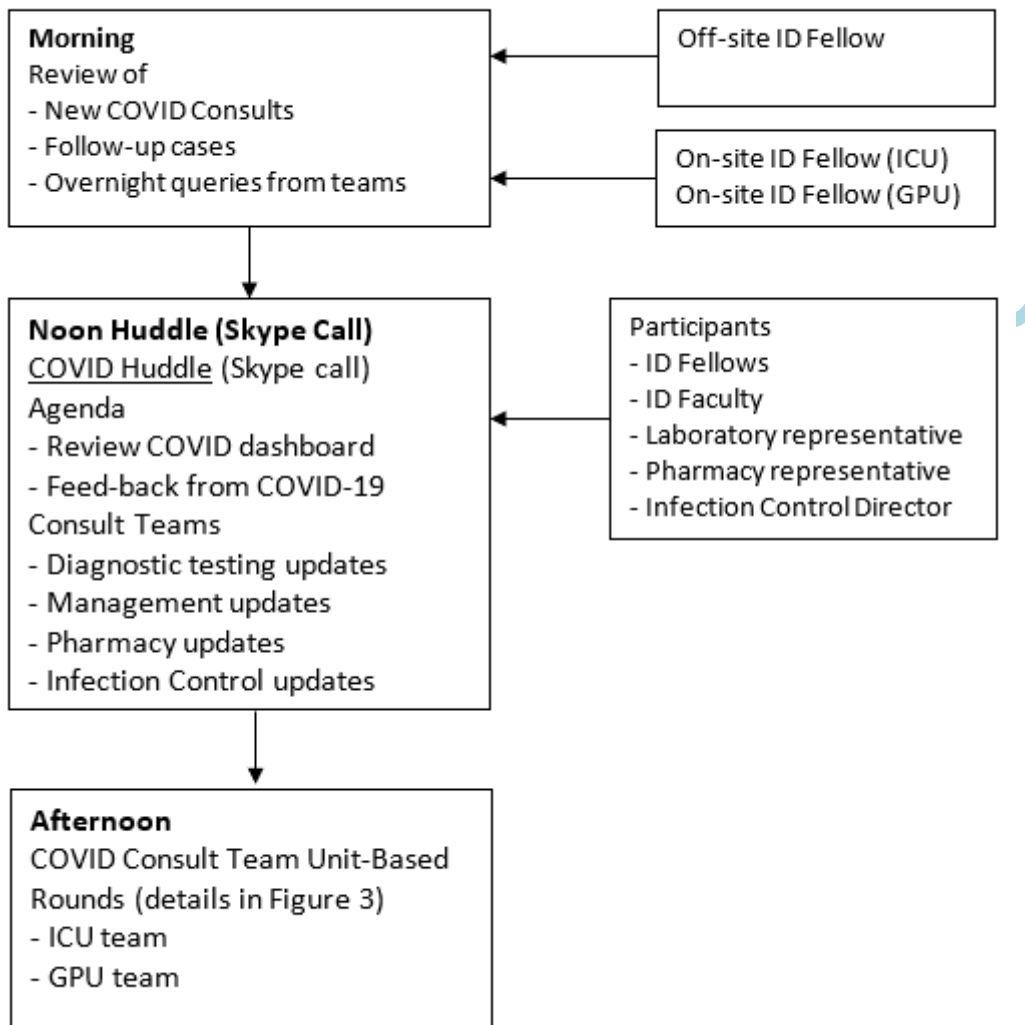
Figure 1



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Figure 2

Figure 2: Flowchart of Daily Operations of the COVID-19 ID Team



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Figure 3

Figure 3: Phases of Unit-Based Rounds by Infectious Diseases COVID-19 teams

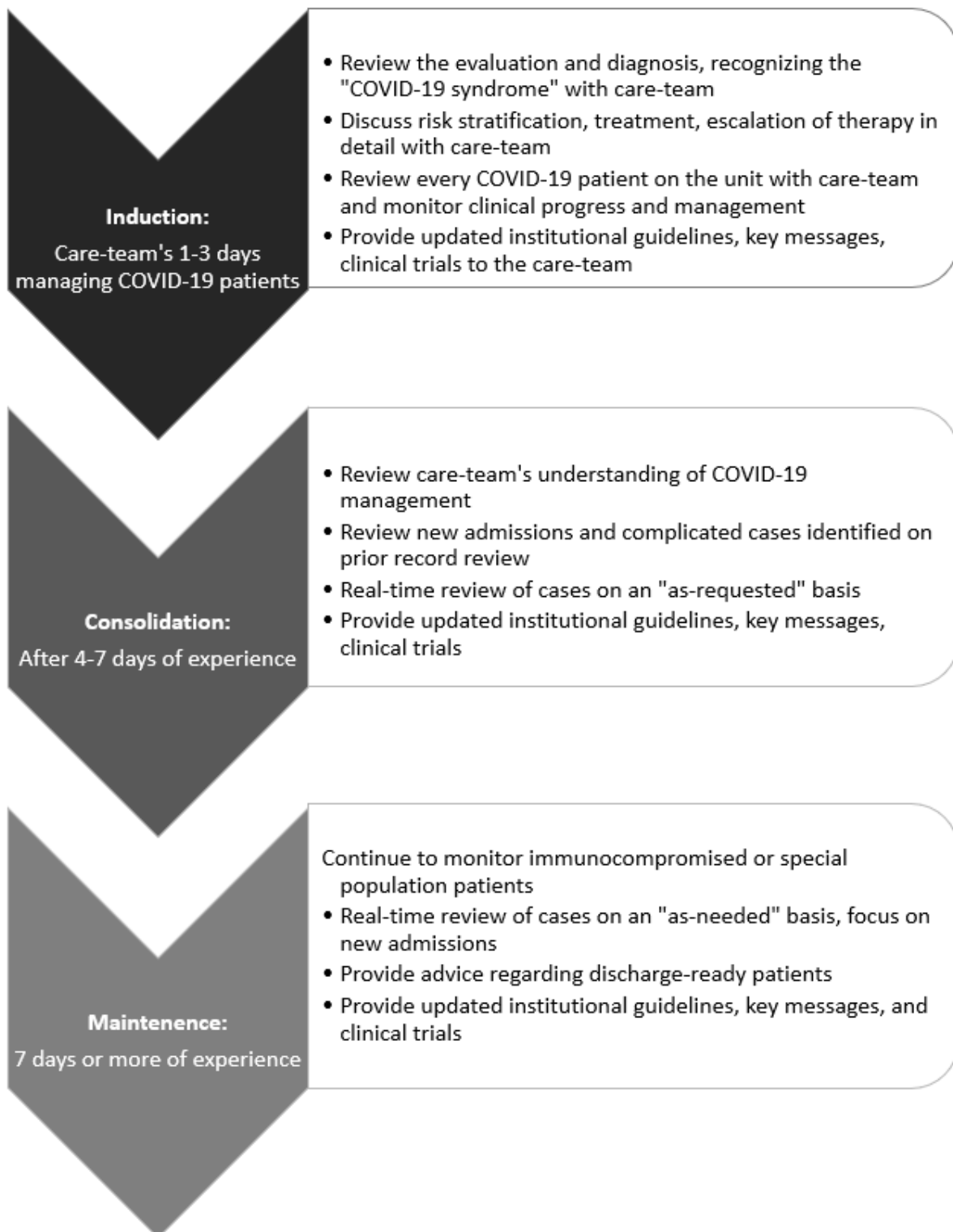
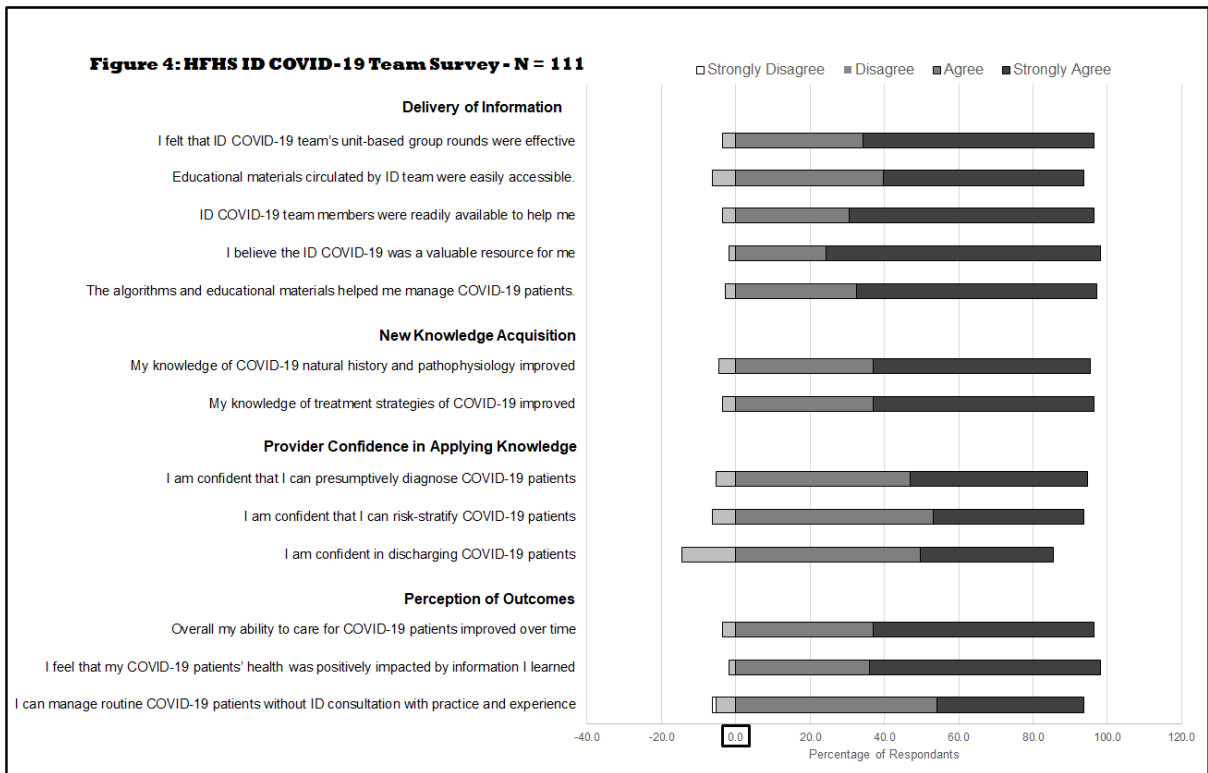


Figure 4



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Table 1

Table 1: Rationale for development of Infectious Diseases COVID-19 teams and unit-based rounds		
Level	Impacting Factors	Resulting Challenges to Medical Care
Administration	Cancellation of educational conferences due to social distancing executive orders and implementation of ACGME Pandemic Emergency Status Guidance	Limited avenues for rapid dissemination of information about management of COVID-19 to frontline care teams
	Surge in volumes of COVID-19 patients requiring ramping up of ICU and GPU capacity staffed by redeployed care teams	Rapid increase in demand for education of IM and non-IM frontline care teams about management of COVID-19
	Furloughing of exposed HCW resulting in turnover of care team members	Increased demand for education of new team members
Hospital	Surge in volume of hospitalized COVID-19 patients	Rapid increase in ID consultations that made traditional one-on-one patient consultations unsustainable
	Lack of availability of an in-house SARS-CoV-2 diagnostic test and potential for “false-negative” test results	Uncertainty among care teams regarding diagnosis, management and discontinuation of isolation of suspected COVID-19 patients
	Limited availability of diagnostic imaging studies and procedures due to Infection Prevention and Control measures	Increased use of empiric antimicrobial therapies to treat suspected bacterial co-infections
	Evolving Infection Prevention and Control guidelines and PPE usage from federal and state and limitations of PPE supplies resulting in frequent changes in institutional guidelines	Demand for rapid delivery of updated key information about Infection Prevention and Control measures and appropriate PPE use
Provider	Limited evidence around clinical management of COVID-19	Uncertainty among care teams regarding optimal day-to-day management of COVID-19 patients
	Accelerated availability of medical literature with new information resulting in frequent changes in institutional guidelines for COVID-19 management	Demand for rapid delivery of frequently updated key messages about management of COVID-19
	Expedited implementation of several investigational trials for treatment of COVID-19	Limited knowledge among care teams about availability and enrollment criteria for investigational trials

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Table 2

Table 2: Infectious Disease COVID-19 Team Members and Responsibilities	
Members	Role
Fellows	<ul style="list-style-type: none"> • Clinical unit-based consultation of COVID-19 patients • Float team review of all COVID-19 patients and communication with rounding fellows providing unit-based consultations • Dissemination of clinical management and Infection Control guidelines • Provide daily feedback from frontlines teams on gaps in knowledge and challenges to delivery of care
Faculty	<ul style="list-style-type: none"> • Clinical unit-based consultation of COVID-19 patients • Dissemination of clinical management and Infection Control guidelines • Review emerging literature on COVID-19 to develop and update institutional guidelines • Develop algorithms for diagnosis and treatment • Create order sets to standardize lab testing including relevant biomarkers
Infection Control Medical Director	<ul style="list-style-type: none"> • Develop institutional Infection Control guidelines and educational materials • Provide updates on changes to Infection Control guidelines, PPE use and availability • Provide Employee Health updates
Pharmacy Representative	<ul style="list-style-type: none"> • Review emerging literature to assist in the development and update of clinical management guidelines • Provide updates on formulary status and availability of antimicrobial and adjunctive agents • Conduct audit and feedback of empiric use of antibiotics
Clinical Microbiology Director	<ul style="list-style-type: none"> • Develop and operationalize in-house COVID-19 diagnostic testing platforms • Provide updates on testing capability and capacity, volumes, positivity rates and limitations

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