


SPECIAL REPORT

Strategic Deployment of Cardiology Fellows in Training Using the Accreditation Council for Graduate Medical Education Coronavirus Disease 2019 Framework

Michael J. Gallagher, MD; Richard Bloomingdale, MD; Aaron D. Berman, MD; Brian D. Williamson, MD; Simon R. Dixon, MBChB; Robert D. Safian , MD

ABSTRACT: Coronavirus disease 2019 is a global pandemic affecting >3 million people in >170 countries, resulting in >200 000 deaths; 35% to 40% of patients and deaths are in the United States. The coronavirus disease 2019 crisis is placing an enormous burden on health care in the United States, including residency and fellowship training programs. The balance between mitigation, training and education, and patient care is the ultimate determinant of the role of cardiology fellows in training during the coronavirus disease 2019 crisis. On March 24, 2020, the Accreditation Council for Graduate Medical Education issued a formal response to the pandemic crisis and described a framework for operation of graduate medical education programs. Guidance for deployment of cardiology fellows in training during the coronavirus disease 2019 crisis is based on the principles of a medical mission, and adherence to preparation, protection, and support of our fellows in training. The purpose of this review is to describe our departmental strategic deployment of cardiology fellows in training using the Accreditation Council for Graduate Medical Education framework for pandemic preparedness.

Key Words: COVID-19 ■ education ■ fellows in training ■ health education

Forces beyond your control can take away everything you possess except one thing, your freedom to choose how you will respond to the situation.

When we are no longer able to change a situation, we are challenged to change ourselves.

—Viktor E. Frankl, *Man's Search for Meaning*

countries, causing >200 000 deaths; 35% to 40% of patients and deaths are in the United States. The COVID-19 crisis places an enormous burden on patient care and graduate medical education; there are no guidelines for deploying cardiology fellows in training (C-FIT).¹ The purpose of this review is to describe our strategic deployment of C-FIT using the Accreditation Council for Graduate Medical Education (ACGME) framework for pandemic preparedness (Figure 1).

GOALS AND VISION OF THE PROGRAM

Coronavirus disease 2019 (COVID-19) is a global pandemic affecting >3 million people in >170

Local Challenges in Implementation

Several challenges had to be overcome to allow us to achieve our goals. These challenges relate to striking a balance between mitigation policies, the demands for patient care, and the needs of C-FIT.

Correspondence to: Robert D. Safian, MD, Fellowship Training Program in Interventional Cardiology, The Lucia Zurkowski Endowed Chair for the Center of Innovation and Research in Cardiovascular Diseases, Oakland University William Beaumont School of Medicine, Beaumont Hospital–Royal Oak, Royal Oak, MI 48073. E-mail: robert.safian@beaumont.edu

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Nonstandard Abbreviations and Acronyms

ACGME	Accreditation Council for Graduate Medical Education
CC	COVID-19 cardiology consultation team
C-FIT	cardiology fellows in training
COVID-19	coronavirus disease 2019
ICU	intensive care unit
IM	internal medicine
PES	pandemic emergency status
PPE	personal protective equipment

Mitigation Strategies

Mitigation strategies, mandated by federal, state, hospital, and departmental policies, are designed to attenuate the risk of exposure and transmission (Figure 1).

Demands for Patient Care

Beaumont Health in metropolitan Detroit, MI, has the highest volume of COVID-19 patients in Michigan; the largest hospital is Beaumont Hospital–Royal Oak (≈ 1000 beds), which has $>50\%$ of the residents and fellows in training in the system. The Department of Cardiovascular Medicine (Royal Oak) has 23 C-FIT, including 12 in clinical cardiology, 2 in clinical cardiac electrophysiology, 5 in interventional cardiology, 2 in cardiac imaging, and 2 in structural heart diseases.

Impact on Training and Education

On March 24, 2020, the ACGME proposed 3 stages for graduate medical education activities during the COVID-19 pandemic (Table 1). In stage 3, institutions may declare pandemic emergency status (PES) under the extraordinary circumstances policy (Figure S1), allowing graduate medical education to increase the availability of residents and fellows in training for patient care by suspending traditional educational activities for 30 days.² Most ACGME requirements are suspended, but there are 4 mandatory requirements for all residents and fellows in training: they must be trained in, and provided with, appropriate personal protective equipment (PPE); they must be supervised on the basis of the clinical situation and their level of experience; they must adhere to duty hour requirements; and they may function within their core specialty (C-FIT who are board certified in cardiovascular diseases can function as independent cardiologists or internists; C-FIT who are board certified in internal medicine [IM] can function as independent internists).

Cardiology rotations are directly impacted by ACGME stage (Figure 2). Beginning in stage 2 and

certainly by stage 3, our outpatient and inpatient imaging services were severely restricted. Elective procedures in the cardiac catheterization laboratory and clinical cardiac electrophysiology were canceled in stage 2. During the surge in stage 3, the number of hospitalized non-COVID-19 patients declined, the geographic coronary care unit was converted to a COVID-19 intensive care unit (ICU), and “usual” criteria for admission to the coronary care unit were modified to preserve all ICU beds for COVID-19 patients. By stage 3, all C-FIT in imaging and ECG rotations, clinical cardiac electrophysiology, inpatient service and coronary care unit were reassigned to COVID-19 units; 2 interventional cardiology C-FIT remained in the cardiac catheterization laboratory. All activities in the Continuity Clinic were suspended. Standard educational conferences were canceled early in stage 2, resulting from hospital mitigation policies to eliminate gatherings of >10 people, and for C-FIT on nonessential rotations to shelter at home. Our daily noon teaching conference was replaced by daily virtual videoconferences to update C-FIT and staff on new developments with COVID-19 admissions, impact on ICU beds and ventilator requirements, and anticipated deployments of personnel into new areas of responsibility. Reduction in patient contact, elimination of teaching conferences, and restrictions on invasive and noninvasive services had profound impact on training and education.

Other Considerations

C-FIT raised concerns about hazard pay. Although we support these concerns, lobbying for enhanced pay and benefits should begin with nurses and others on the “frontline.” However, we abide by the American Heart Association recommendations that C-FIT should not be placed in direct COVID-19 care without adequate PPE.³

DESIGN OF THE INITIATIVE

Although it is easy to understand the negative impact on learning activities, the crisis may create opportunities to enhance experience (Table 2). From the outset, our departmental approach was based on 2 principles: consider the care of our patients as a medical mission and advocate for our C-FIT.

The Department as a Medical Mission

The spirit of selflessness applies to care of our patients, without expectation of special benefits. Although the ACGME Extraordinary Circumstances policy provides hospitals with the authority to reassign C-FIT to roles outside our specialty, our approach was to solicit

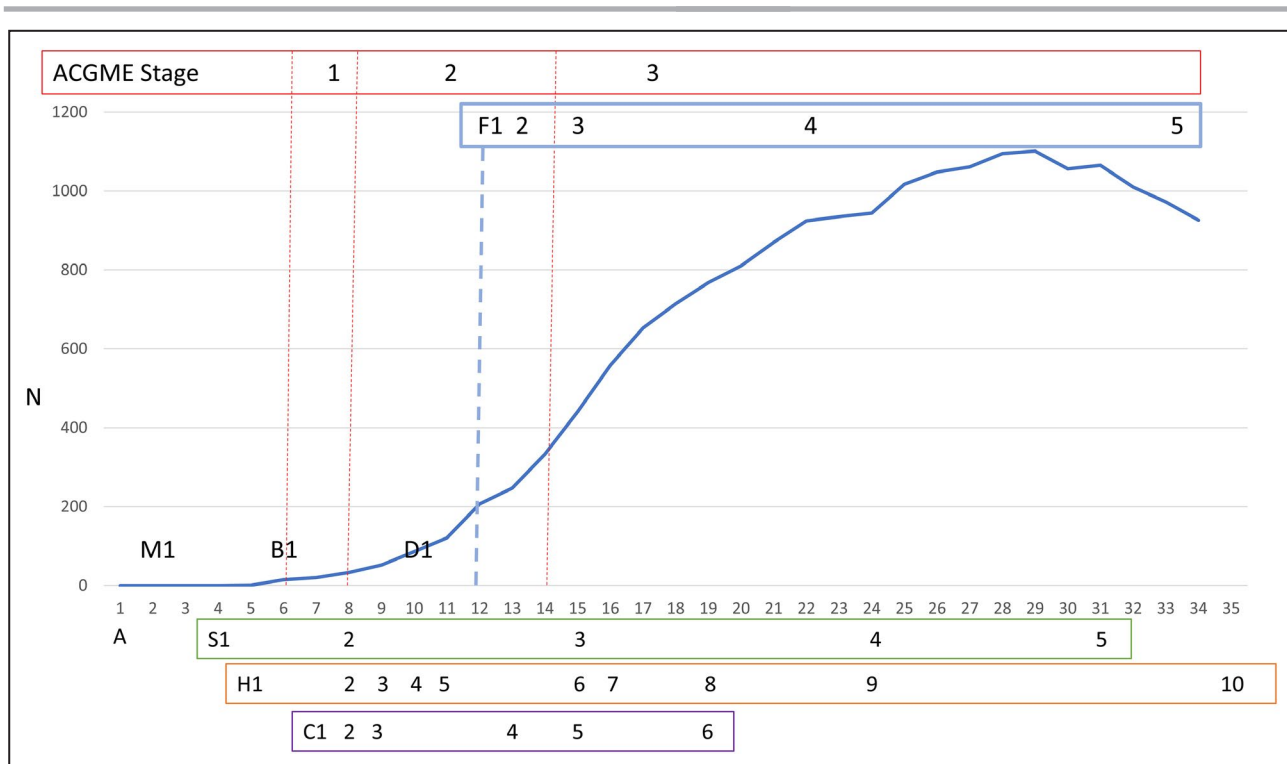


Figure 1. Graphic representation of the number (N) of positive coronavirus disease 2019 (COVID-19) patients in Beaumont Health (y axis) as a function of the day of crisis (x axis).

Layered on the graph are the Accreditation Council for Graduate Medical Education (ACGME) stages (red), deployment of cardiology fellows (F; blue), and mitigation strategies used by the state of Michigan (S; green), Beaumont Hospital–Royal Oak (H; orange), and the Department of Cardiovascular Medicine (C; purple). Statewide mitigation strategies include school closures (S1), prohibit public gathering >50 people (S2), orders to shelter at home (S3), permanent school closure (S4), and extend order to shelter at home (S5). Hospital mitigation strategies include cancel conferences, impose travel and visitor restrictions (H1), curbside testing (H2), on-site testing, no meetings >10 people, cancel medical school rotations (H3), test hospitalized patients (H4), close outpatient offices (H5), suspend outpatient testing (H6), consolidate “clean” intensive care unit (ICU) (H7), expand personal protective equipment availability (H8), implement serologic testing (H9), and implement clinical study of serologic testing for employees (H10). Department mitigation strategies include cancel elective procedures and off-site electives, change physician rounding to minimize patient contact (C1), nonessential fellows shelter at home (C2), COVID-19 echocardiographic studies performed as “limited studies” (C3), develop acute coronary syndrome algorithm for COVID-19 patients (C4), reduce outpatient noninvasive testing (C5), and implement telemedicine (C6). Deployment of cardiology fellows in training to COVID-19 units include consultation service (F1), expand consultation service to 2 teams (F2), ICU-line service (F3), internal medicine service (F4), and hybrid ICU service (F5). A indicates cancel the annual session of the American College of Cardiology; B1, first COVID-19 patient in Beaumont Health; D1, first COVID-19 death in Beaumont Health; and M1, first COVID-19 patient in Michigan.

volunteers and to assign these individuals into areas in which their skills were matched with specific needs for patient care. All 23 C-FIT volunteered to participate in the medical mission.

Prepare, Protect, and Support Our C-FIT

Preparation for the COVID-19 pandemic requires careful planning and flexibility because of rapid changes on the ground. Such planning should start

Table 1. Description and Requirements During ACGME Stages of Pandemic Preparedness

Stage	Description	ACGME Requirements
Stage 1	“Business as usual”; no disruption of patient care and educational activities	Common and specialty-specific requirements remain in effect
Stage 2	Increased clinical need for care of COVID-19 patients; some residents/FIT may need to shift to clinical activities; minimal disruption of educational activities	Common and specialty-specific requirements remain in effect; programs may advance telemedicine initiatives and self-study activities
Stage 3	Most or all of residents/fellows will need to shift to patient care; educational activities will be severely disrupted	Requirements related to duty hours compliance, attending supervision remains in effect. FIT may function in core specialty, programs are required to supply proper PPE and adequate resources

ACGME indicates Accreditation Council for Graduate Medical Education; COVID-19, coronavirus disease 2019; FIT, fellows in training; and PPE, personal protective equipment.

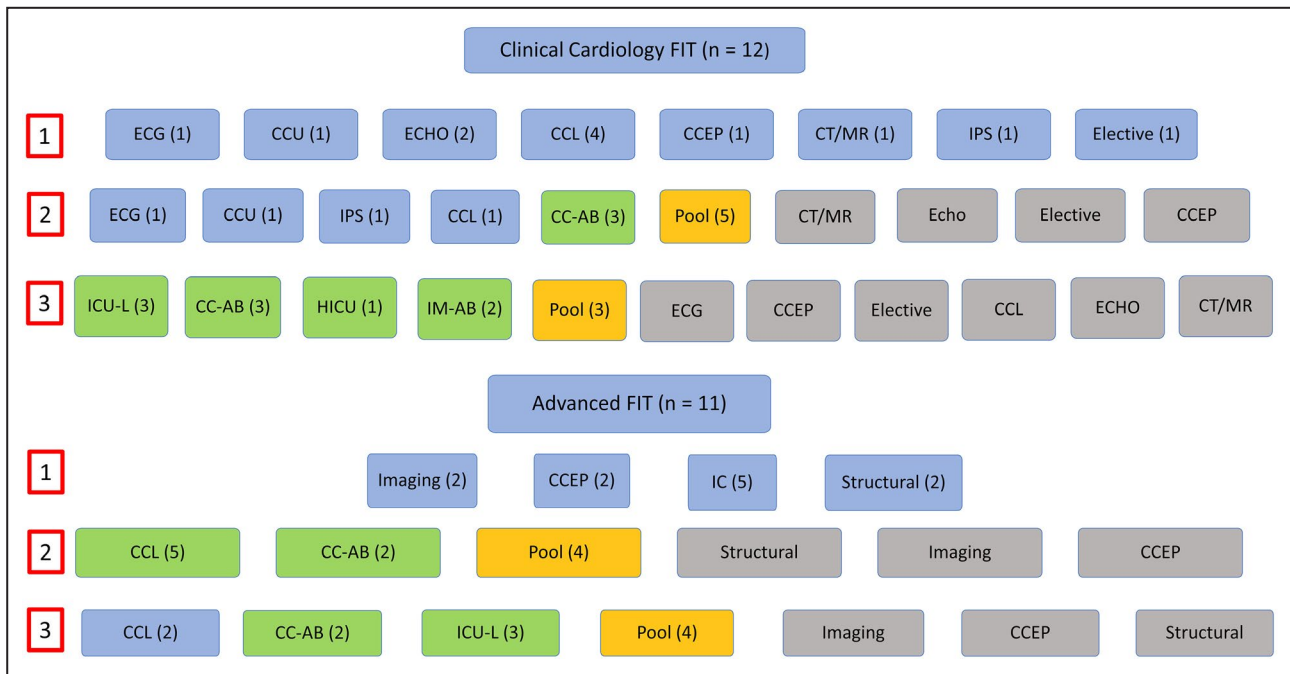


Figure 2. Rotations of cardiology fellows in training (FIT) during stage 1 to 3 of the coronavirus disease 2019 (COVID-19) crisis (as indicated by the red boxes).

Stage 1 represents “business as usual.” Although stage 2 is characterized as minimal disruption of educational activities, hospital and departmental mitigation strategies required that FIT in “nonessential” activities shelter at home. Stage 3 is characterized by complete disruption of educational activities, mandated by the surge in COVID-19 admissions that overwhelmed existing manpower. Cardiology FIT (C-FIT) in the “pool” had several responsibilities, including backup for others in case of absence, remote services (adjudicate need for ECGs or echocardiograms and evaluate corrected QT interval for COVID-19 patients), participate in C-FIT deployment decisions, and participate in research or quality assurance projects. FIT assigned to coronary care unit (CCU) and inpatient service (IPS) were reassigned to COVID-19 cardiology consultation teams (CCs) A and B. Blue indicates usual fellowship rotations; gray, inactive fellowship rotations; green, COVID-19 patient care responsibilities; and yellow, pool. CCEP indicates clinical cardiac electrophysiology; CCL, cardiac catheterization laboratory; CT/MR, cardiac computed tomography/magnetic resonance imaging; ECHO, echocardiogram; HICU, hybrid intensive care unit; IC, interventional cardiology; ICU-L, intensive care unit team for central lines (all intensive care units were COVID-19 intensive care units); and IM-AB, internal medicine teams A and B.

before stage 1, if possible. All C-FIT express fear of infection and transmission; strategies for protection are to minimize direct contact between patients and C-FIT and to train C-FIT in the use of PPE (Table 3). Stress and anxiety are fundamentally related to fear, which can be ameliorated by education and learning; online resources are available to C-FIT to provide general and specific information on safety, family and mental health, patient care, and adapting clinical care to the COVID-19 environment (Table S1). These efforts lead to personal growth and deeper satisfaction about being involved in this medical mission.

IMPLEMENTATION OF THE INITIATIVE

The rapid increase in demand for patient care mandated early identification of a strategic group to identify the hospital’s needs and to match those needs by strategic deployment of C-FIT on the basis of individual expertise and skills.

Leadership Group in Cardiology

The leadership role was held by the program director (M.J.G.), who maintained direct communication with the hospital’s residency redeployment team and graduate medical education director 3 to 4 times daily. The chief fellow (R.B.) and the clinical chief (A.D.B.) ensured coordination of responsibilities between C-FIT and cardiology attendings. Incorporation of advanced C-FIT was facilitated by the program directors of clinical cardiac electrophysiology (B.D.W.) and interventional cardiology (R.D.S.), and all activities were supervised by the chairman (S.R.D.). Strategy meetings occurred 1 to 2 times daily by telephone conference or Zoom (Zoom Video Communications, San Jose, CA). Depending on severity of illness, patients were assigned by the residency redeployment team to regular medical floors, progressive care units, or ICUs. In early stage 3, all ICU beds (100 beds, >80% on ventilators) and half of non-ICU beds were occupied by COVID-19 patients. On March 25, 2020, the hospital requested a declaration of PES,

Table 2. Potential Learning Opportunities in the ACGME Core Competencies During C-FIT Deployment During the COVID-19 Crisis

Competency	Description	Learning Opportunity
Patient care and procedural skills	Compassionate and effective care, perform all procedures considered essential for the area of practice	New aspects of critical care, ventilator management, MOSF, central line placement, infection control; enhance understanding of end-of-life issues
Medical knowledge	Cognitive understanding and application to care	Cardiac complications of COVID-19, use of PPE, inflammatory components to acute cardiopulmonary failure
Practice-based learning and improvement	Investigate and evaluate care of patients, assimilate scientific evidence, continuously improve patient care	New applications for telemedicine, videoconferencing, experiential learning, simulation; understanding the use of novel and nonapproved therapies during a pandemic; prioritizing care and resources
Interpersonal skills and communication	Effective interpersonal and communication skills with patients, families, and healthcare team	Collaborative team-based care with critical care, emergency medicine, nursing staff, hospice, and palliative care services; end-of-life discussions and decisions; learn to deal with personal stress and anxiety as they impact your behavior
Professionalism	Adhere to ethical principles and be sensitive to diversity	Understanding patient and family isolation; willingness to take on unexpected responsibilities and clinical roles; understanding the needs of others during a pandemic, including nursing staff and others
System-based practice	Awareness and responsiveness to the larger healthcare system, ability to call on other resources to provide optimal care	The role of cardiology in a larger system of care, adapt to disruption of systems of care and organizational structure; need for team work to understand how to improve the system of care, effacement of differences between specialties to solve problems in logistics and patient care, emergency preparedness, understand available resources to enhance well-being; learn to adapt to change

ACGME indicates Accreditation Council for Graduate Medical Education; C-FIT, cardiology fellows in training; COVID-19, coronavirus disease 2019; MOSF, multiorgan system failure; and PPE, personal protection equipment.

followed by widespread deployment of residents and C-FIT to COVID-19 units.

Strategic Deployment of C-FIT

Our department began to deploy C-FIT ≈48 hours before the PES declaration. Cardiologists have unique expertise that make us superbly qualified to serve during the COVID-19 crisis (Table 4, Figure 3).

C-FIT as Consultants

Cardiovascular complications occur in 25% to 50% of COVID-19 patients, and the need for cardiology consultants requires more resources than any other cardiology activity. Cardiology consultations were

performed by the COVID-19 cardiology consultation teams (CCs). When possible, consultations were performed by chart review and telephone contact with the patient; the attending may examine the patient without the C-FIT, if needed. The consultation report is generated by the C-FIT; reasons for consultation are similar to non-COVID-19 patients (acute coronary syndromes, asymptomatic increase in cardiac biomarkers, rapid atrial fibrillation, other arrhythmias, and assessment of congestive heart failure superimposed on a background of pulmonary infiltrates and dyspnea). In the ICUs, more complex assessments are required (multiorgan failure, respiratory failure, shock, renal injury, and venous or arterial thrombosis). QT prolongation emerged as a

Table 3. Departmental Responsibilities for C-FIT

Responsibility	Description
Patient care	Provide appropriate supervision to ensure optimal patient care.
Prepare	Preparation should start at least 3 wk before initiation of stage 3; organize and implement planning strategies for FIT. Work with hospital to identify specific needs, and match needs with skills of FIT.
Protect	Maintain social distance, assume each patient is COVID-19 positive, wear appropriate PPE, one-to-one training on use of PPE by experienced staff, maintain emergency "backup" supply of PPE for FIT.
Support	Stress and anxiety are fundamentally related to fear, which can be attenuated by education and learning. Establish effective protocols for "virtual" communication and rapid dissemination of information using web-based systems. Program directors must be available 24/7 during pandemic to ensure adequate resources to support the mental and physical well-being of their FIT.

C-FIT indicates cardiology FIT; COVID-19, coronavirus disease 2019; FIT, fellows in training; and PPE, personal protection equipment.

Table 4. Specific Roles of C-FIT During the COVID-19 Crisis

Role	Description
Consultant	C-FIT managed cardiology consultations for all COVID-19 units (ICU, PCU, RMF). Reasons include ACS, \uparrow biomarkers, AF, CHF, MOSF, VDRF, AKI, VTE, \uparrow QT. Rely on chart review, telephone contact with the patient, and direct communication with primary service. The consultation teams consisted of ≥ 1 cardiology attendings and ≥ 1 C-FIT.
ICU-L	C-FIT placed central and arterial lines; participated in daily rounds with the ICU team and provided collaborative critical care management of ICU patients. C-FIT assisted critical care teams with management of cardiovascular comorbidities, emergency procedures, and handheld portable echocardiography when necessary. C-FIT were supervised by critical care attendings. C-FIT also responded to cardiac emergencies in non-COVID-19 patients (especially during night shift).
Medical service	C-FIT function as a member of the primary IM hospitalist team for the general medical COVID-19 services. The teams consisted of 1 cardiology attending, 1 C-FIT, and physician extenders.
CCU	Non-COVID-19 cardiac ICU patients are managed by the COVID-19 cardiology consultation teams during the day and covered by the C-FIT on the ICU-L team at night.
Other	C-FIT performed remote ECG interpretation and assessment of QT intervals; adjudicated need for echocardiography and 12-lead ECGs on COVID-19 patients, assisted with “virtual” COVID-19 consultations to support on-site CCs, participated in research and quality assurance projects as permissible.

ACS indicates acute coronary syndrome; AF, atrial fibrillation; AKI, acute kidney injury; CC, COVID-19 cardiology consultation team; CCU, coronary care unit; C-FIT, cardiology fellows in training; CHF, congestive heart failure; COVID-19, coronavirus disease 2019; ICU, intensive care unit; ICU-L, ICU team for central lines; IM, internal medicine; MOSF, multiorgan system failure; PCU, progressive care unit; RMF, regular medical floor; VDRF, ventilator-dependent respiratory failure; and VTE, venous thromboembolism.

frequent issue for patients on hydroxychloroquine and azithromycin.

C-FIT in the COVID-19 ICUs

The need for central and arterial lines in the ICUs led to the formation of the ICU team for central lines. C-FIT were selected on the basis of their skill in rapid placement of central lines. Additional daytime responsibilities included rounds and assisting in critical care management. After hours, the C-FIT responded to cardiac emergencies anywhere in the hospital. Full PPE was required when entering patient rooms, and N95 masks were required while on the units. Attending supervision was provided by pulmonary or surgical critical care.

C-FIT on IM Services

In contrast to consultants, there was an expanding need for attending cardiologists and C-FIT as IM hospitalists. These IM teams included 1 attending cardiologist, 1 C-FIT, 1 to 2 physician extenders, and nursing staff. Although the ACGME provided guidance to allow C-FIT to serve as IM attendings, we used C-FIT as supervising residents. Their strong base of knowledge in IM and their exceptional supervisory and organizational skills were ideally suited to lead a team of physician extenders and non-IM residents. This strategy allowed them to focus on patient management and communication with patients and families while minimizing their direct exposure to COVID-19 patients. The cardiology attending was the primary physician for these COVID-19 patients (requiring full PPE for each patient encounter); C-FIT did not enter patient rooms. N95 masks were required for all C-FIT on IM units. The C-FIT determined treatment plans, triaged admissions and transfers, wrote notes, and managed

consultants; physician extenders may assist. Daily communication with the patient and families was by telephone or FaceTime (Apple, Inc, Cupertino, CA).

C-FIT in the Hybrid ICU

Because of 100% occupancy of ICUs by COVID-19 patients, contingency plans required conversion of progressive care units to hybrid ICUs to accommodate patients on ventilators. C-FIT shared night coverage with fellows in training from other specialties. C-FIT had direct patient exposure, so full PPE was required.

C-FIT and Cardiovascular Emergencies

There is an absolute need to maintain an immediate response to cardiovascular emergencies, whether arising from the emergency department or the hospital, irrespective of COVID-19 status (Table 5). Guidelines for management of acute cardiovascular emergencies were developed by the department chair in collaboration with department leaders (Figures S2 through S4).

Other Activities

C-FIT had brief periods of “downtime” between shifts. Even at home, C-FIT were engaged in ECG interpretation by Skype Communications (Microsoft Corporation, Palo Alto, CA), screening the need for ECGs and echocardiograms, obtaining measurement of QT intervals, or performing research or quality assurance projects. It is possible to adapt the educational environment by incorporating virtual learning and telemedicine.^{4,5}

Summary of C-FIT Assignments by Stage

Stage 1 only lasted 2 days (Figure 1); we maintained the usual structure of our clinical services (Figures 2

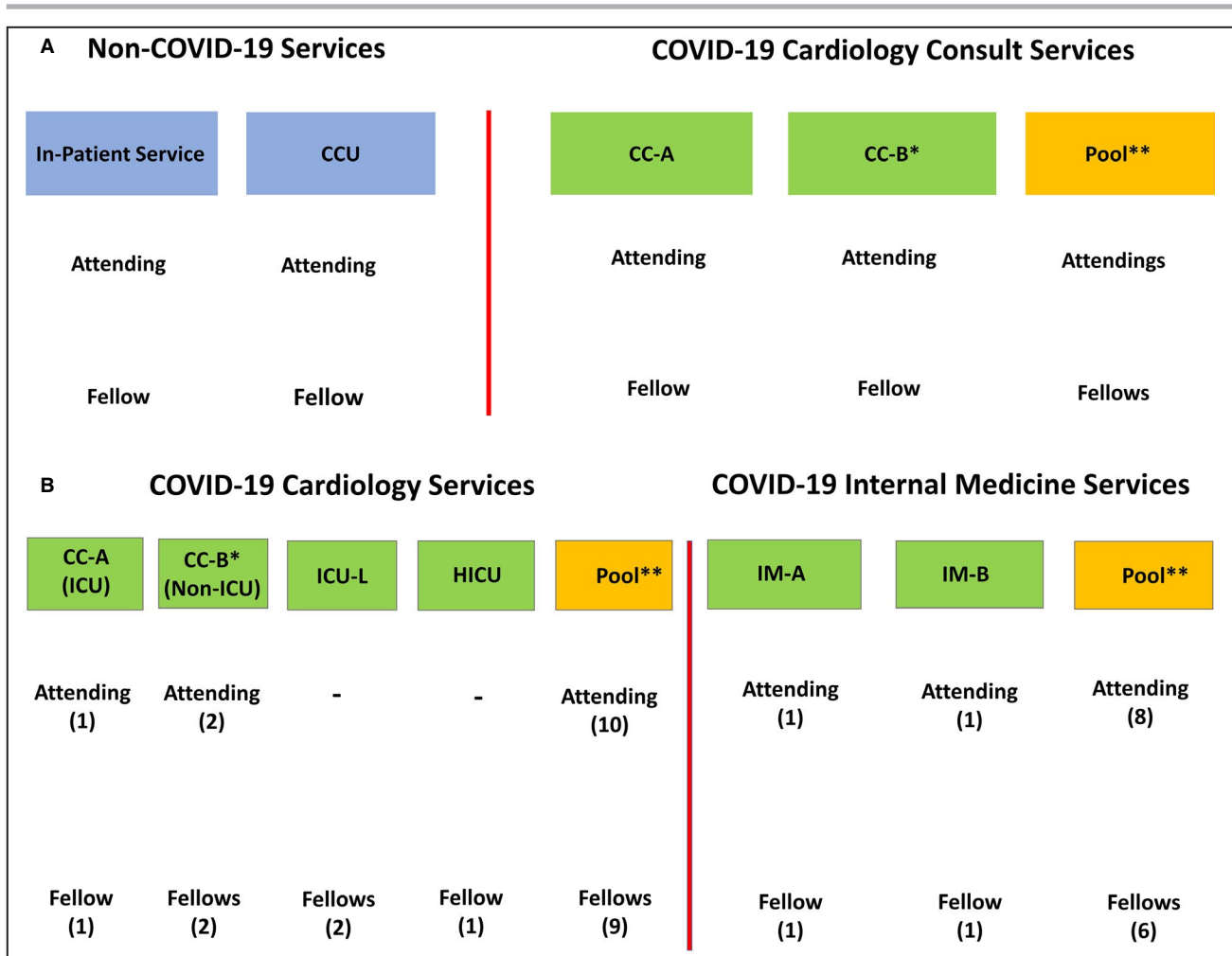


Figure 3. Deployment of cardiology attendings and fellows in training (FIT) during stages 2 and 3 of the coronavirus disease 2019 (COVID-19) crisis.

A, “Usual” non–COVID-19 cardiology services and new COVID-19 cardiology consultation services (consultation teams A and B) during stage 2. Each service was assigned 1 cardiology attending and 1 FIT. **B**, Deployment of cardiology attendings and FIT during stage 3 of the COVID-19 crisis. At this point, there was complete disruption of all usual cardiology rotations, and all 23 fellows had assigned roles on COVID-19 services. By the peak of stage 3, cardiology attendings and FIT were assigned to roles on 1 of 4 COVID-19 cardiology services or 1 of 2 COVID-19 internal medicine services. The numbers in parentheses represent the number of physicians assigned to the rotation. *The attending and FIT on team B were fully deployed when the census on team A approached 25 patients. Before that time, team B was available as “backup.” **The pool included attendings and FIT who were not assigned to one of these clinical services, to serve as additional clinical needs or to replace others who were ill. Unlike the consultation services, members of internal medicine teams A and B had primary responsibility for the care of COVID-19 patients. CC-A and CC-B indicate COVID-19 cardiology consultation teams A and B; and CCU, coronary care unit.

and 3, Table 6). Stage 2 only lasted 6 days, which was characterized by a rapidly increasing demand for cardiology consultations. During this stage, most activities were disrupted by mitigation strategies, rather than by C-FIT redeployments. We anticipated additional demands for cardiology consultations, so we created 2 consultation teams (CC-A and CC-B) and pools of attendings and C-FIT in case of unexpected illness. CC-A (ICU consultations) and CC-B (non-ICU consultations) were deployed within 24 hours of each other. Our entry into stage 3 occurred when residency

redeployment team requested immediate deployment of C-FIT to provide coverage on ICU team for central lines; this request was 24 hours before the ACGME framework was announced and 48 hours before approval of PES. By this time, C-FIT educational programs were completely disrupted, and except for 2 interventional cardiology C-FIT in the cardiac catheterization laboratory, all C-FIT were assigned to COVID-19 units. Additional C-FIT were assigned to CC-B to meet growing needs for consultations. The IM department was overwhelmed, so 2 IM teams

Table 5. Coverage for Cardiovascular Emergencies and Urgent Patient Evaluations

Area	Shift	First-Degree Contact	Second-Degree Contact
ED	7 AM–7 PM	ACS team	STEMI: F-IC; other: F-CC
	7 PM–7 AM	F-ICU-L or F-HICU	STEMI: F-IC; other: attending
Hospital	7 AM–7 PM	F-CC	STEMI: F-IC; other: attending
	7 PM–7 AM	RRG	STEMI: F-IC; other: F-ICU-L or F-HICU

ACS indicates team of nurse clinicians to evaluate patients with acute coronary syndromes and other cardiac emergencies; ED, emergency department; F-CC, cardiology fellows on the coronavirus disease 2019 consultation services; F-HICU, cardiology fellows on the hybrid intensive care unit; F-IC, interventional fellows in the cardiac catheterization laboratory; F-ICU-L, fellow on ICU line team; RRG, rapid response group consisting of nurse clinicians and physician extenders; and STEMI, ST-segment–elevation myocardial infarction.

(IM-A and IM-B) were each assigned to a cardiology attending and C-FIT to serve as the “primary” hospitalists. There was 100% occupancy of the ICUs, so C-FIT were assigned to cover hybrid ICU patients, including those on ventilators. By the peak in stage 3, all C-FIT were covering the COVID-19 unit.

TRANSLATION TO OTHER SETTINGS

The COVID-19 pandemic has created a crisis of extraordinary proportions that has never been witnessed during our lifetimes. The pandemic has impacted the lives of millions of people around the world and is still spreading across the United States. We wanted to

take a deep dive into the impact on our C-FIT. We recognize that each program has its own unique profile, but we hope that this document provides useful insights and a template for action, particularly as C-FIT are deployed into areas of unexpected responsibility. It is essential for programs to define their leadership structure, objectives, and priorities, to ensure a flexible response with appropriate contingency plans. We hope it is possible to look at this crisis as a life-changing experience, including many things we would like to forget, but also some things that have allowed us to grow as humans and as physicians.

SUMMARY OF THE EXPERIENCE, FUTURE DIRECTIONS, AND CHALLENGES

It appears that we have passed the peak of the COVID-19 crisis; 4 C-FIT and 3 cardiology attendings developed illnesses consistent with coronavirus, although none required hospitalization and all tested negative. The prospect for returning our fellowship to normal is an unrealized dream, and there are new and persistent challenges ahead. The hospital plans to renew our PES for another 30 days, and the pace of unwinding will differ for cardiology compared with other specialties. We anticipate a “new normal,” which may include retaining several mitigation strategies, incorporating telemedicine into our clinical and educational practices, modifying how we conduct interviews and recruitment for new C-FIT, and encouraging patients and families to return to our hospital, despite the magnitude of the crisis we face.

Table 6. Deployment Requirements at Peak of COVID-19

Rotation	Cardiology Attending		Cardiology FIT		Shifts*	Duration, d	Responsibility
	On Service	Pool†	On Service	Pool†			
CC-AB	2	8	3	8	7 AM–7 PM	7	Cardiology consultations on COVID-19 patients in ICU and medical units; manage CCU patients
ICU-L	...	...	1	6	7 AM–7 PM	4	Manage COVID-19 ICU patients, lines, rounds
	...	...	1	6	7 PM–7 AM	4	Cover COVID-19 ICU patients and lines, cover cardiac emergencies
IM-AB	2	8	2	8	7 AM–7 PM	7	Primary care of COVID-19 units
HICU	...	...	1	4	7 PM–7 AM	4	Primary care of HICU patients; cover cardiac emergencies
CCL	2	22	2	5	7 AM–7 PM	7	Only IC FIT; emergency and urgent procedures
	1	22	1	5	7 PM–7 AM	7	Only IC FIT; emergency procedures

CC-AB indicates COVID-19 cardiology consultation teams A and B; CCL, cardiac catheterization laboratory; CCU, coronary care unit; COVID-19, coronavirus disease 2019; FIT, fellows in training; HICU, hybrid ICU (non-ICU setting includes sick patients on and off ventilators); IC, interventional cardiology; ICU, intensive care unit; ICU-L, ICU team for central lines; and IM-AB, internal medicine teams A and B.

*Shifts on CC-AB and IM-AB were staggered between the attending physician and the FIT, to ensure continuity of care and to avoid situations where the attending and FIT were changing service on the same day.

†Pools of physicians were selected to ensure continuity of service, rather than include all attendings and FIT for all services.

ARTICLE INFORMATION

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Affiliations

From the Department of Cardiovascular Medicine, Beaumont Hospital–Royal Oak, Royal Oak, MI.

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Disclosures

None.

Supplementary Materials

Table S1

Figures S1–S4

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Supplemental Material

Table S1. Resources for FIT for a variety of subjects pertaining to COVID-19 crisis.

Category	Description	Citation/Link
General	ACC: Fellows-in-Training & Early Career Section Perspectives; effect of COVID-19 on education & training	https://www.acc.org/latest-in-cardiology/features/accs-coronavirus-disease-2019-covid-19-hub/fit-ec-perspectives
	Clinical guidelines on cardiac care of COVID-19 patients	https://covidprotocols.org/protocols/06-cardiology
	ACC Hub for clinical guidance, webinars, perspectives, updates	https://www.acc.org/covid19
	TCT Hub for news, podcasts, opinions	https://www.tctmd.com/COVID19
	SCAI Hub for COVID-19 issues	http://www.scai.org/covid-19-resources
	ESC Hub for podcasts, insights, resources	https://www.escardio.org/Education/COVID-19-and-Cardiology
	WHO Hub for public & provider updates	https://www.who.int/emergencies/diseases/novel-coronavirus-2019
Provider Safety	CDC Recommendations for PPE	https://www.cdc.gov/coronavirus/2019-ncov/hcp/using-ppe.html
	Protecting cardiologists-lessons from Wuhan, China	https://www.escardio.org/Education/COVID-19-and-Cardiology/protecting-cardiologists-during-the-covid-19-epidemic-lessons-from-wuhan
	Supporting the Health Care Workforce PPE, hospital policies, family safety	http://jamanetwork.com/article.aspx?doi=10.1001/jama.2020.3972
	ASE Statement on Protection of Patients & Echocardiography Service Providers	https://doi.org/10.1016/j.jacc.2020.04.002
Mental Health	Coronavirus and Mental Health: Taking Care of Ourselves During Infectious Disease Outbreaks	https://www.psychiatry.org/newsroom/apa-blogs/apa-blog/2020/02/coronavirus-and-mental-health-taking-care-of-ourselves-during-infectious-disease-outbreaks
	Podcast on anxiety, stress, PTSD related to pandemics	https://www.apa.org/research/action/speaking-of-psychology/coronavirus-anxiety
	CDC: COVID-19 Stress and Coping	https://www.cdc.gov/coronavirus/2019-ncov/daily-life-coping/managing-stress-anxiety.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-

		ncov%2Fprepare%2Fmanaging-stress-anxiety.html
Family Health	CDC: Helping Children Cope with Emergencies	https://www.cdc.gov/childrenanddisasters/helping-children-cope.html
	CSTS: recommendations on family protection	https://www.cstonline.org/assets/media/documents/CSTS_FS_Corona_Taking_Care_of_Your_Family.pdf
Adapting Delivery of Care	Telemedicine: The Essentials	https://www.cfp.ca/sites/default/files/pubfiles/PDF%20Documents/Blog/telehealth_tool_eng.pdf
	The role of cardiac point of care ultrasound	https://doi.org/10.1016/j.echo.2020.04.004
	SCCT Recommendations for cardiac CT	https://doi.org/10.1016/j.jcct.2020.03.002
	HRS, ACC, AHA recommendations on care of the EP patient	https://doi.org/10.1016/j.hrthm.2020.03.028
Adapting Education	Implementing experiential learning, telemedicine, virtual education, and social media for FIT	https://dx.doi.org/10.1016%2Fj.jacc.2020.04.013
Patient Management	Review of the basics of ARDS and mechanical ventilation for FIT.	https://doi.org/10.1016/j.jaccas.2020.03.007
	Video series, tips on mechanical ventilation	https://www.aarc.org/resources/clinical-resources/pandemic-ventilation-video-series-covid-19/
	Physiology of mechanical ventilation (Part 1).	https://doi.org/10.12968/hmed.2018.79.12.C188
	Practical considerations and case-based tips of mechanical ventilation (Part 2)	https://doi.org/10.12968/hmed.2019.80.1.C12
	Measurement of the QT interval	https://dx.doi.org/10.2174%2F1573403X10666140514103612

FIT= fellows-in-training, COVID-19= coronavirus 2019, ACC= American College of Cardiology, TCT= Transcatheter Cardiovascular Therapeutics, SCAI= Society for Cardiovascular Angiography and Interventions, WHO= World Health Organization, ESC= European Society of Cardiology, CDC= Centers for Disease Control, PPE= personal protection equipment, ASE= American Society of Echocardiography, PTSD= post-traumatic stress disorder, CSTS= Center for the Study of Traumatic Stress, SCCT= Society for Cardiovascular Computed Tomography, HRS= Heart Rhythm Society, AHA= American Heart Association, ARDS= adult respiratory distress syndrome, EP= electrophysiology

Figure S1. ACGME Pandemic Emergency Status Declaration Form.



Pandemic Emergency Status Declaration Form

Email completed and signed forms to dio@acgme.org. The ACGME will contact the designated institutional official (DIO) with any questions and will send confirmation of Pandemic Emergency Status declaration to the DIO and institutional coordinator.

1. Sponsoring Institution Name

2. ACGME 10-Digit ID

3. Designated Institutional Official Name

4. Pandemic Emergency Status Requested Start Date

5. What is the term of the Sponsoring Institution's declaration of Pandemic Emergency Status?
 30-day declaration Other end date (less than 30 days only) _____

6. The Sponsoring Institution may exempt programs from this declaration only if those exempted programs have no participating sites in common with other programs that are subject to this declaration. If the Sponsoring Institution wishes to exempt programs from this declaration, list the programs to be exempted and their participating sites. Add rows as needed.

Specialty/Subspecialty	ACGME ID	Participating Site(s)

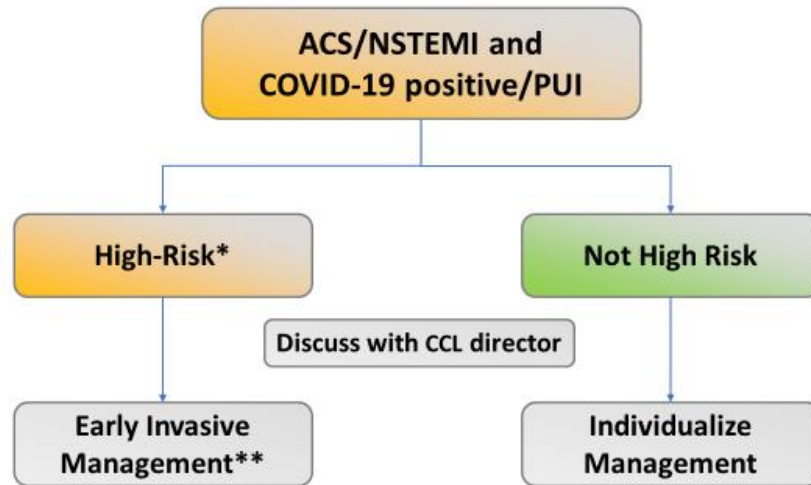
By signing the Pandemic Emergency Status Declaration Form, the designated institutional official:

- requests that the Sponsoring Institution and its ACGME-accredited program(s) be granted Pandemic Emergency Status through the ACGME's Extraordinary Circumstances policy;
- attests that this request for Pandemic Emergency Status has been approved by the clinical leadership of the primary clinical site(s) of the Sponsoring Institution's accredited program(s);
- attests that all voting members of the Sponsoring Institution's Graduate Medical Education Committee have been informed in writing of this request; and,
- attests that the Sponsoring Institution will ensure that its ACGME-accredited programs are compliant with specified ACGME Common Program Requirements that protect residents/fellows, health care teams, and patients throughout the term of the Pandemic Emergency Status declaration.

 Designated Institutional Official Signature

 Date

Figure S2. Beaumont Health guidelines for the management of COVID-19 patients with acute coronary syndromes.

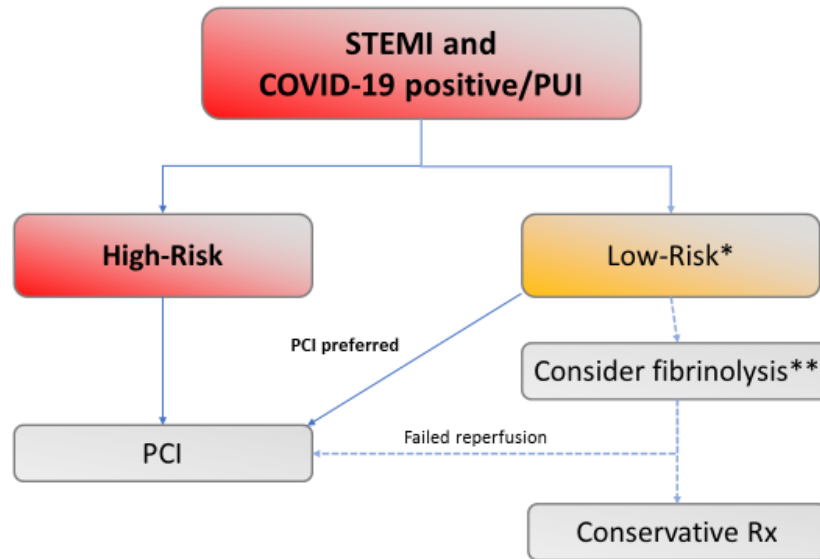


ACS= acute coronary syndromes, NSTEMI= non-ST-segment elevation myocardial infarction,
PUI= patient under investigation, CCL= cardiac catheterization laboratory.

*High-risk features include refractory angina, hemodynamic or electrical instability, and acute heart failure

**Early hospital discharge is recommended if possible

Figure S3. Beaumont Health guidelines for the management of COVID-19 patients with STEMI.

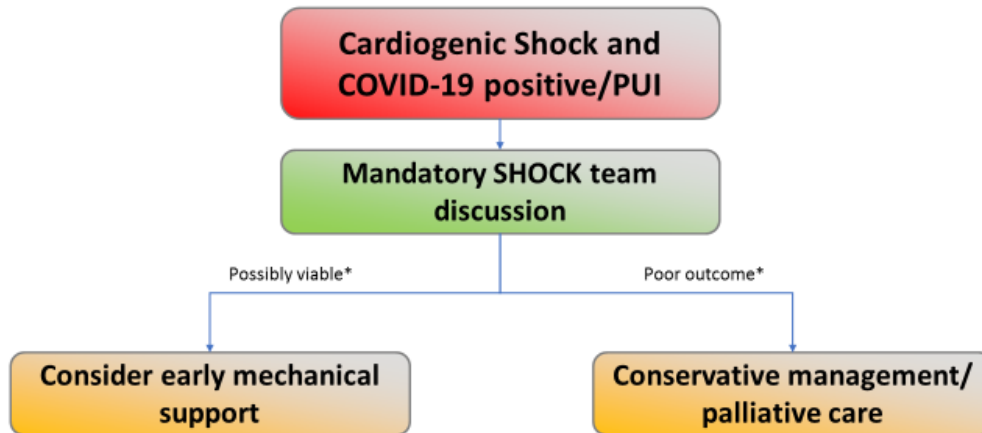


STEMI= ST-segment elevation myocardial infarction, PUI= patient under investigation, PCI= percutaneous coronary intervention.

*Low-risk features include hemodynamic stability and inferior STEMI. Early discharge may be considered in patients with successful PCI, single vessel disease, ejection fraction > 50%, and absence of complications.

**Tenecteplase (Genentech, Inc, South San Francisco, CA) is the preferred agent for thrombolysis.

Figure S4. Beaumont Health guidelines for the management of COVID-19 patients with cardiogenic shock.



*Careful consideration is required before initiating mechanical support, that relies on immediate mandatory discussion with our institutional multidisciplinary SHOCK team. Considerations include age (no absolute cutoff), the presence of serious comorbidities (disseminated intravascular coagulopathy, renal failure, ventilator-dependent respiratory failure, multi-organ system failure), and the presence of adverse markers of inflammation and acidosis (lactate, pH, ferritin, c-reactive protein, interleukin-6, erythrocyte sedimentation rate, procalcitonin). PUI= patient under investigation.