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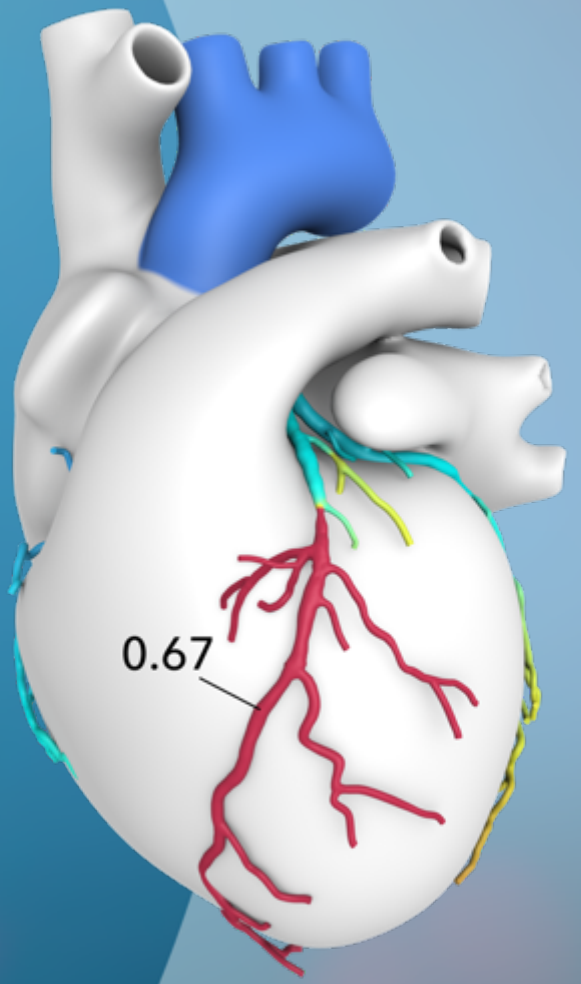
COVID-19 Guidance and Considerations

Updated April 2020

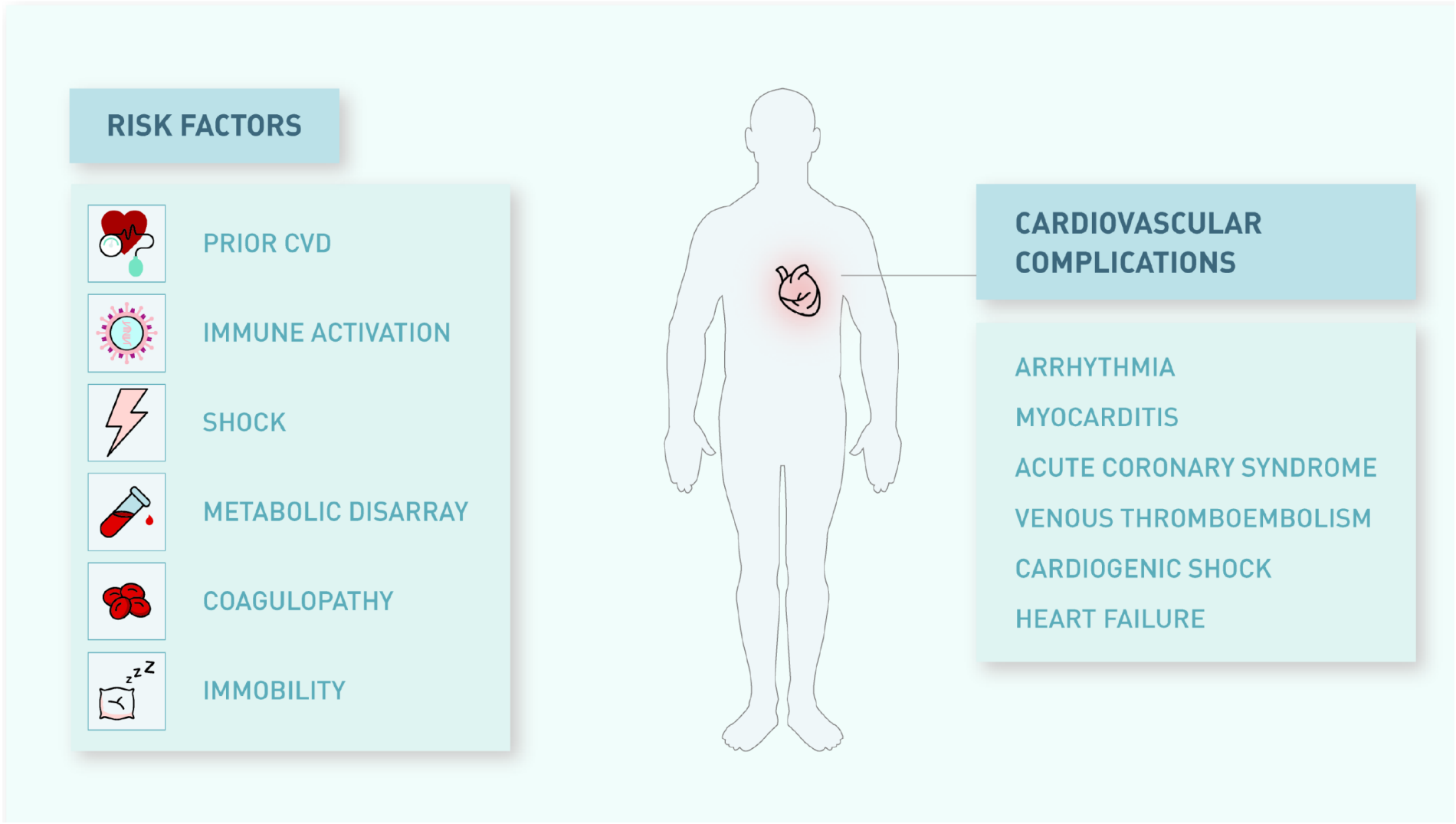


COVID-19 Guidance and Considerations

- As the COVID-19 situation continues to evolve, guidance documents around elective procedures are being published daily by various entities (government bodies, professional societies, publications, etc.)

- The following provides a summary of:
  - Clinical implications of COVID-19 and cardiovascular disease
  - Key guidance around elective procedures
  - Considerations regarding the appropriate use of CCTA for patients with stable coronary artery disease

COVID-19 and Cardiovascular Disease



Driggin, Parikh, et al, JACC 2020

85535685 v2

JACC: Some patients presenting with elevated troponins and other signs of STEMI or ACS may actually have COVID-19 related myocarditis

Journal of the American College of Cardiology
March 2020
DOI: 10.1016/j.jacc.2020.03.031

JACC STATE-OF-THE-ART REVIEW

Just Accepted

Cardiovascular Considerations for Patients, Health Care Workers, and Health Systems During the Coronavirus Disease 2019 (COVID-19) Pandemic

Elissa Driggin, Mahesh V. Madhavan, Behnood Bikdeli, Taylor Chuich, Justin Laracy, Giuseppe Bondi-Zoccai, Tyler S. Brown, Caroline Der Nigoghossian, David A. Zidar, Jennifer Haythe, Daniel Brodie, Joshua A. Beckman, Ajay J. Kirtane, Gregg W. Stone, Harlan M. Krumholz and Sahil A. Parikh

Myocarditis related to COVID-19 may complicate diagnosis of STEMI / ACS.

Key excerpts:

With severe respiratory infection and hypoxia, especially in the setting of severe infection and ARDS due to COVID-19, it is likely that a number of patients will develop such injury. Elevated serum troponin levels have been described in many patients infected with COVID-19, with significant differences noted between patients who died and those who survived to discharge.

Additionally, it is important to note potential overlapping symptomatology between ACS and COVID-19.

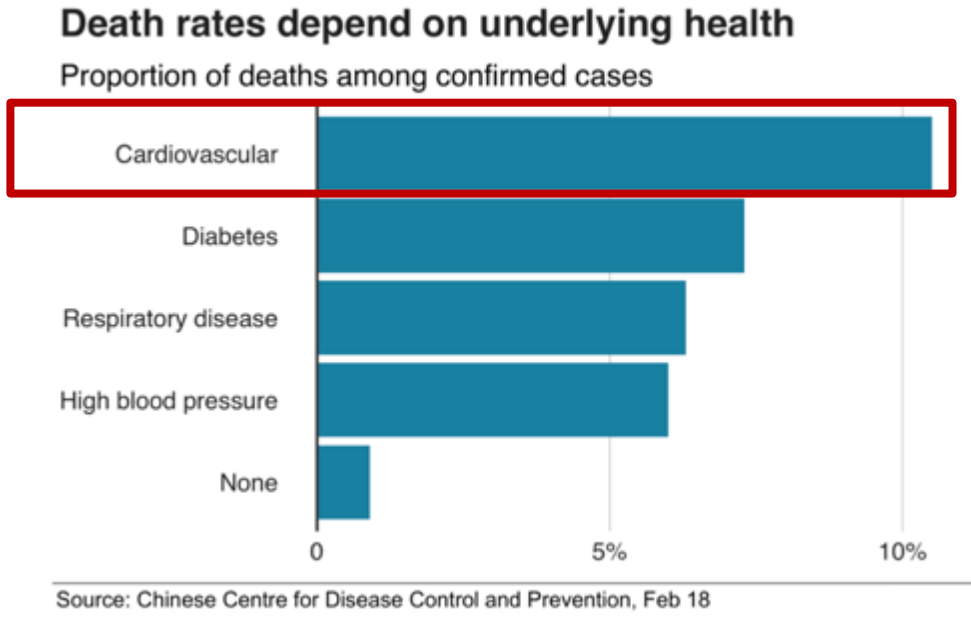
Link to publication

Lancet: High Burden of Underlying CVD in COVID-19 Patients

Epidemiological and clinical characteristics of 99 cases of 2019 novel coronavirus pneumonia in Wuhan, China: a descriptive study

Nanshan Chen, Min Zhou*, Xuan Dong*, Jieming Qu*, Fengyun Gong, Yang Han, Yang Qiu, Jingli Wang, Ying Liu, Yuan Wei, Jia'an Xia, Ting Yu, Xinxin Zhang, Li Zhang*

Chronic medical illness	50 (51%)
Cardiovascular and cerebrovascular diseases	40 (40%)
Digestive system disease	11 (11%)
Endocrine system disease†	13 (13%)
Malignant tumour	1 (1%)
Nervous system disease	1 (1%)
Respiratory system disease	1 (1%)
Admission to intensive care unit	23 (23%)
Clinical outcome	
Remained in hospital	57 (58%)
Discharged	31 (31%)
Died	11 (11%)



85535685 v2

Lancet 2020, Chen et al

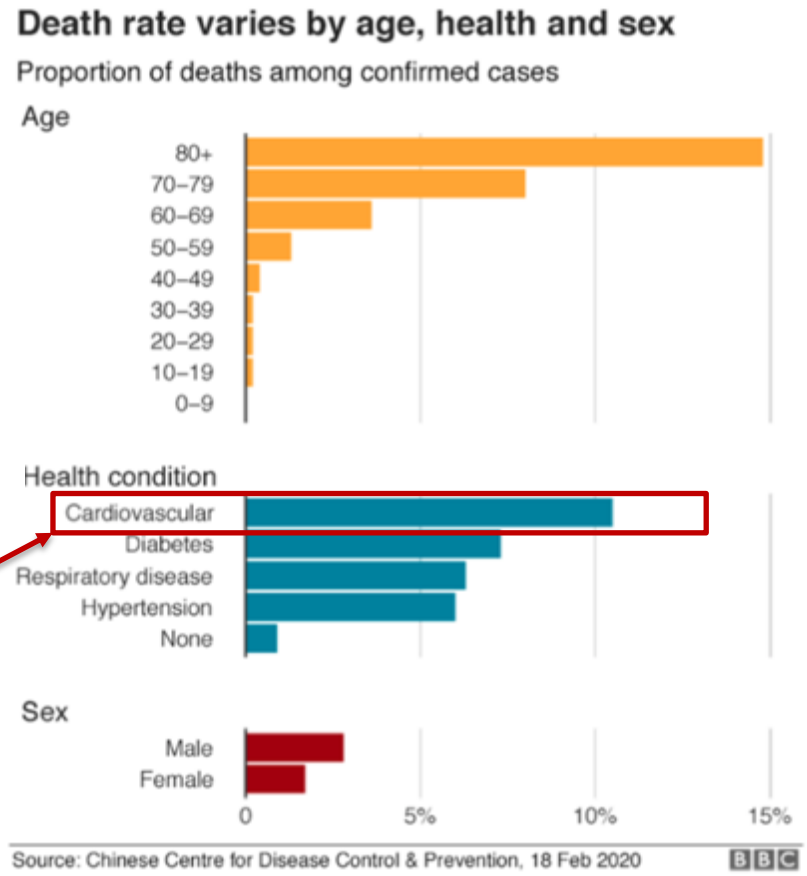
Advisory Board: COVID-19 Clinical Implications for CV Patients

Clinical implications for CV patients

Early data on the virus has established a sobering prognosis for coronavirus patients with CV comorbidities. The **American College of Cardiology** (ACC) published data indicating that 40% of hospitalized COVID patients have cardiovascular disease. Likewise, according to data from the Chinese Center for Disease Control and Prevention, mortality is highest for patients with underlying CV health conditions (at just over 10%) than for any other comorbidity, including respiratory disease.

Moreover, by targeting and inhibiting the lungs, coronavirus makes patients more susceptible to developing CV disease once infected. According to the ACC, 16.7% of patients developed arrhythmia and 7.2% developed acute cardiac injury during the course of their inpatient stays. There have also been cases of acute-onset heart failure, myocardial infarction, myocarditis, and cardiac arrest.

Link to Advisory Board article



Cardiovascular disease is a significant comorbidity for COVID-19

85535685 v2

SCCT: Use of CCTA during COVID-19 Pandemic

SCCT
SOCIETY OF CARDIOVASCULAR COMPUTED TOMOGRAPHY

COVID-19 RESPONSE

Authors

Andrew D. Choi, MD FSCCT[1]; Suhny Abbara MD, MSCCT[2]; Kelley R. Branch, MD, FSCCT[3]; Gudrun M. Feuchtner MD[4]; Brian Ghoshhajra MD, FSCCT[5]; Koen Nieman MD, PhD, FSCCT[6], Gianluca Pontone, MD, PhD, FSCCT[7]; Todd C. Villines, MD, MSCCT[8]; Michelle C. Williams, MBChB, PhD, FSCCT[9]; Ron Blankstein, MD, MSCCT[10]

Use of cardiac computed tomography amidst the COVID-19 pandemic

Table 1: Guiding points to consider when deciding on the role and timing of CCT.

• The delivery of CCT services should be performed in a manner which will be safe to technologists and imagers, as well as patients.
• Consider deferring CCT exams which can be safely postponed in order to minimize risk of exposure to patients and staff.
• CCT may be preferred to transesophageal echocardiography (TEE) in order to rule-out left atrial appendage and intracardiac thrombus prior to cardioversion in order to reduce coughing and aerosolization related to TEE.
• The ability of CCT to decisively exclude coronary disease or high risk anatomy may prevent the need for inpatient admissions and resource use.
• Consider that elderly patients, those with co-morbidities, and those who may be immunosuppressed are at greater risk of morbidity / mortality from COVID-19, and the benefit a nd risk of cardiac CT should be evaluated on a case by case basis.
• In patients under investigation (PUI) and with confirmed COVID-19, the benefit of CCT in most clinical scenarios will likely be lower than the risk of exposure and infection to healthcare personnel. These cases should be considered on a case-by-case basis.
•

Utilizing CCTA can reduce need for ICA, inpatient admissions and resource use

Link to SCCT guidance

85535685 v2

SCCT: Use of CCTA during COVID-19 Pandemic

Use of cardiac computed tomography amidst the COVID-19 pandemic

Table 2: Timing considerations for common indications for CCT amidst COVID-19

	Elective Indications (May be rescheduled > 8 weeks)	Semi-Urgent Indications (Consider scanning within 4-8 weeks)	Urgent Indications (Consider scanning within hours to < 2-4 weeks)
CAD	• Asymptomatic coronary artery calcium imaging		• Acute chest pain when sufficient clinical suspicion for CAD
	• Stable chest pain without high suspicion for CAD		• Stable chest pain at high risk for events, or when there is concern for possible high-risk coronary anatomy

Data points to consider for determining elective vs. urgent patient types:

- In ISCHEMIA, 5% of patients with left main disease were identified by CCTA (AHA 2019)
- SCOT-HEART demonstrated 41% reduction in death and MI at 5 years with CCTA (Newby, et al. N Engl J Med 2018)
- A meta-analysis found FFR-guided PCI led to a 28% reduction in MI at 5 years (Zimmerman, et al. Euro Heart J 2019)

Link to SCCT guidance

85535685 v2

ACC/SCAI: Defer PCIs for Stable Ischemic Heart Disease

Journal of the American College of Cardiology
March 2020
DOI: 10.1016/j.jacc.2020.03.021

CARDIOVASCULAR MEDICINE AND SOCIETY

Just Accepted

Catheterization Laboratory Considerations During the Coronavirus (COVID-19) Pandemic: From ACC's Interventional Council and SCAI

Frederick G.P. Welt, Pinak B. Shah, Herbert D. Aronow, Anna E. Bortnick, Timothy D. Henry, Matthew W. Sherwood, Michael N. Young, Laura J. Davidson, Sabeeda Kadavath, Ehtisham Mahmud, Ajay J. Kirtane and American College of Cardiology's (ACC) Interventional Council and the Society of Cardiovascular Angiography and Intervention (SCAI)

ACC/SCAI recommend avoiding elective invasive procedures when possible.

CCTA+FFR_{CT} has been shown to safely defer >60% of invasive diagnostic angiograms

Key Excerpts:

Under any circumstance, to preserve hospital bed capacity, it would seem reasonable to avoid elective procedures on patients with significant comorbidities or in whom the expected length of stay is >1 to 2 days (or anticipated to require the intensive care unit). In addition, the definition of truly elective requires clinical judgement, because in some cases deferral of patients may have independent deleterious effects.

However, examples of procedures to defer include: a) PCI for stable ischemic heart disease, b) endovascular intervention for ilio-femoral disease in patients with claudication, and c) patent foramen ovale closure.

Link to publication.

85535685 v2

COVID-19 Considerations: Role of CCTA-first Pathway

Utilization of a CCTA-first diagnostic pathway in symptomatic patients for whom cardiac testing cannot wait can offer the following benefits:

- Non-invasive with little requirement for contact between patient and providers
- Highly accurate CAD diagnostic approach with the highest negative predictive value to safely rule out CAD
- Reduced need for diagnostic invasive coronary angiograms, alleviating the burden on hospital cath labs and minimizing negative cath procedures
- Risk-stratify patients, enabling selection for revascularization of only the patients who would be at highest risk if deferred
- All CT reading, and ordering / interpretation of FFRct can be done remotely once CT scanning is complete

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April 2020 Updates

CMS recommends prioritizing emergent and urgent procedures

- The Centers for Medicare and Medicaid Services (CMS) released updated guidance on April 7 recommending a tiered approach for providing care.
- The tiered approach prioritizes services for patients who require emergent or urgent attention to save a life, manage severe disease, or avoid further harms from an underlying condition
- The agency provided this chart to guide decision-making:
- Link to CMS guidance

Utilizing CCTA can determine if a patient is Tier 2 or 3 or *neither* (No CAD or OMT)

Tiers	Definition	Locations	Examples	Action
Tier 1	**Low acuity treatment or service**	• Medical office • FQHC/RHC* • HOPD** • Ambulatory care sites	• Routine primary or specialty care • Preventive care visit/screening • Annual Wellness or Welcome to Medicare Initial Preventive Visit • Supervised exercise therapy • Acupuncture	Consider postponing service Consider follow-up using telehealth, virtual check-in, or remote monitoring
Tier 2	**Intermediate acuity treatment or service** Not providing the service has the potential for increasing morbidity or mortality	• Medical office • FQHC/RHC • HOPD • Ambulatory care sites	• Pediatric vaccinations • Newborn/early childhood care*** • Follow-up visit for management of existing medical or mental/behavioral health condition • Evaluation of new symptoms in an established patient • Evaluation of non-urgent symptoms consistent with COVID-19	Consider initial evaluation via telehealth; triage to appropriate sites of care as necessary If no current symptoms of concern, consider follow-up with virtual check-in
Tier 3	**High acuity treatment or service** Lack of in-person treatment or service would result in patient harm	• Medical office • FQHC/RHC • HOPD • Ambulatory care sites • Emergency department	• Evaluation of new symptoms in a new patient • Evaluation of symptoms consistent with COVID-19, with warning signs including shortness of breath, altered mental status, or other indications of severe disease	We would not recommend postponing in-person evaluation; consider triage to appropriate facility/level of care as necessary

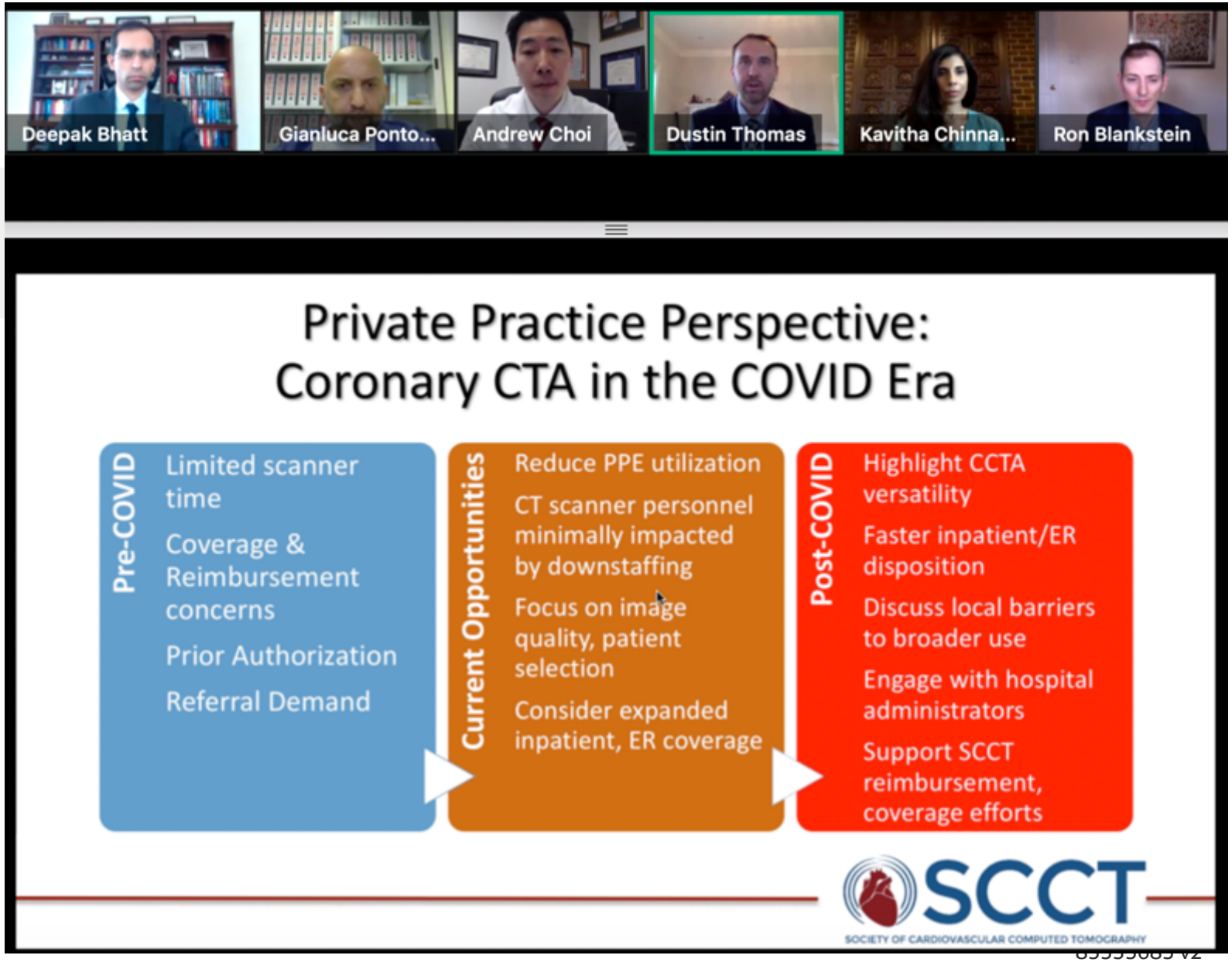
SCCT Webinar – April 15, 2020

SCCT
SOCIETY OF CARDIOVASCULAR COMPUTED TOMOGRAPHY

Potential role of CCTA during / post-COVID-19 crisis:

- Reduced PPE utilization
- Utility for in-patient and ER populations
- Versatility
- Faster patient disposition

Link to webinar recording



SCCT: Use of CCTA during COVID-19 Pandemic - UPDATE

COVID-19 RESPONSE

Authors

Andrew D. Choi, MD FSCCT[1]; Suhny Abbara MD, MSCCT[2]; Kelley R. Branch, MD, FSCCT[3]; Gudrun M. Feuchtner MD[4]; Brian Ghoshhajra MD, FSCCT[5]; Koen Nieman MD, PhD, FSCCT[6], Gianluca Pontone, MD, PhD, FSCCT[7]; Todd C. Villines, MD, MSCCT[8]; Michelle C. Williams, MBChB, PhD, FSCCT[9]; Ron Blankstein, MD, MSCCT[10]

CCTA for Myocardial Injury and Possible ACS in known or suspected COVID-19

- Coronary CTA (CCTA) may be useful in carefully selected patients who have elevated cardiac enzymes, inconclusive electrocardiogram, and symptoms of possible acute coronary syndrome (ACS) in order to exclude obstructive coronary artery disease.

- The use of coronary CTA in such settings should only be considered if it can be performed at centers that have high-level of expertise and when diagnostic quality imaging can be achieved. Furthermore, CTA in this setting should only be considered if it expected to result in a meaningful change to patient management or outcomes.

SCCT Update provides context around the utility of CCTA in the Emergency Department

Link to SCCT guidance

85535685 v2

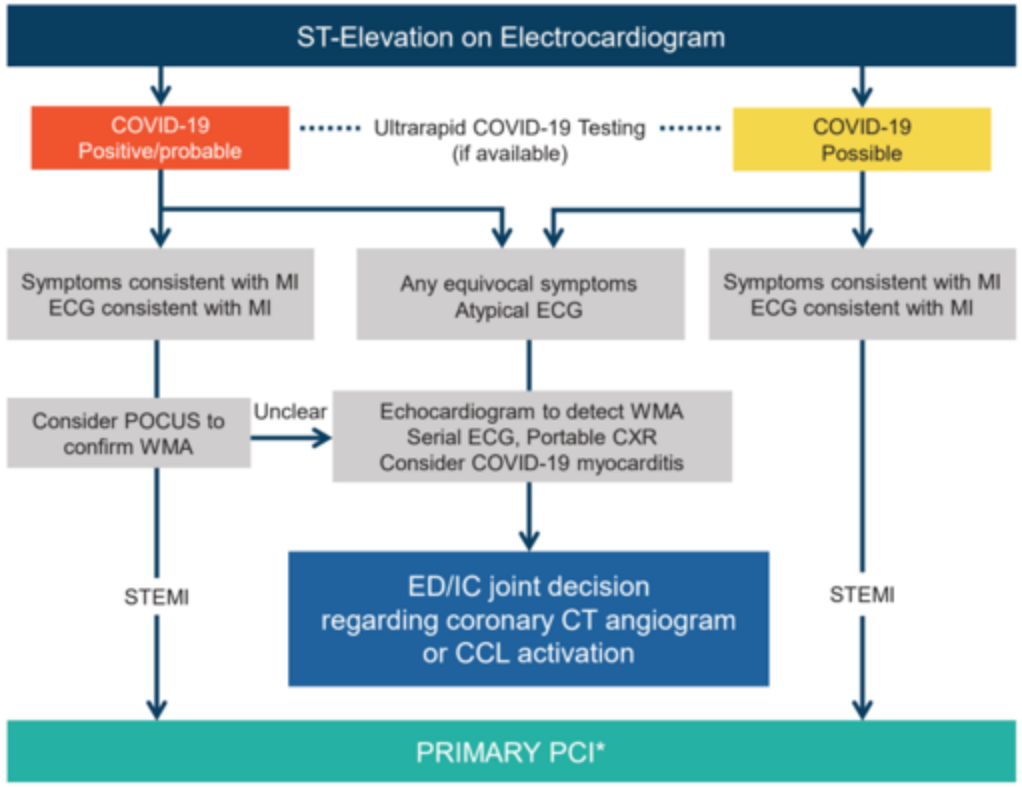
SCAI/ACC/ ACEP Recommendations on AMI Patients

Journal of the American College of Cardiology
Available online 21 April 2020
In Press, Journal Pre-proof

Management of Acute Myocardial Infarction During the COVID-19 Pandemic

Ehtisham Mahmud MD FACC FSCAI [1], Harold L. Dauerman MD FACC FSCAI [2], Frederick GP. Welt MD FACC FSCAI [3], John C. Messenger MD FACC FSCAI [4], Sunil V. Rao MD FACC FSCAI [5], Cindy Grines MD FACC MSCAI [6], Amal Mattu MD FACEP [7], Ajay J. Kirtane MD SM FACC FSCAI [8], Rajiv Jauhar MD FACC FSCAI [9], Perwaiz Meraj MD FACC FSCAI [10], Ivan C. Rokos MD FACEP [11], John S. Rumsfeld MD PhD FACC [12], Timothy D. Henry MD FACC MSCAI [13]

The writing group recommends informing the public that exposure to the virus can be minimized, that patients continue to call the emergency medical services (EMS) when presenting with acute heart attack symptoms,



Key Excerpts:

- During the COVID-19 pandemic, primary PCI remains the standard of care for STEMI patients at PCI capable hospitals when it can be provided in a timely fashion, with an expert team outfitted with PPE in a dedicated CCL room.
- Available clinical, ECG, laboratory and imaging data can inform a decision between the ED physician and interventional cardiologist regarding CCL activation.
- Coronary CT angiography may be considered in cases where the findings of ST elevation and transthoracic echocardiography are divergent.

Link to publication

ESC Guidance on Managing CV Disease – April 2020

ESC
European Society of Cardiology

ESC Guidance for the Diagnosis and Management of CV Disease during the COVID-19 Pandemic

Last updated on 21 April 2020

Link to document

Table 13 Management of chronic coronary syndromes during COVID-19 pandemic

- Continuation of medications in CCS patients is recommended during COVID-19 pandemic
- Follow-up of CCS patients via tele-health is recommended
- Revascularization of CCS patients must be postponed in low to intermediate risk patients
- Postponing of non-invasive testing of CCS patients should be considered during COVID-19 pandemic
- CT angiography should be preferred to non-invasive functional testing during COVID-19 pandemic
- Screening for SARS-CoV-2 infection should be considered before cardiac surgery with nasopharyngeal swab and CT scan
- Revascularization of high-risk[a] CCS patients may be considered during COVID-19 pandemic
- PCI may be considered over CABG in selected patients during COVID-19 pandemic[b]
- Identification of COVID-19-free hospitals may be considered as "Hub" for cardiac surgery
- Invasive management of CCS in SARS-CoV-2 positive patients should be deferred until the patient has recovered whenever possible.

[a]Patients with high-risk symptoms and/or coronary anatomy and/or large ischaemia as assessed by Heart team.
[b]To shorten hospital stay and keep ICU beds available for patients with COVID-19.

ESC Guidance: Key Excerpts on CCTA

- CCTA may be the preferred non-invasive imaging modality to diagnose CAD since it **reduces the time of exposure** of patients and personnel;

- In patients with acute chest pain and suspected obstructive CAD, CCTA is the preferred non-invasive imaging modality since it is **accurate, fast** and **minimizes the exposure of patients.**

- Single photon emission computed tomography (SPECT) or PET may also be used for diagnosing ischaemia in patients with suspected obstructive CAD **when CCTA is not appropriate or available.**

- Nuclear cardiology should be performed only in specific indications and when no other imaging modalities can be performed;

ESC Guidance: Key Excerpts on CCTA

- Patients with Troponin rise and no acute clinical signs of instability (ECG changes, recurrence of pain) might be managed with a primarily conservative approach. Non-invasive imaging using **CCTA may speed-up risk stratification, avoid an invasive approach allowing early discharge.**

- In the event any of the differential diagnoses seem plausible, a non-invasive strategy should be considered and CCTA should be favored, if equipment and expertise are available.

- **In case CCTA is not suitable (e.g. inability of heart rate control, etc.) or available, non-invasive testing should be postponed.** Alternative imaging modalities should be discouraged during the acute pandemic phase unless severe ischaemia is suspected, to minimize the access of the patients to healthcare system (SPECT/PET) or to prevent a close contact between patients and personnel (stress echocardiography).

ESC Guidance: Context

- The document is **not a guideline** but rather a **guidance** document.
- Recommendations are based on observations/ personal experience of health care providers at the forefront of the COVID-19 pandemic.
- Document is meant to provide guidance while pandemic status is maintained by WHO.
- Document is not intended to replace official ESC guidelines or interfere with recommendations provided by local or national health care authorities.
- Guidance may change as knowledge and evidence about COVID-19 changes and matures over time.

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