Stroke in the Time of COVID19

Georgia Coverdell Acute Stroke Registry

All Hospital Conference Call 4/20/2020

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Disclosures (Frankel)

- Nico Corporation: (ENRICH clinical trial) – grant support for clinical trial of surgical evacuation in ICH
- NIH and CDC: grant support
- Marcus Foundation: grant support

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Stroke in the Time of COVID19

- Overview – Frankel
- VTE – Chester and Morgan
- Critical Care considerations – Ratcliff
- Questions

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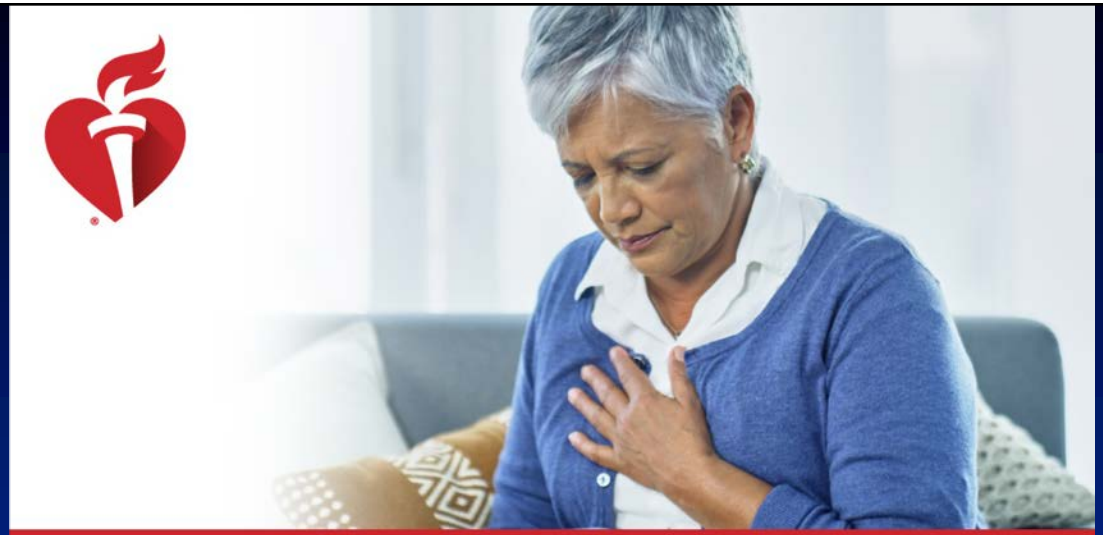

Heart Attacks and Strokes Don't Stop During Pandemics.

Call 911 right away if you have symptoms. Even while fighting the coronavirus, emergency systems stand ready to help.

heart.org

Protecting Georgia's Minds

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COVID19 and Stroke
Workflow Considerations

- Safety first (PPE)
- Personnel
- Telephone; Telestroke
- COVID19 screening challenges
- Imaging
- No known risk of tPA with COVID19, but be more vigilant with coag tests
- Documentation
- Vital sign monitoring
- Bed utilization
- High vigilance for detecting signs/symptoms of COVID19, even if test is neg
- Data collection…

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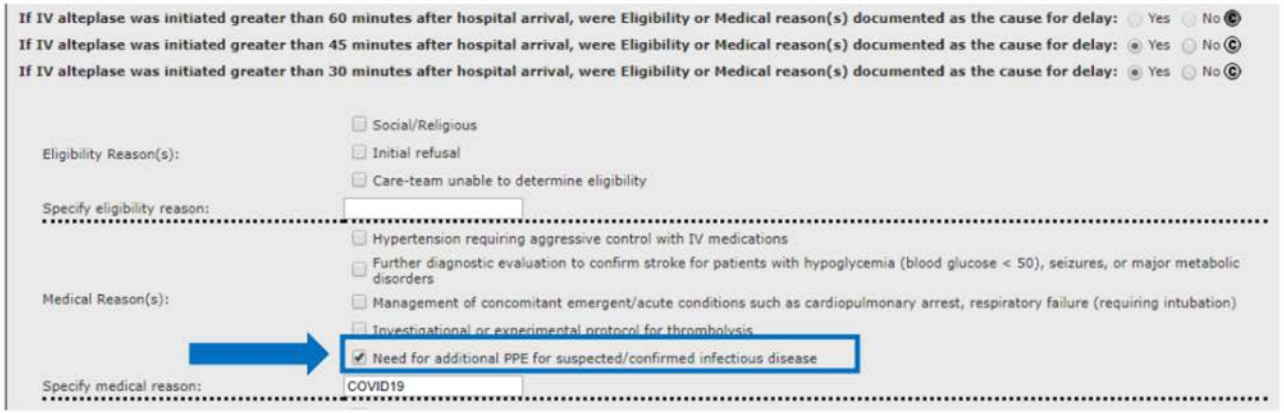
REASON FOR DELAY IN THROMBOLYTICS

Need for additional PPE for suspected/confirmed infectious disease

- Adds the ability to document "Need for additional PPE for suspected/confirmed infectious disease" as a medical reason for delay in thrombolytic administration of thrombolytics.
- Exclusion for 30, 45, 60-minute Door to thrombolytic measures.



American Heart Association.

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COVID-19: The basics

- COVID-19 is caused by the Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2).
- Novel single-stranded enveloped RNA virus.
- Seventh known human coronavirus:
  - 4 common cold viruses: 229E, OC43, NL63, and HKU1
  - 3 severe acute respiratory syndrome (SARS): ARDS
    - SARS-CoV 2002: 10% case fatality
    - Middle East respiratory syndrome (MERS-CoV) 2012: 34% case fatality
    - Coronavirus disease 2019 (COVID-19): 1-3% case fatality

Clerkin KJ et al. Circulation 2020.

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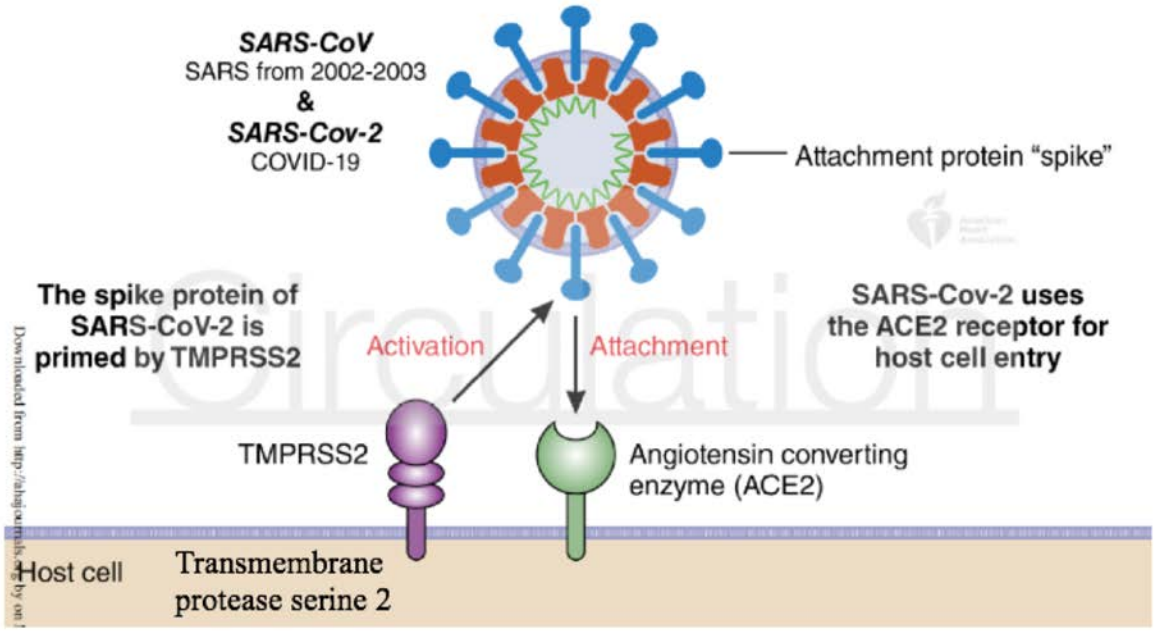
COVID-19: Portal of entry



Clerkin KJ et al. Circulation 2020.

Mitch Elkind, MD
Columbia NYP

COVID-19 and cardiovascular disease/stroke

- Although COVID19 is primarily an infectious respiratory illness, it has cardiovascular relevance and consequent clinical implications.

  Clerkin KJ et al. Circulation 2020.
  Elkind MSV et al. Circulation 2020.

- Common infections, like influenza and sepsis, may **trigger** strokes and acute coronary events.

  Elkind MSV et al. Stroke. 2011;42:1851-1856.
  Boehme AK et al. Ann Clin Transl Neurol. 2018;5:456–463.

- Some patients with COVID-19 *present* with primary cardiac complaints like chest pain and palpitations, *without fever*.

  Zheng YY et al. *Nat Rev Cardiol*. March 5, 2020.

- Early reports from some of our colleagues in US suggest that some patients are presenting with stroke symptoms and then turn out to be COVID positive: related or simply reflection of high infection rate among asymptomatic people.

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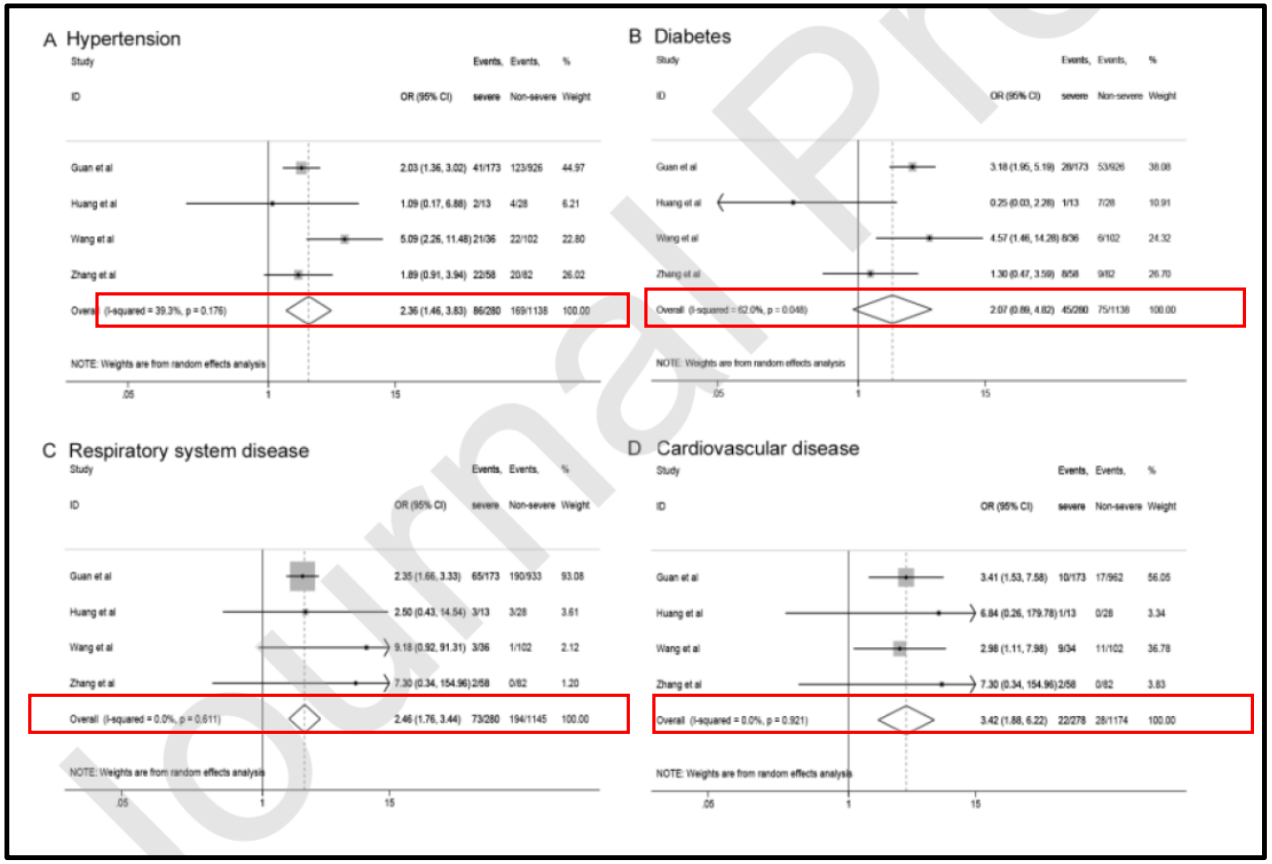
Cardiovascular risk factors associated with worse outcomes

Meta-analysis of 8 studies
N=46,248
52% male; mean age 46 yrs

Hypertension	17%
DM	8%
Cardiovascular disease	5%
Respiratory disease	2%

Each was more common in those with severe disease than those with non-severe disease



Yang J et al. *Int J Infect Dis.* March 12, 2020.

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- Early neurological symptoms
  - Headache, confusion, dizziness, anosmia, and ageusia
    - Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19). February 28, 2020.
- More severe neurological symptoms:
  - Ischemic stroke, ICH, myelitis.
- In China, neurological manifestations occurred in 36% of patients
  - Stroke in 6%
  - Encephalopathy 15% in patients with severe disease
    - Li Y, et.al. Lancet. Mar 13 2020

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Stroke in COVID-19

Table 1. Baseline characteristics of COVID-19 patients with new onset of CVD during infection

	Type of CVD	Subtype of AIS	Age, y	Sex	Smoking History	Drinking History	Blood pressure (mm Hg)	Fasting Blood-glucose (mmol/L)	Type of COVID-19 Patients (Severe/Non-Severe)	Onset Time of SARS-CoV-2 Infection	Onset Time of CVD	Treatment of CVD	Outcome Event
1	AIS	Small vessel	70	M	No	No	110/70	5·44	Severe	01/26/20	02/23/20	Antiplatelet	Survival
2	AIS	Large vessel stenosis	75	F	No	No	110/67	6·03	Severe	01/24/20	02/15/20	Antiplatelet	Survival
3	AIS	Cardioembolic	89	F	No	No	97/64	6·77	Non-severe	02/19/20	02/19/20	Anticoagulant	Survival
4	AIS	Large vessel stenosis	91	F	No	No	192/97	6·7	Severe	02/01/20	02/10/20	Anticoagulant	Survival
5	AIS	Large vessel stenosis	72	F	No	No	155/89	7·93	Severe	02/01/20	02/12/20	Anticoagulant	Survival
6	AIS	Cardioembolic	71	M	Yes	No	142/67	16·25	Severe	01/31/20	02/07/20	Anticoagulant	Death
7	AIS	Cardioembolic	86	M	Yes	No	110/72	13·81	Severe	01/24/20	02/11/20	Antiplatelet	Death
8	AIS	Large vessel stenosis	82	F	No	No	140/83	24·2	Severe	02/02/20	02/16/20	Antiplatelet	Death
9	AIS	Small vessel	78	M	Yes	No	156/82	11·0	Severe	01/17/20	01/17/20	Antiplatelet	Death
10	AIS	Large vessel stenosis	57	M	No	No	127/83	13·24	Non-severe	02/06/20	02/07/20	Antiplatelet	Survival
11	AIS	Small vessel	66	F	No	No	98/62	8·67	Severe	02/11/20	02/17/20	Anticoagulant	Survival
12	CVST		32	M	Yes	Yes	130/80	8·23	Severe	02/09/20	02/23/20	Anticoagulant	Survival
13	CH		62	M	Yes	Yes	150/80	5·81	Severe	01/23/20	02/01/20		Death

* The patients of COVID-19 were confirmed by SARS-CoV-2 RT-PCR positive in throat swab and viral-like pneumonia in chest CT.

Abbreviations: COVID-19, Coronavirus disease 2019; CVD, Cerebrovascular disease; AIS, Acute ischemia stroke; CH, Cerebral hemorrhage; CVST, Cerebral Venous Sinus Thrombosis; F, Female; M, Male

Li Y, et.al. Lancet. Mar 13 2020.

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COVID-19 and CVD/Stroke

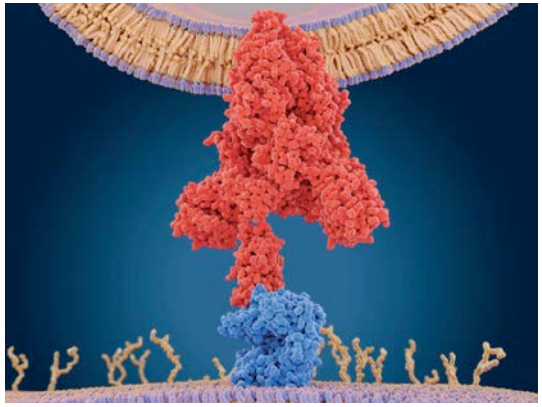
Potential mechanisms

- Increased number of risk factors or comorbid conditions with age
- Impaired immunity making patients more susceptible to virus
- Other susceptibility to coronavirus with cardiovascular disease and risk factors
- Decreased “physiological reserve”: Worse outcomes due to underlying cardiovascular disease
- Increased ACE2 or TMPPRSS2
- Other reasons

COVID-19 may have direct adverse effects on cardiovascular system

- The risk of cardiac injury and arrest appear to be higher than would be expected from pneumonia alone.
- The mortality rate is higher among the elderly and those with cardiovascular disease, including stroke.
- This also appears to be the case for patients with hypertension in several studies.
- The ACE2 receptor is also found in heart, vascular endothelia, and even neurons.
- This tropism could explain cardiac and cerebrovascular effects.
- There is some evidence that ACEI and ARBs commonly used to treat hypertension can lead to an upregulation of ACE2 receptors, potentially facilitating infection.
- However, there is also evidence that these drugs may be of benefit in reducing lung injury inflammation in viral pneumonias.
- At present recommend against changing ACEI/ARBs (Do not stop them.)

AHA/ACC/HFSA statement March 17, 2020.



Fang L et al. Lancet Resp Med 2020.

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Increased risk of venous thrombosis and venous thromboembolism with COVID19 patients who have pneumonia

Netherlands (3 centers)
184 ICU pts
Pneumonia
C19+
Received std VTE

Median time of obs: 7 days
VTE 27%
Arterial thrombosis 3.7%

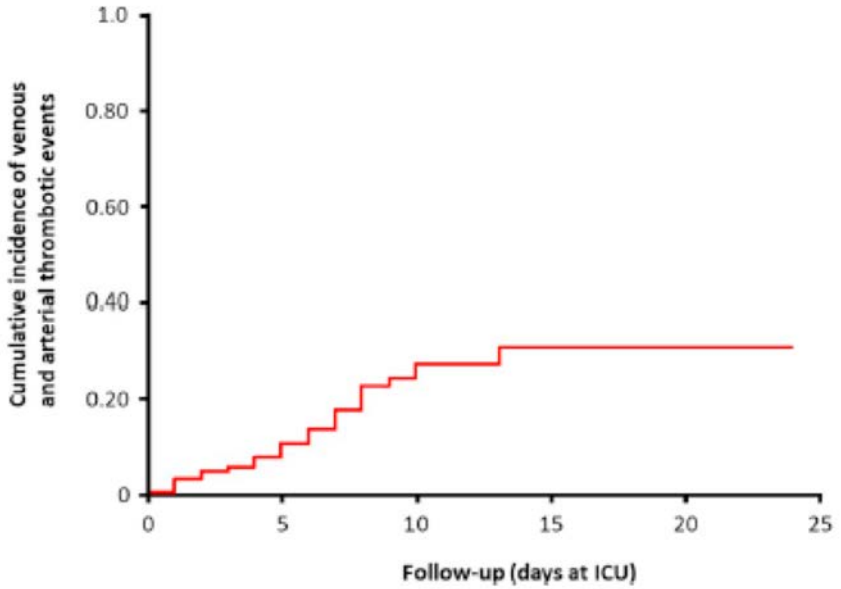

Fig. 1. Cumulative incidence of venous and arterial thrombotic complications during the course of intensive care unit admission of patients with proven COVID-19 pneumonia.

Klok FA, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thrombosis Research*. April 2020 (in press).

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Table 3
Description of thrombotic complications.

Type of event	Number of cases	Relevant details
Pulmonary embolism	25	– 18 cases with at least PE in segmental arteries, 7 cases PE limited to subsegmental arteries
Other venous thromboembolic events	3	– 1 proximal deep-vein thrombosis of the leg – 2 catheter related upper extremity thrombosis
Arterial thrombotic events	3	– All ischemic strokes

Note: acute pulmonary embolism was diagnosed with CT-pulmonary angiography, deep vein thrombosis/upper extremity vein thrombosis was diagnosed with ultrasonography, strokes were diagnosed with CT.

Klok FA, et al. Incidence of thrombotic complications in critically ill ICU patients with COVID-19. *Thrombosis Research*. April 2020 (in press).

COVID-19 Associated Coagulation Disorders

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Disclosure Statement

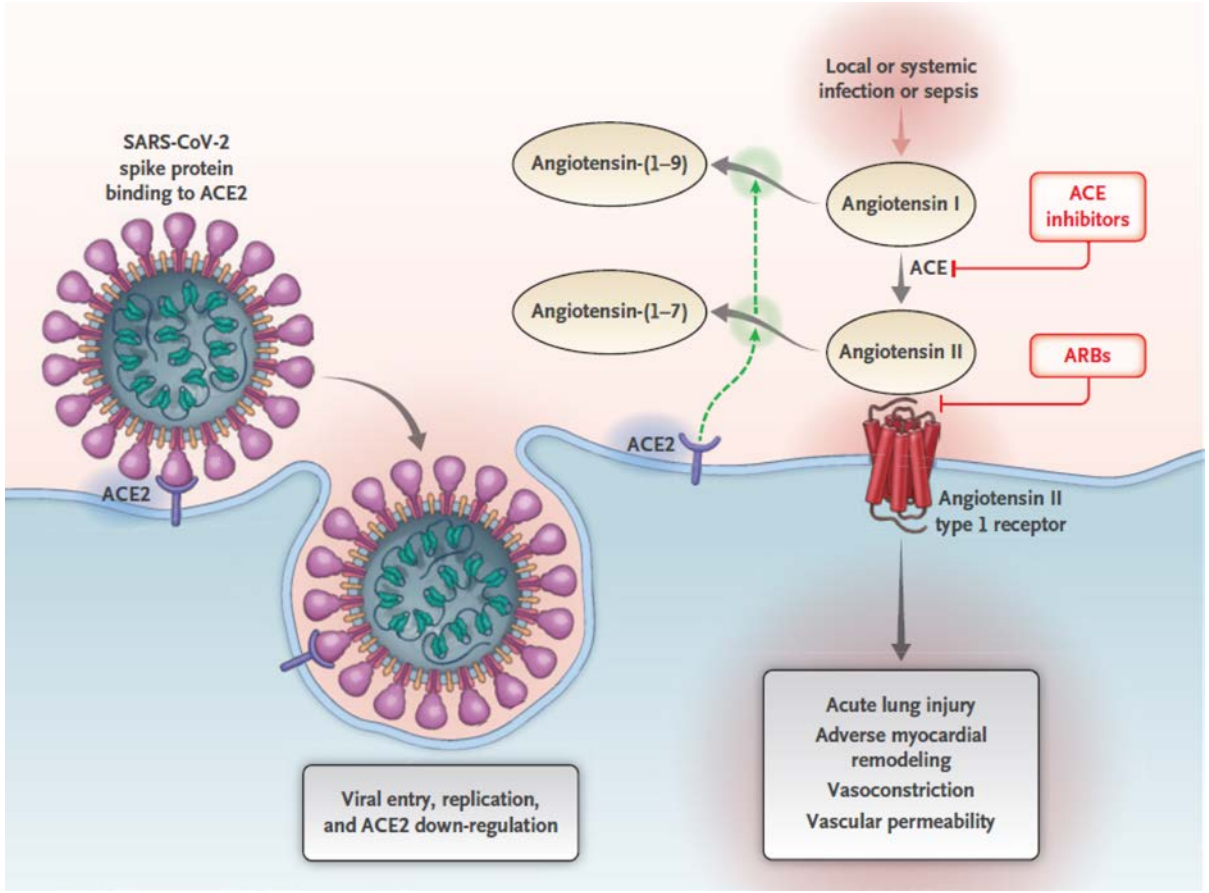
The following individuals have nothing to disclose concerning possible financial or personal relationships with commercial entities (or their competitors) that may be referenced in this presentation:

- Katleen W. Chester, PharmD, BCCCP,BCGP
- Olivia J. Morgan, PharmD, BCCCP, BCGP

Presentation Content

- Pathogenesis and epidemiology
- Clinical/Laboratory presentation
- Prophylaxis
- Treatment

Pathogenesis



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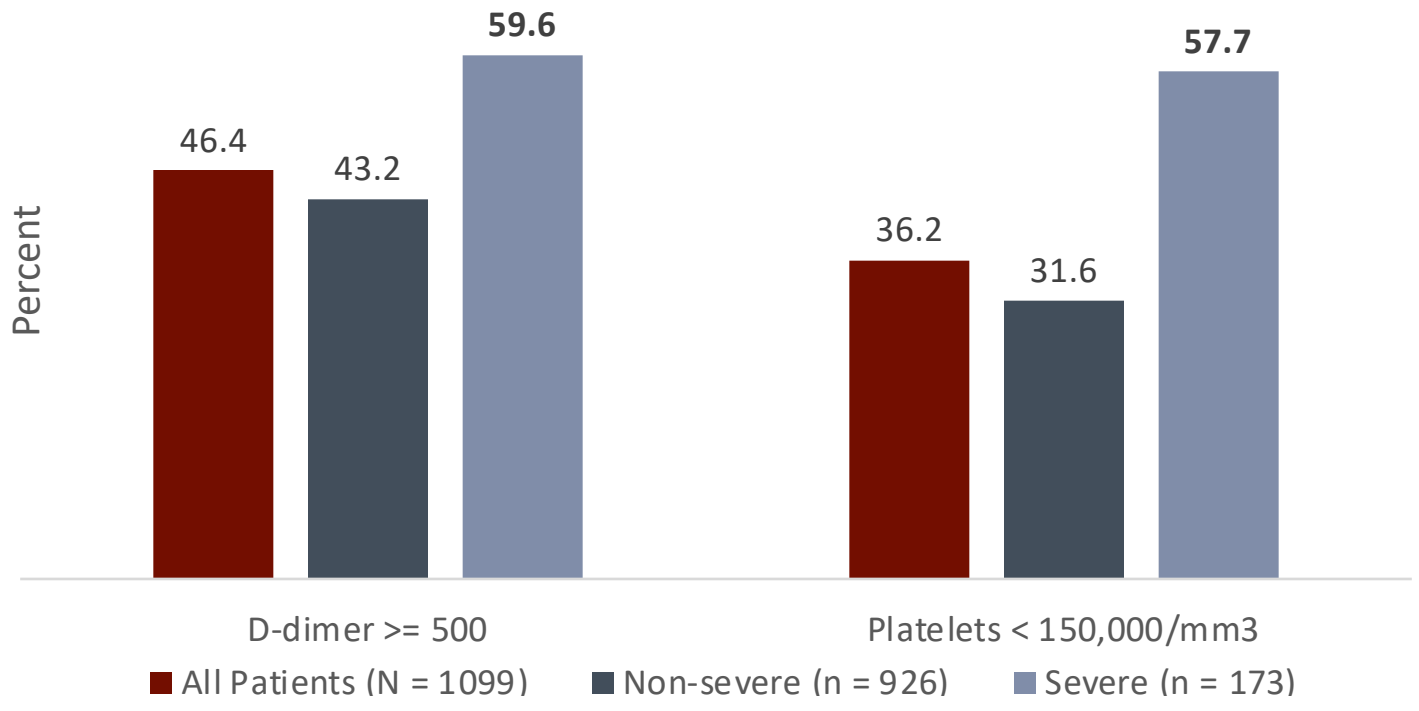
Vaduganathan M, et al. NEJM. 2020. DOI: 10.1056/NEJMsr2005760

COVID-19 Associated Coagulation Disorders (CACD)

Guan W, et al.



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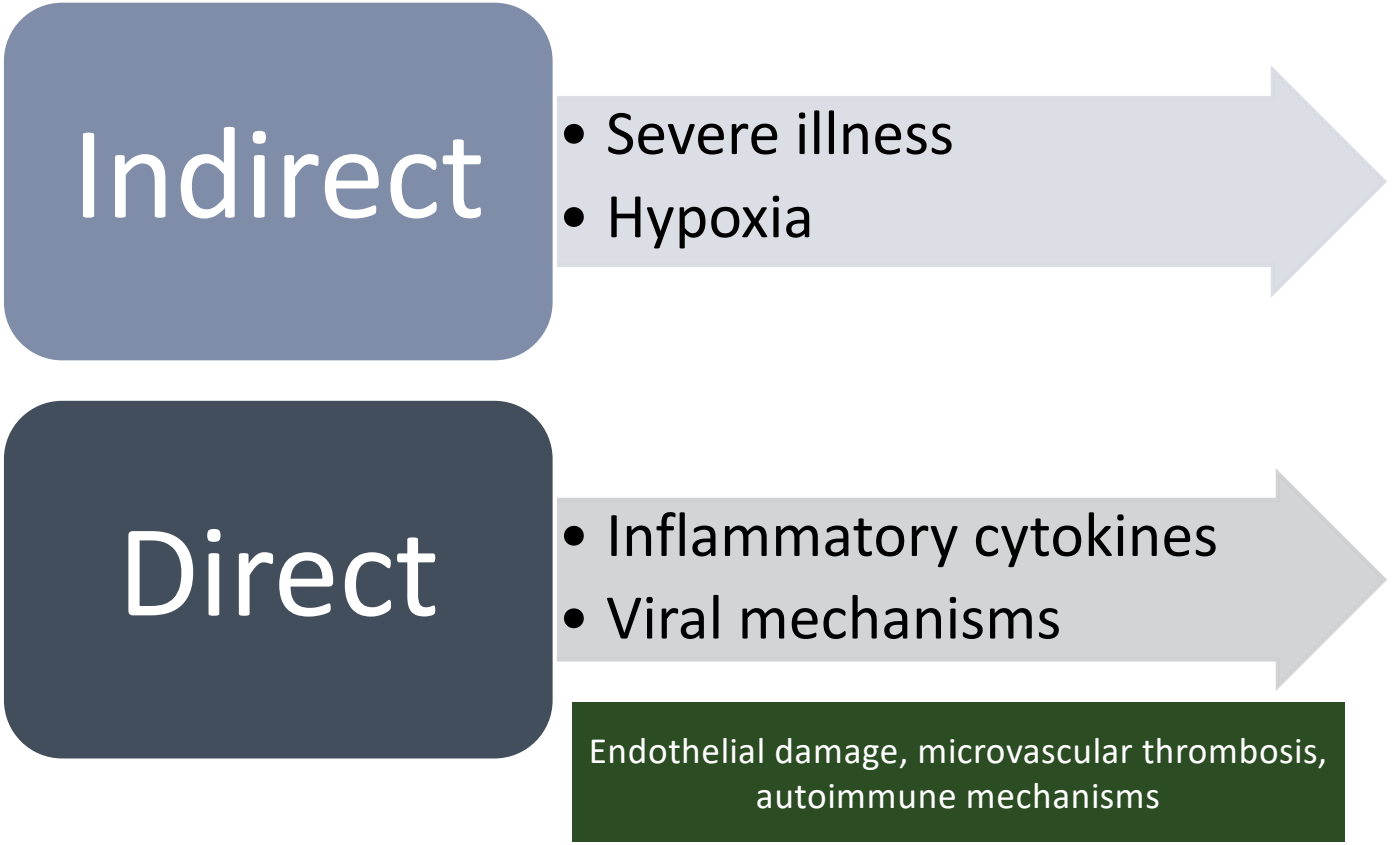
Guan W, et al. NEJM. 2020. DOI: 10.1056/NEJMoa2002032
Kollias A, et al. Br J Haematol. 2020. DOI: 10.1111/bjh.16727

COVID-Related Thrombotic Disease



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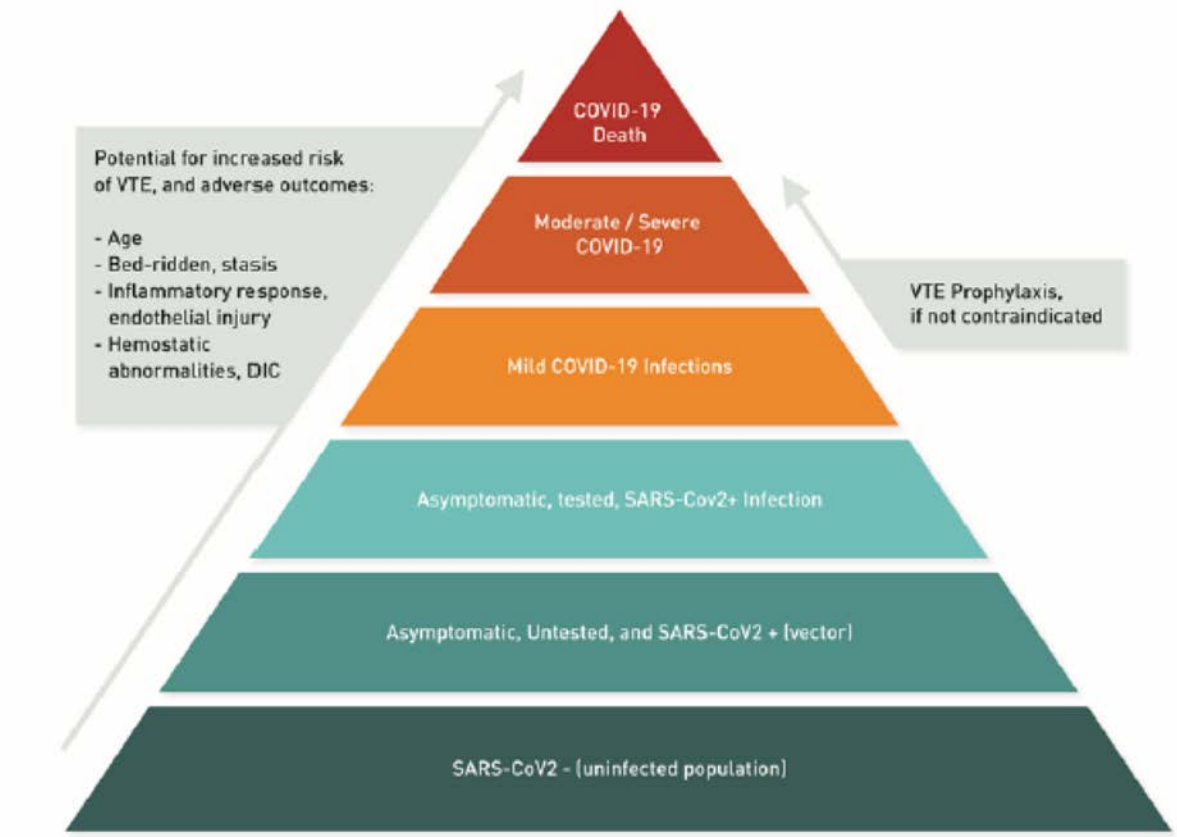
Bikdeli B, et al. 2020. https://doi.org/10.1016/j.jacc.2020.04.031

SARS-CoV and Thromboembolic Risk



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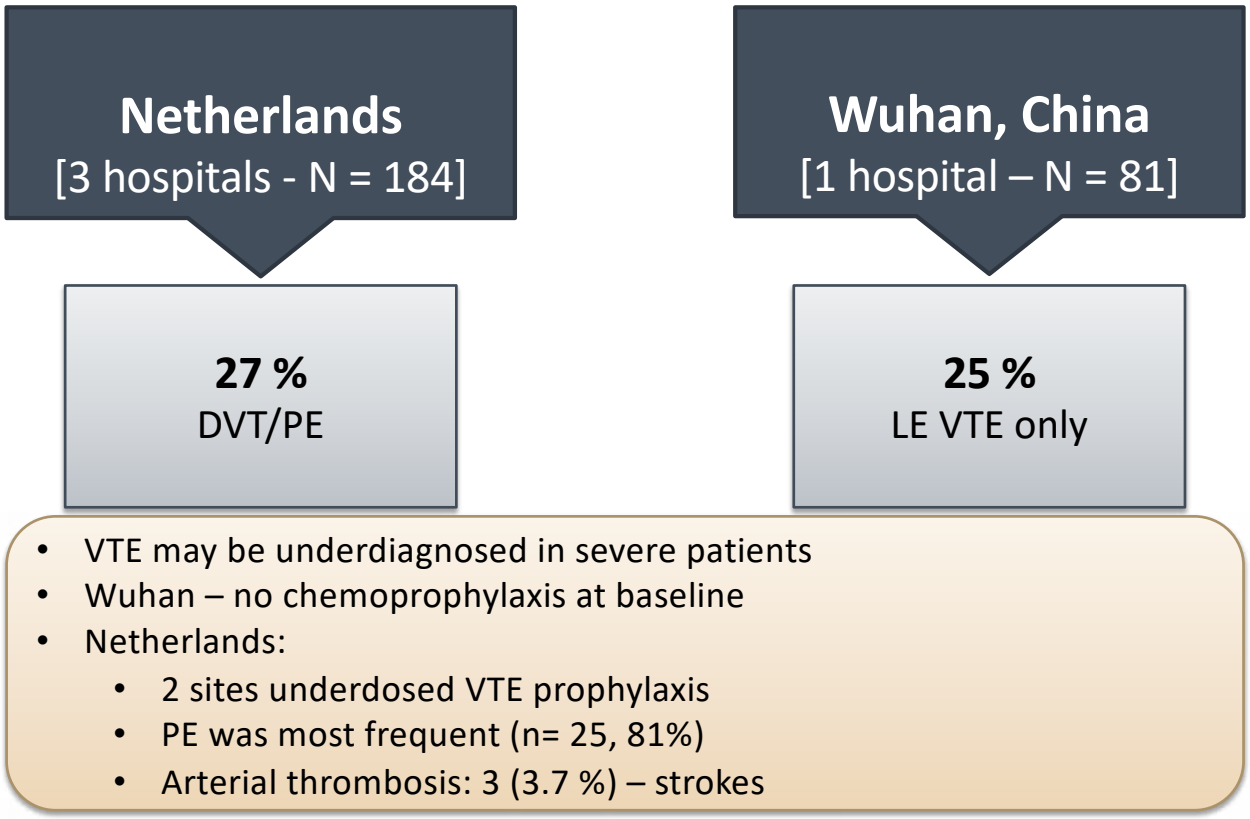
Bikdeli B, et al. 2020. https://doi.org/10.1016/j.jacc.2020.04.031

Evidence

- International variability
- Non-peer-reviewed sources
- Small, retrospective analyses
- Abundance

Severe COVID-19 and VTE



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Songping et al. 2020. doi: 10.1111/JTH.14830
F.A. Klok, et al., Thrombosis Research, https://doi.org/10.1016/j.thromres.2020.04.013

Thrombotic Presentations

	SARS-CoV	SARS	Influenza
Venous	• Netherlands evaluation • Wuhan evaluation • In a **preprint retrospective study**, 10/25 patients who underwent computed tomography pulmonary angiography had acute PE • **Two-case series** of acute pulmonary embolism were described in patients hospitalized with COVID-19	• **Retrospective analysis** of 46 critically ill patients with SARS showed 11 DVT and 7 PE events • **Case series** of 8 SARS positive ICU patients. Autopsy identified PE in 4, and DVT in 3 individuals	• **Retrospective study** of 119 patients showed 4 VTE events in patients receiving prophylactic anticoagulation • **Case series** describes 7 PEs in patients with influenza pneumonia. In 6/7 there was no evidence of DVT • **Multicenter, observational, case-control study** (n=1454) suggests lower VTE rates are associated with influenza vaccination (odds ratio: 0.74; 95% CI: 0.57-0.97)

· This is a representative but not comprehensive list of associated studies.

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Bikdeli B, et al. 2020. https://doi.org/10.1016/j.jacc.2020.04.031
(https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3548771)

Thrombotic Presentations

	SARS-CoV	SARS	Influenza
Arterial	• **Anecdotal reports** • **Pre-print single center retrospective study** reported 11 cases of acute ischemic stroke among 221 patients	• **Prospective series:** AMI in 2 / 75 patients • **Case report** of MI	• **Self-controlled study** of 364 patients: Increased incidence ratio (IR = 6.05, CI 3.86 – 9.5) for MI after influenza compared with controls • **Retrospective cohort**: 3 / 119 with arterial event (2 STEMI)
Other	• **Retrospective:** 15/21 (71.4%) of non-survivors met criteria for DIC, versus 1/162 (0.6%) of survivors	• **Case series** of 206 patients with SARS, 5 developed large artery ischemic stroke with DIC present in 2/5 • **Retrospective analysis** of 157 patients with SARS, DIC developed in 4 patients	• DIC has been described with influenza infection in a number of **case reports and small case series**

Bikdeli B, et al. 2020. https://doi.org/10.1016/j.jacc.2020.04.031
(https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3550025)

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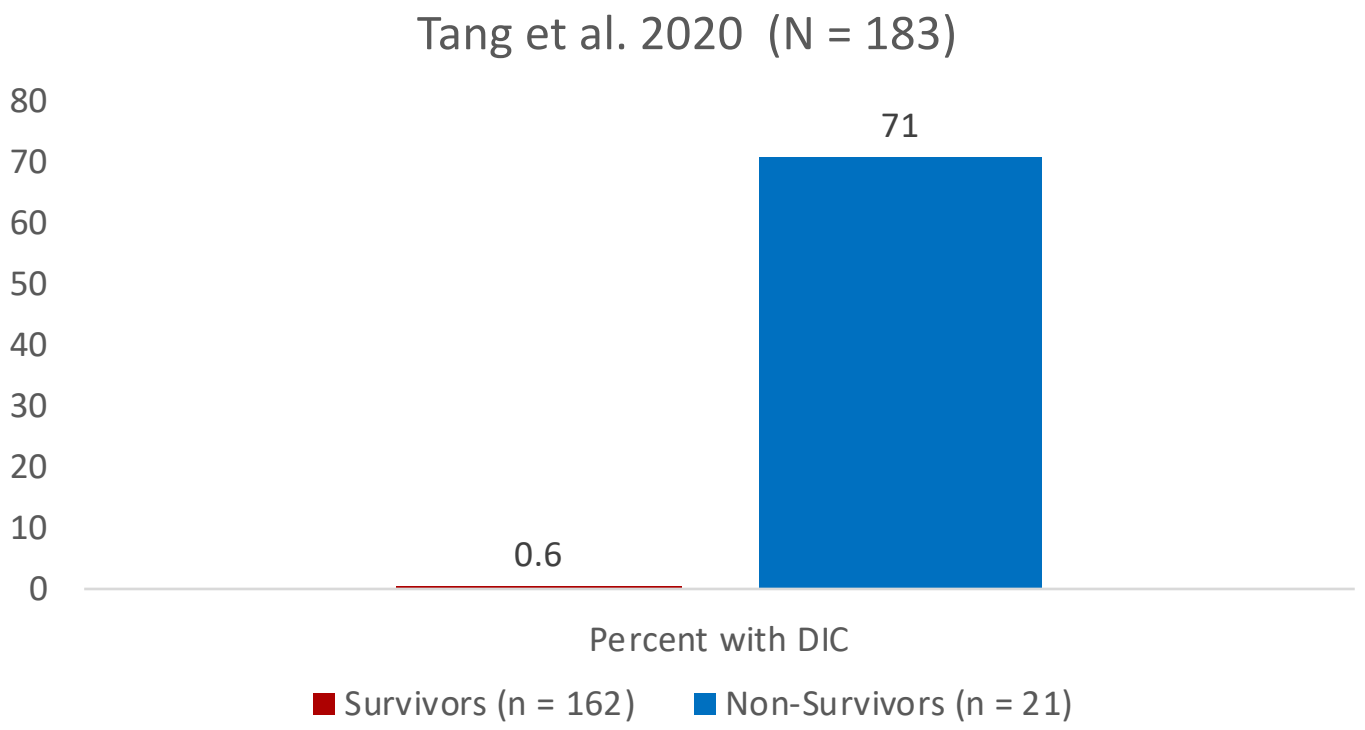
Disseminated Intravascular Coagulation



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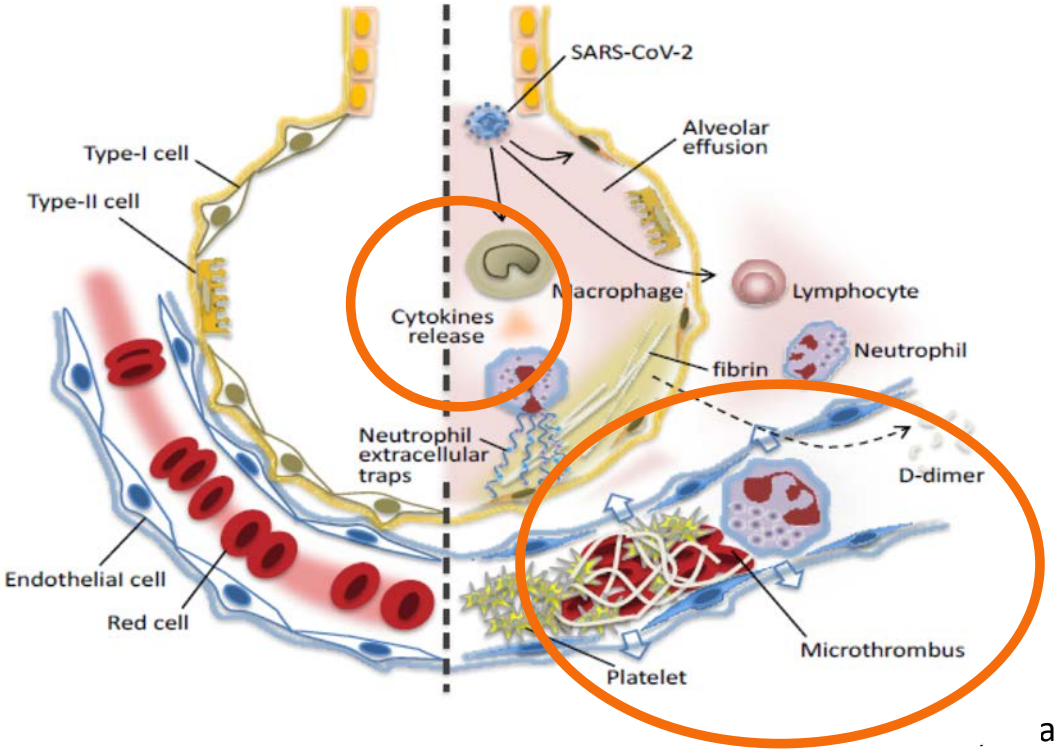
Bikdeli B, et al. 2020. https://doi.org/10.1016/j.jacc.2020.04.031

Thromboinflammatory Response



al. 2020

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Iba T, et al. 2020

Laboratory Findings

Abnormalities	IL-6	D-Dimer
• Lymphopenia • Thrombocytopenia • ↑ CRP • ↑ Ferritin • ↑ FDP • ↑ IL-6 • ↑ D-dimer	• Disease severity • Procoagulant profile	• Mechanical ventilation • ICU admission • Death

Thrombo-inflammatory Response

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Songping et al. 2020. doi: 10.1111/JTH.14830
Bikdeli B, et al. 2020. https://doi.org/10.1016/j.jacc.2020.04.031

Laboratory Findings

	Non-survivor (n = 54)	Survivor (n = 137)	*P* value
Platelets < 100 x 10^9/L	11 (20%)	2 (1 %)	< 0.0001
Platelets count, x 10^9/L	165.5 (107 – 229)	220 (168 – 271)	< 0.0001

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Zhou F, et al. Lancet. 2020. DOI:https://doi.org/10.1016/S0140-6736(20)30566-3

Laboratory Findings

	Non-survivor (n = 54)	Survivor (n = 137)	*P* value
Prothrombin Time (PT) > 16s	7 (13%)	4/128 (3 %)	< 0.0001
D-Dimer > 1 mcg/mL	44 (81 %)	28/118 (24 %)	< 0.0001
Serum ferritin > 300 mcg/L	44/46 (96 %)	58/82 (71 %)	0.0008
IL-6 (pg/mL)	11 (7.5 – 14.4)	6.3 (5-7.9)	< 0.0001

- **Mimics DIC, but atypical of classic sepsis-related DIC:**
  - Less prominent thrombocytopenia
  - Less consumption of coagulation factors

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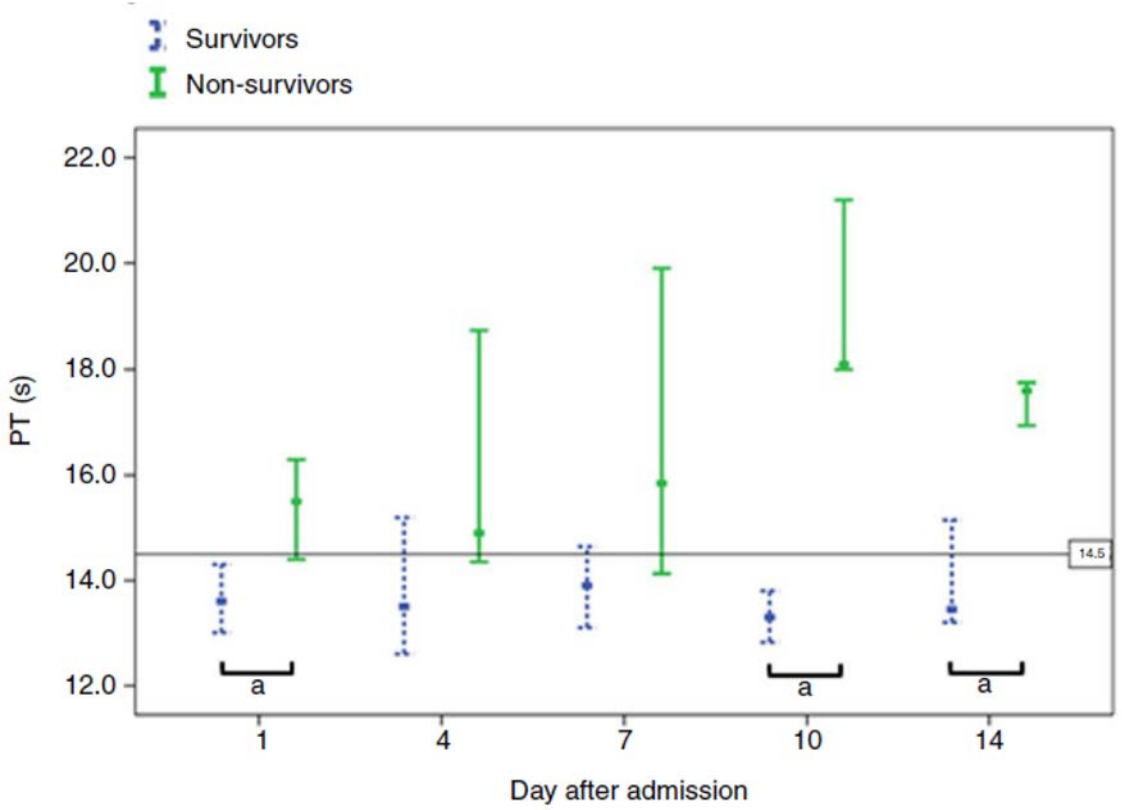
Zhou F, et al. Lancet. 2020. DOI:https://doi.org/10.1016/S0140-6736(20)30566-3
Tang N, et al. J Thromb Haemost. 2020. 18:844-847

Laboratory Findings
Prothrombin Time (PT)



Tang N, et al. J Thromb Haemost. 2020. 18:844-847

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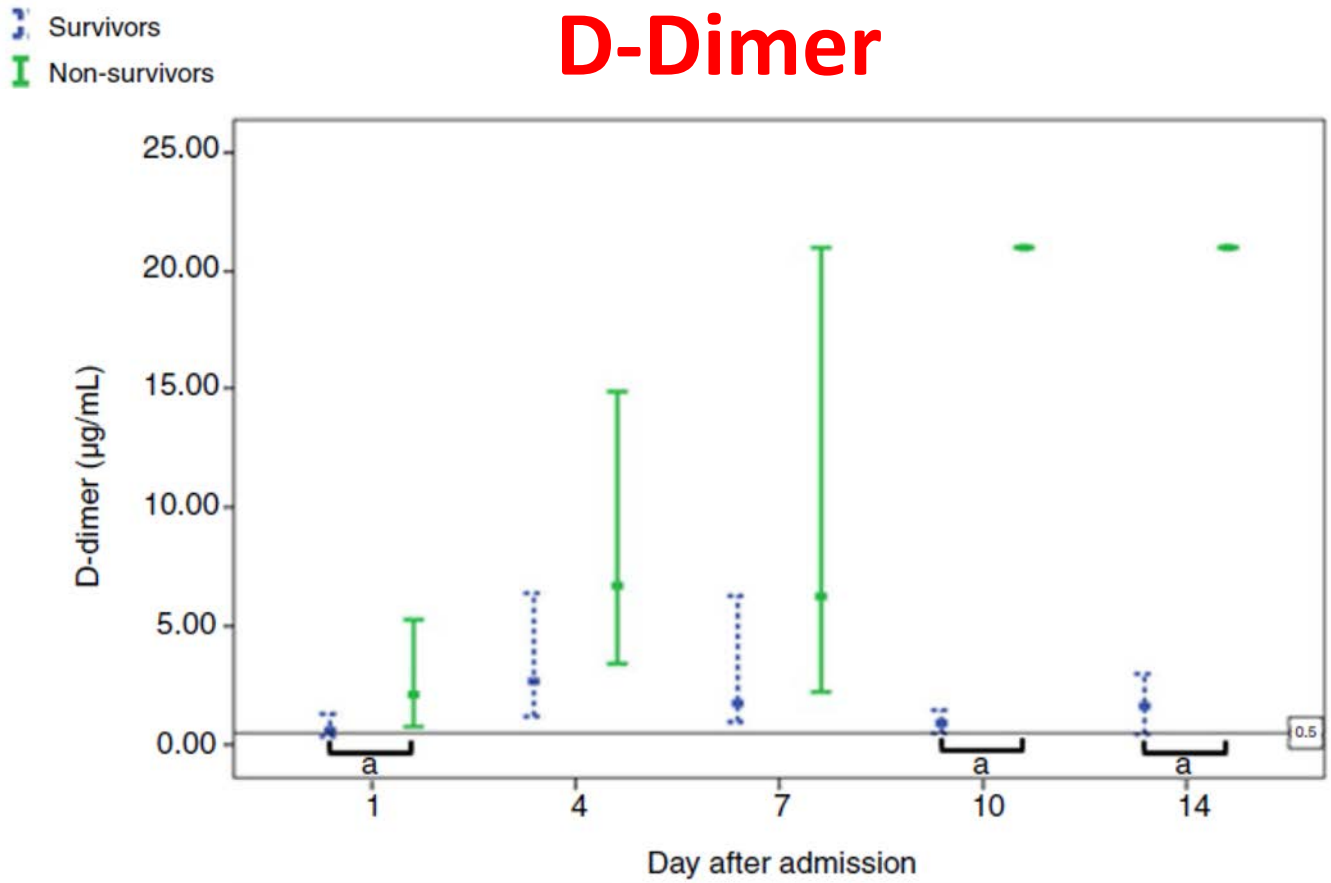
Laboratory Findings: D-Dimer



Tang N, et al. J Thromb Haemost. 2020. 18:844-847

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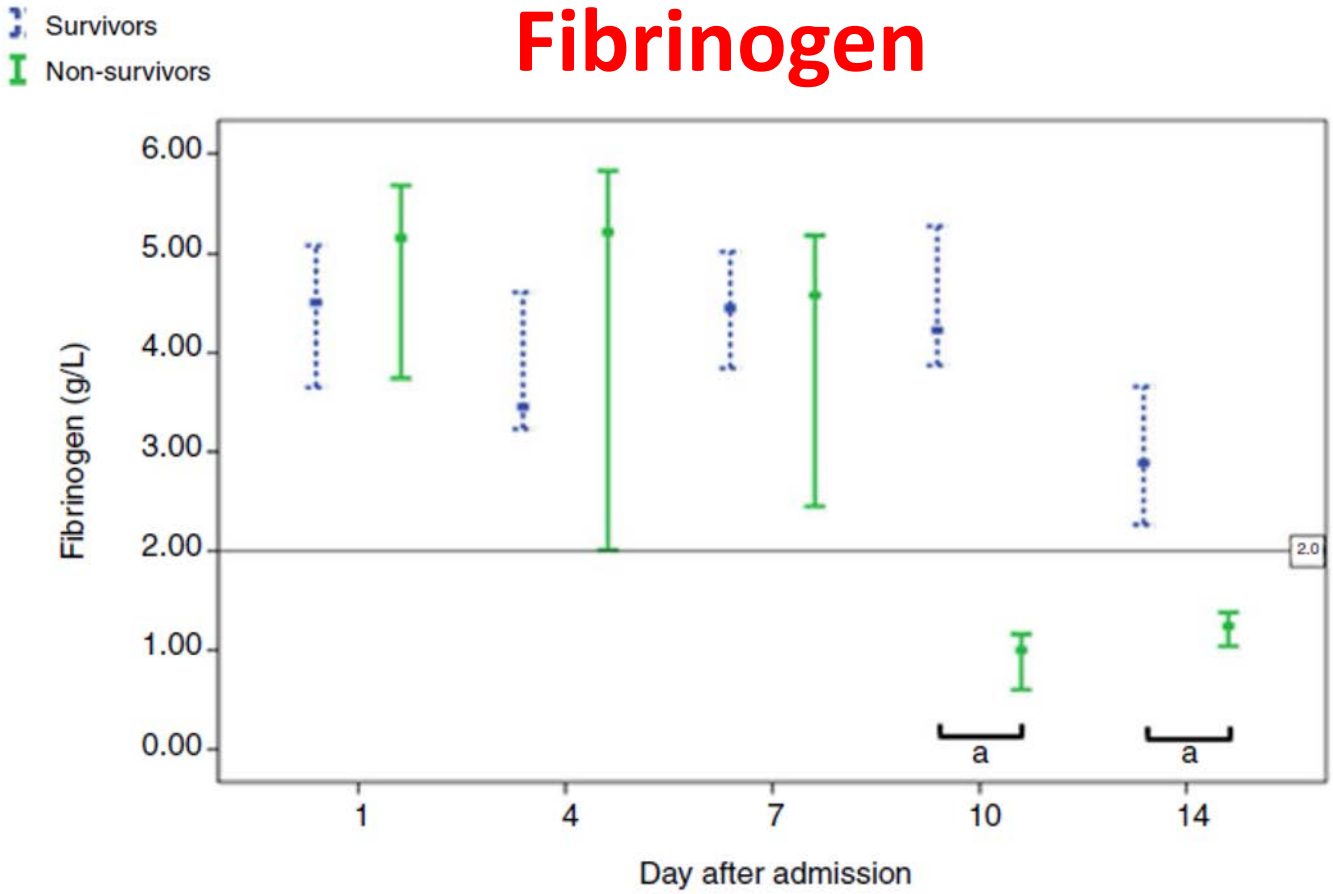
Laboratory Findings: Fibrinogen



Tang N, et al. J Thromb Haemost. 2020. 18:844-847

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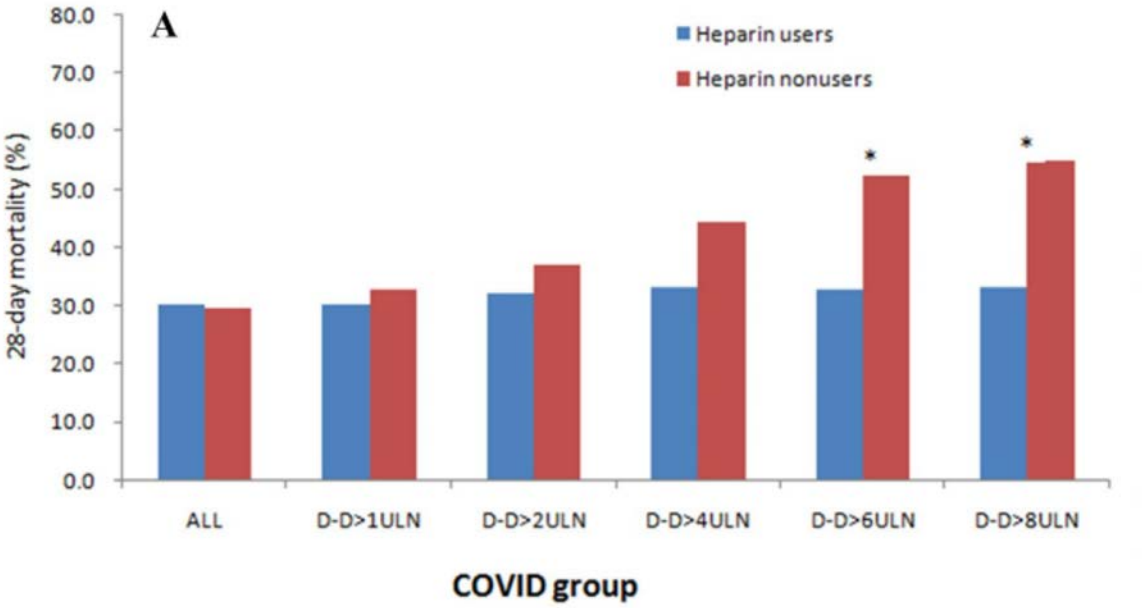
Laboratory Monitoring

- D-dimer
- Fibrinogen
- PT/aPTT

Yin et al. 2020



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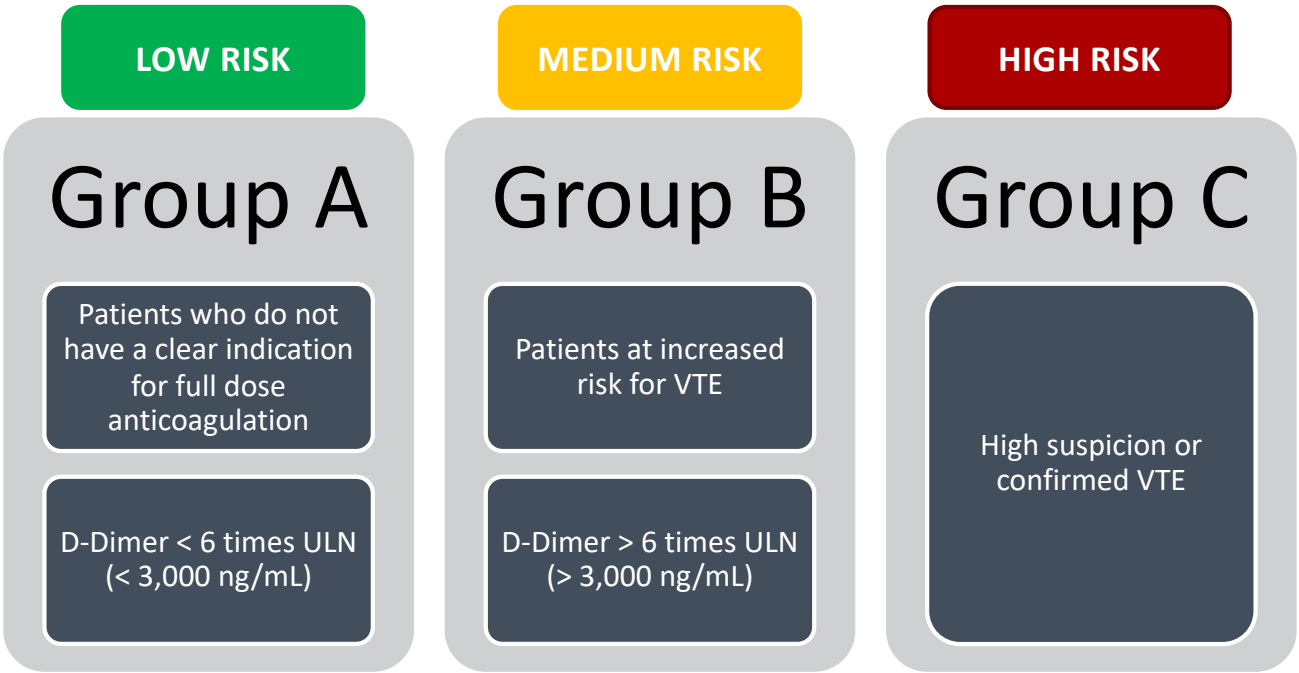
Yin, S et al. J Thromb Thrombolyisis. 2020. doi: 10.1007/s11239-020-02105-8.

Management Strategies for CACD

- Quick identification of patients at increased risk for thromboembolism
- Prompt initiation of VTE prophylaxis and frequent laboratory monitoring
- Escalation of prophylactic intensity in patients with more severe coagulopathy
- Escalation of anticoagulation in patients with suspected VTE

CACD Patient Stratification

All patients should receive anticoagulation unless contraindicated



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Thachil J. J Thromb Haemost. 2020.

GHS Hematology

Group A: Prophylactic Anticoagulation

LMWH should be considered as first line agents in the absence of contraindications:

- Active bleeding
- Platelet count < 25 x 10^{9}/L
- Severe renal impairment
- Invasive procedures within 12 hours

Enoxaparin doses up to 0.5 mg/kg day may be considered

- On average, patients will requires enoxaparin doses between 30 – 50 mg SQ daily
- Patients who cannot receive LMWH may get UFH 5000 units SQ 8 - 12 hours or SCDs

Routine VTE prophylaxis guidance in stroke patients should be observed

LMWH: Low Molecular Weight Heparin, UFH: Unfractionated Heparin, SCD: Sequential Compression Device

Thachil J. J Thromb Haemost. 2020. GHS Hematology; Bikdeli B. J Am Coll Cardiol. 2020

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CACD Laboratory Monitoring

Non-critically ill patients

- Daily CBC with differential and D-Dimer

Critically-ill patients

- Daily CBC with differential and DIC panel
- Bi-weekly MOCHA panel and PAI-1

IL-6 can be considered in any patient with a significant change in clinical condition

DIC panel: PT, aPTT, fibrinogen, d-dimer; PAI-1: Plasminogen activator inhibitor-1; MOCHA: Markers of Coagulation and Hemostasis Activation Panel (Fibrinogen Activity, Prothrombin Fragment 1+2, Thrombin/Antithrombin Complex)
IL-6: Interleukin 6

Thachil J. J Thromb Haemost. 2020.

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Group B: Intermediate Anticoagulation

Elevation in d-dimer levels is a common finding in patients with COVID-19, and may correlate with detection of VTE

- Does not currently warrant routine investigation for acute VTE in absence of clinical manifestations or other supporting information

Clinicians are considering intermediate-dose anticoagulation in patients with d-dimer > 6 times ULN (> 3,000 ng/L)

Enoxaparin 1 mg/kg/day SQ to target Anti-Xa levels 0.3 - 0.5

- Anti-Xa levels should be checked 4 hrs after 3rd dose; recheck after 3rd dose with every dose change, or with significant change in clinical status
- Low intensity UFH infusions targeting similar anti-xa levels should be considered in patients unable to receive LMWH

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Thachil J. J Thromb Haemost. 2020.
GHS Hematology; Bikdeli B. J Am Coll Cardiol. 2020

Group C: Therapeutic Anticoagulation

Patients with confirmed or suspected VTE

- Can be considered in patients with an unexplained increase in oxygen requirement, dead space, or organ failure with concern for microvascular thrombi

Enoxaparin 1 mg/kg SQ Q12 hours should be considered first line to achieve Anti-Xa goal of 0.6 - 1

- High intensity UFH infusions targeting similar anti-xa levels should be considered in patients unable to receive LMWH

Heparin resistance has been reported due to reduced anti-thrombin levels and other procoagulant factors

- Failure to achieve goal Anti-Xa levels despite adequate doses (UFH > 35,000 units/ 24 hrs or LMWH > 300-500units/kg/ day) should prompt ordering an anti-thrombin level and hematology consult
- May warrant use of direct thrombin inhibitor (DTI) while inpatient and DOAC upon discharge

Patients with COVID-19 and an alternative indication for anticoagulation (atrial fibrillation, mechanical heart valve) should be converted to LMWH or UFH in the acute setting

LMWH: Low Molecular Weight Heparin, UFH: Unfractionated Heparin
DOAC: Direct Oral Anticoagulant

Thachil J. J Thromb Haemost. 2020.
GHS Hematology; Bikdeli B. J Am Coll Cardiol. 2020

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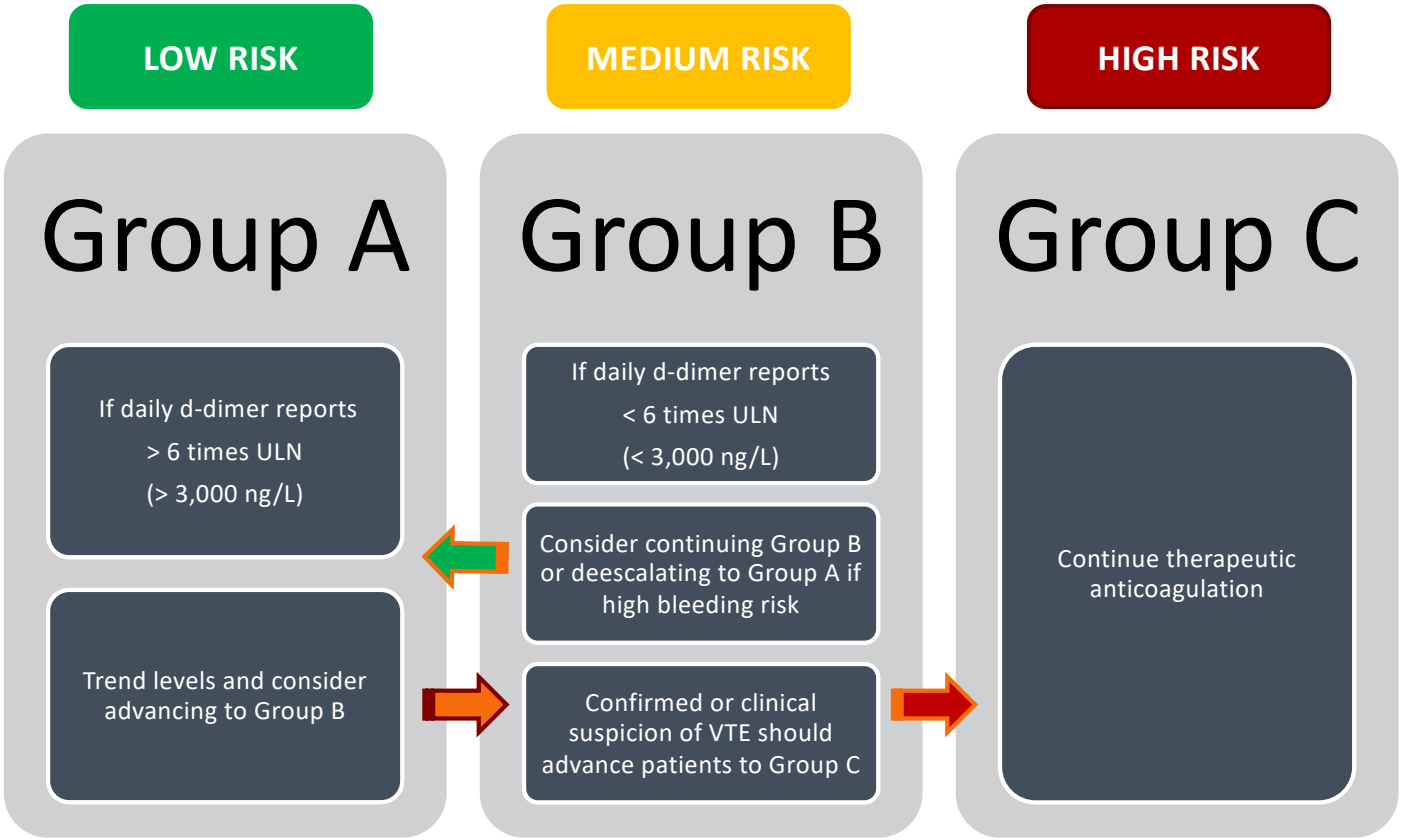
Transitioning Between Treatment Groups



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Anticoagulant Dosing Considerations

Obesity	Pregnancy	Heparin Induced Thrombocytopenia (HIT)

• Group A
  • Enoxaparin 0.5 mg/kg SQ daily (Max: 80 mg SQ daily)
  • UFH SQ every 8 hours should be considered
• Group B and C
  • Consider enoxaparin 0.8 mg/kg/day to avoid supratherapeutic anti-xa levels
	• Concomitant hypercoagulable state
	• Can contribute to elevated d-dimers
	• Utilize clinical judgment when escalating anticoagulation
	• LMWH is the drug of choice
	• DOAC therapy has not been formally evaluated
		• Consider fondaparinux for prophylactic and full anticoagulation
		  • Requires adjustments for weight and renal impairment
		• Alternatively, direct thrombin inhibitors can be considered
		• Consider hematology consult

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Bleeding

- Bleeding is rare in the setting of COVID-19 and blood products should not be utilized based on laboratory parameters alone
- If bleeding occurs, consider blood transfusions to maintain the following:
  - Platelet count above 50 x 10^9/L
  - Fibrinogen above 2 g/L
  - PT ratio < 1.5 (not the same as INR)

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COVID-19 Associated Coagulopathy (CAC)

LMWH prophylaxis may decrease thrombin generation

- Long acting antiplatelet therapies should be discontinued unless benefit outweighs risk

There is no evidence that correction of laboratory parameters with blood products will improve outcomes

In a patient with CAC who is *actively* bleeding:

- Transfuse platelets if the platelet count is less than 50 x 10^9/L
- Fresh frozen plasma if the INR is above 1.8
- Order fibrinogen concentrate or cryoprecipitate if the fibrinogen level is less than 1.5 g/L

The hemostatic effectiveness of tranexamic acid (TXA) is unknown in this setting and is not recommended

LMWH: Low Molecular Weight Heparin

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Tissue Plasminogen Activator (t-PA)

Proposed as a salvage treatment for COVID-19 patients with decompensating respiratory function when mechanical ventilation or extracorporeal membrane oxygenation (ECMO) is not available

Currently, there is limited clinical experience and no clinical trial data to promote routine use in COVID patients with acute respiratory distress syndrome (ARDS)

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Discharge Considerations

Extended prophylaxis with LMWH or direct oral anticoagulants (DOACs) can reduce the risk of VTE

- Limited data supports use of anticoagulation at discharge in all patients admitted for COVID-19, but optimal duration is unknown

Patients with confirmed VTE should receive a minimum of 3 months of therapeutic anticoagulation

Decision to use thromboprophylaxis at discharge should consider the individual patient's VTE risk factors

- Financial feasibility, compliance, laboratory monitoring, drug interactions, bleeding risk, immobility
- VKA or aspirin therapy can be considered in patients not appropriate for LMWH or DOAC therapy

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LMWH: Low Molecular Weight Heparin, VTE: Venous Thromboembolism
VKA: Vitamin K Antagonist

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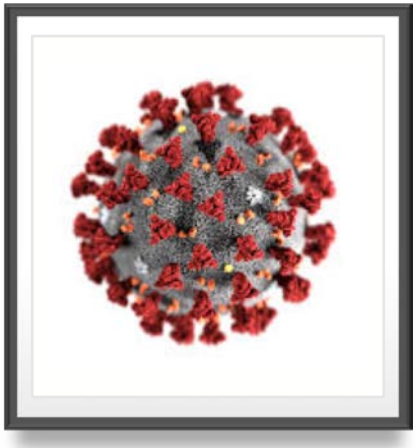

With COVID-19, what we do today may be history tomorrow. We must continuously learn as we treat patients with this disease

Select Resources

- International Society of Thrombosis and Hemostasis
- American Society of Hematology
- Journal of the American College of Cardiology
- American Heart Association/American Stroke Association
- National Blood Clot Alliance
- American Society of Health-System Pharmacists

Stroke in the era of COVID19

Jonathan Ratcliff, MD, MPH

20 April 2020

EMORY UNIVERSITY SCHOOL OF MEDICINE
Department of Emergency Medicine
Department of Neurology
MARCUS STROKE & NEUROSCIENCE CENTER
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Disclosures

- Research funding:
  - Nico Corp – ENRICH Clinical Trial
  - CDC – TEaM trial
  - NIH – NETT, SIREN, BOOST-3, TRACK-TBI
  - DOD – HOPES
  - Sense Diagnostics – SENSE Pivotal Trial

Stroke Work-Flow

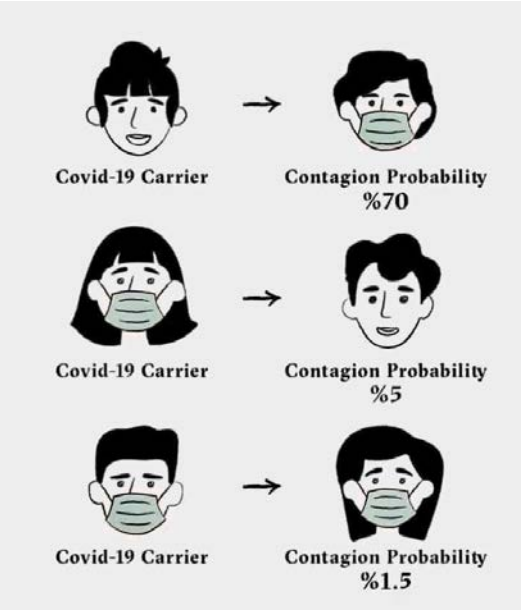
- COVID19 has led to major disruptions of our acute stroke work-flow
- ED
- Neuroimaging
- ICU
- Special Circumstances

Basics

- PPE – All staff at Grady are currently wearing masks while they are in the hospital
- When possible, patient encounters begin with a symptom screen
- All workflow changes are in place to mitigate spread of the virus

EMS/ED

- Mask the patient
- Obtaining a history that permits risk stratification is very complicated in stroke patients
- Assume all patients are infected
- If screens positive, obtain test and identify as Person Under Investigation (PUI)
- Contact Infectious Diseases (ID)



Neuroimaging

- Proceed directly to CT, as per usual
- Obtain usual imaging protocols
- Treatment decisions are made in the CT scanner
- MRI is very limited to high-risk patients, especially if they are intubated

ICU

Keep the patient masked	
Re-screen on arrival and again at 24hrs	• Cohort high-risk patients
COVID19 test for all patients, regardless of screen	• D-Dimer on admission
Temperatures at ICU arrival, then q 4hrs for 24 hrs.	
CXR on admission if not done in the ED	• CXR again at 24 hrs

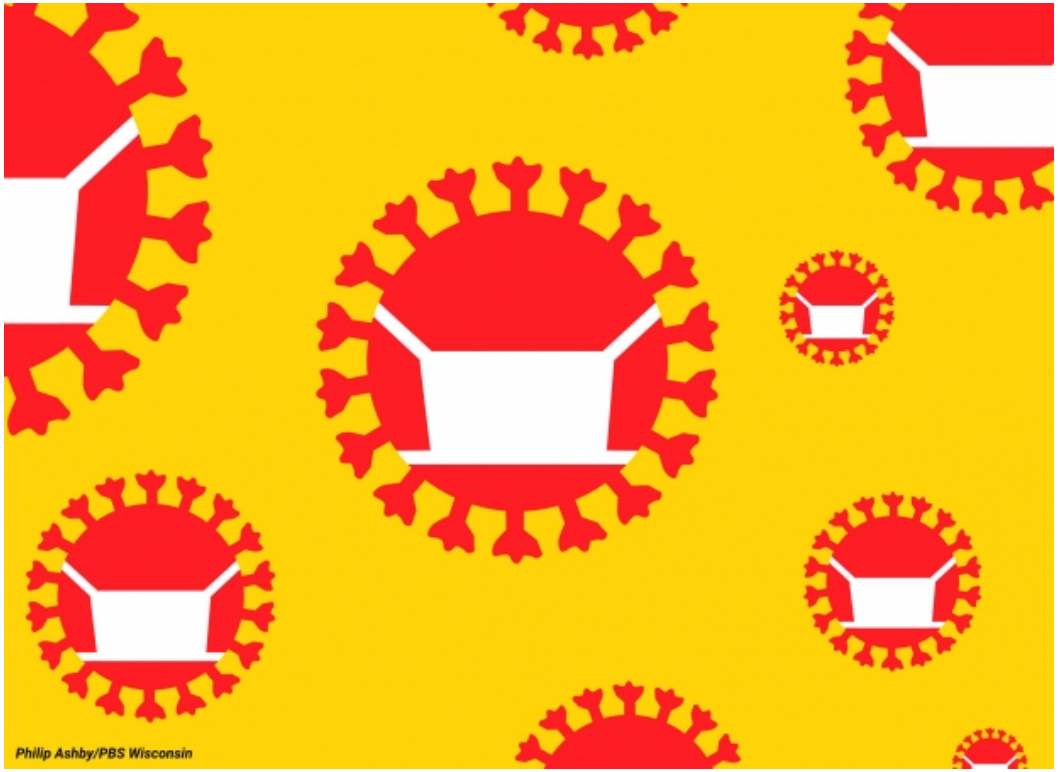
Maintain Situational Awareness

- Median incubation time to symptoms is about 5 days.
- High degree of suspicion for COVID19 in the setting of new respiratory symptoms, or fevers.
- Negative test on admission may not satisfactorily rule out infection if suspicion is high

Nosocomial Spread

- Always consider nosocomial infection
  - Impeccable hand hygiene
  - Mask always for providers
  - Cohort and mask PUI or COVID19 positive
- Team is more likely to become infected from each other than from an infected patient
- This then puts our patients at risk for spread

Special Circumstances



Hypoxic Respiratory Failure

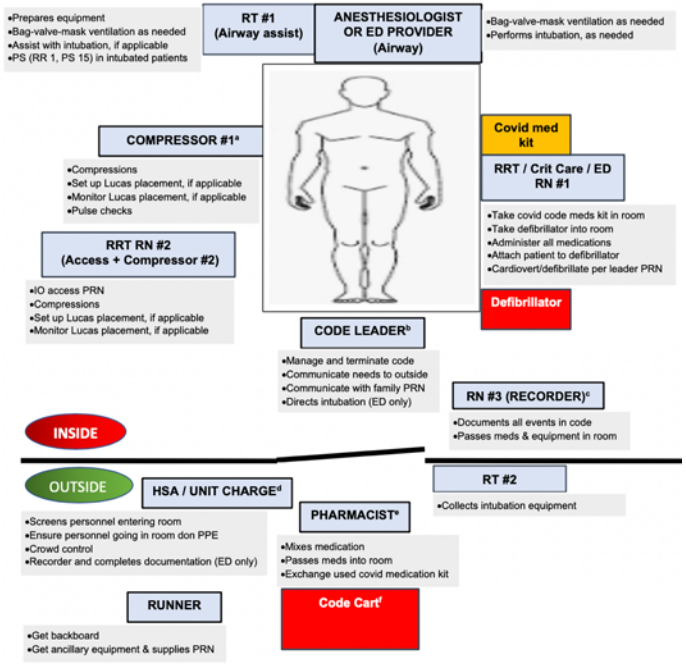
- NC (up to around 6 LPM)
- NRB vs HFNC
- No BiPAP
- Intubation – which is done through a plastic barrier. Normal induction agents. RSI is preferred to avoid BVM

Codes

- AM Huddle with RT and Nursing to discuss code roles and RTs comfort with airway technique
- Limit the number of people in code room

Codes

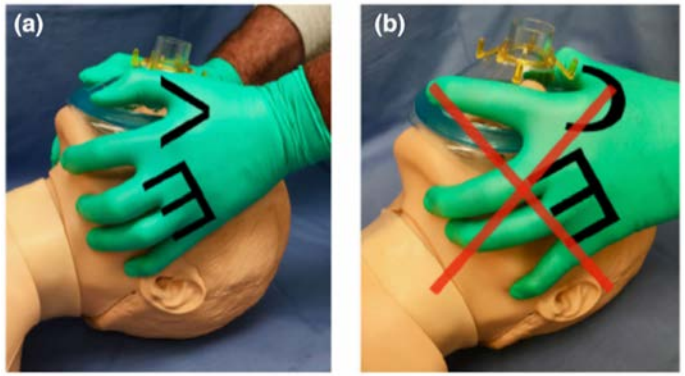
- Starter kit that contains 4 rounds of epi
- Code Cart stays outside room (door closed)
- Only enter once in full PPE: N95, gown, gloves
- Crowd control/Safety officer outside room to monitor PPE donning and limit people from entering that don't have a specific role



Codes

- If BVM is necessary because ETT or SGA cannot be placed immediately, then two person bagging only

- Drape face after airway managed or during BVM



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Resource Slides

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COVID19 and Stroke – resources

- AHA's Stroke Council statement on COVID19 and Stroke; https://www.ahajournals.org/doi/pdf/10.1161/STROKEAHA.120.030023
- Utilizing the link below, you can access a Covid-19 risk tool by county. The tool will give you county-level characteristics related to increased risk for severe COVID-19 complications. Within the article, click on the data visualization tool and you can select a state in the upper margin drop down and see all counties in that state. https://healthmetrics.heart.org/new-resource-to-identify-communities-at-high-risk-for-severe-illness-from-covid-19-and-increased-healthcare-utilization/
- COVID19 CVD Registry https://www.heart.org/en/professional/quality-improvement/covid-19-cvd-registry
- Podcast interview re Stroke and COVID https://www.stroke.org/en/life-after-stroke/covid19-stroke-podcast-series-for-patients-and-caregivers/episode-1-stroke-and-the-impact-of-covid19
- **COVID-19 911 Sample Social Media Posts**
  - Emergencies don't stop for COVID-19; certain heart and stroke symptoms require immediate medical intervention, and every second matters. For more info https://bit.ly/2JG5VaA
  - Calling 9-1-1 at the first sign of heart attack, stroke, or cardiac arrest saves lives. Fast access to medical treatment is the No. 1 factor for surviving a cardiovascular event. For more info https://bit.ly/2JG5VaA
  - Heart attacks and strokes still happen during pandemics. Even while fighting the coronavirus, don't hesitate to call 911. https://bit.ly/2JG5VaA
  - Even in uncertain times, be certain that calling 911 increases your chance of survival -For more info https://bit.ly/2JG5VaA

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