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COVID-19 Pandemic Impact on Patient Cardiac Care

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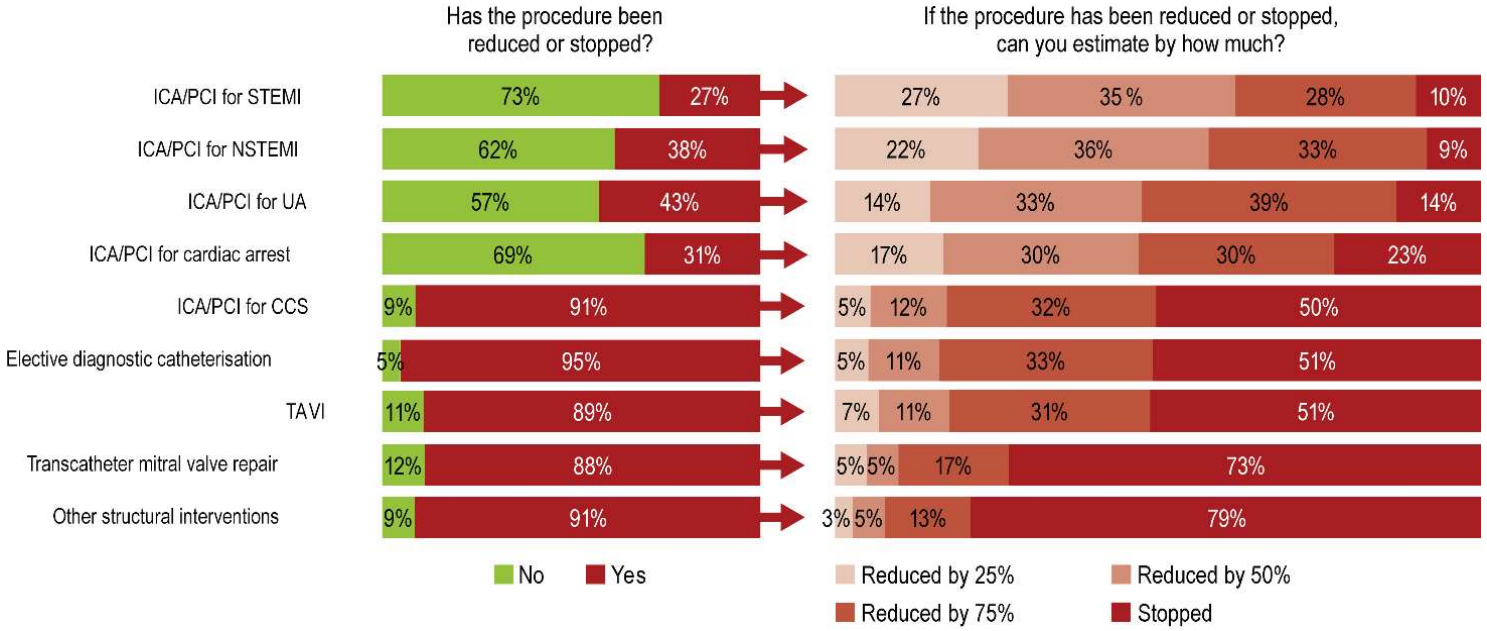
Impact of COVID-19 on IC Procedures



Roffi et al. EuroIntervention 2020;16:247-250

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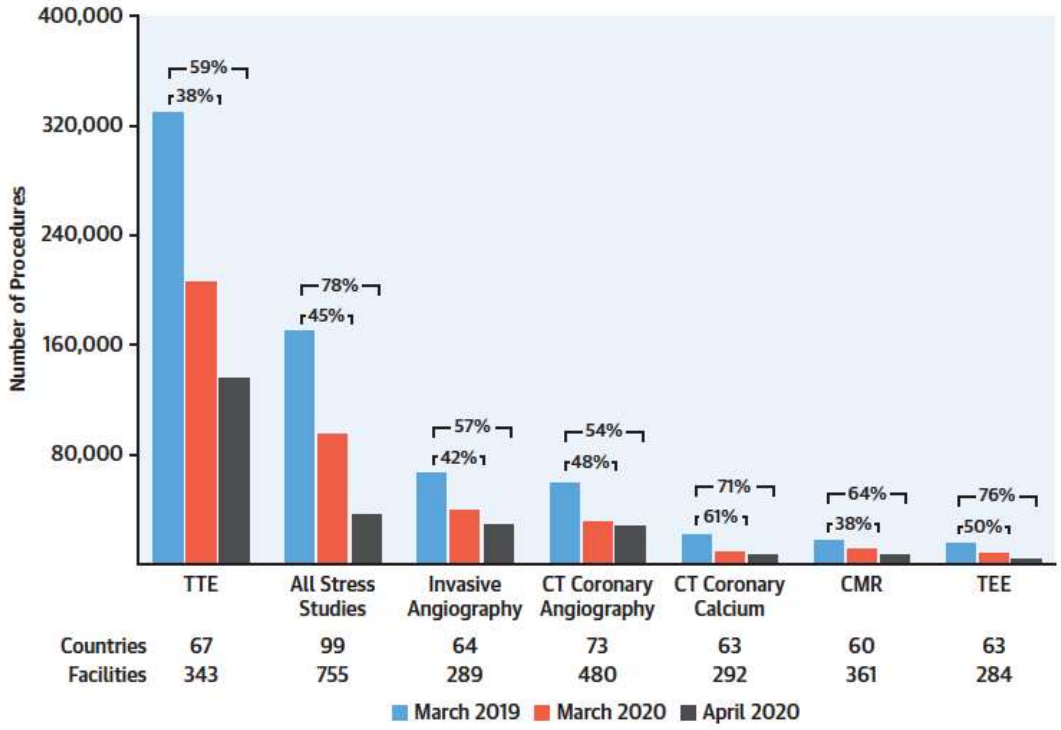
Cardiac Diagnostic Procedures



Einstein et al. JACC 2021; 77(2)173-85

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Key Messages - COVID and ACS

- **Admissions for ACS (STEMI / NSTEMI) reduced during lockdown**
  - **Greater impact on NSTEMI vs STEMI**
- **Patient presentation for treatment (STEMI) delayed**
  - **Increased time to first medical contact**
  - **Impact on door to balloon times variable**
  - **Reduced community CPR**
  - **More deaths at home**
- **Percutaneous treatment of CAD more likely during pandemic**
- **Reduced duration of hospital admission for ACS**
  - **STEMI: 3 days – 2 days**
  - **NSTEMI: 5 days – 2 days**
- **Increased CVD mortality during COVID-19 lockdown**

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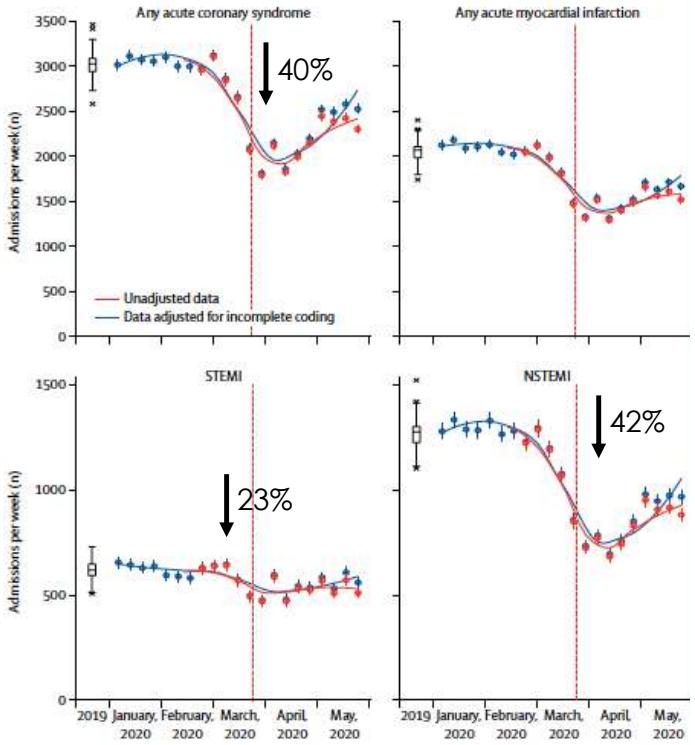
Admissions for ACS (STEMI/NSTEMI) Reduced During Lockdown

ACS Admissions in England



Mafham et al. Lancet 2020; 6736(20)31356-8

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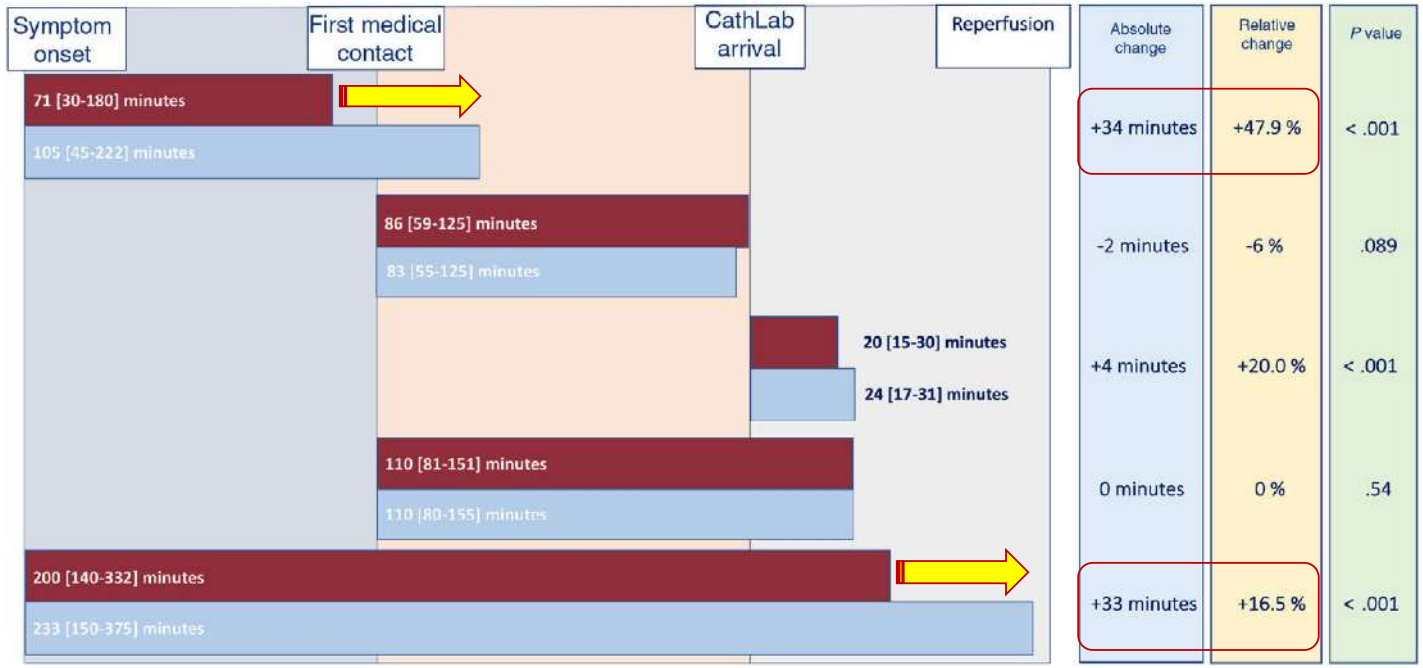
Delayed Presentation for STEMI Care



Rodriguez-Leor et al. Rev Esp Cardiol 2020 Dec;73(12):994-1002

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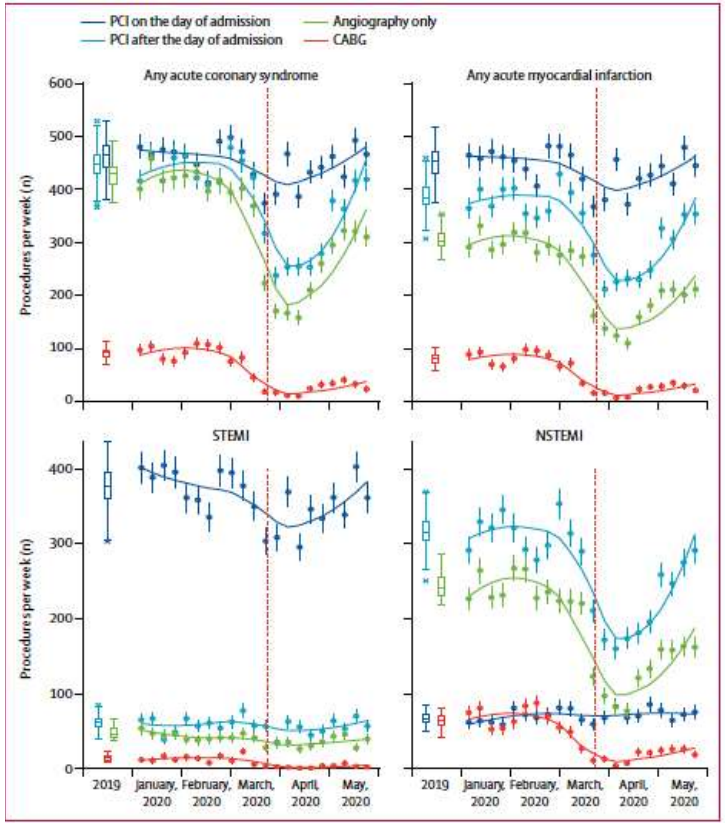
Percutaneous Treatment of CAD More Likely During Lockdown

ACS Admissions in England



Mafham et al. Lancet 2020; 6736(20)31356-8

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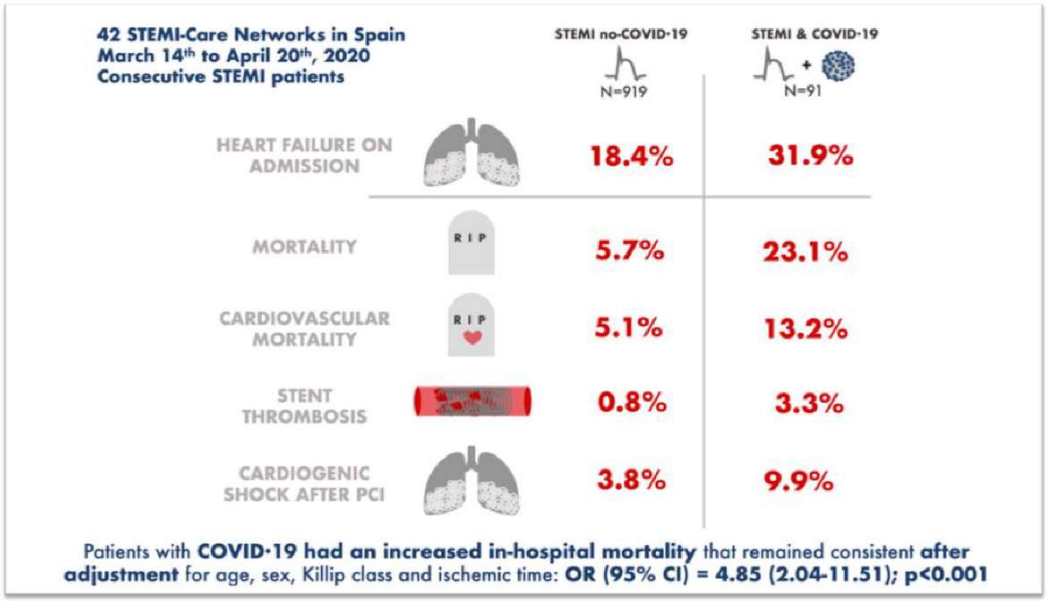
ACS in COVID-19 + Patients = Poor Outcome

In-hospital outcomes of Covid-19 ST elevation myocardial infarction patients



Rodriguez-Leor et al. Rev Esp Cardiol 2020 Dec;73(12):994-1002

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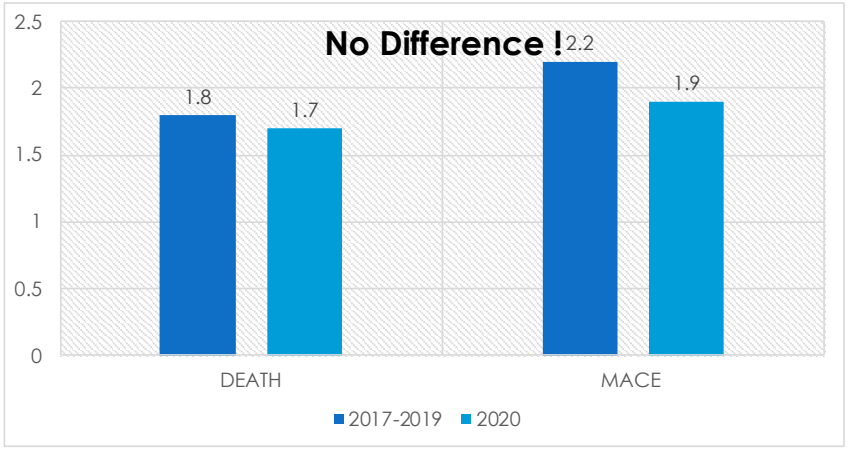
ACS Outcome During COVID–19 Lockdown



Outcome	2017-2019	Mar 2020	P
Death	2059 (1.8)	45 (1.7)	0.67
MACE (death, reinfarction, PCI)	2498 (2.2)	51 (1.9)	0.30

Kwok et al. Circ Cardiovasc Interv 2020;13:e009654

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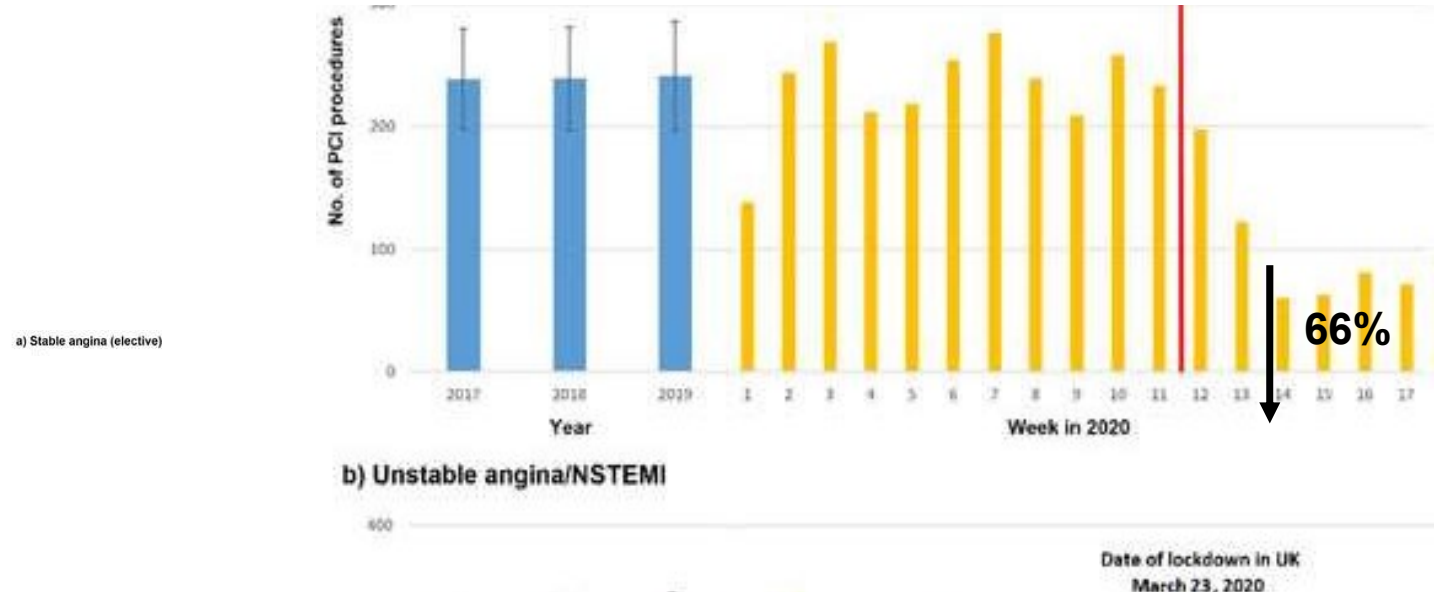
Impact of COVID-19 on Stable Coronary Syndromes



Kwok et al. Circ Cardiovasc Interv 2020;13:e009654

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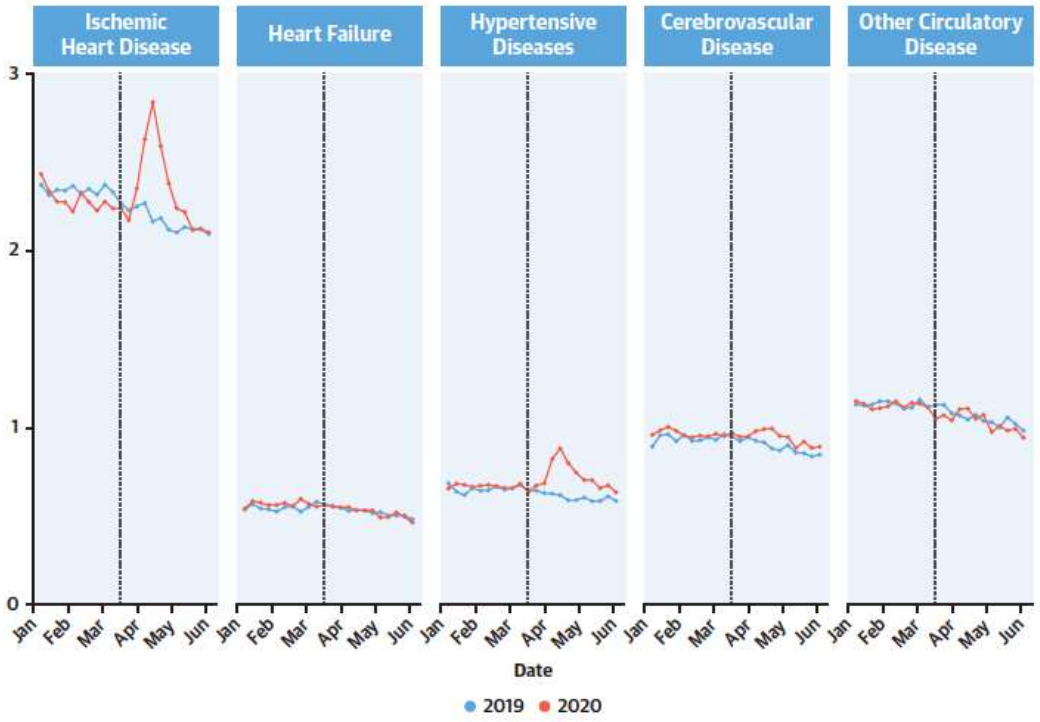
Weekly Death Rates by Cardiovascular Cause



Deaths attributable to IHD (2.39; 95% CI: 1.39 to 4.09)

Wadhera, R. K. et al. J Am Coll Cardiol. 2021;77(2):159–69

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COVID and Structural Heart Disease Procedures

PCR

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COVID-TAVI Study *(work in progress)*

- **Data available from 34 international centres**
  - 23% stopped TAVI
  - 38.3% reduced TAVI
- **Data from BIBA Med Tech**
  - TAVI expansion delayed
- **Negative impact of delaying TAVI**

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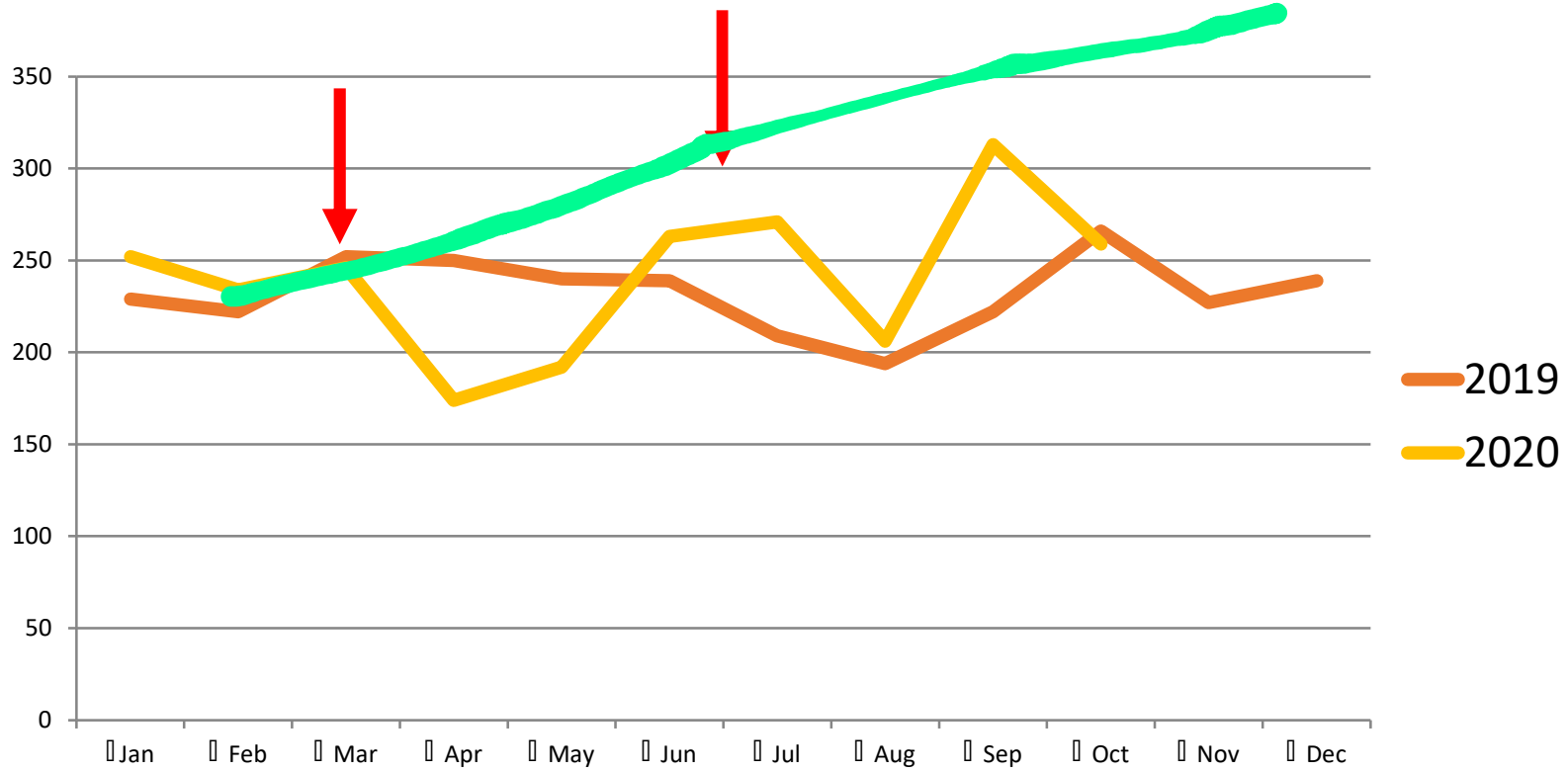
COVID-TAVI Study - TAVI Volume per Month



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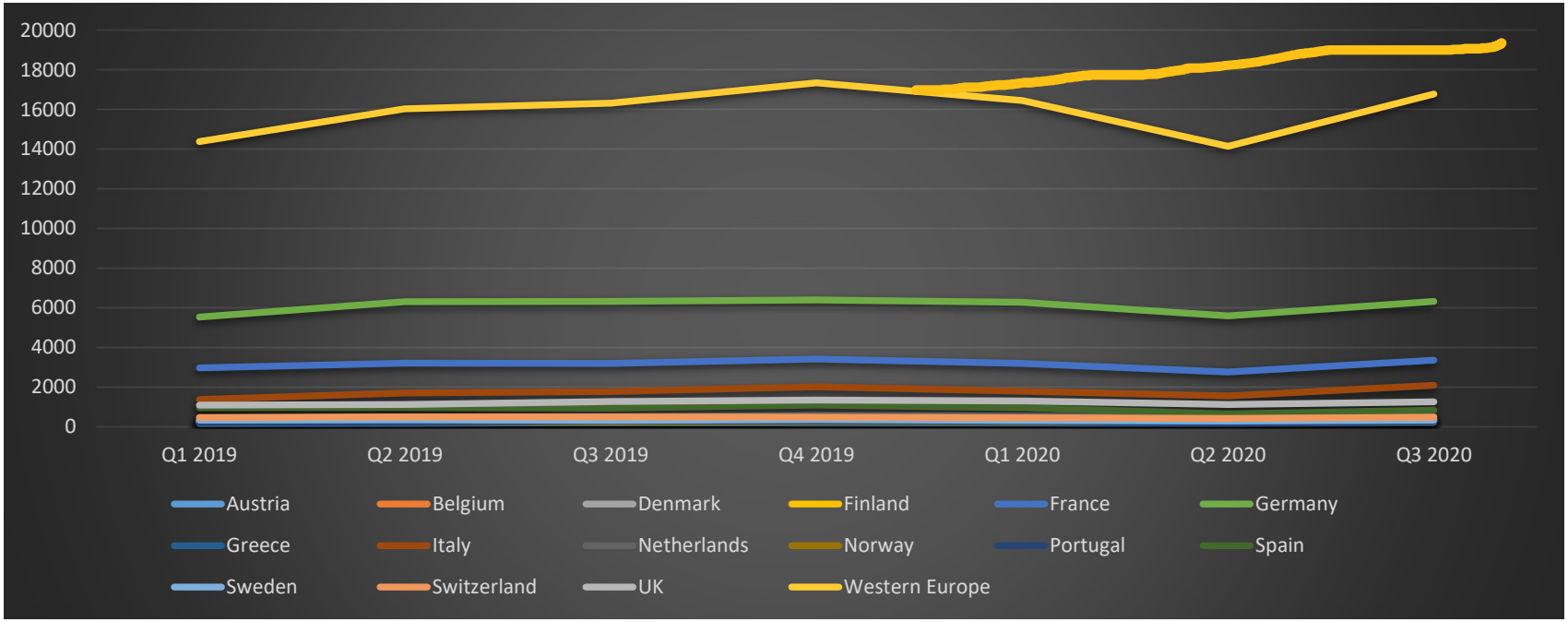
BIBA MedTech TAVI Tracker



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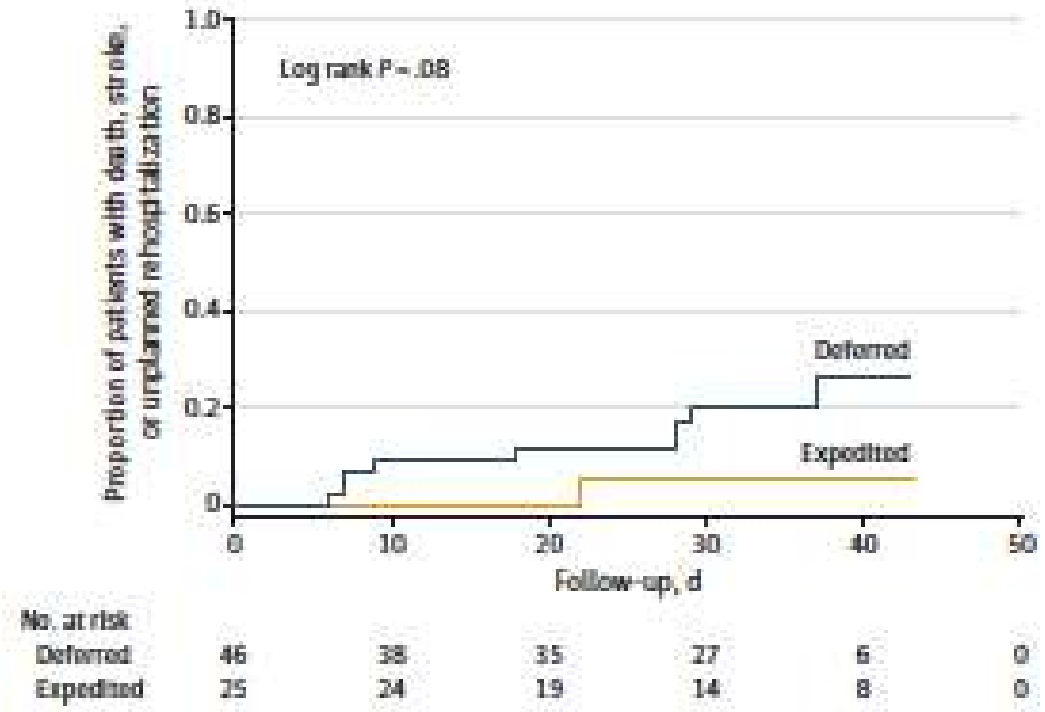
Impact of Deferring TAVI due to COVID-19



Ryffel et al. JAMA Open 2020;3(9):e2020402

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Impact of Deferring TAVI due to COVID-19

- **10%** experience a cardiac event **within 1 month** of TAVI deferral
- **35%** experience a cardiac event **within 3 months** of TAVI deferral

Ro et al. JAMA Open 2020;3(9):e2019801

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Cardiac Injury from COVID-19 Infection

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Cardiac Injury from COVID-19

Myocardial injury from cytokine storm manifested by elevated levels of interleukin-6 (IL-6), ferritin, lactate dehydrogenase (LDH), and D-dimer

Myocardial dysfunction from the direct effect of COVID-19 on the heart via ACE2 (homolog of angiotensin-converting enzyme that converts angiotensin II to angiotensin 1 to 7, thereby diminishing vasoconstriction mediated by the renin angiotensin system)

Hypercoagulable state, resulting in an increased rate of thrombotic and thromboembolic events

- C-reactive protein, ferritin, and D- dimer
- neutrophil-to-lymphocyte ratio
- production of cytokines such as IL-6, IL-7
- tumor necrosis factor (TNF)
- inflammatory chemokines including CC-chemokine ligand 2 (CCL2), CCL3 and CXC-chemokine ligand 10 (CXCL10)

Hypoxia-induced excessive intracellular calcium leading to cardiac myocyte apoptosis

Miriam Merad and Jerome C. Martin. Nature Reviews Immunol 2020;20(6):355-362.
Clerkin KJ, et al. Circulation. 2020;141:1648-1655.

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Cardiac Injury from COVID-19

- Inflammatory cells and viral inclusions cause endotheliitis and vasculitis
- Hyperinflammatory response may also lead to stress cardiomyopathy (Takotsubo), secondary to the release of potent inflammatory cytokine and sympathetic surge
- Stress cardiomyopathy may also be related to microvascular injury secondary to catecholamine-induced microvascular dysfunction

Arrhythmias secondary to myocardial injury or ischemia, hypoxia, shock, electrolyte disturbances, or medications that prolong the QT interval

- ✓ atrial fibrillation (3.6%)
- ✓ non-sustained ventricular tachycardia (1.4%)
- ✓ brady-arrhythmias (1.3%)
- ✓ cardiac arrest (1.3%)

Pericardial effusion secondary to direct viral cytotoxic effects, systemic inflammation, or immune-mediated mechanisms

Bhatla A, et al. Heart Rhythm 2020;17:1439-1444.
Ortega-Paz L, et al. JAHA 2020, Nov 24 ahead of print
https://doi.org/10.1161/JAHA.120.019650

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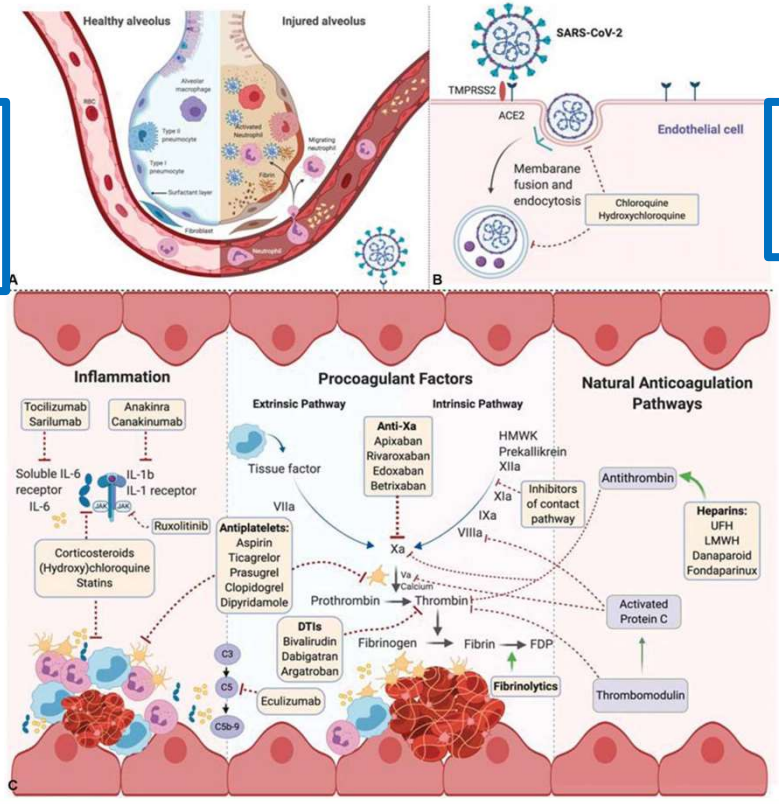
Postulated Mechanism of Novel Treatment Options for Management of Thrombosis in COVID-19

Viral alveolar injury and inflammation, including fibrin deposition



Viral entry into the endothelial cells and the possible protective effect of hydroxychloroquine

Potential mechanism of effect of various agents with antithrombotic properties for mitigating thrombotic complications in COVID-19

Bikdeli B, et al. Thromb Haemost. 2020;120:1004-1024.

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Strategic Recommendations

Cardiac injury from COVID-19

- The mechanism for which COVID-19 causes cardiac injury depends on the **severity of the disease** affecting the patient
- **Inflammation** leading to thrombosis and coagulopathy seem to play a central role among the reported complications
- The severity of complications are **directly linked** to the severity of the COVID-19 infection

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Diagnostics/ACS/PCI

- **Inform patients and HCPs**
  - Reduction in diagnostic procedures / OPD has an impact
  - Increased time to first medical contact in ACS
  - Less bystander CPR
  - HCPs need to maintain door to balloon time
  - More CV deaths at home
  - Patients afraid

- **COVID-19 increased mortality** due to ischaemic heart disease

- Reminder of the **natural history of CVD**

(COVID-19 has reduced allocation to CABG /COVID-19 reduced LOS for ACS)

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TAVI

- **Inform patients and HCPs**
  - Reduction in TAVI volume a/w COVID-19 pandemic
- **TAVI deferral a/w adverse outcomes**
- **Strategies to avoid TAVI deferral**

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Cardiac Injury from COVID-19

- **Inform patients and HCPs**
  - COVID-19 infection can impact the heart
  - Severity of COVID-19 infection determines outcome

- **Specific treatment targets** may emerge but no clear evidence for specific therapies to date

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A Final Word

Diagnosis and treatment of CVD should be designated **a health system priority that remains intact** during pandemia as the magnitude of harm induced by its interruption is **substantial**.

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Thank You!