

**Acute Coronary Syndromes undergoing Percutaneous Coronary Intervention in the COVID-19 Era:  
Comparable Case Volumes but Delayed Symptom Onset to Hospital Presentation**

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Timely revascularization is the standard of care for patients presenting with acute coronary syndromes (ACS). Delays in patient factors such as symptom onset to hospital presentation time or hospital factors such as door-to-balloon time correlate with poor patient outcomes<sup>1</sup>. While healthcare systems are being overwhelmed by the COVID-19 pandemic<sup>2</sup>, there has been a significant reduction in rates of ACS presentations in some European countries<sup>3</sup>. It is speculated this stems from patient avoidance of medical care due to social distancing or concerns of contracting COVID-19 from healthcare interactions.

We sought to compare case volume and symptom-to-door-time (STDT) in patients presenting with ACS that underwent percutaneous coronary intervention (PCI) for a period of one month from the commencement of lockdown in Australia (March 16-April 15, 2020; referred to herein as COVID-era) at a tertiary hospital cardiac catheterization laboratory in Melbourne with a core catchment population of 1.14 million people. These were compared with a historical cohort during the same 31-day period each year from 2014-2019 at our institution using prospectively collected data from the hospital PCI registry. In the event of stuttering symptoms, we restricted the coding for symptom-to-door time to 1 week as per our standardized registry data definition<sup>4</sup>.

Baseline clinical characteristics are summarized in Table 1. Mean age and risk factor profile for patients was comparable across the COVID and non-COVID eras. We included a total of 122 ACS cases that underwent PCI during the one-month period during the COVID-era and the corresponding time over the preceding six years. In the COVID-era, we recorded twenty ACS cases that underwent PCI including seventeen cases of non-ST elevation ACS and three

ST-elevation ACS. Seven additional patients presented with ACS but were not included in the analysis; three with late presentation infarcts deemed for medical management, who underwent coronary artery bypass grafting, two cases of Takotsubo cardiomyopathy and one out-of-hospital cardiac arrest. None of these patients tested positive for COVID-19.

The case volume for the number of ACS patients undergoing PCI was not significantly different in the COVID and non-COVID eras (20 vs historical mean 18 cases/month;  $p=0.20$ ). However, median STDT was significantly higher during the COVID-era (11.1 (IQR 5.0-102) vs 2.4 (1.3-6.2) hours,  $p<0.001$ ). Moreover, the proportion of patients that presented late ( $\geq 12$  hours post symptom-onset) was also substantially higher during the COVID era (45% vs 13%,  $p<0.001$ ).

The main finding in this observational study is a four-fold increase in symptom-to-door-time in patients with ACS requiring percutaneous revascularization during the COVID-era. This occurred despite a comparable case volume during the same time period in the preceding six years. Our findings are in contrast with reports from Austria where a reduction in patient presentations with ACS have been recorded<sup>3</sup>. Whether this may be partially explained by a flatter epidemic curve and lower rates of community transmission and deaths in Australia is unclear. The substantial increase in STDT coincides with the rigorous public health measures including physical distancing and social-isolation intended to mitigate the risk posed by the COVID-19 pandemic. This may be further accentuated by the media coverage highlighting the heightened mortality risk in older adults with pre-existing cardiovascular disease. Irrespective of the exact reason, the significant delay to hospital presentation with

approximately 1 in 2 patients presenting over 12-hours following symptom onset is concerning due to the risk posed by infarct related morbidity and mortality.

The importance of educating the community on warning signs of a heart attack and timely medical intervention is well known and particularly relevant in the COVID-19 era<sup>5</sup>. While social distancing is essential to limit the spread of COVID-19, this message should not deter patients from seeking prompt medical care for cardiac emergencies. Public-awareness campaigns are necessary to reinforce this message.

## References

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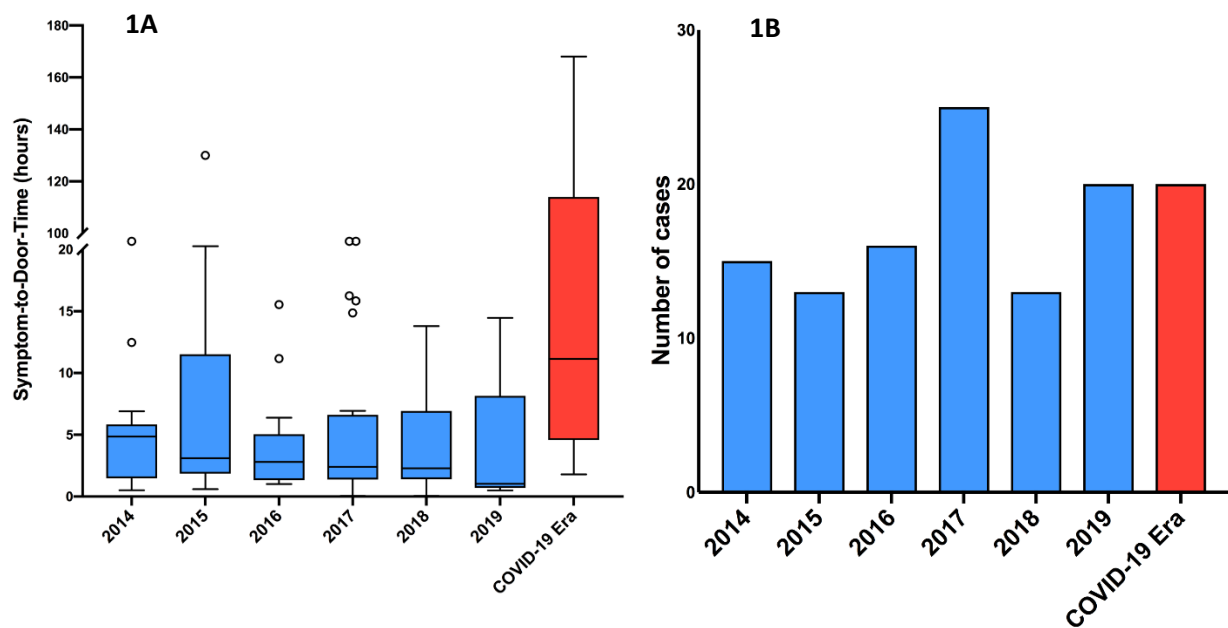


Fig. 1A. Median symptom-to-door time (hours) for the COVID-19 era compared to the same time period in previous years,  $p$  for trend  $< 0.001$ . Fig. 1B. Number of acute coronary syndrome cases undergoing percutaneous coronary intervention in the COVID-19 era compared to the same time period in previous years,  $p$  for trend = 0.21. COVID-19 era defined as 16 March-April 15, 2020.

**Table 1: Baseline Characteristics**

	COVID-19 Era	Non-COVID-19 Era	p value
	N = 20	N = 102	
Age (years)	68.1 ±14	65.0 ±12	0.31
Male gender	65.0%	71.6%	0.56
Smoking History	40.0%	35.2%	0.80
Hypertension	80.0%	65.7%	0.21
Dyslipidaemia	65.0%	57.8%	0.55
Diabetes	20.0%	22.5%	0.80
Ischaemic heart disease	20.0%	23.5%	0.73
Family history	10.0%	31.4%	0.051

Values presented as mean ± standard deviation or proportions. COVID-19 era refers to patients undergoing revascularization for acute coronary syndromes between March 16-April 15, 2020. Non-COVID-19 era refers to patients undergoing revascularization for acute coronary syndromes between March 16-April 15 between 2014 - 2019.

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**Conflict of interest**

None to declare.