

# Overcoming Challenges of the COVID-19 Pandemic: Data from HyperAcute Stroke Thrombolysis and ENdovascular (HASTEN) Value Driven Care Initiative in Asian Population

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## Background

Globally, Stroke is a major cause of disability and mortality. In Singapore, acute ischaemic stroke (AIS) is among the top three leading causes of disability. Timely treatment with intravenous thrombolysis (IVT) and/or endovascular thrombectomy (EVT) has been proven to be highly effective in improving outcomes and reducing the risks of disability in AIS patients.

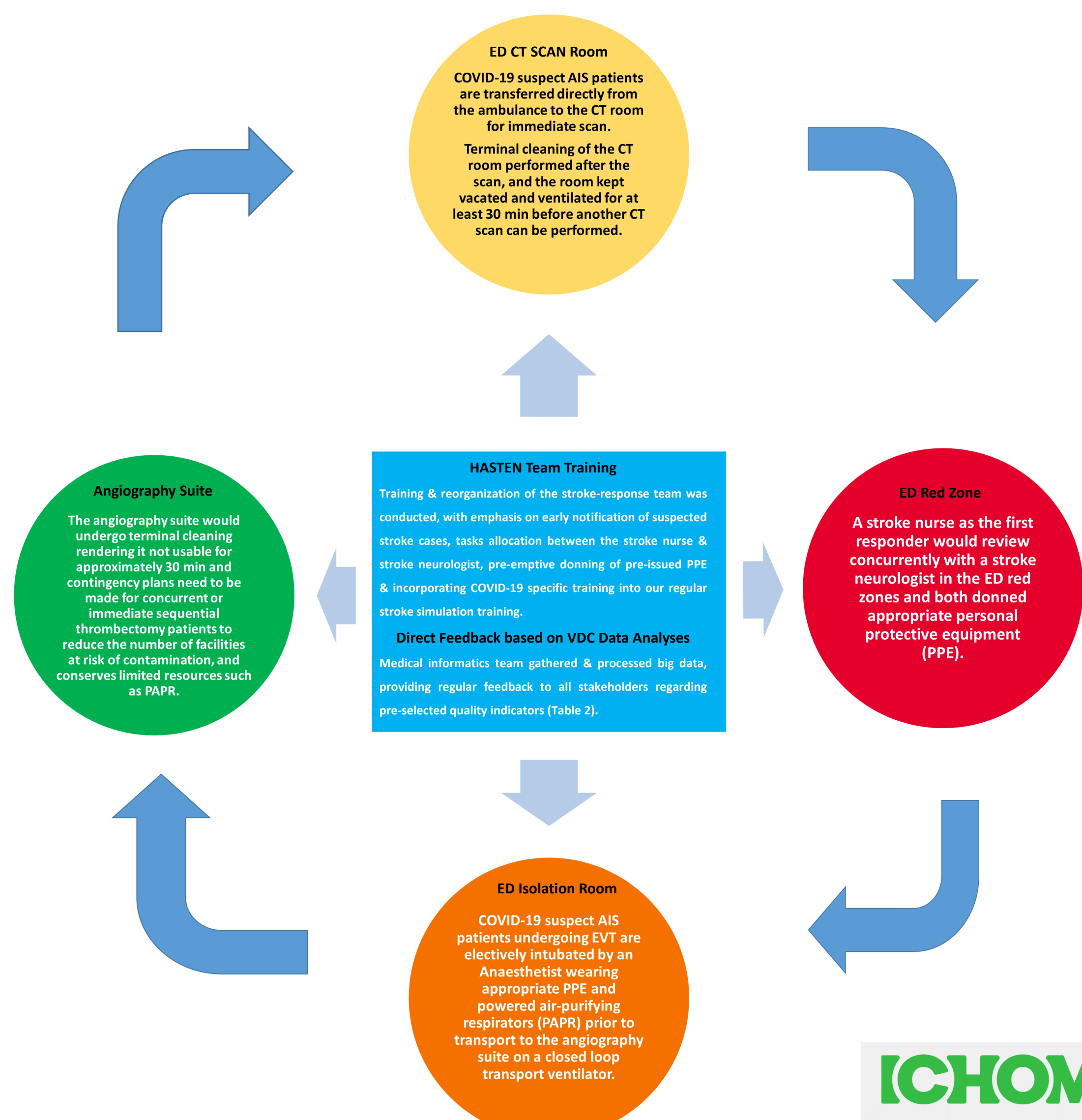
National University Hospital (NUH), as a comprehensive stroke centre, adopted HyperAcute Stroke Thrombolysis and ENdovascular (HASTEN) Value Driven Care (VDC) methodology to ensure optimal value of care for IVT and EVT services in the Western region of Singapore. HASTEN VDC received AIS patients directly via ambulance services and emergent referrals from two acute-stroke ready hospitals (Fig. 1). In 2020, Coronavirus disease 2019 (COVID-19) pandemic posed significant challenges to healthcare systems globally, and may have hampered time-critical AIS treatment and resulted in poorer patient outcomes. Furthermore, there was a need to balance appropriate and timely delivery of AIS care with reducing unnecessary exposure of healthcare staff to COVID-19.

## Methodology

HASTEN VDC team is an integrated practice unit (IPU) formed by Emergency, Anaesthesia, Interventional Radiology, Neurology and VDC Departments with the vision of improving and maintaining patient outcomes, whilst ensuring the most efficient utilisation of resources and costs. During the COVID-19 pandemic (2020-2022), this multidisciplinary team incorporated a protocol-based healthcare cluster wide strategy to expedite AIS treatment, aiming to maximize patient outcomes, whilst adhering to strict infection control measures.

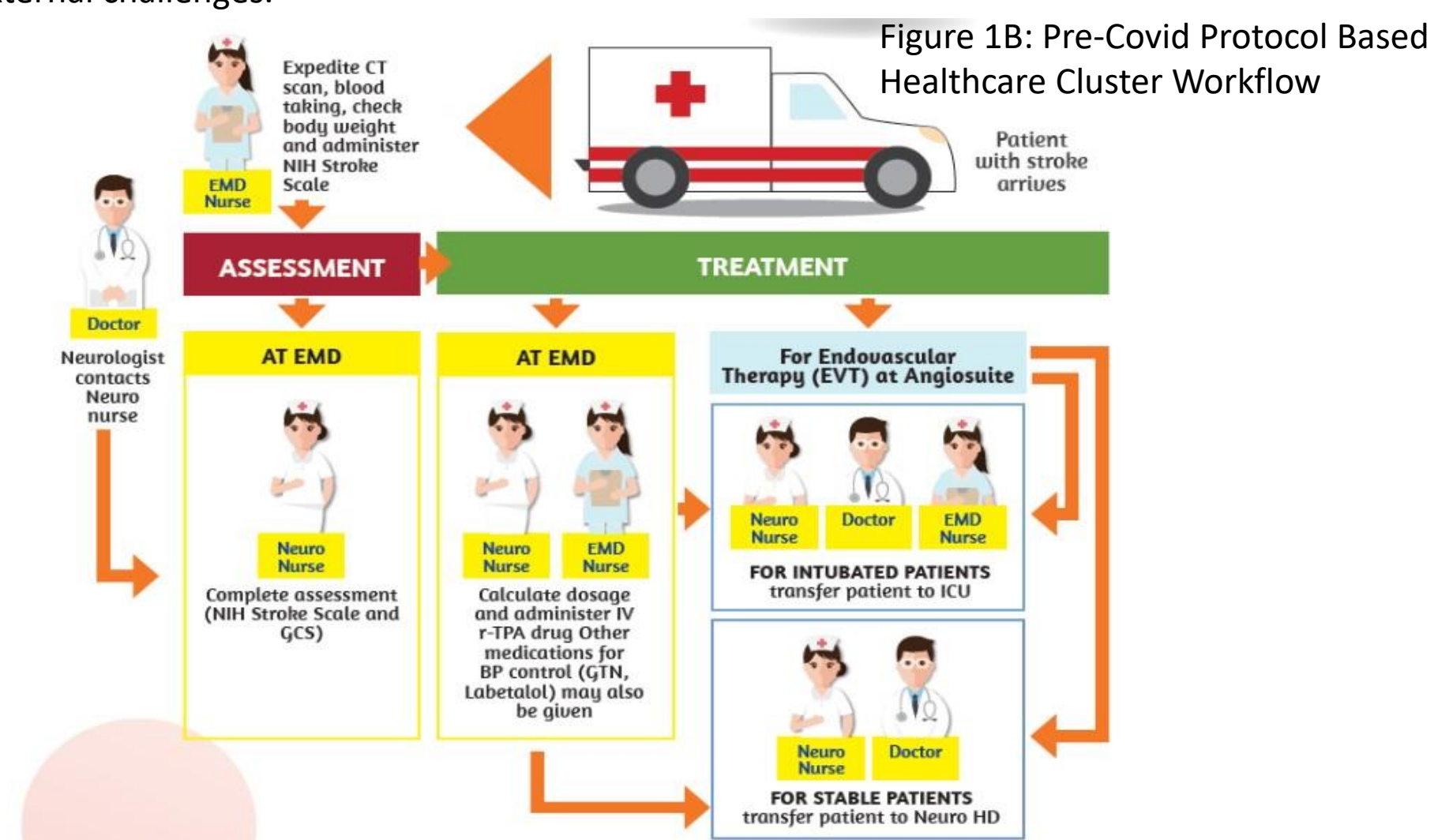
For example, the CT scan rooms and Angiography suites were thoroughly sterilized and vacated for approximately 30 minutes to reduce the risk of contamination, which would potentially hinder the prompt treatment of AIS patients. To adapt to the change, HASTEN VDC team has incorporated the COVID-19 specific training into regular stroke simulation training and constantly monitored the quality indicators via feedback from VDC department to maintain the value of care (Figure 1A).

Figure 1A: Protocol-based healthcare cluster wide strategy to improve AIS outcomes



## Objective

Evaluate the effectiveness of HASTEN VDC methodology in improving value of care while overcoming external challenges.



## Result

A total of 641 AIS patients were treated with IVT and/or EVT during the COVID-19 pandemic period from period of Jan 2020 – Sep 2022. Compared to the pre-COVID period, overall quality indicators and standards in 2020-2022 were maintained (Table 2). The rate of functional independence (mRS 0-2 at 3 months) was slightly lower in Year 2020 and 2021, but subsequently improved in Year 2022. There was a significant reduction in overall length of stay from 17.77 days to 12.12 days ( $p=0.03$ ) in 2022 compared to the pre-COVID period (Table 3).

Ordinary Least Squares Regression (OLS) analysis is performed for Door-to-Needle (DTN) controlling for patients' demographic and comorbidities. In 2019, HASTEN VDC managed to shorten DTN time by 8.9 minutes ( $p = 0.01$ ). Maintenance of DTN time was hampered by COVID-19, however, the impact was not statistically significant and there is still reduction in DTN time when compared to Baseline data.

Table 2

INDICATORS		2018	2019	2020	2021	2022
LOS < 20 days	Mean	82%	83%	82%	77%	85%
	p-value (t-Test, base Y2018)		0.84	0.88	0.18	0.37
door to needle < 60mins	Mean	72%	77%	71%	69%	68%
	p-value (t-Test, base Y2018)		0.30	0.84	0.53	0.44
door to cts < 30mins	Mean	89%	92%	88%	88%	86%
	p-value (t-Test, base Y2018)		0.28	0.82	0.95	0.38
EMD Groin punc< 100mins	Mean	37%	40%	32%	41%	38%
	p-value (t-Test, base Y2018)		0.58	0.47	0.47	0.85
MRS 3 Months (Score 0 to 2)	Mean	50%	47%	37%	35%	45%
	p-value (t-Test, base Y2018)		0.60	0.00	0.00	0.30
MRS 6 Months (Score 0 to 2)	Mean	46%	50%	40%	40%	48%
	p-value (t-Test, base Y2018)		0.41	0.22	0.21	0.71
No readmission within 90 days (any cause)	Mean	83%	86%	85%	87%	93%
	p-value (t-Test, base Y2018)		0.39	0.40	0.15	0.00
No mortality within 90 days from discharge	Mean	88%	87%	85%	90%	90%
	p-value (t-Test, base Y2018)		0.89	0.38	0.39	0.46
No SICH Complications	Mean	95%	96%	96%	97%	96%
	p-value (t-Test, base Y2018)		0.71	0.79	0.19	0.73
Rate of CQI (9QI)	Mean	20%	27%	19%	17%	25%
	p-value (t-Test, base Y2018)		0.08	0.74	0.38	0.24
Number of HASTEN Cases		229	221	233	236	172

Table 3

		2018	2019	2020	2021	2022
LOS	Mean	17.77	12.29	13.82	14.78	12.12
	p-value (t-Test, base Y2018)	Baseline	0.00	0.03	0.11	0.03
Door To Needle	Mean	60.11	53.16	56.64	56.62	57.98
	p-value (t-Test, base Y2018)	Baseline	0.08	0.35	0.37	0.64
Door To CT	Mean	19.15	14.39	17.19	10.28	31.40
	p-value (t-Test, base Y2018)	Baseline	0.38	0.70	0.02	0.16
EMD Groin Punc	Mean	120.91	134.58	131.69	117.40	135.45
	p-value (t-Test, base Y2018)	Baseline	0.21	0.20	0.61	0.31
MRS 3 Months	Mean	2.68	2.68	2.97	2.93	2.67
	p-value (t-Test, base Y2018)	Baseline	0.99	0.11	0.16	0.98
MRS 6 Months	Mean	2.78	2.61	2.93	2.87	2.58
	p-value (t-Test, base Y2018)		0.43	0.46	0.64	0.36
No Readmission 90 days Any Cause	Mean	0.99	0.99	0.99	0.98	0.99
	p-value (t-Test, base Y2018)	Baseline	0.97	0.67	0.43	0.74

## Conclusion

HASTEN VDC methodology proved the consistent delivery and maintenance of quality indicators year-on-year when compared to the baseline in 2018 despite the tremendous strain from COVID-19 global pandemic. Amidst the presence of external challenges, VDC methodology is flexible and adaptive to new care protocols. This enables the care team to drill down on the ineffective processes and formulate appropriate solutions to ensure the optimal care.

## References

- Magdalene Chia, Case Manager  
Division of Neurology  
National University Hospital
- Shikha Kumari, Deputy Director National Academic Informatics Office  
National University Health System

