IO in the COVID World: Singapore

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Disclosures

No relevant financial disclosures to report.

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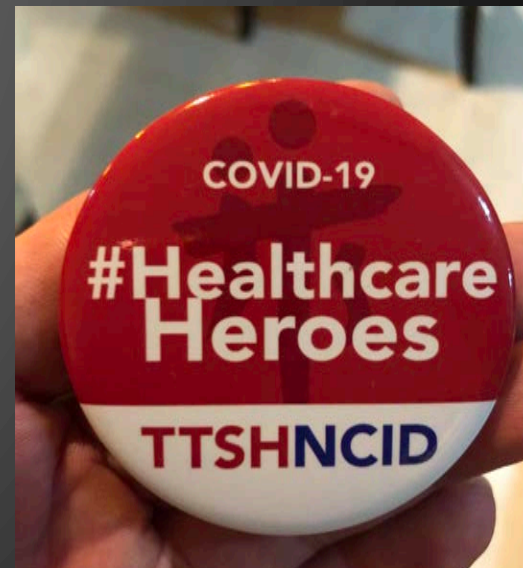
COVID-19 IR:
Tan Tock Seng Hospital (TTSH) +
National Center for Infectious Disease (NCID)



COVID-19 in Singapore

- One of the first countries outside of China to have a positive case (23 Jan 2020)
- Total case load n = 57576 (18 Sept)
- Mortality n = 27 (0.04%)
- Peak single-day new cases of 1,426 (20 April 2020)
- 8-week lockdown (“circuit breaker”) with largest surge (April–June 2020)

World Health Organization. Coronavirus disease 2019 (COVID-19) situation report
Ministry of Health S. COVID-19 Situation Report 2020 https://covidsitrep.moh.gov.sg/

COVID-19 in TTSH

- Co-located with the National Center for Infectious Disease (NCID)
- Main hospital handling COVID-19 in Singapore, up to 80% of all COVID-19 cases requiring acute care
- Single-day highest COVID-related encounter of 520
- Bed surge of 1,450 COVID beds, 700 non-COVID beds during peak

- Battle-hardened IR unit with experience from prior major outbreaks

- SARS 2003 (designated hospital)
- H1N1 2009
- Zika, Ebola, you name it

Pua U, Wong D. *Korean J Radiol.* 2020;21(5):629-631.

TTSH/NCID
SARS, H1N1, COVID-19

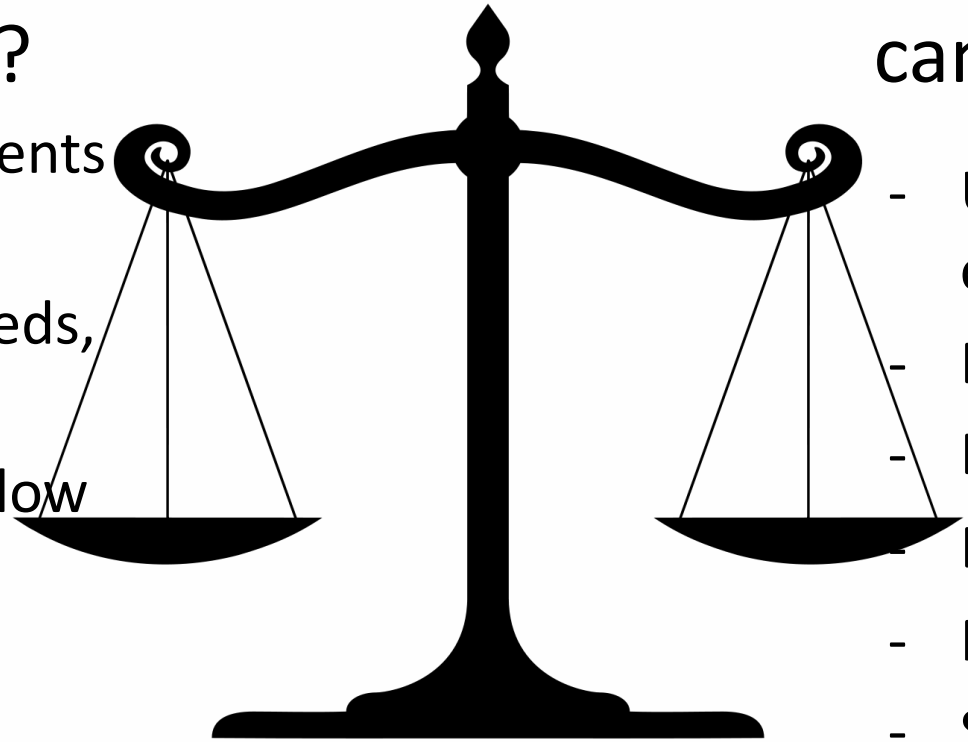
TTSH: 1,500 beds
VIR: 12 IRs
Biz as usual for life-saving/limb-saving cases

NCID: ID only cases (purpose built after SARS)
330 isolation beds (up to 500+ beds)
30 ICU beds
Bio-safety level 3

IR During Pandemic

COVID-19 Issues: Stop EVERYTHING until it blows over?

- Cross-infection risk to patients and staff
- Resource conservation (beds, ICU, PPE)
- Staff redeployment/workflow
- National policies (social distancing, lockdown)
- Logistics chain: Y90, Tc99m
- Physician movement limitations



Non-COVID-19 Patients: How far can we kick the can?

- Uncertainty of duration of outbreak
- Delay in definitive treatment
- Delay in cancer diagnosis
- Delay in palliative procedures
- Psychological impact
- Sudden escalation of outbreak with complete hospital shutdown

Wang Z, Wang J, He J. *JAMA Oncol.* 2020. Hanna TP, Evans GA, Booth CM. *Nat Rev Clin Oncol*. 2020.

IR-Procedure Acuity Scale Tier	Definition	Examples	Action
Tier 1	Low-acuity procedure	T1a Renal tumors ablation	Postpone
Tier 2			ossible
Tier 3	High-acuity procedure	Embolization (bleeders) Drainage (infection)	Do not postpone

Postpone Tier 1 by 4 weeks

Replace Tier 1 sche with Tier 2 cases
Aka: "list compressi
Tier 2 gets done ea than usual

Rationale:

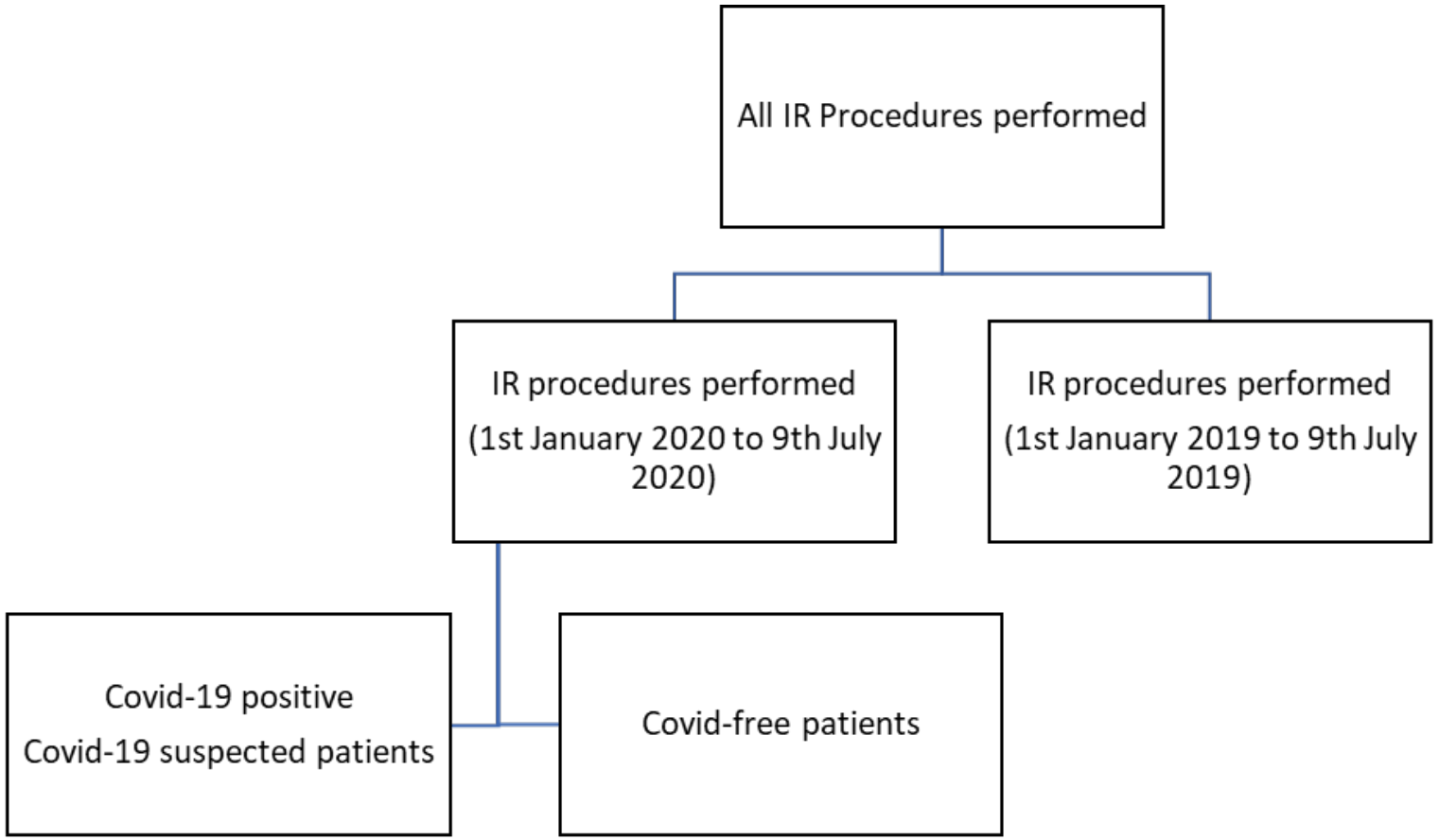
- Can't "keep kicking can down the road"
- Most Tier 2 cases are outpatient-based with no inpatient burden (cancel at short notice is possible)
- Augmented IR manpower due to leave curtailment/travel restriction
- Significant impact on treatment delays in non-COVID conditions
- Caveat: good infection control measures, nimble response to fluid situation

https://www.sirweb.org/practice-resources/toolkits/covid-19-toolkit/covid-19-case-classification/

Management of IR Caseload in TTSH

Quek LHH, Tan GWL, Pua U. *Ann Vasc Surg.* 2020;66:3-5. Tan GW, Pua U, et al. *J Vasc Surg.* 2020;72(1):12-15.

IR Caseload Analysis of the First 28 Weeks of COVID-19 in TTSH



Wang Z, Wang J, He J. *JAMA Oncol.* 2020. Hanna TP, Evans GA, Booth CM. *Nat Rev Clin Oncol.* 2020.

IR Procedures on COVID-19 Patients (2020) vs. SARS-CoV patients (2003)

Table 3 (IR procedures performed during the Covid-19 pandemic (at NCID) and the SARS-CoV outbreak)

Type of procedure	Procedure	Covid-19 Pandemic (2020) n (%) n= 34	SARS-CoV Outbreak (2003) n (%) n=28
Vascular intervention	Permanent catheter insertion/change	3 (8.8%)	4 (14.3%)
	Peripherally inserted central catheter	7 (20.6%)	8 (28.6%)
	Thoracic Endovascular Aortic Repair (TEVAR)	1 (2.9%)	
	Retrieval of vascular central catheter		1 (3.6%)
	Inferior vena cava filter insertion		1 (3.6%)
Interventional oncology	Axillary biopsy	1 (2.9%)	
	Hepatic tumor embolization	1 (2.9%)	
General intervention radiology	Para/thoracentesis	7 (20.6%)	12 (42.9%)
	Lung biopsy	2 (5.9%)	
	Feeding tube insertion	2 (5.9%)	
	Abdominal abscess drain insertion	3 (8.8%)	
	Drain review studies	2 (5.9%)	
	Percutaneous cholecystostomy/biliary drain insertion	1 (2.9%)	1 (3.6%)
	Biliary stent insertion		1 (3.6%)
	Percutaneous nephrostomy insertion/change	2 (5.9%)	
	Nephro-ureteric stent insertion/review	2 (5.9%)	

Intensive care procedures account for >50% of the IR load

Goh SSN, Pua U, et al. Br J Surg. 2020. Yong E, Pua U, et al. *Br J Surg.* 2020.

Figure 2 (Weekly number of Covid-19 cases with weekly IR procedures performed classified based on IR-PAS classification)

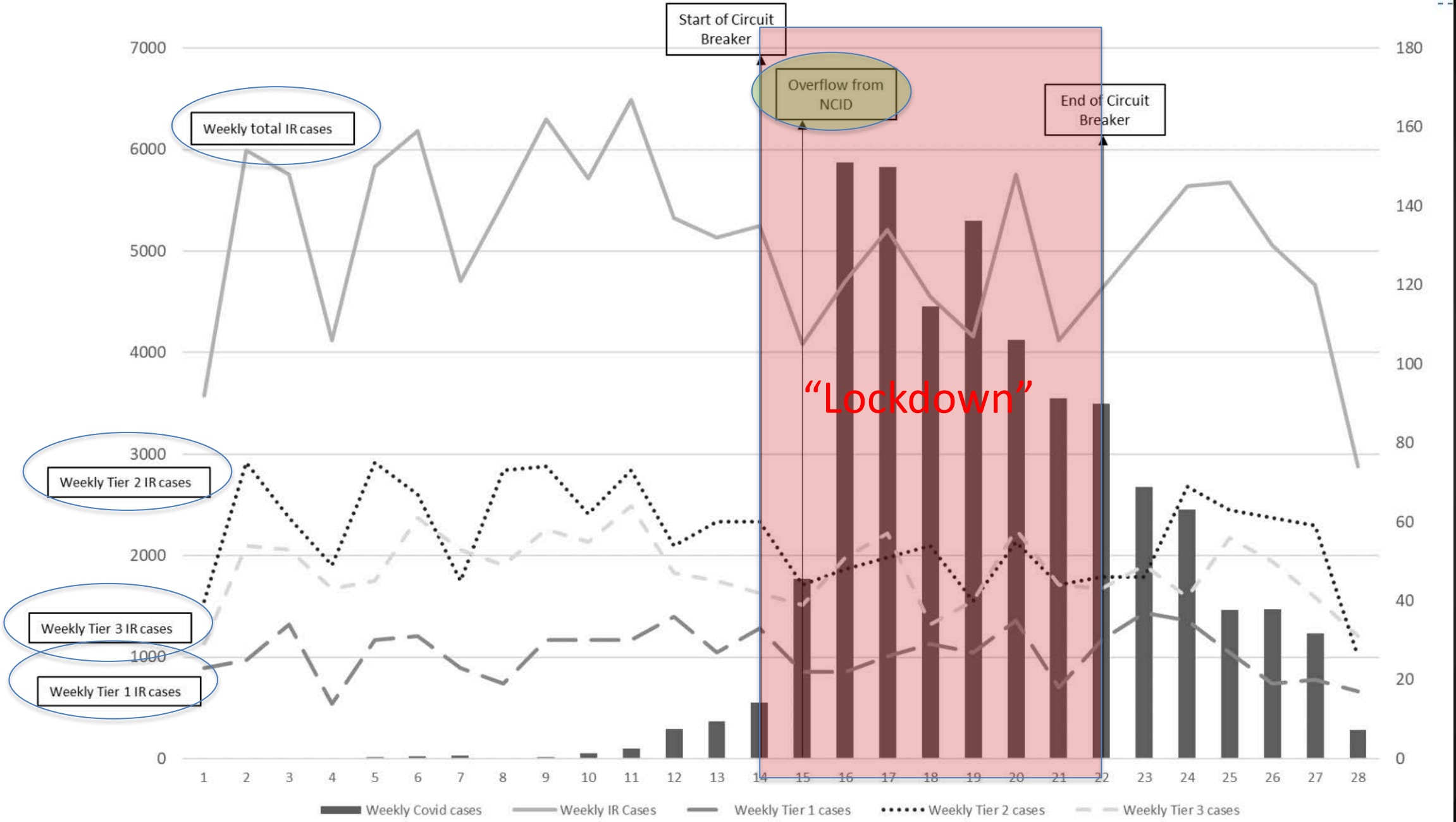
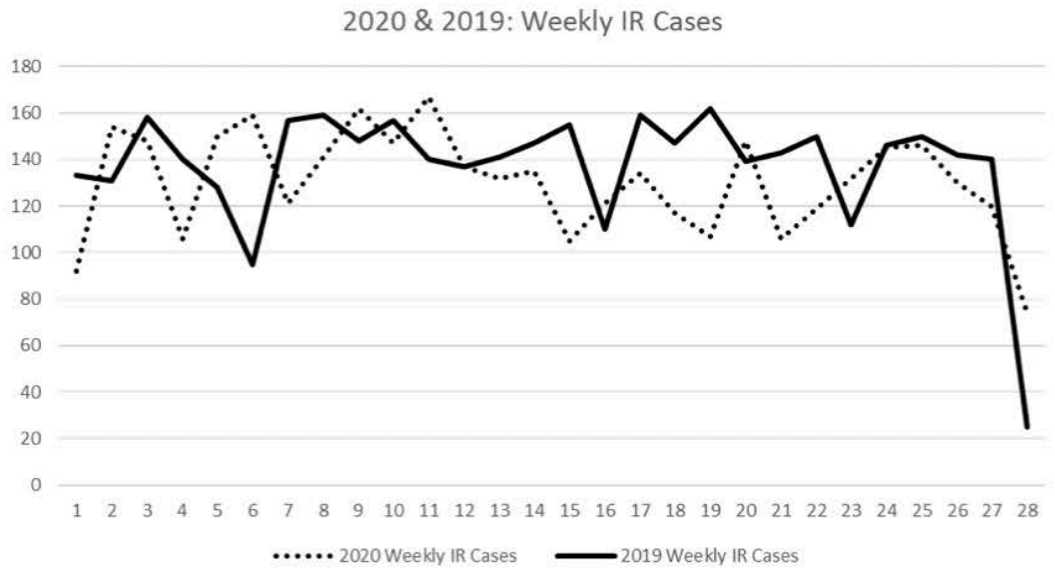
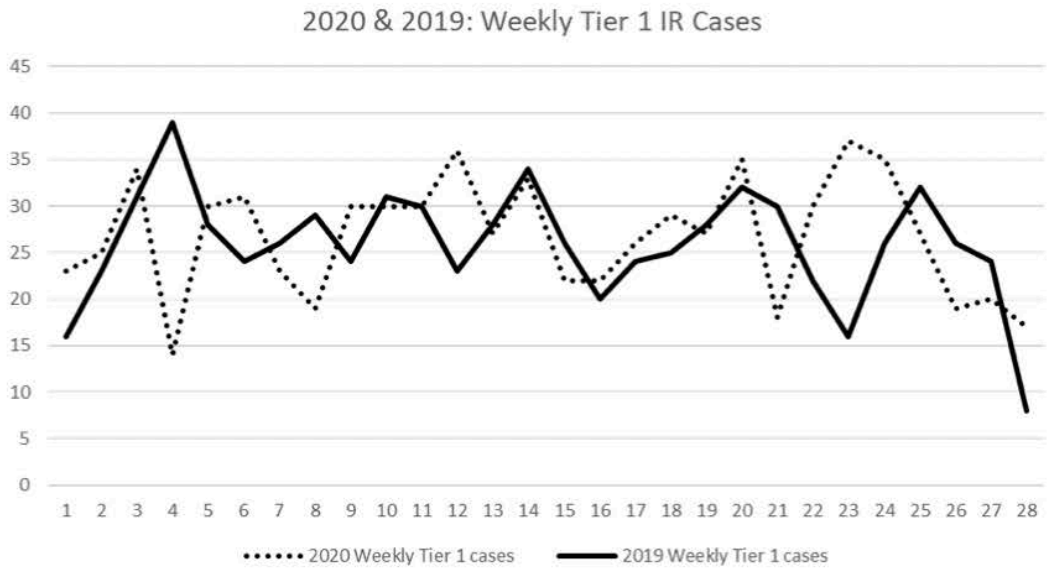
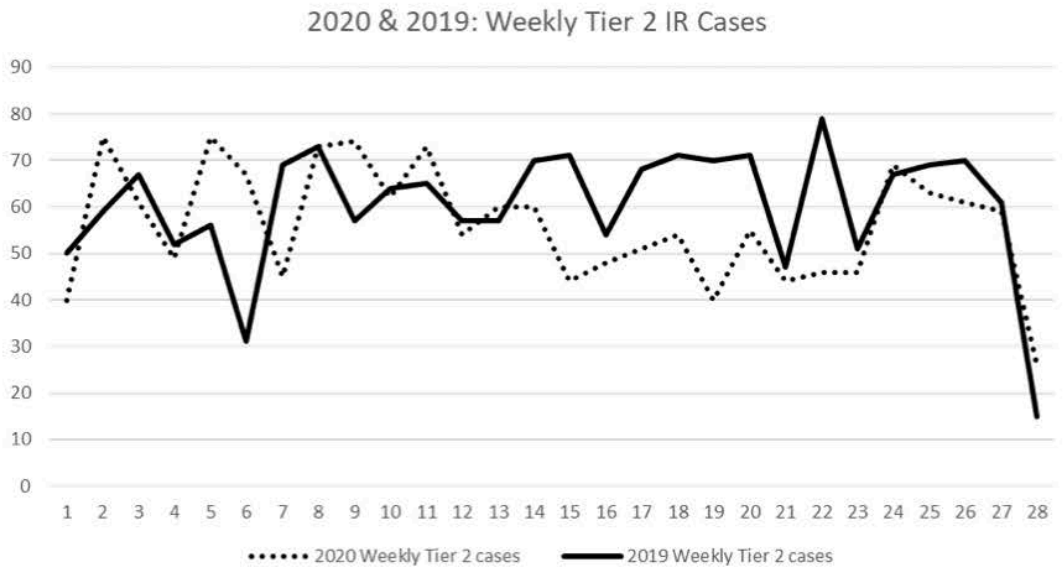
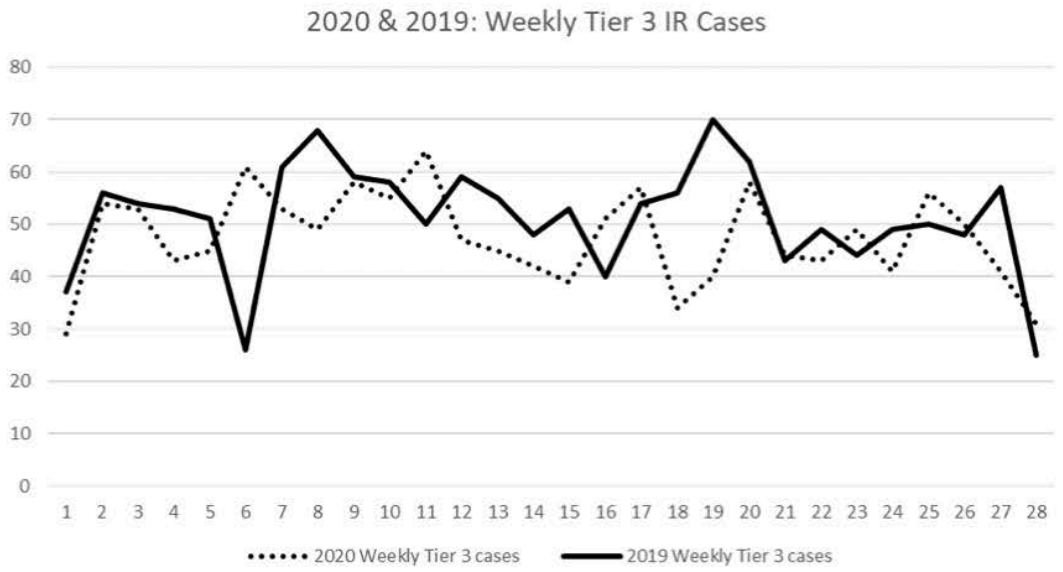


Figure 3 (2020 & 2019 : Weekly number of IR procedures based on IR-PAS classification)









Difference in procedure type: vascular, IO, MSK, general IR (pandemic vs. non-pandemic)

Table 2 (2020 & 2019: IR procedures classified based on type of procedure)

			Year			Chi-Square Test		Symmetric measures
			2020 (COVID-19 pandemic)	2019 (pre-pandemic)	Total	Pearson Chi-Square	df	Cramer's V
Type of Procedure	Vascular intervention (dialysis access angioplasties, lower limb angioplasties, aortic repair etc.)	Count	665	745	1410	7.648 (p = 0.054)	3	0.032 (p = 0.054)
		% within Type of Procedure	47.2%	52.8%	100.0%			
		% within Year	18.2%	19.3%	18.8%			
		% of Total	8.9%	9.9%	18.8%			
	Interventional oncology (Intra-arterial therapy, tumor ablation, biopsy etc.)	Count	441	502	943			
		% within Type of Procedure	46.8%	53.2%	100.0%			
		% within Year	12.1%	13.0%	12.6%			
		% of Total	5.9%	6.7%	12.6%			
	Musculoskeletal intervention (spine augmentation, joint injections etc.)	Count	15	28	43			
		% within Type of Procedure	34.9%	65.1%	100.0%			
		% within Year	0.4%	0.7%	0.6%			
		% of Total	0.2%	0.4%	0.6%			
	General intervention radiology (Central lines, Para/thoracentesis, percutaneous nephrostomy, GI/GU stenting etc.)	Count	2534	2576	5110			
		% within Type of Procedure	49.6%	50.4%	100.0%			
		% within Year	69.3%	66.9%	68.1%			
		% of Total	33.8%	34.3%	68.1%			
	Total	Count	3655	3851	7506			
		% within Type of Procedure	48.7%	51.3%	100.0%			
		% within Year	100.0%	100.0%	100.0%			
		% of Total	48.7%	51.3%	100.0%			

*p < 0.05

Summary of TTSH IR Workload During pandemic

- 5.1% decrease in the total of IR procedures during the pandemic (n = 3,655) versus pre-pandemic period (n = 3,851)
- COVID-19 cases account for 0.93% of total IR cases

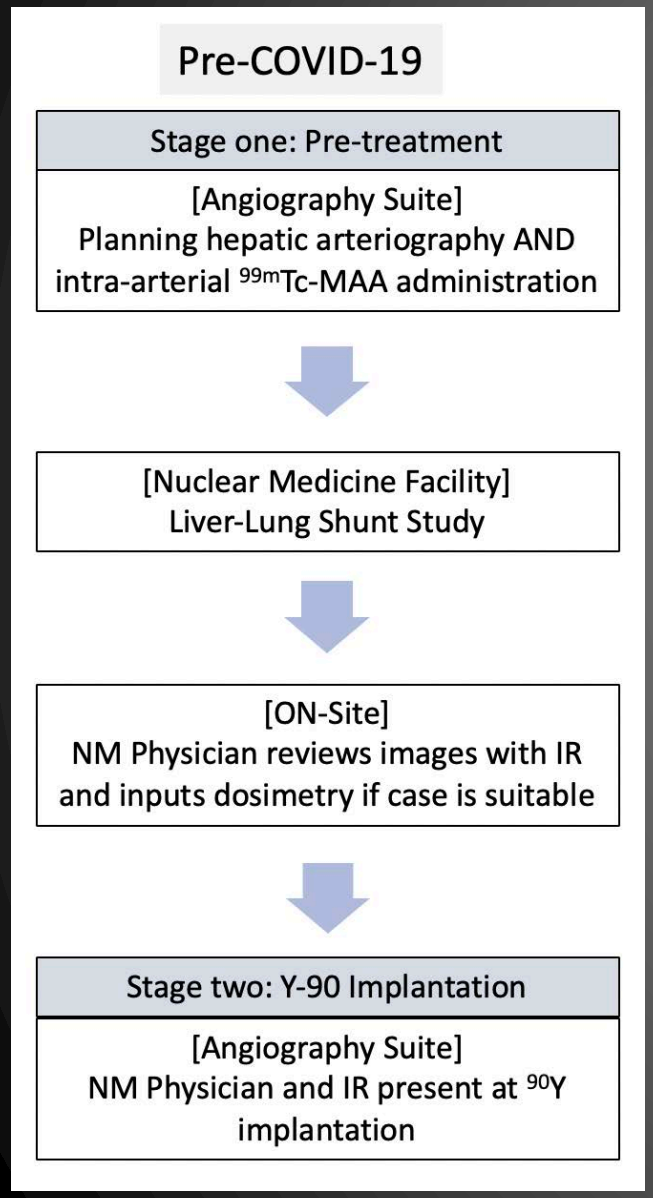
Median weekly IR procedures (COVID vs. non-COVID periods), no stats difference

- Tier 1: 27 (SD = 6.299) vs. 26 (SD = 6.142)
- Tier 2: 57 (SD = 12.556) vs. 64.50 (SD = 13.492)
- Tier 3: 48 (SD = 8.871) vs. 53 (SD = 10.423)

- No difference in case-mix by subspecialty
- No staff or patient cross-infection related

Innovation During COVID-19

Tele-Y90 – COVID-19 Era



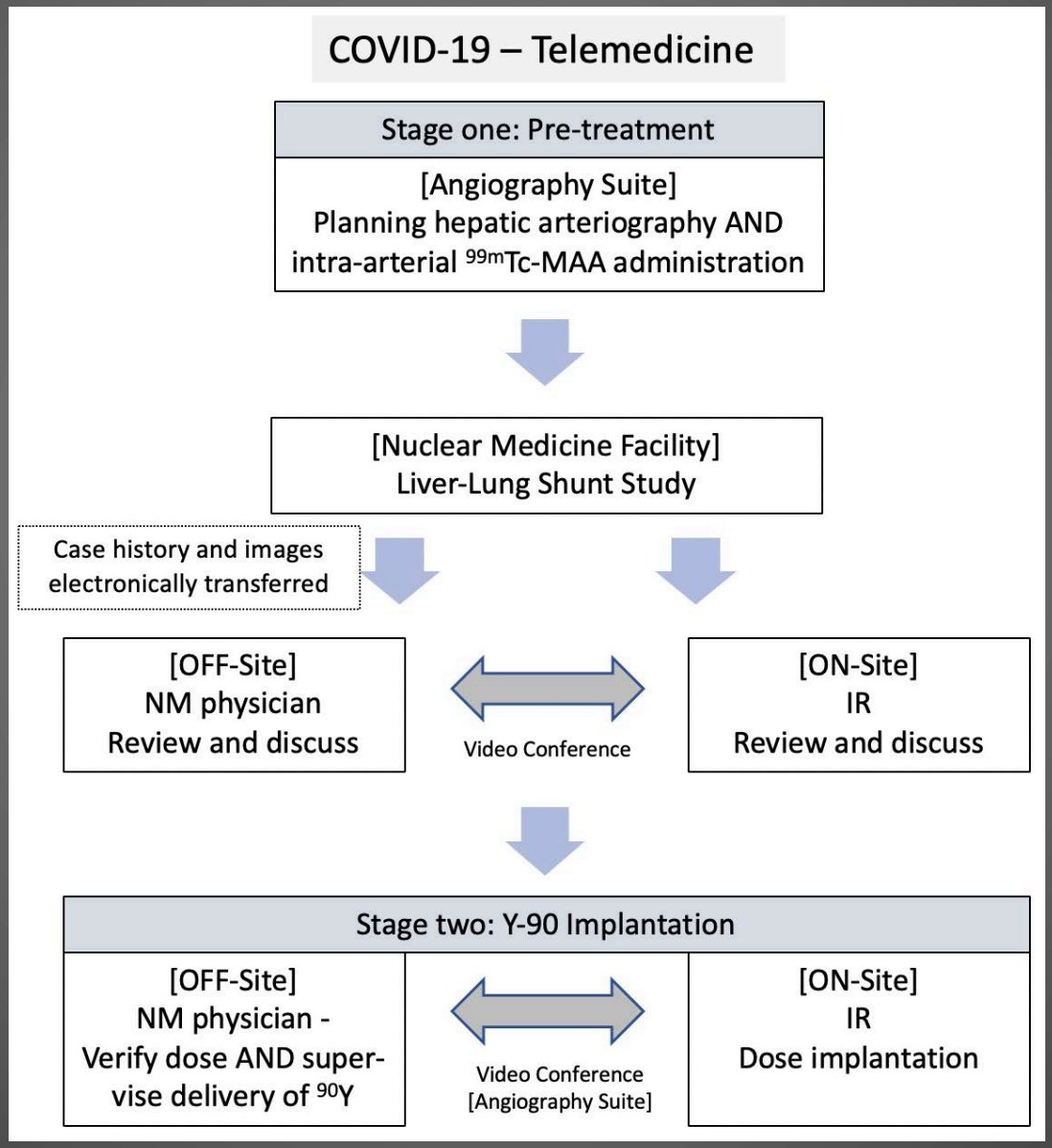


Figure
Workflow change in radioembolization therapy between Pre-COVID-19 and COVID-19 - Telemedicine

^{99m}Tc-MAA: Technetium-99m Macroaggregate Albumin NM: Nuclear Medicine
IR: Interventional Radiologist
^{90}Y: Yttrium-90

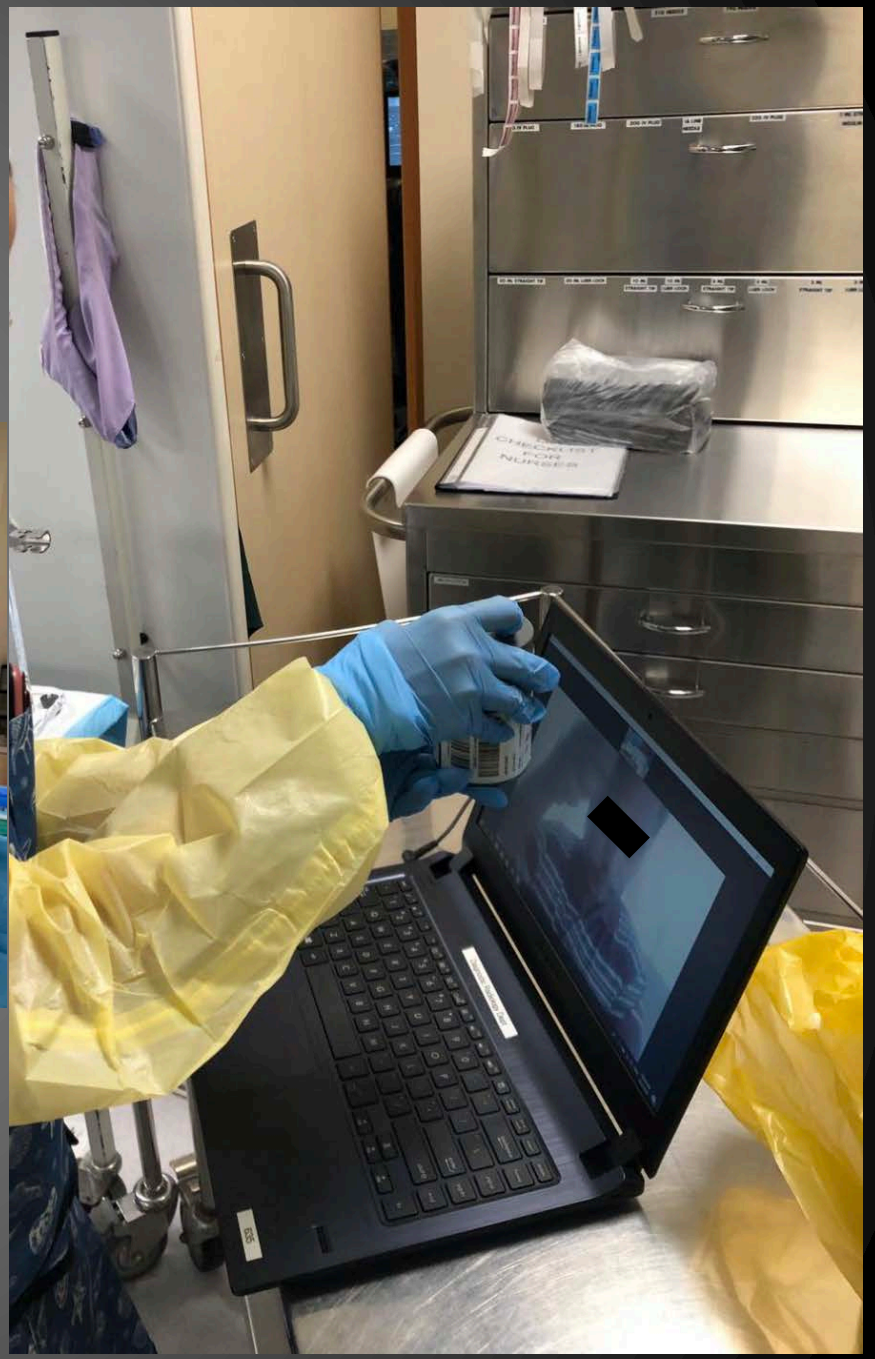
15 cases of Y90 including same-day Y90

Courtesy of Dr. Lawrence Quek

J Nucl Med. 2020 Jun;61(6):780. doi: 10.2967/jnumed.120.246389. Epub 2020 Apr 17.

^{90} Y Radioembolization: Telemedicine During COVID-19 Outbreak, Opportunity for Prime Time

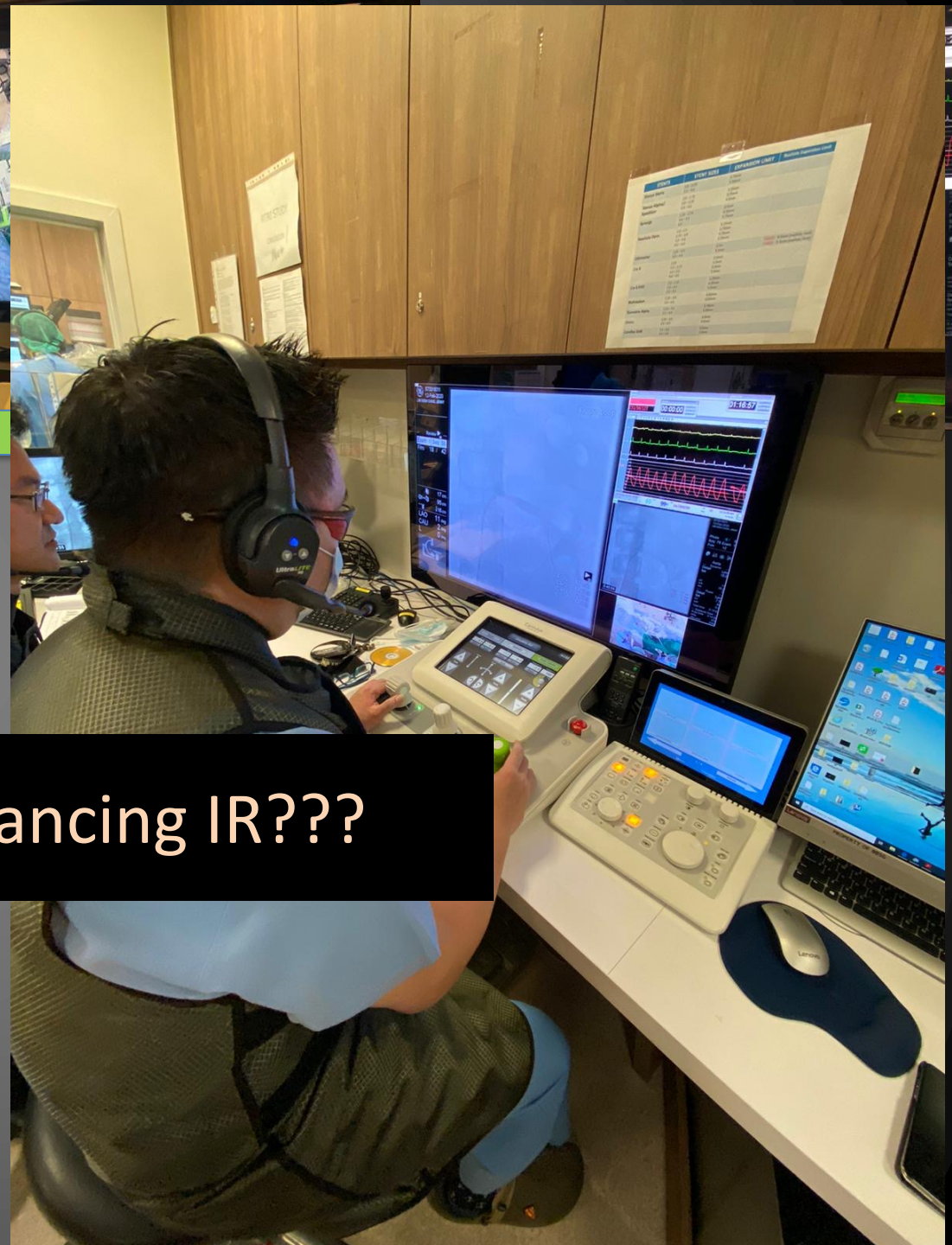
Lawrence Quek [1], Anbalagan Kannivelu, Uei Pua




CorPath GRX


Exchange Devices
Exchange Devices,
Close Cover and Gates

Robotic Renal Artery Stenting



Social Distancing IR???

Wiring
IVUS
iFFR
Balloon and Stenting

Conclusion

- COVID-19 accounts for minimal # of IR procedures (0.93%)
- Demand for non-COVID-related IR procedures remains high throughout the pandemic
- A more sustainable care-delivery model is needed in view of future surges and outbreaks
- With good infection control, a safe and sustainable care delivery to non-COVID-19 patients can be maintained

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