

# National COVID-19 Clinical Rounds: Critical Care

## **Critical Care: Lifesaving Treatment and Clinical Operations**

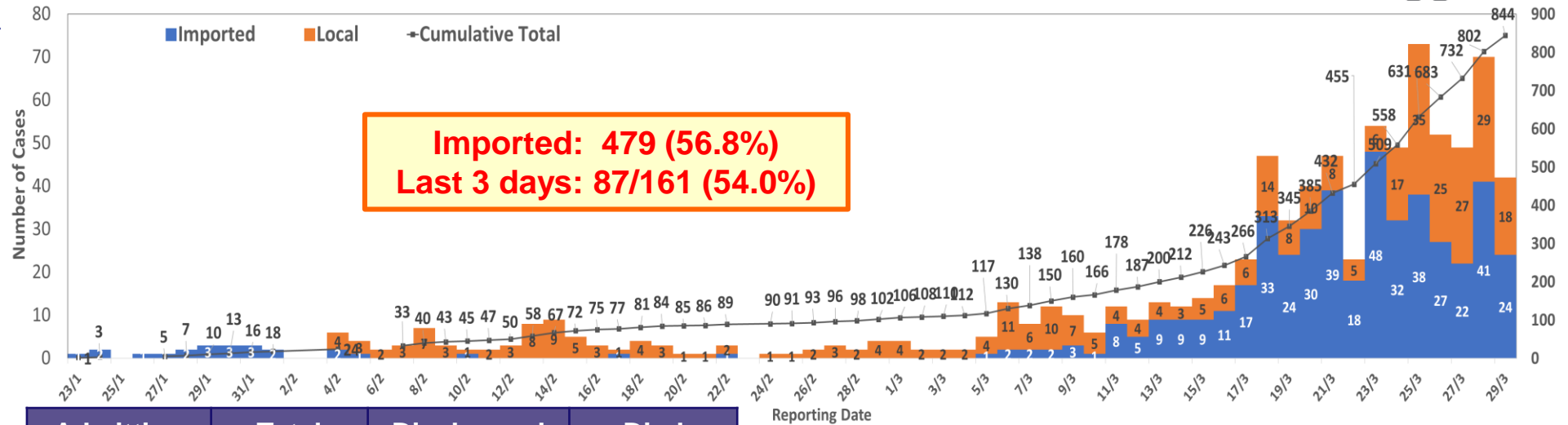
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# Outline

- Situation in Singapore
- NCID set up and ICU surge planning
- Profile of cases including ICU admissions
- Predictors/characteristics of CXR progression and critically ill patients
- Local treatment protocols
- Experience with Kaletra / IFN B-1B thus far

# Local Situation Update

## Total COVID-19 Cases by Reporting Date



Admitting Hospital	Total (N=843)	Discharged (N=212)	Died (N=3)
<b>NCID</b>	<b>553</b>	<b>143</b>	<b>2</b>
<b>NTFGH</b>	51	15	0
<b>SGH</b>	51	15	1
<b>NUH</b>	45	15	0
<b>CGH</b>	39	3	0
<b>SKH</b>	35	10	0
<b>KTPH</b>	31	5	0
<b>KKH</b>	21	5	0
<b>AH</b>	7	2	0
<b>MEH</b>	6	0	0
<b>GH</b>	2	0	0
<b>FPH</b>	1	1	0
<b>MAH</b>	1	0	0

Characteristic	
Age, years (Median, Range)	39 (6 months – 86 years)
Male, n (%)	469 / 844 (56%)
Locally acquired, n (%)	365 (43%)

**161 new confirmed COVID cases on 27-29 Mar**

- ☐ **Linked: 41**
- ☐ **Unlinked: 33**
- ☐ **Imported: 88**

National Public Health and Epi Unit

Updated 29 Mar 2020, 2200hrs

# About NCID



The National Centre for Infectious Diseases (NCID) is a 330-bed purpose-built facility designed to strengthen Singapore's capacity and capability in infectious diseases and outbreak related prevention, surveillance, clinical management, outbreak readiness and response.

NCID houses clinical services, public health, research, training and education, and community engagement under one overarching structure.

## **Mission**

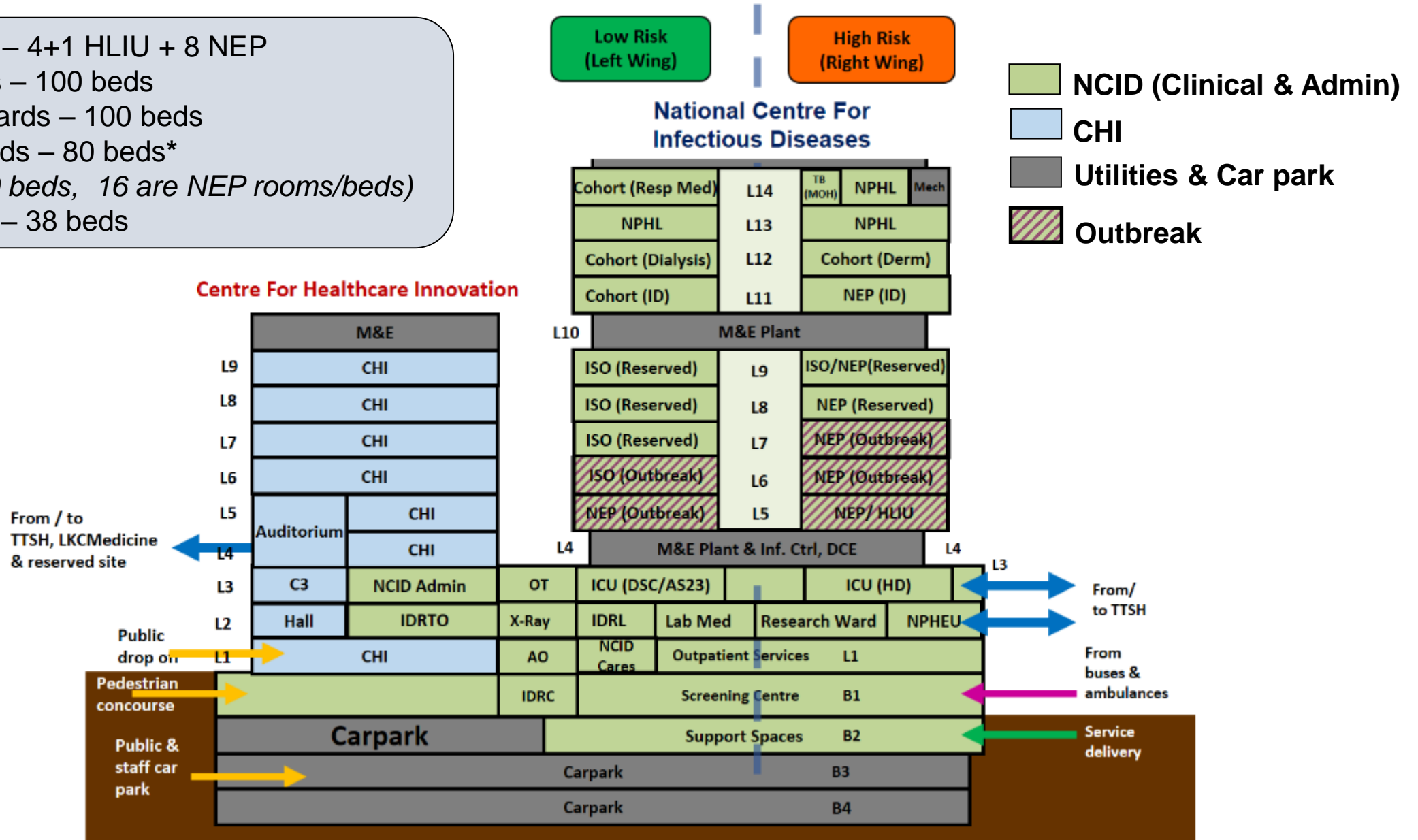
Protecting the people of Singapore from infectious diseases

## **Vision**

Strong, trusted and united in keeping Singapore safe from infectious diseases

# NCID Building and Location of Services

1 HLIU Ward – 4+1 HLIU + 8 NEP  
 5 NEP Wards – 100 beds  
 5 Isolation Wards – 100 beds  
 4 Cohort Wards – 80 beds\*  
 \*(Of these 80 beds, 16 are NEP rooms/beds)  
 2 ICU Wards – 38 beds





# NCID Design Principles

## Capacity and Scalability

**Collated on-site with Tan Tock Seng Hospital (SARS 2003 Hospital), staff shared, provides additional surge capacity**



**64 Cohort beds**

For general cases



**100 Isolation beds**

For non-ID patients requiring isolation



**124 Negative Pressure (NEP) Beds**

For airborne cases

Scalable design to increase number of beds to more than 500 beds

# ICU Decant and Conversion for Outbreak Patients



**Tan Tock Seng**  
HOSPITAL



National Centre for  
Infectious Diseases

Event	Outbreak ICU Patients	Action for ICU	Non-outbreak ICU Patients (BAU, Max bed occupancy)						ICU Grand Total
			NICU	SICU	CCU	MICU	3E (NCID)	BAU Total	
No Outbreak	0		14	11	8	10	10	53	53
1st outbreak case admitted to 3E	1	Isolated cases may not require decanting Start decanting 3E to 6B Reduce BAU	14	11	8	18	0	51	52
3E : 50% BOR	10	Start decanting 3F (if not done yet) Reduce BAU	12	10	8	16	0	46	56
3E : 100% BOR	20	Start admission to 3F	12	10	8	16	0	46	66
3E : 100% BOR 3F : 50% BOR	29	Start decanting 6B to 3A/B Reduce BAU Escalate to SMM for national ICU response	10	10	8	14	0	42	71
3E & 3F : 100% BOR	38	Start admission to 6B Reduce BAU	10	8	6	12	0	36	74
3E & 3F : 100% BOR 6B : 50% BOR	47	Reduce BAU	10	8	6	10	0	34	81
3E, 3F & 6B : 100% BOR	56		10	8	6	10	0	34	90

## Notes:

1. Ward 3E: 20 ICU beds; Ward 3F, 6B, 6A, 3A, 3B: 18 ICU beds each; Ward 6C: 30 HDU beds; Ward 6D: 22 HDU beds.
2. 90 ICU beds maximum because of ICU manpower and resources.
3. 52 HDU beds because there are 30 HDU beds in Ward 6C and 22 HDU beds in Ward 6D.
4. Downscaling of ICU and HDU beds is a simulation. In an actual outbreak, the downscaling plan may differ.
5. Critical day is when there are 29 outbreak ICU patients (Ward 3E: 20 patients and Ward 3F: 9 patients).

Updated on 21 November 2018

Slide: Courtesy Dr Tan HL

## NCID Inpatient Status (accurate as of 29 Mar 2020, 1000hrs)

<b>Current COVID-19 Inpatients</b>	<b>249</b>
Supplemental O <sub>2</sub>	18
Critical care	
ICU	8
HDU	0

<b>Total COVID-19 Inpatients (Including Discharged)</b>	<b>554</b>
Require ICU	24 (4.3%)
ICU duration (excludes current ICU pts), median (range) n=16	9 (1-50) days
Symptom onset to ICU (n=23)	8 (1-21) days
Require O <sub>2</sub> supplementation	50 (9%)
Symptom onset to O <sub>2</sub> supplementation, median (range) n=52	8 (1-16) days

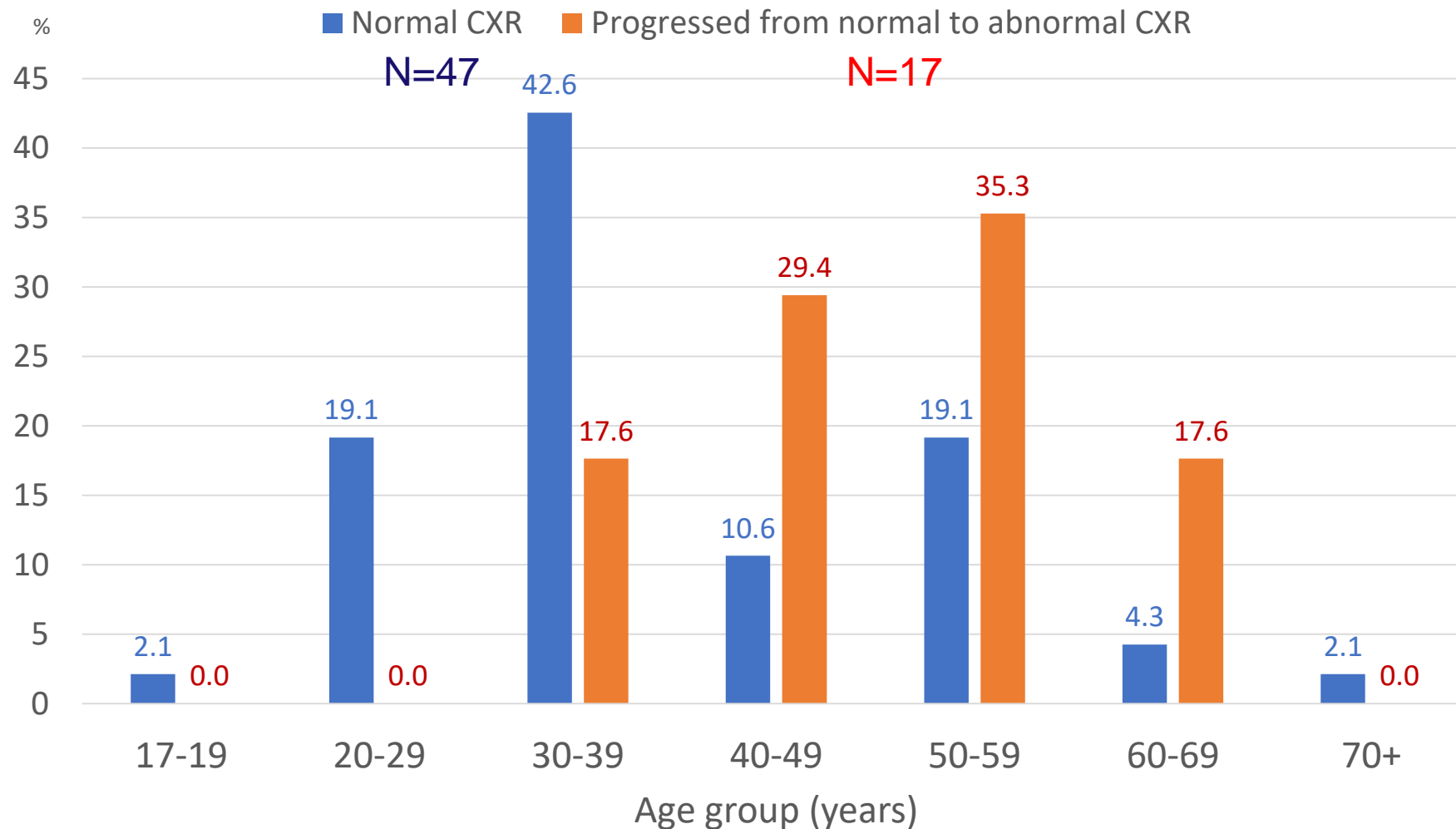
<b>Discharged COVID-19 Patients</b>	<b>305</b>
LOS for Patient discharged, median (range), n=126 (2 patients were deceased)	12 (3-50) days
LOS for Patient decanted, median (range), n=179	7 (2-25) days



# NCID patients with 1<sup>st</sup> normal CXR

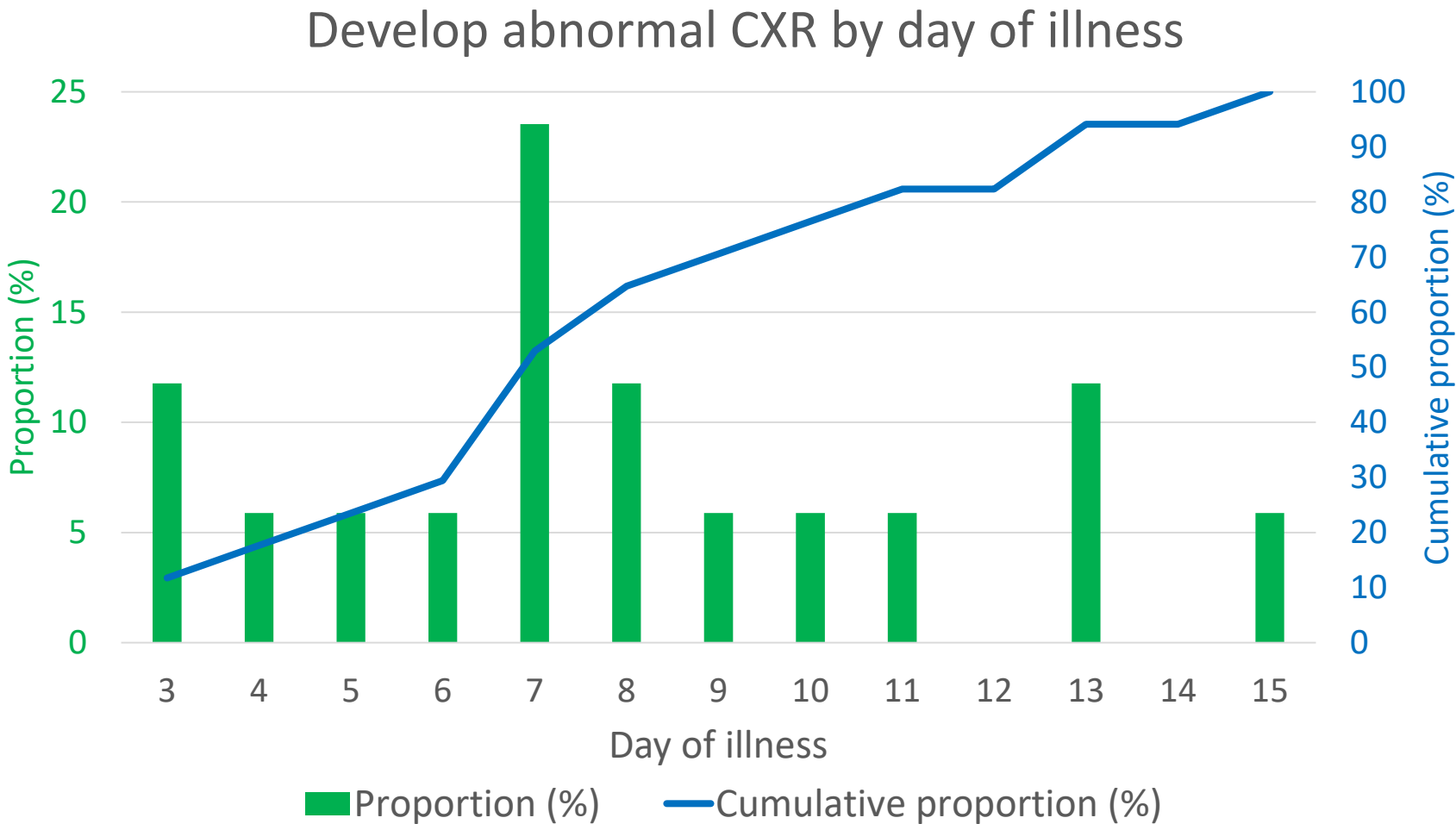
17/64 (27%) subsequently had an abnormal CXR

## Age distribution of patients with 1<sup>st</sup> normal CXR



# NCID patients with 1<sup>st</sup> normal CXR

Subsequently develop abnormal CXR (by age group) [N=17]



Progression to abnormal CXR	Median	p75	p95	Max
Day of illness	7	10	13	15

# Clinical Features and Predictors of Severity in COVID-19 in ICU patients, Singapore(50 non-ICU vs 10 ICU)

- Ventilated patients were more likely to:
  - Be Older (52 years vs 43 yrs)
  - Report dyspnea (80% vs 16%)
  - Higher temperatures (38.7 vs 37.6C)
  - Higher RR, Lower SpO2 (20.5 vs 18, SpO2 94 vs 98%)
  - Higher Neutrophil counts (5.3 versus  $2.7 \times 10^9/L$  )
- Logistic regression: RR (aOR 2.83, 95 CI 1.24-6.47) ; Neutrophil count (aOR2.39 95 CI 1.3-4.3) independent predictors of intubation (AUROC 0.928)
- Median duration of ventilation 6.5 days (IQR 5.5-13)
- Nationally, 2 patients were placed on ECMO so far.

## Patient and treatment characteristics: Kaletra +/- Beta-Interferon 1B

	Total (n=43)
Mean age (range)	59 (30-86) years
Male (%)	31 (72%)
Mean time to kaletra initiation from onset of symptoms (range)	7 (1-15) days
<b>Started kaletra therapy <math>\leq 7</math> days</b>	<b>21 (49%)</b>
Mean duration of kaletra therapy (range) [n=34]	8.5 (2-15) days
<b>Also on IFN</b>	<b>17 (40%)</b>
Mean time to IFN initiation from onset of symptoms (range)	8 (1-15) days
Started IFN therapy $\leq 7$ days (%)	8 (47%)
<b>Mean no. of doses of IFN (range)[n=13]</b>	<b>3 (1-7)</b>

## Outcomes: Kaletra +/- Beta-Interferon 1B

	Total (n=43)
<b>Mean hospital length of stay (range)[n=19]</b>	<b>15 (8-31) days</b>
<b>Required ICU/HD stay</b>	<b>25 (58%)</b>
Mean ICU/HD length of stay (range)[n=20]	9 (1-28) days
<b>Required supplemental oxygen</b>	<b>37 (86%)</b>
Mean duration of Supplemental oxygen (range)[n=21]	9 (1-29) days
<b>Required mechanical ventilation</b>	<b>16 (37%)</b>
Mean duration of mechanical ventilation (range)[n=11]	11 (3-29) days
Required vasopressors	12 (28%)
Mean duration of vasopressors (range)[n=9]	4 (2-13) days
Mean time to defervescence (range)[n=36]	11 (2-24) days
Died	2



## Adverse effects: Kaletra +/- Beta-Interferon 1B

	Total (n=43)
Any adverse effects	27 (63%)
GI intolerance (nausea, vomiting, diarrhoea)	11 (26%)
Abnormal LFTs (any grade)	23 (53%)
Time to onset of abnormal LFTs from start of therapy	4 (1-10)
Time to improvement of LFTs from end of therapy [n=16]	7 (0-22)
Other adverse effects	
Isolated Tspike attributed to IFN	1 (2%)
Thrombocytopenia possibly attributed to IFN	2 (5%)
Rash possibly attributed to kaletra	2 (5%)

## Low versus High Risk of Disease Progression in COVID-19

### Low Risk

- Age <30
- No chronic comorbidities
- Reassuring Clinical Features
  - No dyspnoea
  - Respiratory rate  $\leq 20$  breaths/min
  - Normal SpO<sub>2</sub> %
  - Not requiring oxygen therapy
- Normal Chest X ray
- Reassuring Laboratory results
  - CRP  $\leq 60$  mg/L
  - LDH  $\leq 550$  U/L
  - Lymphocytes  $\geq 1 \times 10^9$ /L
  - Neutrophils  $\leq 3 \times 10^9$ /L

### High Risk

- Age > 30, particularly >50
- Chronic comorbidities (chronic lung, heart or kidney disease, A1c >7.2%, immunosuppression)
- Concerning clinical features
  - Dyspnoea
  - Respiratory rate > 20 breaths/min
  - Abnormal SpO<sub>2</sub> % (<95%)
  - Requiring oxygen therapy
- Chest X ray with pneumonia
- Concerning Laboratory results
  - CRP  $\geq 60$  mg/L
  - LDH > 550 U/L
  - Lymphocytes <  $1 \times 10^9$ /L
  - Neutrophils >  $3 \times 10^9$ /L
  - Others: Worsening thrombocytopenia <  $100 \times 10^9$ /L, Ferritin > 300 ug/L, D-dimer > 1 ug/mL, Elevated troponin

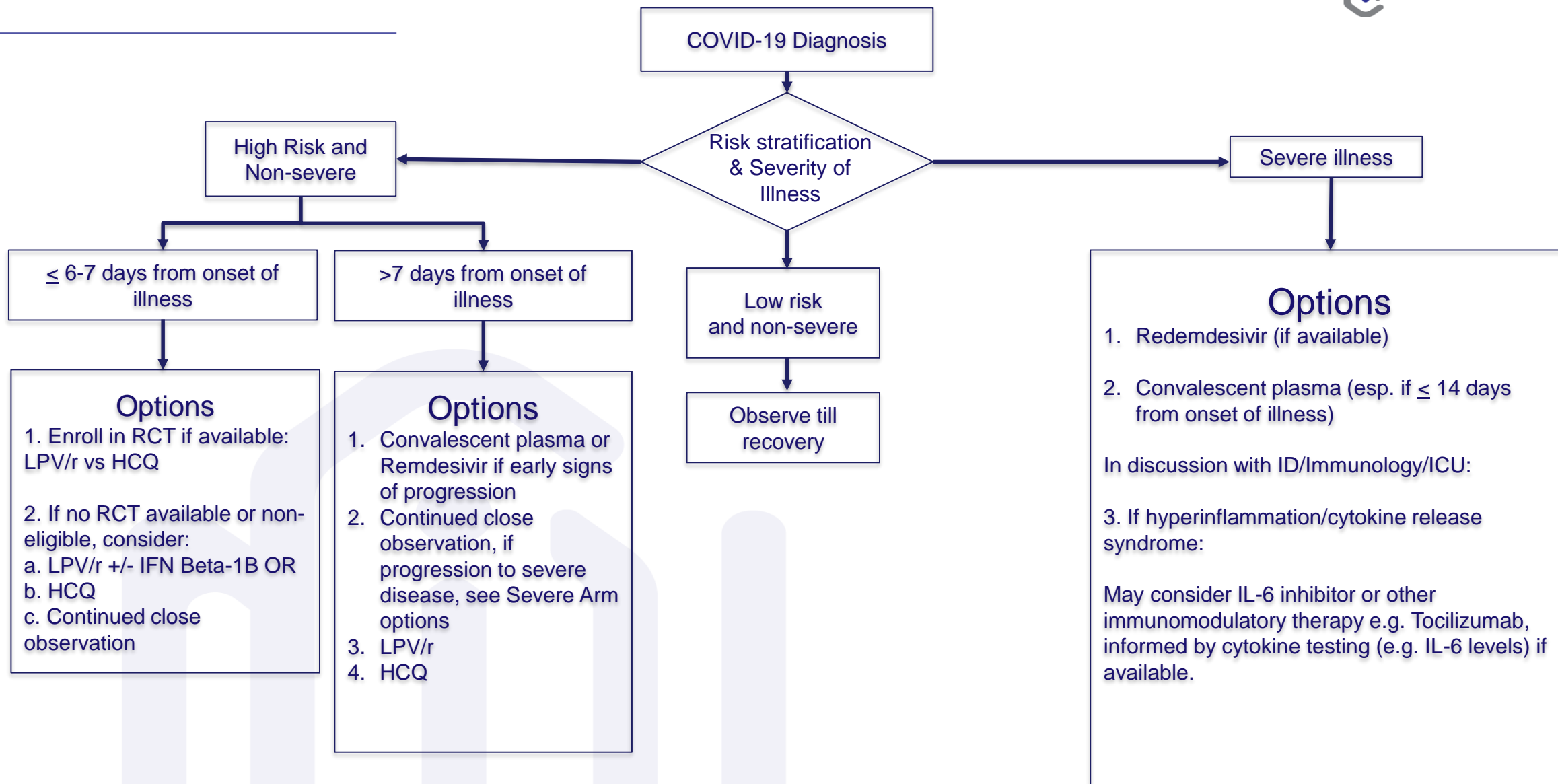
# Definition of Severe COVID-19 Disease

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COVID-19 Infection with any one or more of the following features, attributable to SARS-CoV-2 infection:

- Dyspnea, RR >30 breaths/min, P/F ratio <300, Lung infiltrates >50% of lung fields within 24-48 hours (WHO Criterion)
- Admission to an ICU
- Current receipt of mechanical invasive or non-invasive ventilation
- Current receipt of intravenous vasoactive medications to maintain mean arterial pressure >65 mmHg
- Myocarditis/myocardial dysfunction secondary to SARS-CoV-2

# Proposed National Treatment Algorithm for COVID-19



Note that algorithm may be updated/modified pending further clinical trial results

# Teamwork – Thank You

