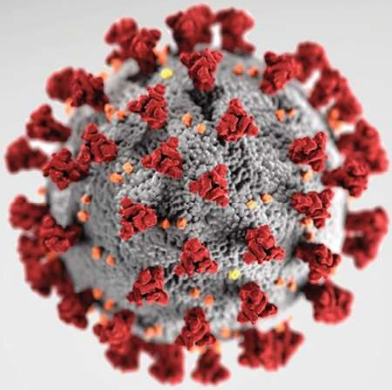
# COVID CORNER

Ongoing COVID-19 updates
brought to you by
The Office of CME&PD and
The Physician Learning Program



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Physician
Learning
Program

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## Moderators

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**Kelly Burak MD FRCPC MSc (Epid)**

Any direct financial payments, gifts, in-kind compensation or honoraria

- Employee, University of Calgary

**Selena Au MD FRCPC MSc**

- Nothing to disclose

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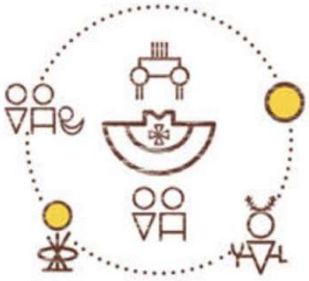
## Territorial Acknowledgement



ii' taa'poh'to'p

Source: https://www.ucalgary.ca/Indigenous

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## Housekeeping

- Multiple speakers will address various aspects of the topic
- There will be a Q&A after all the presentations
- Use the Q&A box to enter questions by text. No spoken questions.
- **Refer to this How-to page for info on Questions, Chat etc.**
  - https://olab.ca/using-zoom-for-large-groups/
- We get lots of Questions: scan the list and give a thumbs up if you are interested in a question already posed.
- Formal notices, copyright, declarations and disclaimers will be offered throughout the presentation and within the chatbox

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## Disclosure of Financial Support

UNIVERSITY OF CALGARY

- The program was developed and planned to achieve scientific integrity, objectivity and balance
- This program has received an educational grant from the College of Physicians and Surgeons of Alberta

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Help us provide ongoing COVID-19 education, training and resources for healthcare professionals by donating here **http://c-fund.us/rkg**

Scan me!

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## Presenter Disclosure

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**Lynora Saxinger MD, FRCPC, CTropMed**

Associate Professor, Division of Infectious Diseases
Departments of Medicine and Medical Microbiology and Immunology, University of Alberta

**Disclosure**
None to Disclose

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In the Corner with...

Dr. Lynora Saxinger
Co-Chair
Scientific Advisory Group
Alberta Health Services

**Risk of COVID-19 amongst HCWs**

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albertahealthservices.ca — Private

## Scientific Advisory Group COVID-19 Recommendations

novel coronavirus (COVID-19)

AHS' Scientific Advisory Group is connecting with clinicians, operational leaders, researchers and other experts to review emerging evidence and guidance of national and international bodies to provide information for focused areas of healthcare in relation to COVID-19. These resources are created to provide research informed advice to AHS physicians, staff, patients and families. Reports are updated frequently based on emerging evidence or concerns.

**COVID-19 Resources for AHS Staff & Health Professionals**

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## COVID-19 Scientific Advisory Group Rapid Response Report

**Key Research Questions: 1) Among countries who are past their initial peak of COVID-19 cases, what proportion of total cases were in healthcare workers (HCW), and what is the estimated proportion of the total number of HCWs who developed COVID-19 from presumed occupational exposure?**
**2) Is there any evidence that household members of HCWs are at elevated risk of COVID-19 disease, and if so, are there guidelines for mitigating that risk?**

Alberta Health Services

www.albertahealthservices.ca

May 4, 2020

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## Coronavirus: Doctor death toll in Italy rises to 150

Another physician has died says FNOMCEO

Redazione ANSA

ROME

24 April 2020 18:05 NEWS

- 86% of physicians felt they had a greater than 50% chance of acquiring COVID19 during the coming months*

* Informal social media poll

May 4, 2020

https://www.ansa.it/english/news/2020/04/24/coronavirus-doctor-death-toll-in-italy-rises-to-150_5fc712eb-9b2f-40a0-8434-1105f1ea64ca.html

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| | Country/ Region | Total HCW Cases | Total HCWs | General Population Cases | 2018 General Population | HCW risk % | General population risk % |
|---|---|---|---|---|---|---|---|
| High Risk | Italy | **15,314** | 587,211 | **124,063** | 59,844,069 | 2.61% | 0.21% |
| | China (Hubei) | 1,809 | 75,075 | 65,993 | 7,480,925 | 2.41% | 0.88% |
| | Spain | 15,433 | 448,641 | 94,805 | 46,275,109 | 3.44% | 0.21% |
| | **Overall high-risk** | **25,600** | 1,110,927 | **284,861** | 113,600,103 | **2.93%** | **0.25%** |
| Low Risk | China (non-Hubei) | 246 | 6,389,978 | 14,463 | 1,378,784,022 | 0.004% | 0.001% |
| | Philippines | 501 | 590,318 | 2,517 | 106,061,602 | 0.085% | 0.003% |
| | Indonesia | 23 | 760,699 | 1,963 | 266,902,731 | 0.003% | 0.0007% |
| | **Overall low-risk** | **770** | 7,740,996 | **18,943** | 1,751,748,354 | **0.010%** | **0.001%** |
| | **Alberta** | **137** | 103,467 | 4,307 | 4,287,068 | **0.13%** | **0.10%** |

- Source of infection (work, household, community) not reported
- Difficult to determine HCW denominators – hard to determine risk for specific HCW types

May 4, 2020

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**Table 1. Alberta SARS-CoV-2 testing and COVID-19 testing and case data broken down by Alberta Health Services employees, physicians and the general non-healthcare worker population.**

| Group | Number | # tested | % tested | # (%) of test results positive for SARS-CoV-2 | # (%) of test positives from occupational exposure | Occupational risk % (PAR) | Overall risk % (PAR) |
|---|---|---|---|---|---|---|---|
| Total AHS Employees* (non-physician) | 103,467 | 15,603 | 15.1% | 137 (0.9%) | 12 (8.8%) | 0.01% | 0.13% |
| AHS Physician | 7,408 | 933 | 12.6% | 22 (2.4%) | N/A ** | N/A | 0.30% |
| General Population (non-HCW) *** | 4,287,068 | 122,386 | 2.9% | 4,307 (3.5%) | N/A | N/A | 0.10% |
| Total AB Population | 4,397,816 | 138,922 | 3.2% | 4,469 (3.2%) | N/A | N/A | 0.10% |

** 2 cases under investigation. 20 cases linked to single community outbreak

May 4, 2020

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# Key Messages from the Evidence Summary

- Alberta WHS dashboard indicates a current absolute occupational risk of COVID-19 in HCW to be 0.01%, with an overall HCW risk of 0.14% (vs 0.1% risk in the community)
  - May be explained in part by higher rates of testing in the HCW population (15% HCW tested versus 2.9% of the general population tested), and differences in travel patterns amongst HCWs prior to travel restrictions
- There are still no available data on the transmission of COVID-19 from infected HCWs to household members outside case reports
  - Recent publication suggested a household attack rate of 4.7%, supporting prompt household self isolation with any symptoms to further reduce risk (Cheng et al., 2020)

May 4, 2020

Alberta Health Services

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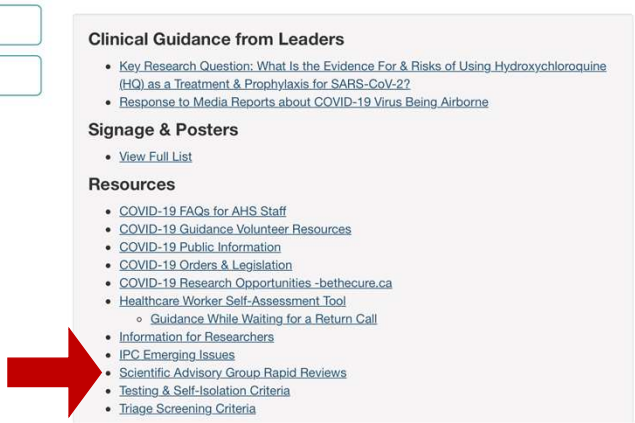
Alberta Health Services

www.albertahealthservices.ca

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## For more information visit

- https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-hcw-risk-rapid-review.pdf

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# COVID CORNER Webinar:

# The Critically Ill COVID-19 ICU Patient

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**Presenters:**
Sean Bagshaw MD MSc
Chris Grant MD FRCPC
Daniel Niven BSc MD MSc, PhD FRCPC
Ken Parhar MD FRCPC
Wendy Sligl BSc MD MSc FRCPC
Sean Spence MD FRCPC

**Panellists:**
Amanda Roze des Ordons MD FRCPC
Brian Yipp MD FRCPC

May 6, 2020

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## Epidemiology & Clinical Features of the Critically Ill Patient with COVID-19

**Daniel Niven BSc MD MSc, PhD FRCPC**
Assistant Professor, Department of Critical Care Medicine, University of Calgary; Community Health Sciences O'Brien Institute for Public Health, University of Calgary

### Disclosure

- Grants of Clinical Trials: MSI foundation, CIHR, Alberta Innovates, Choosing Wisely Alberta. In addition, I am a local PI for the following clinical trials: STARRT-AKI, PROSPECT, REVISE

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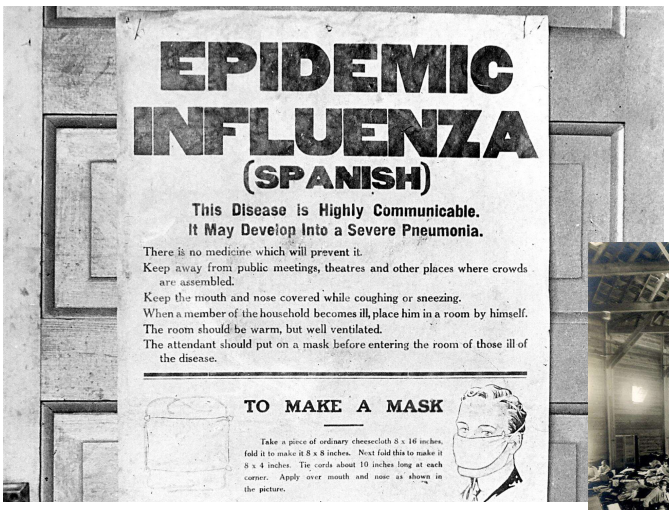


Glenbow Museum

## No ICUs in 1918…

## 17M– 50M deaths worldwide

Otis Historical Archives, National Museum of Health and Medicine

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## Between 1 and 10% of COVID-19 Cases Admitted to ICUs Worldwide

Image Source: *The Province*, Sep 25, 2012
http://www.canada.com/aboutus/copyright.html

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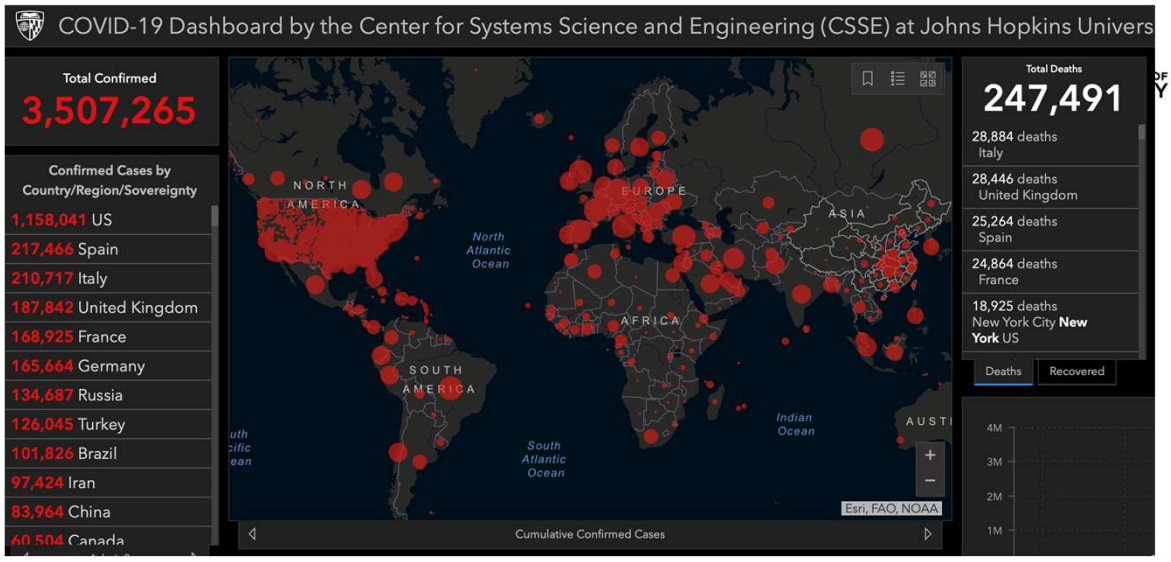


**Potential 350,000 patients with COVID-19 admitted to ICUs worldwide since December 2019!**

https://coronavirus.jhu.edu/map.html 21

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**COVID-19 Patients in a Wuhan ICU**

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https://www.washingt... ...treat-sickest-coronavirus-patients/ 22

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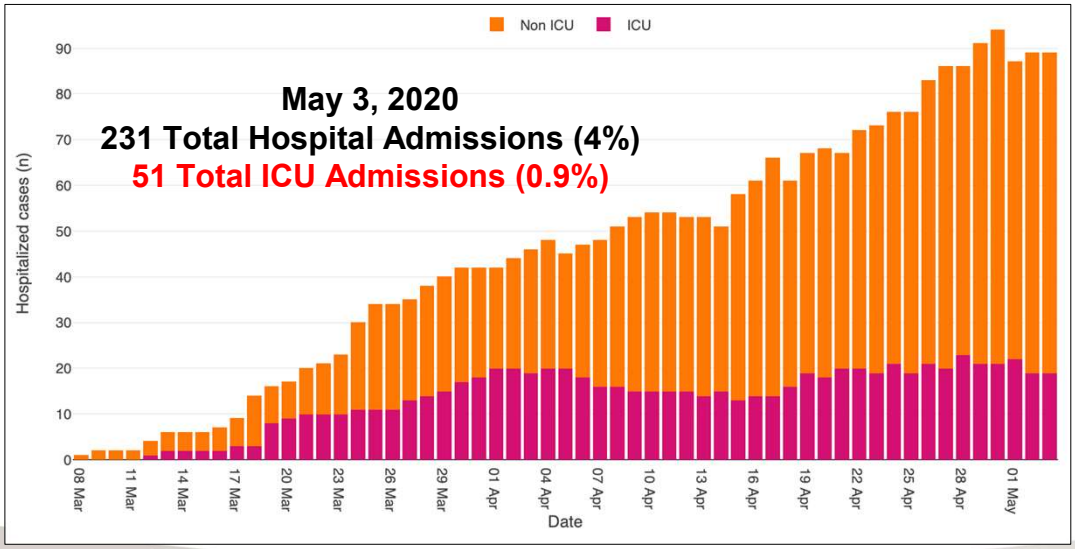
## Physical Distancing Has Insulated Alberta ICUs from Predicted COVID-19 Surge…




https://covid19stats.alberta.ca

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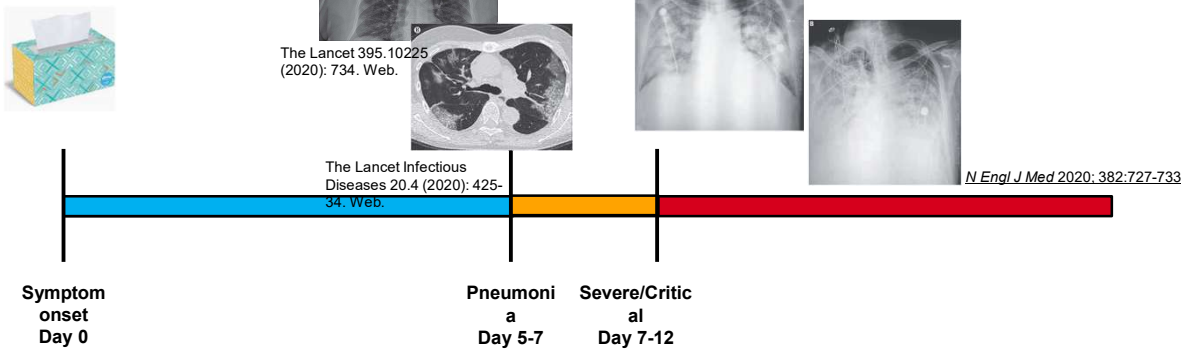
## Progression from Mild to Severe/Critical COVID-19




- **Severe-** Dyspnea, RR >=30, PaO2/FiO2 < 300 mmHg, increase in lung infiltrates > 50% within 24-48h
- **Critical-** Respiratory failure (ARDS), shock, multiple organ dysfunction syndrome

Phua et al. Lancet Resp Med 2020. ePub April 6

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icnarc intensive care national audit & research centre

25 years and counting...

Napier House
24 High Holborn
London WC1V 6AZ
email: COVID-19@icnarc.org
www.icnarc.org

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## ICNARC report on COVID-19 in critical care

01 May 2020

- One of (if not the…) **best source of data on critically ill COVID-19 patients** to date
- **7,542 patients with COVID-19 from 254 adult ICUs** in England, Wales, and Northern Ireland
- **5,139 patients with outcome data** reported

https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports 25

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## COVID-19 Compared to Non-COVID Viral Pneumonia

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| Characteristic | Patients with COVID-19 N = 7542 | Non-COVID Viral PNA 2017-19 N=5782 |
|---|---|---|
| Median Age (IQR) | 60 (52 – 68) years | 61 (48 – 71) years |
| **Male Sex** | **72%** | **54%** |
| **Non-caucasian ethnicity** | **41%** | **14%** |
| Very severe comorbidity | 8% | 24% |
| PaO2/FiO2 ratio < 200 mmHg | 88% | 77% |
| Median APACHE II (IQR) | 14 (11 – 18) | 17 (13 – 21) |
| **Mechanical ventilation in 1st 24h** | 66% | 43% |
| **Death in ICU** | **49%** | **22%** |
| Median ICU LOS in Survivors (IQR) | 6 (3 – 13) days | 6 (3 – 12) days |
| Median duration advanced resp support | 9 (5 – 15) days | 9 (4 – 17) days |

https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports 26

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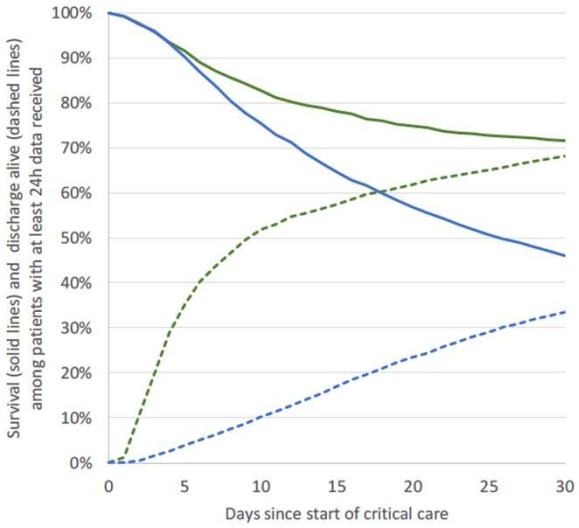
## Survival Dependent on Degree of Organ Support Required




Patients not receiving mechanical ventilation in the first 24h

Patients receiving mechanical ventilation in the first 24h

**Survival > 70%**

**Survival < 50%**

https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports 27

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## Other Factors Associated with Death: COVID-19 Compared to Non-COVID Viral Pneumonia

| Characteristic | Patients with COVID-19 Who Died in Critical Care | Non-COVID Viral PNA 2017-19 Who Died in Critical Care |
|---|---|---|
| Age >= 70 years | 67% | 32% |
| Male sex | 51% | 24% |
| Any very severe comorbidities | 57% | 34% |
| Advanced resp support only | 47% | 19% |
| Advanced resp and cardiovascular support | 71% | 41% |
| Advanced resp, cardiovascular and renal support | 83% | 58% |

https://www.icnarc.org/Our-Audit/Audits/Cmp/Reports 28

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## COVID-19 Thrombotic Phenotype – Link To MODS?

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CORRESPONDENCE

COVID-19 CASES

**Coagulopathy and Antiphospholipid Antibodies in Patients with Covid-19**

CORRESPONDENCE

**ST-Segment Elevation in Patients with Covid-19 — A Case Series**

Photo by Brad Barket/Invision/AP, File
https://www.cbc.ca/news/canada/hamilton/cordero-amputations-complications-1.5542217

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ORIGINAL

## High risk of thrombosis in patients with severe SARS-CoV-2 infection: a multicenter prospective cohort study

Check for updates

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- **Propensity-matched cohort study from 4 ICUs** in France
- Compared to 145 non-COVID ARDS pt, 77 COVID ARDS pt:
  - **Increased pulmonary emboli: 11.7% vs 2.1% (p = 0.01)**
  - Increased extracorporeal circuit clotting (CRRT Filters)
- **Mechanism increased thrombogenicity not clear**

Helms et al. Intensive Care Medicine 2020 30

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## COVID-19 Scientific Advisory Group Rapid Response Report

**Key Research Question: Are there clinical features that reliably indicate need for intubation and mechanical ventilation? Among patients requiring intubation and mechanical ventilation, are there clinical features that predict probability of survival or mortality?**

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www.albertahealthservices.ca

April 10, 2020

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## Key Messages from the Evidence Summary

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- Several guidelines provide consensus based indications for intubation
  - No empirically-derived evidence to guide best practice in COVID-19 patients
- Published mortality rates for intubated patients is 40-70%
  - Older patients and those with co-morbidity have higher mortality risk, particularly after intubation
    - CV disease, chronic respiratory disease, hypertension, diabetes
  - Recommend clinicians consider early goals of care discussions

April 10, 2020

https://www.albertahealthservices.ca/assets/info/ppih/if-ppih-covid-19-rapid-review-predictors-of-intubation.pdf

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# Diagnosis and Therapy

**Wendy Sligl BSc MD MSc FRCPC**
Professor, Critical Care Medicine and Infectious Diseases, Adjunct appointment, School of Public Health, University of Alberta

**Disclosure**
None to Disclose

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## SARS-CoV2

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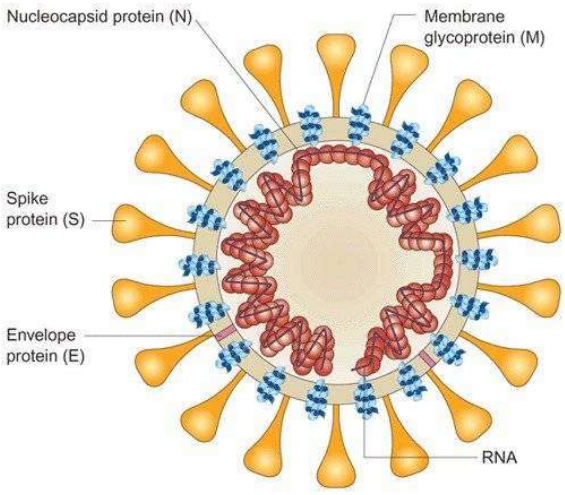


*Nature Reviews Microbiology* ISSN 1740-1534 (online)

*Nature Medicine* 10.12s (2004): S88-S97. Web.

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For image please go to the Financial Times:
https://www.ft.com/content/0faf8e7a-d966-44a5-b4ee-8213841da688

*Financial Times*

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RESEARCH LETTER

**Detection of SARS-CoV-2 in Different Types of Clinical Specimens**

Table. Detection Results of Clinical Specimens by Real-Time Reverse Transcriptase–Polymerase Chain Reaction

| Specimens and values | Bronchoalveolar lavage fluid (n = 15) | Fibrobronchoscope brush biopsy (n = 13) | Sputum (n = 104) | Nasal swabs (n = 8) | Pharyngeal swabs (n = 398) | Feces (n = 153) | Blood (n = 307) | Urine (n = 72) |
|---|---|---|---|---|---|---|---|---|
| Positive test result, No. (%) | 14 (93) | 6 (46) | 75 (72) | 5 (63) | 126 (32) | 44 (29) | 3 (1) | 0 |
| Cycle threshold, mean (SD) | 31.1 (3.0) | 33.8 (3.9) | 31.1 (5.2) | 24.3 (8.6) | 32.1 (4.2) | 31.4 (5.1) | 34.6 (0.7) | ND |
| Range | 26.4-36.2 | 26.9-36.8 | 18.4-38.8 | 16.9-38.4 | 20.8-38.6 | 22.3-38.4 | 34.1-35.4 | |
| 95% CI | 28.9-33.2 | 29.8-37.9 | 29.3-33.0 | 13.7-35.0 | 31.2-33.1 | 29.4-33.5 | 0.0-36.4 | |

Abbreviation: ND, no data.

Wang W, Xu Y, Gao R, et al. Detection of SARS-CoV-2 in Different Types of Clinical Specimens. *JAMA*. Published online March 11, 2020. doi:10.1001/jama.2020.3786

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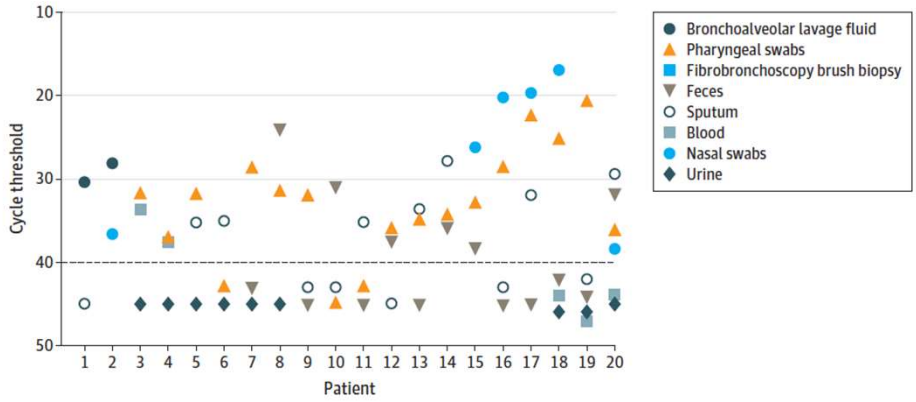
Figure. Severe Acute Respiratory Syndrome Coronavirus 2 Distribution and Shedding Patterns Among 20 Hospitalized Patients




The specimen with a cycle threshold value above the dashed line is interpreted as positive for SARS-CoV-2 RNA; those under, negative.

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nature

Accelerated Article Preview

UNIVERSITY OF CALGARY

# Virological assessment of hospitalized patients with COVID-2019

Received: 1 March 2020

Accepted: 24 March 2020

Accelerated Article Preview
Published online 1 April 2020

Cite this article as: Wölfel, R. et al. Virological assessment of hospitalized patients with COVID-2019. *Nature* https://doi.org/10.1038/s41586-020-2196-x (2020).

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To view graph please go to:
https://www.nature.com/articles/s41586-020-2196-x
They will be available when published

https://www.nature.com/articles/s41586-020-2196-x

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To view graph please go to:
https://www.nature.com/articles/s41586-020-2196-x
They will be available when published

https://www.nature.com/articles/s41586-020-2196-x

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## Diagnostics Take-Home Points

- PCR diagnostic test of choice for active infection
- Sensitivity varies by site and quality of sample collection
  - False negatives can occur – most often due to poor sample acquisition, early or late in disease, in those with pneumonia
- PCR positivity does not necessarily correlate with viable/infectious virus and persists well beyond symptoms and antibody response
  - Infection control implications
- Serologic testing in development

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## Therapeutics

- Number of drugs with in vitro antiviral activity against SARS-CoV2
- Antivirals
  - Lopinavir/ritonavir, hydroxychloroquine, remdesivir
- Immune modulators
  - IL-6 inhibitors, IL-1 inhibitors, steroids, interferons

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The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

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# A Trial of Lopinavir–Ritonavir in Adults Hospitalized with Severe Covid-19

*NEJM*, March 18, 2020

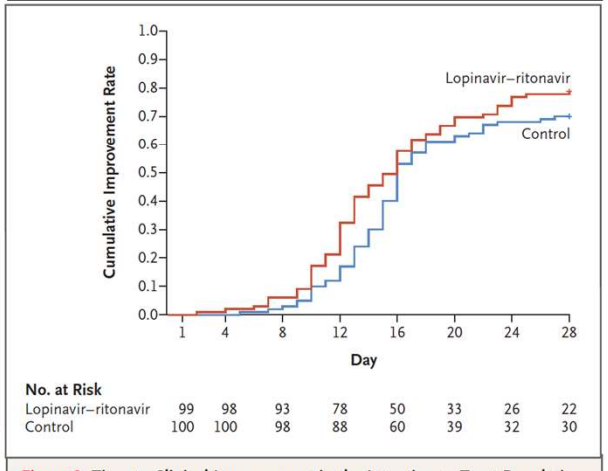


**Figure 2.** Time to Clinical Improvement in the Intention-to-Treat Population.

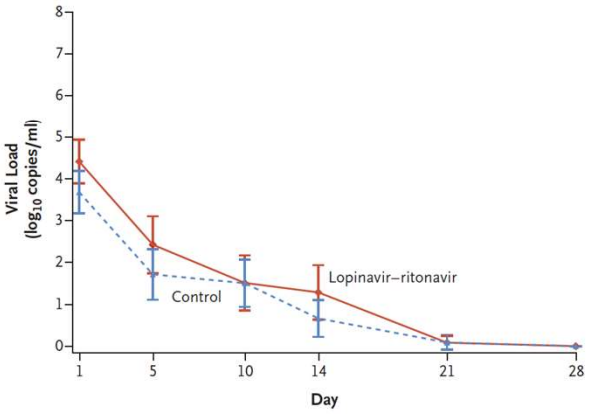


**Figure 3.** Mean Change from Baseline in SARS-CoV-2 Viral RNA Load by qPCR on Throat Swabs.

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## Hydroxychloroquine in patients with COVID-19: an open-label, randomized, controlled trial

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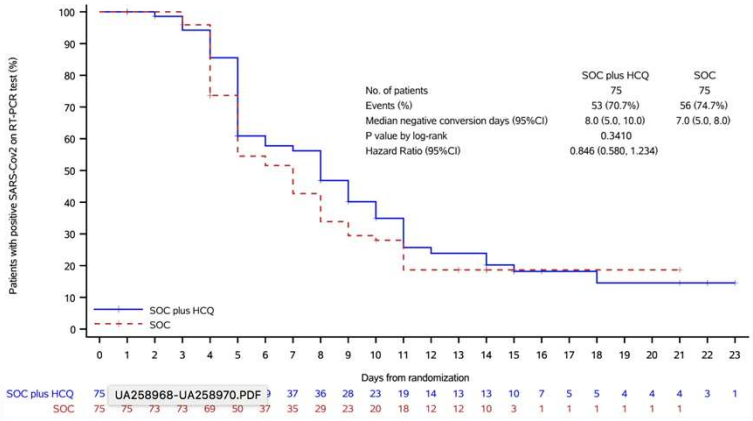
Wei Tang, Zhujun Cao, Mingfeng Han, Zhengyan Wang, Junwen Chen, Wenjin Sun, Yaojie Wu, Wei Xiao, Shengyong Liu, Erzhen Chen, Wei Chen, Xiongbiao Wang, Jiuyong Yang, Jun Lin, Qingxia Zhao, Youqin Yan, Zhibin Xie, Dan Li, Yaofeng Yang, Leshan Liu, Jieming Qu, Guang Ning, Guochao Shi, Qing Xie

**doi:** https://doi.org/10.1101/2020.04.10.20060558

**This article is a preprint and has not been peer-reviewed**




https://www.medrxiv.org/content/10.1101/2020.04.10.20060558v1.full.pdf+html

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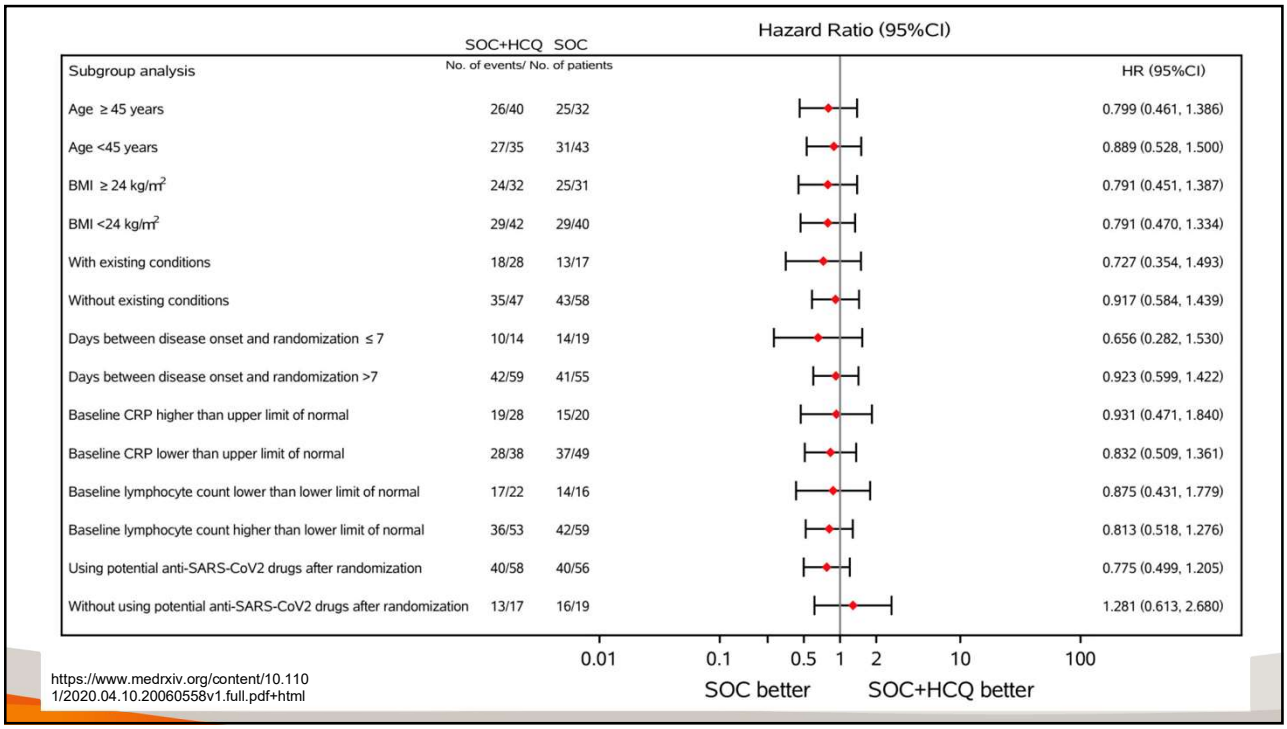


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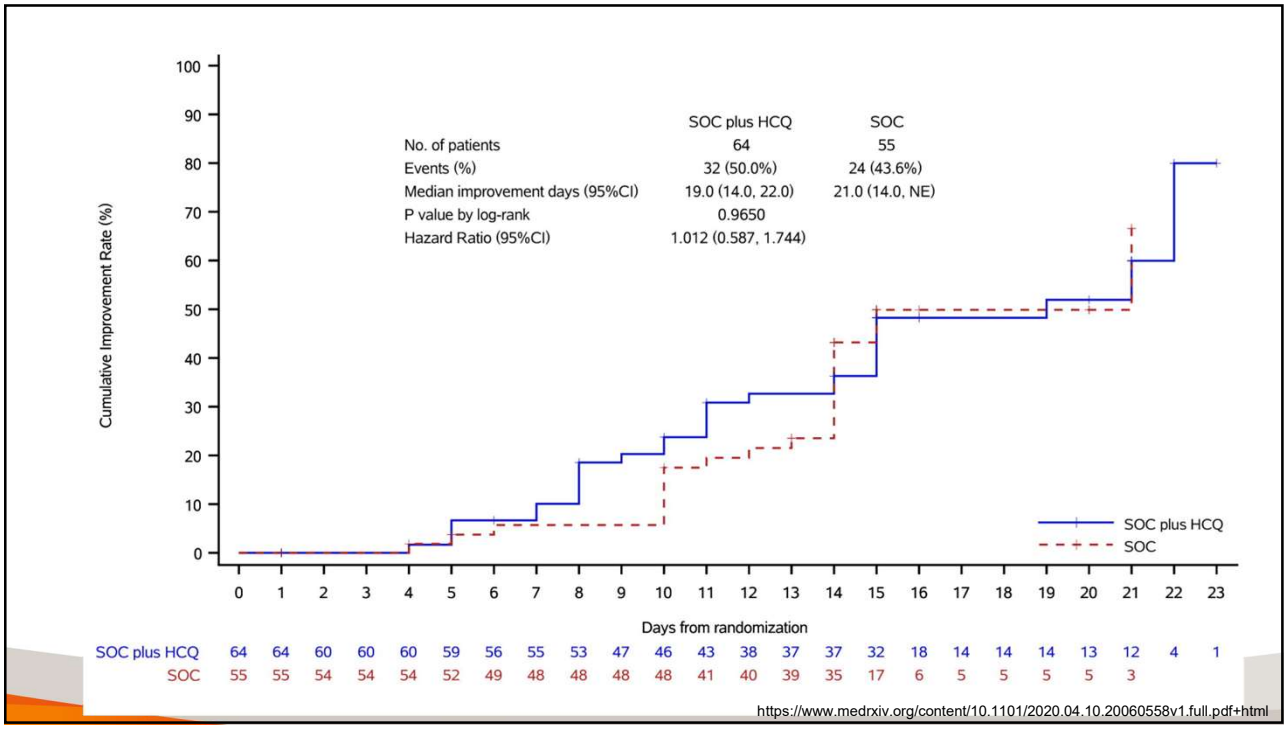


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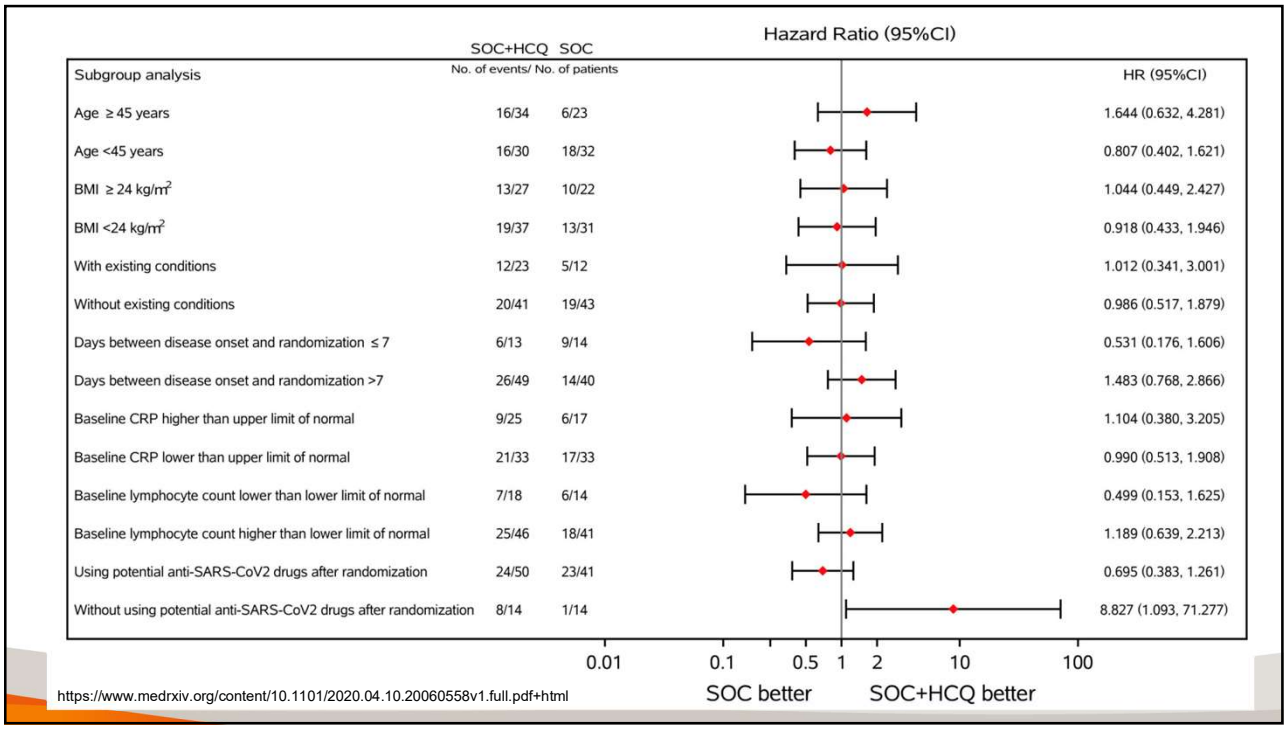


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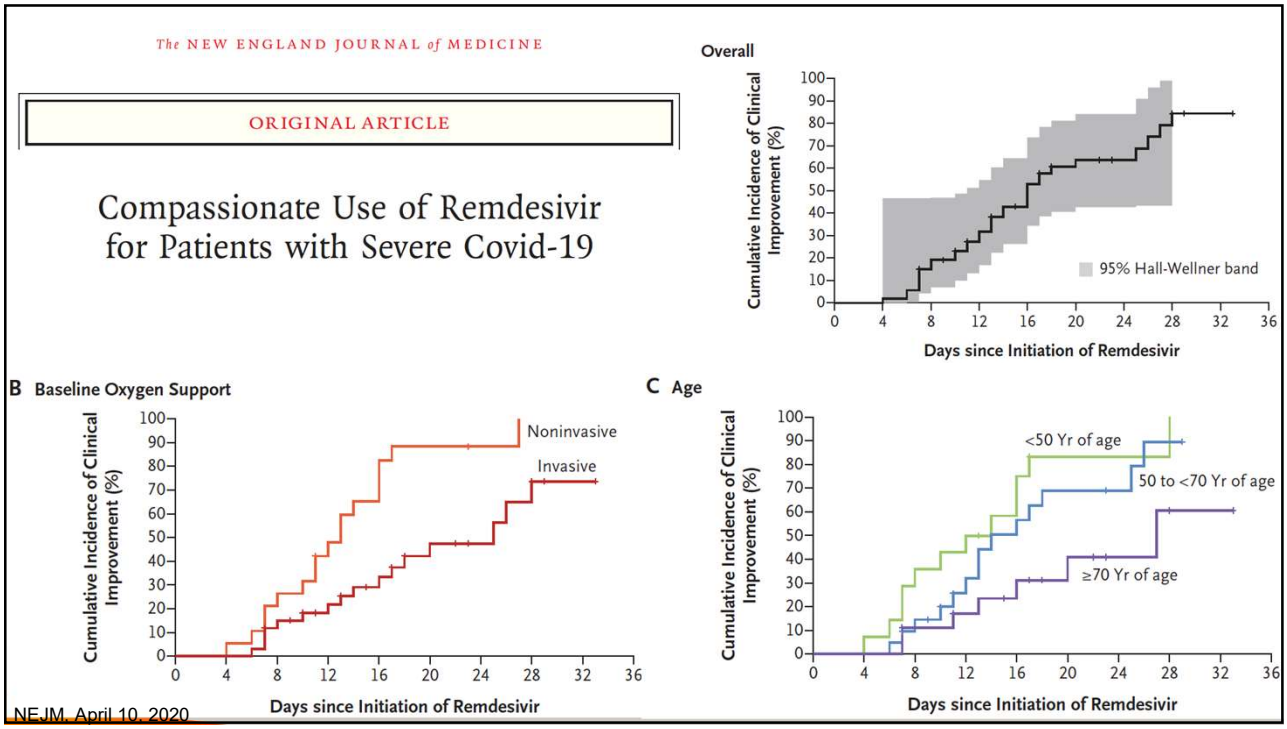


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## Remdesivir in adults with severe COVID-19: a randomised, double-blind, placebo-controlled, multicentre trial

Yeming Wang*, Dingyu Zhang*, Guanhua Du*, Ronghui Du*, Jianping Zhao*, Yang Jin*, Shouzhi Fu*, Ling Gao*, Zhenshun Cheng*, Qiaofa Lu*, Yi Hu*, Guangwei Luo*, Ke Wang, Yang Lu, Huadong Li, Shuzhen Wang, Shunan Ruan, Chengqing Yang, Chunlin Mei, Yi Wang, Dan Ding, Feng Wu, Xin Tang, Xianzhi Ye, Yingchun Ye, Bing Liu, Jie Yang, Wen Yin, Aili Wang, Guohui Fan, Fei Zhou, Zhibo Liu, Xiaoying Gu, Jiuyang Xu, Lianhan Shang, Yi Zhang, Lianjun Cao, Tingting Guo, Yan Wan, Hong Qin, Yushen Jiang, Thomas Jaki, Frederick G Hayden, Peter W Horby, Bin Cao, Chen Wang

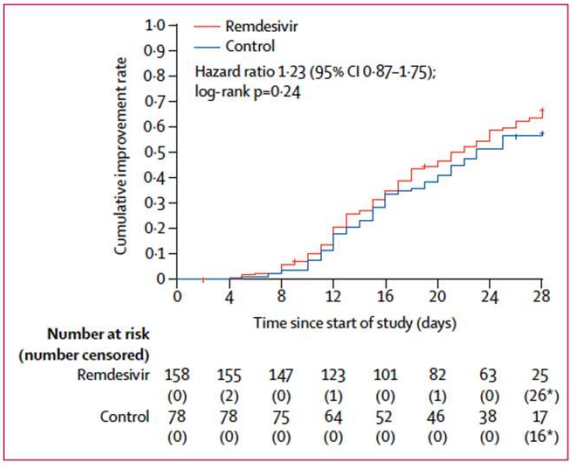


*Figure 2:* Time to clinical improvement in the intention-to-treat population

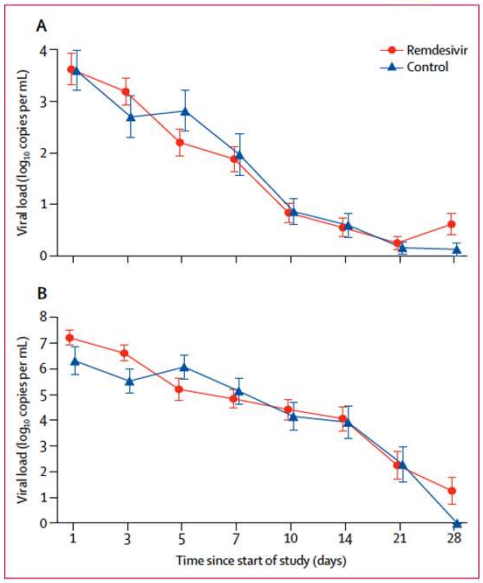


*Figure 3:* Viral load by quantitative PCR on the upper respiratory tract specimens (A) and lower respiratory tract specimens (B)

The Lancet, April 29, 2020

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NIH National Institutes of Health
*Turning Discovery Into Health*

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NEWS RELEASES

Wednesday, April 29, 2020

# NIH clinical trial shows Remdesivir accelerates recovery from advanced COVID-19

Preliminary results indicate that patients who received remdesivir had a 31% faster time to recovery than those who received placebo (p<0.001).

Specifically, the median time to recovery was 11 days for patients treated with remdesivir compared with 15 days for those who received placebo. Results also suggested a survival benefit, with a mortality rate of 8.0% for the group receiving remdesivir versus 11.6% for the placebo group (p=0.059).

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**BREAKING NEWS**

DR. FAUCI ON "SIGNIFICANT" NEW FINDINGS: REMDESIVIR HAS A "CLEAR CUT" EFFECT IN DIMINISHING RECOVERY TIME

CNN

May 01, 2020

**Gilead's Investigational Antiviral Remdesivir Receives U.S. Food and Drug Administration Emergency Use Authorization for the Treatment of COVID-19**

*-- Authorization Enables Broader Use of Remdesivir to Treat Hospitalized Patients with Severe COVID-19 Disease in the United States --*

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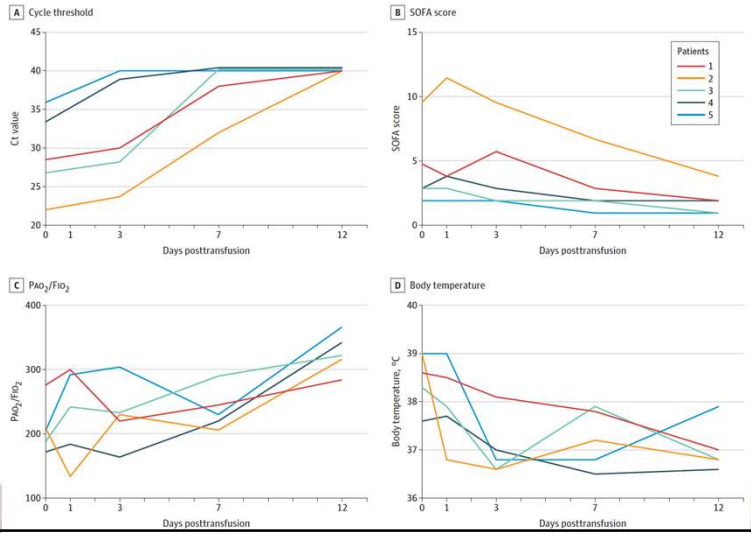
JAMA | Preliminary Communication

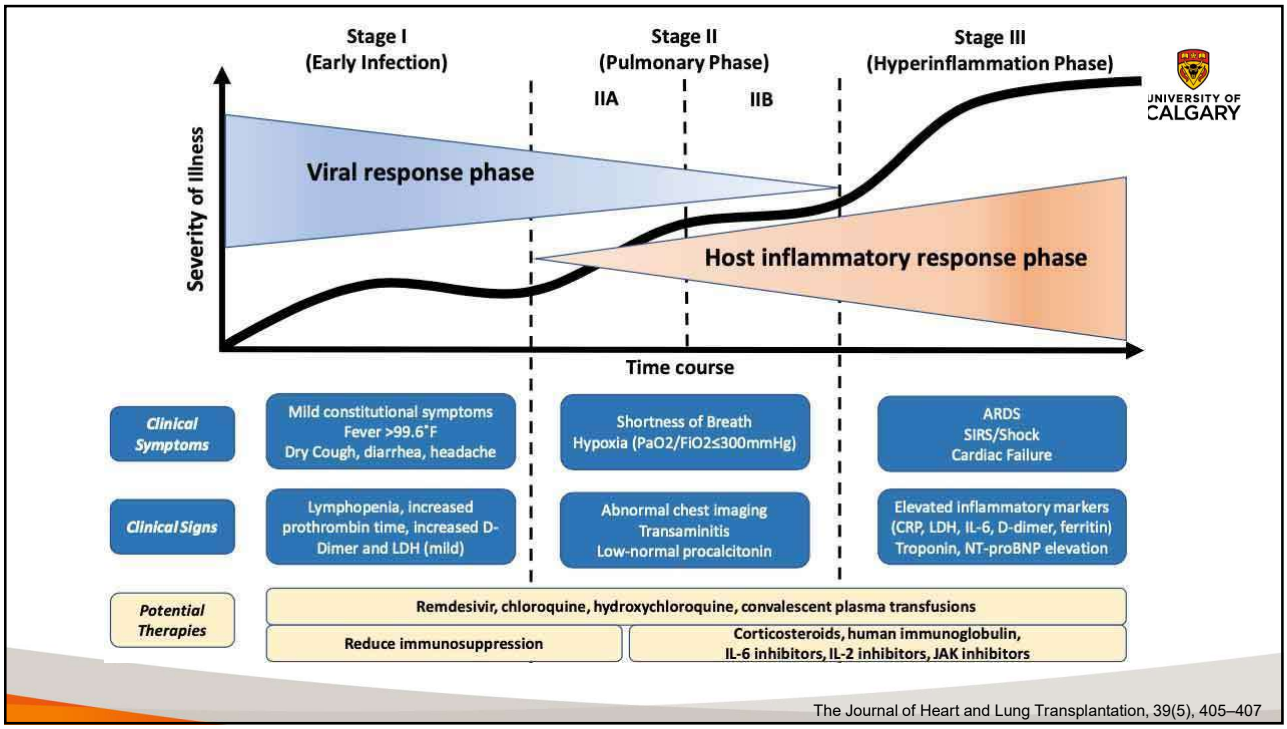
**Treatment of 5 Critically Ill Patients With COVID-19 With Convalescent Plasma**

Chenguang Shen, PhD; Zhaoqin Wang, PhD; Fang Zhao, PhD; Yang Yang, MD; Jinxiu Li, MD; Jing Yuan, MD; Fuxiang Wang, MD; Delin Li, PhD; Minghui Yang, PhD; Li Xing, MM; Jinli Wei, MM; Haixia Xiao, PhD; Yan Yang, MM; Jiuxin Qu, MD; Ling Qing, MM; Li Chen, MD; Zhixiang Xu, MM; Ling Peng, MM; Yanjie Li, MM; Haixia Zheng, MM; Feng Chen, MM; Kun Huang, MM; Yujing Jiang, MM; Dongjing Liu, MD; Zheng Zhang, MD; Yingxia Liu, MD; Lei Liu, MD




*JAMA* 323.16 (2020): 1582-1589. Web.

52

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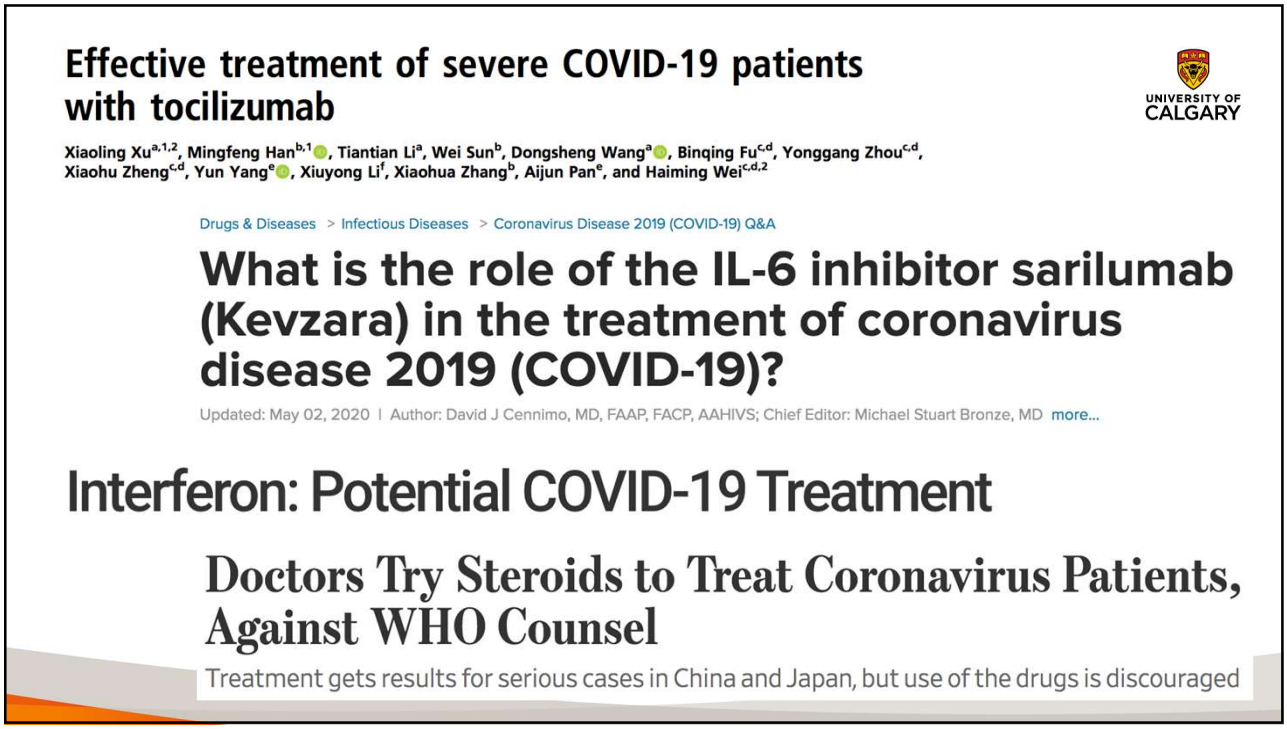


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## Therapeutics Take-Home Points

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- No known effective COVID therapies at this time
- Therapeutic studies to date have been limited by:
  - Small patient populations
  - Lack of comparison group in some studies
  - Limited outcome and safety data
  - Lack of correlation between reduction in viral load and clinical outcomes
- Clinical trials ongoing

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# Nonpharmacological Management

**Ken Parhar MD FRCPC**

Intensivist; Clinical Assistant Professor, Department of Critical Care Medicine, University of Calgary

**Disclosure**

Membership on advisory boards or speakers' bureau: Elsius Biomedical
Grants or clinical trials: PI/CoPI on TheraPPP Trial, SMART-BP Trial, COVI-PRONE trial, CORONA trial , SubI on CATCO

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## Learning Objectives

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- To review ARDS
- To review non-pharmacological management strategies for COVID19 ARDS including:
  - Lung protective ventilation
  - Prone Positioning
  - Extracorporeal Life Support
  - (Neuromuscular Blockade)

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## What is ARDS?

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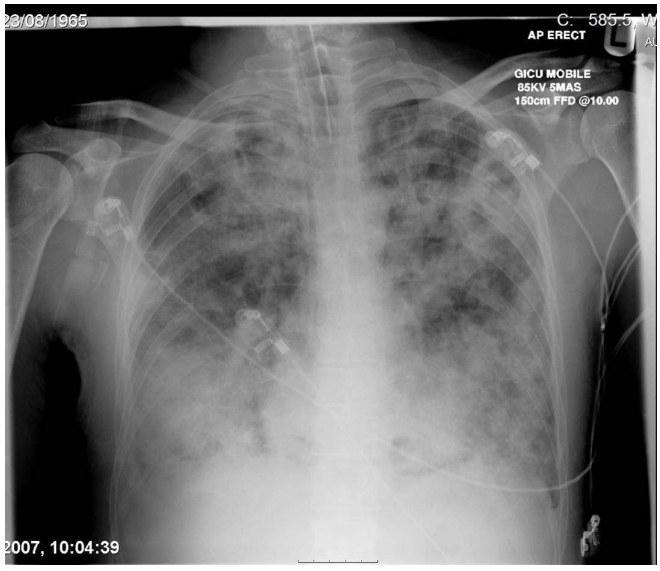


Ferguson N et al - Intensive Care Med (2012) 38:1573–1582

58

## What is ARDS?

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- ARDS is a Syndrome (not an etiology)
- Characterized by
  - hypoxemic respiratory failure
  - reduced lung compliance
  - bilateral pulmonary infiltrates

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## Risk Factors for ARDS

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| Table 2. Risk Factors for ARDS. |
|---|
| **Direct lung-injury risk factors** |
| Pneumonia (bacterial, viral, fungal, or opportunistic)* |
| Aspiration of gastric contents* |
| Pulmonary contusion |
| Inhalation injury |
| Near drowning |
| **Indirect lung-injury risk factors** |
| Sepsis (nonpulmonary source)* |
| Nonthoracic trauma or hemorrhagic shock |
| Pancreatitis |
| Major burn injury |
| Drug overdose |
| Transfusion of blood products |
| Cardiopulmonary bypass |
| Reperfusion edema after lung transplantation or embolectomy |

*N Engl J Med* 2017; 377:562-572

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## Berlin Definition - 2012

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| | Acute Respiratory Distress Syndrome | | |
|---|---|---|---|
| **Timing** | Within 1 week of a known clinical insult or new/worsening respiratory symptoms | | |
| **Chest Imaging** [a] | Bilateral opacities – not fully explained by effusions, lobar/lung collapse, or nodules | | |
| **Origin of Edema** | Respiratory failure not fully explained by cardiac failure or fluid overload; Need objective assessment (e.g., echocardiography) to exclude hydrostatic edema if no risk factor present | | |
| | **Mild** | **Moderate** | **Severe** |
| **Oxygenation** [b] | $200 < PaO_2/FiO_2 \leq 300$ with PEEP or CPAP ≥ 5 $cmH_2O$ [c] | $100 < PaO_2/FiO_2 \leq 200$ with PEEP ≥ 5 $cmH_2O$ | $PaO_2/FiO2 \leq 100$ with PEEP ≥ 5 $cmH_2O$ |

JAMA. 2012;307(23):2526-2533

61

## The Baby Lung

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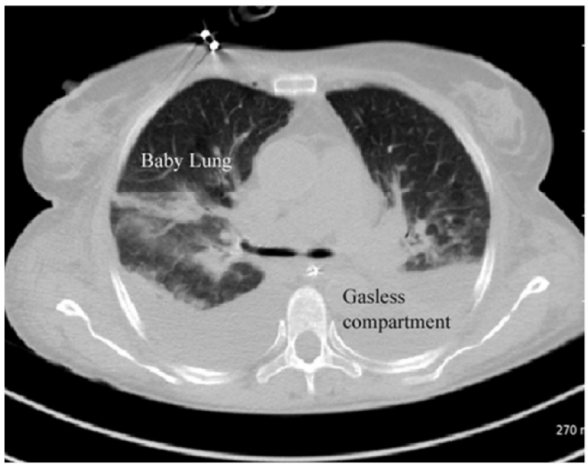
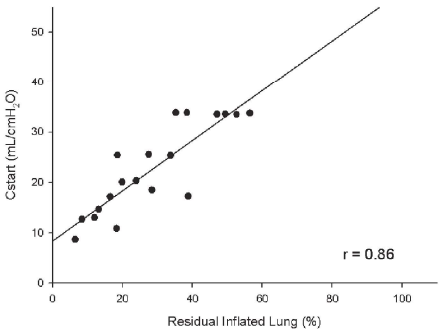
Reduced compliance because ARDS lungs are small not stiff




Intensive Care Med (2016) 42:663–673
DOI 10.1007/s00134-015-4200-8




Intensive Care Med (2005) 31:776–784
DOI 10.1007/s00134-005-2627-z

62

## Ventilator Induced Lung Injury

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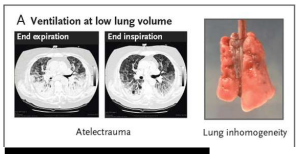
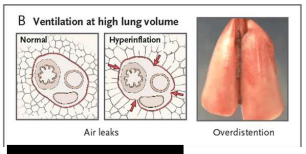
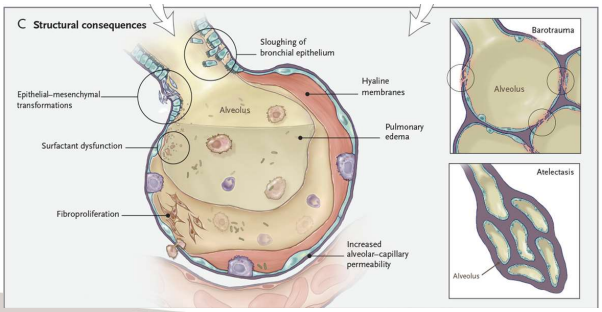


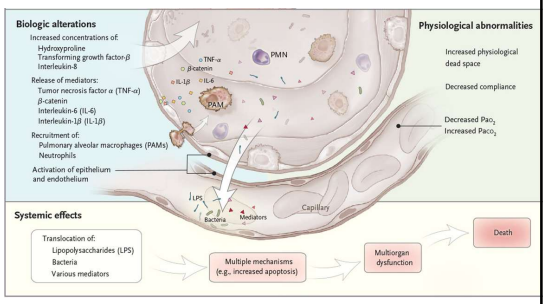

Atelectrauma




Volutrauma
Barotrauma




Biotrauma




VILI through Biotrauma leads to multi-organ dysfunction syndrome to death

N Engl J Med 2013;369:2126-36.
DOI: 10.1056/NEJMra1208707

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## Other types of VILI

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CRITICAL CARE PERSPECTIVE

SILI

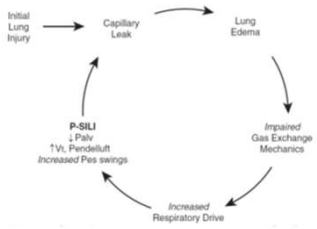
**Mechanical Ventilation to Minimize Progression of Lung Injury in Acute Respiratory Failure**

Laurent Brochard[1,2], Arthur Slutsky[1,2], and Antonio Pesenti[3,4]

[1]Keenan Research Centre for Biomedical Science of St. Michael's Hospital, Toronto, Ontario, Canada; [2]Interdepartmental Division of Critical Care Medicine, University of Toronto, Toronto, Ontario, Canada; [3]Department of Anesthesia, Critical Care, and Emergency, Fondazione Istituto di Ricovero e Cura a Carattere Scientifico Ca' Granda Ospedale Maggiore Policlinico, Milan, Italy; and [4]Dipartimento di Fisiopatologia Medico-Chirurgica e dei Trapianti, Universita degli Studi di Milan, Milan, Italy

American Journal of Respiratory and Critical Care Medicine Volume 195 Number 4 | February 15 2017

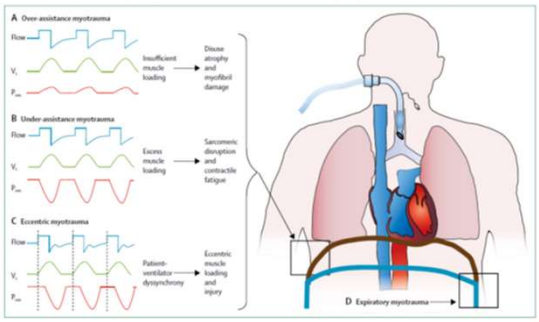
American Journal of Respiratory and Critical Care Medicine 2017, 195(4), 438-442




**Diaphragmatic myotrauma: a mediator of prolonged ventilation and poor patient outcomes in acute respiratory failure**

Ewan C Goligher, Laurent J Brochard, W Darlene Reid, Eddy Fan, Olli Saarela, Arthur S Slutsky, Brian P Kavanagh, Gordon D Rubenfeld, Niall D Ferguson

***Lancet Respir Med* 2019; 7: 90–98**




Myotrauma

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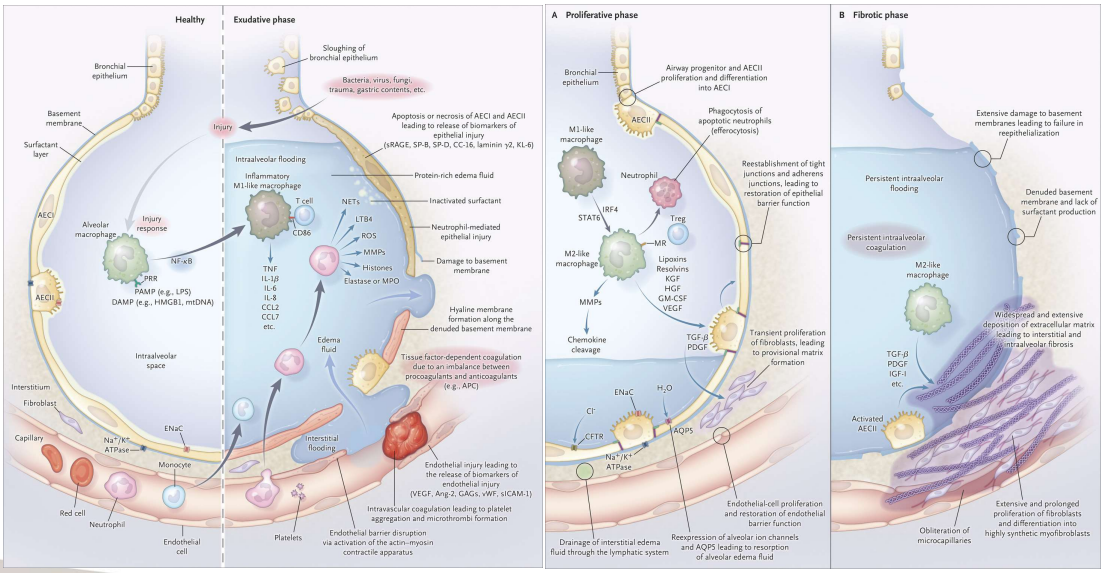
## Pathophysiology

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N Engl J Med 2017; 377:562-572

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## Landmark Trials for Treatment of ARDS

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- Low tidal volume ventilation (ARMA)
- PEEP (LOVS/EXPRESS/ALVEOLI)
- Neuromuscular blockade (ACCURASYS/ROSE)
- Prone Positioning (PROSEVA)
- Oscillator (OSCAR/OSCILLATE)
- Extracorporeal Life Support (CESAR/EOLIA Bayesian)
- Conservative Fluid Strategy (FACTT)
- Esophageal Balloon (EP-VENT1/EP-VENT2)
- ESICM Steroid Recommendations
- Open Lung Ventilation (ART trial)

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## Low Tidal Volume Ventilation – ARMA study

UNIVERSITY OF CALGARY

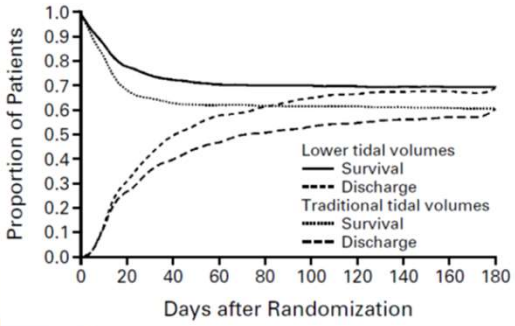
The New England Journal of Medicine



VOLUME 342 MAY 4, 2000 NUMBER 18

VENTILATION WITH LOWER TIDAL VOLUMES AS COMPARED WITH TRADITIONAL TIDAL VOLUMES FOR ACUTE LUNG INJURY AND THE ACUTE RESPIRATORY DISTRESS SYNDROME

THE ACUTE RESPIRATORY DISTRESS SYNDROME NETWORK*




Patient Population: ALI or ARDS (PF < 300)

| VARIABLE | GROUP RECEIVING TRADITIONAL TIDAL VOLUMES | GROUP RECEIVING LOWER TIDAL VOLUMES |
|---|---|---|
| Ventilator mode | Volume assist–control | Volume assist–control |
| Initial tidal volume (ml/kg of predicted body weight)† | 12 | 6 |
| Plateau pressure (cm of water) | ≤50 | ≤30 |
| Ventilator rate setting needed to achieve a pH goal of 7.3 to 7.45 (breaths/min) | 6–35 | 6–35 |
| Ratio of the duration of inspiration to the duration of expiration | 1:1–1:3 | 1:1–1:3 |
| Oxygenation goal | $PaO_2$, 55–80 mm Hg, or $SpO_2$, 88–95% | $PaO_2$, 55–80 mm Hg, or $SpO_2$, 88–95% |
| Allowable combinations of $FiO_2$ and PEEP (cm of water)‡ | 0.3 and 5<br>0.4 and 5<br>0.4 and 8<br>0.5 and 8<br>0.5 and 10<br>0.6 and 10<br>0.7 and 10<br>0.7 and 12<br>0.7 and 14<br>0.8 and 14<br>0.9 and 14<br>0.9 and 16<br>0.9 and 18<br>1.0 and 18<br>1.0 and 20<br>1.0 and 22<br>1.0 and 24 | 0.3 and 5<br>0.4 and 5<br>0.4 and 8<br>0.5 and 8<br>0.5 and 10<br>0.6 and 10<br>0.7 and 10<br>0.7 and 12<br>0.7 and 14<br>0.8 and 14<br>0.9 and 14<br>0.9 and 16<br>0.9 and 18<br>1.0 and 18<br>1.0 and 20<br>1.0 and 22<br>1.0 and 24 |
| Weaning | By pressure support; required by protocol when $FiO_2 \leq 0.4$ | By pressure support; required by protocol when $FiO_2 \leq 0.4$ |

N Engl J Med 2000; 342:1301-1308

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## Driving Pressure

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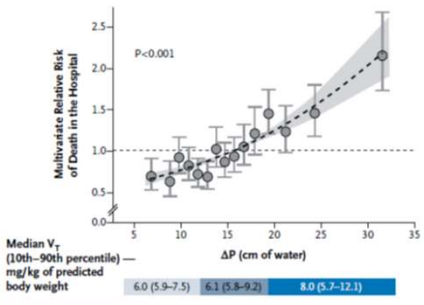
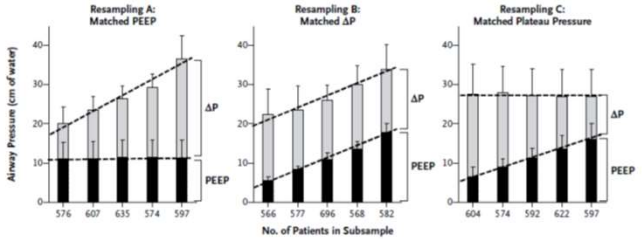
The NEW ENGLAND JOURNAL of MEDICINE
N ENGL J MED 372;8 NEJM.ORG FEBRUARY 19, 2015

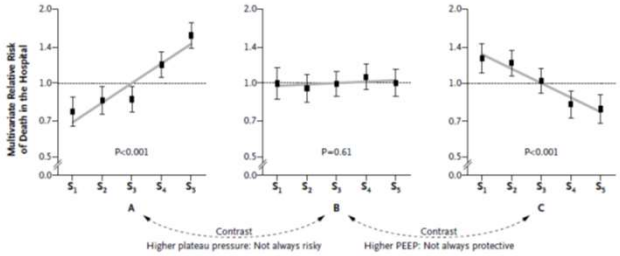
SPECIAL ARTICLE

Driving Pressure and Survival in the Acute Respiratory Distress Syndrome

Marcelo B.P. Amato, M.D., Maureen O. Meade, M.D., Arthur S. Slutsky, M.D.,




Patient Population: ALI or ARDS (PF < 300)

N Engl J Med 2015; 372:747-755

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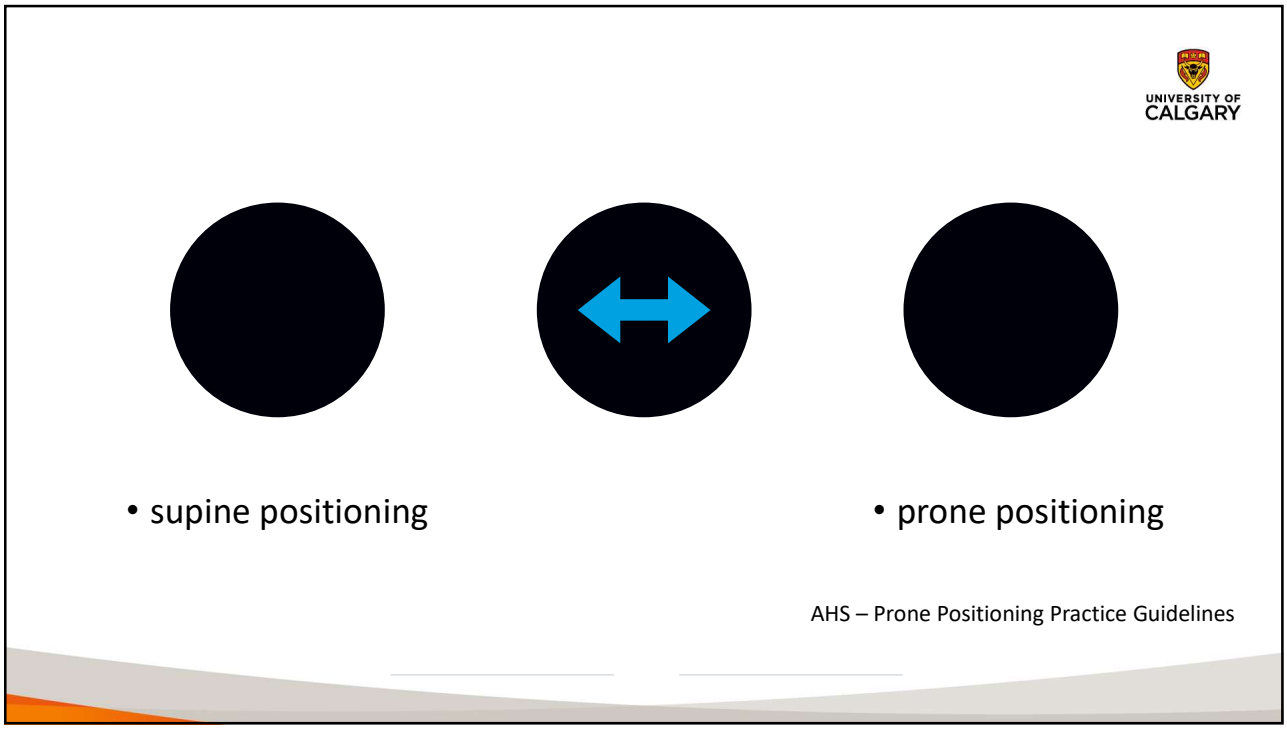


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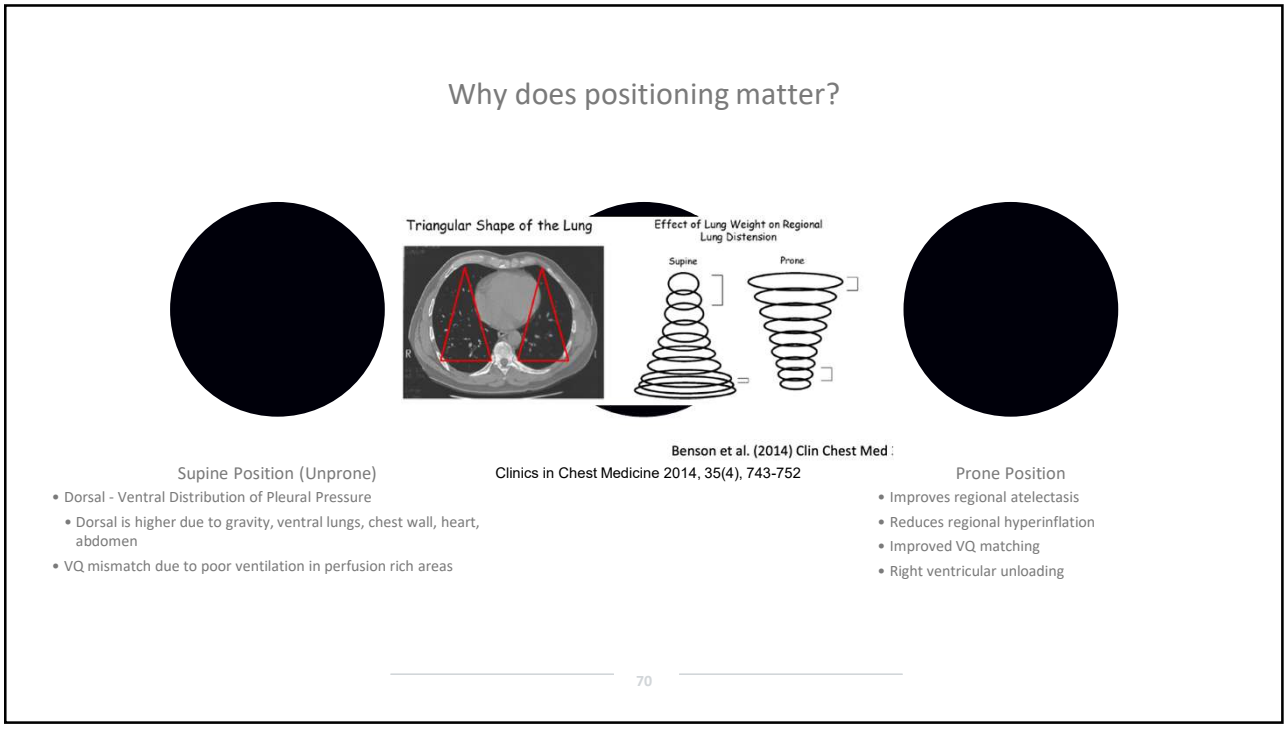


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## PROSEVA trial

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The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 JUNE 6, 2013 VOL. 368 NO. 23

Prone Positioning in Severe Acute Respiratory Distress Syndrome

Claude Guérin, M.D., Ph.D., Jean Reignier, M.D., Ph.D., Jean-Christophe Richard, M.D., Ph.D., Pascal Beuret, M.D.,

Patient Population: Severe ARDS (PF < 150, FiO2 > 0.60 and PEEP ≥ 5 cm H20)

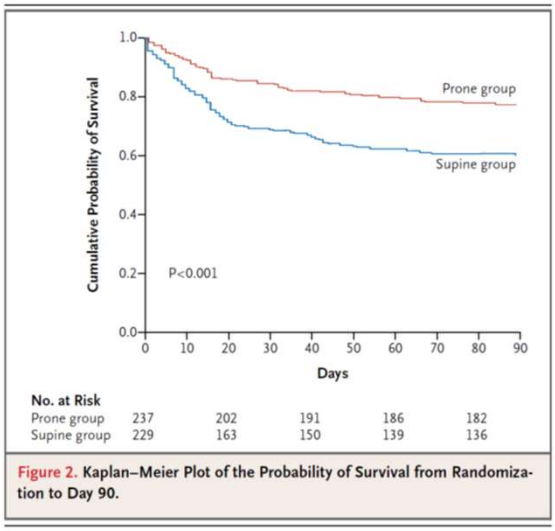


Figure 2. Kaplan–Meier Plot of the Probability of Survival from Randomization to Day 90.

N Engl J Med 2013; 368:2159-2168

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## Veno-venous ECMO

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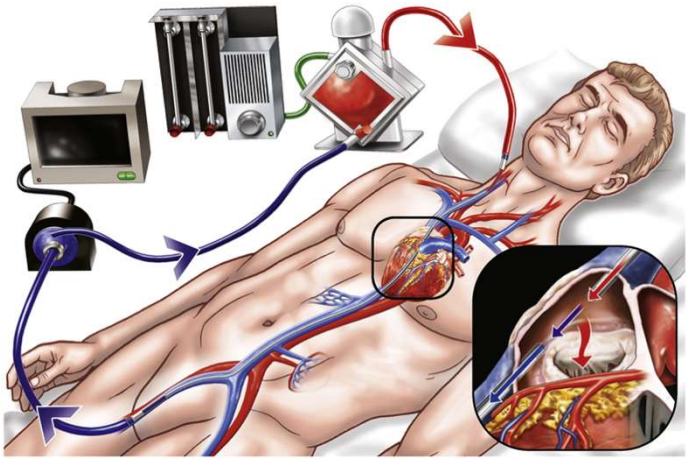

JACC 2014, 63(25), 2769-2778

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## CESAR Trial

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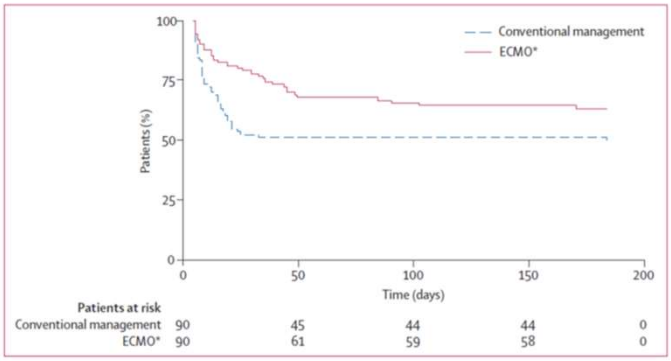
Efficacy and economic assessment of conventional ventilatory support versus extracorporeal membrane oxygenation for severe adult respiratory failure (CESAR): a multicentre randomised controlled trial

Giles J Peek, Miranda Mugford, Ravindranath Tiruvoipati, Andrew Wilson, Elizabeth Allen, Marianna M Thalanany, Clare L Hibbert, Ann Truesdale, Felicity Clemens, Nicola Cooper, Richard K Firmin, Diana Elbourne, for the CESAR trial collaboration

Murray Score:
PaO2/FiO2 ratio
PEEP
Lung compliance
Chest radiograph (no of quadrants involved)




Patient Population:
severe reversible respiratory failure and a Murray score of 3 or higher, FiO2 =1
OR
hypercapnoea with a pH < 7.20 despite optimum conventional treatment

The Lancet 2009, 374(9698), 1351-1363

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## EOLIA trial

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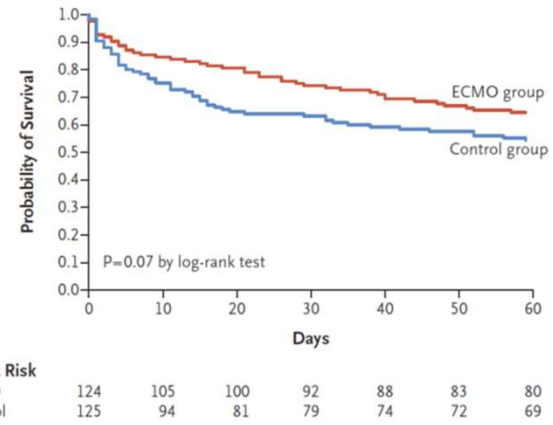
The NEW ENGLAND JOURNAL of MEDICINE
ESTABLISHED IN 1812 MAY 24, 2018 VOL. 378 NO. 21

Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome

A. Combes, D. Hajage, G. Capellier, A. Demoule, S. Lavoué, C. Guervilly, D. Da Silva, L. Zafrani, P. Tirot, B. Veber,

AECC ARDS AND
PF <50 mm Hg for > 3 hours OR
PF <80 for > 6 hours OR
pH < 7.25 or PaCO2 ≥ 60 > 6 hours

Despite vent optimization
(RR>35, plat ≤32 cm H20, PEEP ≥ 10 cm H20, TV 6mL/kg)




N Engl J Med 2018; 378:1965-1975

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## EOLIA – Bayesian post hoc

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Clinical Review & Education

JAMA | Special Communication | CARING FOR THE CRITICALLY ILL PATIENT

### Extracorporeal Membrane Oxygenation for Severe Acute Respiratory Distress Syndrome and Posterior Probability of Mortality Benefit in a Post Hoc Bayesian Analysis of a Randomized Clinical Trial

Ewan C. Goligher, MD, PhD; George Tomlinson, PhD; David Hajage, MD, PhD; Duminda N. Wijeysundera, MD, PhD; Eddy Fan, MD, PhD; Peter Jüni, MD; Daniel Brodie, MD; Arthur S. Slutsky, MD; Alain Combes, MD, PhD

Table 2. Probability of Treatment Effects Estimated by Bayesian Analysis According to Varying Prior Beliefs About Mortality Benefit From ECMO in Patients With Very Severe ARDS

| Prior Belief | Posterior Median RR (95% Credible Interval) | Posterior Probability That True RR Is <Specified Threshold, % | | | |
|---|---|---|---|---|---|
| | | RR <1 | RR <0.9 | RR <0.8 | RR <0.67 |
| Reference prior distributions | | | | | |
| Minimally informative | 0.78 (0.56-1.04) | 96 | 85 | 60 | 18 |
| Strongly enthusiastic | 0.74 (0.57-0.95) | 99 | 94 | 73 | 22 |
| Moderately enthusiastic | 0.78 (0.63-0.96) | 99 | 91 | 61 | 8 |
| Skeptical | 0.84 (0.64-1.07) | 93 | 73 | 39 | 5 |
| Strongly skeptical | 0.88 (0.71-1.09) | 88 | 58 | 18 | 0 |
| Data-derived prior distributions | | | | | |
| No downweighting of previous studies[a] | 0.71 (0.55-0.94) | 99 | 96 | 83 | 48 |
| 50% downweighting of previous studies | 0.73 (0.56-0.96) | 99 | 94 | 77 | 40 |
| 75% downweighting of previous studies | 0.74 (0.56-0.98) | 98 | 92 | 72 | 36 |

Table 3. Probability That Early ECMO Reduces Mortality by a Proposed Minimum Clinically Important Difference According to Varying Prior Beliefs About Mortality Benefit From ECMO in Patients With Very Severe ARDS

| Prior Belief | Posterior Median ARR, % (95% Credible Interval) | Posterior Probability That True ARR Is ≥Specified Threshold, %[a] | | | | | |
|---|---|---|---|---|---|---|---|
| | | 2% | 4% | 6% | 8% | 10% | 20% |
| Reference prior distributions | | | | | | | |
| Minimally informative | 10.6 (−1.8 to 20.0) | 92 | 86 | 78 | 67 | 53 | 2 |
| Strongly enthusiastic | 12.0 (2.1 to 19.9) | 98 | 95 | 89 | 79 | 65 | 2 |
| Moderately enthusiastic | 10.4 (2.0 to 17.2) | 97 | 93 | 85 | 71 | 51 | 0 |
| Skeptical | 7.8 (−3.4 to 16.5) | 86 | 76 | 62 | 47 | 30 | 0 |
| Strongly skeptical | 5.6 (4.1 to 13.3) | 78 | 63 | 45 | 26 | 13 | 0 |
| Data-derived prior distribution | | | | | | | |
| No downweighting of previous studies | 13.6 (2.9 to 20.5) | 98 | 96 | 93 | 88 | 79 | 4 |
| 50% Downweighting of previous studies | 12.8 (1.9 to 20.4) | 97 | 95 | 91 | 83 | 72 | 3 |
| 75% Downweighting of previous studies | 12.1 (1.1 to 20.3) | 97 | 93 | 88 | 79 | 66 | 3 |

Abbreviations: ARDS, acute respiratory distress syndrome; ARR, absolute risk reduction; ECMO, extracorporeal membrane oxygenation; EOLIA, ECMO to Rescue Lung Injury in Severe ARDS.

[a] ARR was computed assuming a baseline mortality risk of 46% (based on the mortality rate in the EOLIA control group).

JAMA. 2018;320(21):2251–2259

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- Guidelines
- Summary of Evidence

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Critical Care

REVIEW Open Access

### Respiratory support in patients with acute respiratory distress syndrome: an expert opinion

AMERICAN THORACIC SOCIETY DOCUMENTS

### An Official American Thoracic Society/European Society of Intensive Care Medicine/Society of Critical Care Medicine Clinical Practice Guideline: Mechanical Ventilation in Adult Patients with Acute Respiratory Distress Syndrome

Am J Respir Crit Care Med Vol 195, Iss 9, pp 1253–1263, May 1, 2017

Clinical Review & Education

JAMA | Review

### Acute Respiratory Distress Syndrome Advances in Diagnosis and Treatment

JAMA. 2018;319(7):698-710. doi:10.1001/jama.2017.21907

Eddy Fan, MD, PhD; Daniel Brodie, MD; Arthur S. Slutsky, MD

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- Questions?
- Supplementary reading….
- Email: ken.parhar@ahs.ca or @kenparhar

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# Post ICU Care

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Clinical Assistant Professor, Department of Critical Care Medicine, Department of Neurosciences, University of Calgary

**Disclosure**

None to Disclose

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https://www.theguardian.com/world/2020/may/01/lingering-and-painful-long-and-unclear-road-to-coronavirus-recovery-long-lasting-symptoms

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# Severe Acute Respiratory Syndrome and Coronavirus

David S.C. Hui, MD(UNSW), FRACP, FRCP[a,*], Paul K.S. Chan, MD, FRCPath[b]

**KEYWORDS**
• SARS • Clinical features • Pathogenesis
• Treatment • Outcome

Severe acute respiratory syndrome (SARS) emerged unexpectedly in 2003 and posed an enormous threat to international health and economy.[1–4] By the end of the epidemic in July 2003, 8098 probable cases were reported in 29 countries and regions with a mortality of 774 (9.6%).[5] SARS re-emerged at small scales in late 2003 and early 2004 in South China after resumption of wild animal trading activities in markets.[6,7]

"The functional disability seems out of proportion to the degree of lung function impairment"

Infect Dis Clin North Am. (2010) 24(3):619-38

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The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 FEBRUARY 20, 2003 VOL. 348 NO. 8

## One-Year Outcomes in Survivors of the Acute Respiratory Distress Syndrome

Margaret S. Herridge, M.D., M.P.H., Angela M. Cheung, M.D., Ph.D., Catherine M. Tansey, M.Sc., Andrea Matte-Martyn, B.Sc., Natalia Diaz-Granados, B.Sc., Fatma Al-Saidi, M.D., Andrew B. Cooper, M.D., Cameron B. Guest, M.D., C. David Mazer, M.D., Sangeeta Mehta, M.D., Thomas E. Stewart, M.D., Aiala Barr, Ph.D., Deborah Cook, M.D., and Arthur S. Slutsky, M.D., for the Canadian Critical Care Trials Group

ABSTRACT

BACKGROUND

As more patients survive the acute respiratory distress syndrome, an understanding of the long-term outcomes of this condition is needed.

METHODS

We evaluated 109 survivors of the acute respiratory distress syndrome 3, 6, and 12 months after discharge from the intensive care unit. At each visit, patients were interviewed and underwent a physical examination, pulmonary-function testing, a six-minute–walk test, and a quality-of-life evaluation.

RESULTS

Patients who survived the acute respiratory distress syndrome were young (median age, 45 years) and severely ill (median Acute Physiology, Age, and Chronic Health Evaluation score, 23) and had a long stay in the intensive care unit (median, 25 days). Patients

From the Department of Medicine, University Health Network (M.S.H., A.M.C., C.M.T., A.M.-M., F.A.-S.); the Interdepartmental Division of Critical Care Medicine (M.S.H., A.B.C., C.B.G., C.D.M., S.M., T.E.S., A.S.S.); the Department of Public Health Sciences (A.M.C., N.D.-G., A.B.); the Departments of Critical Care Medicine and Anaesthesia, Sunnybrook and Women's College Health Sciences Centre (A.B.C., C.B.G.); the Departments of Anesthesia and Critical Care Medicine (C.D.M.) and Medicine and Critical Care Medicine (A.S.S.), St. Michael's Hospital; the Departments of Medicine (S.M., T.E.S.) and Anesthesia

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ARDS survivors 1 year after ICU

- n = 109
- young (45 years)
- sick (APACHE II = 23)
- long ICU stays (25 days)
- long time on vent (21 days)

NEJM. (2003) 348(8):683-93

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**Table 3. Ability to Exercise and Return to Work and Health-Related Quality of Life among Patients with the Acute Respiratory Distress Syndrome during the First 12 Months after Discharge from the ICU.**

| Outcome | 3 Months | 6 Months | 12 Months |
|---|---|---|---|
| Distance walked in 6 min | | | |
| No. evaluated | 80* | 78† | 81‡ |
| Median — m | 281 | 396 | 422 |
| Interquartile range — m | 55–454 | 244–500 | 277–510 |
| Percentage of predicted value§ | 49 | 64 | 66 |
| Returned to work — no./total no. (%)¶ | 13/83 (16) | 26/82 (32) | 40/82 (49)‖ |
| Returned to original work — no./total no. (%) | 10/13 (77) | 23/26 (88) | 31/40 (78) |
| SF-36 score** | | | |
| Physical functioning | | | |
| Median (normal value) | 35 (90) | 55 (89) | 60 (89) |
| Interquartile range | 15–58 | 30–75 | 35–85 |
| Physical role | | | |
| Median (normal value) | 0 (85) | 0 (84) | 25 (84) |
| Interquartile range | 0–0 | 0–50 | 0–100 |
| Pain | | | |
| Median (normal value) | 42 (77) | 53 (77) | 62 (77) |
| Interquartile range | 31–73 | 37–84 | 41–100 |
| General health | | | |
| Median (normal value) | 52 (78) | 56 (77) | 52 (77) |
| Interquartile range | 35–67 | 36–74 | 35–77 |
| Vitality | | | |
| Median (normal value) | 45 (69) | 55 (68) | 55 (68) |
| Interquartile range | 30–55 | 28–63 | 28–63 |
| Social functioning | | | |
| Median (normal value) | 38 (88) | 63 (88) | 63 (88) |

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One year after ICU discharge …

NEJM. (2003) 348(8):683-93

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One year after ICU discharge …

- Physical: 6-minute walk = 2/3$^{rds}$ of predicted

NEJM. (2003) 348(8):683-93

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One year after ICU discharge …

- Physical: 6-minute walk = 2/3$^{rds}$ of predicted
- Return to work: 49%

NEJM. (2003) 348(8):683-93

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| Median (normal value) | 38 (88) | 63 (88) | 63 (88) |
| Interquartile range | 19–69 | 38–88 | 38–100 |

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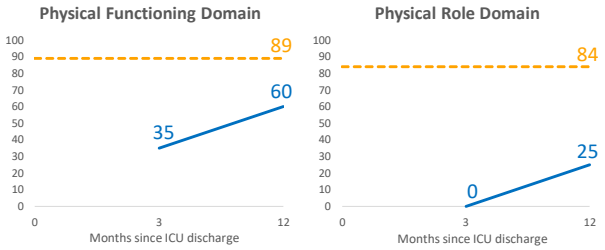
One year after ICU discharge …

- Physical: 6-minute walk = 2/3rds of predicted
- Return to work: 49%
- Quality of life: not so great




NEJM. (2003) 348(8):683-93

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# Impact of Patient and Family Involvement in Long-Term Outcomes

Christopher J. Grant, MD, FRCPC[a,b,c,*], Lauren F. Doig[c,d], Joanna Everson, MN, NP[c,e], Nadine Foster, RN[f], Christopher James Doig, MD, MSc, FRCPC[a,c,g]

**KEYWORDS**

- Critical care • Critical illness recovery • Critical care outcomes
- Post–intensive care syndrome (PICS)
- Post–intensive care syndrome, family (PICS-F)

**KEY POINTS**

- Recovery from a critical illness includes addressing physical, cognitive, emotional, and functional effects that can persist for many months following discharge from an intensive care unit (ICU).
- Attending to patient and family care needs across the spectrum of care (in the ICU, on the

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Critical illness affects families …

relationships, social, financial

"I'm so tired I can't imagine having sex. I need help getting dressed. I need help with personal care. After dialysis I want to puke. After I eat, I want to puke. Sex is the last thing on my mind. I haven't even asked my wife. Do you think she wants to have sex with the person whose bum she has to wipe?"

– patient

CCNC. (2020) In press.

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## What to expect

- A large percentage will not express concerns
  … but, when you scratch the surface:
  - "I'm weak."
  - "I'm fatigued."
  - "I can't sleep."
  - "I can't think."
  - "I don't remember what happened."
  - "I'm stressed."
  - "How do I go back to work?"
  - "Will I get sick again?"
- Commonly they don't volunteer symptoms. You have to ask.

- A small percentage will be camped out in your waiting room.
- Typically :
  - Non-cardiopulmonary medical concerns
    - Shoulder pain
    - digit ischemia
    - neuropathy
    - Telogen effluvium
  - Mental health
    - Stress/anxiety > mood
- These people are looking for help.

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## Issues following critical illness

- Medical/Surgical

  (typically fairly straightforward)

- Recovery/Rehabilitation

  (sometimes challenging)

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## Medical issues post-critical illness

- Key information resources:
  - ICU transfer summary
  - Hospital discharge summary
- Important touch points:
  a) New diagnoses (education)
  b) Specialist follow-ups and procedures
  c) Medication Reconciliation (e.g. stress ulcer prophylaxis, anti-psychotics)
  d) Incidental findings (e.g. hernias, pulmonary nodules, renal cysts)
  e) Addictions (alcohol, smoking, substances)
  f) Goals of care

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## Rehabilitation issues post-critical illness

- Start with grandmother medicine:
  - "Eat well. Sleep well. Move your body. Do joyful, meaningful things."
- Give permission
- Focus on function
  - Likely, physical reconditioning is the lowest hanging fruit.
  - Leave room for the patient to discuss feelings. Expect stress.
  - Ask about cognitive concerns. Validate if present, but probably try to fix the pain, mood, sleep, anxiety, social, and vocational issues first.

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albertahealthservices.ca/icurecovery

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# COVID-19 in Rural Alberta

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**Disclosure**
None to Disclose

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## Geographic Context

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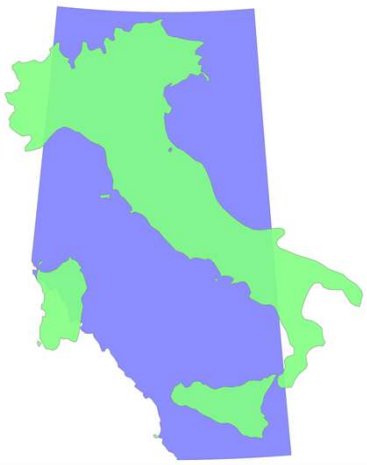
- **Population of Alberta:**
  - 4,371,316 (AB Gov)
- **Population of Italy:**
  - 60,421,760 (Worldbank)
- **Surface Area:**
  - Alberta 2.2x larger



http://www.comparea.org/ITA+CA_AB/

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## Not Just an Urban Disease

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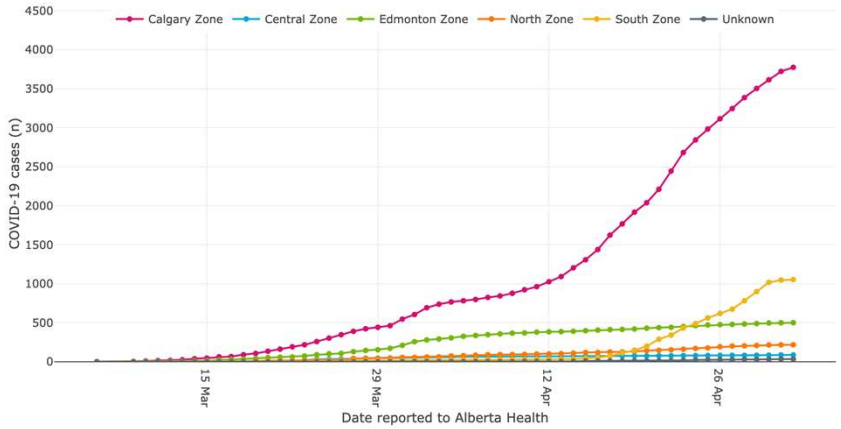


Figure 10: Cumulative COVID-19 cases in Alberta by zone and date reported to Alberta Health

https://covid19stats.alberta.ca/

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## Not Just an Urban Disease (cont.)

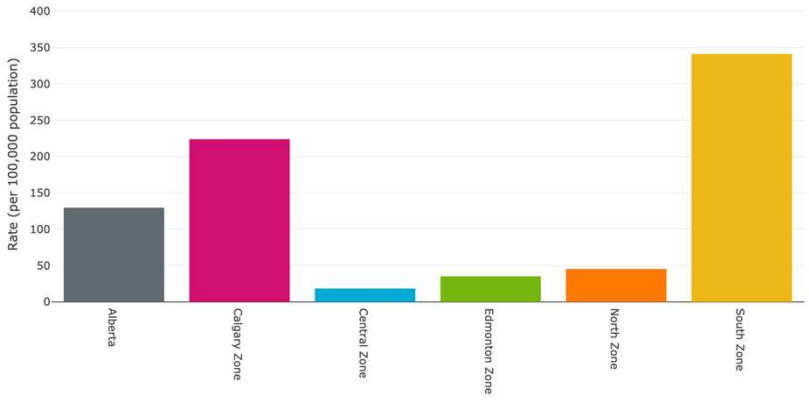


Figure 11: Rate of COVID-19 cases (per 100,000 population) in Alberta and by zone

https://covid19stats.alberta.ca/

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## RAAPID

Referral, Access, Advice, Placement, Information & Destination

North: 1-800-282-9911 · 780-735-0811

South: 1-800-661-1700 · 403-944-4486

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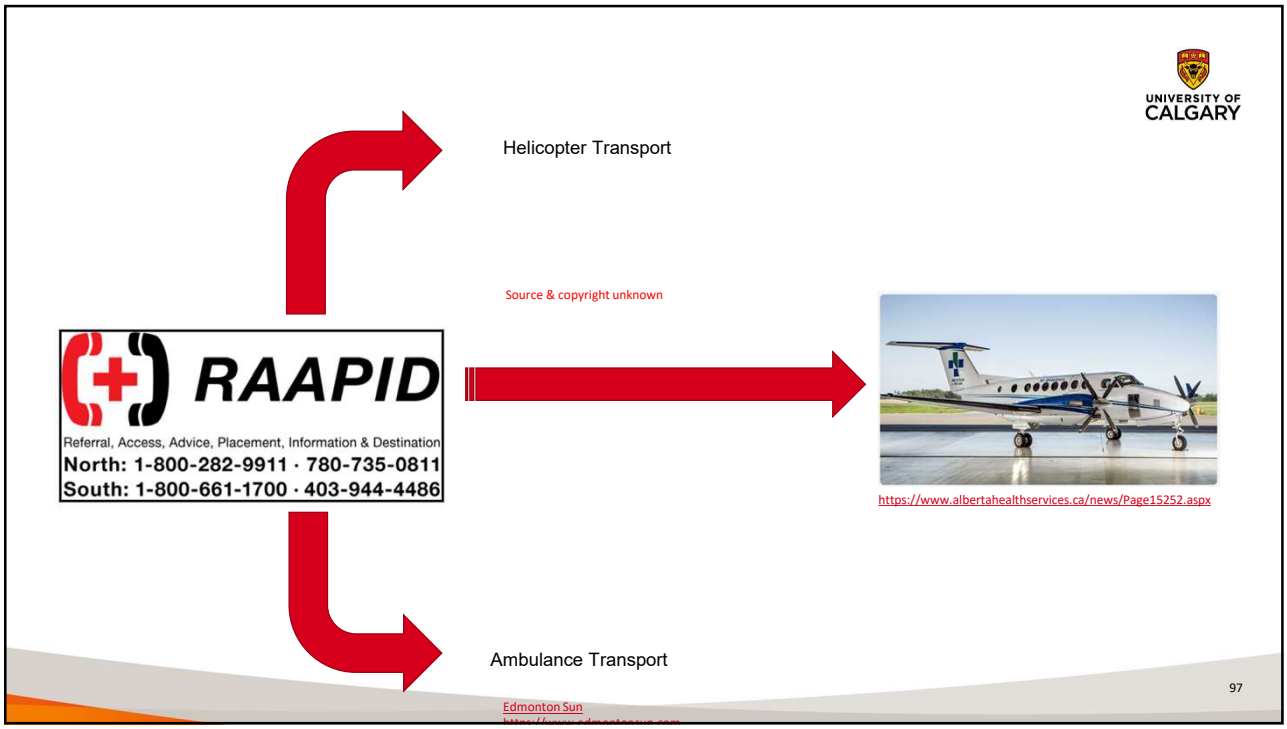


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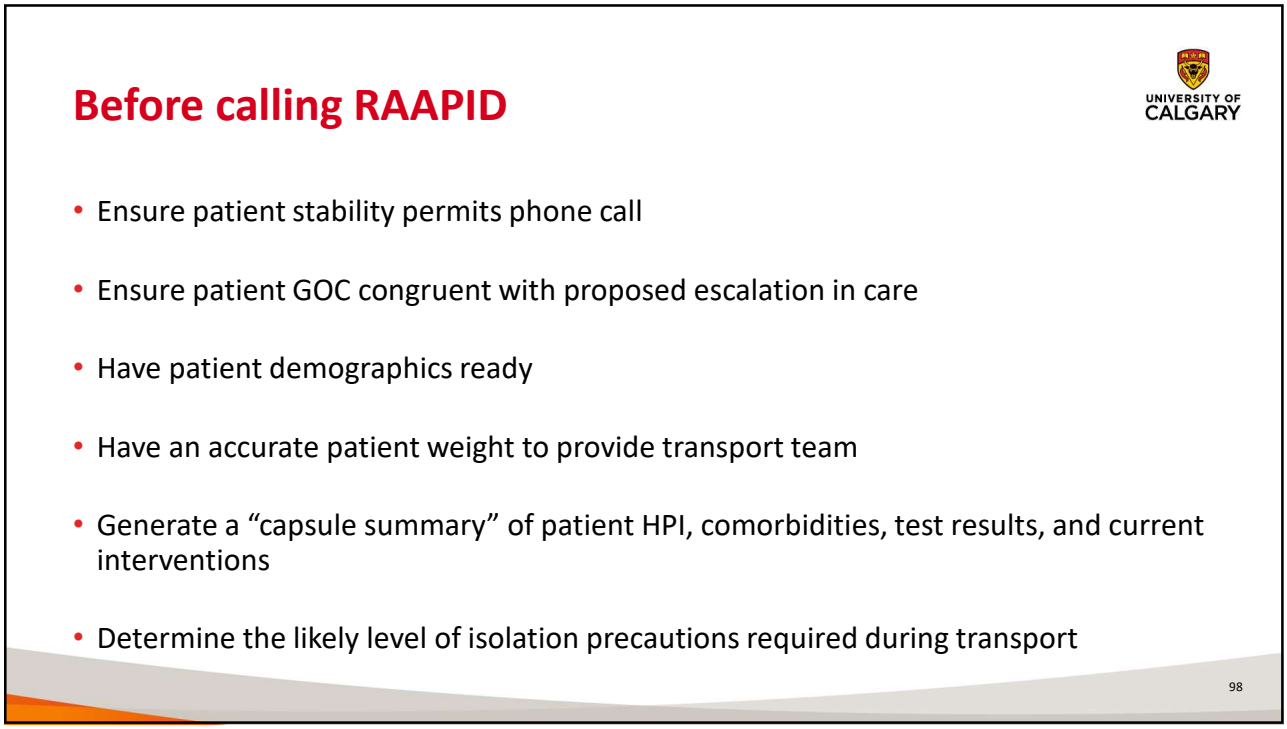


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## Intubating Safely

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- Ensure the 1st attempt is the best attempt:
  - Most experienced operator available
  - Airway pause where time permits
  - Ensure adequate sedation (ideally paralysis)
  - Video Laryngoscopy for 1st attempt
- Use a hemodynamically stable induction strategy
- Diligent PPE (consider a buddy system)

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**Table 1.** ARDS Berlin definition.

| The Berlin definition of acute respiratory distress syndrome | |
|---|---|
| Timing | Within 1 week of a known clinical insult or new or worsening respiratory symptoms |
| Chest imaging[a] | Bilateral opacities — not fully explained by effusions, lobar/lung collapse, or nodules |
| Origin of edema | Respiratory failure not fully explained by cardiac failure or fluid overload.<br>Need objective assessment (e.g., echocardiography) to exclude hydrostatic edema if no risk factor present |
| Oxygenation[b] | |
| Mild | 200 mmHg < $PaO_2/FIO_2$ ≤300 mmHg with PEEP or CPAP ≥5 $cmH_2O$[c] |
| Moderate | 100 mmHg < $PaO_2/FIO_2$ ≤200 mmHg with PEEP ≥5 $cmH_2O$ |
| Severe | $PaO_2/FIO_2$ ≤100 mmHg with PEEP ≥5 $cmH_2O$ |

Abbreviations: CPAP, continuous positive airway pressure; $F_IO_2$, fraction of inspired oxygen; $PaO_2$, partial pressure of arterial oxygen; PEEP, positive end-expiratory pressure; [a]Chest radiograph or computed tomography scan; [b]If altitude is higher than 1,000 m, the correction factor should be calculated as follows: [$PaO_2/FIO_2$ (barometric pressure/760)]; [c]This may be delivered noninvasively in the mild acute respiratory distress syndrome group.

Fanelli, V., Vlachou, A., Ghannadian, S., Simonetti, U., Slutsky, A. S., & Zhang, H. (2013). Acute respiratory distress syndrome: new definition, current and future therapeutic options. *Journal of Thoracic Disease, 5*(3), 326-334. Retrieved from http://jtd.amegroups.com/article/view/1057

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## Ventilating Safely

- Identify patients who meet criteria for ARDS
- Measure patient height→ use this to calculate ideal body weight (IBW)
- Initial ventilation with Vt @ 6cc/kg IBW (or less)
- High PEEP can help; ensure Pplat 30 cmH20 or less
- Conservative oxygen targets
- Deep sedation, paralysis

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## Transport Tips

- If patient intubated: ensure ETT well secured and good position confirmed on CXR
- Ensure robust vascular access (and backup) established: central lines and art lines are **not** a MUST
- If any suspicion of PTX ensure pleural space is decompressed or PTX has been definitively ruled out (esp. for air transport)
- Ensure patient well-sedated (if not paralyzed) to facilitate a smooth and safe transport
- Ensure family kept up to date re: patient transport and destination to avoid any confusion and minimize stress

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## Therapies to Defer

- Advanced ventilatory modalities (IRV, APRV)
- Prone ventilation
- Anticoagulation in the absence of a clear indication
- Antiviral therapies
- Decisions around ECLS
- Inhaled medications (NO, Epoprostenol)

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## Bottom Lines

- The Alberta Critical Care Network has not been overrun
- Barring any major changes, rural centers are to act as waypoints for critically ill COVID patients
- It is always OK to ask for help or to say “I’m not sure”
- Call early, call often, call RAAPID
- You are not alone! We are in this as a province-wide team!

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# Critical Care Strategic Clinical Network (CC SCN) - COVID-19 Response

**Sean Bagshaw MD MSc**

Chair and Professor, Department of Critical Care Medicine, Faculty of Medicine and Dentistry, University of Alberta

**Disclosure**

Any direct financial payments, gifts, in-kind compensation or honoraria: Spectral Medical
Membership on advisory boards or speakers' bureau: Baxter, CNA Diagnostics
Grants or trials: CIHR

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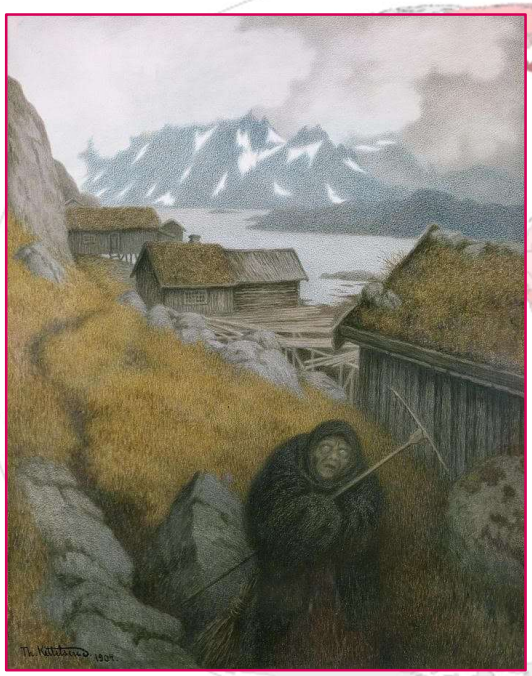
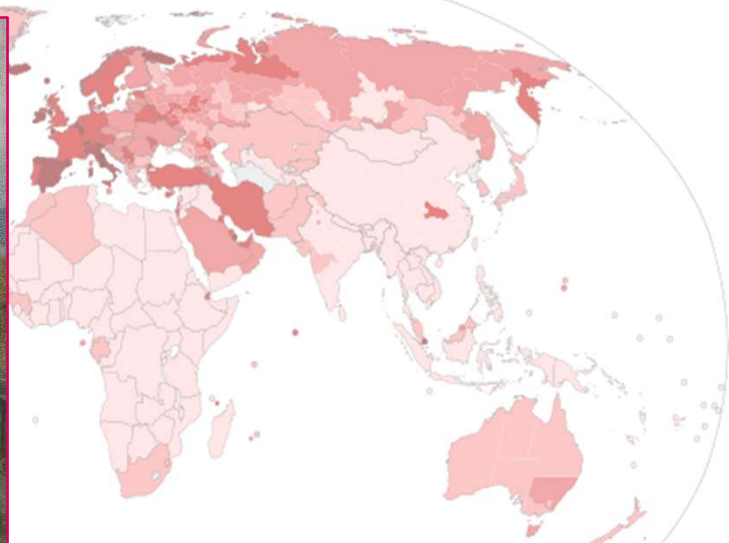


Theodor Kittelsen. *Pesta farer landet rundt* (1904)



**"The Plague Travels Around the Country"**
**Theodor Kittelsen (1904)**



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# Building ICU Capacity

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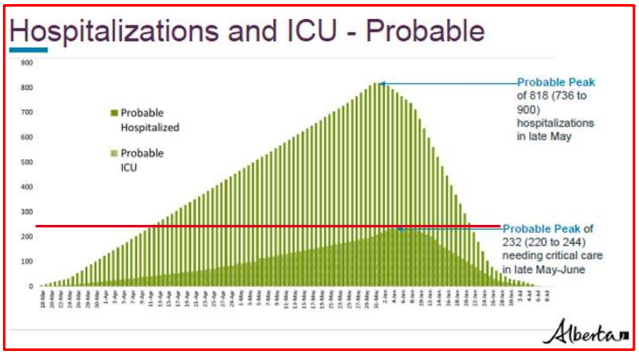


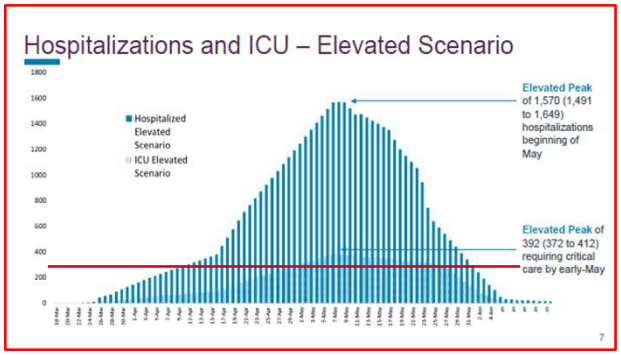


https://www.alberta.ca/assets/documents/covid-19-case-modelling-projection.pdf

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Elizabeth MacKay via Twitter

Sources: Sky News; Wall Street Journal; Twitter (Elizabeth McKay)

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Critical Care Strategic Clinical Network:

## Information infrastructure ensures a learning health system

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Samantha L. Bowker PhD, Henry T. Stelfox MD PhD, Sean M. Bagshaw MD MSc; for the Critical Care Strategic Clinical Network

- Focuses on ensuring the highest-quality evidence-based care for people with critical illness in Alberta.
- Three foundational principles: 1) patient and family-centered care; 2) evidence-informed decision-making; 3) quality improvement.
- Leverages a provincial informatics infrastructure (eCritical Alberta) to drive innovation, knowledge translation and implement evidence-informed science.
- Ensure diverse inter-professional participation in all SCN activities.

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Alberta Health Services Inspiring solutions. Together.

Critical Care Strategic Clinical Network™

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# Foster Provincial Connection

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## Daily Provincial Critical Care COVID-19 Calls and Summary

| Summary | # Currently Ventilated Patients | # Patients on ECLS | # Currently Suspected Cases | # Currently Confirmed Cases | # Current Confirmed Cases Ventilated | # Currently Confirmed Cases Transferred | # Confirmed Cases Transferred out (CUMULATIVE) | # Confirmed Deaths DAILY | # Confirmed Deaths (CUMULATIVE Total) |
|---|---|---|---|---|---|---|---|---|---|
| North | 5 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 |
| Edmonton | 48 | 0 | 7 | 3 | 3 | 0 | 8 | 0 | 1 |
| Central | 6 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 |
| Calgary | 38 | 2 | 4 | 14 | 11 | 0 | 22 | 0 | 9 |
| South | 3 | 0 | 0 | 3 | 1 | 0 | 1 | 0 | 0 |
| TOTAL | 100 | 2 | 16 | 20 | 15 | 0 | 33 | 0 | 11 |

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# Foster Provincial Connection

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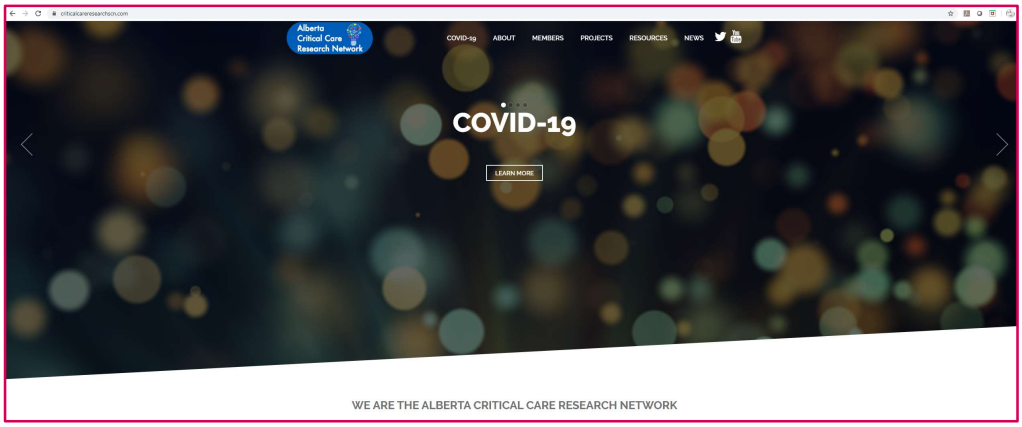


www.criticalcareresearchscn.com

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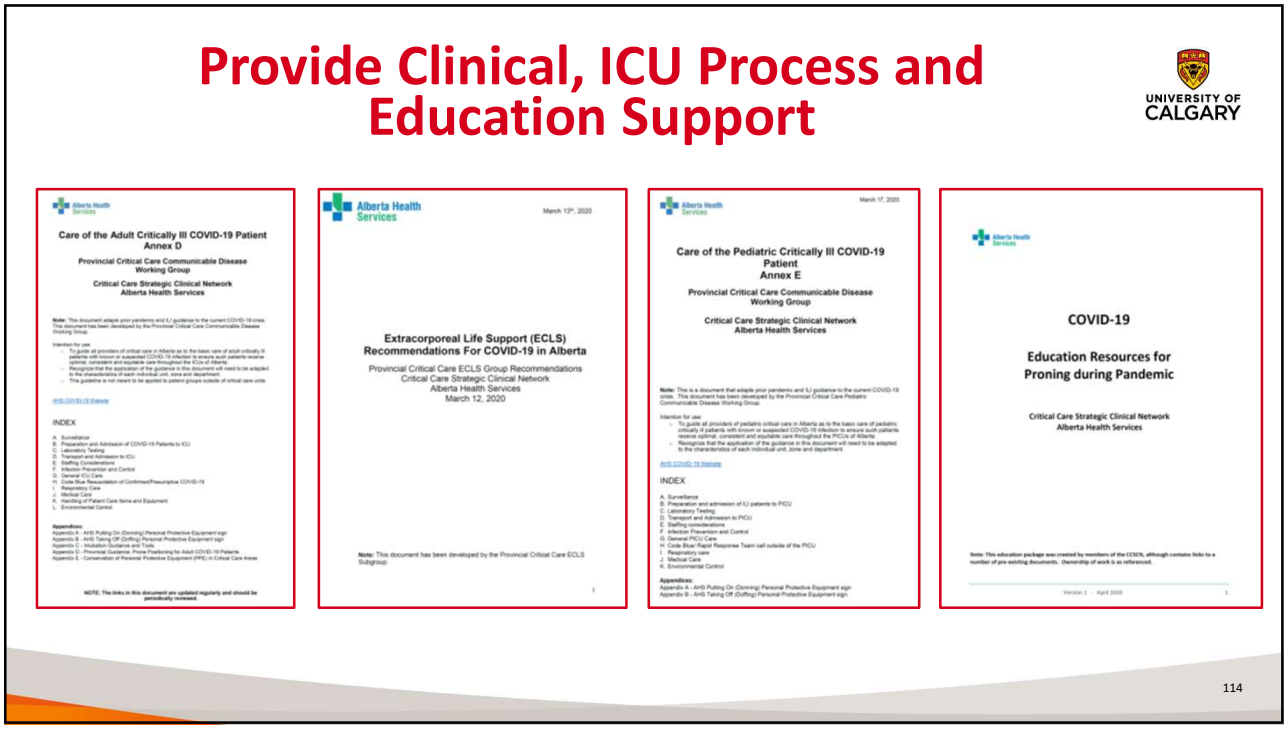


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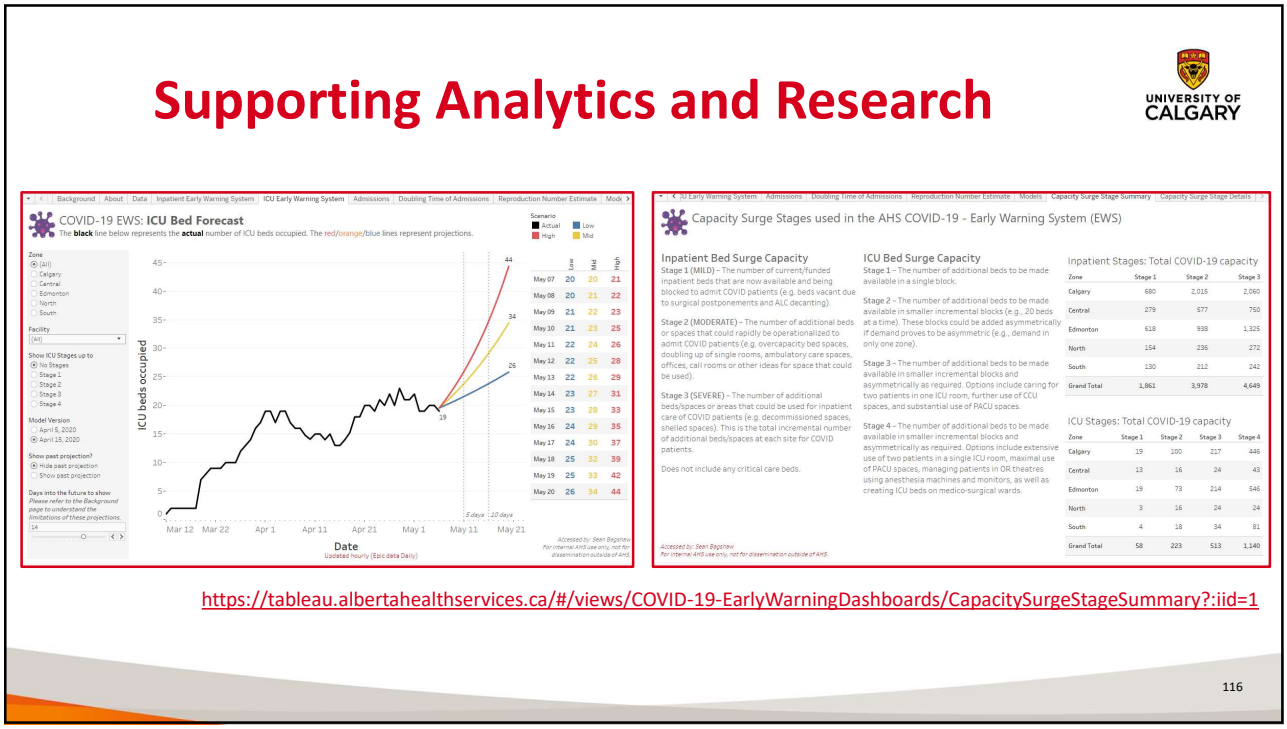


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## CC SCN Core Leadership Team

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- Nancy Fraser – Senior Provincial Director
- Danny J Zuege – Senior Medical Director
- Sean M Bagshaw – Scientific Director
- Sherri Kashuba – Executive Director
- Samantha Bowker – Assistant Scientific Director
- Jeanna Morrissey – Manager
- Kristin Robertson – Practice Lead
- Brooke Blythe – Practice Lead
- Jo Harris – Senior Analytics & Project Consultant
- Karen Shariff – Knowledge Translation Practice Lead
- Peter Blondeel – Senior Project Manager
- Arlene Providence – Executive Assistant
- Popy Karavidas – Administrative Support

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## Thank you for your attention!

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# Panellists

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**Disclosure**

None to Disclose

**Brian Yipp MD FRCPC**

Assistant Professor, University of Calgary; Intensivist

**Disclosure**

None to Disclose

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# Q&A

Amanda Roze des Ordons

Brian Yipp

Sean Bagshaw

Sean Spence

Chris Grant

Daniel Niven

Ken Parhar

Wendy Sligl

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## Family in the ICU

Changes to Visitation Policy
- Family Presence Focus
  → Essential Visitor Policy
- Adapting Communication Practices
  - Using technology
  - Infosheets to family members and staff
  - MyHealth.Alberta.ca

Alberta Health Services

Novel coronavirus (COVID-19) Guidance

**COVID-19 Visitor Guidance**

### Virtually Connecting with Families During COVID-19

Technology is extremely important during this time of temporary limits on visitation.

Using technology to involve families can ensure patients are not socially isolated and maintain valuable partnerships with families.

OpenClipart-Vectors/ Pixaba

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Order an ankle x-ray if:
- Bone tenderness at A
- Bone tenderness at B
- Inability to weight bear both immediately and in the ED

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- **Your feedback is essential; please make sure you complete the online evaluation survey**
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