Case Discussants:

Dr. Jean Abbott
Dr. Abbey Lara
Dr. Marc Moss
Total Confirmed

932,605

Confirmed Cases by Country/Region/Sovereignty

213,372 US
110,574 Italy
104,118 Spain
82,361 China
77,872 Germany
57,749 France
47,593 Iran
29,865 United Kingdom
17,768 Switzerland
15,679 Turkey

Total confirmed cases as of April 1, 2020
HPI

73-year-old M h/o of TIA, HTN presents after syncope
- Sitting up from toilet, lightheaded, and syncopal episode with mild head trauma
- One week ago developed non-productive cough, fever, sweats, anorexia, worsening dyspnea on exertion
- No recent travel, wife with similar symptoms

- In ED, his temp is 102F and his O2 sat is 69% on 6L (88% on 12L nrb)
- Physical exam notable for diffuse coarse crackles
- Labs are relatively unremarkable (Na 133, SCr 1.1, WBC 7)
- He is started empirically on ceftriaxone and azithromycin
History

Past Medical History
- TIA
- HTN
- HLD

Social History
- Tobacco: remote 10 PY history
- No EtOH or illicits
- Volunteers at pet shelter, wife works
  at a bookstore

Medications
- Plavix
- Losartan
- Nifedipine
- Simvastatin
Clinical course

- COVID-19 testing is **positive**
- Head CT unremarkable
- Chest CT had been obtained in the ED:
The ICU is completely full of COVID patients on mechanical ventilation, and there are three other patients awaiting an ICU bed for possible intubation. Considering the COVID epidemic, there has been discussion of how to allocate critical resources including ICU beds, ventilators, and staff expertise.

Would you offer ICU admission and intubation to this patient? How to decide?
Would you reallocate resources from a patient currently in the ICU?
What if the patient was a practicing physician?
Medical resource allocation in a time of scarcity

Ethical frameworks and challenges during a pandemic
15 days until peak resource use on April 16, 2020

Resources needed for COVID patients on peak data

- **All beds needed**
  - 260,342 beds
  - Bed Shortage: 84,671 beds

- **ICU beds needed**
  - 38,849 beds
  - ICU Bed Shortage: 18,905 beds

- **Invasive ventilators needed**
  - 31,082 ventilators

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**Total deaths**

Total COVID-19 deaths projected to August 4, 2020 in United States of America

93,765 COVID-19 deaths

IHME: https://covid19.healthdata.org/projections
Allocation of scarce resources in a pandemic

1. What are the competing ethical interests and frameworks in place?
2. What are the current guidelines in Colorado?
Widely accepted tenants:

• Utilitarian approach of maximizing life and years of life

• Allocation should not be based on factors such as socioeconomic, insurance, racial/ethnic, nationality status

• Independent triage committees should be encouraged

• Repeated assessment of the process to ensure bias remains minimal

John Stuart Mills
Challenges that remain:

How to accurately triage based on short and long-term mortality?

Strict age cutoff?

Singer et al., *JAMA*, 2016
Vincent et al., *Crit Care Med*, 1998
Ferreira et al., *JAMA*, 2001
Vergano, SIAARTI, 2020
Challenges that remain:

Are their populations that should receive priority?
Those with “instrumental value”, AKA:
- Frontline health workers
- Those who participate in research

Truog et al., *NEJM*, 2020
Emanuel et al., *NEJM*, 2020
Challenges that remain:

• First-come first-serve vs random allocation

• How to allocate to non-pandemic patients (non-COVID)?

• How do you manage involuntary withdrawal of care?

Lanken et al., *Am J Respir Crit Care Med*, 1987
Biddison et al., *CHEST*, 2019
Truog et al., *NEJM*, 2020
“To appropriately respond to a catastrophic disaster in which resources are overwhelmed, the needs of the greater community generally must rise above the needs of any single individual, and there may be circumstances in which resources should be diverted from patients with a lower likelihood of benefit to those with a greater likelihood of benefit.”
On multiple patients per ventilator: “Finally, there are ethical issues. If the ventilator can be lifesaving for a single individual, using it on more than one patient at a time risks life-threatening treatment failure for all of them.”
### MECHANICAL VENTILATION / EXTERNAL OXYGENATION

#### STRATEGIES FOR SCARCE RESOURCE SITUATIONS (cont.)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Strategy</th>
<th>Crisis</th>
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</thead>
<tbody>
<tr>
<td>1. Organ system function&lt;sup&gt;a&lt;/sup&gt;</td>
<td>Low potential for death (SOFA score ≤ 7)</td>
<td>Resource re-allocated</td>
</tr>
<tr>
<td>2. Duration of benefit/prognosis</td>
<td>Good prognosis based upon epidemiology of specific disease/injury</td>
<td>High potential for death (SOFA score ≥ 8)</td>
</tr>
<tr>
<td>3. Duration of need</td>
<td>Short duration – flash pulmonary edema, chest trauma, other conditions anticipating &lt; 3 days on ventilator</td>
<td>Poor prognosis based upon epidemiology of specific disease/injury (e.g., pandemic influenza)</td>
</tr>
<tr>
<td>4. Response to mechanical ventilation</td>
<td>Improving ventilatory parameters over time</td>
<td>Severe underlying disease with poor long-term prognosis and/or ongoing resource demand (e.g., home oxygen dependent, disylathy dependant) and unlikely to survive more than 1-2 years.</td>
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</table>

<sup>a</sup>The Sequential Organ Failure Assessment (SOFA) score is the currently preferred assessment tool but other predictive models may be used depending on the situation / epidemiology. Note: SOFA scores were not designed to forecast mortality, and thus single or a few point difference between patients may not represent a 'substantial difference' in mortality, but larger differences and trends can be extremely helpful in determining resource assignment.

<sup>b</sup>Examples of underlying diseases that predict poor short-term survival include (but are not limited to):

1. Congestive heart failure with ejection fraction < 25% (or persistent ischemia unresponsive to therapy or non-reversible ischemia with pulmonary edema)
2. Severe chronic lung disease including pulmonary fibrosis, cystic fibrosis, obstructive or restrictive diseases requiring continuous home oxygen use prior to onset of acute illness
3. Central nervous system, solid organ, or hematopoietic malignancy with poor prognosis for recovery
4. Cirrhosis with ascites, history of variceal bleeding, fixed coagulopathy or encephalopathy
5. Acute hepatic failure with hyperammonemia

<sup>c</sup>Changes in Oxygenation Index over time may provide comparative data, though of uncertain prognostic significance.

OI = MAWP x FI02 / PaO2 where: OI = oxygenation index, MAWP= Mean Airway Pressure, FI02 = inspired oxygen concentration, PaO2 = arterial oxygen pressure (May be estimated from oxygen dissociation curve if blood gas unavailable.)

#### Step Three: Re-allocate ventilator/resource only if patient presenting with respiratory failure has significantly better chance of survival/benefit as compared to patient currently receiving ventilation. Follow additional regional and state/federal guidance and institutional processes for scarce resource situations.
ECMO in COVID

In 2013, median cost ECMO $590k / patient

Sibai et al., BMC Emergency Medicine, 2018
Yang et al., Lancet Respir Med, 2020
McClaren et al., JAMA, 2020
Clinical course

• Patient was intubated and developed rapid, severe ARDS
• Continued to worsened despite prone positioning and neuromuscular blockade
• ECMO was not offered
• Transitioned to comfort care
Case 2
HPI

85 year old with a hx of HTN and CAD presents with 5 days of feeling ill:
• Non-productive cough, headache, extreme fatigue, diarrhea, and chills
• Also notes shortness of breath that has been worsening
• No recent travel outside of Denver

• In ED, his temp is 99.9 and his O2 sat is 90% on RA
• Labs are relatively unremarkable (Na 133, Cr 1.3, WBC 5.5, AST 44)
• He is started empirically on ceftriaxone and azithromycin
History

Past Medical History
- Depression
- HTN
- CAD

Social History
- Lives with his partner
- EtOH: none
- Former smoker
- Retired, previously worked as a middle school Spanish teacher

Medications
- Lisinopril-HCTZ 20-25mg qD
- ASA 81mg qD
- Plavix 75mg qD
- Atorvastatin 40mg qD
- Sertraline 100mg qD
- Lorazepam 1mg PO prn
Clinical course

- Admitted to the hospital floor
- COVID-19 positive
- By hospital day 3 is requiring 8-10L NC
- He is empirically started on Plaquinel, and is transferred to the ICU
- A CXR and CT chest are obtained:
Upon arrival to the ICU, the patient decompensates and is intubated.

In light of the COVID pandemic, there has been discussion about initiating a unilateral DNR policy to intubated patients with COVID.

In the chance of a cardiac arrest, would you offer CPR to this patient?

What if the patient was 45 years old? What if the patient was your coworker?
CPR in patients with airborne pathogens

Potential barriers and ethical issues in times of pandemic
CPR in patients with airborne pathogens

• What are the values of medical ethics that underlie CPR?
• What is the risk to healthcare workers?
2 models of CPR decision-making

• Rule of rescue
  • Based on the ethical principal of beneficence
  • When a patient faces a threat to their welfare that may lead to preventable death, it is a benefit to them when physicians intervene

• Informed consent/substituted interests
  • Based on the ethical principal of autonomy
  • Transforms what would be an assault on an individual into the treatment of a patient
  • Gives patients the right to choose between available treatment options or to refuse treatment, but not to demand treatment that is not indicated

Bester and Kodish. The Journal of Clinical Ethics, 2019
Unilateral DNR

• In extreme situations in which CPR may not be effective or may put health care workers at risk, clinicians may unilaterally decide to write a DNR order *without* patient or surrogate consent
Does unilateral DNR break the rule of rescue?

- Clinicians should rescue patients with the means at their disposal, unless there are compelling reasons to refrain.
- No demand for CPR can be asserted by patients if it is not authorized by conditions consistent with the rule of rescue:
  - Cardiac arrest is not reversible
  - Rescue is not possible due to physiological or physical impediments
  - Patient has a clear objection to CPR

What about in times of resource scarcity?
- In a crisis, we may have to shift the standard of care to emphasize the needs of the community

Bester and Kodish. The Journal of Clinical Ethics, 2019
• “To appropriately respond to a catastrophic disaster in which resources are overwhelmed, the needs of the greater community generally must rise above the needs of any single individual, and there may be circumstances in which resources should be diverted from patients with a lower likelihood of benefit to those with a greater likelihood of benefit.”
Informed assent is an alternative approach to unilateral DNR decisions

- The clinician does not ask the patient or family member to take responsibility for the DNR decision, but rather asks the patient or family member to allow the clinician to assume responsibility

1. Assess patient’s values and goals
   - Elicit values and preferences for therapies and outcomes from the patient or designated family member and formulate overall therapeutic goals
   
   "Is it important to your mother to live as long as possible, no matter what her quality of life, or are there circumstances in which she would not want to receive life support, such as a prolonged nursing home stay?"

2. Discuss cardiopulmonary resuscitation (CPR)
   - Briefly describe CPR explaining how, when, and why it is performed
   
   "We want to be sure we are taking the best possible care of your mother, so I would like to talk to you about CPR."

3. Summarize the role of CPR
   - Provide a personalized explanation about the lack of ability of CPR to achieve the previously assessed patient goals
   
   "Given what you have told me about your mother and her goals, CPR will not help her reach her goals."

4. Present a definitive assent statement
   - Inform the patient or the patient’s family that CPR will not be offered
   
   "Since CPR will not work to achieve your mother’s goals in this situation, we do not provide it."

5. Assess understanding and allow for objection
   - Discuss the patient’s or family’s understanding of the assent statement, the decisions made, and any objections they may have
   
   "I want to make sure you understand. Do you have any questions?"

Curtis et al. JAMA 2020
UCHealth suggested language for unilateral DNR

“Based on our review of your loved one’s clinical status, we are worried that the COVID-19 infection along with their previous medical conditions, is leading to an end-of-life process”

“We are sorry to share that we believe your loved one is dying”

“Under these circumstances we are unable to provide advanced cardiovascular support”

“What we can do is focus our efforts and care on your loved one’s comfort and support your family during that time”

“We are also worried about the risk to health care workers of exposure to COVID-19 that may occur while conducting a procedure that is not expected to improve your loved one’s outcome”
What about when CPR provides risk to the health care worker?

- Health care workers need to be protected
  - Training in infection control
  - Personal protective equipment (PPE)
Aerosol-generating procedures expose providers to a greater risk of disease transmission

• Systematic review of HCWs caring for patients with acute respiratory infections (1990 – 2010)
  • 10 non-randomized studies identified that evaluated the risk of transmission in providers treating patients undergoing aerosolizing procedures
    • All studies evaluated transmission of SARS-CoV
    • All considered low quality evidence

Tran et al. Plos One 2012
Table 2. Risk of SARS Transmission to HCWs Exposed and Not Exposed to Aerosol-Generating Procedures, and Aerosol Generating Procedures as Risk Factors for SARS Transmission

<table>
<thead>
<tr>
<th>Aerosol Generating Procedures</th>
<th>Odds ratio (95% CI)</th>
<th>Pooled estimate; $I^2$</th>
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<tbody>
<tr>
<td></td>
<td>Point estimate</td>
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<tr>
<td>Tracheal intubation (4 cohort studies)</td>
<td>3.0 (1.4, 6.7) [25]</td>
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<tr>
<td></td>
<td>22.8 (3.9, 131.1) [26]</td>
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<td></td>
<td>13.8 (1.2, 161.7) [27]</td>
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<tr>
<td></td>
<td>5.5 (0.6, 49.5) [29]</td>
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<tr>
<td>Tracheal intubation (4 case-control studies)</td>
<td>0.7 (0.1, 3.9) [23]</td>
<td>6.6 (4.1, 10.6); 61.4%</td>
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<td></td>
<td>9.2 (4.2, 20.2) [21]</td>
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<td>8.0 (3.9, 16.6) [20]</td>
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<tr>
<td></td>
<td>9.3 (2.9, 30.2) [24]</td>
<td></td>
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<tr>
<td>Suction before intubation (2 cohort studies)</td>
<td>13.8 (1.2, 161.7) [27]</td>
<td>3.5 (0.5, 24.6); 59.2%</td>
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<tr>
<td></td>
<td>1.7 (0.7, 4.2) [25]</td>
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<tr>
<td>Suction after intubation (2 cohort studies)</td>
<td>0.6 (0.1, 3.0) [27]</td>
<td>1.3 (0.5, 3.4); 28.8%</td>
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<tr>
<td></td>
<td>1.8 (0.8, 4.0) [25]</td>
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<tr>
<td>Nebulizer treatment (3 cohort studies)</td>
<td>6.6 (0.9, 50.5) [27]</td>
<td>0.9 (0.1, 13.6); 73.1%</td>
</tr>
<tr>
<td></td>
<td>0.1 (0.0*, 1.0) [28]</td>
<td></td>
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<tr>
<td></td>
<td>1.2 (0.1, 20.7) [23]</td>
<td></td>
</tr>
<tr>
<td>Manipulation of oxygen mask (2 cohort studies)</td>
<td>17.0 (1.8, 165.0) [27]</td>
<td>4.6 (0.6, 32.5); 64.8%</td>
</tr>
<tr>
<td></td>
<td>2.2 (0.9, 4.9) [25]</td>
<td></td>
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<tr>
<td>Bronchoscopy (2 cohort studies)</td>
<td>3.3 (0.2, 59.6) [27]</td>
<td>1.9 (0.2, 14.2); 0%</td>
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<td></td>
<td>1.1 (0.1, 18.5) [25]</td>
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<tr>
<td>Non-invasive ventilation (2 cohort studies)</td>
<td>2.6 (0.2, 34.5) [26]</td>
<td>3.1 (1.4, 6.8); 0%</td>
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<td>3.2 (1.4, 7.2) [25]</td>
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<tr>
<td>Insertion of nasogastric tube (2 cohort studies)</td>
<td>1.7 (0.2, 11.5) [27]</td>
<td>1.2 (0.4, 4.0); 0%</td>
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<tr>
<td></td>
<td>1.0 (0.3, 4.5) [26]</td>
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<tr>
<td>Chest compressions (1 case-control study)</td>
<td>4.5 (1.5, 13.8) [24]</td>
<td></td>
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<tr>
<td>Chest compressions (2 cohort studies)</td>
<td>3.0 (0.4, 24.5) [25]</td>
<td>1.4 (0.2, 11.2); 27.3%</td>
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<tr>
<td></td>
<td>0.4 (0.0**, 7.8) [27]</td>
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<tr>
<td>Defibrillation (2 cohort studies)</td>
<td>0.5 (0.0**, 12.2) [27]</td>
<td>2.5 (0.1, 43.9); 53.3%</td>
</tr>
</tbody>
</table>

Intubation: OR 6.6
CPR: OR 1.4
N95 masks protect against 95% of droplets <0.3μm

https://www.cdc.gov/niosh/topics/aerosols/pdfs/Aerosol_101.pdf
Clinical course

• Patient remains intubated...
• He has required prone ventilation and paralysis, however vent requirements have improved and is now is on 50% FiO2 and PEEP of 10
• Course has been complicated by profound anasarca and delirium, which has prohibited weaning from the ventilator
ATLANTA, GA – Accepting that COVID-19 is progressing despite all of our best efforts, Palliative has been consulted and has officially made the United States DNR... 

There had been a delay in calling together hundreds of millions of Americans for fear that a prolonged family meeting would lead to every single one of them being infected with COVID-19. “But everyone’s DNR now, myself included,” Dolphy pointed out, “so it’s a moot point.”

Other countries battling COVID-19 remain Full Code.