PHARMACY VISION 2020

CSHP SEMINAR 20 • OCTOBER 21-25

Disneyland RESORT

An Emergency Medicine and Infectious Diseases Pharmacist's Perspective from the Frontlines of the COVID-19 Pandemic

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DISCLOSURE

I have no conflicts of interest to disclose.

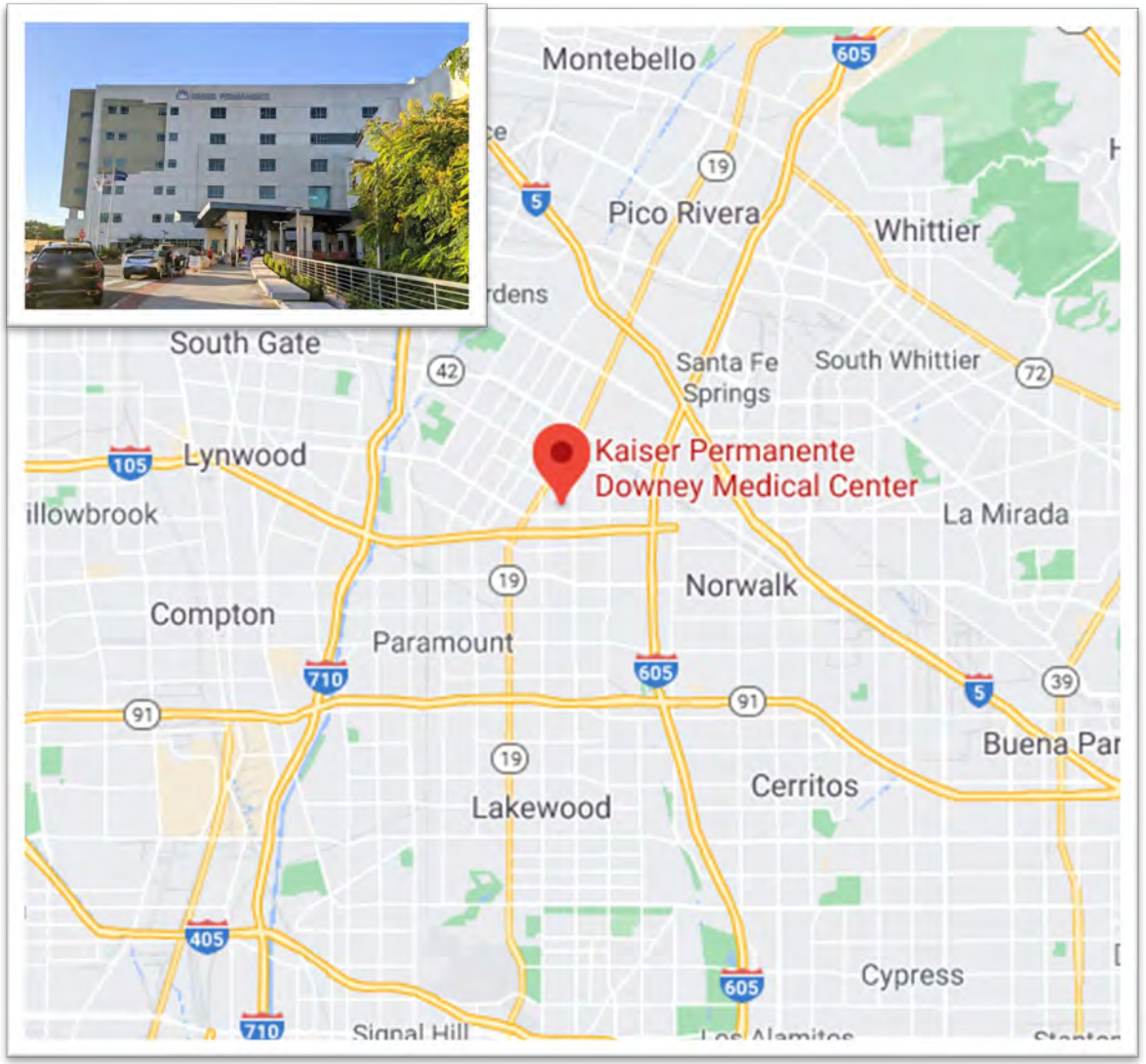
Learning Objectives

At the completion of this knowledge-based activity, participants will be able to:

- Identify challenges that pharmacists faced during the COVID-19 pandemic.
- Discuss opportunities for pharmacists in assisting with the management of patients with COVID-19.
- Describe key pharmacotherapeutic agents used in the management of patients with COVID-19.

KAISER PERMANENTE DOWNEY MEDICAL CENTER

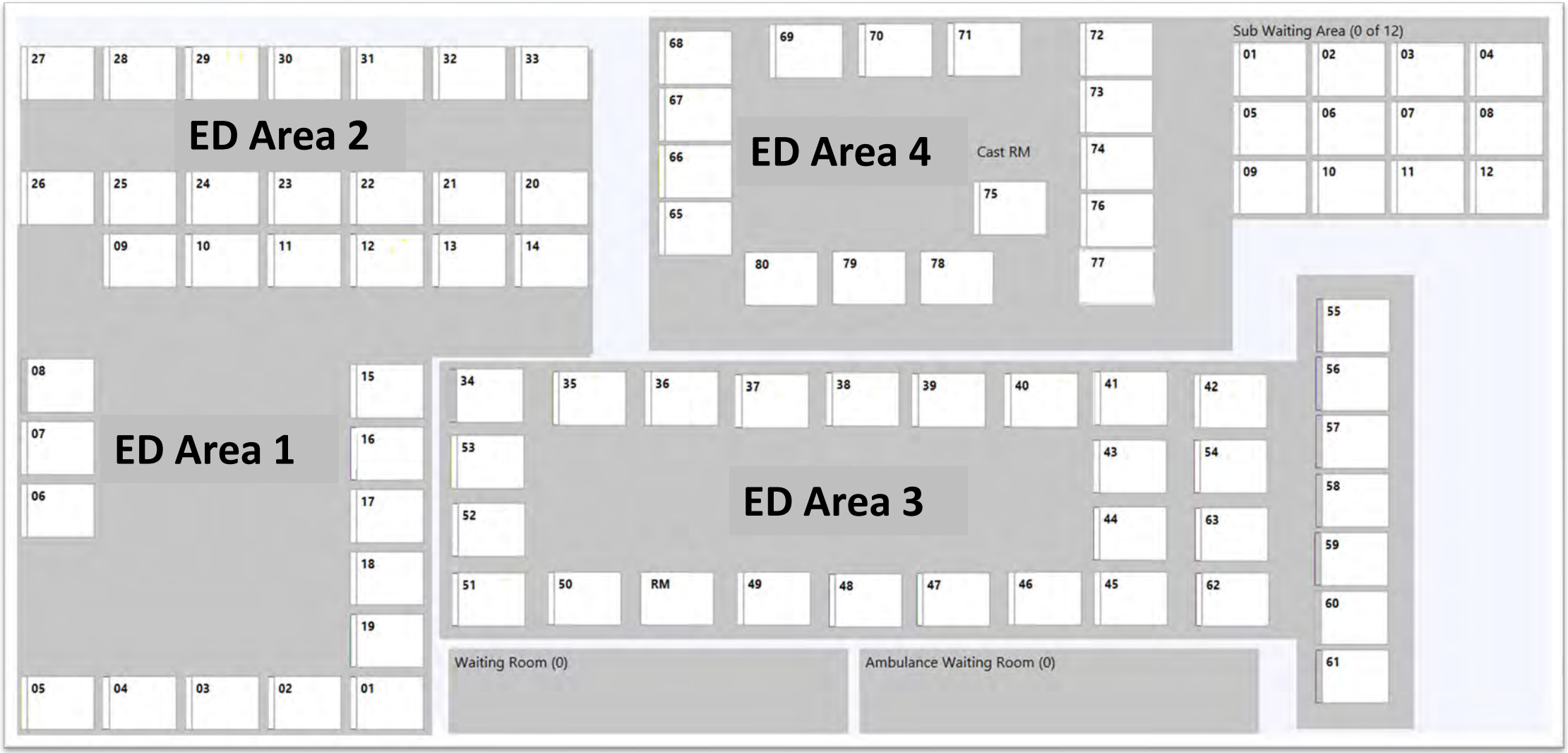
- 352 hospital beds
  - 30 beds in Intensive Care Unit
  - 96 beds will be added by March 2021
- 80 Emergency Department (ED) beds
  - Average ED census: ~350 patients/day



EMERGENCY MEDICINE (EM) PHARMACIST PERSPECTIVE

Emergency Medicine Pharmacy Service

- Monday to Sunday
  - 1030-2230
- 2 full-time pharmacists
- 4 cross-trained pharmacists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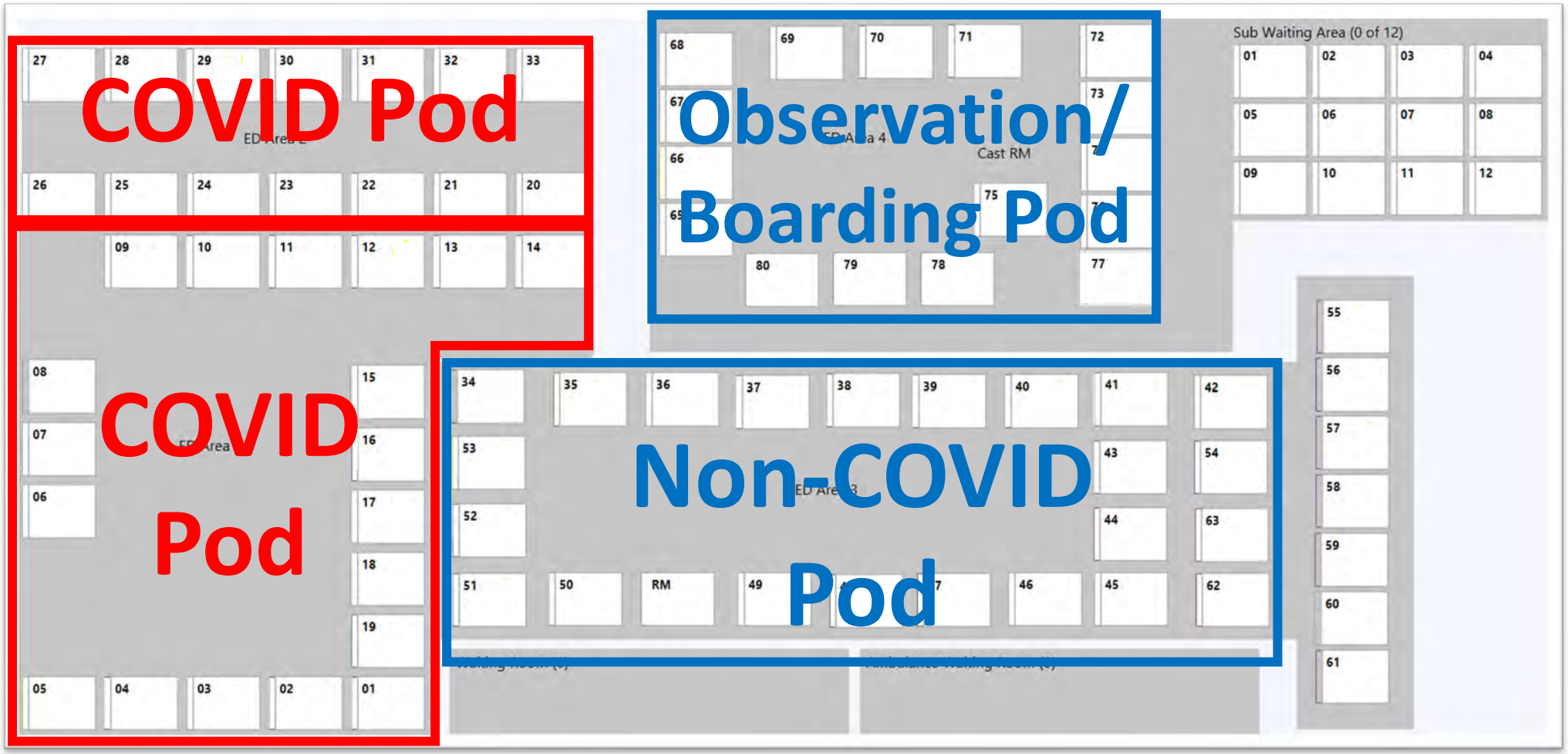
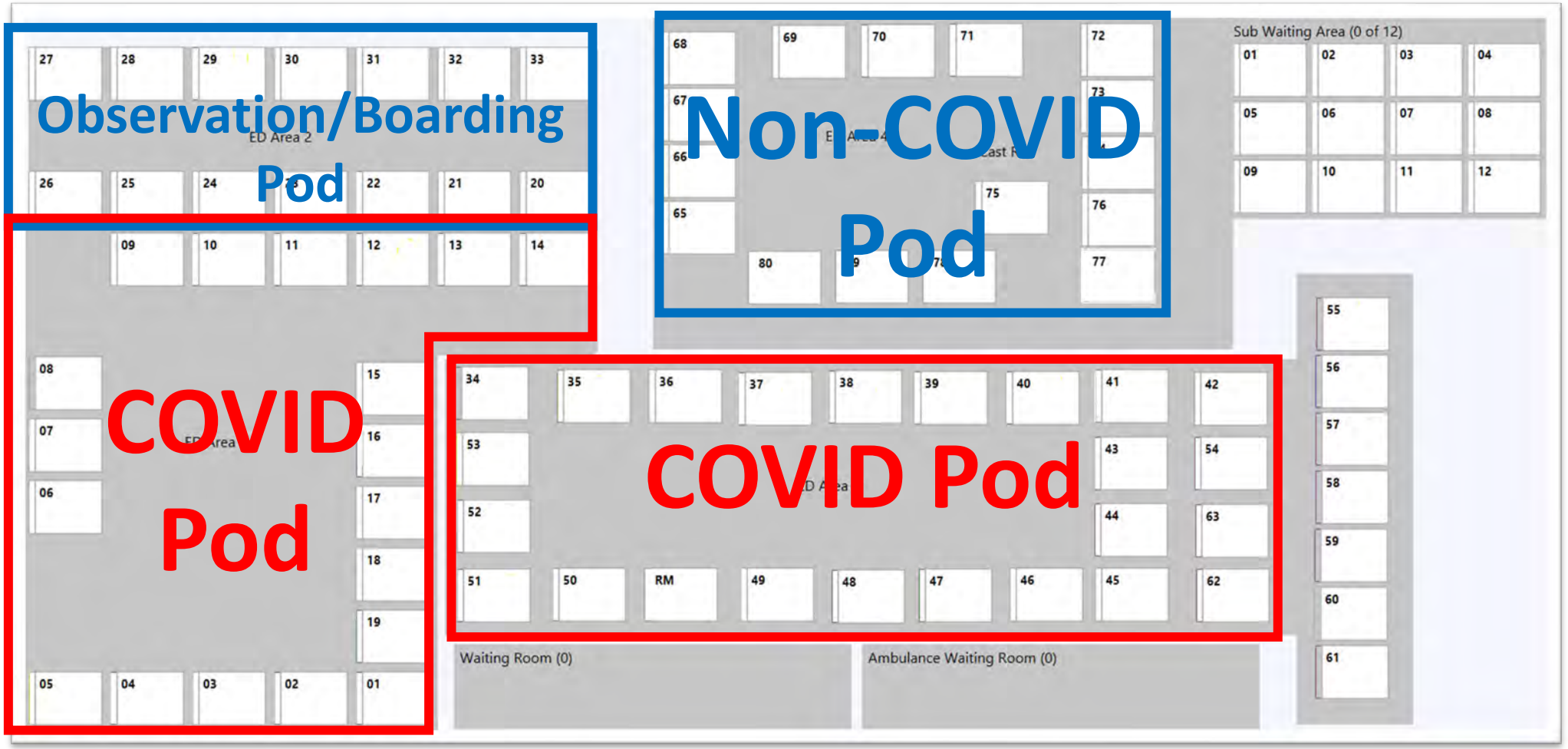
Waiting Room (0)
Ambulance Waiting Room (0)

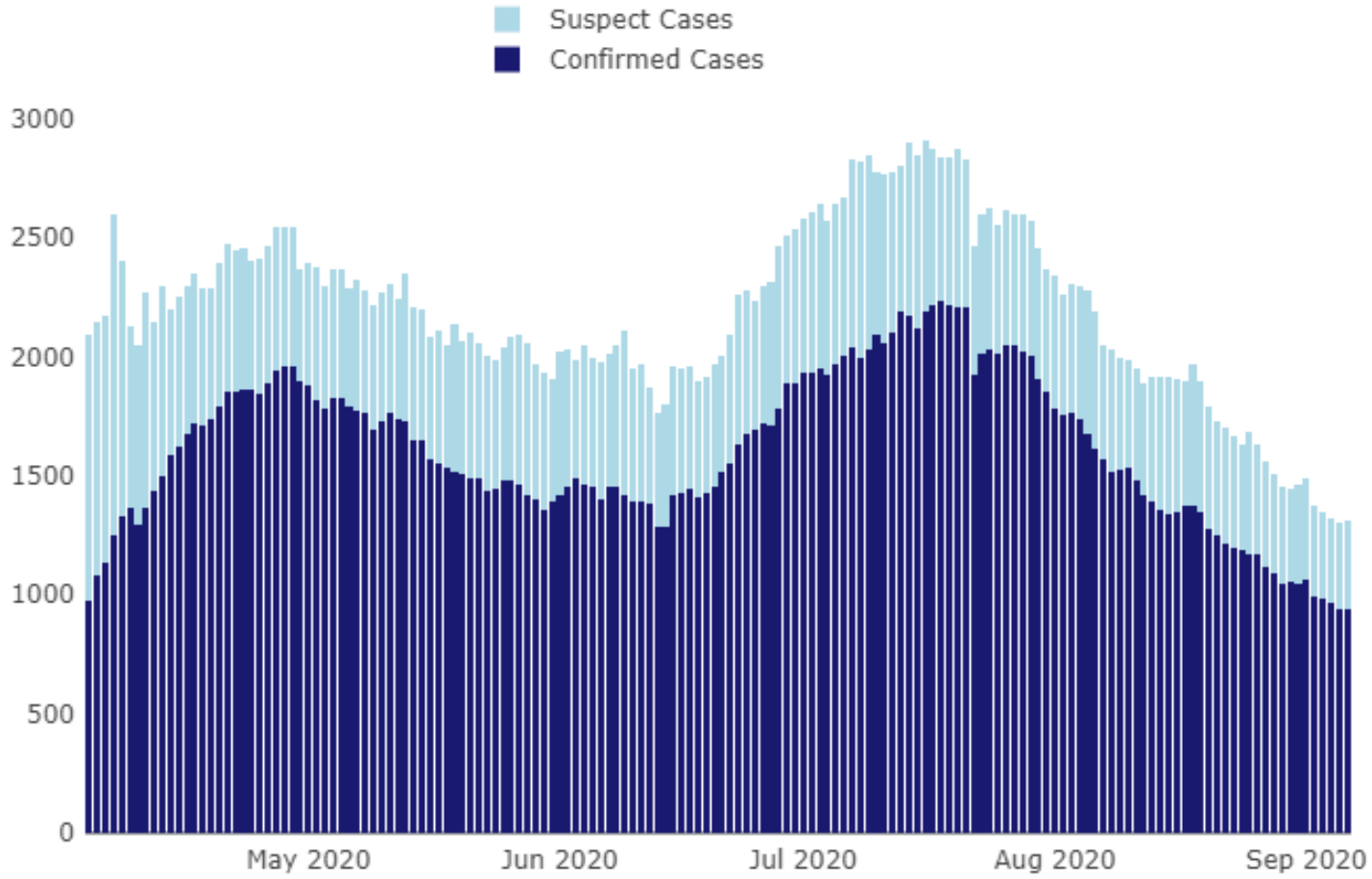
Preparing for the First Wave



Preparing for Future Waves

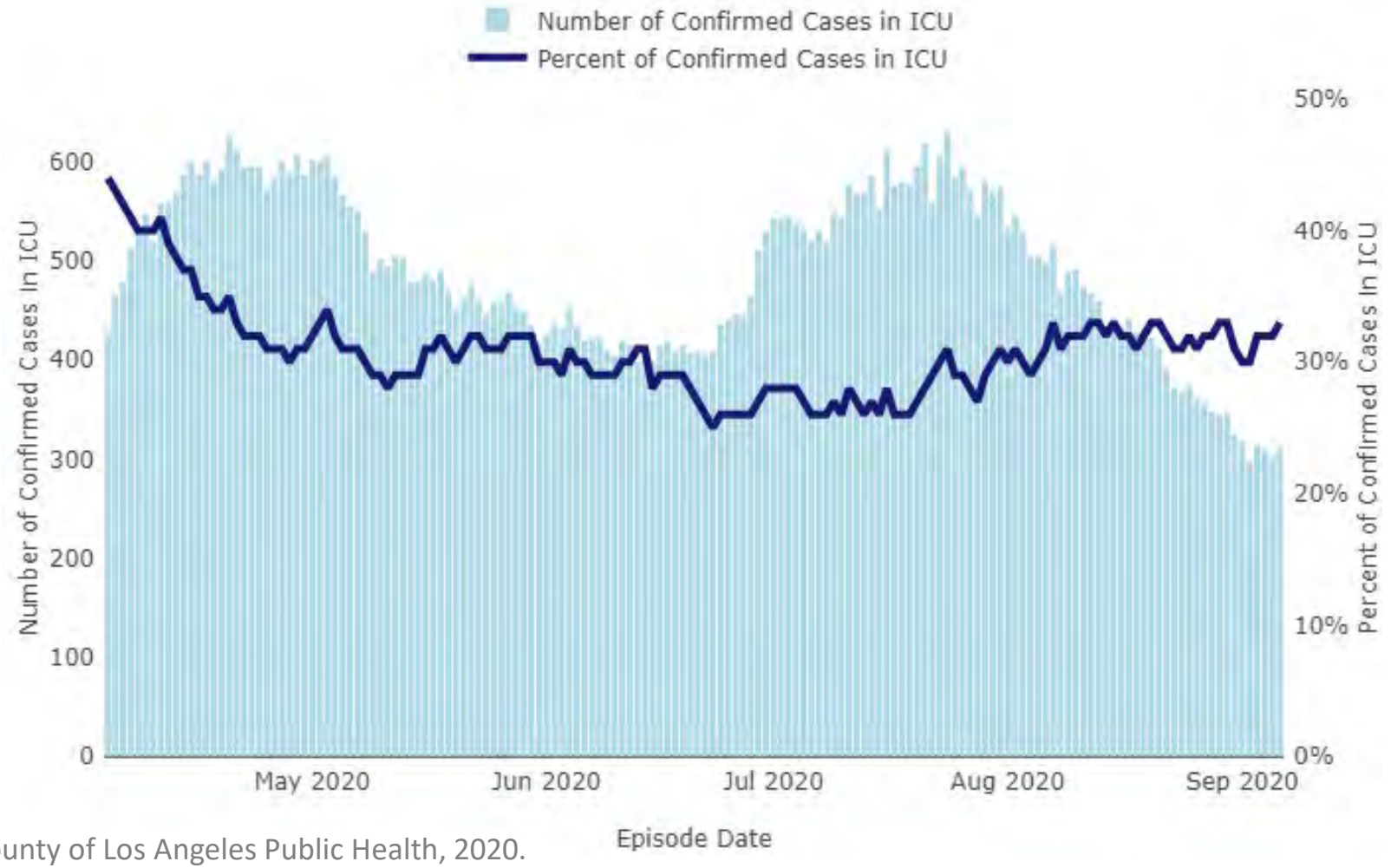


HOSPITALIZED COVID-19 PATIENTS IN LOS ANGELES COUNTY



1. County of Los Angeles Public Health, 2020.

VENTILATED COVID-19 PATIENTS IN LOS ANGELES COUNTY



1. County of Los Angeles Public Health, 2020.

First Challenge was transitioning to less direct patient care

- No more running to bedside for critical events
  - Cardiac arrests
  - Rapid sequence intubations (RSI)
- Minimize our potential exposure to COVID-19 and use of personal protective equipment

RESPONDING TO CARDIAC ARRESTS WITH CODE BLUE BAG

- (3) Epinephrine 1 mg/10 mL
- (1) Sodium bicarbonate 50 mEq/50 mL
- (1) Calcium chloride 1000 mg/10 mL
- (1) Dextrose 50% 25 g/50 mL
- (5) Sodium chloride 0.9% 10 mL Flushes

- No code carts in patient rooms

RESPONDING TO INTUBATIONS WITH RSI KITS

- (1) Etomidate 40 mg/20 mL
- (1) Rocuronium 100 mg/10 mL
- (1) Succinylcholine 200 mg/20 mL

OTHER MEDICATIONS AND SUPPLIES TO CONSIDER FOR RSI KIT

Medications	Supplies
• Ketamine 10 mg/mL (1 x 20 mL vial) • Etomidate 2 mg/mL (2 x 10 mL vial) • Fentanyl 50 mcg/mL (2 x 2 mL vial) • Midazolam 1 mg/mL (4 x 2 mL vial) • Propofol 500 mg/50 mL (1 x 50 mL vial) • Propofol 200 mg/20 mL (1 x 20 mL vial) • Rocuronium 10 mg/mL (3 x 5 mL vial) • Succinylcholine 20 mg/mL (1 x 10 mL vial) • Phenylephrine 100 mcg/mL (2 x 10 mL syringe) • Norepinephrine 1 mg/mL (1 x 4 mL vial) • Epinephrine 1 mg/mL (5 x 1 mL vial) • Sugammadex 100 mg/mL (4 x 5 mL vial) • Atropine 0.1 mg/mL (1 x 10 mL syringe) • Glycopyrrolate 0.2 mg/mL (2 x 1 mL vial)	• Medication labels (1 roll) • 20 mL syringe (2) • 10 mL syringe (10) • 3 mL syringe (5) • 18 gauge needle (10) • Filter needle (10) • Alcohol swab (10) • Gloves (10 pairs) • 0.9% sodium chloride flush (10 x 5 mL) • 0.9% sodium chloride bags (1 x 250 mL bag) • 0.9% sodium chloride bags (1 x 100 mL bag)

2. Faine BA, et al. *AJHP*. 2020. 22;14:1102-1103.

BEING PROACTIVE PRIOR TO INTUBATIONS

- Formulate plan with EM physician
  - Induction medication
  - Paralytic medication
  - Postintubation analgesic and sedative
  - Vasopressor
- Label all syringes with medication name and dose
- Prepare and prime tubing for medications
- Ensure pump and channel is at bedside

COVID-19 SIMULATIONS

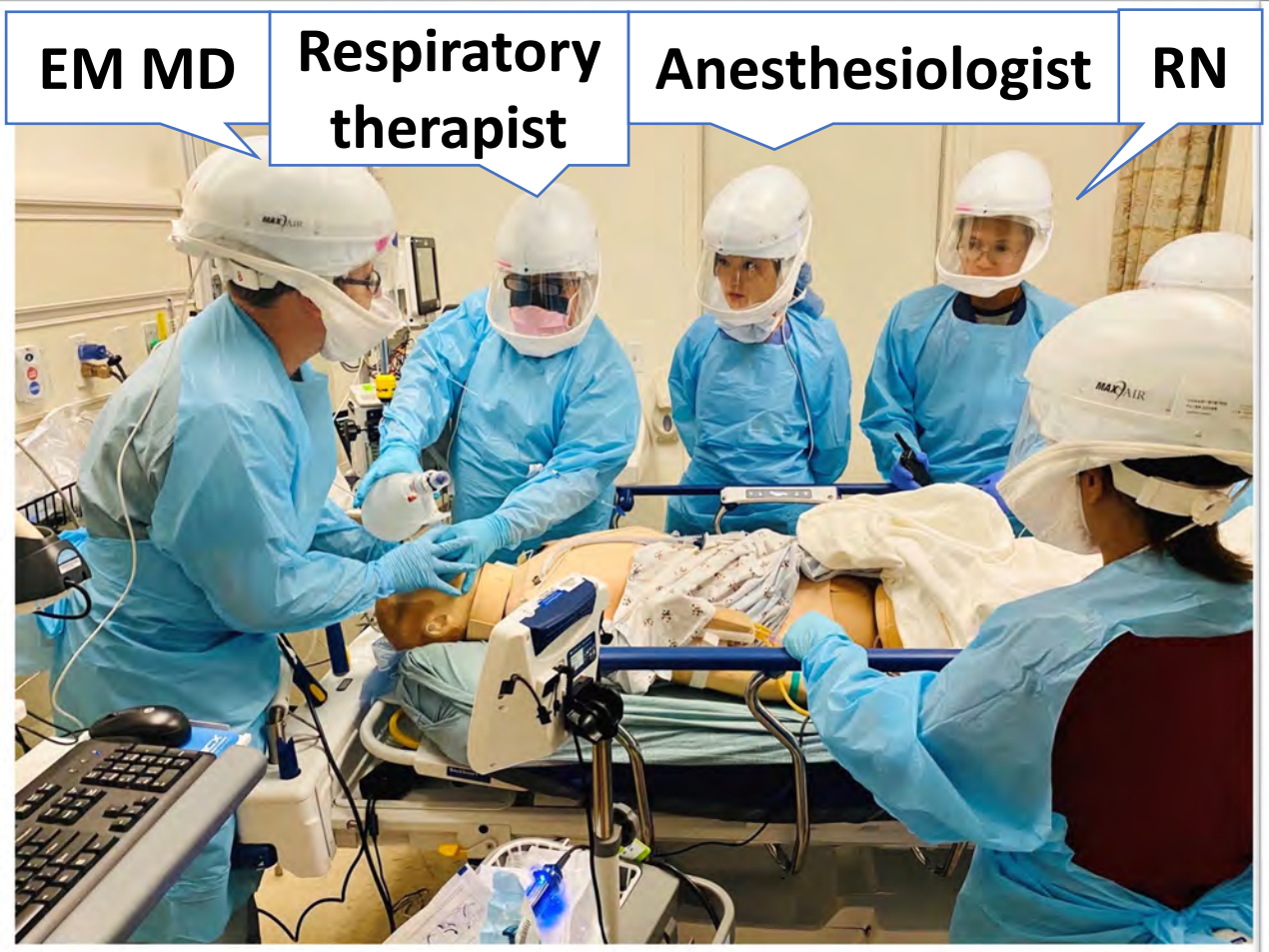


Photo Credit: Leslie Wu

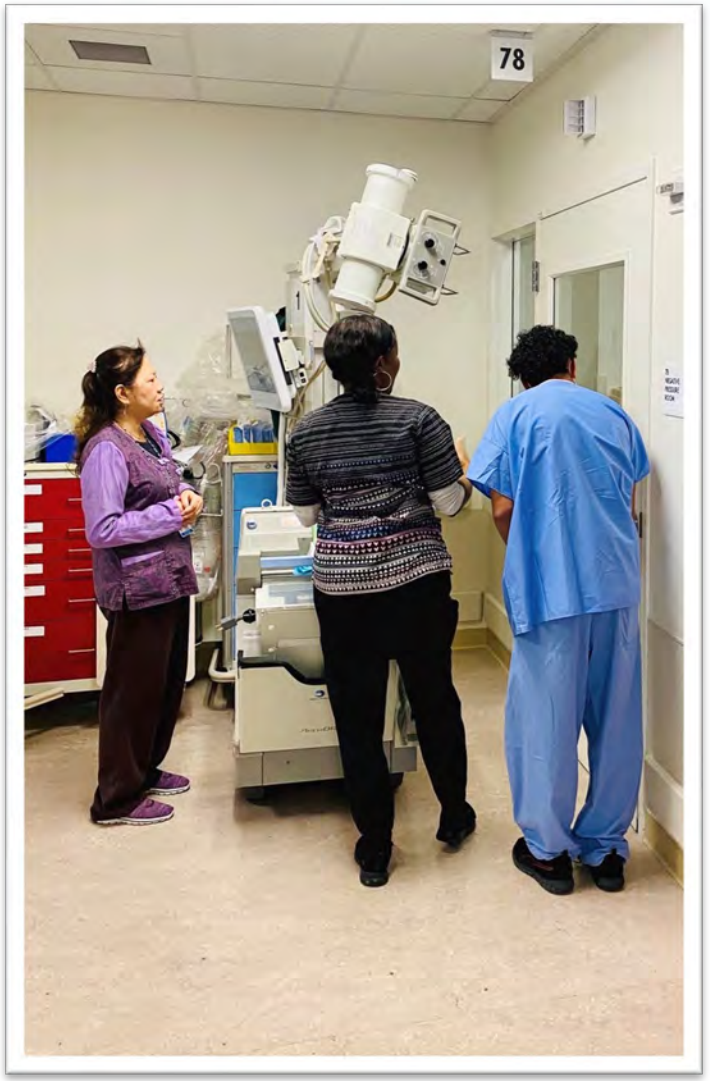
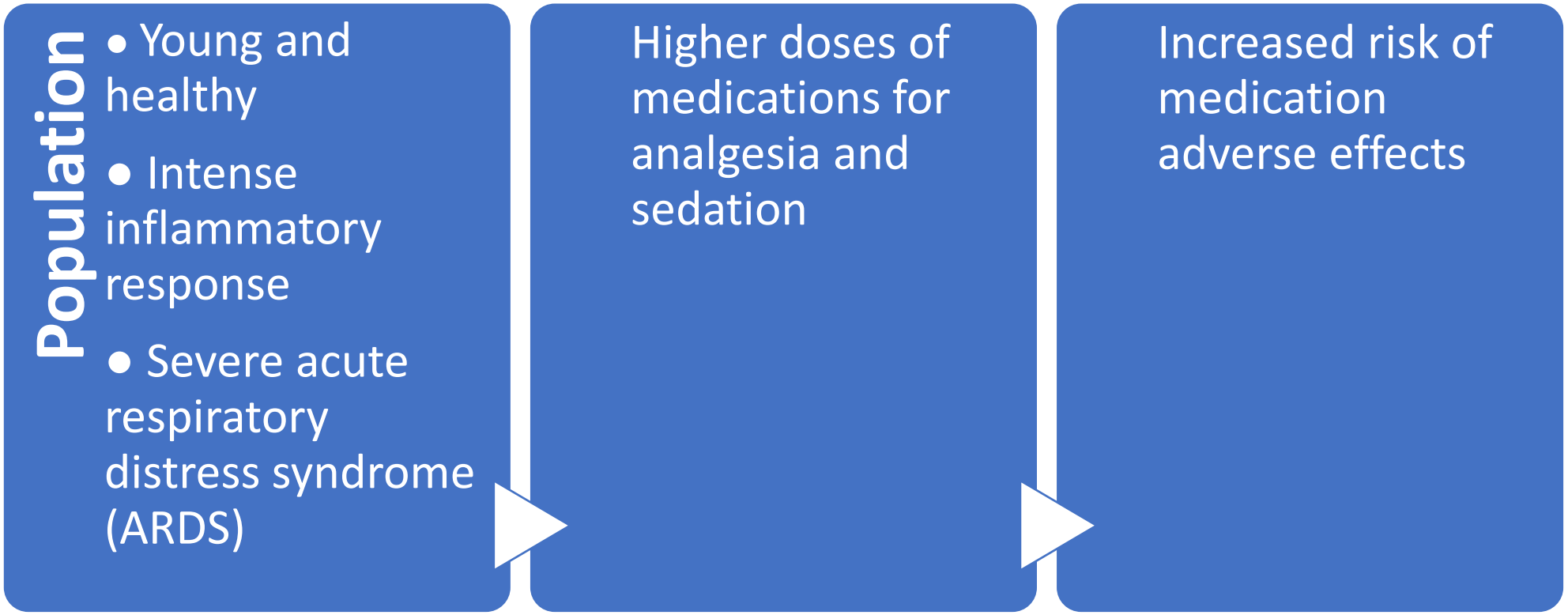


Photo Credit: Leslie Wu

POSTINTUBATION MANAGEMENT WAS MORE DIFFICULT



3. Handiziar D and Bittner EA. *Anesth Analg*. 2020.

OPTIMIZING USE OF MEDICATIONS FOR INTUBATION

Intubation	Ketamine IV or etomidate IV + Rocuronium IV or succinylcholine IV
Analgesia and Sedation	Fentanyl IV bolus + IV infusion + Propofol IV infusion
Hypotension management	Norepinephrine IV to target MAP > 65 mmHg
Paralysis	Rocuronium IV or vecuronium IV

Critical Care Medications in the Emergency Department

Rapid Sequence Intubation Medications

Sedation Medications	Dose
Etomidate	0.3 mg/kg
Ketamine	2 mg/kg
Propofol	1 mg/kg
Midazolam	0.05 mg/kg

Paralytic Medications	Dose
Rocuronium	1 mg/kg
Succinylcholine	1.5 mg/kg
Vecuronium	0.1 mg/kg

Postintubation Analgesia and Sedation Medications

Analgesia	Initial Rate	Maximum Rate	Titration Instructions
Fentanyl	25 mcg/hr	100 mcg/hr	Titrate by 12.5 mcg/hr every 15 minutes to achieve CPOT less than or equal to 2.

Sedation	Initial Rate	Maximum Rate	Titration Instructions
Propofol	5 mcg/kg/min	100 mcg/kg/min	Titrate by 5-10 mcg/kg/min every 5 minutes to a maximum of 100 mcg/kg/min until RASS TARGET is achieved.
Midazolam	0.5 mg/hr	10 mg/hr	See order for midazolam boluses every 5 minutes as needed for breakthrough RASS.

CPOT: Critical Care Pain Observation Tool, RASS: Richmond Agitation and Sedation Scale

Vasoactive Medications

Medications	Initial Rate	Maximum Rate	Titration Instructions
Norepinephrine	0.05 mcg/kg/min	0.5 mcg/kg/min	Titrate by 0.05 mcg/kg/min every 3 minutes to keep MAP >65 mm Hg.
Vasopressin	0.03 units/min	0.03 units/min	Do NOT titrate.
Epinephrine	0.05 mcg/kg/min	0.5 mcg/kg/min	Titrate by 0.05 mcg/kg/min every 3 minutes to keep MAP >65 mm Hg.
Dopamine	5 mcg/kg/min	20 mcg/kg/min	Titrate by 5 mcg/kg/min every 3 minutes to keep MAP >65 mm Hg.
Phenylephrine	0.5 mcg/kg/min	9.1 mcg/kg/min	Titrate by 1 mcg/kg/min every 3 minutes to keep MAP > 65 mm Hg.

Kaiser Permanente Downey Medical Center (revised 3/2020)

ANOTHER BARRIER WAS DRUG SHORTAGES

MITIGATING DRUG SHORTAGES

- Develop special approval procedures and criteria for certain medications
- Design electronic best practice alerts to promote appropriate prescribing
- Consider intravenous to oral conversion
- Identify alternative therapeutic options
- Establish protocols to minimize medication waste

4. Balreldin HA and Attallah B. Res Social Adm Pharm. 2020 May 19.

OTHER OPPORTUNITIES FOR EM PHARMACISTS

- Anticoagulation management
  - Initiate direct oral anticoagulants
  - Convert patients from warfarin to direct oral anticoagulants
- Standardization of medication administration times
- “Meds to Beds” and Medication Counseling

MINIMIZING RISK OF AEROSOLIZATION

- Discontinue use of nebulized medications
- Promote use of albuterol metered dose inhalers (MDIs) and spacers
- Discharge patients with albuterol MDIs

Drug Name: **Albuterol MDI** Strength: 90 mcg/ACT
Patient Name: Qty Dispensed:
Directions for Use: Inhale 2 puffs orally every 4-6 hours as needed for wheezing, shortness of breath, or cough
Expiration Date:_____

Date of Issue_____
Prescriber_____
Clinic Name_____
Address_____

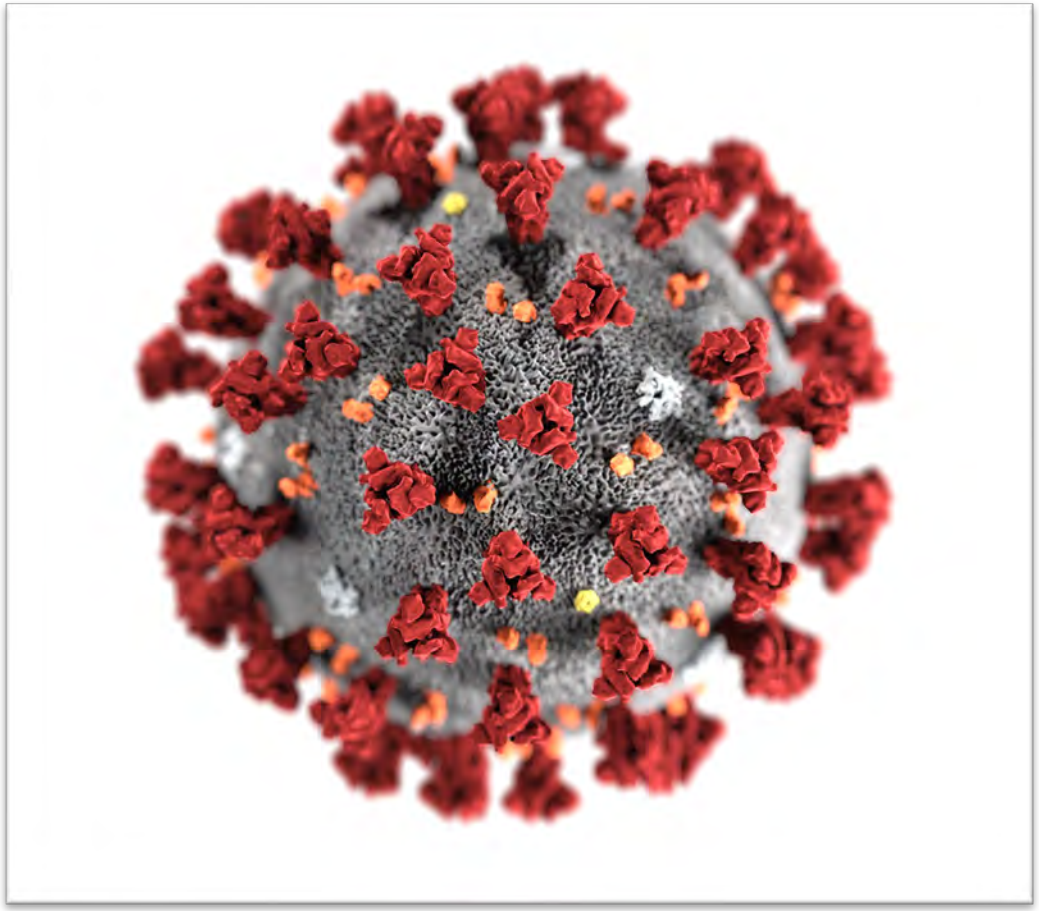
Drug Name: **Inhalational Spacer**
Patient Name:_____ Qty Dispensed: 1 ea.
Directions for Use: Use as directed with inhaler.
Expiration Date:_____

Date of Issue_____
Prescriber_____
Clinic Name_____
Address_____

INFECTIOUS DISEASES (ID) PHARMACIST PERSPECTIVE

SCREENING ACTIVELY FOR COVID-19 PATIENTS

- Access clinical status to determine eligibility for potential pharmacotherapies
- Order relevant laboratory tests
- Manage medications to prevent adverse events and mitigate drug shortages



ALISSA ECKERT, DAN HIGGINS/CDC

THE NOVELTY OF COVID-19 HINDERED SUCCESSFUL STEWARDSHIP

2002-2004 Severe acute respiratory syndrome coronavirus (SARS-Cov-1)	• 42/135 (31%)
2012-2013 Middle East respiratory syndrome coronavirus (MERS-CoV)	• 5/349 (1%)
2019 SARS-CoV-2 pandemic	• 62/806 (8%)

5. Rawson TM, et al. Clin Infect Dis. 2020;(xx):1-10.

THERE IS AN OVERALL LOW PERCENTAGE OF BACTERIAL INFECTION IN PATIENTS WITH COVID-19

- Systemic review of 38 studies

Overall bacterial infection:
8%

Acute bacterial co-infection:
4.9%

Secondary bacterial infection:
16%

Hospitalized patients:
5.9%

Critically ill patients:
16%

6. Toronto Antimicrobial Resistance Research Network. https://www.tarrn.org/covid.

7. Langford BJ, et al. *Clinical Microbiology and Infection*. 2020.

BACTERIAL COINFECTION LOWER IN VENTILATED PATIENTS WITH COVID-19 COMPARED PATIENTS WITH INFLUENZA

Population: Ventilated adults with confirmed SARS-CoV-2 or influenza with ≥ 1 respiratory tract sample sent for culture

	Influenza cohort	SARS-CoV-2 cohort	P-value
Early bacterial coinfection:	14/24 (58%)	3/36 (8%)	P < 0.0001
Late bacterial coinfection:	12/24 (50%)	13/36 (36%)	P = 0.3

8. Youngs J, et al. *J Infect.* 2020;81(3):e55-57.

RESUMING ANTIMICROBIAL STEWARDSHIP ACTIVITIES

- Recommend:
  - Blood and sputum cultures and other microbiological tests before antimicrobials are initiated
  - Standard antimicrobial therapy for community acquired pneumonia
  - Standard treatment duration of 5 days
  - MRSA screen to de-escalate vancomycin therapy
  - Discontinuation of antimicrobials if procalcitonin (PCT) noted to be low

9. Metlay, JP and Watere GW. *Annals of Internal Medicine*. 2020.

10. Huttner BD, et al. *Clinical Microbiology and Infection*. 2020. 26(7):p808-810.

HIGHER PCT VALUES MAY BE ASSOCIATED WITH MORE SEVERE SARS-COV-2 INFECTION

- Meta-analysis of 4 studies

Study	Odds Ratio (95% confidence interval)
Guan et al, 2020.	4.14 (2.06 - 8.33)
Zhang et al, 2020.	3.25 (1.48 - 7.15)
Huang et al, 2020.	3.50 (0.82 - 14.93)
Wang et al, 2020.	10.91 (4.48 - 26.56)
OVERALL	**4.76 (2.74 – 8.29)**

11. Lippi G and Plebani G. *Clin Chim Acta.* 2020 Jun;505:190-191.

GUIDELINES RECOMMEND EMPIRIC ANTIMICROBIALS IN SEVERE AND CRITICAL PATIENTS WITH COVID-19

National Institutes of Health	Society of Critical Care Medicine	World Health Organization
In patients with COVID-19 with severe or critical illness, there are insufficient data to recommend empiric antimicrobial therapy in the absence of another indication.	In mechanically ventilated patients with COVID-19 and respiratory failure, administer empiric antimicrobials (weak recommendation, low quality evidence).	In patients with suspected or confirmed severe COVID-19, administer empiric antimicrobials to treat all likely pathogens based on clinical judgment, patient host facts, and local epidemiology.
Assess use of antimicrobial daily. If there is no evidence of bacterial infection, de-escalate or stop antimicrobial therapy.		

12. National Institutes of Health, 2020.
13. Alhazzani W, et al. *Intensive Care Med*. 2020.
14. World Health Organization, 2020.

THERE WAS AN OVERLOAD OF INFORMATION

 15. National Institutes of Health, 2020.

PRACTICING AND EDUCATING BASED ON SCIENTIFIC EVIDENCE

- Stay up-to-date with potential treatment options
- Analyze the literature and educate physicians
  - Angiotensin-converting enzyme inhibitors (ACEi) and Angiotensin II receptor blockers (ARBs)
  - Nonsteroidal anti-inflammatory drugs (NSAIDs)
  - Hydroxychloroquine and azithromycin
  - Ivermectin

Table 1. Medical Management of Adult Patients with Suspected or Confirmed COVID-19

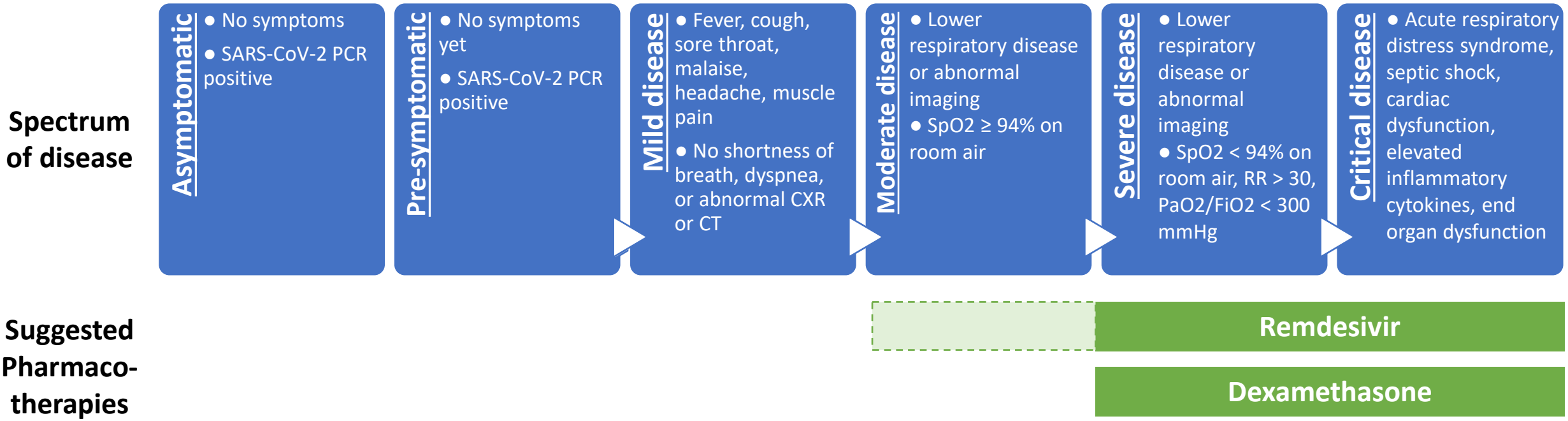
Clinical Presentation	Definition	Medication	Comments
Rule-out COVID-19	COVID-19 PCR pending	Symptomatic management only	Antipyretics: Consider acetaminophen over NSAIDs due to theoretical risk of NSAIDs in COVID-19. See Table 5 for more information. Corticosteroids: Avoid systemic corticosteroids in patients not requiring supplemental oxygen as preliminary trial results show no benefit and there is potential for prolonging viral replication. Use only for non-COVID-19 indications (e.g., COPD or asthma exacerbations). See Table 5 for more information. Bronchodilators: Use metered dose inhalers only. Avoid nebulizers due to increased aerosolization of viral particles.
Confirmed COVID-19 with Mild Disease	COVID-19 PCR positive + No pneumonia on imaging	Symptomatic management only	
Confirmed COVID-19 with Moderate Disease	COVID-19 PCR positive + Room air $SpO_2 > 94\%$ + Pneumonia on imaging	Symptomatic management only	
Confirmed COVID-19 with Severe Disease	COVID-19 PCR positive + Room air $SpO_2 \leq 94\%$ or on supplemental oxygen or on mechanical ventilation + Pneumonia on imaging	Remdesivir 200 mg IV x 1 day, then 100 mg IV q24H x 4 days when available (see Table 3 for access options) ± Dexamethasone 6 mg PO/IV q24H x 10 days (or until discharge if earlier) if requiring oxygen or mechanical ventilation ± Convalescent plasma (See Table 5 for more information) ± Other adjunctive therapy (See Table 5 for more information)	Remdesivir ▪ Check liver enzymes and serum creatinine at baseline and monitor daily. ▪ Not recommended in patients with CrCl < 30 mL/min or ALT ≥ 5x ULN. ▪ See Table 2 for more information. Corticosteroids ▪ Review medical history and assess risks and benefits prior to starting dexamethasone. ▪ Monitor for potential adverse effects, including hyperglycemia, secondary infections, and activation of latent infections.

Table 5. Adjunctive Therapy (continued)

Medication	Recommendation	Evidence
Systemic Corticosteroids	Requiring supplemental oxygen or mechanical ventilation: dexamethasone 6 mg PO/IV q24H x 10 days (or until discharge if earlier) Not requiring supplemental oxygen: not recommended Consult Rheumatology for cytokine storm syndrome recommendations	In the non-peer reviewed RECOVERY trial preliminary report, 2104 patients were randomized to receive dexamethasone 6 mg IV or PO q24H for up to 10 days and 4321 patients were randomized to receive usual care.[24] The median duration of dexamethasone was 6 days. In the dexamethasone group, 28-day mortality was reduced by one-third in ventilated patients (RR 0.65, p=0.0003) and by one-fifth in patients requiring oxygen (RR 0.80, p=0.0021). Dexamethasone use lowered 28-day mortality in patients with symptoms >7 days but not in patients with symptoms ≤ 7 days. There was no benefit with dexamethasone use in patients not requiring oxygen (RR 1.22, p=0.14). Various observational cohort studies of COVID-19 patients receiving various corticosteroids have found both beneficial and harmful effects.[8,25-30] These findings should be interpreted cautiously due to non-randomized study design. Henry Ford Health System started a protocol to administer early IV methylprednisolone x 3 to 7 days in moderate to severe COVID-19 pneumonia.[31] The rate and duration of steroid use were similar between the pre- and post-protocol groups, but the post-protocol group received steroids sooner after admission (median 2 days vs 5 days). The post-protocol group had lower rates of death, ICU transfer, mechanical ventilation, ARDS, and shorter hospital LOS compared to the pre-protocol group. While this study suggests early, as opposed to late, corticosteroid use can prevent disease progression, it does not compare early corticosteroids to no corticosteroids or study the risks of corticosteroids. Updated NIH and IDSA guidelines now recommend the use of dexamethasone for patients requiring supplemental oxygen or mechanical ventilation.[32,33]
Inhaled Medications (such as albuterol and ipratropium)	Use metered-dose inhalers (MDIs) with spacers	Nebulizers are aerosol-generating therapies and should be avoided in patients with COVID-19 to prevent aerosolization of viral particles.[34]
IVIG (intravenous immunoglobulin)	Not recommended	A retrospective cohort study in China found no mortality benefit from IVIG use, but the study had major limitations such as significant differences in baseline characteristics and the use of numerous other treatments.[35] Current commercially available IVIG products are unlikely to include antibodies against SARS-CoV-2. IVIG has been associated with serious adverse events, including anaphylactic reactions, aseptic meningitis, renal failure, thromboembolism, hemolytic reactions, and transfusion-related lung injury.[36]
NSAIDs (nonsteroidal anti-inflammatory drugs)	Consider acetaminophen over NSAIDs	There may be a potential risk of NSAIDs aggravating COVID-19 through upregulation of angiotensin-converting enzyme 2 (ACE2), which is utilized by SARS-CoV-2 to bind to target cells to facilitate infection.[37] Currently, there is no clinical data to support this hypothesis, but alternative analgesic and antipyretics are available, and risk and benefit should be considered.[38]

PHARMACOTHERAPEUTICS FOR COVID-19

CURRENT TREATMENT OPTIONS INCLUDE REMDESIVIR AND DEXAMETHASONE



16. IDSA Guidelines on the Treatment and Management of Patients with COVID-19, 2020.

REMDESIVIR (VEKLURY)

- **Mechanism of action:**
  - Nucleotide prodrug, when converted within cells to its active form, binds to RNA polymerase of SARS-CoV-2, causing chain termination and inhibition of viral replication
- **Dose:**
  - 200 mg IV x 1 day, then 100 mg IV q24H x 4 days
- **Adverse drug effects:**
  - Elevated liver enzymes, hypersensitivity reactions, nausea, hypokalemia, headache

REMDESIVIR SHORTENS TIME TO RECOVERY

- **Population:** Hospitalized adults with pneumonia and SpO2 ≤ 94% on room air, oxygen supplement, mechanical ventilation (MV), or extracorporeal membrane oxygenation (ECMO)

Outcomes	Remdesivir x 10 days	Placebo
Median time to recovery	11 days	15 days
	Rate ratio for recovery: 1.32 95% confidence interval: 1.12 – 1.55; p< 0.001	
Mortality at day 14	32/538 (5.9%)	54/521 (10.4%)
	Hazard ratio for death: 0.70 95% confidence interval: 0.47 – 1.04	

18. Beigel JH, et al. *New Engl J Med*. 2020

BENEFITS OF REMDESIVIR SEEN IN HOSPITALIZED PATIENTS RECEIVING OXYGEN

Subgroup	Recovery rate ratio (95% Confidence interval (CI))
Symptoms ≤ 10 days	**1.28 (1.07 – 1.59)**
Symptoms > 10 days	**1.38 (1.05 – 1.81)**
Baseline ordinal score 4	1.38 (0.94 – 2.03)
Baseline ordinal score 5	**1.47 (1.17 – 1.84)**
Baseline ordinal score 6	1.20 (0.79 – 1.81)
Baseline ordinal score 7	0.95 (0.64 – 1.42)

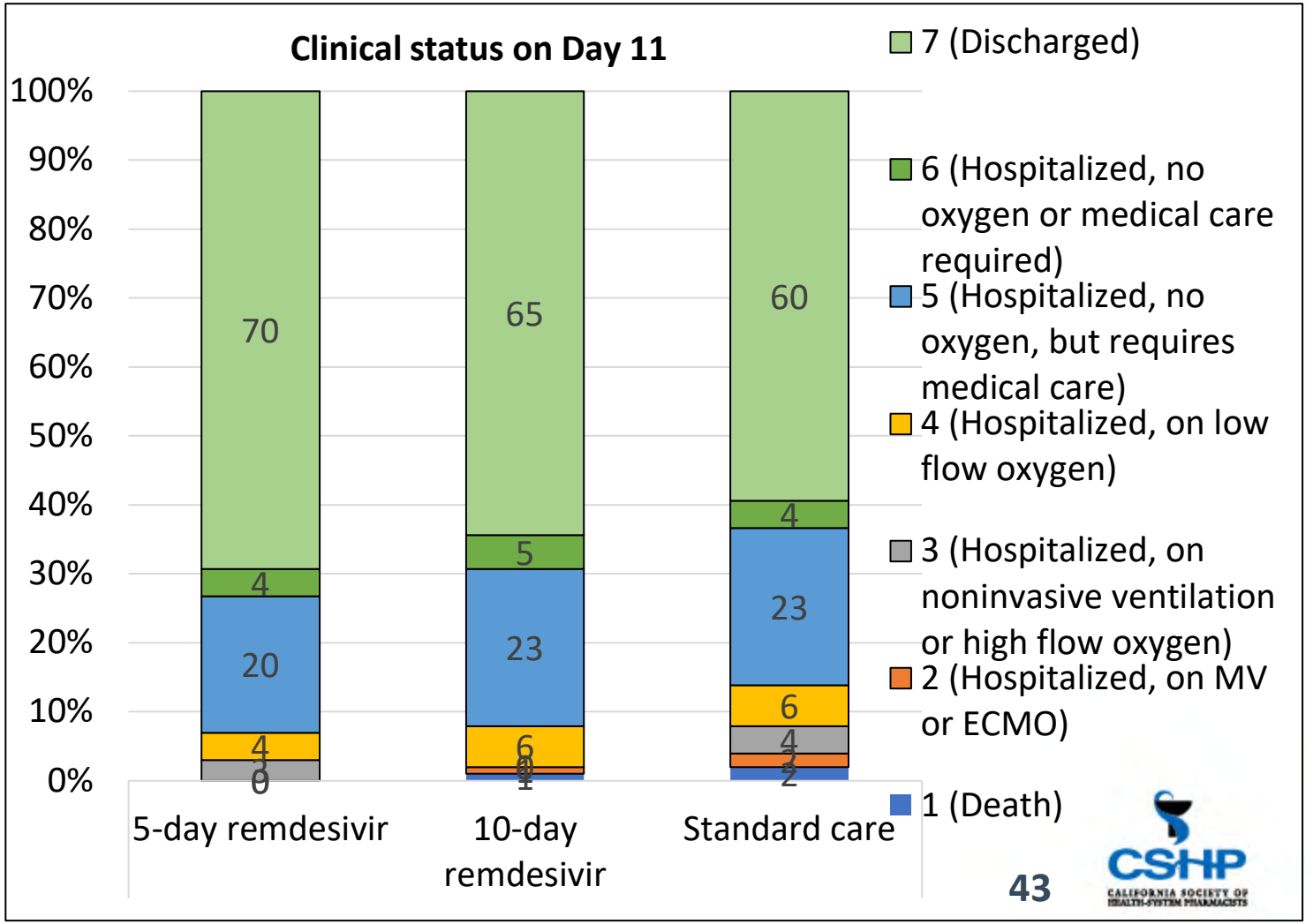
Ordinal scale	Description
1	Not hospitalized, no limitations to activities
2	Not hospitalized, limitations to activities, home oxygen requirement or both
3	Hospitalized, not requiring oxygen and no longer requiring ongoing medical care
4	Hospitalized, not requiring oxygen but requiring ongoing medical care
5	Hospitalized, requiring oxygen
6	Hospitalized, requiring noninvasive ventilation or high flow oxygen devices
7	Hospitalized requiring MV or ECMO
8	Death

18. Beigel JH, et al. *New Engl J Med*. 2020

5-DAY REMDESIVIR SHOWS BENEFITS IN MODERATE COVID-19

Population: Hospitalized patients ≥ 12 years of age with confirmed SARS-CoV-2 infection, pneumonia on radiographic imaging, and SpO2 >94% on room air

Clinical status distribution on Day 11
5-day remdesivir versus standard care: OR: 1.65 95% CI: 1.09 – 2.48, p = 0.02
10-day remdesivir versus standard care: p = 0.18



19. Spinner et al. *JAMA*. 2020.

No difference between 5 and 10 days in severe disease

- **Population:** Hospitalized patients ≥ 12 years of age with confirmed SARS-CoV-2 infection, pneumonia on radiographic imaging, and either had SpO2 ≤ 94% on room air or required supplemental oxygen

Outcomes	Result
Clinical improvement at Day 14	5-day remdesivir: 129/200 (64%) 10-day remdesivir: 107/197 (54%) RR: 1.19 (95% CI: 1.01-1.40) Baseline adjusted difference: p = 0.14
Mortality at Day 14	5-day remdesivir: 16/200 (8%) 10-day remdesivir: 21/197 (10.7%) HR: 0.75 (95% CI: 0.4-1.39)

20. Goldman et al. *New Engl J Med*. 2020.

REMDESIVIR IS RECOMMENDED IN SEVERE DISEASE

Clinical status	National Institutes of Health	Infectious Diseases Society of America
Mild to Moderate	Insufficient data to recommend for or against use	-
Severe	On supplemental oxygen: Remdesivir x 5 days or until hospital discharge (Strong recommendation, I)	On supplemental oxygen: Remdesivir x 5 days rather than 10 days (Conditional recommendation, low certainty of evidence)
	On HFNC, NIV, MC, or ECMO: no recommendation for or against remdesivir	On MV or ECMO: Remdesivir x 10 days

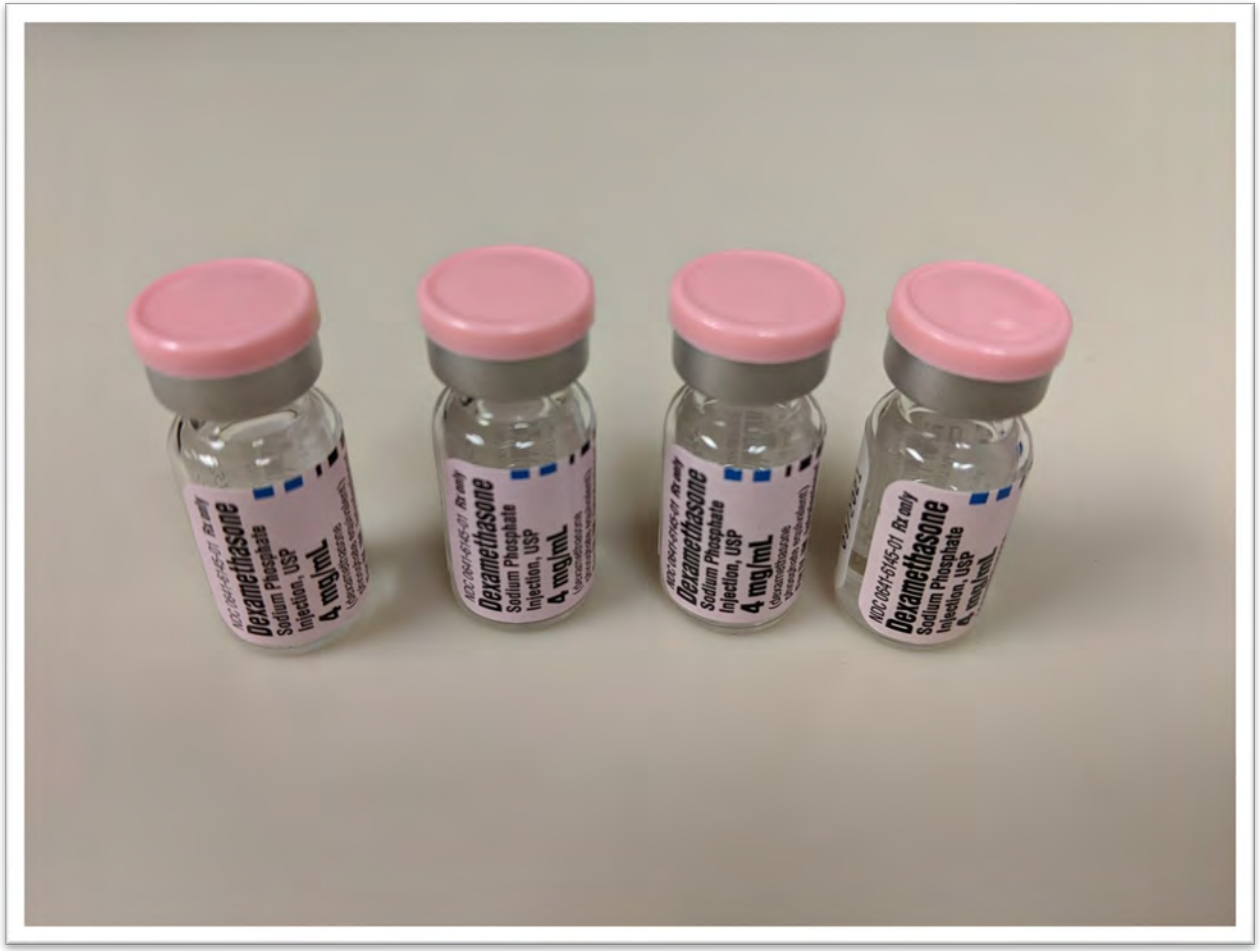
ECMO – extracorporeal membrane oxygenation; HFNC – high flow nasal cannula; MV – mechanical ventilation; NIV – non-invasive mechanical ventilation

12. National Institutes of Health, 2020.

16. IDSA Guidelines on the Treatment and Management of Patients with COVID-19, 2020.

DEXAMETHASONE

- **Mechanism of action:**
  - Glucocorticoid with anti-inflammatory properties, which can mitigate the inflammatory organ injury caused by SARS-CoV-2
- **Dose:**
  - 6 mg IV/PO up to 10 days
- **Adverse drug effects:**
  - Hyperglycemia, secondary infections



21. Recovery Collaborative Group. *NEJM.* 2020.

DEXAMETHASONE DECREASES MORTALITY IN CERTAIN PATIENTS

- **Population:** Hospitalized patients

Outcome	Dexamethasone 6 mg IV/PO	Placebo	Rate ratio (95% CI)
28-day mortality	482/2104 (22.9%)	1110/4321 (25.7%)	0.83 (0.75-0.93) p<0.001
On mechanical ventilation	95/324 (29.3%)	283/683 (41.4%)	0.64 (0.51-0.81)
On oxygen only	298/1279 (23.3%)	682/2604 (26.2%)	0.82 (0.72-0.94)
Not on any oxygen	89/501 (17.8%)	145/1034 (14%)	1.19 (0.91-1.55)

21. Recovery Collaborative Group. *NEJM.* 2020.

META-ANALYSIS FURTHER ASSESSES ASSOCIATION OF CORTICOSTEROIDS AND 28-DAY MORTALITY

Study	N		Initial steroid dose/administration	Mechanical ventilation (%)
	Steroid	No Steroid		
DEXA-COVID 19	7	12	Dexamethasone 20 mg/d IV	19 (100%)
CoDEX	128	128	Dexamethasone 20 mg/d IV	256 (100%)
RECOVERY	324	683	Dexamethasone 6 mg/d PO/ IV	1007 (100%)
CAPE COVID	76	73	Hydrocortisone 200 mg/d IV	121 (81.2%)
COVID STEROID	15	14	Hydrocortisone 200 mg/d IV	15 (51.7%)
REMAP-CAP	105	92	50 mg every 6 hours IV	117 (59.4%)
Steroids-SARI	24	23	Methylprednisolone 40 mg every 12 hour IV	27 (57.5%)
Overall fixed effect odds ratio: 0.66 (0.53-0.82) p < 0.001				

22. The WHO Rapid Evidence Appraisal for COVID-19 Therapies (REACT) Working Group. *JAMA*. 2020.

ASSOCIATION BETWEEN CORTICOSTEROIDS AND 28-DAY MORTALITY WITHIN VARIOUS SUBGROUPS

Clinical characteristic at baseline	Subgroup	Odds ratio (95% CI)
On mechanical ventilation	No	**0.41 (0.19 – 0.88)**
	Yes	**0.69 (0.55 – 0.86)**
On vasoactive medication	No	**0.55 (0.34 – 0.88)**
	Yes	1.05 (0.65 – 1.69)
Symptomatic	≤ 7 days	0.63 (0.39 – 1.04)
	> 7 days	**0.64 (0.49 – 0.83)**

22. The WHO Rapid Evidence Appraisal for COVID-19 Therapies (REACT) Working Group. *JAMA*. 2020.

NO EVIDENCE THAT HIGHER DOSES ASSOCIATED WITH GREATER BENEFITS

Corticosteroid dose	Examples	Odds ratio (95% CI)	P –value
Low	Dexamethasone 6 mg IV/PO	0.61 (0.48-0.78)	p < 0.001
	Hydrocortisone 200 mg/d IV		
High	Dexamethasone 20 mg/d IV	0.83 (0.53-1.29)	P = 0.46
	Methylprednisolone 40 mg IV q12 hours		

22. The WHO Rapid Evidence Appraisal for COVID-19 Therapies (REACT) Working Group. *JAMA*. 2020.

DEXAMETHASONE IS RECOMMENDED IN PATIENTS REQUIRING OXYGEN OR ON MECHANICAL VENTILATION

Clinical status	National Institutes of Health	Infectious Diseases Society of America	World Health Organization
No supplemental oxygen	Not recommended (Strong recommendation, I)	Not recommended (Conditional recommendation, low evidence)	
On supplemental oxygen but not mechanically ventilated	Dexamethasone[a] 6 mg IV/PO up to 10 days (Moderate recommendation, I)	Dexamethasone[a] 6 mg IV/PO for up to 10 days (Conditional recommendation, moderate evidence)	Dexamethasone[a] 6 mg IV/PO for up to 10 days (Strong recommendation, moderate evidence)
On mechanical ventilation	Dexamethasone[a] 6 mg IV/PO up to 10 days (Strong recommendation, I)		

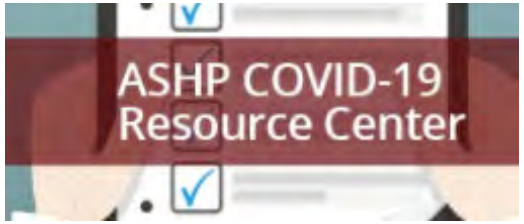
[a]If dexamethasone is not available, consider alternative glucocorticoids, such as prednisone 40 mg PO, methylprednisolone 32 mg IV, and hydrocortisone 150 mg IV.

12. National Institutes of Health, 2020.
16. IDSA Guidelines on the Treatment and Management of Patients with COVID-19, 2020.
23. Corticosteroids for COVID-19. World Health Organization, Sep 2020.

MANY COVID-19 RESOURCES ARE OUT THERE

EM:RAP COVID-19 RESOURCES

COVID-19 Resources
SIDP SOCIETY OF INFECTIOUS DISEASES PHARMACISTS



IDSA Infectious Diseases Society of America

SHEA The Society for Healthcare Epidemiology of America

CLINICAL CARE OPTIONS® INFECTIOUS DISEASE

IDSTEWARDSHIP
Promoting Clinical Pharmacy & Antimicrobial Stewardship

QUESTION 1:

How did pharmacists help during the COVID-19 pandemic?

A. Create COVID-19 Code Blue packs.
B. Find alternative therapies for postintubation sedation and analgesia.
C. Standardize medication administration times to save PPE and minimize staff exposure.
D. Develop local guidelines for management of patients with COVID-19.
E. All of the above.

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E. **All of the above.**

QUESTION 2:

A 35 year male presents to the Emergency Department with a fever to 39^{o}C, shortness of breath, and cough for 4 days. On arrival, his oxygen saturation (SpO2) in room air is 86%, so he is placed on 2 liters of nasal cannula. His SpO2 subsequently improves to 98%. A chest x-ray is done and shows bilateral interstitial infiltrates. A SAR-CoV-2 PCR test and procalcitonin level are sent, but the results will take 24 hours to come back. The admitting physician orders remdesivir, dexamethasone, ceftriaxone, and azithromycin. When you, the antimicrobial stewardship pharmacist comes into work the next day, the SARS-CoV-2 PCR test comes back positive. The procalcitonin level is 0.14. What recommendation do you have for the hospitalist regarding the patient's antibiotic orders?

A. Continue empiric antibiotics for 10 days.

B. Continue empiric antibiotics because the risk of bacterial coinfection in patients with COVID-19 is high.

C. Discontinue empiric antibiotics because the risk of bacterial coinfection in patients with COVID-19 is low.

D. Continue empiric antibiotics because the procalcitonin level is suggestive of a bacterial coinfection.

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QUESTION 3:

Which treatment regimen has been shown to decrease mortality in patients infected with SARS-CoV-2 and requiring supplemental oxygen?

A. Remdesivir 200 mg IV x 1 day, then 100 mg IV x 4 days
B. Dexamethasone 6 mg IV daily x 10 days
C. Tocilizumab 800 mg IV x 1 dose
D. Anakinra 100 mg SQ daily x 7 days
E. Hydroxychloroquine 400 mg PO BID x 5 days

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