Pandemic Stewardship: New Roles and Contributions of Antimicrobial Stewardship Programs During COVID-19

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May 21, 2021

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Disclosures

- No relevant disclosures

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Overview

- Describe novel activities that Antimicrobial Stewardship Programs (ASPs) have taken on during the COVID-19 pandemic
- Describe ASP collaboration with infection prevention programs during the pandemic
- Discuss implications from the pandemic on future ASP activities and program building

VCU HIPP

- 4 ID physician epidemiologists
- 10 infection preventionists
- 1 IT specialist
- 1 data curator analyst
- 1 microbiology technician

VCU ASP

- 2 ID physicians (1 adult, 1 peds)
- 4 pharmacy FTEs
  - 5 total pharmacists
  - 1 FTE for peds AS
- 0.1 IT FTE

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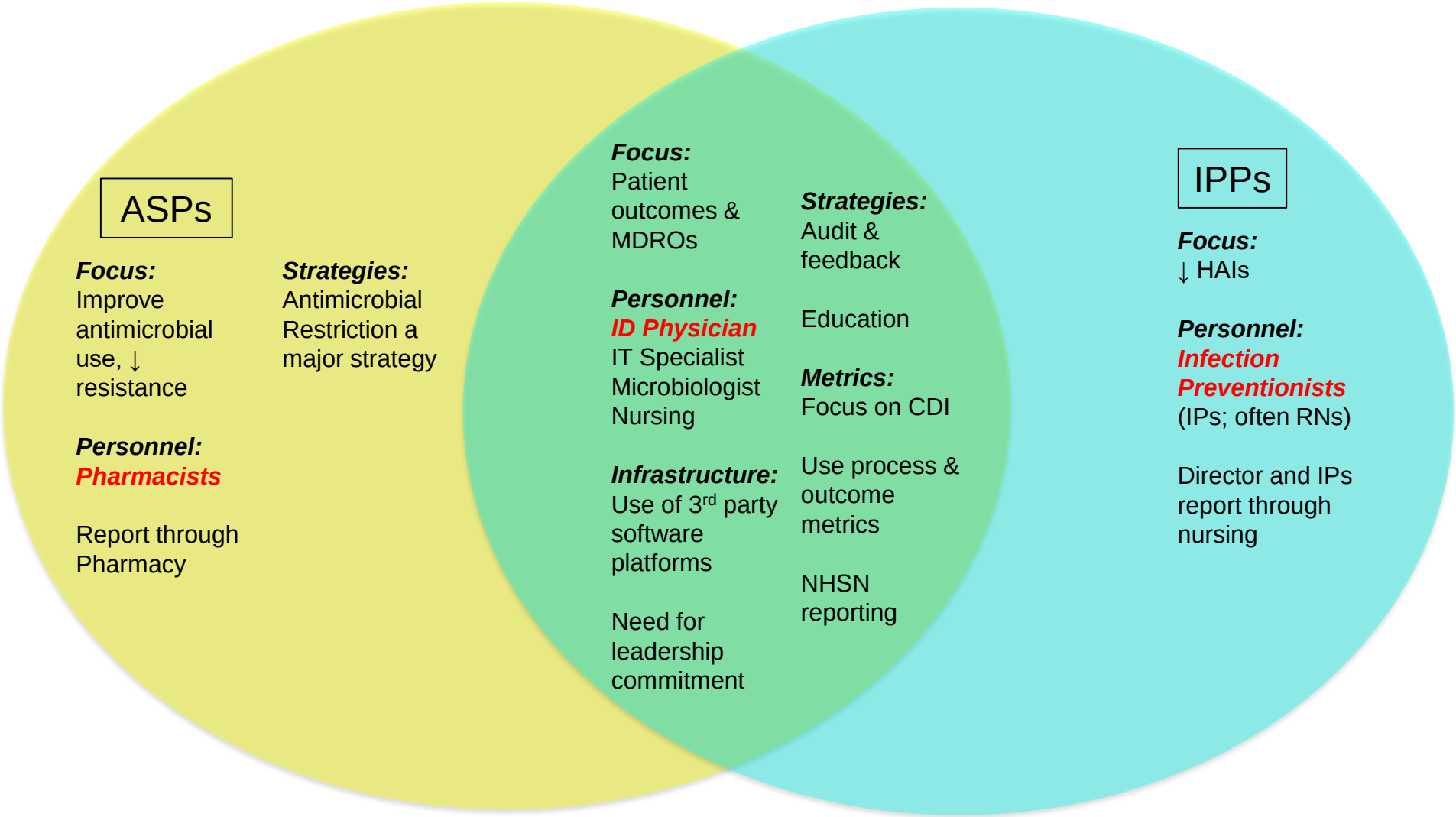
Similarities and Differences Between ASPs and Infection Prevention Programs



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Abbas & Stevens. Med Clin N Amer 2018;102:873-882.

Another ? for #IDtwitter: has your #AntimicrobialStewardship team been involved in #COVID19 response or preparation? Plz comment on what you think the implications are for ASPs/ the best way our community can help; plz RT & tag folks outside of the US, too; thanks!! #SARSCoV2

VCU Health

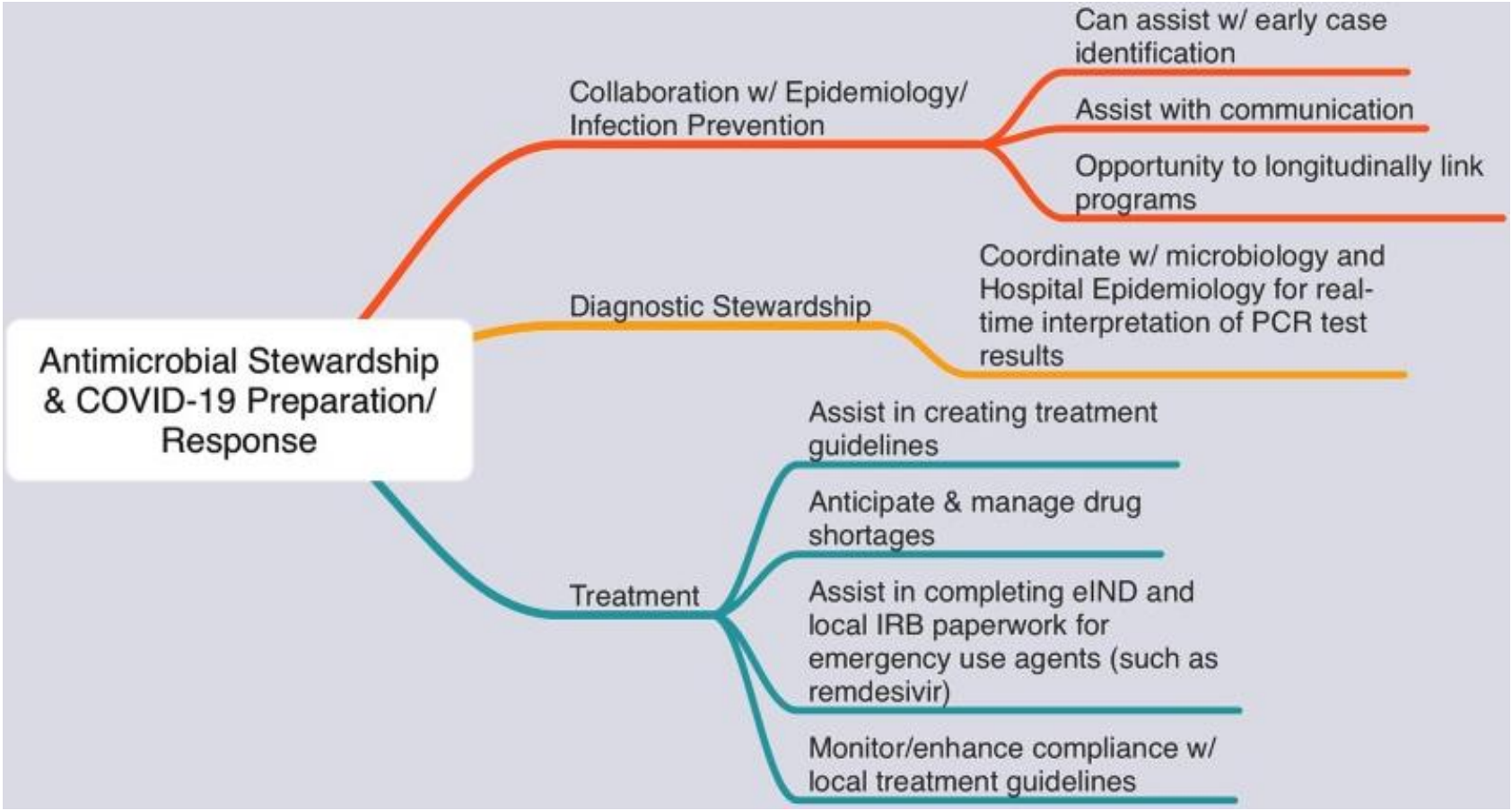
March 3, 2020

Infect Control Hosp Epidemiol. 2020 Mar 13 : 1–2.
Published online 2020 Mar 13. doi: 10.1017/ice.2020.69
PMCID: PMC7137534
PMID: 32167442

Involving antimicrobial stewardship programs in COVID-19 response efforts: All hands on deck

Michael P. Stevens, MD, MPH,[1] Payal K. Patel, MD, MPH,[2] and Priya Nori, MD[3]

To the Editor—To our knowledge, no formal recommendations exist for the inclusion of antimicrobial stewardship programs (ASPs) in disaster planning or emergency response preparedness efforts.[1] A PubMed search utilizing the search terms "antimicrobial stewardship" AND "disaster planning" was performed on March 4, 2020, and yielded no results. ASPs are now ubiquitous. They often include pharmacists and physicians with advanced infectious diseases training, and they are a valuable part of hospital safety and quality programs. In some hospitals, compartmentalization of stewardship and epidemiology functions have developed over time to meet distinct institutional needs. However, domains should coalesce for purposes of emergency preparedness. The current SARS-CoV-2/COVID-19 outbreak highlights numerous



VCU Health

Stevens MP, Patel PK, Nori P. Infect Control Hosp Epidemiol 2020 Mar 13:1-2.

Overview

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- Describe ASP collaboration with infection prevention programs during the pandemic
- Discuss implications from the pandemic on future ASP activities and program building

ASP Involvement in COVID-19 Response Efforts

- Major ways Antimicrobial Stewardship Programs (ASPs) have been involved (not exhaustive):
  - Case identification and diagnostic stewardship of SARS-CoV-2 testing
  - COVID-19 treatment
    - Guidelines
    - Facilitating access to potential therapeutics
  - Outpatient pandemic stewardship
    - Preauthorization for potential therapeutics
    - Managing access process for monoclonal antibodies
  - Vaccine planning

Nori P, Patel P, Stevens MP. Infect Control Hosp Epi, published online April 16, 2021.

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VCU Health: Early COVID-19 Experience

- March 16, 2020: first patient with confirmed COVID-19 admitted
- March 16, 2020: COVID-19 Command Center opens
- March 17, 2020: Dedicated Adult COVID-19 consult service established

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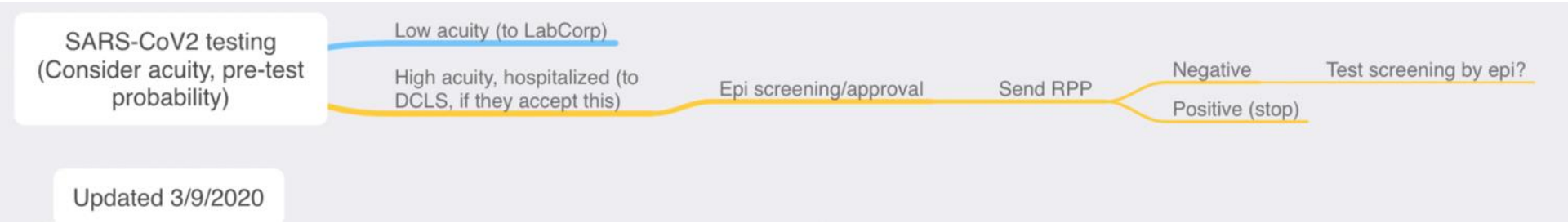
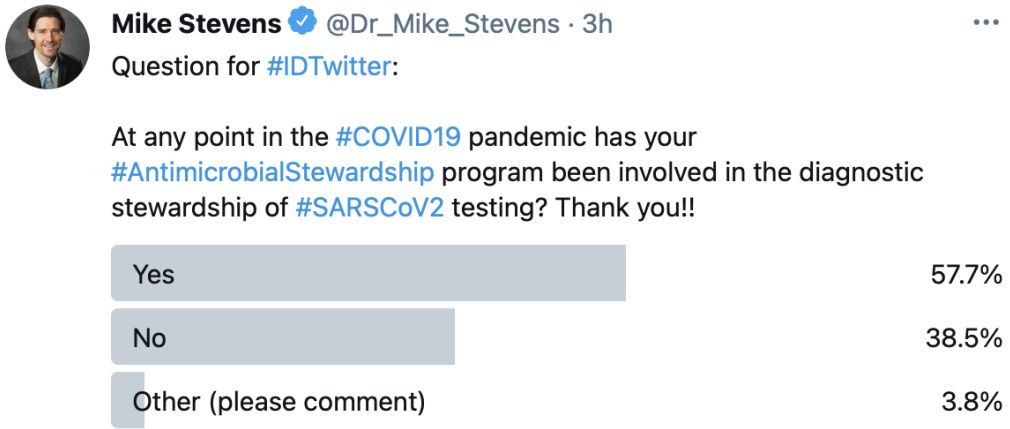
Diagnostic Stewardship of SARS-CoV-2 Testing at VCU Health

- Infection preventionists and physician epidemiologists with HIPP team initially screened all possible patients



stewardship



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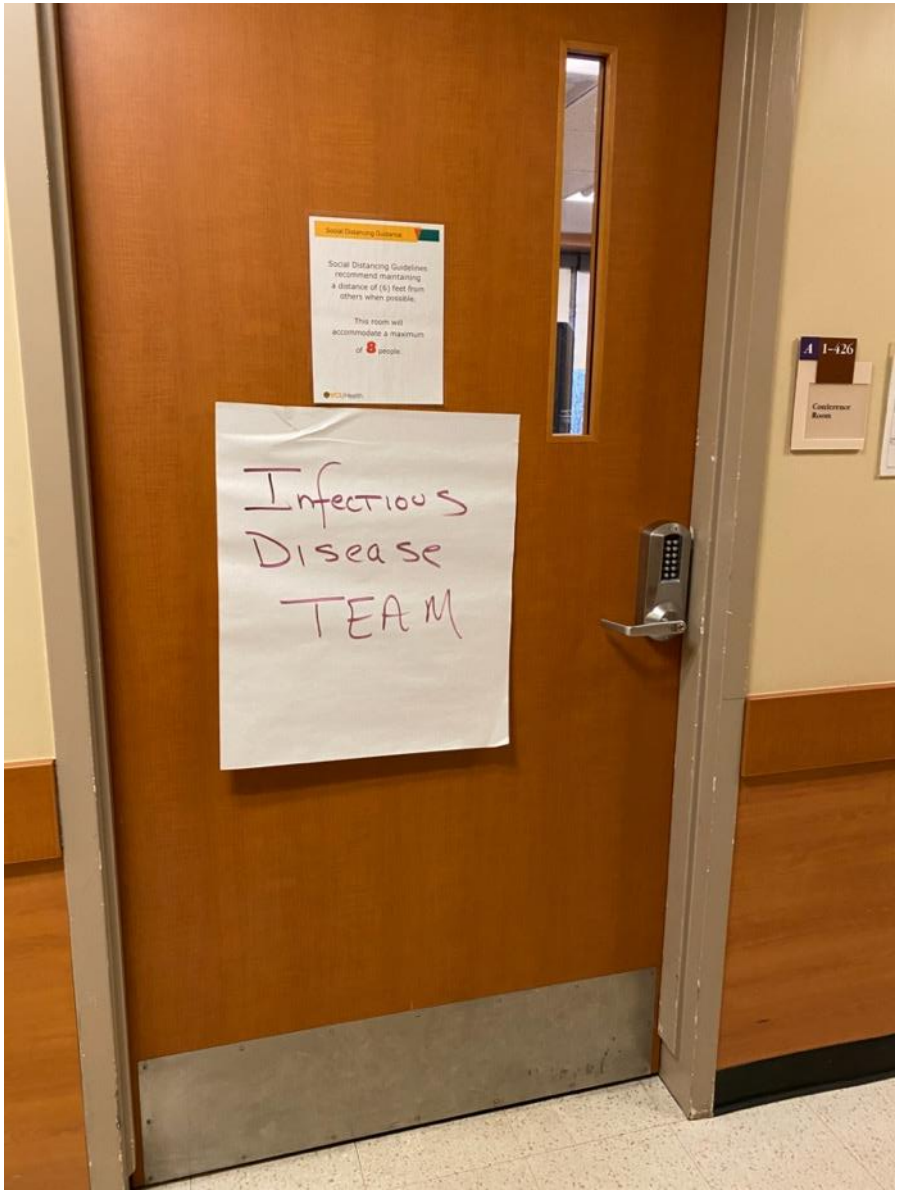
Nori P, Patel P, Stevens MP. Infect Control Hosp Epi, published online April 16, 2021.


Social Distancing Guidance
Social Distancing Guidelines recommend maintaining a distance of (6) feet from others when possible.
This room will accommodate a maximum of 8 people.
A 1-426
Conference Room
Infectious Disease TEAM

VCUHealth™

VCU Health™

May 27, 2020

> Infect Control Hosp Epidemiol. 2020 Jul;41(7):859-861. doi: 10.1017/ice.2020.224.
Epub 2020 May 11.

Utility of retesting for diagnosis of SARS-CoV-2/COVID-19 in hospitalized patients: Impact of the interval between tests

Michelle E Doll [1], Rachel Pryor [1], Dorothy Mackey [1], Christopher D Doern [1], Alexandra Bryson [1], Pamela Bailey [1], Kaila Cooper [1], Emily Godbout [1], Michael P Stevens [1], Gonzalo Bearman [1]

Affiliations + expand

PMID: 32389155 PMCID: PMC72397

> Am J Infect Control. 2020 Aug;48(8):966-967. doi: 10.1016/j.ajic.2020.05.002.
Epub 2020 May 12.

The electronic medical record and COVID-19: Is it up

elle Doll [2], Emily Godbout [2],

ajic.2020.05.002

ust occur prior to the next pandemic.

advise staff, not review charts.

d quality.

> Infect Control Hosp Epidemiol. 2020 Oct;41(10):1231-1233. doi: 10.1017/ice.2020.358.
Epub 2020 Jul 23.

Universal screening for the SARS-CoV-2 virus on hospital admission in an area with low COVID-19 prevalence

Sangeeta R Sastry [1], Rachel Pryor [1], Jillian E Raybould [1], Julie Reznicek [1], Kaila Cooper [1], Amie Patrick [1], Shelley Knowlson [1], Pamela Bailey [1], Emily Godbout [1], Michelle Doll [1], Michael P Stevens [1], Gonzalo Bearman [1]

Affiliations + expand

PMID: 32698924 PMCID: PMC7411438 DOI: 10.1017/ice.2020.358

Free PMC article

ASP Involvement in COVID-19 Response Efforts

- Major ways Antimicrobial Stewardship Programs (ASPs) have been involved (not exhaustive):
  - Case identification and diagnostic stewardship of SARS-CoV-2 testing
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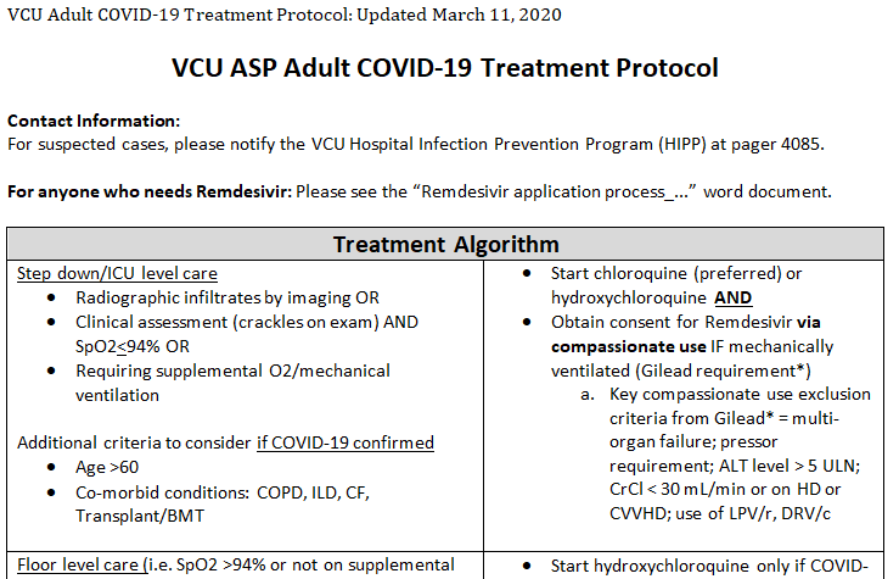
Nori P, Patel P, Stevens MP. Infect Control Hosp Epi, published online April 16, 2021.


Antimicrobial Stewardship & COVID-19 Preparation/ Response
Collaboration w/ Epidemiology/ Infection Prevention
Can assist w/ early case identification
Assist with communication
Opportunity to longitudinally link programs
Diagnostic Stewardship
Coordinate w/ microbiology and Hospital Epidemiology for real-time interpretation of PCR test results
Treatment
Assist in creating treatment guidelines
Anticipate & manage drug shortages
Assist in completing eIND and local IRB paperwork for emergency use agents (such as remdesivir)
Monitor/enhance compliance w/ local treatment guidelines

VCU Health

COVID-19 Treatment Guidelines

- Created local treatment guidelines
  - Collaborated with multiple other medical centers and reviewed guidance documents from China and Italy as well
  - On 3/11/2020 we released our first treatment guidelines
    - Between 3/11/20-4/22/21 we updated these guidelines > 90 times
    - Document went from 6 pages → 35 pages



VCU Adult COVID-19 Treatment Protocol: Updated March 11, 2020

VCU ASP Adult COVID-19 Treatment Protocol

Contact Information:
For suspected cases, please notify the VCU Hospital Infection Prevention Program (HIPP) at pager 4085.

For anyone who needs Remdesivir: Please see the "Remdesivir application process_..." word document.

Treatment Algorithm	
Step down/ICU level care • Radiographic infiltrates by imaging OR • Clinical assessment (crackles on exam) AND SpO2≤94% OR • Requiring supplemental O2/mechanical ventilation Additional criteria to consider if COVID-19 confirmed • Age >60 • Co-morbid conditions: COPD, ILD, CF, Transplant/BMT	• Start chloroquine (preferred) or hydroxychloroquine **AND** • Obtain consent for Remdesivir **via compassionate use** IF mechanically ventilated (Gilead requirement*) a. Key compassionate use exclusion criteria from Gilead* = multi-organ failure; pressor requirement; ALT level > 5 ULN; CrCl < 30 mL/min or on HD or CVVHD; use of LPV/r, DRV/c
Floor level care (i.e. SpO2 >94% or not on supplemental	• Start hydroxychloroquine only if COVID-

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VCU ASP Adult COVID-19 Treatment Guidelines

These guidelines are based on the best available evidence and professional society guidelines. Although some "preprint" data are referenced, in general these guidelines include peer-reviewed data primarily, and include links to the most relevant literature. For questions regarding these guidelines please contact Mike Stevens via email (michael.stevens@vcuhealth.org) or pager 8422.

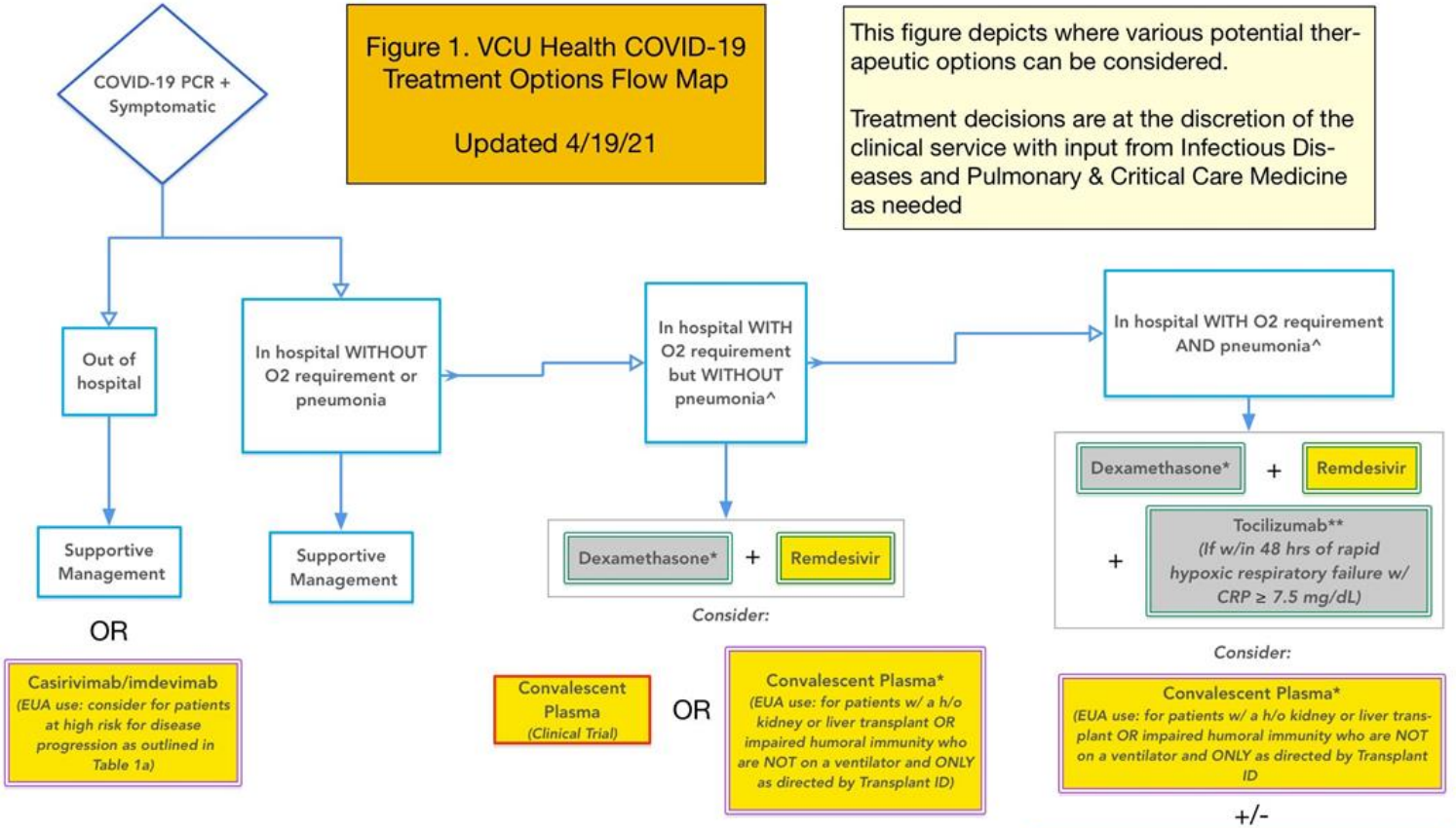
Table of Contents

Figure 1. VCU Health COVID-19 Treatment Options Flow Map

Updated 4/19/21

This figure depicts where various potential therapeutic options can be considered.

Treatment decisions are at the discretion of the clinical service with input from Infectious Diseases and Pulmonary & Critical Care Medicine as needed



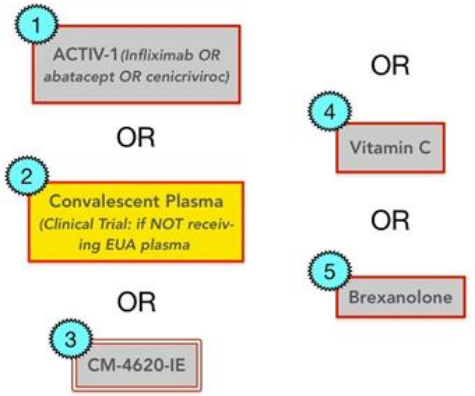
Clinical Trials are in RED boxes; drugs available under FDA emergency use authorization (EUA) criteria are in PURPLE boxes; other (non-trial) options are in GREEN boxes; boxes with double lines = agents that are available to patients who are incarcerated.

Gray shading = targeting immune response.
Yellow shading = targeting virus directly.

**If dexamethasone/other corticosteroids are contraindicated EUA baricitinib can be substituted (in combination with remdesivir).*

***Would give a one time dose of tocilizumab (8 mg/kg, up to 800 mg) for patients within 48 hours of the development of rapid progressive hypoxic respiratory failure requiring NIV or MV or high-flow O2 (>0.4 FiO2/30L/min oxygen flow) who also have a CRP of ≥ 7.5 mg/dL.*

^The clinical trials teams are screening patients and will reach out to primary providers about potential enrollment. Primary teams can also put a clinical trial referral in CERNER (type in "Clinical Trials Referral").



Key Updates: Table View

Therapeutic	Available under EUA? (Date of EUA release)	Use outside of clinical trials recommended by IDSA and/or the NIH?	Use outside of clinical trials^ recommended at VCU Health?	Other comments
Remdesivir	Yes (8/28/20; but FDA approved for patients 12 years and older who weigh > 40 kg)	Yes	Yes	Use not recommended in patients without hypoxia
Dexamethasone	No	Yes	Yes	Use not recommended in patients without hypoxia
Convalescent plasma	Yes (8/23/20; updated 2/4/21)	No	Yes^	Clinical trial use is favored for all patients except EUA use for patients who are s/p kidney and liver transplantation but only if recommended by Transplant ID consultation.
Tocilizumab	No (but commercially available)	Yes; both IDSA and the NIH recommend use under certain circumstances (IDSA: 2/22/21 update; NIH: 3/5/2021 update)	Yes (as of 2/11/21; see Table 3b)	
Bamlanivimab	No (FDA revoked EUA on 4/16/2021)	No	No	***Monotherapy no longer being distributed by federal government given issues with resistance**
Baricitinib	Yes (11/19/20)	Yes	Yes^^	

What's New:

On 4/20/2021 monoclonal antibody therapy will be offered to outpatients with COVID-19 at high risk for disease progression as outlined in Table 1a. Providers with non-ER patients who desire screening for eligibility should contact ASP via pager 3144 between the hours of 8 AM and 4:30 PM (all days).

On 4/16/2021 the FDA revoked its Emergency Use Authorization for bamlanivimab (given alone). This is due to the high circulating percentage of SARS-CoV-2 variants that are resistant to bamlanivimab. There is still an FDA EUA in place for bamlanivimab/etesevimab but we prefer to use casirivimab/imdevimab when monoclonal antibody therapy is indicated as the latter is more active against SARS-CoV-2 variants.

On 4/14/2021 the IDSA released updated guidelines-now recommending against the use of convalescent plasma and recommending casirivimab/imdevimab or bamlanivimab/etesevimab in select outpatients at high risk for disease progression. At VCU Health convalescent plasma should only be given for patients with a h/o solid organ transplantation if recommended by Transplant ID consultation; no other (non-trial) use is recommended. In terms of casirivimab/imdevimab and bamlanivimab/etesevimab, VCU Health's ASP does recommend use in select outpatients at high risk for disease progression (see Table 1a for use criteria). Providers with non-ER patients who desire screening for eligibility should contact ASP via pager 3144 between the hours of 8 AM and 4:30 PM (all days).

On 4/12/21 a preprint of the PRINCIPLE trial looking at inhaled budesonide for patients with COVID-19 in the community was released. This is a multicenter, open-label adaptive effectiveness RCT involving people > or = 65 or > or = 50 with comorbidities who were outpatient and < or = 14 days from symptom onset with suspected COVID-19 wheo were randomized to inhaled budesonide or usual care. There were 2 primary endpoints: time to self-reported recovery and hospitalization/death related to COVID-19 (both measured at 28 days from randomization). The results are from an interim analysis of 4,663 randomized patients; only 2,617 had + SARS-CoV-2 testing. Of positive patients, 751 ultimately received budesonide (800 mcg bid for 14 days), 1,028 usual care and 643 "other interventions." Time to recovery was shorter in the budesonide arm compared to the usual care arm (by a median of 3 days, HR 1.208, 95% CI 1.076-1.356); among those in the interim analysis with 28 day data, there were 59/692 (8.5%) COVID-19 related

Table 1a. Antiviral Agents

- Hydroxychloroquine, chloroquine, lopinavir/ritonavir and darunavir/cobicistat are no longer restricted (as of 9/15/2020). These agents should not be used to treat or prevent COVID-19.
- **Remdesivir is restricted requiring Antimicrobial Stewardship Program (ASP: pager 3144) approval. Any remdesivir approval requests for greater than 5 days of therapy or in patients with a eGFR of < 30 will require ID consult approval (pager 9001).**
- **Tocilizumab is restricted requiring Pulmonary and Critical Care Medicine approval.**
- The restriction process for remdesivir follows that of other restricted antimicrobials at VCU Health (from 9 PM-8 AM the drug can be ordered and a single dose given without approval-but the ordering team will need to page 3144 at 8 AM to request approval of additional doses). Overnight verifying pharmacists should verify that the patient has a + COVID-19 PCR test within 14 days (either within the VCU Health system or outside our system if the ordering provider confirms this). Would not start remdesivir if the patient has significant baseline hepatitis or renal insufficiency (as defined in the table below).
- For patients with a pending COVID-19 PCR test whose providers wish to start treatment before the test returns, the provider should page the ID consult service (pager 9001). *In general no treatment will be approved until a patient has a positive COVID-19 PCR test*.

	Anti-Virals	Dosing, Use Criteria and Comments
Preferred	Remdesivir[A] *Restricted to Antimicrobial Stewardship Program (pager 3144) or ID Consult approval (pager 9001).*	200mg IV x1, followed by 100mg IV q24h for total of 5-10 days • 5 days is the default duration of treatment at VCU Health • Duration of treatment can be extended to 10 days based on ID consultant recommendation **Obtain baseline hepatic panel and daily while on remdesivir* **Discontinue remdesivir if ALT > 300 or ALT >150 with T.bili > 2.6 or with eGFR <30*
es	Convalescent plasma[B] ***Compassionate use**; would use as directed by the Transplant ID Consult service. Routine use not recommended.*	One unit (~200ml) of ABO-compatible convalescent plasma obtained from an individual who has recovered from COVID-19. Can be followed by subsequent units at provider discretion. • To order EUA COVID Convalescent Plasma, providers should: 1. Review the EUA Fact Sheet for Healthcare Providers and also provide the patient or their legal authorized representative a copy of the Fact Sheet for Patients • COVID-19 Convalescent Plasma remains in short supply nationwide; would use as directed by the COVID-19 ID Consult service • In some instances only IND convalescent plasma will be available (not EUA convalescent plasma); please note: the IND consent process is DIFFERENT than that outlined above. When IND convalescent plasma will be released the clinical pathology resident on call will call the primary team to go over the details of the consent process. For IND units the person consenting needs to be told that this is an investigational product, and it needs to be written on the VCU transfusion consent form that this is an investigational product. IND units will NOT be marked as high or low titer

Table 1b. Supportive Agents

	Supportive Care	Dosing
Other	Dexamethasone[O]	Dexamethasone 6 mg once per day (po or IV) for up to 10 days (or until discharge if earlier) • Open label use based on data released on 6/16/2020 from the RECOVERY trial showing a mortality benefit in patients requiring oxygen supplementation or mechanical ventilation • Recommended by the Infectious Diseases Society of America in its 6/25/2020 COVID-19 treatment guideline update for hospitalized patients with an $SpO_2 \leq 94\%$ on room air requiring supplemental oxygen, mechanical ventilation or ECMO. They note an equivalent glucocorticoid (such as methylprednisolone or prednisone) can be substituted if dexamethasone is not available • *Patients receiving a short course of steroids may develop hyperglycemia, agitation and/or confusion, adrenal suppression and an increased risk for bacterial and fungal infections* • *Dexamethasone is associated with multiple potential drug interactions. See Addendum 3.*
	CM4620-204 (Auxora)[N] ***Investigational; PI = Dr. Paula Ferrada***	Being studied in a phase 2, multicenter, randomized, double-blind, placebo-controlled study 
	ACTIV-1: Infliximab (Remicade)	Being studied in a phase 3, multicenter, randomized, master protocol, multiple-arm, double-blind, placebo-controlled study ACTIV-1 IM through the National Center for the Advancement of Translational Science (NCATS)

Table 2. Safety Considerations & Lab Monitoring

Potential Therapy	Tolerability/Adverse Effects/Other Comments	Monitoring/Recommended Labs (in addition to routine labs)
Labs to order at time of admission	• *N/A*	• *Recommend obtaining a CBC with differential, BMP, hepatic panel, CRP, PT/aPTT, fibrinogen, D-dimer, ferritin, LDH and CK at the time of admission*
Remdesivir	• Remdesivir is generally well tolerated • Self-limiting, reversible hepatotoxicity has been observed, which resolved after therapy cessation • Nephrotoxicity was observed in preclinical studies	• Recommend sending a CBC, BMP and hepatic panel daily if on remdesivir
Tocilizumab (Actemra)	• Use associated with potential for heightened risk for infection • Use in patients with active infection is a relative contraindication • Would not use in patients with known active tuberculosis	• Consider checking a QuantiFERON TB Gold test + strongyloides IgG Ab testing
Convalescent plasma	• Transfusion reactions possible • As with other blood products, there is a low risk for infections • Transfusion-related acute lung injury (TRALI) is possible	• Routine lab work
CM4620-IE (Auxora)	• Intravenous Infusion is generally well tolerated • Allergic reactions possible	• Routine lab work
Dexamethasone	• Prolonged use can cause adrenal suppression and hypercortisolism • Prolonged use associated with increased risk for infection (including secondary bacterial and fungal	• Follow blood glucose values • Consider Strongyloides Ab testing, especially in patients with risk factors for chronic infection (history of walking

Addendum 1. COVID-19 Guidelines for Patients with Renal Transplantation

Authors: Megan Morales, MD, Nicole Vissichelli, MD, Kimberly Lee, PharmD and Mike Stevens, MD, MPH

Last Updated: April 15, 2021

Treatment of Non-Hospitalized Patients with Kidney Transplantation

Clinical Presentation	Preferred Treatment	Comments
Asymptomatic	No direct treatment	Close monitoring at home with daily coordinator call and home pulse oximetry monitoring

Treatment of Hospitalized Patients with Kidney Transplantation

Clinical Presentation	Preferred Treatment				
	Convalescent Plasma[1]	DVT prophylaxis per guidelines[2]	Reduce MMF* if possible	Dexamethasone 6 mg daily x 10 days	Remdesivir[3,4]
Symptomatic NOT hypoxic - SpO_2 > 94% on room air - With any of the following: -Dyspnea or cough -RR > 30 -Lung Infiltrates > 50% -WBC < 2.0	X	X	X		X[3]
Symptomatic, hypoxic - SpO_2 ≤ 94% on room air	X	X	X	X	X

Addendum 2. COVID-19 Guidelines for Patients with Liver Transplantation

Authors: Megan Morales, MD, Nicole Vissichelli, MD, David Bruno, MD, Kimberly Lee, PharmD and Mike Stevens, MD, MPH

Last Updated: April 15, 2021

Treatment of Non-Hospitalized Patients with Liver Transplantation

Clinical Presentation	Preferred Treatment	Comments
Asymptomatic	Stop MMF	Close monitoring at home with daily coordinator call and home pulse oximetry monitoring

Treatment of Hospitalized Patients with Liver Transplantation

Clinical Presentation	Preferred Treatment				
	Convalescent Plasma[1]	DVT prophylaxis per guidelines[2]	Stop MMF	Dexamethasone 6 mg daily x 10 days	Remdesivir[3,4]
Symptomatic NOT hypoxic - SpO_2 > 94% on room air - With any of the following: -Dyspnea or cough -RR > 30 -Lung Infiltrates > 50%	X	X	X		X[3]

Addendum 3. Possible Bacterial Superinfection in Patients Admitted with COVID-19

Authors: Cathy Grossman, MD, Kimberly Lee, PharmD, Jihye Kim PharmD, Michael P. Stevens, MD, MPH
Last Updated: April 13, 2021

Background:

- This guidance document is focused on patients hospitalized with a NEW diagnosis of COVID-19 in the past 14 days. Recommendations are broken down by time frame of hospitalization (≤ 48 hours and > 48 hours), and by risk factors for infection with drug-resistant bacteria (e.g., MRSA and *Pseudomonas aeruginosa*/other MDR Gram negative organisms).
- Patients with COVID-19 who develop worsening respiratory disease later than 14 days after symptom onset, especially who received potentially immunosuppressing medications (like steroids, tocilizumab, et cetera), have increased risk for bacterial superinfection as well as fungal infections (e.g., invasive aspergillosis). Would consider consultation with Infectious Diseases as needed.
- Patients with baseline immunosuppression (from things like neutropenia, transplant-related medications, et cetera) are at risk for infection with a broader array of possible organisms. Would consider consultation with Infectious Diseases as needed.

Evaluation:

- We acknowledge that time from COVID-19 testing to result return varies, and that many patients with COVID-19 may present similarly to severe community-acquired pneumonia (CAP)
    - Patients hospitalized with COVID-19 can develop hypoxic respiratory failure, viral pneumonia and can also develop ARDS. Diagnosing concomitant bacterial superinfection in these patients can be challenging.
    - The following diagnostic findings may indicate increased risk for bacterial superinfection:

Addendum 4. Daily Dexamethasone and Potential Drug-Drug Interactions

Author: Patricia Pecora Fulco, PharmD, BCPS, FASHP, AAHIVP
Last Updated: July 8, 2020

- Daily dexamethasone is now being used as an adjunctive therapy for the treatment of COVID-19.
- Dexamethasone may alter the metabolism of numerous medications resulting in potential sub-therapeutic levels of these other drugs (see Table 1); dexamethasone is a strong inducer of cytochrome P450 (CYP) 3A4 and a moderate inducer of CYP 2C9 and p-glycoprotein.

Table 1. Potential Drug-Drug Interactions with Dexamethasone and Other Medications

Drug Class	Medication Examples (not inclusive)	Effect of Dexamethasone on Metabolism	Recommendations for Management
Antiretrovirals	Integrase inhibitors [II: Bictegravir, Elvitegravir/cobicistat]	II level may ↓	Consult ID for alternative ART recommendations.
	Non-nucleoside reverse transcriptase inhibitors [NNRTIs: doravirine, rilpivirine]	NNRTI level may ↓	Consult ID for alternative ART recommendations.
	Protease inhibitors	PI level may ↓	Consult ID for

Addendum 5. COVID-19 Clinical Trials Referral Ordering Process in CERNER

If you would like your patient screened for possible COVID-19 clinical trial enrollment, please place an order in CERNER for this (type in "Clinical Trials Referral") and select "COVID-19 (CRC)" under "Area Requested." You can identify the specific trial you are interested in having the patient screened for or just indicate you would like the patient screened for all COVID-19 clinical trials.

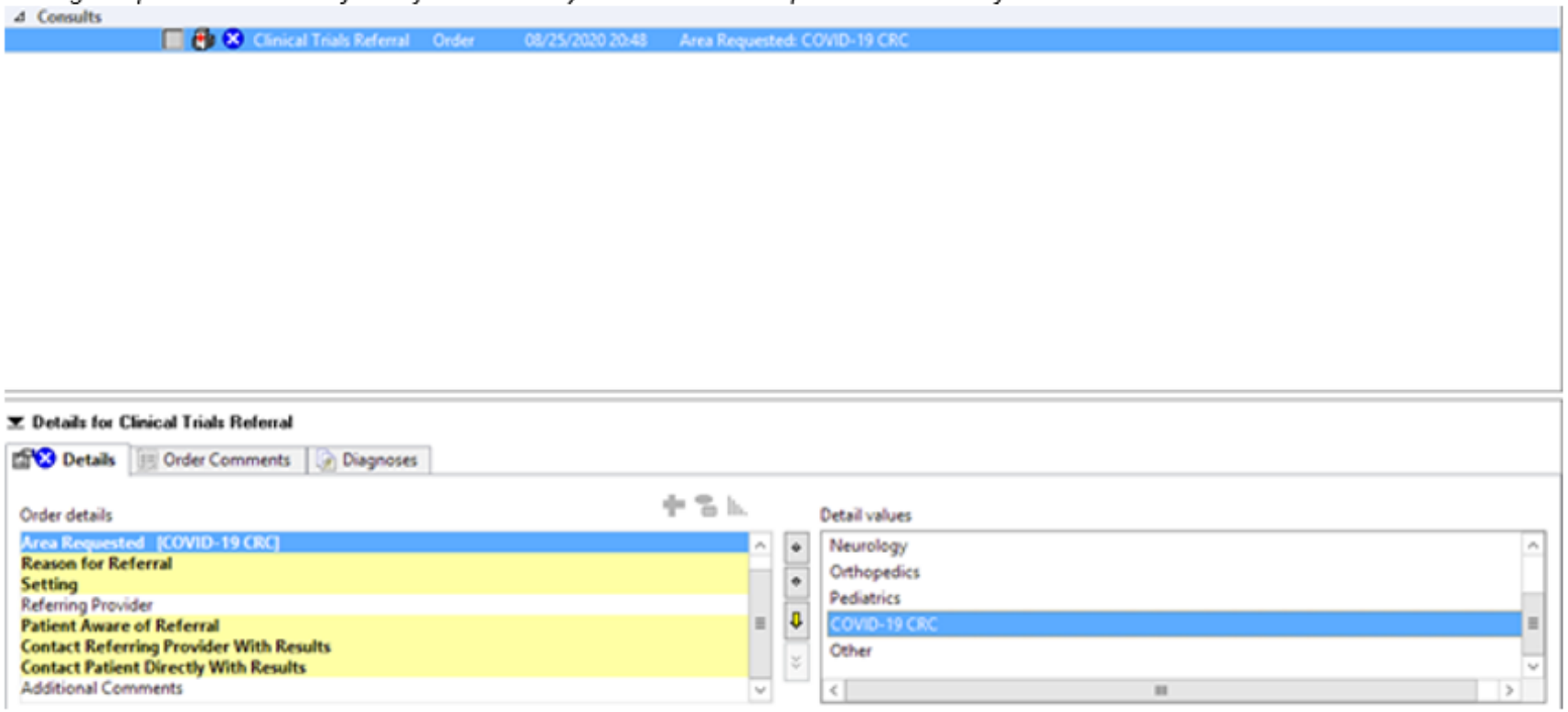


Table 3a. Quality of Evidence Behind Available Medications for COVID-19: Antiviral Agents*

Therapy	Status of Medication Use for COVID-19 at VCU Health	Mechanism of Action	Currently Available Data/*Comments on Potential Harm*	Qualitative Assessment of Quality of Current Evidence^
ANTIVIRALS				
Remdesivir^^ *Summary: available peer-reviewed, RCT data suggest a possible clinical benefit in terms of time to recovery.* *Patients on oxygen via nasal canula who are NOT requiring O2 via HFNC, NIV, MV or ECMO appear to benefit most.* *Available RCT data do not show a mortality benefit.* *IDSA does NOT recommend use in patients with a room air oxygen saturation > 94% (as of 11/22/20 update)*	• Two phase 3 randomized clinical trials (closed) • Commercial access now available • On 10/22/2020 the FDA approved remdesivir for use in hospitalized patients with COVID-19 • Medication is restricted and has to be approved by ASP (pager 3144) or ID (pager 9001)	• Broad-spectrum antiviral nucleotide prodrug	• Multiple RCTs • The ACTT-1 trial (a double-blind, randomized, placebo-controlled trial of 1062 patients) showed remdesivir was associated with a median time to recovery of 10 days versus 15 with placebo (RR for recovery 1.29; 95% CI 1.12-1.49, P<0.001). There was no mortality benefit. Further analysis revealed that the benefit was in patients on oxygen but NOT requiring O2 via HFNC, NIV, mechanical ventilation or ECMO. • Open label phase 3 trial of 584 patients with moderate COVID-19 pneumonia (infiltrates + RA O2 saturation > 94%) revealed 5 days of RDV better than standard of care in terms of clinical status improvement by day 11 (OR 1.65, 95% CI: 1.09-2.48, p = 0.02); this improvement was only 9.7% over the standard of care baseline, however. There was no significant difference in terms of clinical improvement by day 11 for the 10	HIGH

Table 3b. Quality of Evidence Behind Available Medications for COVID-19: Immunomodulating/Anti-inflammatory agents*

Therapy	Status of Medication Use for COVID-19 at VCU Health	Mechanism of Action	Currently Available Data/*Comments on Potential Harm*	Quality of Current Evidence^
IMMUNOMODULATING/ANTI-INFLAMMATORY AGENTS				
Dexamethasone *Summary: high-quality evidence suggests a mortality benefit for patients requiring mechanical ventilation > oxygen supplementation. There was no benefit in patients not requiring oxygen supplementation (and use may be associated with harm in this population).* *In its 9/25/2020 COVID-19*	• Being used off-label • Use not restricted	• Immunomodulatory effects	• RECOVERY trial data: 2,104 patients randomized to dexamethasone (6 mg po or IV once daily x 10 days) vs 4,321 randomized to usual care; dexamethasone arm with 22.9% 28 day mortality versus 25.7% in usual care arm (RR 0.83, 95% CI: 0.75-0.93, p<0.001); for patients requiring mechanical ventilation, 29.3% died in the dexamethasone group vs. 41.4% in the control group (RR 0.64; 95% CI: 0.51-0.81); for those receiving oxygen supplementation but not on mechanical ventilation there were 23.3% vs. 26.2% deaths (RR 0.82, 95% CI 0.72-0.94). There was no benefit in patients who were not requiring oxygen at the time of randomization. • The IDSA COVID-19 treatment guidelines were updated on 6/25/2020 recommending dexamethasone for patients with an $SpO_2 \leq 94\%$ on room air requiring supplemental oxygen, mechanical ventilation or ECMO • On 9/2/2020 a WHO sponsored meta-analysis was released investigating steroids and COVID-19 outcomes; 7 trials were examined involving ~ 1,700 critically ill patients; the 28 day mortality rate was significantly lower in corticosteroid users (32% absolute mortality versus 40% for controls); the WHO updated their recommendations based on these data [they recommend using dexamethasone (or hydrocortisone) for 7-10 days for patients with severe and critical COVID-19].	HIGH

Running Notes by Drug

A. **Remdesivir:** remdesivir is a prodrug metabolized via CYP3A4, concomitant CYP3A4 inhibitors should be avoided if possible.
   a. Data from 53 patients who received remdesivir via compassionate use was published in the NEJM on 4/10/2020; in this cohort 68% had an improvement in their oxygen status and there was an overall mortality of 13%; 23% of patients had mild to moderate elevations in ALT/AST or both; there was no control group. https://www.nejm.org/doi/full/10.1056/NEJMoa2007016; https://clinicaltrials.gov/ct2/show/NCT04257656.
   b. A RCT in from China of 237 patients did not show any clinical benefits for RDV but was underpowered (see Wang et al, The Lancet).
   c. On May 1, 2020, the FDA released a EUA for remdesivir for hospitalized patients who are hypoxic (SpO2 ≤ 94% on room air and requiring supplemental oxygen); https://www.fda.gov/media/137564/download.
   d. The ACTT-1 trial (a double-blind, randomized, placebo-controlled trial of 1062 patients) showed remdesivir was associated with a median time to recovery of 10 days versus 15 with placebo (RR for recovery 1.29; 95% CI 1.12-1.49, P<0.001). There was no mortality benefit. Further analysis revealed that the benefit was in patients on oxygen but NOT requiring O2 via HFNC, NIV, mechanical ventilation or ECMO. See: https://www.nejm.org/doi/full/10.1056/NEJMoa2007764.
   e. A phase 3, open label study of 5 versus 10 days of remdesivir revealed no significant differences in terms of clinical status at day 14, time to clinical improvement and death from any cause-the authors of the manuscript raised concern about extrapolating these findings to patients receiving mechanical ventilation based on post-hoc subgroup analysis: https://www.nejm.org/doi/full/10.1056/NEJMoa2015301.
   f. A study by Olender et al was published on 7/24/2020; this compared patients with COVID-19 who received remdesivir from the phase 3 RCT GS-US-540-5773 to a retrospective cohort who did not. The authors noted a significant time to clinical improvement in the RDV treated group and also noted a 62% reduced odds of death compared to standard of care treatment. **Of note, this study was of inferior methodologic quality to the RCT results that had already been released that DID NOT show a mortality benefit with RDV.** See: https://academic.oup.com/cid/article/doi/10.1093/cid/ciaa1041/5876045.

Table 4a. Clinical Trial Criteria

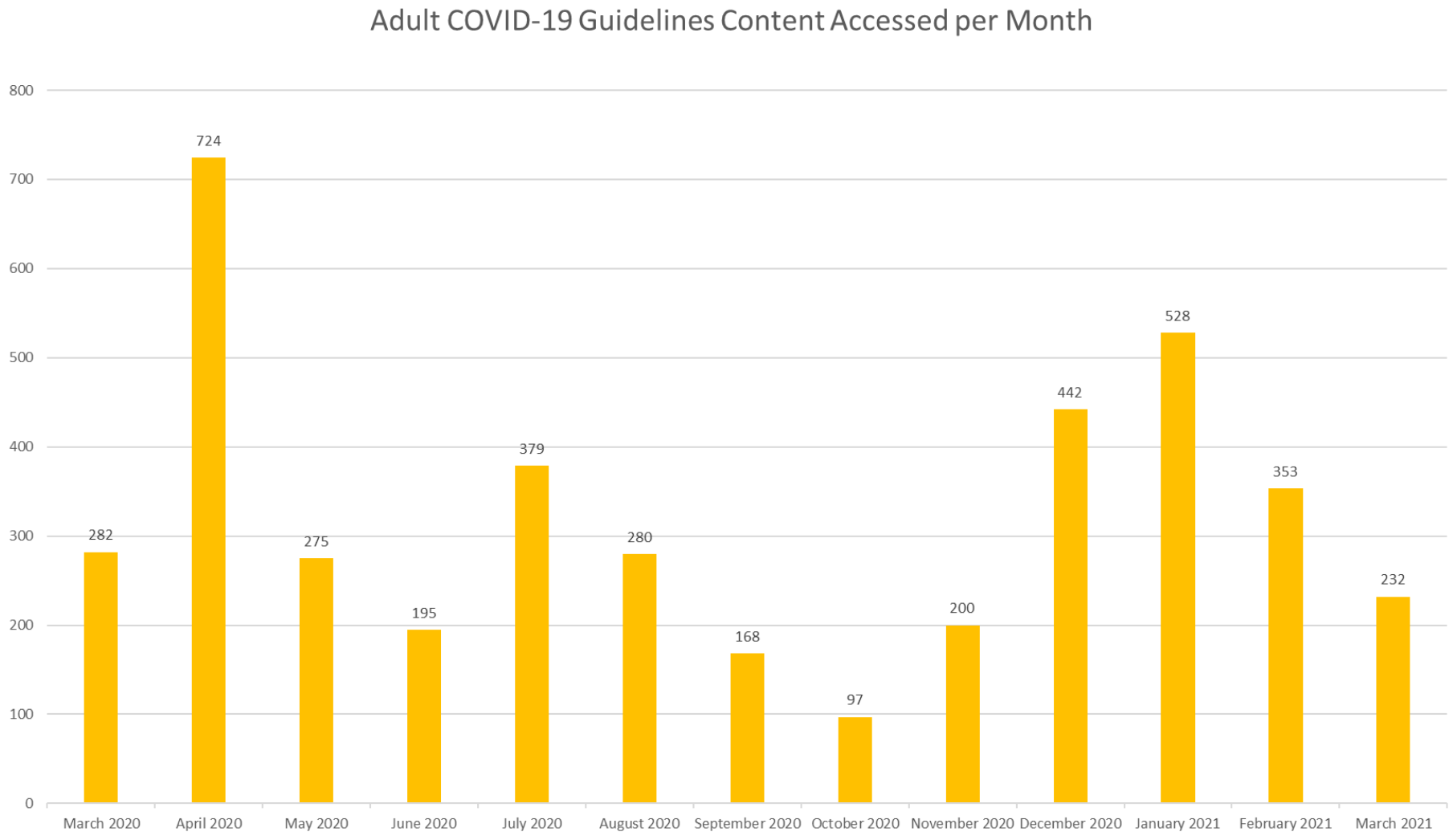
If you would like your patient screened for possible COVID-19 clinical trial enrollment, please place an order in CERNER for this (type in "Clinical Trials Referral") and select "COVID-19 (CRC)" under "Area Requested." You can identify the specific trial you are interested in having the patient screened for or just indicate you would like the patient screened for all COVID-19 clinical trials. See Addendum 4.

CM4620-204 (Auxora); a calcium release-activated calcium channel inhibitor *PI: Dr. Paula Ferrada*	**Inclusion criteria** **Exclusion criteria**
PassItOn (Passive Immunity Trial for Our Nation)**:** convalescent plasma *PI: Dr. Marjolein de Wit*	**Inclusion criteria**

VCU Adult ABX Guide

Monthly

- Content accessed 5,000-6,000 times


Adult COVID-19 Guidelines Content Accessed per Month
800
700
600
500
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200
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282
724
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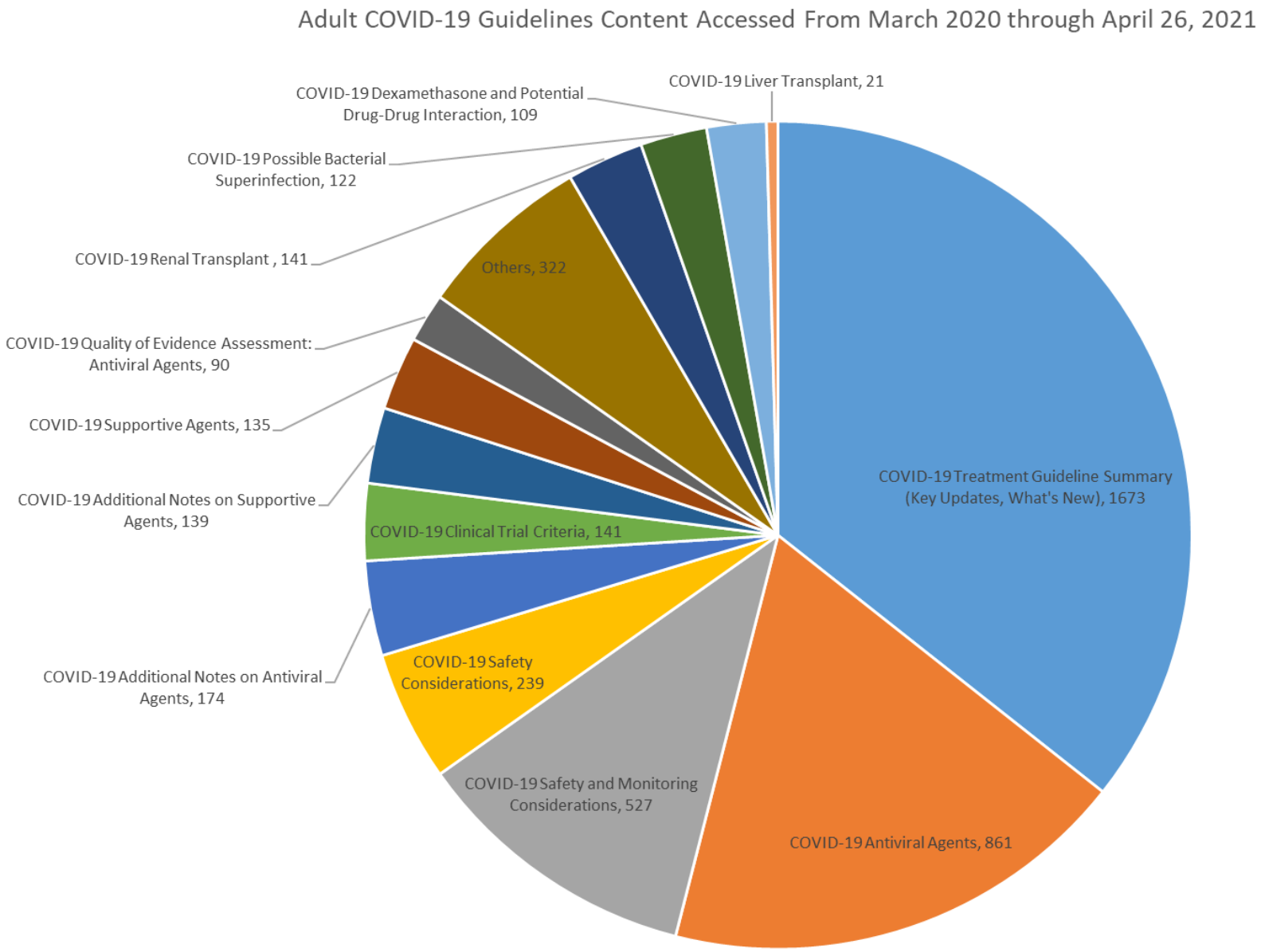
Adult COVID-19 Guidelines Content Accessed From March 2020 through April 26, 2021
COVID-19 Liver Transplant, 21
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COVID-19 Possible Bacterial Superinfection, 122
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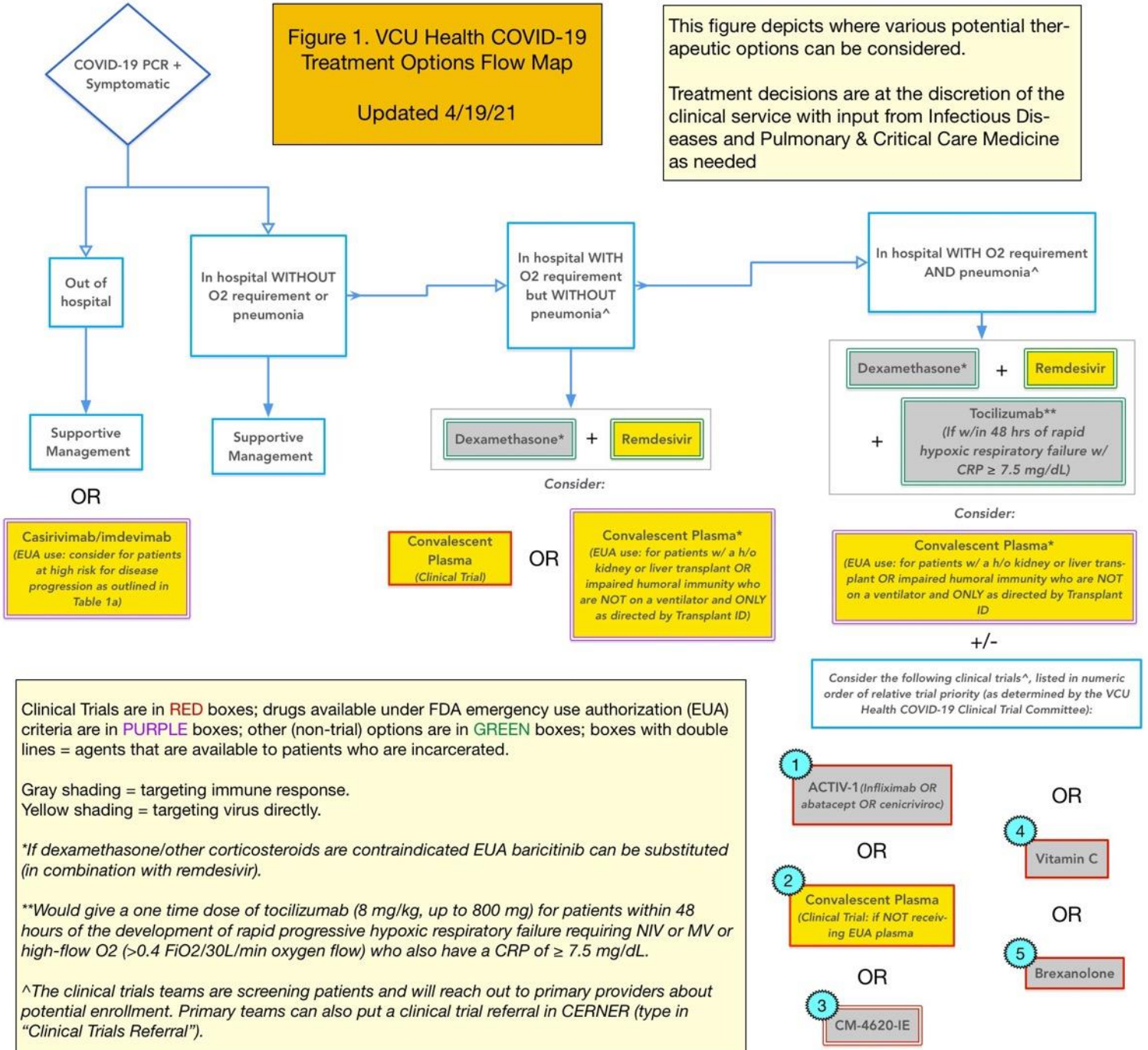
COVID-19 Antiviral Agents, 861
COVID-19 Treatment Guideline Summary (Key Updates, What's New), 1673

Figure 1. VCU Health COVID-19 Treatment Options Flow Map

Updated 4/19/21

This figure depicts where various potential therapeutic options can be considered.

Treatment decisions are at the discretion of the clinical service with input from Infectious Diseases and Pulmonary & Critical Care Medicine as needed



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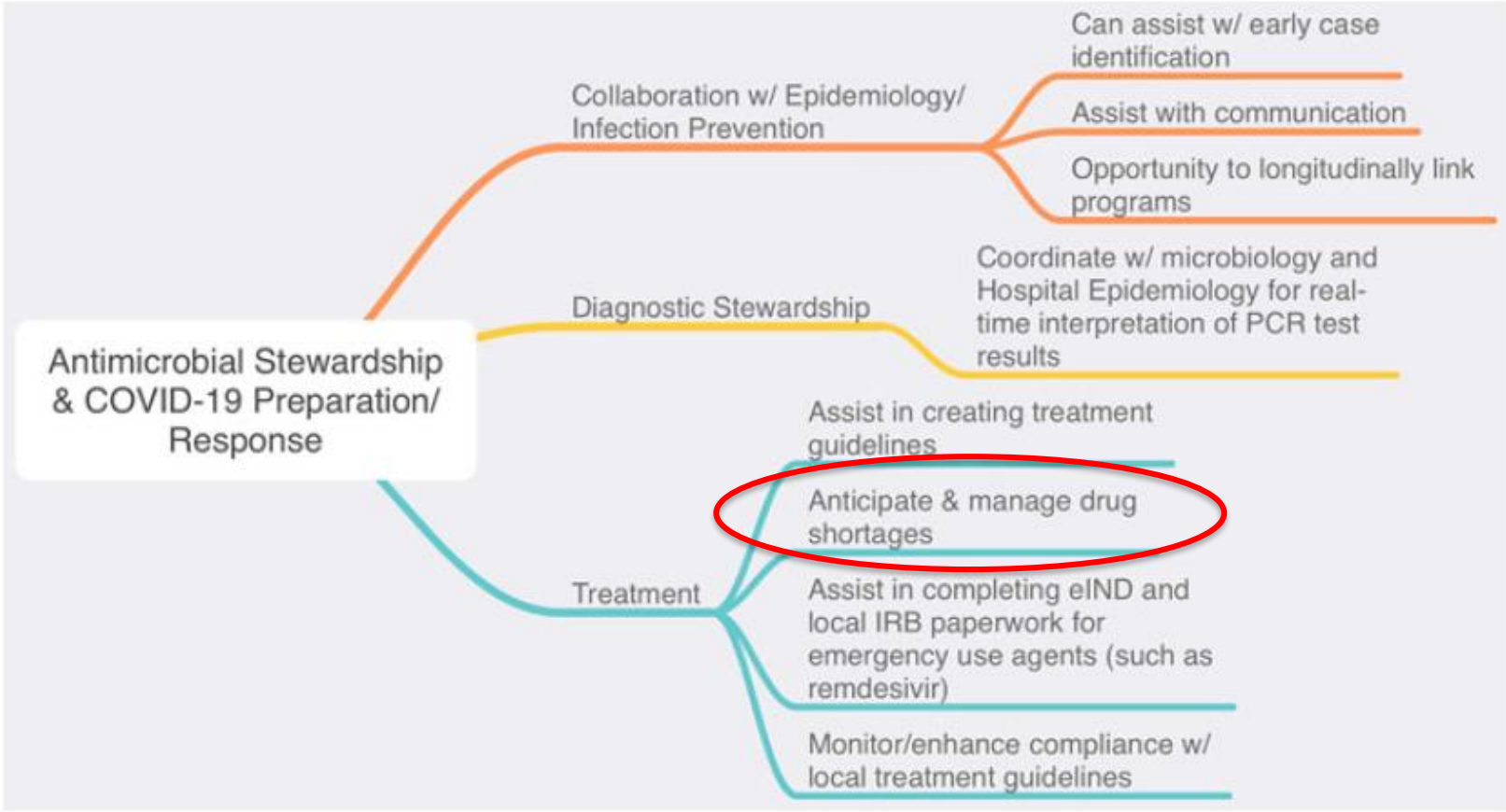
Gray shading = targeting immune response.
Yellow shading = targeting virus directly.

**If dexamethasone/other corticosteroids are contraindicated EUA baricitinib can be substituted (in combination with remdesivir).*

***Would give a one time dose of tocilizumab (8 mg/kg, up to 800 mg) for patients within 48 hours of the development of rapid progressive hypoxic respiratory failure requiring NIV or MV or high-flow O2 (>0.4 FiO2/30L/min oxygen flow) who also have a CRP of ≥ 7.5 mg/dL.*

^The clinical trials teams are screening patients and will reach out to primary providers about potential enrollment. Primary teams can also put a clinical trial referral in CERNER (type in "Clinical Trials Referral").


Antimicrobial Stewardship & COVID-19 Preparation/ Response
Collaboration w/ Epidemiology/ Infection Prevention
Can assist w/ early case identification
Assist with communication
Opportunity to longitudinally link programs
Diagnostic Stewardship
Coordinate w/ microbiology and Hospital Epidemiology for real-time interpretation of PCR test results
Treatment
Assist in creating treatment guidelines
Anticipate & manage drug shortages
Assist in completing eIND and local IRB paperwork for emergency use agents (such as remdesivir)
Monitor/enhance compliance w/ local treatment guidelines

VCU Health

Antimicrobial Restriction

- Restricted:
  - Hydroxychloroquine, chloroquine, darunavir/cobicistat and lopinavir/ritonavir: 3/11/2020
  - Remdesivir when released under Emergency Use Authorization
  - Monoclonal antibodies (involved w/ outpatient screening)
  - Helped guide:
    - Convalescent plasma use

Not Recommended	Hydroxychloroquine[E]	Not recommended
	Lopinavir/ritonavir[D] +/- Interferon-beta[E] (Nonformulary)	Not recommended
	Darunavir/cobicistat[E]	Not recommended
	Baloxavir marboxil[G]	Not recommended
	Oseltamivir[H]	Not recommended
	Ribavirin[I]	Not recommended
	Hydroxychloroquine + azithromycin (combination therapy)[C]	Not recommended
	Ivermectin[J]	Not recommended
	Bamlanivimab[K]	Use (as monotherapy) not recommended

Antimicrobial Restriction

- Our antimicrobial stewardship pharmacists took on expanded antimicrobial restriction pager coverage
  - Usually 8 AM to 5 PM M-Fr, then ID fellows take call 5 PM to 9 PM and on weekends/holidays
  - Hours expanded to 8 AM to 9 PM
    - Hospital provided additional pay for expanded coverage hours

Expanded AS Restriction Pager Coverage

- March 30-July 3rd pharmacy paid ASP pharmacists to take call from 5 PM-9 PM

VCU Health

Critical Drug Monitoring

- Working with Drug Information Services have helped monitor critical drug supplies

9/9/2020

Medication	Total*	Target patients ablet to treat†	Patients able to treat‡	Change of patients able to treat§	Supplier status	Weeks Remaining
Dexamethasone (PO)		200	429	-1%		
Dexamethasone (IV)		200	961	3%		
Hydrocortisone (IV)		200	89	4%		
Methylprednisolone (IV)		200	895	2%		
Prednisone (PO)		200	292	-3%		
Albuterol HFA 90 mcg MDI		2000	2380	9%		
Remdesivir‖		100	132	-26%		17.6

* total based on dosage form (tablet, milliliter, pre-filled syringe, or vial)

† target 2000 patients for albuterol; 400 patients for dexamethasone; 200 patients for hydrocortisone, methylprednisolone, and prednisone

‡ adult dosing provided by VCU protocol

§ updated weekly on Wednesdays

‖ weeks remaining based on 3 month average of 7.5 patients treated per week

Patients able to treat	
	able to treat < 50% of target patients
	able to treat 50-89% of target patients
	able to treat ≥ 90% of target patients
Supplier status	
	product unavailable
	product on backorder
	product readily available

C/o Kyle Hoelting, PharmD

Critical Drug Monitoring

9/9/2020

Medication	Total*	Target patients able to treat	Patients able to treat‡	Change of patients able to treat§
Cefepime		75	75	15%
Ciprofloxacin		75	16	1%
Levofloxacin		75	47	3%
Meropenem		75	38	10%
Metronidazole		75	57	-6%
Micafungin		50	14	-13%
Piperacillin/tazobactam		75	137	0%
Azithromycin		75	670	0%
Ceftaroline		25	6	24%
Ceftazidime/avibactam		15	0	-100%
Ceftriaxone		75	98	0%
Ceftolozane/tazobactam		15	1	0%
Doxycycline		75	64	6%
Ertapenem		20	2	50%
Meropenem/vaborbactam		75	1	17%

* total based on dosage form (vial, premix, tablet)

‡ target to treat established with ID input

§ updated weekly on Wednesdays

C/o Kyle Hoelting, PharmD

Critical Drug Monitoring

9/9/2020

Medication	Total*	Total mg	Total mg per course	Target patients able to treat†	Patients able to treat‡	Change of patients able to treat§	Alternative medication for use available	Supplier status
Etomidate				400	410	9%	Yes	
Rocuronium				400	634	1%	Yes	
Succinylcholine				400	845	12%	Yes	
Cisatracurium				400	32	7%	Yes	
Vecuronium				400	57	2%	Yes	
Dexmedetomidine				400	24	-11%	Yes	
Fentanyl‖				400	2625	1%	Yes	
Hydromorphone‖				400	144	-1%	Yes	
Ketamine‖				400	46	-2%	Yes	
Lidocaine				400	39577	1%	Yes	
Midazolam‖				400	43	-33%	Yes	
Propofol				400	49	-85%	Yes	
Norepinephrine				400	112	13%	Yes	
Epinephrine				400	37	0%	Yes	
Dopamine				400	46	-2%	No	
Vasopressin¶				400	18	6%	No	
Albuterol MDI				400	2380	9%	No	
Albuterol Nebs				400	127	3%	No	
Albuterol-ipratropium Nebs				400	45	0%	No	

* total based on dosage forms available

† target to treat 400 patients (derived from 20% of estimated 2000 patients)

‡ 7-day adult dosing estimate for intubated patient (85 kg)

§ updated weekly on Wednesdays

‖ based on formulations used to make CADDs and IV bags

¶ dose expressed in units

C/o Kyle Hoelting, PharmD

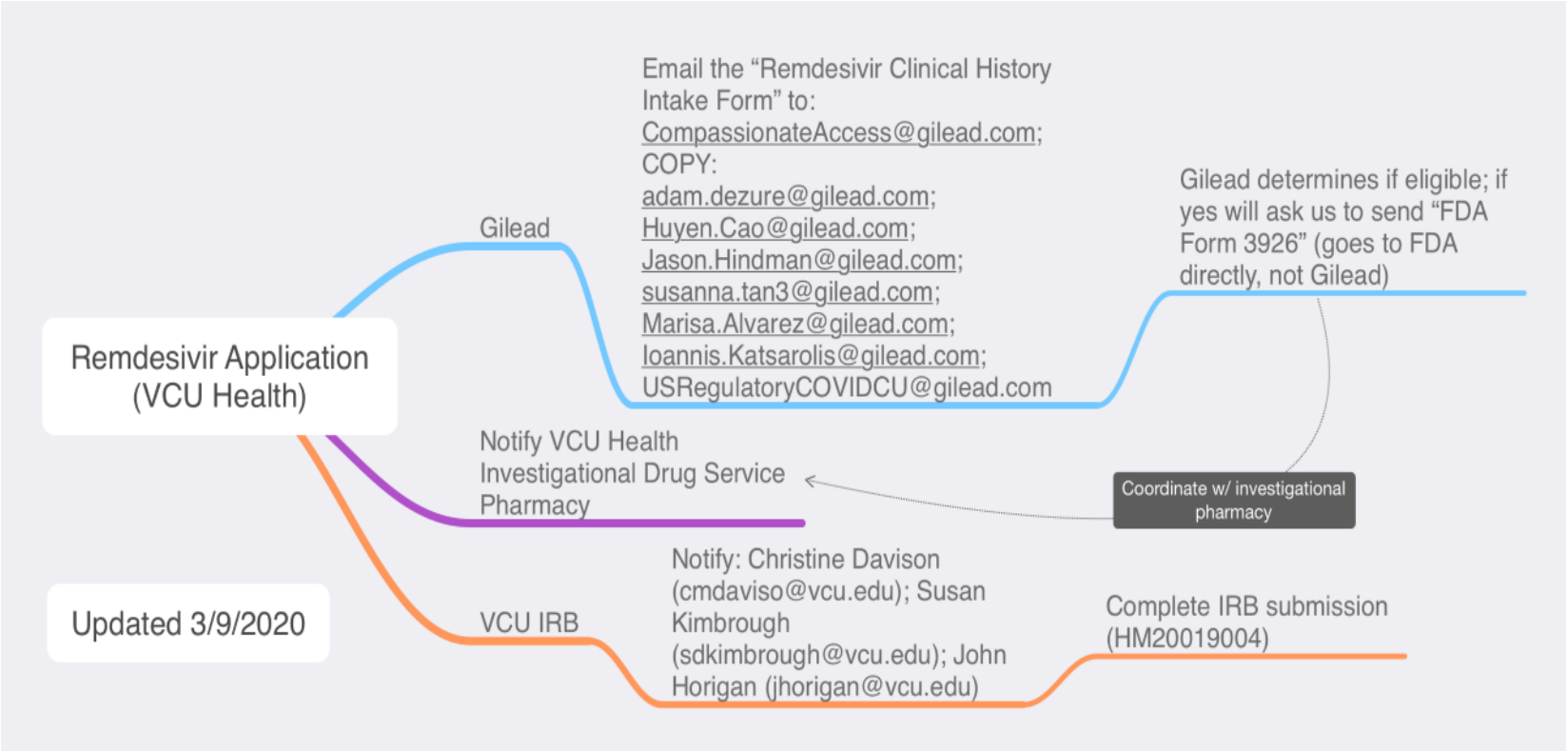
ASP Involvement in COVID-19 Response Efforts

- Major ways Antimicrobial Stewardship Programs (ASPs) have been involved (not exhaustive):
  - Case identification and diagnostic stewardship of SARS-CoV-2 testing
  - COVID-19 treatment
    - Guidelines
    - Facilitating access to potential therapeutics
  - Outpatient pandemic stewardship
    - Preauthorization for potential therapeutics
    - Managing access process for monoclonal antibodies
  - Vaccine Planning

Nori P, Patel P, Stevens MP. Infect Control Hosp Epi, published online April 16, 2021.

Remdesivir

- ASP prepared to take on paperwork/assist with process for compassionate use



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"VCU is one of only a handful of institutions in the United States to make these clinical trials available to patients who meet the criteria for this investigational drug." bit.ly/3aghZeF #COVID—19 @VCUHealth

> **Michael Rao, Ph.D.** @VCUpresident · 4h
> We are proud to share that #VCU researchers have started two clinical trials on a potential, experimental treatment for COVID-19. @VCU @VCUHealth @VCU_CCTR @NIH #COVID—19 #SARS—Cov2
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Integration with Clinical Trial Teams

- Early enrollment in two remdesivir trials in March
- ASP personnel and ID physicians involved in screening positive patients
  - Daily (all patients) through mid-May for remdesivir trials
  - As content experts available via consultation from May onward
- Clinical trials included in COVID-19 guidelines
- ASP and ID physicians on newly created COVID-19 Clinical Trials Oversight Committee

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Figure 1. VCU Health COVID-19 Treatment Options Flow Map

Updated 4/19/21

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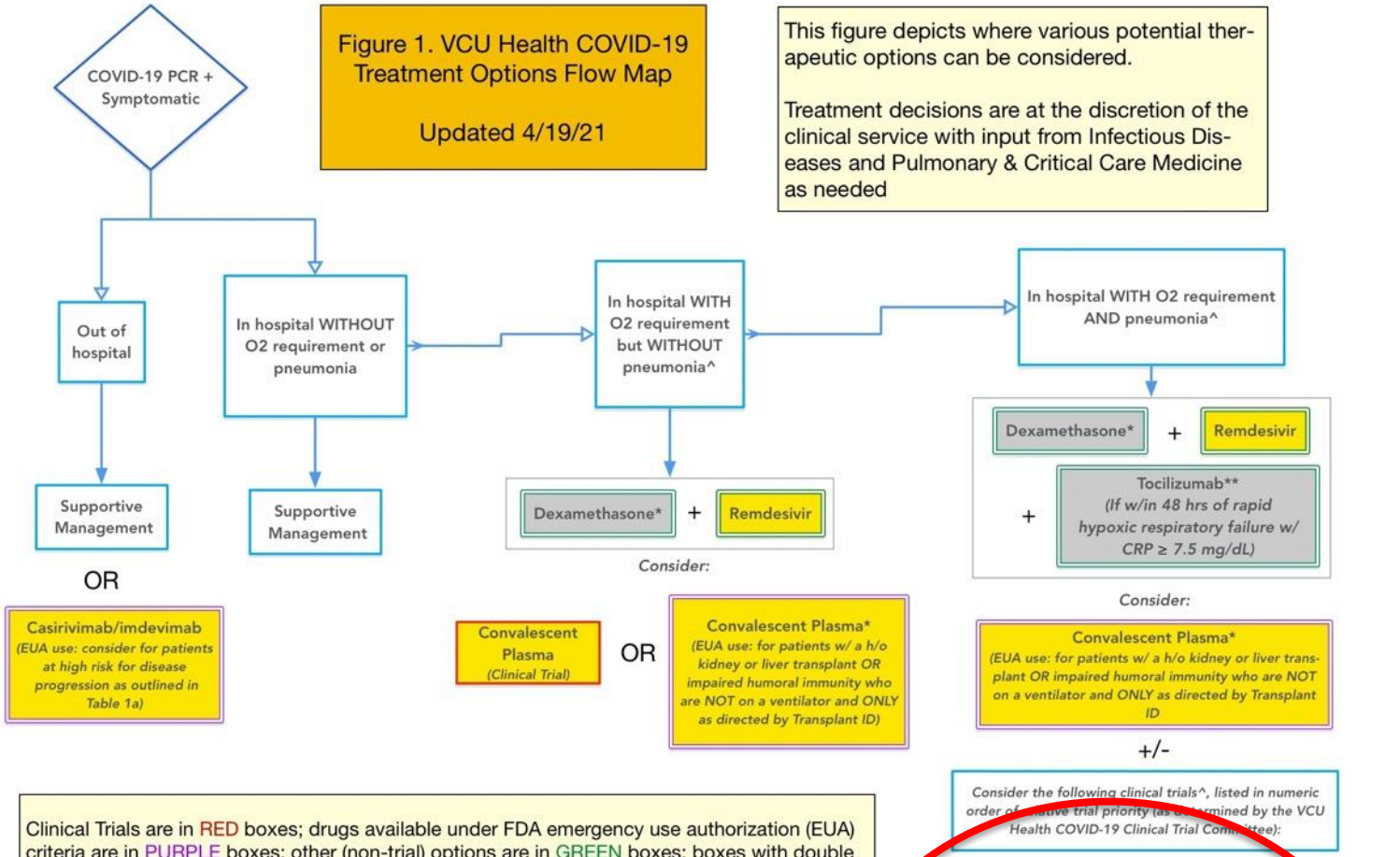

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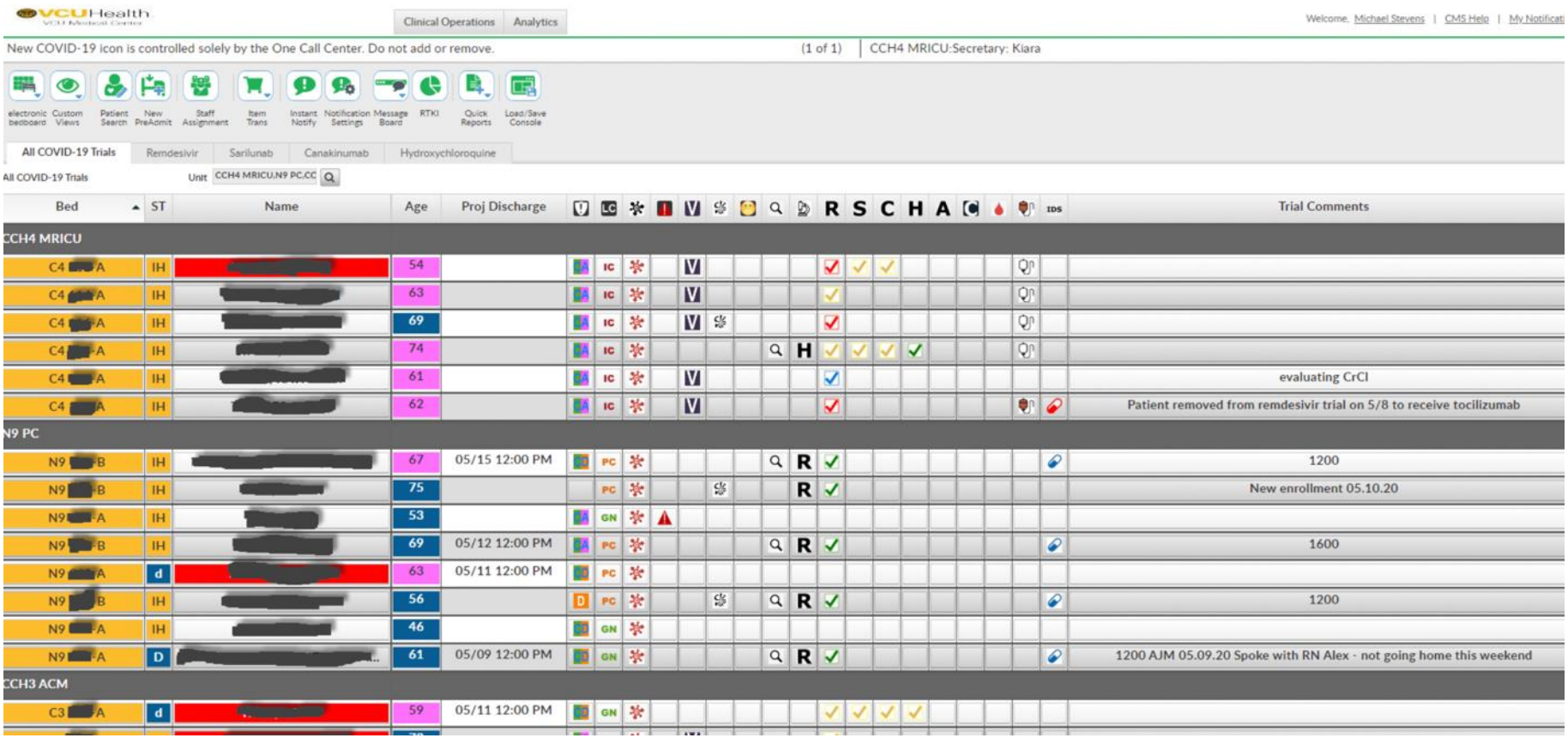
Integration with Clinical Trial Teams



Center for clinical and translational research COVID-19 clinical trial committee: The development of a review and prioritization matrix during a pandemic

Published online by Cambridge University Press: **25 January 2021**

Leslie Bobb, Lisa Richman Ballance, Antonio Abbate, Jesse C. Bain, Patricia J. Sime, F. Gerard Moeller, Margaret K. Lessard, Alison J. Montpetit, Mary P. Harmon, Michael P. Stevens and Deborah DiazGranados

Show author details

Abstract

The rate at which the coronavirus disease (COVID-19) spread required a rapid

Remdesivir Under EUA Process

- Hospitals required to complete time-consuming patient monitoring and documentation with reporting to the Virginia Department of Health
  - Our ASP took this on
  - From 5/16/20-9/10/20 helped facilitate treatment with and monitored 114 patients

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P
Subject number	Treating Hospital Name	Age	Gender	Race	Ethnicity	Date of First Symptom Onset, if known	Date of Hospital Admission	Date of Remdesivir Initiation	Patient Location During Date of Initiation	Total Duration of Remdesivir Therapy, days	Patient Disposition	Date of Patient Disposition	Was the patient ever mechanically ventilated during duration of remdesivir therapy	Was the patient ever placed on ECMO during duration of remdesivir therapy	Payor Source for Hospitalization
1	VCUHS	51	Female	White	Not Hispanic or L	05/06/2020	5/13/2020	5/16/2020	ICU	5	Discharged	5/26/2020	No	No	Private/Commercial
2	VCUHS	78	Male	Black/African-Am	Not Hispanic or L	5/10/2020	5/15/2020	5/17/2020	ICU	5	Discharged	6/1/2020	Yes	No	Medicare
3	VCUHS	71	Male	Other	Hispanic or Latin	5/16/2020	5/16/2020	5/20/2020	Non-ICU	5	Expired	6/26/2020	Yes	No	Private/Commercial
4	VCUHS	57	Female	White	Not Hispanic or L	5/19/2020	5/19/2020	5/20/2020	Non-ICU	5	Discharged	5/28/2020	No	No	Private/Commercial
5	VCUHS	53	male	black/African-Am	Not Hispanic or L	5/1/2020	5/20/2020	5/21/2020	Non-ICU	5	Discharged	5/26/2020	No	No	Medicaid
6	VCUHS	29	male	Other	Hispanic or Latin	5/13/2020	5/21/2020	5/21/2020	Non-ICU	5	Discharged	5/28/2020	No	No	Self-pay
7	VCUHS	68	male	White	Not Hispanic or L	4/4/2020	5/12/2020	5/21/2020	Non-ICU	4	Expired	5/29/2020	Yes	No	Medicare

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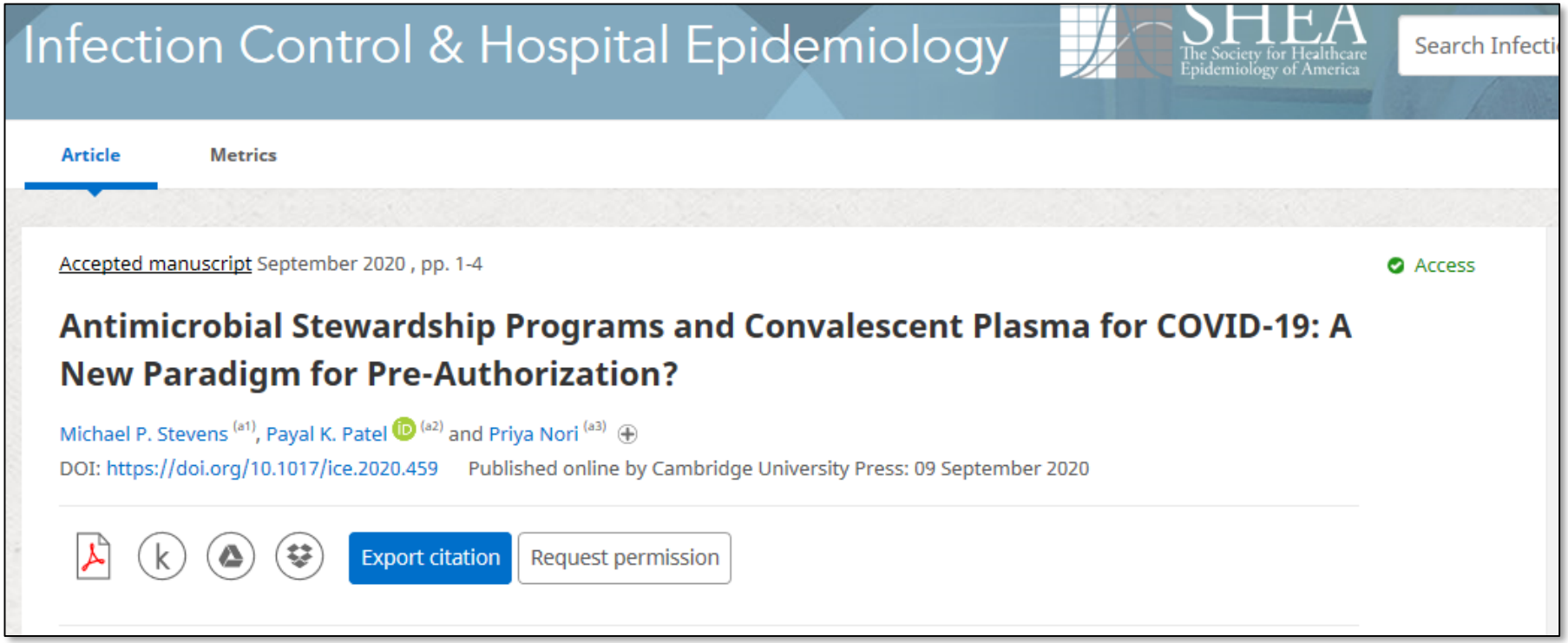
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Accepted manuscript September 2020 , pp. 1-4
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Antimicrobial Stewardship Programs and Convalescent Plasma for COVID-19: A New Paradigm for Pre-Authorization?
Michael P. Stevens (a1), Payal K. Patel (a2) and Priya Nori (a3)
DOI: https://doi.org/10.1017/ice.2020.459 Published online by Cambridge University Press: 09 September 2020
Export citation
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Table 1. Considerations for and Against Antimicrobial Stewardship Program (ASP) Involvement in COVID-19 Convalescent Plasma Pre-authorization

Pro-ASP involvement	Against ASP Involvement
• ASPs already have pre-authorization infrastructure in-place ○ Transfusion Medicine programs likely would need to create pre-authorization processes de novo and identify how to staff these • ASP personnel are experts at creating and applying algorithm-based pre-authorization criteria • ASPs that are already responsible for local COVID-19 guidelines can help contextualize CP use relative to other potential therapies • ASP personnel are experts at cooperative integration with non-Infectious Diseases or pharmacy-based service lines	• ASPs have no direct involvement with Transfusion Medicine programs or authority to restrict access to blood products • ASP personnel are not experts in Transfusion Medicine • ASP involvement will divert time away from other important stewardship activities, such as antibiotic use monitoring • ASPs are put in the difficult position of brokering CP access against scientific community recommendations to use only in the context of randomized, clinical trials

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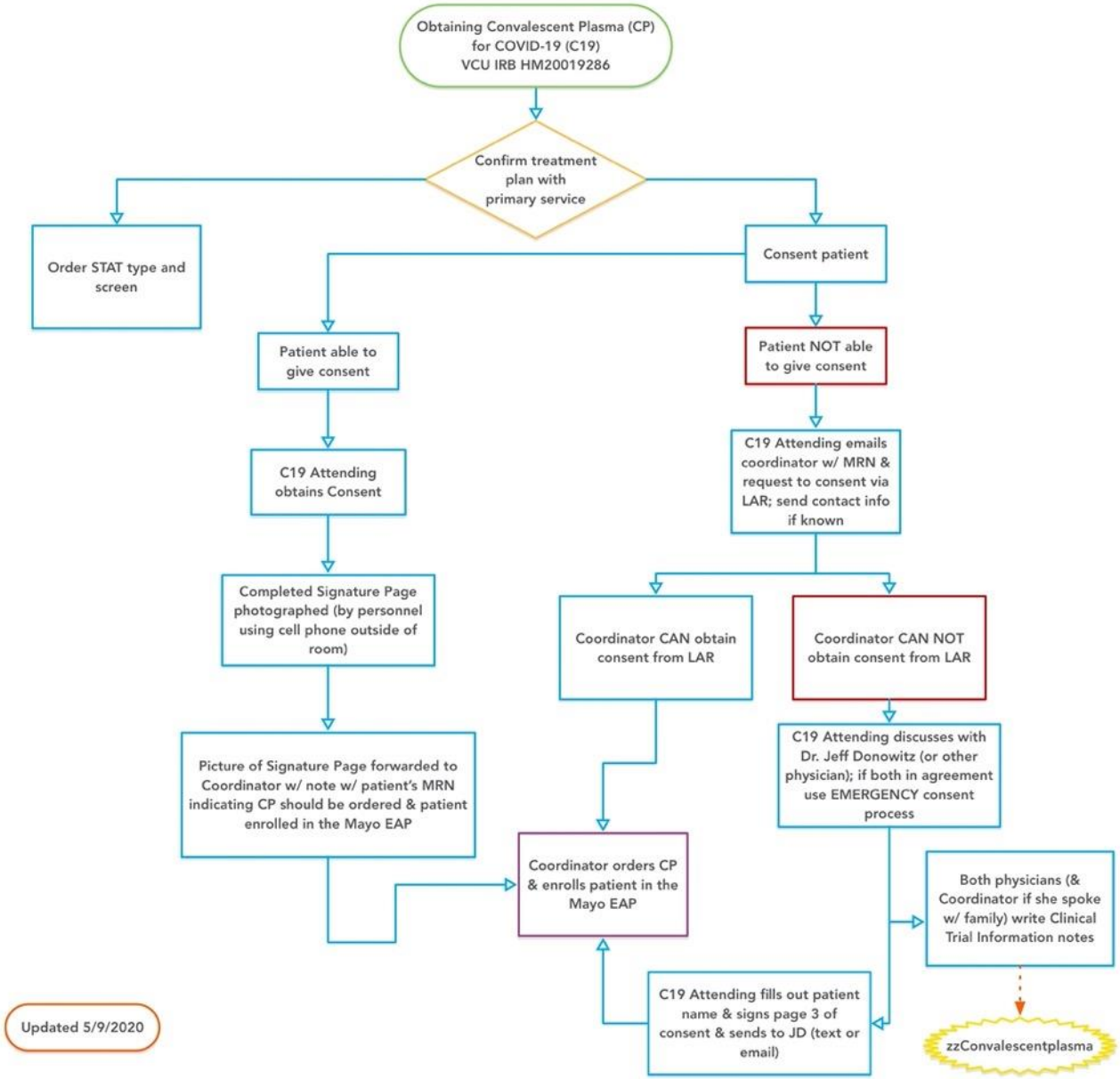
Stevens MP, Patel PK, Nori P. Infect Contr Hosp Epi 2020 Epub 09 September.


Obtaining Convalescent Plasma (CP) for COVID-19 (C19) VCU IRB HM20019286
Confirm treatment plan with primary service
Order STAT type and screen
Consent patient
Patient able to give consent
Patient NOT able to give consent
C19 Attending obtains Consent
C19 Attending emails coordinator w/ MRN & request to consent via LAR; send contact info if known
Completed Signature Page photographed (by personnel using cell phone outside of room)
Coordinator CAN obtain consent from LAR
Coordinator CAN NOT obtain consent from LAR
Picture of Signature Page forwarded to Coordinator w/ note w/ patient's MRN indicating CP should be ordered & patient enrolled in the Mayo EAP
C19 Attending discusses with Dr. Jeff Donowitz (or other physician); if both in agreement use EMERGENCY consent process
Coordinator orders CP & enrolls patient in the Mayo EAP
Both physicians (& Coordinator if she spoke w/ family) write Clinical Trial Information notes
C19 Attending fills out patient name & signs page 3 of consent & sends to JD (text or email)
zzConvalescentplasma
Updated 5/9/2020

May 9, 2020

Comment > Infect Control Hosp Epidemiol. 2020 Sep;41(9):1108-1110.
doi: 10.1017/ice.2020.133. Epub 2020 Apr 15.

Practical implementation of COVID-19 patient flags into an antimicrobial stewardship program's prospective review

Ryan W Stevens [1], Lynn Estes [1], Christina Rivera [1]

Affiliations + expand

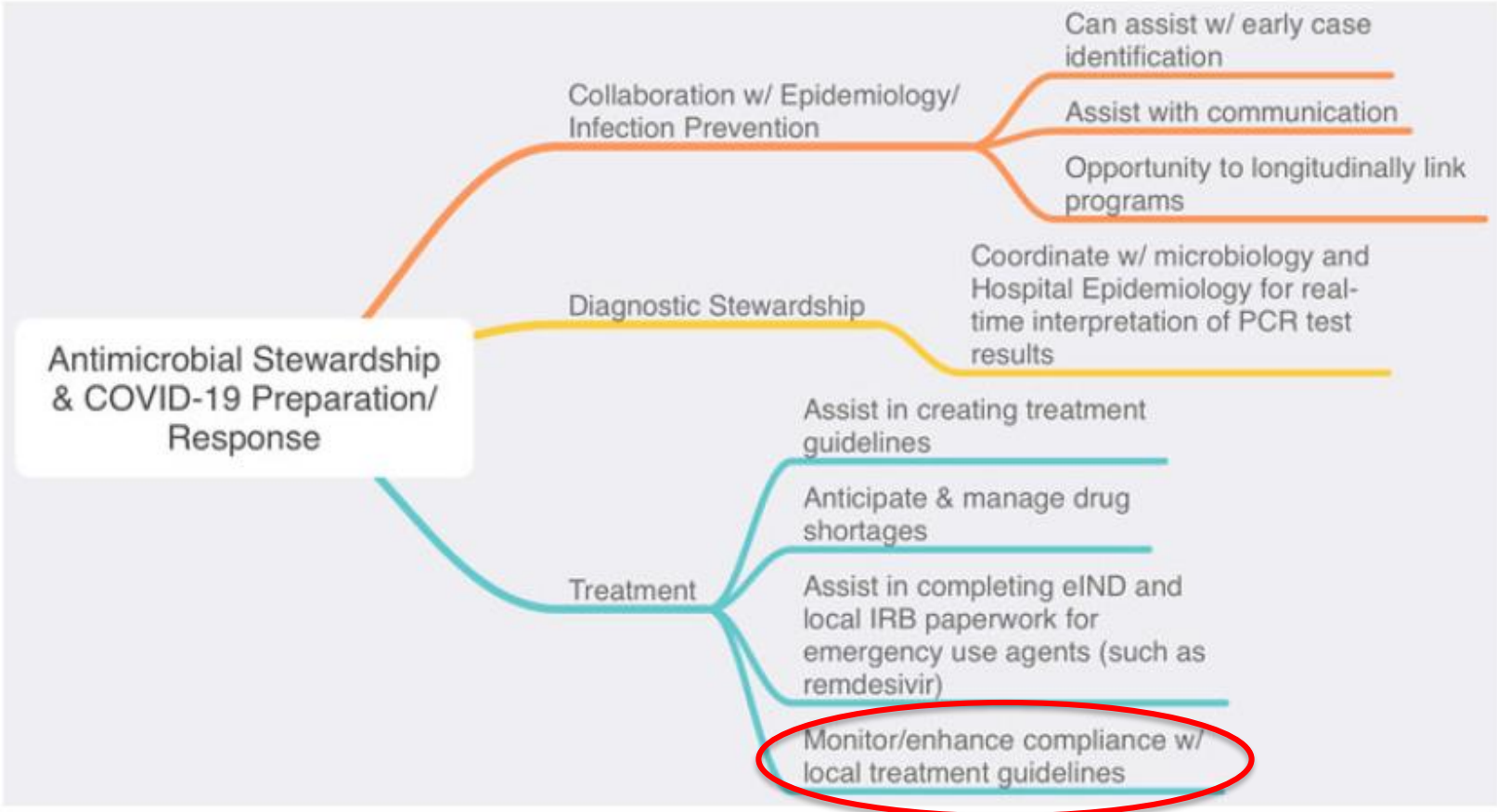
PMID: 32290883 PMCID: PMC7184145 DOI: 10.1017/ice.2020.133

Free PMC article

Prospective Audit and Feedback

- Stevens and colleagues described the creation of custom EMR-based flags for patients with possible COVID-19 that were utilized by their ASP as a part of prospective audit and feedback activities
  - Identified patients with negative PCR tests on potential COVID-19 therapeutics
  - Identified patients with positive PCR tests for ASP review
    - To verify appropriate ID team involvement
    - To consider candidacy for clinical trial involvement
    - To assess for eligibility for potential therapeutics

Stevens RW et al. Infect Control Hosp Epidemiol 2020 Apr 15: 1-2.


Antimicrobial Stewardship & COVID-19 Preparation/ Response
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Opportunity to longitudinally link programs
Diagnostic Stewardship
Coordinate w/ microbiology and Hospital Epidemiology for real-time interpretation of PCR test results
Treatment
Assist in creating treatment guidelines
Anticipate & manage drug shortages
Assist in completing eIND and local IRB paperwork for emergency use agents (such as remdesivir)
Monitor/enhance compliance w/ local treatment guidelines

VCU Health

Addendum 3. Possible Bacterial Superinfection in Patients Admitted with COVID-19

Authors: Cathy Grossman, MD, Kimberly Lee, PharmD, Jihye Kim PharmD, Michael P. Stevens, MD, MPH
Last Updated: April 13, 2021

Background:

- This guidance document is focused on patients hospitalized with a NEW diagnosis of COVID-19 in the past 14 days. Recommendations are broken down by time frame of hospitalization (≤ 48 hours and > 48 hours), and by risk factors for infection with drug-resistant bacteria (e.g., MRSA and *Pseudomonas aeruginosa*/other MDR Gram negative organisms).
- Patients with COVID-19 who develop worsening respiratory disease later than 14 days after symptom onset, especially who received potentially immunosuppressing medications (like steroids, tocilizumab, et cetera), have increased risk for bacterial superinfection as well as fungal infections (e.g., invasive aspergillosis). Would consider consultation with Infectious Diseases as needed.
- Patients with baseline immunosuppression (from things like neutropenia, transplant-related medications, et cetera) are at risk for infection with a broader array of possible organisms. Would consider consultation with Infectious Diseases as needed.

Evaluation:

- We acknowledge that time from COVID-19 testing to result return varies, and that many patients with COVID-19 may present similarly to severe community-acquired pneumonia (CAP)
    - Patients hospitalized with COVID-19 can develop hypoxic respiratory failure, viral pneumonia and can also develop ARDS. Diagnosing concomitant bacterial superinfection in these patients can be challenging.
    - The following diagnostic findings may indicate increased risk for bacterial superinfection:
        - Leukocytosis; lobar consolidation; evidence of necrotizing pneumonia on imaging; new fever after defervescence WITH new consolidation on chest imaging
- We do not recommend routinely administering empiric therapy for bacterial pneumonia in patients with COVID-19; the best available data suggests 3-14% of hospitalized patients with COVID-19 may have bacterial superinfection (either presenting with this or developing it during their hospitalization)
- If empiric antibiotics are going to be initiated based on clinical/radiographic evaluation, the following diagnostic testing should be considered

Diagnostic Test	Duration of hospitalization	
	≤ 48 hours	> 48 hours – 14 days
Blood cultures x 2 sets (if risk factors present for MRSA or *P.* aeruginosa[1])	x	x

Infection Control & Hospital Epidemiology

SHEA The Society for Healthcare Epidemiology of America

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Accepted manuscript July 2020 , pp. 1-9

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Impact of COVID-19 on Pneumonia-Focused Antibiotic Use at an Academic Medical Center

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Table 1: Antibiotic Use for April and May 2020 versus April 2019 - March 2020

Unit	April COVID-19 PD	May COVID-19 PD	Antibiotic	April 2019 -March 2020 Mean *(DOT /1000 PD)*	April 2020 *(DOT /1000 PD)*	April 2020 vs Mean *p-value*	May 2020 *(DOT /1000 PD)*	May 2020 vs Mean *p-value*
MICU	156 (28% of total PD)	212 (30% of total PD)	Cefepime	134	117	0.61	184	0.16
			Pip-Tazo	341	385	0.42	324	0.75
			Meropenem	72	78	0.81	56	0.49
			Vancomycin	281	262	0.55	271	0.76
			Ceftriaxone	55	193	0.00	81	0.10
			Azithromycin	50	109	0.03	49	0.95
			Levofloxacin	56	24	0.07	3	0.01
			Doxycycline	15	12	0.81	0	0.23
CICU	6 (3% of total PD)	14 (5% of total PD)	Cefepime	53	72	0.56	46	0.84
			Pip-Tazo	210	216	0.89	268	0.25
			Meropenem	25	38	0.42	46	0.20
			Vancomycin	167	168	0.95	168	0.95
			Ceftriaxone	31	131	0.00	36	0.79
			Azithromycin	14	17	0.80	31	0.26
			Levofloxacin	9	14	0.57	0	0.31
			Doxycycline	18	21	0.86	0	0.19

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Impact on Normal ASP Activities

Activity	Projected # of hours invested (as of April 22, 2021)
Updating COVID-19 treatment guidelines (including mobile app updating)	> 300
Nighttime antimicrobial restriction pager coverage	~ 372
Remdesivir monitoring under EUA distribution	~ 200
Remdesivir and other COVID-19 focused therapeutic restriction	~ 195 (call volume up 40-60%)
Monoclonal Ab outpatient screening (including meetings and planning)	~ 35
Meetings (including clinical trial committee meetings)	> 100
Research (not included in hour total)	*~ 150*
TOTAL	~ 1,200 + hours

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ASP Involvement in COVID-19 Response Efforts

- Major ways Antimicrobial Stewardship Programs (ASPs) have been involved (not exhaustive):
  - Case identification and diagnostic stewardship of SARS-CoV-2 testing
  - COVID-19 treatment
    - Guidelines
    - Facilitating access to potential therapeutics
  - Outpatient pandemic stewardship
    - Preauthorization for potential therapeutics
    - Managing access process for monoclonal antibodies
  - Vaccine planning

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Letter to the Editor

Antimicrobial stewardship and bamlanivimab: Opportunities for outpatient preauthorization?

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To the Editor—Preauthorization is a fundamental action of antimicrobial stewardship programs (ASPs).[1] ASPs have played essential roles in coronavirus disease 2019 (COVID-19) response efforts since the onset of the pandemic. For instance, ASPs have implemented the preauthorization of remdesivir throughout its path from an experimental antiviral obtained via compassionate use or expanded access, to Food and Drug Administration (FDA) Emergency Use Authorization (EUA), to ultimate FDA approval.[2,3] On November 9, 2020, the FDA released an EUA for bamlanivimab, a recombi-

available literature, including several inpatient studies of monoclonal antibodies that were halted due to unfavorable data,[6-8] it may be prudent to await further data and/or guidance from professional organizations (eg, the Infectious Diseases Society of America). See Figure 1 for additional considerations.

The bamlanivimab EUA may present ASPs with a golden opportunity to enhance their outpatient stewardship impact. As of January 1, 2020, the Joint Commission has mandated that health systems deploy active antimicrobial stewardship interventions in

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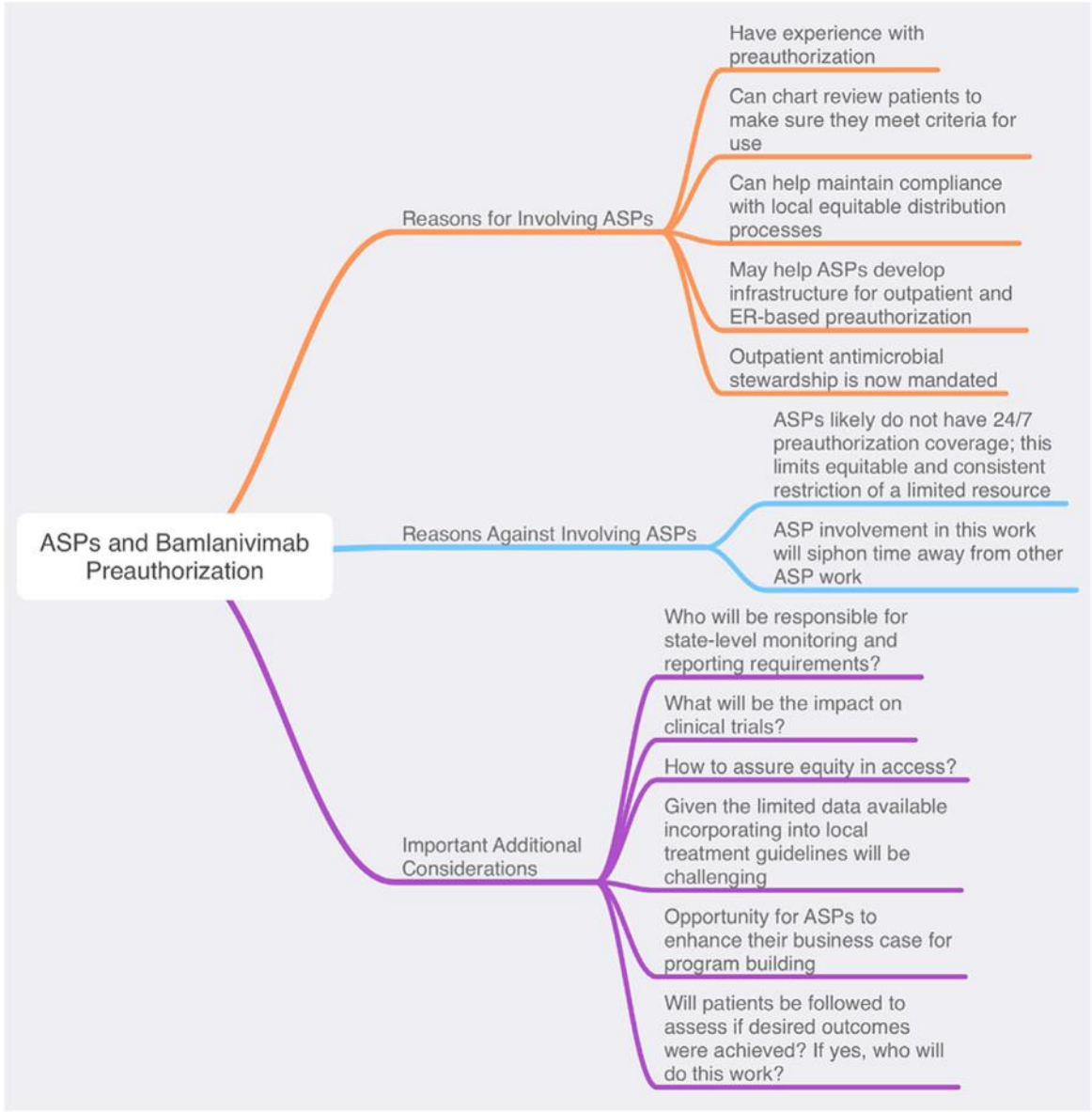

Figure 1. ASPs and Bamlanivimab preauthorization

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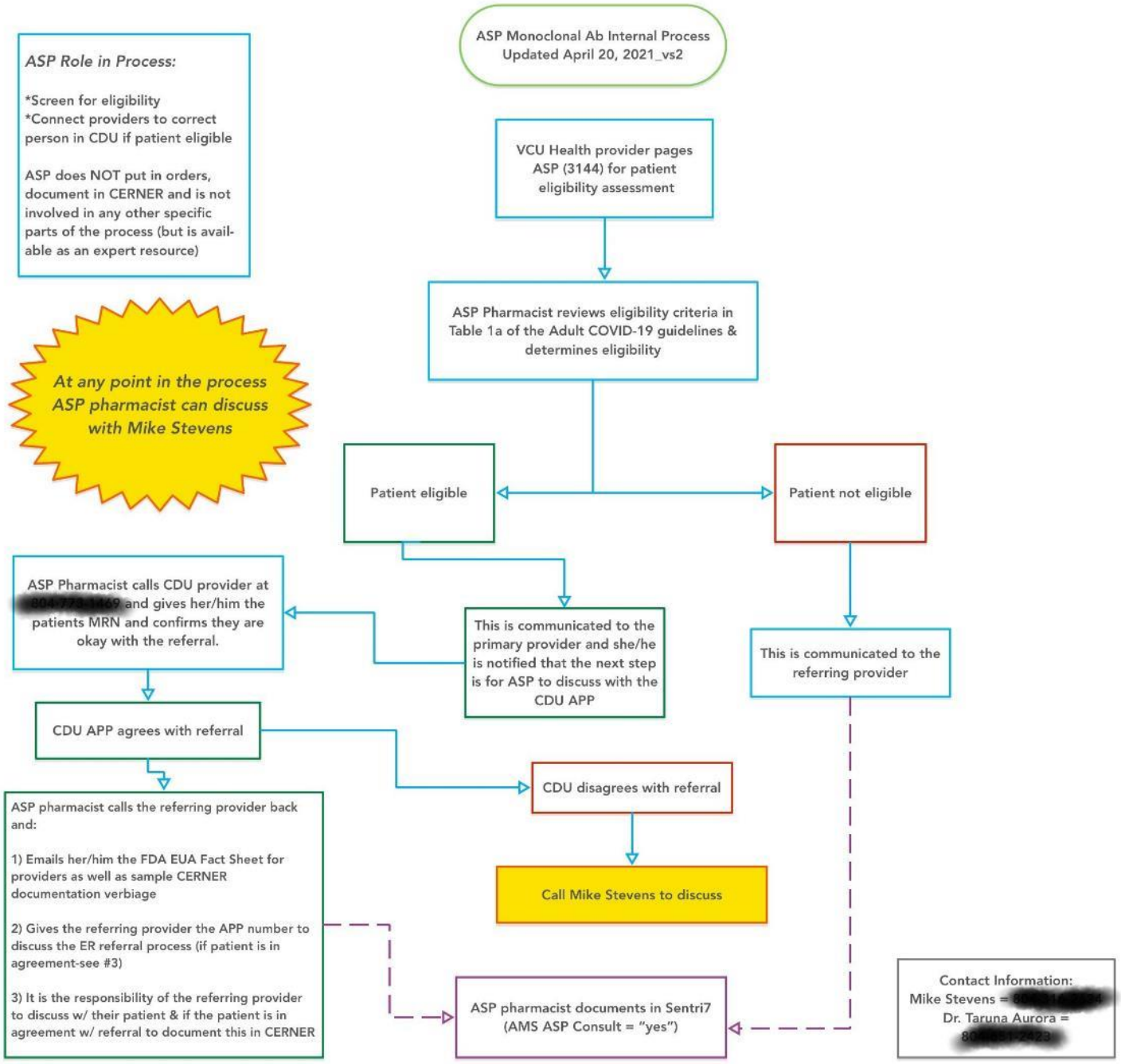
ASP Monoclonal Ab Internal Process
Updated April 20, 2021_vs2
ASP Role in Process:
*Screen for eligibility
*Connect providers to correct person in CDU if patient eligible
ASP does NOT put in orders, document in CERNER and is not involved in any other specific parts of the process (but is available as an expert resource)
VCU Health provider pages ASP (3144) for patient eligibility assessment
ASP Pharmacist reviews eligibility criteria in Table 1a of the Adult COVID-19 guidelines & determines eligibility
At any point in the process ASP pharmacist can discuss with Mike Stevens
Patient eligible
Patient not eligible
ASP Pharmacist calls CDU provider at [redacted] and gives her/him the patients MRN and confirms they are okay with the referral.
This is communicated to the primary provider and she/he is notified that the next step is for ASP to discuss with the CDU APP
This is communicated to the referring provider
CDU APP agrees with referral
CDU disagrees with referral
ASP pharmacist calls the referring provider back and:
1) Emails her/him the FDA EUA Fact Sheet for providers as well as sample CERNER documentation verbiage
2) Gives the referring provider the APP number to discuss the ER referral process (if patient is in agreement-see #3)
3) It is the responsibility of the referring provider to discuss w/ their patient & if the patient is in agreement w/ referral to document this in CERNER
Call Mike Stevens to discuss
ASP pharmacist documents in Sentri7 (AMS ASP Consult = "yes")
Contact Information:
Mike Stevens = [redacted]
Dr. Taruna Aurora = [redacted]

ASP Involvement in COVID-19 Response Efforts

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  - COVID-19 treatment
    - Guidelines
    - Facilitating access to potential therapeutics
  - Outpatient pandemic stewardship
    - Monoclonal antibodies
  - Vaccine planning

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Article contents

Rational allocation of COVID-19 vaccines to healthcare personnel and patients: a role for antimicrobial stewardship programs?

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Priya Nori, Payal K. Patel and Michael P. Stevens

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Abstract

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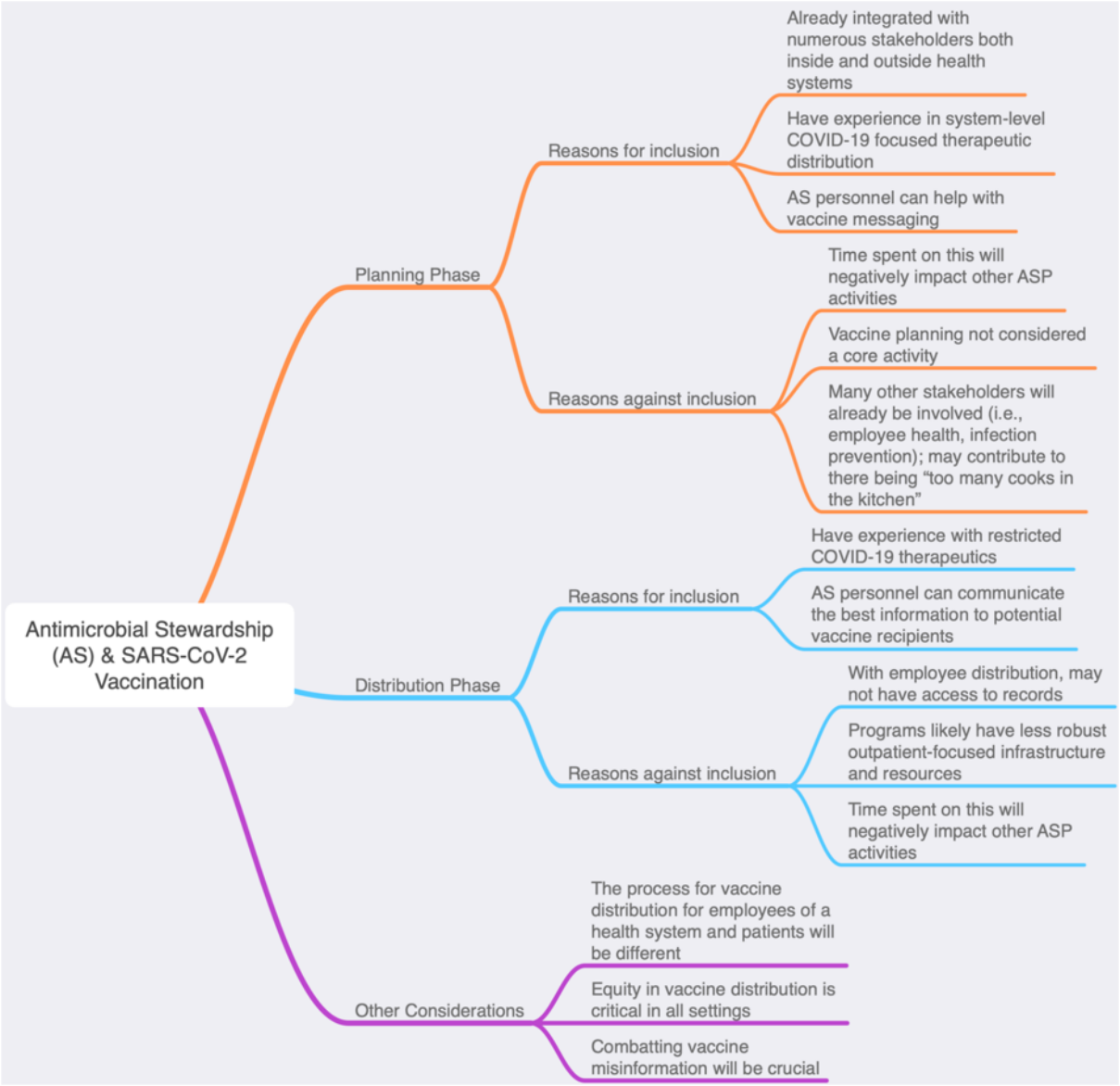

Figure 1. Antimicrobial Stewardship (AS) and SARS-CoV-2 Vaccination

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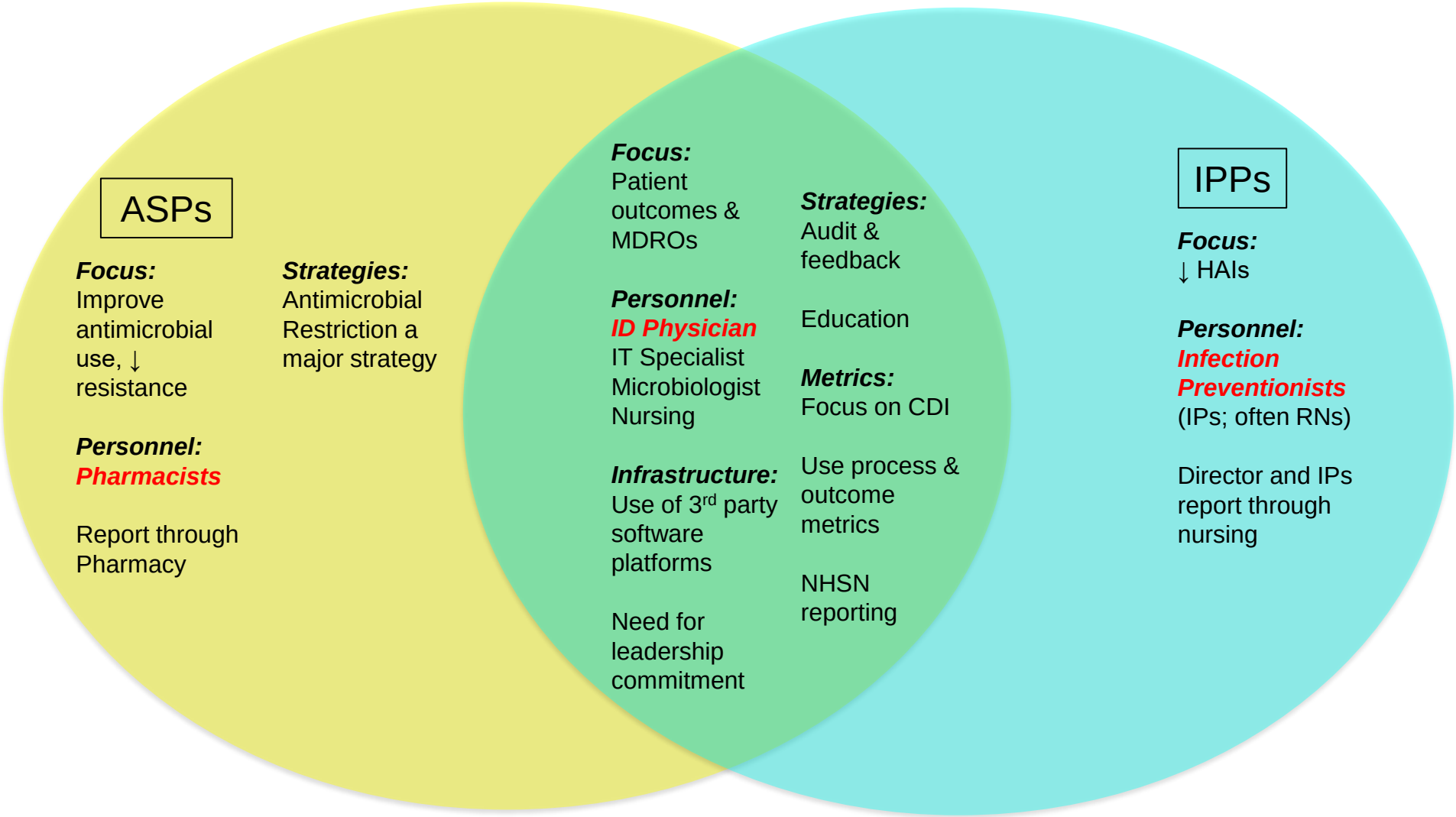
Overview

- Describe novel activities that Antimicrobial Stewardship Programs (ASPs) have taken on during the COVID-19 pandemic
- Describe ASP collaboration with infection prevention programs (IPP) during the pandemic
- Discuss implications from the pandemic on future ASP activities and program building

Similarities and Differences Between ASPs and Infection Prevention Programs



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Abbas & Stevens. Med Clin N Amer 2018;102:873-882.

ASP and IPP Key Activities During the COVID-19 Pandemic

IPPs	ASPs	Comments
• Identification and isolation of potentially infected patients; including test stewardship • Managing evolving PPE strategies based on access • Communication with leadership, staff and patients • Outbreak investigation and mitigation	• Creation and maintenance of treatment guidelines • Restriction of potential therapeutics • Managing access process for key therapeutics • Monitoring and reporting on key drug stock/shortages	• ASPs can play a role in test stewardship, case identification and can alert IPPs about possible cases • As part of guidelines dissemination ASPs can reinforce key IP messaging • New mechanisms for data acquisition and reporting have been important to both IPPs and ASPs

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Mazdeyasna H & Stevens MP et al. Curr Infect Dis Rep 2020;22(9):23.

ASP and IPP Collaboration During the Pandemic

- Playing a key role in managing guidelines and potential therapeutics provided ASPs a “seat at the table” and reinforced program value to key stakeholders
- The COVID-19 pandemic created new real-time data needs; IPPs and ASPs have collaborated w/ other groups to create new reports and mechanisms for reporting
- Enhancement in communication infrastructure was developed during the pandemic
- An emphasis on social distancing and telework has led to the adoption of new technologies for real-time collaboration
- The pandemic has highlighted the critical need for real-time IT support
- Some ASPs and IPPs enhanced telehealth services to other hospitals during the pandemic

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ASPs and IPPs: Future Activities

Low Hanging Fruit	Moderate Fruit	High Fruit
• ASPs can utilize IPP structures to solidify regular C-suite access • Technology for remote communication will facilitate ASP/IPP collaboration • Infrastructure created for data access, reporting and collaboration can facilitate collaboration	• ASPs can work with IPPs to refine/enhance data tracking and reporting • Includes NHSN reporting • ASPs and IPPs can create business plans for collaborative access to IT infrastructure and specialists • ASPs and IPPs can collaborate on staff and patient education	• Enhanced models for ID physician and pharmacist recruitment, training and certification can be developed • ASPs and IPPs can consider new combined program models • ASPs and IPPs can collaborate on bundled telehealth services to other hospitals

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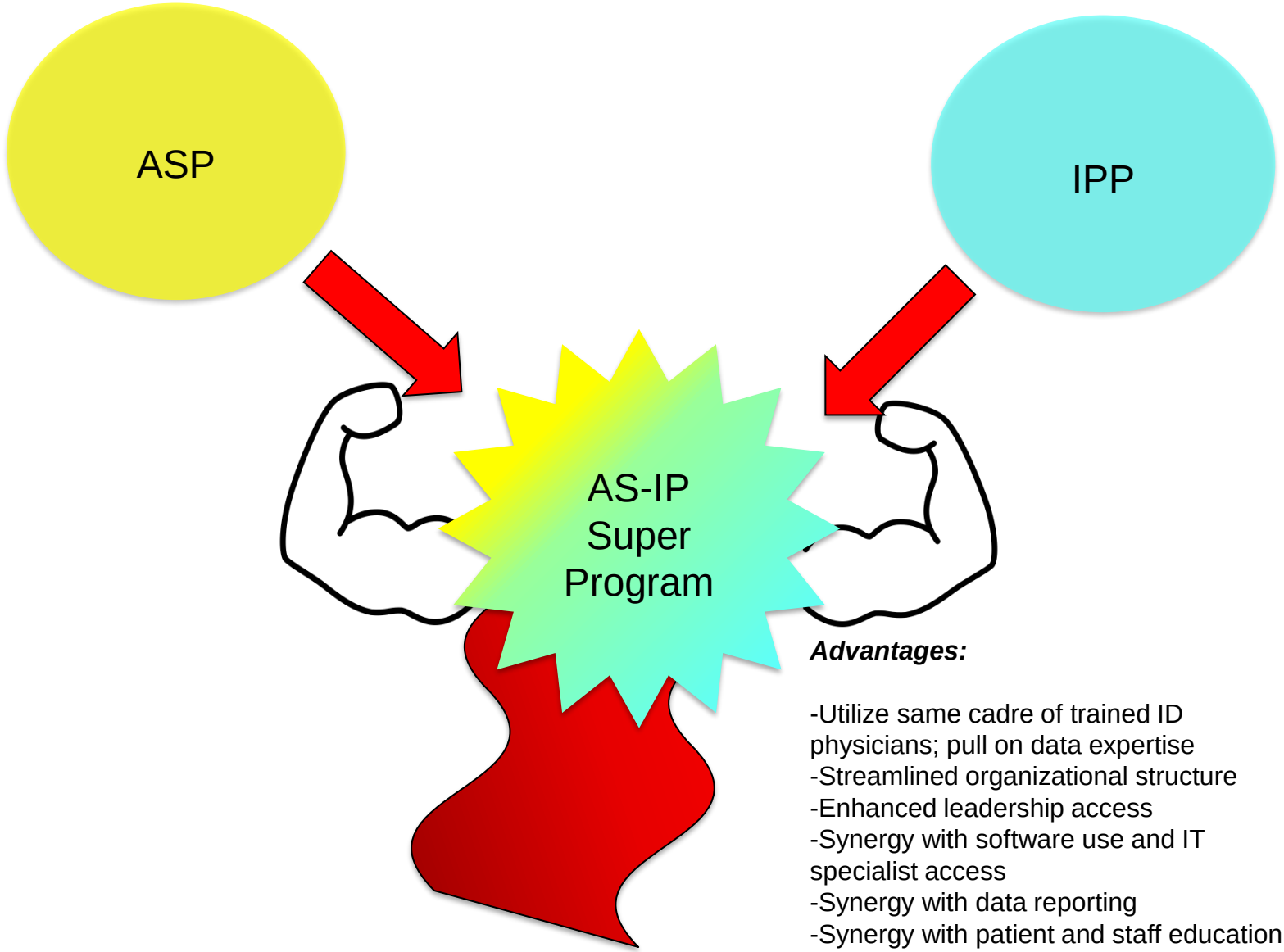
Post-Pandemic Collaboration: A Model



Advantages:

-Utilize same cadre of trained ID physicians; pull on data expertise
-Streamlined organizational structure
-Enhanced leadership access
-Synergy with software use and IT specialist access
-Synergy with data reporting
-Synergy with patient and staff education
-Enhanced patient outcomes

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Thank You

- The VCU Health Antimicrobial Stewardship Program
  - Dr. Kim, Dr. Deja, Dr. Lee, Dr. Cooksey, Dr. Noda, Dr. Godbout
- The VCU Health Hospital Infection Prevention Program
- Dr. Priya Nori and Dr. Payal Patel

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