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Implementation of Clinical Practice Guidelines for Hospitalized Patients With COVID-19 in Academic Medical Centers

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Introduction

COVID-19 management has evolved rapidly, creating challenges for implementation. This study was conducted to assess the fidelity with which academic medical centers (AMCs) adopted evidence into practice.

Methods

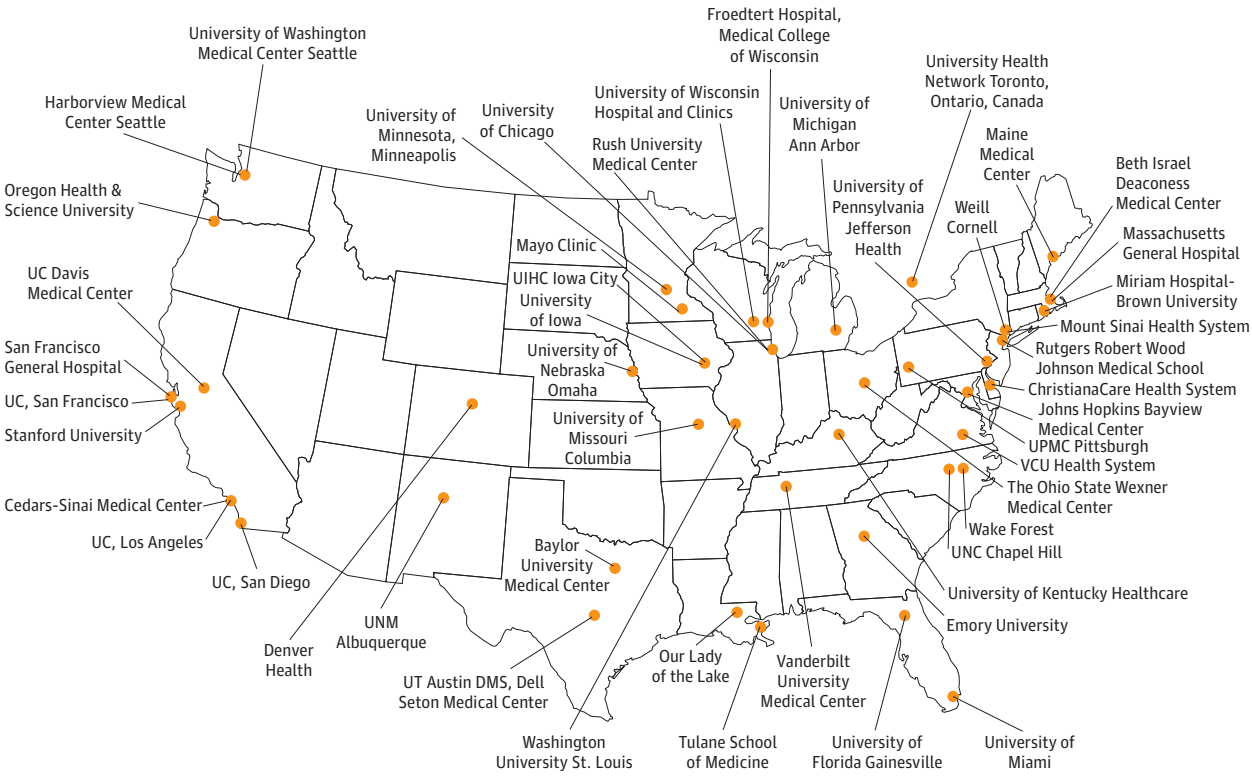
This survey study was deemed exempt from review and informed consent by the University of California, San Francisco, because it does not involve human participants. Response rates were computed according to the American Association for Public Opinion Research (AAPOR) reporting guideline.

We surveyed members of the Hospital Medicine Reengineering Network (**Figure 1**)[1] from

+ Supplemental content

Author affiliations and article information are listed at the end of this article.

Figure 1. Map of Hospitals Participating in the Hospital Medicine Reengineering Network



UC indicates University of California; UIHC, University of Iowa Hospitals and Clinics; UNC, University of North Carolina; UNM, University of New Mexico; UPMC, University of Pittsburgh Medical Center; UT, University of Texas; and VCU, Virginia Commonwealth University.

December 17, 2020, to February 10, 2021, and compared their institutional recommendations for COVID-19 management with available evidence at that time from pivotal randomized clinical trials (RCTs) (eAppendix in the Supplement) and guidelines from the National Institutes of Health,[2] Infectious Diseases Society of America,[3] and American Society of Hematology.[4] Data were analyzed from February 10 to March 4, 2021.

Results

Of 83 hospitals contacted, 52 (63%) responded. Hospitalist leaders involved in the direct care of patients with COVID-19 provided responses. A total of 49 sites (94%) self-identified as AMCs; the remaining 3 sites (6%) identified as AMC-affiliated teaching hospitals. Fifty-one sites (98%) issued internal COVID-19 management guidance. Guidance at 48 sites (94%) was generated by multidisciplinary committees, including infectious disease (47 sites [98%]), infection control (43 sites [90%]), hospital medicine (42 sites [88%]), and critical care (40 sites [83%]). Of 51 sites with internal COVID-19 management guidance, recommendations were disseminated most commonly through email (43 sites [84%]), institutional websites (42 sites [82%]), and integration into the electronic health record as COVID-19-specific order sets (37 sites [73%]) and note templates (33 sites [65%]). The percentage of institutions recommending each studied intervention is shown in **Figure 2**, alongside simplified RCT findings and guidelines. Notable results include 94% to 100% of sites recommending dexamethasone for patients requiring at least 4 L of oxygen, 69% recommending remdesivir for patients receiving mechanical ventilation, 81% recommending dexamethasone for patients requiring 1 to 2 L of oxygen, 67% implementing awake proning, 35% limiting remdesivir use to the "early or viral phase of illness," and 17% recommending D-dimer–based therapeutic anticoagulation. The proportion of sites recommending each intervention varied from a low of 10% for convalescent plasma for patients without antibodies to 100% for dexamethasone in patients requiring mechanical ventilation.

Discussion

In this survey study, 3 themes emerged from our analysis. First, translation from evidence to practice guidelines was remarkably complete for interventions supported by aligned national guidelines and high-quality studies. A striking example is the near universal adoption of dexamethasone among patients requiring at least 4 L of supplementary oxygen only 6 to 8 months after the RECOVERY trial demonstrated a survival benefit. The lone exception to this trend was baricitinib; however, new evidence and guidelines were released within 1 week of survey distribution. Practice convergence was also observed when evidence and guidelines aligned against interventions, as seen in the infrequent recommendation of dexamethasone for patients with oxygen saturation greater than 94%, as measured by pulse oximetry. However, clear opportunity for improvement still exists.

Second, institutions favored treatment over not treatment, particularly when guidelines diverged from each other or from the underlying evidence, as exemplified by 69% to 81% of sites recommending remdesivir or dexamethasone, respectively, when evidence or guidelines conflicted. We suspect this finding reflects systemic biases to do something rather than nothing when faced with uncertainty, likely exacerbated by inconsistent definitions of disease severity across studies and guidelines.

Finally, AMCs demonstrated a willingness to innovate across a range of interventions. Novel interventions, such as awake proning, phase-of-illness–restricted remdesivir, and D-dimer–based therapeutic anticoagulation, varied widely with respect to patient selection and procedural specifics, but collectively, and with 17% to 67% of sites recommending 1 or more of such novel interventions, they demonstrate that AMCs were sophisticated consumers of information, willing to bridge

Figure 2. Comparing Academic Medical Centers' Institutional Recommendations to National Guidelines and Randomized Clinical Trial (RCT) Data

Evidence of benefit | Evidence of no benefit | No high-quality evidence | Guideline supports use | Guideline opposes use | Neither supports nor opposes use

Intervention	Disease severity	Notable RCTs		Guidelines		Sites recommending intervention, %
		ACTT-1	Solidarity	IDSA	NIH	
Remdesivir	Moderate illness (Spo_2 > 94%)	No benefit	No benefit	Suggests against	No recommendation	21
	Severe illness requiring 1-6 L NC	Benefit	No benefit	Suggests use	Recommends use	83
	Severe illness requiring HFNC or NIPPV	No benefit		Suggests use	Recommends use	86
	Critical illness requiring mechanical ventilation	No benefit	No benefit	Suggests use	Recommends against	69
Intervention	**Disease severity**	**Notable RCTs RECOVERY**		**Guidelines**		**Sites recommending intervention, %**
				IDSA	NIH	
Dexamethasone	Moderate illness at high risk for progression	No benefit		Suggests against	Recommends against	20
	Severe Illness (Spo_2 <95%) not receiving O_2			Suggests use	Recommends against	26
	Severe illness requiring 1-2 L NC	Benefit		Suggests use	Recommends against	81
	Severe illness requiring 4-6 L NC			Suggests use	Recommends use	94
	Severe illness requiring HFNC or NIPPV			Suggests use	Recommends use	100
	Critical illness requiring mechanical ventilation	Benefit		Recommends use	Recommends use	100
Intervention	**Disease severity**	**Notable RCTs ACTT-2**		**Guidelines**		**Sites recommending intervention, %**
				IDSA	NIH	
Baricitinib	Receiving O_2 + steroids contraindicated	Benefit		No recommendation	Recommends use (12/14/20)	25
Intervention	**Disease severity**	**Notable RCTs**		**Guidelines**		**Sites recommending intervention, %**
		PlasmAr	PLACID	IDSA	NIH	
Convalescent plasma	Early or viral phase of infection	Not evaluated	No benefit	Recommends against	No recommendation	18
	Undetectable or low antibody titer	No benefit	No benefit			10
Intervention	**Disease severity**	**Notable RCTs REMAP-CAP, ACTIV-4, ATTACC**		**Guidelines**		**Sites recommending intervention, %**
				ASH	NIH	
Therapeutic anticoagulation	D-dimer over institution threshold	In progress during survey period		Prophylactic dose recommended	Prophylactic dose recommended	17
Intervention	**Disease severity**	**Notable RCTs**		**Guidelines NIH**		**Sites recommending intervention, %**
Proning	Not receiving O_2	In progress as of manuscript preparation		No recommendation		43
	1-6 L NC			"Consider a trial" for persistent hypoxemia		53
	HFNC or NIPPV					61

The percentage of sites recommending use of each clinical intervention for a given patient population, stratified by disease severity, is presented alongside simplified findings from notable RCTs (eAppendix in the Supplement) and guidelines available at the time of the survey from the National Institutes of Health (NIH),[2] Infectious Diseases Society of America (IDSA),[3] and American Society of Hematology (ASH).[4] No published RCTs were available at the time of the survey for anticoagulation or proning. ACTIV-4 indicates Anti-thrombotics for Adults Hospitalized With COVID-19; ACTT, Adaptive COVID-19 Treatment Trial; ATTACC, Antithrombotic Therapy to Ameliorate Complications of COVID-19; HFNC, high-flow nasal cannula; NC, nasal cannula; NIPPV, noninvasive positive-pressure ventilation; PLACID, Convalescent Plasma in the Management of Moderate COVID-19 in Adults in India; PlasmAr, Convalescent Plasma and Placebo for the Treatment of COVID-19 Severe Pneumonia; RECOVERY, Randomized Evaluation of COVID-19 Therapy; REMAP-CAP, A Randomised, Embedded, Multi-factorial, Adaptive Platform Trial for Community-Acquired Pneumonia; Spo_2, oxygen saturation as measured by pulse oximetry.

knowledge gaps with expert opinion. Additional research is needed to understand how AMCs monitor innovation outcomes and deimplement practices when negative evidence emerges.

Limitations of this study include a 37% nonresponse rate, reliance on self-reporting, lack of longitudinal follow-up, and lack of data on actual clinical practice and outcomes. Nonetheless, our findings demonstrate that AMCs were capable of responding nimbly to emerging data and shifting guidelines, although both overtreatment and experimentation were observed where significant uncertainty persisted. While factors unique to the early pandemic likely shaped this performance, we hope some strategies, such as use of focused multidisciplinary teams and novel information sharing tools, can be harnessed to accelerate the translation of evidence to bedside for COVID-19 and beyond.

ARTICLE INFORMATION

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Author Contributions: Drs Berger and Kubey had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis. Drs Berger and Simchoni contributed equally as co–first authors.

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SUPPLEMENT.

eAppendix. Pivotal Randomized Clinical Trials