Title

Hospital Ward Adaptation During the COVID-19 Pandemic: A National Survey of Academic Medical Centers

Journal

Journal of Hospital Medicine, 15(8)

ISSN

1553-5592

Authors

Auerbach, Andrew
O'Leary, Kevin J
Greysen, S Ryan
et al.

Publication Date

2020-08-01

DOI

10.12788/jhm.3476

Peer reviewed

Hospital Ward Adaptation During the COVID-19 Pandemic: A National Survey of Academic Medical Centers

Andrew Auerbach, MD, MPH[1]*, Kevin J O'Leary, MD, MS[2], S Ryan Greysen, MD, MHS[3], James D Harrison, PhD[1], Sunil Kripalani, MD, MSc[4], Gregory W Ruhnke, MD, MS, MPH[5], Eduard E Vasilevskis, MD, MPH[4], Judith Maselli, MSc[1], Margaret C Fang, MD, MPH[1], Shoshana J Herzig, MD, MPH[6], Tiffany Lee, MA[1], Jeffrey Schnipper, MD, MPH[7], for the HOMERuN COVID-19 Collaborative Group

[1]*University of California, San Francisco School of Medicine, San Francisco, California;* [2]*Northwestern University Medical Center, Feinberg School of Medicine, Chicago, Illinois;* [3]*Perelman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania;* [4]*Vanderbilt University School of Medicine, Nashville, Tennessee;* [5]*University of Chicago School of Medicine, Chicago, Illinois;* [6]*Beth Israel Deaconess Medical Center, Boston, Massachusetts;* [7]*Brigham and Women's Hospital, Boston, Massachusetts.*

IMPORTANCE: Although intensive care unit (ICU) adaptations to the coronavirus disease of 2019 (COVID-19) pandemic have received substantial attention , most patients hospitalized with COVID-19 have been in general medical units.

OBJECTIVE: To characterize inpatient adaptations to care for non-ICU COVID-19 patients.

DESIGN: Cross-sectional survey.

SETTING: A network of 72 hospital medicine groups at US academic centers.

MAIN OUTCOME MEASURES: COVID-19 testing, approaches to personal protective equipment (PPE), and features of respiratory isolation units (RIUs).

RESULTS: Fifty-one of 72 sites responded (71%) between April 3 and April 5, 2020. At the time of our survey, only 15 (30%) reported COVID-19 test results being available in less than 6 hours. Half of sites with PPE data available reported PPE stockpiles of 2 weeks or less. Nearly all sites (90%) reported implementation of RIUs. RIUs primarily utilized attending physicians, with few incorporating residents and none incorporating students. Isolation and room-entry policies focused on grouping care activities and utilizing technology (such as video visits) to communicate with and evaluate patients. The vast majority of sites reported decreases in frequency of in-room encounters across provider or team types. Forty-six percent of respondents reported initially unrecognized non–COVID-19 diagnoses in patients admitted for COVID-19 evaluation; a similar number reported delayed identification of COVID-19 in patients admitted for other reasons.

CONCLUSION: The COVID-19 pandemic has required medical wards to rapidly adapt with expanding use of RIUs and use of technology emerging as critical approaches. Reports of unrecognized or delayed diagnoses highlight how such adaptations may produce potential adverse effects on care. *Journal of Hospital Medicine* 2020;15: 483-488. © 2020 Society of Hospital Medicine

The coronavirus disease of 2019 (COVID-19) pandemic has resulted in a surge in hospitalizations of patients with a novel, serious, and highly contagious infectious disease for which there is yet no proven treatment. Currently, much of the focus has been on intensive care unit (ICU) and ventilator capacity for the sickest of these patients who develop respiratory failure. However, most hospitalized patients are being cared for in general medical units.[1] Some evidence exists to describe adaptations to capacity needs outside of medical wards,[2-4] but few studies have specifically addressed the ward setting. Therefore, there is a pressing need for evidence to describe how to expand capacity and deliver medical ward–based care.

To better understand how inpatient care in the United States is adapting to the COVID-19 pandemic, we surveyed 72 sites participating in the Hospital Medicine Reengineering Network (HOMERuN), a national consortium of hospital medicine groups.[5] We report results of this survey, carried out between April 3 and April 5, 2020.

METHODS

Sites and Subjects

HOMERuN is a collaborative network of hospitalists from across the United States whose primary goal is to catalyze research and share best practices across hospital medicine groups. Using surveys of Hospital Medicine leaders, targeted medical record review, and other methods, HOMERuN's funded research interests to date have included care transitions, workforce issues, patient and family engagement, and diagnostic errors. Sites participating in HOMERuN

*Corresponding Author: Andrew Auerbach, MD, MPH; Email: andrew.auerbach@ucsf.edu Twitter:@ADAuerbach.

Published online first July 22, 2020.

Find additional supporting information in the online version of this article.

Received: April 20, 2020; **Revised**: May 18, 2020; **Accepted**: May 21, 2020

sites are relatively large urban academic medical centers (Appendix).

Survey Development and Deployment

We designed a focused survey that aimed to provide a snapshot of evolving operational and clinical aspects of COVID-19 care (Appendix). Domains included COVID-19 testing turnaround times, personal protective equipment (PPE) stewardship,[6] features of respiratory isolation units (RIUs; ie, dedicated units for patients with known or suspected COVID-19), and observed effects on clinical care. We tested the instrument to ensure feasibility and clarity internally, performed brief cognitive testing with several hospital medicine leaders in HOMERuN, then disseminated the survey by email on April 3, with two follow-up emails on 2 subsequent days. Our study was deemed non–human subjects research by the University of California, San Francisco, Committee on Human Research. Descriptive statistics were used to characterize survey responses.

RESULTS

Of 72 hospitals surveyed, 51 (71%) responded. Mean hospital bed count was 940, three were safety-net hospitals, and one was a community-based teaching center; responding and nonresponding hospitals did not differ significantly in terms of bed count (Appendix).

Health System Adaptations, Testing, and PPE Status

Nearly all responding hospitals (46 of 51; 90%) had RIUs for patients with known or suspected COVID-19 (Table 1). Nearly all hospitals took steps to keep potentially sick healthcare providers from infecting others (eg, staying home if sick or exposed). Among respondents, 32% had rapid response teams, 24% had respiratory therapy teams, and 29% had case management teams that were dedicated to COVID-19 care. Thirty-two (63%) had developed models, such as ethics or palliative care consult services, to assist with difficult resource-allocation decisions (eg, how to prioritize ventilator use if demand exceeded supply). Twenty-three (45%) had developed post-acute care monitoring programs dedicated to COVID-19 patients.

At the time of our survey, only 2 sites (4%) reported COVID-19 test time turnaround under 1 hour, and 15 (30%) reported turnaround in less than 6 hours. Of the 29 sites able to provide estimates of PPE stockpile, 14 (48%) reported a supply of 2 weeks or less. The most common approaches to PPE stewardship focused on reuse of masks and face shields if not obviously soiled, centralizing PPE distribution, and disinfecting or sterilizing masks. Ten sites (20%) were utilizing 3-D printed masks, while 10% used homemade face shields or masks.

Characteristics of COVID-19 RIUs

Forty-six hospitals (90% of all respondents) in our cohort had developed RIUs at the time of survey administration. The earliest RIU implementation date was February 10, 2020, and the most recent was launched on the day of our survey. Admission to RIUs was primarily based on clinical factors associated with known or suspected COVID-19 infection (Table 2). The number of non–critical care RIU beds among locations at that time ranged from 10 or less to more than 50. The mean number of hospitalist attendings caring for patients in the RIUs was 10.2, with a mean 4.1 advanced practice providers, 5.5 residents, and 0 medical students. The number of planned patients per attending was typically 5 to 15. Nurses and physicians typically rounded separately. Medical distancing (eg, reducing patient room entry) was accomplished most commonly by grouped timing of medication administration (76% of sites), video links to room outside of rounding times (54% of sites), the use of video or telemedicine during rounds (17%), and clustering of activities such as medication administration or phlebotomy. The most common criteria prompting discharge from the RIU were a negative COVID-19 test (59%) and hospital discharge (57%), though comments from many respondents suggested that discharge criteria were changing rapidly.

Effects of Isolation Measures on In-Room Encounters and Diagnostic Processes

More than 90% of sites reported decreases in in-room encounter frequency across all provider types whether as a result of policies in place or not. Reductions were reported among hospitalists, advanced practice providers, residents, consultants, and therapists (Table 3). Reduced room entry most often resulted from an established or developing policy, but many noted reduced room entry without formal policies in place. Nearly all sites reported moving specialty consultations to phone or video evaluations. Diagnostic error was commonly reported, with missed non–COVID-19 medical diagnoses among COVID-19 infected patients being reported by 22 sites (46%) and missed COVID-19 diagnoses in patients admitted for other reasons by 22 sites (45%).

DISCUSSION

In this study of medical wards at academic medical centers, we found that, in response to the COVID-19 pandemic, hospitals made several changes in a short period of time to adapt to the crisis. These included implementation and rapid expansion of dedicated RIUs, greatly expanded use of inpatient telehealth for patient assessments and consultation, implementation of other approaches to minimize room entry (such as grouping in-room activities), and deployment of ethics consultation services to help manage issues around potential scarcity of life-saving measures such as ventilators. We also found that availability of PPE and timely testing was limited. Finally, a large proportion of sites reported potential diagnostic problems in the assessment of both patients suspected and those not suspected of having COVID-19.

RIUs are emerging as a primary modality for caring for non-ICU COVID-19 patients, though they never involved medical students; we hope the role of students in particular will increase as new models of training emerge in response to the pandemic.[7] In contrast, telemedicine evolved rapidly to hold a substantial role in RIUs, with both ward and specialty teams using video visit technology to communicate with patients.

TABLE 1. **Health System Adaptations, Testing, and PPE Practices* (N = 51)**

Strategies in your primary hospital	**n (%)**
RIU for known or suspected COVID-19 patients	46 (90)
Transitional Care Unit for known or suspected COVID-19 patients	16 (31)
ICU for known or suspected COVID-19 patients	44 (86)
Quarantining staff exposed to COVID-19	15 (29)
Keeping staff home if sick or exposed	48 (94)
Checking healthcare staff's health daily	31 (63)
Dedicated admitting team for known or suspected COVID-19 patients	32 (63)
Dedicated COVID-19 rapid response or ICU-outreach teams	16 (32)
Dedicated COVID-19 respiratory therapists	12 (24)
Dedicated COVID-19 occupational or physical therapy	3 (6)
Dedicated COVID-19 case management team	15 (29)
Ethics or Palliative Care consult service to assist with allocation choices	32 (63)
Home care to facilitate early discharge of COVID-19 patients	17 (33)
Dedicated sub-acute facilities to care for discharged COVID-19 patients	10 (20)
Post-discharge monitoring programs for discharged COVID-19 patients	23 (45)
COVID-19 test time turnaround for hospitalized patients	**n (%)**
≤1 hour	2 (4)
2-6 hours	13 (26)
7-10 hours	18 (36)
11-18 hours	12 (24)
>18 hours	5 (10)
Unknown	1 (2)
Estimated PPE stockpile	**n (%)**
≤1 week or less	7 (14)
2 weeks	7 (14)
3 weeks	4 (8)
4 weeks	3 (6)
>4 weeks	8 (16)
Unknown	22 (43)
Current PPE stewardship approaches in your hospital	**n (%)**
Reuse masks if not soiled	44 (86)
Reuse face shields	41 (80)
Centralize distribution of PPE to providers	30 (59)
Disinfect/sterilize masks or launderable gowns	22 (43)
Use surgical masks on top of N95	11 (22)
Use launderable gowns	11 (22)
Use 3D-printed masks	10 (20)
Reuse gowns	7 (14)
Reuse elastomeric respirators	6 (12)
Use homemade PPE	5 (10)
Use homemade plastic face shields	5 (10)
Repurpose nonhealthcare masks	3 (6)
Use adhesive bandages as nasal PPE	0
Use plastic ponchos, poly bags, or bedbag sheet material for gowns	0
Disallow reuse	2 (4)

*Some sites declined to disclose estimates, resulting in variations in response rate.

Abbreviations: ICU, intensive care unit; PPE, personal protective equipment; RIU, respiratory isolation unit.

COVID-19 has been viewed as a perfect use case for outpatient telemedicine,[8] and a growing number of studies are examining its outpatient use[9,10]; however, to date, somewhat less attention has been paid to inpatient deployment. Although our data suggest telemedicine has found a prominent place in RIUs, it remains to be seen whether it is associated with differences in patient or provider outcomes. For example, deficiencies in the physical examination, limited face-to-face contact,

TABLE 2. **Characteristics of COVID-19 RIUs (N = 46 sites)**

Date RIU opened (Date range)	**2/10-4/04**
Criteria for admission	**n (%)**
Fever	29 (63)
Cough	28 (61)
Dyspnea	30 (65)
Infiltrate pattern	23 (50)
Hypoxemia	28 (61)
Exposure to COVID-19	30 (65)
Known positive COVID-19 test	35 (76)
Lab abnormalities	12 (26)
Geographic localization	**n (%)**
Yes	42 (91)
No	1 (2)
Multiple units	8 (17)
Number of non–critical care beds on RIU	**n (%)**
≤10	1 (2)
11-20	5 (11)
21-30	14 (30)
31-40	4 (9)
41-50	7 (15)
≥51	11 (24)
Unable to estimate	4 (9)
Services provided in RIU	**n (%)**
Continuous pulse oximetry	40 (87)
Telemetry	39 (85)
Video monitoring for falls	15 (33)
BiPAP/CPAP	10 (22)
Clinicians caring for patients in RIU	**Mean (SD)**
Number of attending hospitalists (39 responses)	10.2 (14.3)
Number of nonhospitalist physicians (35 responses)	1.2 (3.0)
Number of advanced practice providers (34 responses)	4.1 (8.3)
Number of fellows (34 responses)	1.3 (4.1)
Number of resident physicians (34 responses)	5.5 (10.5)
Medical students (30 responses)	0
Number of planned patients per attending	**n (%)**
<5	0
5-10	18 (37)
11-15	19 (39)
16-20	4 (8)
Missing	8 (16)
Rounding models	**n (%)**
MD and RN round separately	34 (67)
Shared rounds with RN, MD general medicine floor–based teams	12 (26)
Shared rounds with RN, MD, and broader specialist teams	6 (13)
Medical distancing/minimizing room entry	**n (%)**
Timing of meds administration	35 (76)
Video links to patient in room during rounds	8 (17)
Video links to room outside of rounds	25 (54)
Allowing nonbillable notes	19 (41)
RN blood draws rather than separate phlebotomy draws	17 (37)
Criteria for discharge from RIU	**n (%)**
Negative COVID-19 test	27 (59)
Transitioning to comfort care	5 (11)
Hospital discharge	26 (57)
Meeting clinical improvement criteria	14 (30)

Abbreviations: BiPAP, bilevel positive airway pressure; CPAP, continuous positive airway pressure; ICU, intensive care unit; MD, medical doctor; PPE, personal protective equipment; RIU, respiratory isolation unit; RN, registered nurse.

TABLE 3. **Effects of Isolation Measures on In-Room Encounters and Diagnostic Processes***

Have you noted any of the following in relation to known or suspected COVID-19 patients in isolation?	**n (%)**
Fewer in-room assessments by attending hospitalists (N = 46)	
No	1 (2)
Yes, due to policy/algorithm	26 (57)
Yes, not due to policy/algorithm	19 (41)
Fewer in-room assessments by APPs (N = 46)	
No	4 (9)
Yes, due to policy/algorithm	27 (59)
Yes, not due to policy/algorithm	15 (32)
Fewer in-room assessments by residents (N = 47)	
No	1 (2)
Yes, due to policy/algorithm	32 (68)
Yes, not due to policy/algorithm	14 (30)
Fewer in-room assessments by specialty consulting services (N = 50)	
No	3 (6)
Yes, due to policy or algorithm	26 (52)
Yes, not due to policy/algorithm	21 (42)
Fewer in-room assessments by interprofessional team (OT, PT) (N = 50)	
No	5 (10)
Yes, due to policy/algorithm	25 (50)
Yes, not due to policy/algorithm	20 (40)
Specialty consultation converting to phone or video visits (N = 49)	
No	2 (4)
Yes, due to policy or algorithm	31 (63)
Yes, not due to policy/algorithm	17 (33)
Have you noted either of the following taking place at your hospital?	**n (%)**
Missed non-COVID-19 diagnosis in patient under evaluation for COVID-19 (N = 48)	22 (46)
Missed COVID-19 diagnosis in patient admitted for other reasons (N = 49)	22 (45)

*Some sites declined to disclose estimates, resulting in variations in response rate.
Abbreviations: APP, advanced practice provider; OT, occupational therapy; PT, physical therapy.

and lack of physical presence could all affect the patient–provider relationship, patient engagement, and the accuracy of the diagnostic process.

Our data suggest the possibility of missing non–COVID-19 diagnoses in patients suspected of COVID-19 and missing COVID-19 in those admitted for nonrespiratory reasons. The latter may be addressed as routine COVID-19 screening of admitted patients becomes commonplace. For the former, however, it is possible that physicians are "anchoring" their thinking on COVID-19 to the exclusion of other diagnoses, that physicians are not fully aware of complications unique to COVID-19 infection (such as thromboembolism), and/or that the above-mentioned limitations of telemedicine have decreased diagnostic performance.

Although PPE stockpile data were not easily available for some sites, a distressingly large number reported stockpiles of 2 weeks or less, with reuse being the most common approach to extending PPE supply. We also found it concerning that 43% of hospital leaders did not know their stockpile data; we believe this is an important question that hospital leaders need to be asking. Most sites in our study reported test turnaround times of longer than 6 hours; lack of rapid COVID-19 testing further stresses PPE stockpile and may slow patients' transition out of the RIU or discharge to home.

Our study has several limitations, including the evolving nature of the pandemic and rapid adaptations of care systems in the pandemic's surge phase. However, we attempted to frame our questions in ways that provided a focused snapshot of care. Furthermore, respondents may not have had exhaustive knowledge of their institution's COVID-19 response strategies, but most were the directors of their hospitalist services, and we encouraged the respondents to confer with others to gather high-fidelity data. Finally, as a survey of large academic medical centers, our results may not apply to nonacademic centers.

Approaches to caring for non-ICU patients during the COVID-19 pandemic are rapidly evolving. Expansion of RIUs and developing the workforce to support them has been a primary focus, with rapid innovation in use of technology emerging as a critical adaptation while PPE limitations persist and needs for "medical distancing" continue to grow. Although rates of missed COVID-19 diagnoses will likely be reduced with testing and systems improvements, physicians and systems will also need to

consider how to utilize emerging technology in ways that can improve clinical care and provider safety while aiding diagnostic thinking. This survey illustrates the rapid adaptations made by our hospitals in response to the pandemic; ongoing adaptation will likely be needed to optimally care for hospitalized patients with COVID-19 while the pandemic continues to evolve.

Acknowledgment

Thanks to members of the HOMERuN COVID-19 Collaborative Group: Baylor Scott & White Medical Center – Temple, Texas - Tresa McNeal MD; Beth Israel Deaconess Medical Center - Shani Herzig MD MPH, Joseph Li MD, Julius Yang MD PhD; Brigham and Women's Hospital - Christopher Roy MD, Jeffrey Schnipper MD MPH; Cedars-Sinai Medical Center - Ed Seferian MD, ; ChristianaCare - Surekha Bhamidipati MD; Cleveland Clinic - Matthew Pappas MD MPH; Dartmouth-Hitchcock Medical Center - Jonathan Lurie MD MS; Dell Medical School at The University of Texas at Austin - Chris Moriates MD, Luci Leykum MD MBA MSc; Denver Health and Hospitals Authority - Diana Mancini MD; Emory University Hospital - Dan Hunt MD; Johns Hopkins Hospital - Daniel J Brotman MD, Zishan K Siddiqui MD, Shaker Eid MD MBA; Maine Medical Center - Daniel A Meyer MD, Robert Trowbridge MD; Massachusetts General Hospital - Melissa Mattison MD; Mayo Clinic Rochester – Caroline Burton MD, Sagar Dugani MD PhD; Medical College of Wisconsin - Sanjay Bhandari MD; Miriam Hospital - Kwame Dapaah-Afriyie MD MBA; Mount Sinai Hospital - Andrew Dunn MD; NorthShore - David Lovinger MD; Northwestern Memorial Hospital - Kevin O'Leary MD MS; Ohio State University Wexner Medical Center - Eric Schumacher DO; Oregon Health & Science University - Angela Alday MD; Penn Medicine - Ryan Greysen MD MHS MA; Rutgers- Robert Wood Johnson University Hospital - Michael Steinberg MD MPH; Stanford University School of Medicine - Neera Ahuja MD; Tulane Hospital and University Medical Center - Geraldine Ménard MD; UC San Diego Health - Ian Jenkins MD; UC Los Angeles Health - Michael Lazarus MD, Magdalena E. Ptaszny, MD; UC San Francisco Health - Bradley A Sharpe, MD, Margaret Fang MD MPH; UK HealthCare - Mark Williams MD MHM, John Romond MD; University of Chicago – David Meltzer MD PhD, Gregory Ruhnke MD; University of Colorado - Marisha Burden MD; University of Florida - Nila Radhakrishnan MD; University of Iowa Hospitals and Clinics - Kevin Glenn MD MS; University of Miami - Efren Manjarrez MD; University of Michigan - Vineet Chopra MD MSc, Valerie Vaughn MD MSc; University of Missouri-Columbia Hospital - Hasan Naqvi MD; University of Nebraska Medical Center - Chad Vokoun MD; University of North Carolina at Chapel Hill - David Hemsey MD; University of Pittsburgh Medical Center - Gena Marie Walker MD; University of Vermont Medical Center - Steven Grant MD; University of Washington Medical Center - Christopher Kim MD MBA, Andrew White MD; University of Washington-Harborview Medical Center - Maralyssa Bann MD; University of Wisconsin Hospital and Clinics - David Sterken MD, Farah Kaiksow MD MPP, Ann Sheehy MD MS, Jordan Kenik MD MPH; UW Northwest Campus - Ben Wolpaw MD; Vanderbilt University Medical Center - Sunil Kripalani MD MSc, Eduard E Vasilevskis MD, Kathleene T Wooldridge MD MPH; Wake Forest Baptist Health - Erik Summers MD; Washington University St. Louis - Michael Lin MD; Weill Cornell - Justin Choi MD; Yale New Haven Hospital - William Cushing MA, Chris Sankey MD; Zuckerberg San Francisco General Hospital - Sumant Ranji MD.

Disclosures: Dr Schnipper reports grants from Mallinckrodt Pharmaceuticals outside the scope of the submitted work. The other authors have no potential conflicts of interest to disclose.

Funding: Dr Auerbach, Dr Schnipper, and Ms Lee were supported by R01 HS027369-01 from the Agency for Healthcare Research and Quality (AHRQ). This project was funded in part by the Gordon and Betty Moore Foundation. Dr Harrison is supported by the AHRQ Award Number K12HS026383 and the National Center for Advancing Translational Science (KL2TR001870). Dr Herzig holds grants from the National Institute on Aging (K23AG042459) and AHRQ (R01HS026215).

References

1. Institute for Health Metrics and Evaluation. COVID-19 Projections: United States of America. 2020. Accessed May 5, 2020. https://covid19.healthdata.org/united-states-of-america
2. Iserson KV. Alternative care sites: an option in disasters. *West J Emerg Med*. 2020;21(3):484-489. https://doi.org/10.5811/westjem.2020.4.47552
3. Paganini M, Conti A, Weinstein E, Della Corte F, Ragazzoni L. Translating COVID-19 pandemic surge theory to practice in the emergency department: how to expand structure [online first]. *Disaster Med Public Health Prep*. 2020:1-10. https://doi.org/10.1017/dmp.2020.57
4. Kumaraiah D, Yip N, Ivascu N, Hill L. Innovative ICU Physician Care Models: Covid-19 Pandemic at NewYork-Presbyterian. NEJM: Catalyst. April 28, 2020. Accessed May 5, 2020. https://catalyst.nejm.org/doi/full/10.1056/CAT.20.0158
5. Auerbach AD, Patel MS, Metlay JP, et al. The Hospital Medicine Reengineering Network (HOMERuN): a learning organization focused on improving hospital care. *Acad Med*. 2014;89(3):415-420. https://doi.org/10.1097/acm.0000000000000139
6. Livingston E, Desai A, Berkwits M. Sourcing personal protective equipment during the COVID-19 pandemic [online first]. *JAMA*. 2020. https://doi.org/10.1001/jama.2020.5317
7. Bauchner H, Sharfstein J. A bold response to the COVID-19 pandemic: medical students, national service, and public health [online first]. *JAMA*. 2020. https://doi.org/10.1001/jama.2020.6166
8. Hollander JE, Carr BG. Virtually perfect? telemedicine for Covid-19. *N Engl J Med*. 2020;382(18):1679-1681. https://doi.org/10.1056/nejmp2003539
9. Hau YS, Kim JK, Hur J, Chang MC. How about actively using telemedicine during the COVID-19 pandemic? *J Med Syst*. 2020;44(6):108. https://doi.org/10.1007/s10916-020-01580-z
10. Smith WR, Atala AJ, Terlecki RP, Kelly EE, Matthews CA. Implementation guide for rapid integration of an outpatient telemedicine program during the COVID-19 pandemic [online first]. *J Am Coll Surg*. 2020. https://doi.org/10.1016/j.jamcollsurg.2020.04.030