


Care Disruption During COVID-19: a National Survey of Hospital Leaders



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BACKGROUND: The COVID-19 pandemic caused massive disruption in usual care delivery patterns in hospitals across the USA, and highlighted long-standing inequities in health care delivery and outcomes. Its effect on hospital operations, and whether the magnitude of the effect differed for hospitals serving historically marginalized populations, is unknown.

OBJECTIVE: To investigate the perspectives of hospital leaders on the effects of COVID-19 on their facilities' operations and patient outcomes.

METHODS: A survey was administered via print and electronic means to hospital leaders at 588 randomly sampled acute-care hospitals participating in Medicare's Inpatient Prospective Payment System, fielded from November 2020 to June 2021. Summary statistics were tabulated, and responses were adjusted for sampling strategy and non-response.

RESULTS: There were 203 responses to the survey (41.6%), with 20.7% of respondents representing safety-net hospitals and 19.7% representing high-minority hospitals. Over three-quarters of hospitals reported COVID testing shortages, about two-thirds reported staffing shortages, and 78.8% repurposed hospital spaces to intensive care units, with a slightly higher proportion of high-minority hospitals reporting these effects. About half of respondents felt that non-COVID inpatients received worsened quality or outcomes during peak COVID surges, and almost two-thirds reported worsened quality or outcomes for outpatient non-COVID patients as well, with few differences by hospital safety-net or minority status. Over 80% of hospitals participated in alternative payment models prior to COVID, and a third of these reported decreasing these efforts due to the pandemic, with no differences between safety-net and high-minority hospitals.

CONCLUSIONS: COVID-19 significantly disrupted the operations of hospitals across the USA, with hospitals serving patients in poverty and racial and ethnic minorities reporting relatively similar care disruption as non-safety-net and lower-minority hospitals.

J Gen Intern Med 38(5):1232-8

DOI: 10.1007/s11606-022-08002-5

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INTRODUCTION

The COVID-19 pandemic disrupted usual care to a tremendous degree in hospitals across the country. Hospitals were under great pressure to care for high numbers of high-acuity COVID patients while also continuing to care for patients with more typical clinical conditions.¹⁻³ Early reports of shortages in personal protective equipment (PPE), COVID testing supplies, and clinical staff raised concerns not only for suboptimal care and outcomes for patients presenting with COVID, but also for those experiencing acute events such as heart attacks and strokes, or exacerbations of chronic disease such as heart failure or chronic obstructive pulmonary disease.

The pandemic also exposed long-standing health inequities along racial, ethnic, and socioeconomic lines. Minority populations in the USA suffered higher case numbers, hospitalizations, and deaths due to COVID-19⁴⁻⁷, and evidence demonstrated a large disparity in the impact of COVID-19 on those in disadvantaged neighborhoods.⁸⁻¹¹ However, while the impact of the pandemic on vulnerable individuals is well-established, less is known about its effect on the hospitals serving them. Hospitals with fewer resources at the onset of the pandemic, or those caring for a higher number of or more severely ill COVID patients during its initial surge, may have faced unique challenges. Understanding the changes in operations and potential differences at hospitals disproportionately caring for underserved patients may provide important context for policy decisions as well as resource allocation for future COVID-19 surges and public health crises.

Therefore, we aimed to fill this gap by answering three research questions, based on a national survey distributed to hospital leaders following the first wave of the COVID-19 pandemic: (1) What were the major challenges in maintaining hospital operations during the initial COVID wave, and did these differ for safety-net and high-minority hospitals compared with hospitals with less vulnerable patients? (2) Were

Received July 10, 2022

Accepted December 23, 2022

Published online January 17, 2023

there any perceived changes in health care delivery or patient outcomes for non-COVID patients during the pandemic (i.e., the “spillover” of the pandemic onto usual clinical care), and did these differ between safety-net and high-minority hospitals and other facilities? (3) Were there any perceived disruptions in other quality improvement efforts, specifically those linked to value-based and alternative payment models, and did these differ between safety-net and high-minority hospitals and other facilities?

METHODS

Survey Development and Administration

The questions reported herein on the challenges and operations of medical care during COVID-19 were a module added to a broader survey aimed at understanding hospitals’ response to bundled payment programs. The initial survey questions had been finalized, and the survey was scheduled to enter the field in April 2020. However, after the pandemic began in March 2020, we recognized that the survey would need to be delayed, and also recognized that the survey vehicle presented an opportunity to collect data on hospitals’ response to COVID that could be helpful in understanding the strain the pandemic placed on usual operations. With permission from the survey funders, we elected to develop a new module related to COVID and appended it to the original survey. To develop questions related to COVID, we conducted interviews with hospital leaders. Based on their responses, we developed a survey module that was tested with potential respondents and revised accordingly (Appendix Table I).

Sample selection began with a list from Medicare of all acute-care hospitals paid under the Inpatient Prospective Payment System (IPPS) in 2019. From that list, we selected 600 hospitals, oversampling hospitals participating in the Bundled Payments for Care Improvement-Advanced initiative (BPCI-A) at a 3:1 ratio based on sample size calculations performed for the broader survey goals. There were 12 hospitals in our sample that had closed, merged with other hospitals, or become critical access hospitals or long-term care facilities; our final sample was therefore 588 hospitals (442 BPCI-A and 146 non-BPCI-A).

To identify clinical leaders, we obtained the hospital leadership list of chief medical officers (CMOs) from the American Hospital Association. Study staff called each hospital to verify contact information, and once a recipient was verified, his or her hospital was moved into the active fielding stage. The survey was conducted by SSRS (Glen Mills, PA) and was in the field between November 1, 2020, and June 27, 2021. Hospitals were mailed a hard copy of the survey, along with a cover letter explaining the intent of the survey and the consent process. There was a personalized link to an online portal where the survey could be completed. An incentive check for \$100 was included in the initial mailing. This was followed by follow-up phone calls and a second mailing. Throughout the survey, although the initial point of contact was the office

of the CMO, we encouraged that individual to reach out to other leaders within the hospital best equipped to help either provide assistance or complete the survey.

Hospital Characteristics

Additional information on hospital characteristics was obtained from the American Hospital Association Annual Survey for 2019. We followed the Centers for Medicare and Medicaid Services’ recent approach^{12,13} and considered hospitals in the highest quintile of dual enrollment among Medicare admissions to be safety-net hospitals,^{14,15} and those in the highest quintile of the proportion of their Medicare admissions who were identified to be Black or Hispanic to be high-minority hospitals, following a similar convention.^{14,16,17}

Analysis

We first summarized hospital characteristics overall and for safety-net and high-minority hospitals. We compared hospital characteristics between the groups of interest using Fisher exact tests. We then computed summary statistics for survey responses both overall and stratified by safety-net and minority status. Raw responses were tabulated for each question. For multiple-choice or Likert-scale questions, responses were summed within groups as they were defined on the survey (“not important,” “somewhat important,” “very important,” and “extremely important”; or “disagree strongly,” “disagree,” “neither agree nor disagree,” “agree,” or “agree strongly”).

Survey responses were then adjusted for both sampling strategy and non-response to better reflect a national representation of US hospitals. To adjust for sampling strategy, we assigned sample weights to hospitals based on group (BPCI-A or non-BPCI-A), with weights representing the inverse probability of each hospital’s selection. These weights make the sample more reflective of the actual distribution of BPCI-A and non-BPCI-A hospitals nationally. To adjust for non-response, we constructed a logistic regression model in which returning the survey was the primary outcome and hospital characteristics, including size, teaching status, ownership, urban location, and region were predictors, as has been done previously.^{18,19} Each hospital received a likelihood of response based on this model; responses were then weighted with the inverse of this likelihood. These weights make the sample more reflective of all surveyed hospitals, regardless of the distribution of hospitals that actually responded.

Generalized linear models incorporating the weights above were then used to compare responses between the different hospital types of interest. In our primary models, no hospital characteristics were included due to small cell sizes that rendered comparisons impossible for a few key survey questions. However, analyses in which we controlled for hospital size, teaching status, ownership, urban location, and region are presented in the Appendix, with notation indicating where coefficients were inestimable because of the distribution of the characteristics.

All responses were de-identified before analysis. Informed consent was obtained within the survey itself; the introductory page to the survey included detailed information about privacy and data de-identification and stated, "Completion of this survey implies informed consent." The study was approved by the Human Research Protection Office at Washington University in St. Louis.

RESULTS

Hospital Characteristics

The cohort included 203 survey respondents (response rate, 41.6%), each representing a unique hospital entity (Table 1). The majority of hospitals were urban (95.1%), not-for-profit (72.9%), and teaching hospitals (52.7%). Safety-net hospitals comprised 20.7% of the respondents, and high-minority hospitals comprised 19.7% of the respondents. In unweighted comparisons, respondents and non-respondents were similar across a number of key structural characteristics (Table 1), similarities that persisted in weighted comparisons (Appendix Table II). Hospital characteristics by safety-net and high-minority status are shown in Appendix Table III. Of the 203 respondents, 136 were chief medical/clinical/quality officers, 56 were chief executive/operating officers, 8 were VPs or heads of population health or equivalent, 5 were the directors of case management, care coordination, or equivalent, and 16 were other (Table 1).

Hospital Operations

After applying sample and survey weights, more than three-quarters of hospitals reported COVID testing shortages in the first year of the pandemic (Table 2, top panel), and over half reported shortages in personal protective equipment (PPE). Similarly, high proportions of hospitals reported having to repurpose non-ICU clinical space to serve as ICU space (78.8%) and having a difficult time discharging patients to skilled nursing facilities (92.9%). Many hospitals reported using e-consults or other virtual tools in the inpatient setting (86.0%) or the outpatient setting (88.4%) during the pandemic.

In comparisons adjusted for sample and nonresponse weights only, there were few differences by hospital safety-net or minority status in these measures, though high-minority hospital leaders more often reported COVID testing shortages (91.3% versus 75.3%, $p = 0.035$) and having to repurpose non-ICU space (96.6% versus 75.1%, $p = 0.010$).

Overall, 72.4% of hospitals reported staffing shortages (Table 2, bottom panel), while a third reported having to reduce salaries or benefits, and about half reported needing to eliminate or furlough clinical and administrative staff. In comparisons adjusted for sample and nonresponse weights only, safety-net hospitals were less likely to report reducing salaries (17.0% versus 36.2%, $p = 0.014$) and high-minority hospitals were more likely to report staff shortages (88.4% versus 69.1%, $p = 0.016$) and, relatedly, less likely to report eliminating or furloughing clinical staff (37.3% versus 49.8%,

Table 1 Hospital Characteristics

	Respondents (203)		Non-respondents (385)		p value
	N	%	N	%	
Respondent identity					
Chief executive/operating officer	56	27.6			
Chief medical/clinical/quality officer	136	67.0			
VP or head of population health or equivalent	8	3.9			
Director of case management, care coordination, or equivalent	5	2.5			
Other	16	7.9			
Profit status					
For profit	44	21.7	113	29.4	0.061
Not for profit	148	72.9	243	63.1	
Public	11	5.4	29	7.5	
Hospital size					
Small	44	21.7	83	21.6	0.76
Medium	129	63.6	236	61.3	
Large	30	14.8	66	17.1	
Teaching status					
Major teaching	22	10.8	30	7.8	0.45
Minor teaching	85	41.9	164	42.6	
Non-teaching	96	47.3	191	49.6	
Urban-rural status					
Rural	10	4.9	18	4.7	1.00
Urban	193	95.1	367	95.3	
Region					
Northeast	45	22.2	59	15.3	0.19
Midwest	49	24.1	98	25.5	
South	67	33.0	149	38.7	
West	42	20.7	79	20.5	
Safety-net (highest quintile dual)	42	20.7	71	18.4	0.51
High-minority (highest quintile Black/Hispanic)	40	19.7	82	21.3	0.67

Comparisons are unweighted. Weighted comparisons are shown in Appendix Table II. p values were calculated with Fisher's exact test

Table 2 Changes in Hospital Operations During COVID

Measure	Overall (%)	Safety net (%)	Non-safety net (%)	p value	High minority (%)	Non-high minority (%)	p value
N respondents	203	42	161		40	163	
Supplies and workflow							
Had COVID testing shortages	78.0	81.0	77.2	0.61	91.3	75.3	0.035
Had PPE shortages	53.0	47.8	54.4	0.42	63.2	50.9	0.12
Repurposed hospital floors/OR/PACU to ICUs	78.8	84.3	77.3	0.28	96.6	75.1	0.01
Transferred COVID patients to another facility	46.6	42.4	47.8	0.42	43.0	47.4	0.54
Noted difficult discharge to SNFs	92.9	99.4	91.2	0.18	99.6	91.5	0.26
Used e-consults or virtual tools for inpatient care	86.0	82.1	87.1	0.37	95.7	84.0	0.068
Used telehealth for outpatient care	88.4	86.5	88.9	0.35	84.0	89.3	0.99
Staffing							
Experienced staff shortages	72.4	82.9	69.6	0.063	88.4	69.1	0.016
Had to reduce staff salary or benefits	32.2	17.0	36.2	0.014	18.9	34.9	0.061
Had to eliminate/furlough clinical staff	47.1	37.3	49.8	0.16	25.7	51.5	0.005
Had to eliminate/furlough administrative staff	52.9	52.4	53.0	0.85	38.7	55.8	0.06

Percents shown and comparison p values adjust for sampling and survey nonresponse weights. p values were calculated using generalized linear models

OR operating room, PACU post-anesthesia care unit, PPE personal protective equipment, SNF skilled nursing facility

$p = 0.005$). In fully adjusted models, the findings were qualitatively similar, and there was no change in the statistical significance of the results (Appendix Table IV).

Health Care Delivery and Outcomes

After applying sample and survey weights, overall, 59.9% of respondents felt that quality or outcomes worsened for admitted, non-COVID patients during the peak of COVID-19 at their hospitals, with no significant differences based on safety-net or high-minority status (Table 3, top panel). Among respondents that felt quality worsened, the most commonly endorsed reasons were patients coming in too late in their illness (84.6%), post-acute-care facilities were unavailable (70.1%), bed shortages interfered with patient care (49.1%), clinical staff shortages affected patient care (48.3%), and there

was a negative impact on ED throughput (45.7%). In comparisons adjusted for sample and nonresponse weights only, there were no differences in response among high-minority and safety-net hospitals compared to their respective comparison groups. In fully adjusted models, there was a significant difference in patients at high-minority hospitals avoiding seeking care (96.6% vs. 100%, $p = 0.003$) and in patients at safety-net hospitals having worse access to outpatient clinics (70.5 vs. 68.4, $p = 0.008$).

Roughly two-thirds of respondents felt that quality or outcomes worsened for outpatient non-COVID-19 patients during the peak of COVID-19 cases (Table 3, bottom panel). Almost universally, the most common reason endorsed by respondents was that patients avoided seeking care, even when needed (97.2%). About two-thirds of respondents agreed that

Table 3 Change in Health Care Delivery and Outcomes for Non-COVID Patients During COVID

Measure	Overall (%)	Safety net (%)	Non-safety net (%)	p value	High minority (%)	Non-high minority (%)	p value
Inpatient care							
Do you think that quality or outcomes worsened for admitted, non-COVID patients during the peak of COVID-19 cases at your hospital? (% yes)	59.9	57.1	60.7	0.64	59.6	60.0	0.97
Among hospitals who responded yes, why:	N = 105	N = 20	N N = 85		N = 21	N = 84	
Patients coming in too late in course of illness	84.6	99.4	80.9	0.13	94.0	82.8	0.19
Post-acute-care facilities declined or unavailable	70.1	72.1	69.6	0.79	72.4	69.6	0.78
Bed shortages interfered with patient care	49.1	37.4	52.0	0.17	49.9	48.9	0.93
Negative ED throughput	48.3	37.1	51.2	0.41	62.7	45.5	0.32
Clinical staff shortages affected patient care	45.7	38.8	47.4	0.18	55.1	43.8	0.13
QI/analytics staff furloughed/unavailable	38.2	26.5	41.2	0.15	39.9	37.9	0.85
Inpatient or ED protocol disruptions	22.0	29.5	20.1	0.28	28.8	20.6	0.38
Outpatient care							
Do you think that quality or outcomes worsened for outpatient non-COVID patients during the peak of COVID-19 cases at your hospital? (% yes)	65.3	52.4	68.8	0.42	63.2	65.8	0.99
Among hospitals who responded yes, why:	N = 128	N = 22	N = 106		N = 24	N = 104	
Patients avoided seeking care entirely, even when needed	97.2	100.0	96.5	1.00	100.0	96.6	1.00
Worse access to outpatient clinic due to closure	68.8	70.5	68.4	0.82	48.1	72.9	0.014
Patients ran out of prescription medications	26.5	42.7	22.5	0.023	31.1	25.6	0.55

Percents shown and comparison p values adjust for sampling and survey nonresponse weights. p values were calculated using generalized linear models

Table 4 Change in Payment Model Participation During COVID

Measure	Overall (%)	Safety net (%)	Non-safety net (%)	<i>p</i> value	High minority (%)	Non-high minority (%)	<i>p</i> value
Devoted clinical efforts to APMs pre-COVID	87.0	84.2	87.7	0.51	85.8	87.3	0.80
Decreased/suspended APM efforts during COVID	31.2	37.3	29.6	0.34	23.6	32.7	0.29
Devoted clinical efforts to VBP pre-COVID	96.5	89.9	98.3	0.012	92.2	97.4	0.112
Decreased/suspended VBP efforts during COVID	33.1	36.9	32.1	0.55	32.8	33.1	0.97
Repurposed staff on APM/VBP for COVID	60.6	60.1	60.8	0.93	62.7	60.2	0.76
Dropped out of APM/VBP due to COVID	6.8	9.3	6.1	0.47	3.6	7.4	0.42

Percents shown and comparison *p* values adjust for sampling and survey nonresponse weights. *p* values were calculated using generalized linear models

there was worse access to outpatient care due to clinic closures. In comparisons adjusted for sample and nonresponse weights only, there was no difference among safety-net versus non-safety net hospital leaders, but leaders of high-minority hospitals were less likely to report that this was a major concern (48.1% versus 72.9%, $p = 0.014$). A significantly higher proportion of safety-net hospital leaders reported that their patients ran out of prescription medications (42.7% vs. 22.5%, $p = 0.023$). However, in fully adjusted models, these findings became non-significant (Appendix Table V).

Payment Model Effects

After applying sample and survey weights, overall, 87.0% of hospitals reported devoting clinical efforts to alternative payment models (APMs) prior to COVID, and about a third reported decreasing or suspending these efforts during COVID (Table 4). Similarly, 96.5% of respondents reported devoting clinical efforts to value-based purchasing (VBP) prior to COVID, and 33.1% reported decreasing or suspending these during COVID. About 60.6% of respondents repurposed APM or VBP staff during COVID, and 6.8% reported dropping out of APM or VBP programs due to the pandemic. In comparisons adjusted for sample and nonresponse weights only, there were no differences in responses by safety-net or minority status, with the exception that fewer safety-net hospitals reported devoting clinical efforts to VBP pre-COVID than comparison hospitals (89.9% vs. 98.3%, $p = 0.012$). In fully adjusted models, there was also a significant difference between safety-net and non-safety-net hospitals in devoting clinical efforts to VBP pre-COVID (89.9% vs. 98.3%, $p = 0.007$) (Appendix Table VI).

DISCUSSION

In this national survey of hospital leaders after the first COVID surge, hospitals reported high rates of COVID testing shortages, the need to repurpose hospital space, and staffing shortages, burdens that were slightly more often reported at high-minority hospitals than low-minority institutions. Across the board, hospital leaders believed that quality and outcomes worsened for both admitted and outpatient non-COVID patients during the COVID surge. Essentially all hospital leaders

attributed this to patients delaying or deferring care, and a majority noted significant disruptions to inpatient care delivery. While many hospitals reported repurposing APM or VBP staff during COVID, only a small minority dropped out of these programs as a result of the pandemic. We did not find major differences in the first surge of COVID in reported care delivery disruptions among hospitals that cared for a high proportion of historically marginalized patients versus those who did not.

A large proportion of hospitals reported COVID testing shortages and the need to repurpose hospital spaces to intensive care units, as well as staffing shortages, numbers which were slightly higher among higher- compared to lower-minority facilities. There are various potential explanations for these results. For example, higher rates of testing shortages in high-minority hospitals could be attributed to higher case numbers in their constituent populations^{20–22} or more patients utilizing the ED for testing due to lack of access to primary care offices or health insurance coverage.^{22–24} The repurposing of hospital spaces to ICUs, and the higher rates of staffing shortages among high-minority and safety-net hospitals, could reflect increased COVID caseloads^{25,26} and more limited space, lack of resources, or lower staffing levels prior to COVID when compared to other institutions.^{3,27} Whether or not operational strain contributed to higher rates of adverse patient outcomes for COVID patients in these hospitals compared to others warrants further research.

Survey respondents perceived that there were significant “spillover” effects of the COVID pandemic on non-COVID patients due to a variety of challenges. While over half of all respondents felt that non-COVID inpatient care worsened during COVID surges, and almost two-thirds of respondents felt that non-COVID outpatient care worsened during COVID surges, there were no significant discrepancies in responses between hospitals caring for the most vulnerable and affected populations and other institutions. Prior studies have demonstrated a variety of significant disruptions to usual care during COVID,^{28,29} including changes in treatment for acute myocardial infarction^{30–31} and heart failure.³² Studies have suggested that patients presenting with acute conditions such as heart attack and stroke were generally sicker upon arrival during COVID,³³ perhaps corroborating the delays in care reported by survey respondents. While concrete data on the

long-term impacts of care delay and deferral are lacking, this is an important area for future work. Given that there is significant unmet need for medical care at baseline among individuals living in poverty and those who are members of racial or ethnic minority groups,²⁴ any decrement in care access may have worse consequences for these populations. Additionally, significantly more safety-net hospital leaders reported patients running out of prescription medications than their peers at other institutions; while these reports should be substantiated against data from direct sources, these concerns suggest that tracking the long-term outcomes of care disruption during COVID will be important and could have significant equity implications.

Safety-net hospitals reported lower participation in value-based payment prior to COVID when compared to other hospitals. Although there was no significant difference between groups in decreasing or suspending these efforts during COVID, to the extent that participation in these payment models is associated with improvements in care and outcomes,³⁴ these differences are notable. Since many value-based and alternative payment models were suspended during the pandemic, the long-term impact on participation remains to be seen.

Overall, these findings augment the current and emerging literature surrounding the COVID pandemic and the discrepancies in health care delivery and outcomes among vulnerable populations and the health care system at large. Moreover, to our knowledge, ours is the first survey of hospital leaders to obtain details on their perceptions of operational changes and negative impacts on quality of care for non-COVID conditions. Studies and reports show that most understaffed and under-resourced hospitals across the country during COVID were those that likely served uninsured or Medicaid patients as well as people of color.^{3,27} Our survey adds the perspective of hospital leaders and details the operational changes that were necessitated by COVID surges, demonstrating that hospital strain was high across the entire system. While high-minority hospitals reported slightly higher rates of operational strain, the effects of COVID were markedly widespread, indicating that the resiliency of the system should be strengthened overall, paying particular attention to those who serve vulnerable populations.

This study has several limitations. Our response rate was lower than projected, likely in part due to the tremendous burden under which hospital leaders were operating during the pandemic. Responses reflect participants' perception of and experience with care disruption during COVID, rather than an entirely objective measure of changes in care patterns. Furthermore, survey responses may not have been completed by the individual with knowledge regarding the questions asked despite directions and communication to the office of the CMO. Social acceptability bias may also influence answers, although we conducted testing on each of the data elements prior to survey fielding to try to reduce this source of bias. We defined high-minority and safety-net hospitals based on hospitals' fee-for-service Medicare patients, which

may not precisely correlate with the racial or economic breakdown of their patient population more broadly. Our survey was conducted in the first year of COVID-19 and may not reflect care patterns later in the pandemic.

CONCLUSIONS

Hospitals were under enormous strain during the first COVID-19 surge, and hospital leaders noted high levels of operational burden as well as care disruption. Leaders from hospitals serving high proportions of patients from racial or ethnic minority groups reported somewhat greater operational strain than those from other hospitals. These results contribute further understanding of the impact of the COVID pandemic on hospitals overall as well as those serving patients with higher levels of social risk, and the findings suggest that ongoing work is needed to create a more resilient health care safety net.

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Supplementary Information The online version contains supplementary material available at <https://doi.org/10.1007/s11606-022-08002-5>.

Declarations:

Conflict of Interest: This study was funded by the National Heart, Lung, and Blood Institute (R01HL143421). Dr. Joynt Maddox additionally reports research support from the National Heart, Lung, and Blood Institute (R01HL143421 and R01HL164561), National Institute of Nursing Research (U01NR020555) and National Institute on Aging (R01AG060935, R01AG063759, and R21AG065526), and from Humana. She also serves on the Health Policy Advisory Council for the Centene Corporation (St. Louis, MO). The other authors report no financial interests.

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