Review

Interventions and Hospital Characteristics Associated With Patient Experience: An Update of the Evidence

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Abstract

Patient experience is a key hospital quality measure. We review and characterize the literature on interventions, care and management processes, and structural characteristics associated with better inpatient experiences as measured by the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey. Prior reviews identified several promising interventions. We update these previous efforts by including more recent peer-reviewed literature and expanding the review's scope to include observational studies of HCAHPS measures with process measures and structural characteristics. We used PubMed to identify U.S. English-language peer-reviewed articles published in 2017 to 2020 and focused on hospital patient experience. The two HCAHPS domains for which we found the fewest potential quality improvement interventions were Communication with Doctors and Quietness. We identified several modifiable processes that could be rigorously evaluated in the future, including electronic health record patient engagement functionality, care management processes, and nurse-to-patient ratios. We describe implications for future policy, practice, and research.

Keywords

patient experience, patient satisfaction, HCAHPS, health care surveys, quality improvement

Introduction

In 2006, the Centers for Medicare & Medicaid Services (CMS) initiated the national administration of the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey to measure patient experience across U.S. hospitals (Giordano et al., 2010). Two key HCAHPS objectives are (a) standardization of the measurement of patient experience in hospitals to enable meaningful comparisons across hospitals for public reporting on CMS' Care Compare (formerly known as Hospital Compare) and (b) hospital accountability and payment incentives for improvement. Hospital management and other stakeholders are increasingly interested in improving patient experience and HCAHPS scores and identifying "best practice" hospitals or hospitals to target for quality improvement (QI) interventions.

Reviews of current evidence can move the knowledge base forward. To date, there have been two prior reviews focused on interventions to improve patient experience: (a) a systematic review of hospital interventions based on studies published between 2013 and 2016 (Davidson et al., 2017) and (b) an integrative review of eight nursing-led hospital interventions based on studies published between 2007 and 2018 (Jun et al., 2020). Together, the two reviews identified several QI strategies with promising evidence. However, they omitted other ways hospitals might improve patient experience, such as modifications of existing processes. For this, a review that goes beyond intervention and QI studies, such as those included in Mazurenko and colleagues' (2017) narrative review of cross-sectional studies of hospital correlates of HCAHPS scores published from 2007 through 2015, is needed. This narrative review identified a number of correlations between measures of hospital care and management

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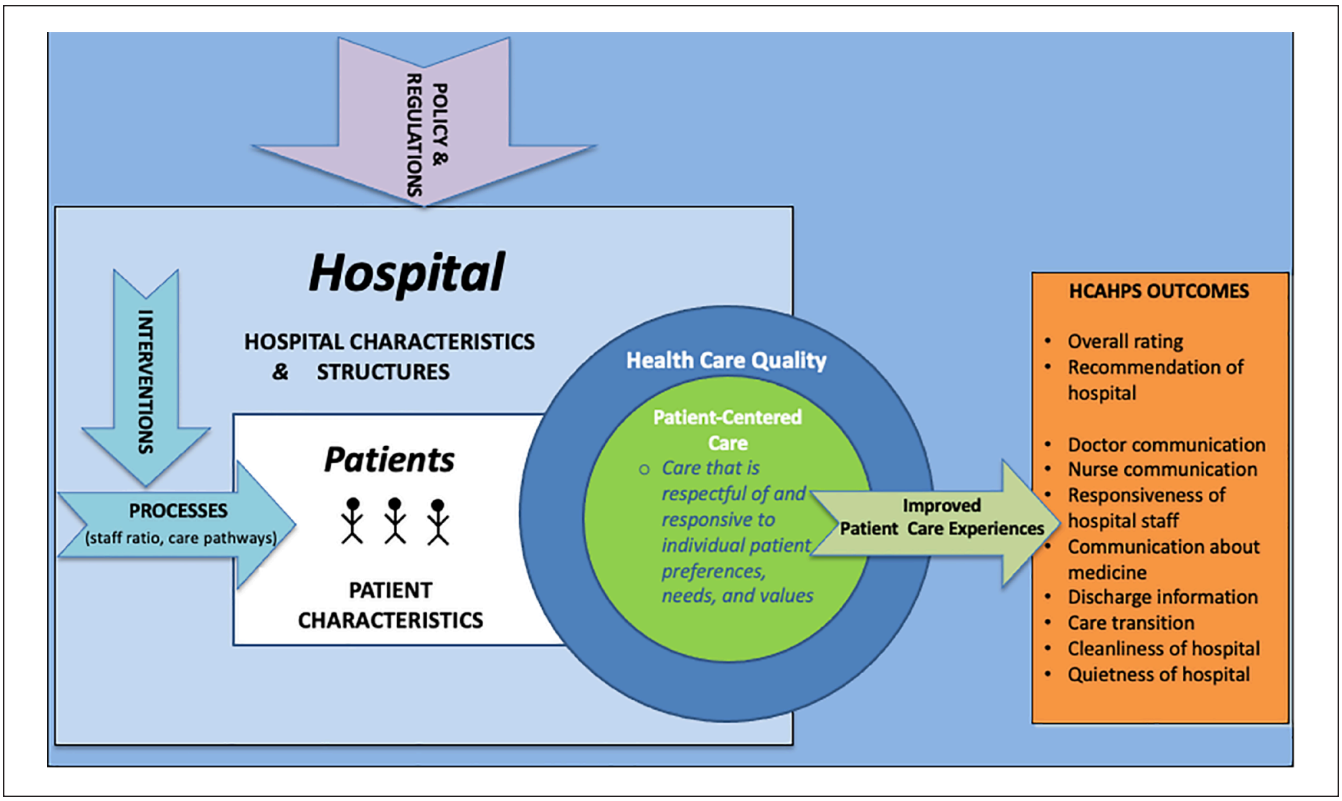

Figure 1. Conceptual Model of Associations Between Nonmodifiable Hospital Characteristics or Modifiable Processes and HCAHPS Outcomes.

Source. Adapted from the Agency for Healthcare Research and Quality (AHRQ, 2014).

Note. The blue arrows represent levers that are *modifiable* by the hospital (i.e., interventions and processes), whereas regular texts within rectangles are *nonmodifiable* aspects of a hospital that are generally not under the control of the hospital, such as hospital characteristics and structures (e.g., bed size, teaching status) and patient characteristics (e.g., age, education, service line). Changes that affect hospitals through policy makers (policies, regulations) are shown by a purple arrow. HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems.

processes and HCAHPS scores, as well as between hospital structural characteristics and HCAHPS scores.

New Contributions

The current review makes two contributions. First, it is more comprehensive than prior reviews of interventions to improve patient experience; we include both intervention and observational studies to develop a more complete picture of potential strategies for improving HCAHPS scores. In contrast to intervention studies, which often use a prospective study design to assess change in HCAHPS scores as the result of an intervention, observational studies assess the cross-sectional or longitudinal relationship between hospital characteristics and HCAHPS scores. Second, the studies included in the current review were published after the end of the publication intervals used in the prior reviews, so its conclusions are based on more recent evidence. Our review focuses on three types of hospital factors:

1. Hospital interventions intended to improve some aspect of health care quality directly.
2. Hospital processes or practices that are modifiable within the hospital or system.
3. Hospital structural and patient characteristics that can serve as the basis for targeting QI resources.

Conceptual Framework

This review was guided by a conceptual framework (Figure 1) adapted from the Agency for Healthcare Research and Quality (2014), which was informed by Donabedian's Structure, Process, and Outcomes Framework (Donabedian, 1966). In this framework, a hospital's nonmodifiable factors (or structural characteristics) affect its modifiable factors (interventions and care and management processes), and both nonmodifiable and modifiable factors affect patient experience as measured by HCAHPS. The influence of hospital factors may be specific, affecting one or a few HCAHPS domains, or broad-based, affecting the full range of patient experience domains. Patient characteristics known to affect patients' reported experiences with care, but not under a hospital's control, are accounted for using patient-mix adjusters to ensure apples-to-apples comparisons of HCAHPS scores

Table 1. HCAHPS Measures and Their Constituent Items by Measure Type.

Measure type/HCAHPS measure	
Measure	Constituent items (if any)
Composites	
Communication with Doctors	Doctor courtesy and respect
	Doctor listen
	Doctor explain
Communication with Nurses	Nurse courtesy and respect
	Nurse listen
	Nurse explain
Staff Responsiveness	Call button
	Bathroom help
Communication about Medicines	Medicine explain
	Side effects
Discharge Information	Help after discharge
	Symptoms
Care Transition	Preferences
	Understanding
Standalone items	
Cleanliness	
Quietness	
Global measures	
Recommend Hospital	
Overall Rating	

Note. HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems.

of hospitals and patients that vary over time and across settings. HCAHPS measures are considered more easily modifiable to the extent that they vary across hospital factors (i.e., have ability to standardize and/or improve) and less modifiable if they vary across fewer across hospital factors. Finally, knowing which structural characteristics positively or negatively corelate with HCAHPS measure scores can help identify the types of hospitals that may be models of best practices or that may benefit from QI efforts, respectively. Patient-level correlates of HCAHPS scores can be used to target within-hospital QI efforts to, for example, patients who prefer another language to English or to specific service lines.

Method

We identified published U.S. peer-reviewed research that used HCAHPS surveys to measure the experiences of patients aged 18 years or older at hospital admission (an HCAHPS eligibility criterion). The HCAHPS survey consists of evaluative and sociodemographic questions. HCAHPS patient experiences measures include six composite measures constructed from 14 items, two standalone items, and two global items (described in Table 1). We adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines (Liberati et al., 2009; Moher et al., 2009).

Search, Screening, and Extraction Strategy

We searched PubMed databases for articles published from January 2017 to December 2020. We searched title and abstract fields using specific terms to identify articles including combinations of terms related to HCAHPS, Medicare Hospital Compare, Care Compare, Hospital CAHPS, hospital surveys, and quality.

We screened all identified articles' titles and abstracts. Studies were included if they (a) were in English, (b) used an HCAHPS score as an outcome measure, and (c) tested an association of a hospital factor and an HCAHPS measure. Figure 2 shows flow of the title and abstract screening process.

During full-text review, we extracted the following information for each article: study design, setting, sample size, hospital modifiable and nonmodifiable factors, patient experience measures, patient-mix and other adjusters, findings, and notes and limitations.

Risk of Bias, Quality Assessment, and Data Synthesis

We assessed risk of bias and study quality using the Newcastle-Ottawa Scale (NOS) (Modesti et al., 2016). The NOS is recommended by the Cochrane Collaboration (Ma et al., 2020; Seehra et al., 2016) and is applicable for assessing study quality for cohort studies, case-control studies, and cross-sectional studies, including observational studies. Two authors (MKB and DDQ) independently scored each article and discussed the results to achieve consensus.

Classifying Studies

Guided by the conceptual framework, we classified the published evidence as follows. First, we assessed whether each hospital factor was modifiable (e.g., an intervention or a care or management process) or nonmodifiable (e.g., a hospital characteristic generally considered fixed, like bed size and ownership status). Next, we classified each hospital factor as broad-based if its association was with an HCAHPS global measure or with measures from three or more HCAHPS domains (listed in Table 1); otherwise, the factor was considered targeted. We characterized studies according to the presence and nature of patient-mix adjustment (PMA; see hcahpsonline.org for further details). We assumed that a study used a standard PMA if the study described applying HCAHPS PMA with reference to the standard CMS methodology (e.g., Broman et al., 2021) or if HCAHPS data were downloaded from Care Compare, which report only fully adjusted HCAHPS scores. Standard PMA includes patient education, self-rated overall health, self-rated mental health

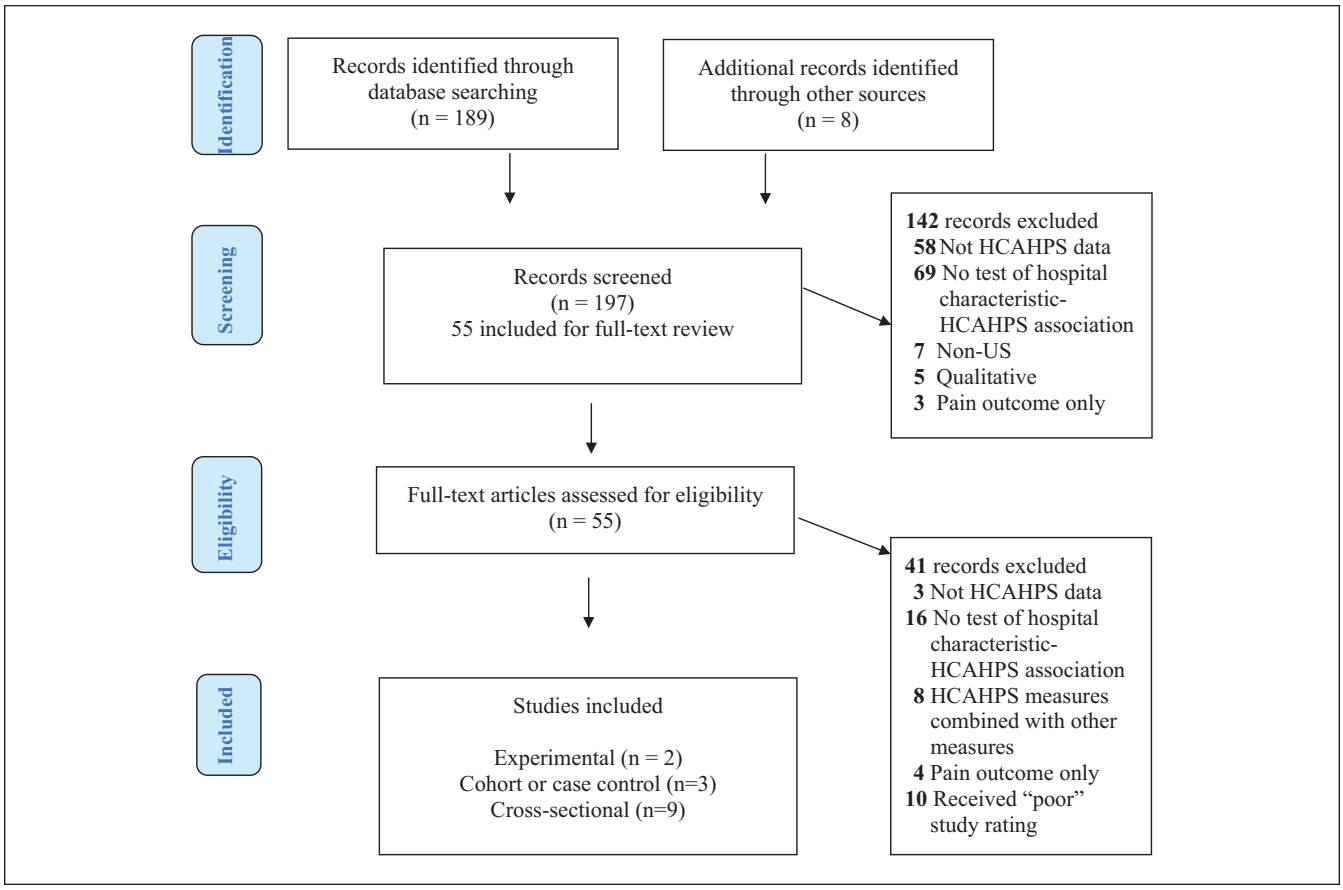

Figure 2. PRISMA Flow Diagram.
Note. PRISMA = Preferred Reporting Items for Systematic Reviews and Meta-Analyses; HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems.

(added 2018), response percentile, survey language, and interactions of service line with age and sex. Additional patient-mix classifications were partial (i.e., used some but not all standard patient-mix adjusters), potentially endogenous (i.e., included potentially endogenous adjustors such as postoperative complications [Featherall et al., 2019], length of stay [Boylan et al., 2019]), and other (i.e., included additional exogenous adjusters, such as race [Featherall et al., 2019]). More than one classification could apply to a single study if different patient-mix adjusters were used for different HCAHPS measures.

When a hospital factor was static or was measured only at one time (usually baseline) and was included in a model, we classified the association of the factor and the HCAHPS outcome as based on a cross-sectional design, even if the hospital factor (usually a structural characteristic) was used as an adjuster in a cohort analysis. If the association between a hospital factor and the HCAHPS measure was not reported, our synthesis did not represent results involving that hospital factor.

For each study, we rated the overall strength of the evidence for the reported association between patient experience and a particular hospital factor ("strongly positive," "positive," "weakly positive," or "null"). For studies that examined broad-based factors, we classified a study as showing a "positive" relationship with patient experience if the net number of HCAHPS measures significantly and positively associated with a given hospital factor (after subtracting those negatively significantly associated) was at least three, regardless of how many HCAHPS measures were reported. This rule guards against the possibility that authors were selective about which results to report. Among studies with a "positive" relationship, if the magnitude of at least one of these measures was at least +5.0 top-box points, corresponding to the percentage of respondents who provide the most positive survey response, (or the equivalent [Elliott et al., 2015]) on a 0 to 100 scale, we classified the relationship as "strongly positive." If the net number of positive measures was less than 3, we classified the relationship as "weakly positive." If the net number of HCAHPS measures with positive association was zero, we classified the relationship as "null." For studies of targeted interventions, which focused on a single HCAHPS measure (such as Communication with Doctors), we replaced the rule of three net HCAHPS measures with (a) a rule of one HCAHPS measure if the study examined a single measure as a whole or (b) a rule of all the

items within a single composite HCAHPS measure if the study individually examined the items within an HCAHPS composite.

Finally, we derived a metric of an HCAHPS measure's variability across settings based on the number of hospital factors that correlate with the measure. A higher count represents greater variability.

Results

Supplemental Table 1 reports the study quality scores. Altogether, 14 studies were included in the synthesis (Asagbra et al., 2019; Boylan et al., 2019; Broman et al., 2021; Courtney et al., 2018; Delhy et al., 2021; Featherall et al., 2019; Figueroa et al., 2018; Hu et al., 2020; Jain et al., 2019; La Rosa et al., 2019; McFarland et al., 2017; Mullings & Sankaranarayanan, 2017; Seiler et al., 2017; Siddiqui et al., 2017).

Measures of Patient Experience Studied

Table 2 summarizes the strength of the relationships between each combination of HCAHPS measure and hospital factor, distinguishing among interventions, processes, or structural characteristics examined in a given study. We note that the distinction between interventions and processes could sometimes be clearer. The most frequently assessed HCAHPS measures were Overall Rating (10 studies) and Recommend Hospital and Communication with Doctor (seven studies each); the least often examined were Quietness (three studies) and Care Transition and Cleanliness (two studies each). Care Transition was added to HCAHPS in 2013, which may account for its limited use.

For all measures but two (Communication with Doctors and Quietness), the number of hospital factors with a positive association with an HCAHPS measure exceeded the number with a null association. Communication with Doctors varied by just two factors, making it less variable according to our metric. However, most studies that considered Communication with Doctors were intervention studies in a single hospital and tended not to include any structural characteristics as control measures, which may underestimate the measure's variability. Quietness varied by three hospital factors, making it the second least variable measure.

Studies Assessing Effectiveness of Interventions

The literature on interventions is still emerging, with only five studies assessing targeted interventions (Broman et al., 2021; Featherall et al., 2019; La Rosa et al., 2019; Seiler et al., 2017; Siddiqui et al., 2017). Three of these interventions targeted physician communication. In each week of a 6-week study, patients on each of three postpartum floors in a single hospital were randomized to either the "white coat" arm (all physicians wore white coats during rounds) or the "no white coat" arm (La Rosa et al., 2019). The authors hypothesized that white coats elicit greater trust and confidence in the physician, producing more positive Communication with Doctors ratings. Differences between the two arms were not statistically significant ($p = .64$ for Communication with Doctors; $p = .35$ for Recommend Hospital, $p = .32$ for Overall Rating). Siddiqui et al. (2017) randomized hospitalists across four hospitals in a single system either to an intervention arm, in which hospitalists received a biweekly etiquette behavior survey asking how frequently they performed bedside etiquette behaviors in the past two weeks, or to a control arm, in which they received an unrelated survey. The authors hypothesized that calling physicians attention to etiquette would improve their communication with patients. The difference-in-difference between the preintervention and postintervention treatment and control arms was nonsignificant (null; $p = .06$), though this may have reflected statistical power issues as the sample included just 64 hospitalists. Seiler et al. (2017) examined a comprehensive physician-training module focused on improving specific etiquette-based physician communication skills through standardized simulations and physician coaching with structured feedback. They used a pre-post design with an intervention group that included hospitalists and internal medicine residents and a comparison group of surgeons. The authors reported no differences between the intervention and comparison groups in any of the three individual items used in the Communication with Doctors measure. The Communication with Doctors measure was about all doctors, rather than specific physicians, encountered during the hospital stay, which may present a possible mismatch (or attribution issue) between the unit of analysis and the unit of measurement. The three studies approached this possible mismatch differently. The white coat intervention matched the unit of analysis and the unit of measurement by randomizing all doctors who interacted with the same patient (La Rosa et al., 2019). Siddiqui et al. (2017) tried to calibrate the measurement to match the unit of analysis by attributing HCAHPS Communication with Doctors item scores to a given hospitalist according to the proportion of days each hospital was billed for the hospitalization. Seiler et al. (2017) did not address this mismatch; because patients received care from physicians who did not participate in the communication skills training study, the observed differences between the treatment and comparison groups may have been biased toward zero.

Two studies focused on care pathways—that is, clinical algorithms designed to standardize care delivery—which may affect the treating providers' clinical decision-making and interactions with patients more than those of hospitalists or nurses. Broman et al. (2021) conducted a before and after (cohort) study of a gastrointestinal surgical oncology unit in a single hospital. The intervention involved establishing postsurgical care pathways and dedicated inpatient advanced practice provider positions; standard practice had been to make staff consults with rotating house staff members. The

Table 2. Strength of Evidence for Reported Association Between Patient Experience Measures and Interventions/Hospital Characteristics.

Patient experience measure	Hospital interventions/process/structural characteristics associated with HCAHPS measure scores, by relationship with measures			
	Strongly positive	Positive	Weakly positive	Null
Communication with Doctors (n = 7 studies)		*Process* High-volume hip/knee replacements (Courtney et al., 2018) *Structure* Small hospital (McFarland et al., 2017)		*Intervention* Wearing white coats during rounds (La Rosa et al., 2019) Prompts to report on bedside etiquette (Siddiqui et al., 2017) Etiquette-based communication training, coaching, feedback (Seiler et al., 2017) Care pathway (Featherall et al., 2019) Advanced practice provider/care pathways (Broman, 2021) *Process* High-volume knee replacement hospital (Featherall et al., 2019)
Communication with Nurses (n = 4 studies)		*Process* High-volume hip/knee replacements (Courtney et al., 2018) More RN and nursing assistant hours (Delhy et al., 2021) *Structure* Larger hospital (McFarland et al., 2017) Smaller hospital (Delhy et al., 2021) Rural status (Delhy et al., 2021) Nonteaching status (Delhy et al., 2021) Nonprofit/government (Delhy et al., 2021)		*Intervention* Care pathway (Featherall et al., 2019) *Process* High-volume knee replacement hospital (Featherall et al., 2019)
Staff Responsiveness (n = 5 studies)		*Process* High-volume hip/knee replacements (Courtney et al., 2018) More RN and nursing assistant hours (Delhy et al., 2021) Certified electronic health records (Hu et al., 2020) *Structure* Smaller hospital (Delhy et al., 2021; Hu et al., 2020; McFarland et al., 2017) Rural status (Delhy et al., 2021; Hu et al., 2020) Nonteaching status (Delhy et al., 2021) Nonprofit/government (Delhy et al., 2021; Hu et al., 2020)	*Process* Private room (vs. double occupancy) (Boylan et al., 2019)	*Process* Position of bed in double occupancy (Boylan et al., 2019) *Structure* System affiliation (Hu et al., 2020) Teaching status (Hu et al., 2020)
Communication about Medicines (n = 5 studies)		*Process* More RN and nursing assistant hours (Delhy et al., 2021) Number of care coordination strategies (Figueroa et al., 2018) Access to health information technology (Mullings & Sankaranarayanan, 2017) *Structure* Small hospital (Delhy et al., 2021) Rural status (Delhy et al., 2021) Government (vs. for-profit) (Delhy et al., 2021) Nonprofit (vs. for-profit) (Mullings & Sankaranarayanan, 2017) Physician owned (Mullings & Sankaranarayanan, 2017) Critical care (Mullings & Sankaranarayanan, 2017) No ED services (Mullings & Sankaranarayanan, 2017)		*Intervention* Advanced practice provider/care pathways (Broman, 2021) *Structure* Nonteaching status (Delhy et al., 2021) Nonprofit (vs. for-profit) (Delhy et al., 2021) Hospital size (McFarland et al., 2017)

(Continued)

Table 2. (Continued)

Patient experience measure	Hospital interventions/process/structural characteristics associated with HCAHPS measure scores, by relationship with measures			
	Strongly positive	Positive	Weakly positive	Null
Discharge Information (n = 4 studies)		*Process* More RN and nursing assistant hours (Delhy et al., 2021) Number of care coordination strategies (Figueroa et al., 2018) Certified electronic health records (Hu et al., 2020) *Structure* Smaller bed size (Delhy et al., 2021; McFarland et al., 2017) Rural status (Delhy et al., 2021; Hu et al., 2020) Nonteaching status (Delhy et al., 2021) Nonprofit/government (Delhy et al., 2021); nonprofit (Hu et al., 2020)		*Structure* System affiliation (Hu et al., 2020) Bed size (Hu et al., 2020) Teaching status (Hu et al., 2020)
Care Transition (n = 2 studies)		*Process* Advanced practice provider/care pathways (Broman, 2021) Certified electronic health records (Hu et al., 2020) *Structure* Rural status (Hu et al., 2020) Nonprofit (Hu et al., 2020)		*Structure* Bed size (Hu et al., 2020) System affiliation (Hu et al., 2020) Teaching status (Hu et al., 2020)
Cleanliness (n = 2 studies)		*Process* More RN and nursing assistant hours (Delhy et al., 2021) *Structure* Smaller bed size (Delhy et al., 2021; McFarland et al., 2017) Rural (Delhy et al., 2021) Nonteaching status (Delhy et al., 2021) Government (vs. for-profit) (Delhy et al., 2021)		*Structure* Nonprofit (vs. for-profit) (Delhy et al., 2021)
Quietness (n = 3 studies)	*Process* Private room (vs. double occupancy) (Boylan et al., 2019)	*Process* More RN and nursing assistant hours (Delhy et al., 2021) *Structure* Smaller bed size (Delhy et al., 2021; McFarland et al., 2017)		*Process* Position of bed in double occupancy (Boylan et al., 2019) *Structure* Rural status (Delhy et al., 2021) Nonteaching status (Delhy et al., 2021) Ownership (Delhy et al., 2021)
Recommend Hospital (n = 7 studies)	*Process* Private room (vs. double occupancy) (Boylan et al., 2019)	*Process* High-volume hip/knee replacements (Courtney et al., 2018) Number of care coordination strategies (Figueroa et al., 2018) More RN and nursing assistant hours (Delhy et al., 2021) *Structure* Certified electronic health records (Hu et al., 2020) Smaller bed size (Delhy et al., 2021) Larger bed size (Hu et al., 2020) Nonteaching status (Delhy et al., 2021) Nonprofit/government (Delhy et al., 2021) Urban status (Delhy et al., 2021)	*Process* High-volume knee replacement hospital (Featherall et al., 2019)	*Intervention* Wearing white coats during rounds (La Rosa et al., 2019) Care pathway (Featherall et al., 2019) Process Position of bed in double occupancy (Boylan et al., 2019) *Structure* System affiliation (Hu et al., 2020) Teaching status (Hu et al., 2020) Ownership (Hu et al., 2020) Rural status (Hu et al., 2020)

(Continued)

Table 2. (Continued)

Patient experience measure	Hospital interventions/process/structural characteristics associated with HCAHPS measure scores, by relationship with measures			
	Strongly positive	Positive	Weakly positive	Null
Overall Rating (n = 10 studies)	*Process* Private room (vs. double occupancy) (Boylan et al., 2019)	*Process* Number of care coordination strategies (Figueroa et al., 2018) Number of patient engagement health information technology functionalities (Asagbra et al., 2019) High-volume hip/knee replacements (Courtney et al., 2018) More RN and nursing assistant hours (Delhy et al., 2021) Certified electronic health records (Hu et al., 2020) *Structure* Smaller bed size (Delhy et al., 2017) Larger bed size (McFarland et al., 2017) Rural status (Hu et al., 2020) Nonteaching status (Delhy et al., 2021) Nonprofit/government (Delhy et al., 2021) Urban status (Delhy et al., 2021)		*Intervention* Wearing white coats during rounds (La Rosa et al., 2019) Care pathway (Featherall et al., 2019) Advanced practice provider/care pathways (Broman, 2021) *Process* Position of bed in double occupancy (Boylan et al., 2019) High-volume knee replacement hospital (Featherall et al., 2019) *Structure* Bed size (Hu et al., 2020) Teaching status (Hu et al., 2020) System affiliation (Hu et al., 2020) Ownership (Hu et al., 2020)
HCAHPS score (n = 1 study)		*Process* Not colocating services (Jain et al., 2019) Care coordination (Jain et al., 2019) *Structure* Not metro (Jain et al., 2019) Nonteaching status (Jain et al., 2019) Small hospital (Jain et al., 2019) Nonprofit status (Jain et al., 2019)		*Process* Data sharing and monitoring (Jain et al., 2019) Transitional care (Jain et al., 2019) Chronic care management (Jain et al., 2019) *Structure* Network affiliation (Jain et al., 2019)

Note. HCAHPS = Hospital Consumer Assessment of Healthcare Providers and Systems; RN = registered nurse; ED = emergency department.

authors anticipated and found that length of stay was shorter after the intervention was implemented. However, contrary to the hypothesized lower Care Transition and Communication with Doctors item scores postimplementation, these scores were unchanged or higher. Similarly, Featherall et al. (2019) found no change in Communication with Doctors, Communication with Nurses, Recommend Hospital, or Overall Rating among patients who received a total knee arthroplasty surgery before or after a care pathway's full implementation. The care pathway was comprehensive—with preoperative, perioperative, and postoperative segments—and was implemented across 11 hospitals in a single system. In contrast to Broman et al. (2021), Featherall et al. (2019) hypothesized that HCAHPS measures would improve following care pathway implementation despite shorter lengths of stay.

Observational Studies Assessing Relationships Between Processes and HCAHPS Measures

We identified nine observational studies that primarily assessed the association between a process and structural measure with HCAHPS scores. Eight of these studies linked HCAHPS data from Care Compare with hospital characteristics from the American Hospital Association (AHA) Annual Survey (Courtney et al., 2018; Delhy et al., 2021; Hu et al., 2020) and its supplements (Asagbra et al., 2019), the Area Resource File (Asagbra et al., 2019), national surveys of hospital administrators (Figueroa et al., 2018), or some combination thereof (Figueroa et al., 2018). One article (Boylan et al., 2019) used data from one hospital to link patient-level information about hospital room characteristics with HCAHPS surveys.

Electronic Health Records/Patient Engagement Functionality. Two studies examined the association between certified electronic health records (EHRs) and patient experience measures. One study (Mullings & Sankaranarayanan, 2017) found a statistically significant positive association between certified EHR information technology and patient-mix adjusted Communication about Medicines Star Rating after also adjusting for bed size, ownership, critical care services, emergency department services, and region. A second study (Hu et al., 2020) also found positive associations between having an EHR and each of the five HCAHPS measures. However, this study was restricted to hospitals that were part of the Inpatient Psychiatric Facility Quality Reporting Program. Because psychiatric patients are not eligible for the HCAHPS survey, the implications of these results for the care of psychiatric patients are limited.

One study (Asagbra et al., 2019) used data from the AHA Health Information Technology (HIT) supplement to examine the association between patient experience and the number (of 11) of EHR patient engagement functionalities reported by the hospital. Patient engagement functionalities were hypothesized to improve patient experience by increasing patient centeredness of care. There was a positive association between HCAHPS scores and the number of patient engagement functionalities a hospital employed; these functionalities included patient access to care summary, patient-specific education, patient-generated data, online support community, and e-tools for tasks such as appointment scheduling, medication refills, and secure messaging. Only a minority of hospitals that completed the AHA survey also completed the HIT supplement, which limits the generalizability of these results. Study hospitals were more likely to be larger, not-for-profit, teaching, system affiliated, urban located, and had higher patient experience ratings than excluded hospitals. The authors cautioned against possible selection bias in that hospitals included in the study were more likely to complete the HIT supplement because they had more staffing and resources and could better utilize patient engagement functionality.

Care Management Processes. One study examined the association of an HCAHPS score (labeled "patient satisfaction") with care management processes (Jain et al., 2019), as reported by hospitals on the AHA Survey of Care Systems and Payment Supplement. Care management processes are practice innovations intended to improve the efficiency of care of chronically ill, high-cost patients. Five management process domains were considered: data monitoring and sharing, care coordination, chronic care management, transitional care, and colocation of services. The hospital-level model controlled for many hospital characteristics, such as network affiliation, bed size, and teaching status. The study did not include a description of its patient experience outcome beyond noting that it was a patient-mix adjusted HCAHPS measure obtained from Care Compare. Two care management processes correlated with the HCAHPS measure. The first was colocation of services, defined as the ability of the hospital to provide integrated primary, acute, and postacute health services and measured as a count of up to 10 endorsed services (primary care, routine specialty care, specialized care, urgent care/emergency care, hospital inpatient care, rehabilitation care, home health, skilled nursing, behavioral health, and palliative, hospice care), and was negatively associated with HCAHPS scores. Because this study relied on an AHA supplement that relatively few hospitals completed, these results may also have limited generalizability to the broader group of hospitals that did not complete the supplement.

A second study (Figueroa et al., 2018) linked HCAHPS scores with data from a survey of the leadership of a sample of 1,600 acute care hospitals eligible for the Hospital Readmissions Reduction Program. The authors computed a count of the number of care coordination strategies endorsed (up to 10) and then differentiated low-strategy (bottom quartile), mid-strategy (middle quartile), and high-strategy (top quartile) hospitals based on this count. Compared with

low-strategy hospitals, high-strategy hospitals scored higher on four patient-mix adjusted HCAHPS measures (Discharge Information, Communication about Medicines, Recommend Hospital, and Overall Rating). These models controlled for bed size, teaching status, urban location, and presence of intensive care unit, but these results were not displayed. When specific strategies were analyzed, one strategy—creating a discharge summary before discharge—was positively associated with all four HCAHPS measures considered. Three other strategies were each associated with one HCAHPS measure: the use of a discharge planner/coordinator (associated with Overall Rating), calling patients 48 hr after discharge (Overall Rating), and the use of pharmacists to help reconcile medications (Communication about Medicines). Most but not all of the patient-facing care coordination strategies were positively related to patient experience. Strategies unrelated to the HCAHPS measures were formal discharge checklist, mobile/web-based postdischarge tools, electronic medication reconciliation, transition coaches, and enrolling patients in formal discharge programs.

Nursing Care. One study (Delhy et al., 2021) assessed the association between the number of registered nurse (RN) hours per patient day and nursing assistant (NA) hours per patient day as reported in the AHA survey, adjusting for an extensive set of hospital characteristics, state hospital staffing regulations, and state and year fixed effects. The main finding was that more RN and NA hours corresponded to more positive patient care experiences for all eight HCAHPS measures examined. A study limitation was that workforce measures they examined were known to have high levels of missingness, but these rates were not reported in the paper.

Private Rooms Versus Double Occupancy. One cross-sectional study of a single, high-volume, academic medical center in a large metropolitan city compared the HCAHPS scores of total joint arthroplasty surgical patients assigned to a private room versus a double-occupancy room. Among those assigned to double-occupancy rooms, the experience of patients positioned near the door versus near the window was compared (Boylan et al., 2019). Patients placed in private rooms provided more positive evaluations for one HCAHPS item (call button help) and three measures (Quietness, Overall Rating, Recommend Hospital). The magnitude of the relationship of these measures with private rooms was the largest reported in the eligible studies reported here (all exceeded 6 top-box points on a 0–100 scale). Within double-occupancy rooms, while the association of position near-the-door (vs. near-the-window) with patient experience did not attain statistical significance, the direction of the odds ratios for all measures was in the direction of more positive evaluations for near-the-window positioning, suggesting that this subanalysis was underpowered. The authors described patient assignment to room types as independent of patient demographics, insurance type, and admitting surgeon. However, they noted that some patients' room assignments may have been nonrandom, reflecting, for example, patient caregiver assertiveness.

Procedure Volume. In a secondary analysis, one study (Courtney et al., 2018) examined the relationship between the volume of primary arthroplasty procedures and each of the five patient-mixed adjusted HCAHPS measures (Communication with Doctors, Communication with Nurses, Staff Responsiveness, Overall Rating, and Recommend Hospital). The study used data from the CMS Inpatient Charge Data set to compare low-volume hospitals ($<$100 procedures) with high-volume hospitals among hospitals that had any such procedures in that year. High-volume hospitals outperformed low-volume hospitals on each of the measures. However, the HCAHPS scores were for all patients, not just arthroplasty patients. A cohort study that examined the effectiveness of care pathways (Featherall et al., 2019) included procedure volume as a control measure and found that it correlated positively with Recommend Hospital but not Communication with Doctors, Communication with Nurses, or Overall Rating, suggesting that procedure volume may be more associated with hospital reputation than specific patient experiences.

Observational Studies Assessing Relationships Between Structural Characteristics and HCAHPS Measures

Bed Size. In a study that predicted hospital size (coded linearly) from eight HCAHPS measures entered simultaneously, five measures (Communication with Doctors, Staff Responsiveness, Cleanliness, Quietness, Discharge Information) were negatively associated with bed size; two (Communication with Nurses and Overall Rating) were (multivariably) positively associated with hospital size; and one (Communication about Medicines) was (multivariably) unrelated to hospital size (McFarland et al., 2017). Two studies included bed size as a control variable: one generally found that bed size correlated negatively with patient experience measures (Delhy et al., 2021); the second found that smaller hospitals had better scores for Staff Responsiveness but worse for Recommend Hospital than larger hospitals, and that bed size was unrelated to three measures (Care Transition, Discharge Information, and Overall Rating [Hu et al., 2020]).

Other Organizational Factors. Three studies (Delhy et al., 2021; Hu et al., 2020; Mullings & Sankaranarayanan, 2017) included other fixed hospital-level organizational variables as controls. Rural, nonteaching, and nonprofit and government hospitals had higher HCAHPS scores than urban, teaching, and for-profit hospitals. Compared with for-profit hospitals, nonprofit hospitals were positively associated with all HCAHPS measures in at least one study, and for-profit hospitals were not positively associated with any measures.

Compared with urban/metropolitan hospitals, rural/nonmetro hospitals were positively associated with all but one (Recommend Hospital) of the eight HCAHPS measures examined in at least one study; urban hospitals were positively associated with two measures (Overall Rating and Recommend Hospital [Delhy et al., 2021; Hu et al., 2020]). Compared with teaching hospitals, nonteaching hospitals were positively associated with all measures but Communication about Medicines and Care Transition (Delhy et al., 2021; Jain et al., 2019); teaching hospitals were not positively associated with any measure. The one study (Mullings & Sankaranarayanan, 2017) that included the provision of critical care access and physician owned as multivariate controls found both characteristics positively correlated with the one HCAHPS measure examined, Communication about Medicines. The studies that included controls for system affiliation (Hu et al., 2020) or the presence of emergency department services (Mullings & Sankaranarayanan, 2017) found that neither was multivariably associated with any HCAHPS measures.

Discussion

We undertook a more comprehensive review of ways that hospitals might improve patient experience than previous reviews by including both intervention and observational studies. The most promising modifiable hospital factors identified included EHR patient engagement functionality, care management processes, and nurse-to-patient ratios.

Based on our variability metric, a proxy for how easily modifiable an HCAHPS measure may be, all measures but Communication with Doctors and Quietness were considered easily modifiable (defined as the number of hospital factors with a positive association exceeding the number with null association). Most studies that examined Communication with Doctors evaluated interventions in a single hospital, so they tended not to include structural characteristics in their analyses. Eight studies measured Communication with Doctors, which was significantly higher only in small- and high-volume hospitals. Communication training for attending physicians also emerged as a promising intervention in Davidson et al. (2017). A challenge with improving Communication with Doctors is that it is already one of the HCAHPS measures with the highest average performance (CMS, 2022).

Quietness was also identified as being less variable, but this may be because Quietness was considered in only two of the included studies. Since 2019, there has been a growing understanding of the need for quality sleep for recovery (DuBose & Hadi, 2016), which may lead to more high-quality studies using HCAHPS to assess efforts to improve sleep by, in part, improving Quietness. For other HCAHPS measures, the number of intervention, process, and structural factors with which there was significant variation exceeded the number of characteristics for which there was no relationship, suggesting malleability and potential for improvement.

Implications for Practice and Policy

By expanding our review to include observational studies of hospital-level correlates, we captured a broader range of potential hospital strategies for improving patient hospital experiences than we would from only including studies of interventions. We found evidence that hospitals that used more EHR patient engagement functionalities and more care management processes and that provided higher nurse-to-patient ratios reported better patient experience. Because higher nurse-to-patient ratios may be challenging to achieve given chronic nursing shortages and financial constraints, hospitals might also consider other ways to reduce nurse workload and allow more time for direct patient care and communication (Carayon & Gurses, 2008). Patient-facing care coordination strategies for hospitals, such as creating discharge summaries before discharge, using a discharge planner/coordinator, calling patients after discharge, and conducting medication reconciliation by a pharmacist were also associated with higher HCAHPS scores, particularly for Discharge Information and Communication about Medicines (Figueroa et al., 2018). A prior review also identified discharge nurses and postdischarge follow-ups as promising (Jun et al., 2020), reinforcing their potential. Before implementing any strategy or modifying an existing process hospital or system wide, hospitals might consider implementing and evaluating these strategies for patients on a particular service or floor (Jun et al., 2020; Quigley et al., 2007), which is a common QI method as part of the Plan-Do-Study-Act (PDSA) process for QI.

One study reviewed found that having a larger number of colocated services in a hospital was associated with lower HCAHPS scores (Jain et al., 2019). This counterintuitive association may indicate that hospitals with more collocated services target fewer QI efforts at inpatient care experiences (the "too many eggs in one basket phenomenon") or it may reflect omitted hospital characteristics (e.g., hospital size).

Care coordination strategies that are patient-facing and not targeted, such as calling patients two days following discharge and using discharge planners, were positively associated with patient experience, but care coordination strategies that were not visible to patients were not. This is consistent with other research finding that "hospital-centric" mobile/web-based tools have low patient take-up rates (Figueroa et al., 2018).

Because hospitals may benefit from targeting of resources to improve patient experience, our review highlighted several nonmodifiable structural correlates of HCAHPS scores. Generally, smaller, rural, nonteaching, and nonprofit hospitals tended to have higher HCAHPS scores than other hospitals. These characteristics may be used to target hospitals that are likely to benefit from QI initiatives. The processes and interventions that work best in smaller versus large hospitals or in rural versus urban hospitals may differ, so hospital leadership and policymakers may want to identify "best practice"

hospitals with characteristics similar to their own. Best practice hospitals might be identified based on their overall HCAHPS performance or based on the uniformity of patient experiences across major patient groups using an approach like the Health Equity Summary Score (Beckett et al., 2023).

Implications for Future Research

Future research should pay attention to the need for careful and complete models of direct and indirect ways that a change in care or management processes may affect patient experience. For example, Broman et al. (2021) and Featherall et al. (2019) each hypothesized that a care pathway might lead to more standardized, effective communication (positive direct effect). Featherall et al. (2019) also hypothesized that the length of stay reductions associated with care pathways might reduce postsurgical time and cause patients to feel rushed. Feeling rushed can weaken the effectiveness of communications, especially if communications occur near transitions, such as admission and discharge (Bowers & Cheyne, 2015). Recognizing and ameliorating such potential adverse consequences may enhance gains from QI strategies.

None of the studies included in our review examined cultural competency (Degrie et al., 2017; Delphin-Rittmon et al., 2013) nor the use of an interpreter, although work suggests that both are important for improving patient experience (Chan et al., 2015). Future work may also want to explore those factors.

Studies could be improved or clarified by researchers confirming that they used standard HCAHPS administration and scoring approaches (Giordano et al., 2010), including standard HCAHPS PMA. PMA may be most important for cross-sectional comparisons across hospitals, wards, or subsets of patients, but it may also correct for bias when measuring change over time in the same hospitals (Elliott et al., 2015). Absent PMA, one cannot rule out the role of differences in the characteristics of patients exposed to an intervention compared with the unexposed in explaining change in HCAHPS scores.

Studies that test interventions using a randomized or cohort design may be better conducted at the patient level within units or hospitals, rather than at the physician level. HCAHPS measures are designed to measure care provided by a team, not by a single physician or nurse (Giordano et al., 2010; Tefera et al., 2017). Evaluations of provider-level interventions must make assumptions about whether questions about Communication with Doctors apply in whole or in part to a specific doctor. It may be preferable to design an evaluation so that the intervention is administered to all doctors on a unit or to all eligible doctors in a hospital in the case of multihospital system. To support testing of interventions, future studies should also pay attention to sample size and power issues (Davidson et al., 2017).

Lessons can also be gleaned from the 41 excluded full-text studies. The most common exclusion ($n = 16$, 39%) was a failure to report statistical tests of differences between intervention and comparison groups. In most cases, it was unclear whether this was because they did not conduct the test or did not report it. Ten (24%) full-text reviewed studies were excluded because of a poor study rating; this suggests a need for developing guidance on improving the design, implementation, and reporting of QI studies. Eight (29%) exclusions were because HCHAPS and non-HCAHPS measures were combined.

The observational studies generally used information on process strategies collected in the AHA Annual Survey or its supplements. In some studies, the authors provided information that indicated a high missingness rate for the AHA supplements; other authors did not note the missingness rate of measures from the AHA survey that was their primary focus (e.g., Delhy et al., 2021). When there is a high missingness rate for a predictor variable, instead of deleting the case using listwise deletion, researchers can retain the case by both reporting the item missingness rate and using imputation methods to fill in missing data on these measures so hospitals with missing data remain in the analysis. Some AHA measures show high skewness and kurtosis; in such instances, researchers might consider converting the values to a continuous 0 to 1 rank, where 0 corresponds, for example, to the hospital with the lowest staffing level, 0.5 corresponds to the median hospital, and 1.0 corresponds to the hospital with the highest staffing level. Because of the low response rate to some of the AHA supplemental surveys, we recommend that researchers who use them report differences in the characteristics between hospitals that did and did not complete the supplemental survey (Asagbra et al., 2019).

Some programs, such as enrollment in formal discharge programs, which usually target high-risk patients, may affect too few patients to be apparent in HCAHPS scores overall (Figueroa et al., 2018). Such targeted programs may need to be assessed using intervention studies instead of observational studies.

Finally, our literature synthesis was focused on peer review studies with adequate study quality because we were interested in studies with broad generalizability. However, small or single-case evaluations of QI and other initiatives are hard to publish in peer-reviewed journals, but often hold helpful lessons. A gray literature review that identifies and describes existing QI strategies for rural hospitals, safety net hospitals, or small hospitals may help the field, as would a gray literature synthesis that summarizes the evidence for these interventions, even if the study quality does not meet the standard used here.

Our work has limitations. We restricted our search to published articles in the 4 years since the last three reviews. We searched only PubMed, excluding Cumulative Index of Nursing and Allied Health Literature database that includes nursing interventions. Notably, the number of relevant studies

identified was small, limiting the strength of any conclusions. However, our review identified several issues in the published evidence while highlighting possible interventions that merit more attention. The HCAHPS measures examined varied across the studies; thus, only limited consensus could be found for any given metric. However, our review helped paint a more detailed descriptive picture of possible influences on HCAHPS measures and corresponding interventions, care and management processes, and structural characteristics. We also identified means by which future studies could strengthen evidence, such as consistently using and describing patient-mix adjusted scores.

Conclusion

Spurred by public reporting, the role of HCAHPS in hospital payment, and hospitals' ability to link patient surveys to internal clinical, administrative, and other data, the published literature on associations of various factors with HCAHPS measures continues to grow. Interest in improving inpatient experiences of care through interventions, targeting hospital processes, or identifying best practices was a driver of this research.

As with the previous systematic reviews, this review was limited by a shortage of adequate-quality studies, including few high-quality studies testing specific interventions to improve HCAHPS scores that could inform hospitals, payers, and policymakers. Nonetheless, we identified several promising interventions and processes along with structural characteristics for targeting QI initiatives. We make recommendations for practice, policy, and research, including identifying several possible avenues that future researchers could pursue to enhance or improve their methods and study designs and thereby build a more solid evidence base about ways to improve patient experience across multiple HCAHPS measures and population subgroups.

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Supplemental Material

Supplemental material for this article is available online.

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