AHRQ Comparative Health System Performance Initiative: Program Overview and Accomplishments, 2015-2020

Contents

Acknowledgments

Executive Summary

In 2015, AHRQ launched the Comparative Health System Performance (CHSP) Initiative to study how healthcare systems promote evidence-based practices in delivering care. AHRQ devoted almost $60 million over 5 years to establish three Centers of Excellence at Dartmouth College, the National Bureau of Economic Research, and RAND, as well as a Coordinating Center at Mathematica.

The CHSP Initiative worked to identify, classify, track, and compare healthcare delivery systems ranging from integrated delivery systems to accountable care organizations across the United States. The goal was for healthcare systems to improve the speed of adoption and diffusion of practices recommended on the basis of comparative effectiveness research. The project funds also helped to establish and regularly convene a technical expert panel to advise AHRQ and the Coordinating Center on how to identify, classify, track, and compare health systems.

Centers of Excellence developed unique data cores to address the research areas outlined in the CHSP Initiative's funding opportunity announcement, which focused on system characteristics and processes to improve care, incentives, environments, and outcomes. Each Center of Excellence compiled data on health systems in the United States, working to characterize the performance of those delivery systems, identify the characteristics of high-performing delivery systems, and understand processes for disseminating and using evidence. Notably:

- The Dartmouth College Center of Excellence fielded a national survey (the National Survey of Healthcare Organizations and Systems),
- The NBER Center of Excellence used diverse proprietary data sources to build a national database to support their health system research (the Health Systems and Providers Database), and
- The RAND Center of Excellence conducted case studies of 24 health systems in four strategically selected markets.

In addition, the Coordinating Center developed the AHRQ Compendium of U.S. Health Systems, a suite of publicly available national data resources identifying hospitals and medical groups in health systems. The Coordinating Center also facilitated conversations across the Centers of Excellence and with a technical expert panel through virtual and in-person meetings.

Throughout the initial 5 years of the CHSP Initiative, 219 scholars associated with CHSP published 105 articles in about 40 peer-reviewed journals and other venues. Many publications were in high-impact journals targeting clinical, health policy, and health services research audiences, such as the *New England Journal of Medicine*, the *Journal of the American Medical Association*, *Health Affairs*, and *Health Services Research*.

CHSP publications contributed findings in six areas:

1. Advancing methods;
2. Characterizing systems;
3. Understanding systems' external environments;
4. Understanding systems' internal processes;

5. Understanding systems' patient factors, patient engagement, and patient-centered outcomes research (PCOR); and
6. Assessing systems' performance.

Prior to the CHSP Initiative, research and data on health systems were limited, with many unanswered questions related to health systems' structure, financing, performance, responsiveness to policy, and application of new evidence to achieve more patient-centered care. The CHSP Initiative advanced knowledge by investing in enduring resources and foundational analyses to better understand and characterize the diversity of health systems' composition and performance in the United States.

The CHSP data products and research findings have provided a comprehensive picture of the landscape of systems in the United States and have identified and described increases in health system consolidation over time. In addition, they have cataloged different dimensions of variation among and within systems (including their composition, types of integration, and change over time), and revealed their complexity.

Researchers outside the CHSP Initiative have already begun to use the Compendium to examine key issues related to health system performance. Moreover, CHSP has produced many policy relevant findings that can help inform future system-level initiatives aimed at improving care delivery and dissemination of PCOR evidence.

This report provides an overview of the CHSP Initiative and interim accomplishments over the first 5 years of the project.

I. Description of CHSP Initiative

Program Objectives

The Comparative Health System Performance (CHSP) Initiative was created to study how healthcare delivery systems promote evidence-based practices in delivering care. The goal was to understand the factors that affect health systems' use of patient-centered outcomes research (PCOR) and to identify best practices in disseminating and using PCOR within systems.

Program Structure

To achieve these objectives, AHRQ devoted around $60 million over 5 years to the CHSP Initiative. A total of $52.3 million was awarded as U19 grants, which funded Centers of Excellence at Dartmouth College, the National Bureau of Economic Research (NBER), and RAND. To advance the core purposes of AHRQ's investment in the CHSP Initiative, the Centers developed unique Data Cores to address the research focus areas related to system characteristics and processes to improve care, incentives, environments, and outcomes.

Each Center of Excellence assembled data on health systems in the United States, working to characterize the performance of those delivery systems, identify the characteristics of high-performing delivery systems, and understand processes for disseminating and using evidence.

Dartmouth Center of Excellence

Principal Investigator*:* Ellen Meara, Ph.D.

Partners:

- University of California at Berkeley
- University of California, San Francisco
- Harvard University
- High Value Healthcare Collaborative
- Mayo Clinic
- University of North Carolina

Overview

The Dartmouth Center of Excellence studied the use of evidence-based innovations in health systems and their impact on healthcare quality, delivery, and costs. Researchers explored how market and organizational factors influence the implementation of biomedical, care delivery, and patient engagement innovations.

In addition, the Dartmouth Center of Excellence conducted the National Survey of Healthcare Organizations & Systems, which included responses from more than 3,300 healthcare leaders in practices, hospitals, and health systems. The survey asked leaders about the external environment, organizational characteristics, operational factors, and characteristics of healthcare innovations.

The aims of the Dartmouth Center of Excellence were to:

- Identify, track, and characterize health systems by developing a taxonomy to define the various types of health systems, hospitals, and physician organizations and their relationships with one another.
- Develop measures of integration and identify how environmental factors influence the adoption of new payment models, levels of integration, and systematic use of evidence.
- Identify mechanisms health systems use to influence adoption of evidence-based practices, reasons and ways different systems adopt these approaches, and effects of these approaches on performance.
- Identify factors that influence the successful deployment of effective biomedical innovations, factors that help target innovations to those most likely to benefit from them, and approaches to eliminating outmoded or low-value care.
- Evaluate factors that influence decisions to adopt healthcare delivery innovations and identify ways to improve the use of evidence-based care.
- Identify factors that influence the adoption of innovations that enhance patient engagement or promote shared decision making and identify the impact of adoption on utilization, health outcomes, and cost.

The Dartmouth Center of Excellence studied important clinical conditions to advance the understanding of factors that influence the implementation of healthcare innovations. Researchers identified potentially high-impact policy and organizational levers by:

- Examining factors that influence the use of specific innovations: (1) external environment, (2) characteristics of organizations that adopt the innovation, (3) mechanisms used to implement the innovation, and (4) characteristics of the innovation.
- Studying how the influence of these factors varies across different types of organizations.
- Distinguishing three major classes of innovation: (1) biomedical innovations that target specific diseases and are generally ordered or delivered by physicians, (2) care delivery innovations that target patient groups defined on the basis of function or illness severity and that are implemented largely by managers and teams, and (3) patient engagement innovations that focus on new ways patients and their caregivers interact with providers.

Research Projects

The Dartmouth Center of Excellence conducted five research projects that focused on understanding characteristics of health systems, external environments in which they operate, and factors that affect their adoption of a wide range of healthcare innovations. The first two projects focused on understanding internal and external factors that drive the use of evidence within health systems:

- **External Influences on the Emergence of Integrated Systems:** This project evaluated how external environmental factors, such as payment and regulatory policies, influence clinical integration, adoption of new payment models, and ways organizations use evidence. This work included developing measures of system integration and external environmental factors, identifying external factors that lead health systems to transition toward value-based payment, and testing whether adoption of value-based payment

mechanisms is associated with the degree of system integration and integrated approaches to using evidence.

- **Deployment and Success of Internal Management and Incentive Mechanisms:** This project identified internal mechanisms physician organizations use to increase evidence-based practices, to better understand how certain characteristics of health systems encourage or discourage the use of evidence. This work involved measuring performance improvement mechanisms across different environmental and organizational contexts; and testing the association between incentive and management mechanisms and performance.

The remaining three projects identified factors that influence health systems' use of biomedical, care delivery, and patient engagement innovations and the impact on cost and quality of care:

- **Adoption and Use of Biomedical Innovations in Diverse Healthcare Systems:** This project studied the environmental, organizational, and operational factors that influence the use of biomedical innovations, such as effective prescribing, which may or may not be well supported by evidence-based research. The study examined the links between these factors, use of biomedical innovations, and performance on outcomes and costs.
- **Adoption and Use of Care Delivery Innovations in Diverse Health Systems:** This project studied the environmental, organizational, and operational factors that influence the use of care delivery innovations that target patients with multiple chronic conditions. The care delivery innovations of interest aimed to reduce hospital readmissions and integrate behavioral health into primary care. The study also examined the links between the noted factors, use of care delivery innovations, and performance on outcomes and costs for complex patients.
- **Adoption and Use of Patient Engagement Innovations in Diverse Healthcare Systems:** This project studied the environmental, organizational, and operational factors that influence the use of innovations to enhance patient engagement. Examples of patient engagement innovations of interest included shared decision making, motivational interviewing, health coaching, and group visits. The study also examined the links between the noted factors, use of patient engagement innovations, and performance on outcomes and costs.

Data Core

The Dartmouth Center of Excellence collected data from multiple sources to create a central repository for comprehensive data sources, robust statistical analyses, taxonomies of health systems, network measures, and performance measures. The five research projects described above drew on a range of data sources, including claims data, survey data, and qualitative interview data.

The Dartmouth-led team created claims databases using Medicare claims. To assess relationships between organizational characteristics, types of healthcare innovations, and patient outcomes, the team linked claims data with data from surveys. These surveys include the National Survey of Accountable Care Organizations, the American Hospital Association (AHA) Annual Hospital Survey, and the National Survey of Healthcare Organizations and Systems.

The Data Core also included data from the High Value Healthcare Collaborative, Leavitt Partners, and IQVIA's OneKey database. Finally, qualitative data from interviews with health system leaders provided further insight into why and how health system organizations adopt and implement innovations.

The Dartmouth Center of Excellence's projects had a national focus and used national claims and survey data. Analyses examined health system characteristics, integration, and performance, as well as data on healthcare innovations. In addition, some of the projects focused on patients with specific conditions, as well as some of AHRQ's other priority populations, such as people with chronic care needs and people with multiple chronic conditions.

NBER Center of Excellence

Principal Investigator*:* David Cutler, Ph.D.

Partners:

- Harvard Medical School (HMS) Department of Health Care Policy
- Harvard Business School
- Network for Regional Healthcare Improvement
- Massachusetts Health Quality Partners
- Comagine Health (formerly HealthInsight)
- Center for Improving Value in Health Care
- HMS Faculty at Dana Farber Cancer Institute
- HMS Faculty at Boston Children's Hospital

Overview

The National Bureau of Economic Research (NBER) Center of Excellence worked to identify relationships among healthcare providers and organization of delivery systems, delivery of evidence-based care, clinical and economic outcomes, and patient experiences. To this end, the Center mapped health systems across the entire United States over several years.

The NBER team also developed new performance measures and calculated new and existing performance measures to study variation in performance across organizational types, health systems, and geographic areas. Finally, the team combined data on healthcare organization and performance to study topics such as the consequences of corporate consolidation and the diffusion of best practices.

The aims of the NBER Center of Excellence were to:

- Characterize the current delivery system and track changes in delivery system structure across space and over time.
- Gather data on the use of evidence from patient-centered outcomes research (PCOR) and related clinical and economic outcomes and merge those data with delivery system information.
- Use these data sources to examine associations between differences in delivery system structure and use of PCOR-based evidence and related clinical and economic outcomes.

Research Projects

Research from the NBER Center of Excellence was conducted at both the national and State levels. Analyses measured health system organization and performance at a point in time, over time, and across geographic areas. Under this initiative, five research projects examined delivery system performance in several distinct areas by:

- Looking across a variety of delivery systems (Projects 1 and 2);
- Considering specific populations where evidence-based care involves tailoring care to the needs of the population, such as oncology, children, and post-acute care (Projects 3, 4, and 5); and
- Considering the outcome of corporate integration in a number of settings (Projects 1 and 5):

Delivery System Structure and Outcomes: A National Look: Project 1 focused on how economic outcomes are affected by delivery system organization and ownership. The team worked to describe these relationships by characterizing the organization of care and variation in clinical and economic outcomes across patients and groups of providers. Examples of studies from this project included:

- An examination of organizational features of health systems in the United States (e.g., size, composition, service scope, geographic scope, governance, mission) and the extent to which these features were associated with PCOR-based clinical, patient experience, and spending measures of performance.
- An examination of the effects of the 340B Drug Pricing Program on hospital–physician consolidation and on the outpatient administration of parenteral drugs by hospital-owned facilities in three specialties in which parenteral drugs were frequently used (Desai, et al., 2018).
- An examination of the relationship between physician practices' commercial prices for office visits and the quality and use of care among fee-for-service Medicare patients served by the practices (Roberts, et al., 2017).
- An examination of the association between horizontal integration in the hospital industry and multiple dimensions of inpatient care (Beaulieu, et al., 2020).

Delivery Systems and Outcomes in Four States: Project 2 focused on how care varied within and across four States (Colorado, Massachusetts, Oregon, and Utah). These States had different health systems and all-payer claims databases (APCDs), which facilitated comparisons in care delivery across settings and tracking of the use of PCOR-based evidence and clinical and economic outcomes over time. Examples of studies from this project included:

- A descriptive account of the process followed to produce healthcare quality and cost measures across and within APCDs from four States to describe how APCDs can be used for multistate analysis (Diaz-Perez, et al., 2019).
- An examination of how care differed for Medicaid and commercially insured patients in four States, focusing on the extent to which these patient populations go to the same or different providers (Zhou, et al., 2020).

- An examination of the overlap of physician networks serving Medicaid and commercial populations, differences in quality by payer, and extent of returns to payer specialization on quality.

Characteristics of High-Performing Delivery Systems of Cancer Care: Project 3 focused on how the organization of oncology care affects the use of PCOR-based processes and related clinical and economic outcomes in adult patients with cancer. Examples of studies from this project included:

- A descriptive study of the number and specialties of oncology physicians across the United States, including their prevalence in National Cancer Institute cancer centers and academic medical centers.
- An examination of variation in the quality of end-of-life cancer care within and across integrated delivery system types and the persistence over time and consistency across measures of high performance on select quality measures.

Accelerating the Performance of Pediatric Health Systems: Project 4 focused on pediatric features of health system structures and examined the degree to which these features relate to PCOR-based care quality. Examples of studies from this project included:

- An examination of the prevalence and scope of pediatric services in healthcare systems, including the extent to which pediatric expertise was present in systems; and the extent to which pediatric-serving entities provided services for low-, medium-, high-, and highest risk pediatric patients.
- An examination of trends in hospital-based pediatric services between 2012 and 2016, including the degree to which hospital characteristics and geographic location explained variation in inpatient pediatric services over time. The study also looked at whether service availability corresponded to greater or lesser healthcare accessibility.

Post-Acute Care and Dialysis: Project 5 focused on consolidation and organizational change in two understudied healthcare industries that account for a significant share of total medical spending: post-acute care facilities and dialysis facilities. The project examined the impact of these facilities on use of PCOR-based evidence, spending, and clinical outcomes. Examples of studies from this project included:

- [An examination of common investor ownership linkages across the acute care, post-acute care, and hospice sectors within the same geographic markets](#) (Fowler, et al., 2017).
- An examination of the impact of vertical integration between hospitals and skilled nursing facilities on cost and quality of healthcare, focusing on self-referrals to hospital-owned skilled nursing facilities.

Data Core
The projects described above used the following data sources on healthcare organization and performance:

- **An "enhanced system database" referred to as the Health Systems and Provider Database:** This relational database contained microdata on health systems, hospitals,

physicians, and other healthcare providers (e.g., post-acute care facilities) for 2010–2016. The NBER team used a network algorithm that combines data from a wide variety of sources (e.g., Medicare Provider Enrollment, Chain, and Ownership System [PECOS], Medicare and commercial claims, IQVIA (formerly SK&A), Internal Revenue Service form 990 filings, AHA survey data) to identify health systems as groups of commonly owned or managed providers.

The team identified health systems in claims data using tax identification numbers and Medicare provider numbers (e.g., National Provider Identifiers and Center for Medicare & Medicaid Services [CMS] Certification Numbers). They linked these providers to the markets in which they participate (e.g., hospital referral regions, primary care service areas) and characterized the local populations.

- **Administrative and claims data to measure the use of PCOR-based evidence, related clinical outcomes, and cost of care:** These data included Medicare claims data, national commercial insurance claims data, cancer registry data, dialysis facility and cost reports, Medicare cost reports, the Healthcare Cost and Utilization Project's Kids' Inpatient Database, CMS Hospital Compare, and all-payer claims data for four States.
- **Patient and family self-reports about the quality of care received:** These data included the Consumer Assessment of Healthcare Providers and Systems, Hospital Consumer Assessment of Healthcare Providers and Systems, and other sources for family surveys.

RAND Center of Excellence on Health System Performance

Principal Investigators: Cheryl L. Damberg, Ph.D., and M. Susan Ridgely, J.D.

Partners:

- Pennsylvania State University
- University of California, Los Angeles (UCLA)
- Stanford University
- Harvard University
- Integrated Healthcare Association of California
- Minnesota Community Measurement
- Washington State Health Alliance
- Wisconsin Collaborative for Healthcare Quality

Overview

The RAND Center of Excellence worked to identify, classify, track, and compare health systems in today's healthcare markets and to characterize the attributes of high-performing health systems—those systems that can more nimbly translate new research evidence into routine clinical practice, thereby improving quality, reducing costs, and achieving better patient outcomes.

The RAND Center of Excellence's researchers used a mix of qualitative and quantitative methods to examine the rapidly evolving healthcare landscape. The team's aims included:

- Investigating changes in health systems (for example, increased consolidation, greater integration among hospitals and physician organizations, and growth of health information technology [IT] systems).
- Seeking to understand how such changes may affect the ability of hospitals and physician organizations to achieve high-quality care at lower costs.
- Cataloging the attributes of health systems and their component entities (i.e., hospitals, physician organizations) and examining the relationship between health system attributes and performance on quality and cost measures.

In addition to work conducted through the Data Core (including the "deep dive" site visit work), the RAND Center of Excellence was home to four study teams. Each team collected primary data to examine a specific aspect of health systems that may influence how uptake of evidence-based practices and performance affects quality, cost, and patient outcomes:

- **Health Information Technology (Health IT):** Health IT can promote adherence to clinical guidelines, improve care quality and patient safety, and help reduce costs. However, implementation of health IT varied across health systems, and systems differ in their health IT capabilities and the extent to which they use them.

  The Health IT study team examined adoption and use of health IT in 24 health systems, identified differential use of health IT functionalities (such as computerized physician order entry and clinical decision support) by health systems and affiliated physician organizations, and tracked changes in health IT use over time. To understand the role of health IT in shaping health system performance, the team created a novel composite measure of health IT capabilities to examine how physician organizations use health IT.
- **Incentives:** The current healthcare environment is characterized by widespread experimentation with incentives. Incentives can be both financial (e.g., compensation) and nonfinancial (e.g., behavioral nudges, physician profiling). But despite the prominence of incentives, a sound understanding of how to design and use them to improve health system performance was lacking. The Incentives study team cataloged financial and nonfinancial incentives used in 24 health systems (and affiliated physician organizations) across four States. The team then conducted analyses to characterize the different compensation structures, use of behavioral nudges, and relationship between different compensation arrangements and performance.
- **Integration:** Fragmentation undermines the ability of health systems to deliver good patient care and to achieve good outcomes. A common strategy for addressing fragmentation is to adopt integrated organizational models such as accountable care organizations (ACOs). Other mechanisms of integration focus on the clinical level—for example, improving communication between primary and specialty physicians. However, studies have yet to demonstrate whether greater integration at the organizational level leads to greater integration at the clinical level and consequently better adoption of evidence-based practices and better outcomes.

The Integration study team developed a conceptual framework to advance the study of integration, developed innovative measures of integration that assess the degree to which care delivery is integrated, and measured clinical integration within 24 physician organizations in 17 health systems across 4 States. The team analyzed these data to assess the relationship between organizational and clinical integration and the relationship between clinical integration and performance.

- **Safety Net:** Community health centers (CHCs) provide primary care to vulnerable and low-income residents. Unlike other types of physician organizations that have rapidly joined large health systems, most CHCs maintain only informal connections with other local healthcare providers and health systems. However, the expansion of new delivery models and value-based payment systems is providing new incentives for safety net providers to develop more integrated systems of care.

  The Safety Net study team examined strategies CHCs use to achieve greater integration with three types of service providers (specialists, hospitals, and social service organizations). The team's goal was to understand whether the strategies promote better integrated care and to determine whether integration affects the provision of evidence-based care.

Research Projects

To advance the RAND Center of Excellence's work, the team addressed research questions such as the following:

- What is a health system? What are its fundamental characteristics? What types of health systems currently exist and how are health systems changing over time? What important attributes characterize different types of health systems?
- What attributes define a health system as "high performing"?
- Is there a relationship between health system attributes and health system performance on cost and quality measures?
- What mechanisms—such as deploying clinical decision support within health IT and other structural supports, using incentives, and engaging in care redesign—are health systems using to facilitate rapid uptake of evidence-based care practices?
- How do market factors (e.g., the competitiveness of the local healthcare market) influence health system performance?
- Does being part of a health system matter (i.e., is quality of care and total cost of care better/worse/no different for physician organizations affiliated with health systems, compared with those that are not)?
- How do health systems vary in primary care spending, and, relatedly, does quality of care vary by the amount of primary care spending?
- Are disparities in care smaller for physician organizations that are affiliated with health systems versus those that are not?

Researchers examined some of the mechanisms health systems and their affiliated physician organizations use to promote the uptake of evidence-based practices and to drive performance improvement. In particular, RAND Center of Excellence investigators examined three sets of

mechanisms to understand variations in the application of these mechanisms and how these variations affect health system performance:

- Adoption and routine use of health IT
- Use of financial and nonfinancial incentives with physicians, including behavioral nudges
- Role of clinical integration and whether organizational integration is associated with clinical integration

In addition, RAND Center of Excellence researchers assessed whether efforts to better integrate with specialists, hospitals, and social service agencies affect the ability of federally qualified health centers and other safety net providers to deliver better care.

RAND Center of Excellence researchers took a deep dive into 24 health systems and their affiliated physician organizations in 4 States. Researchers conducted indepth interviews with 162 C-suite executives in each system to gain a richer understanding than is possible to glean from analyzing administrative and claims data or examining responses to fixed-choice surveys. This indepth assessment yielded a more complete understanding of the complex structures of health systems as well as the myriad contextual and environmental factors that contribute to health system performance.

Data Core

The Data Core provided RAND Center of Excellence research teams with an integrated data library as well as methods, measurement, and analytic support. Center data came from multiple sources (Federal and State agencies, regional quality collaboratives, private sector groups, primary data collection); data are housed at RAND with appropriate safeguards. The Data Core coordinated quantitative and qualitative analyses across all the Center's projects.

The Data Core team has:

- Defined "health system" (as a unit of study).
- Defined what constitutes "high performance" in a health system.
- Developed interview protocols and conducted "virtual" site visits with C-suite executives in 24 health systems across 4 States.
- Constructed a multiyear integrated library of primary and secondary data on physician organizations, hospitals, and health systems.
- Created a novel health system database that maps physicians, physician organizations, and hospitals to health systems.
- Characterized the attributes of health systems and the healthcare markets in which they operate.
- Constructed measures of health system performance (including total cost of care, quality of care, low-value care, and primary care spending).
- Constructed a composite measure of clinical performance that reliably differentiates high-versus low-performing health systems.
- Constructed a novel composite measure of health IT capabilities to distinguish "superusers" of health IT from "underusers" of health IT.

The RAND Center selected 24 health systems for comparative case study analysis. These systems were chosen from four States that have been at the forefront of collecting and publicly reporting standardized performance measures. Each hosts a healthcare improvement collaborative that agreed to partner with RAND to provide performance data and assist in recruiting health systems.

To choose health systems for the study, researchers identified all physician organizations (POs) publicly reporting performance data in those four States and mapped them to health systems. The sample of health systems selected was not random to ensure the sample included small, medium, and large health systems as well as high, medium, and low performers.

The RAND Center then organized "virtual" site visits: a series of 60- to 90-minute telephone interviews with five to eight senior executives (CEO, CFO, Chief Medical Officer, etc.) in each system. Researchers developed the interview protocols with the input of a technical expert panel of health system executives and researchers. The coded interview data were used to compare and contrast health systems and to produce a series of papers on health system organization and governance, clinically integrated networks, care delivery redesign within health systems, and use of health IT to improve performance.

Coordinating Center for Comparative Health System Performance

Project Director: Eugene Rich, M.D.

AHRQ also invested $6.5 million in a contract to support a Coordinating Center for Comparative Health System Performance at Mathematica (then Mathematica Policy Research). These funds helped to establish and regularly convene a technical expert panel to advise AHRQ and the Coordinating Center on how to identify, classify, track, and compare health systems. Using input from AHRQ and the technical expert panel, the Coordinating Center facilitated discussions across the Centers of Excellence to promote cross-center collaborations and harmonize methods and measures when possible. The Coordinating Center also catalogued and synthesized the data collected and research projects conducted by the Centers of Excellence.

The Coordinating Center for Comparative Health System Performance leveraged expertise, infrastructure, and resources across the initiative's three Centers of Excellence to support the study of high-performing healthcare systems. The Coordinating Center was tasked to share research from the three Centers of Excellence on the characteristics of high-performing health systems, to help accelerate the adoption of PCOR to improve care and efficiency within health systems across the Nation.

To achieve these goals, the Coordinating Center conducted various activities, including:

- Facilitating collaboration among the Centers of Excellence.
- Gathering input from stakeholders and technical experts.
- Synthesizing findings.
- Conducting data analyses.
- Developing a compendium of health system characteristics and performance indicators.
- Broadly disseminating the initiative's findings and lessons learned.

Coordinating Center Activities

Coordinate and Facilitate Collaboration: The Coordinating Center facilitated coordination and communication among the Centers of Excellence and promoted collaboration. This coordination and collaboration helped align the concepts, data, methods, and measures needed to compare health system performance and ensured that evidence the Centers of Excellence collected was comprehensively examined to contribute to a synthesis of the initiative's findings. Activities in this area included regular workgroup meetings with researchers from the Centers of Excellence to discuss key topics and annual workshops. By the end of the contract, Mathematica had convened 12 virtual workgroups and 5 workshops.

Convene Experts and Stakeholders: The Coordinating Center convened a technical expert panel (TEP) consisting primarily of health system leaders. These experts met regularly to advise AHRQ and the Centers of Excellence about data and performance measures, types of evidence most useful to stakeholders, research gaps, dissemination products, and effective strategies for reaching stakeholders. By the end of the contract, Mathematica had convened nine virtual and in-person TEP meetings.

Synthesize and Disseminate Research on Health System Performance: To speed the adoption of practices that can improve the performance of health systems, the Coordinating Center synthesized and broadly disseminated research and evidence produced by the Centers of Excellence. Research took the form of journal articles, issue briefs, fact sheets, maps, and data visualizations. The evidence helped clarify the types of systems, processes, incentives, and environments or markets that speed the diffusion of PCOR findings into practice to produce the best patient-centered outcomes.

Dissemination efforts leveraged a network of partners that supported the initiative to effectively target health system decision makers, policymakers, researchers, and other key stakeholders.

Produce a Compendium on U.S. Healthcare Systems: The Coordinating Center created a compendium that enables users to access health system data and information about practices for achieving evidence-based and patient-centered care. The compendium is a valuable resource for those interested in (1) understanding the characteristics of health systems, (2) comparing and contrasting the performance of different health systems, and (3) examining the performance improvement approaches of various health systems.

These data resources provide tools that allow users to identify characteristics of diverse established health systems; make comparisons across systems and communities; and graphically depict key health system characteristics and other environmental factors that may contribute to higher quality care.

II. Accomplishments

The CHSP Initiative invested in data products (datasets and study protocols) to support research on health systems and peer-reviewed and other publications that describe the health system landscape in the United States and contextualize opportunities to disseminate and implement PCOR evidence.

CHSP Data Products

The Centers of Excellence and Coordinating Center developed data resources for identifying, understanding, and comparing health systems. Specifically, Dartmouth's National Survey of Healthcare Organizations & Systems, NBER's Health Systems and Providers Database, RAND's case studies, and AHRQ's Compendium of U.S. Health Systems support research on health system characteristics and performance.

Dartmouth's National Survey of Healthcare Organizations & Systems

Dartmouth's National Survey of Healthcare Organizations & Systems (NSHOS) is "a suite of nationally representative surveys that aim to characterize the structure, ownership, leadership, and care delivery capabilities of health systems, primary and multispecialty care physician practices, and hospitals" (Dartmouth, 2020). The Dartmouth Center of Excellence defined health systems as organizations that owned or managed (1) one or more hospitals and one or more primary or multispecialty care physician practices, (2) two or more hospitals (but no practices), or (3) two or more practices (but no hospitals).

Using the IQVIA OneKey database to identify systems, physician practices, and hospitals, the Dartmouth Center of Excellence created a sampling frame to identify potential respondents. This sampling frame excluded Federal systems (including the Indian Health Service and Department of Veterans Affairs) and systems that focused on a medical specialty, such as cancer (Dartmouth, 2020).

The NSHOS used a coupled sampling approach to link surveys of three different types of organizations (hospitals, physician practices, and corporate owners). By coupling sample selection across the three survey populations, the surveys included representatives from each organizational component of sampled health systems (that is, including a system-owned hospital in the hospital survey guaranteed including the system owner in the system survey and a sample of any owned practices in the practice survey) (O'Malley and Park, 2020).

The Dartmouth Center of Excellence fielded the NSHOS from June 2017 to August 2018 (Dartmouth, 2020). It had four survey populations:

- Primary and multispecialty care physician practice respondents came from practice managers and physicians in practices with at least three primary care physicians (family medicine, geriatric medicine, internal medicine, or preventive medicine). Questions covered topics including organizational characteristics (such as ownership and culture), patient engagement (such as shared decision making), and resources (such as information systems, also referred to as health IT), as well as payment (such as the structure of compensation) and participation in payment and delivery reform initiatives (such as ACOs) (Dartmouth, n.d.a.). The NSHOS includes 2,333 responses from 4,976 sampled practices (Dartmouth, 2020).
- Hospital respondents came from C-suite leaders, such as chief medical officers, at short-term, acute care, and critical access hospitals. The question topics for hospitals cover similar topics as the questions for practices, including organizational characteristics, patient engagement, resources, payment, and participation in payment and delivery

reform initiatives (Dartmouth, n.d.b.). The NSHOS includes 757 responses from 1,628 sampled hospitals (Dartmouth, 2020).

- System respondents came from C-suite leaders, such as chief executive officers and chief medical officers. System questions covered similar topics as the practice and hospital surveys but with more focus on the degree of uniformity or variation across the component organizations in the system (that is, whether none, some, most, or all hospitals or medical groups collect and use information about individual clinicians' performance) (Dartmouth, n.d.c.). The NSHOS includes 341 responses from 570 sampled health systems (Dartmouth, 2020).
- Some healthcare systems include owner subsidiaries, organizations that themselves own physician practices or hospitals. The NSHOS includes responses from C-suite or director-level leaders from 107 of 222 sampled owner subsidiary organizations (Dartmouth, 2020).

NBER's Health Systems and Providers Database

The NBER Health Systems and Providers Database (HSPD) is a relational database with microdata on health systems, hospitals, physicians, and post-acute care facilities for 2010 to 2016. Health systems in the HSPD are defined as sets of provider organizations that are jointly owned or managed and contain at least one general acute care hospital, 10 primary care physicians whose primary billing Tax Identification Number (TIN) is owned or managed by the system, and 50 total physicians billing a plurality of their claims under a system TIN.

The HSPD further specifies that the minimum set of providers must be located within a single hospital referral region (NBER, 2020). This definition aims to ensure that health systems have the capacity to coordinate services across primary and specialty care in multiple settings (NBER, 2020).

The HSPD draws on more than 20 administrative and secondary data sources to identify hospitals and physicians (defined as a medical doctor or a doctor of osteopathy) who delivered care to patients during a given year, including such sources as:

- CMS PECOS file,
- CMS provider of services file,
- CMS Physician Compare,
- IQVIA physician and hospital files,
- CMS Medicare Data on Provider Practice and Specialty,
- Traditional fee-for-service Medicare claims,
- Commercial claims data,
- CMS Medicaid Analytic eXtract Provider Characteristics files,
- Extracts from State all-payer claims data, and
- AHA data.

The NBER Center of Excellence identified physicians by their National Provider Identifier number and classified them by specialty by mapping certifications offered by the American Board of Medical Specialties. The team defined primary care as family practice, general practice, pediatrics, geriatrics, or internal medicine with no medical or surgical specialty (excluding

pediatric subspecialty). The NBER Center of Excellence restricted the sample to those that delivered care to patients during a given year. It defined a physician practice as a "legal entity that is fully or partially owned by physicians or that employs physicians actively delivering care" and mapped physicians to practices based on the majority of their claims (NBER, 2020).

For acute care hospitals, which the NBER Center of Excellence defined as "a facility with at least 6 beds available for patients receiving inpatient care for acute medical conditions," the team combined data from the CMS provider of services file, IQVIA hospital file, and AHA data (NBER, 2020).

The NBER Center of Excellence linked providers with corporate owners through TINs, relying on additional datasets such as:

- PECOS enrollment association files,
- Internal Revenue Service Business Master File and 990 Filings for Tax-Exempt Entities,
- Annual Securities and Exchange Commission 10-K filings,
- Standard & Poor's Capital IQ M&A Transactions, and
- Irving Levin annual files.

The NBER Center of Excellence also leveraged CMS Certification Numbers from the PECOS Medicare ID file to link additional hospitals and post-acute care facilities. Finally, the NBER Center of Excellence categorized health systems that met its definition as academic, public, large not for profit, or large for profit (NBER, 2020).

The HSPD includes variables that can help describe the structure and characteristics of different health systems (that is, their geographic scope and number of providers) and:

- Use of PCOR-based evidence (including delivery of recommended care),
- Related clinical outcomes,
- Cost of care, and
- Patient and family self-reports about the quality of care received (including Consumer Assessment of Healthcare Providers and Systems and Hospital Consumer Assessment of Healthcare Providers and Systems surveys).

RAND's Case Studies

The RAND team selected 24 health systems in 4 States for a comparative case study analysis. The systems were chosen from four States that represent two geographically situated pairs (two in the West and two in the Midwest) that are similar in geography and population demographics.

This convenience sample of States was selected because:

1. These States have been at the forefront of collecting and publicly reporting standardized performance measures;
2. Each is hosting a healthcare improvement collaborative and promoting consumer engagement; and

3. The collaborative in each of these States agreed to partner with RAND to provide performance data, to provide information on market context, to assist in recruiting health systems, and to collaborate in disseminating findings.

To develop the sampling frame, RAND obtained a list of all physician organizations (POs) publicly reporting performance data (e.g., HEDIS, CAHPS, total cost of care measures) in their State, from each of their four partners. Using secondary data sources, they identified whether POs were affiliated with a health system and, if so, with which health system. From that universe of health systems, RAND selected a purposive (nonrandom) sample of 24 health systems with a target of 10 in the largest State and 5 each in the smaller States.

To develop the sample, within each of the four States, they classified health systems on size (large/medium/small) based on the number of physicians and performance (high/medium/low) based on a rough composite of publicly-reported quality measures in that State. In addition to selecting health systems, they selected a single physician organization from each sampled health system for intensive study (Ridgely, et al., 2020).

The RAND Center of Excellence team then organized "virtual" site visits, composed of 60- to 90-minute telephone interviews with five to eight senior executives in each system. The executives included the health system's CEO and chief financial, information, medical, and quality officers and the PO's chief executive, information, and medical officers.

Ph.D.-level investigators conducted and audio recorded interviews with 162 executives over a 21-month period ending in March 2019. Interview topics were informed by a literature review and modified Delphi panel process. A panel of experts composed of leaders who design, build, and operate health systems reviewed and discussed the compiled empirical literature and prioritized attributes of systems relevant for the study (Ridgely, et al., 2020).

Interview protocols were tailored to each executive's sphere of responsibility. Topics included:

- Market context;
- Health system origin;
- Structural organization, governance, and management of the health system and its hospitals and POs;
- Payment and risk-based contracting;
- Influence of the health system on hospital and PO operations;
- Culture and leadership;
- Leadership compensation, physician compensation, and physician performance measurement;
- Health IT;
- Care redesign and population management;
- Quality improvement;
- Structures and processes to move evidence to practice;
- Characteristics of high-performing systems; and
- "Value added" (if any) of belonging to a system.

In addition, as part of the interview process, investigators asked a single representative from each system (and from the affiliated PO) to answer a short series of closed-ended questions about their organization, including, for example, its tax status, corporate structure, ownership, payer base, type of contracting, and percent at-risk contracting (Ridgely, et al., 2020).

AHRQ Compendium of U.S. Health Systems

The AHRQ Compendium of U.S. Health Systems is a publicly available database that identifies systems, describes their clinical and structural attributes, and enumerates the hospitals and practices in each system. The 2016 and 2018 Compendium of U.S. Health Systems identify health systems operating in the United States in 2016 and 2018.

The Compendium defined health systems as organizations that include at least one hospital and at least one group of physicians providing comprehensive care (including primary and specialty care) connected with each other and with the hospital through common ownership or joint management (Barrett, et al., 2019; Kimmey, et al., 2019a). Operationally, a system must include at least one hospital and at least 50 physicians, 10 or more of whom must be primary care physicians (Barrett, et al., 2019; Kimmey, et al., 2019a).

The 2016 and 2018 Compendium used several administrative and secondary data resources to identify health systems, including the AHA Annual Survey, Healthcare Organization Services, and SK&A Healthcare. The IQVIA OneKey database replaced the Healthcare Organization Services and SK&A databases in the 2018 Compendium.

Using these data, the Coordinating Center identified potential systems across the three data sources, including identifying nested relationships, which are subsystems that operate under a parent system (Barrett, et al., 2019; Kimmey, et al., 2019a). The Coordinating Center then used information on the systems' hospitals, group practices, and physicians to restrict the potential systems to those that meet the CHSP working definition of a health system.

The Compendium database includes basic descriptive information about health systems (size and location) and other variables identifying characteristics of health systems. For example, both Compendiums describe the extent to which systems include investor-owned hospitals, serve children, include teaching hospitals, and serve a disproportionately high share of people who have low income and are uninsured (Barrett, et al., 2019).

The 2016 Compendium described health system participation in alternative payment models (ACOs and Medicare bundled payment programs) and insurance product offerings (Barrett, et al., 2019), variables that were added to the 2018 Compendium in January 2021. The 2018 Compendium will also include variables describing advanced practice clinicians and system-affiliated nursing homes (Kimmey, et al., 2019a).

To better enable users to analyze health systems, the Compendium database includes two analytic files that can link system-affiliated providers to external data sources. The Hospital Linkage Files link hospitals to health systems and include information on hospitals, including name, street address, city, State, and ZIP Code. The file also includes CMS Certification Numbers, a hospital identifier that enables users to link the data to a host of other data sources.

For hospitals in systems, the files list the system names and identifiers that can be directly linked to the Compendium system files.

Users of the hospital linkage file can identify hospitals within and outside of health systems. Then, using additional data sources (such as the AHA's annual survey database and CMS's provider of services file), they can examine aspects of systems and their members, such as cost and quality of care (Barrett, et al., 2018; Kimmey, et al., 2019b).

The Group Practice Linkage Files link group practices (that is, TINs) to Compendium systems based on data sources that indicate ownership or tight management relationships. For TINs in systems, the files list the system names and identifiers that can link directly to the Compendium system files. Users of the Group Practice Linkage Files can link data from other data sources through the TIN organization name from the Medicare Data on Provider Practice and Specialty data or the PECOS Associate Control ID (Jones, et al., 2019, 2020).

The files also contain variables (for example, total number of physicians and line items from Medicare claims for the physicians billing the TINs) that can uniquely link to the Medicare Data on Provider Practice and Specialty data. These variables enable users to identify the TINs and National Provider Identifiers for providers in systems. In turn, identifying TINs and National Provider Identifiers in systems enables users to link to a wide range of additional data sources, such as Medicare claims and CMS's Physician Compare.

CHSP Publications

Throughout the initial 5 years of the CHSP Initiative (September 1, 2015, to August 31, 2020), the three Centers of Excellence, the Coordinating Center, and AHRQ collaborated to leverage the data products discussed above and other resources to understand:

- Increasing consolidation in the United States (e.g., Furukawa, et al., 2020b),
- Variation in health system structure and integration mechanisms (e.g., Ridgely, et al., 2020), and
- Relationship between financial integration and quality of care (e.g., Fisher, et al., 2020; Zhou, et al., 2020).

About 220 scholars associated with CHSP published 105 articles in more than 38 peer-reviewed journals and other venues during this time, including high-impact journals targeting clinical, health policy, and health services research audiences. These journals included the *New England Journal of Medicine* (e.g., Beaulieu, et al., 2020), the *Journal of the American Medical Association* (e.g., Briggs, et al., 2018), and *Health Affairs* (e.g., Furukawa, et al., 2020b; Fisher, et al., 2020). In addition, a special issue of *Health Services Research* focused on comparative health system performance, featuring papers from all three Centers of Excellence and the Coordinating Center. (Appendix A has a full list of papers published throughout the CHSP Initiative.)

Published CHSP articles can be classified into six research focus areas:

1. Advancing methods;
2. Characterizing systems;

3. Understanding systems' external environments;
4. Understanding systems' internal processes;
5. Understanding systems' patient factors, patient engagement, and PCOR; and
6. Assessing system performance.

These areas are not mutually exclusive (that is, an article that looked at the relationship between internal processes and system performance could plausibly fall under the understanding systems' internal processes category or the assessing system performance category), but they nonetheless provide a useful heuristic for understanding CHSP findings. The following sections briefly catalog the articles published in each area, including the type of article (empirical, review, or conceptual/commentary), data sources used (if applicable), and the level of delivery system (health systems, ACOs, hospitals, medical groups, or other).

In each of the six areas, we also catalog any explicit focus on specific patient populations. These include AHRQ priority populations (children and adolescents, older patients, people with special healthcare needs, inner-city populations, low-income populations, racial and ethnic minorities, rural populations, or women) and patients with specific diseases or conditions (such as patients with asthma).

Research Focus: Advancing Methods

The Centers of Excellence and Coordinating Center published 13 articles on methods; 8 were empirical, and the remaining 5 were conceptual or commentary articles. The empirical articles drew on different data sources, including the 2016 Compendium of U.S. Health Systems and RAND's case studies. For example, Ridgely, et al. (2019) published an article in *eGEMs* using RAND's case study data examining cross- and within-system variation in health system relationships to the hospitals and physician organizations they own, operate, or manage and to other loosely affiliated organizations.

> "Health systems vary on multiple dimensions related to organizational structure (e.g., size, complexity) which reflects history, market and mission…we observed within-system variation both in mechanisms (e.g., employment of physicians, system-wide EHR, standardization of service lines) and level of influence. Concepts such as 'core' versus 'peripheral' were more salient than 'ownership' versus 'contract.'"
>
> – Ridgely, et al. (2019)

The conceptual articles also supported CHSP work; for example, O'Malley and Park (2020) published a more conceptual piece in *Health Services and Outcomes Research Methodology* about the algorithm used to drive National Survey of Healthcare Organizations & Systems sampling.

> "In this paper we described the development of a novel coupled sampling design for the National Survey of Healthcare Organizations & Systems surveys…A key finding was that the sample-size of complete observations for the estimation of regression models involving measures from across the different surveys is substantially (e.g., 10-fold) greater under coupled sampling compared to under independent sampling designs. Therefore, the coupled sampling design facilitates a wider range of statistical analyses than is feasible under traditional survey designs."
>
> – O'Malley and Park (2020)

Eight articles focused on methods specific to research on health systems, and four focused on methods for studying medical groups. One paper about patient measures did not focus on a specific level of delivery system. None of the articles in the area of advancing methods explicitly focused on specific disease populations. One article focused on an AHRQ priority population: Lewis, et al. (2019) published an article in *Medical Care* developing and validating a measure that estimates individual-level poverty for studies that rely on Medicare administrative data, which is relevant to low-income populations.

Research Focus: Characterizing Systems

The Centers of Excellence and Coordinating Center published 17 articles characterizing systems, all of which were empirical. These publications leveraged the AHRQ Compendium of U.S. Health Systems, RAND case studies, and the National Survey of Healthcare Organizations & Systems, in addition to other primary and secondary data sources, such as interviews and administrative data. In all, 15 articles focused on health systems and two focused on ACOs. For example, in *Health Affairs,* Furukawa, et al. (2020b) enumerated health systems using the Compendium and described variation in structural attributes such as size, ownership, and geographic presence.

> "Provider consolidation into vertically integrated health systems increased from 2016 to 2018. More than half of US physicians and 72 percent of hospitals were affiliated with one of 637 health systems in 2018."
>
> – Furukawa, et al. (2020b)

In addition, in *Health Services Research,* Machta, et al. (2020b) examined the change in percentage of physicians affiliated with health systems by specialty from 2016 to 2018.

> "Between 2016 and 2018, system participation increased for primary care and the 10 other physician specialties…however, rates varied substantially across markets. For most specialties, high market concentration by insurers and hospital-systems was associated with lower rates of physician integration."
>
> – Machta, et al. (2020b)

One article focused on an AHRQ priority population: Machta, et al. (2019) examined how the characteristics of safety net hospitals varied based on whether they were part of a system and on the size of those systems. None of the articles in the area of characterizing systems focused on specific disease populations.

Research Focus: Understanding Systems' External Environments

One article from the Centers of Excellence and Coordinating Center focused on systems' external environments. In *JAMA*, Briggs, et al. (2018) described mandatory health reform efforts in England to draw attention to different challenges facing U.S. reforms. Examples include "conflicting financial incentives for both clinicians and organizations" and performance measures that focus on clinical factors for patients covered by a particular health plan rather than community-level measures that reflect "social, behavioral, and environmental determinants of health." The article focused on health systems and did not specify an explicit focus on a specific patient population.

Research Focus: Understanding Systems' Internal Processes

The Centers of Excellence and Coordinating Center published 24 articles on internal processes. Of these articles, 21 were empirical, and 3 were conceptual or commentary articles. Eleven of the empirical articles used data from the National Survey of Accountable Care Organizations, the National Survey of Healthcare Organizations & Systems, or RAND's case studies. The remaining articles drew on data sources outside the Centers of Excellence' Data Cores, such as the Healthcare Information and Management Systems Society Analytics database.

Eight articles about internal processes focused on health systems, seven focused on ACOs, seven focused on medical groups or physician networks, one focused on post-acute care facilities, and one focused on multiple levels of delivery system organization. For example, in *Health Services Research,* Ridgely, et al. (2020) used RAND's case studies to examine whether and to what extent health systems vary across dimensions of structural, functional, and clinical integration.

> "Structural, functional, and clinical integration vary across systems, with considerable activity around centralizing business functions, aligning financial incentives with physicians, establishing enterprise-wide EHR, and moving toward single signatory contracting. Executives describe clinical integration as more difficult to achieve, but essential."
>
> – Ridgely, et al. (2020)

In addition, in *Milbank Quarterly,* Brewster, et al. (2020) used the National Survey of Healthcare Organizations & Systems to examine practices' social risk screenings and the potential relationship between the screenings and practice's participation in value-based payment models or capacity for innovation.

> "…Implementation of social risk screening—an initial step in enhancing awareness of social needs—is not associated with overall exposure to value-based payment for physician practices. Instead, social risk screening is being implemented by practices with high capacity for innovation and in practices serving patient populations likely to face social risks, regardless of payment incentives."
>
> – Brewster, et al. (2020)

One publication focused on an AHRQ priority population and a specific disease population describing the potential benefits for older patients of designating specific nursing facilities as COVID-19 skilled care centers (Dafny and Lee, 2020).

Research Focus: Understanding Systems' Patient Factors, Patient Engagement, and PCOR

The Centers of Excellence and Coordinating Center published eight empirical articles on patient factors, patient engagement, and PCOR. The articles that referenced data from Centers of Excellence Data Cores primarily relied on the National Survey of Healthcare Organizations & Systems. Other articles used other data sources, such as the CMS Provider of Services file and U.S. Census data.

One article on patient factors, patient engagement, and PCOR focused on health systems, three focused on ACOs, two focused on hospitals, and two focused on medical groups (including those participating in ACOs). For example, in *JAMA Network Open*, Fraze, et al. (2019) used the National Survey of Healthcare Organizations & Systems to examine the types of physician practices and hospitals that screen patients for key social needs, such as food insecurity, housing instability, and transportation needs.

> "Approximately 24% of hospitals and 16% of physician practices reported screening for food insecurity, housing instability, utility needs, transportation needs, and interpersonal violence. Federally qualified health centers and physician practices participating in bundled payments, primary care improvement models, and Medicaid accountable care organizations screened more than other hospitals, and academic medical centers screened more than other practices. "
>
> – Fraze, et al. (2019)

In addition, in the *Journal of General Internal Medicine,* Shortell, et al. (2017) examined the relationships among selected practice characteristics, patient engagement, and patient-reported outcomes of care for adult primary care practices seeing patients with diabetes, cardiovascular disease, or both.

Three articles focused on AHRQ priority populations. For example, Nguyen, et al. (2019) examined low-income populations by quantifying the variation in the supply of primary and specialty care physicians and acute care and specialty hospitals for low- versus high-income communities after passage of the Affordable Care Act. One article in this topic area focused on specific disease populations—in this case, patients with diabetes, cardiovascular disease, or both (Shortell, et al., 2017).

Research Focus: Assessing System Performance

The Centers of Excellence and Coordinating Center published 39 articles on system performance: most (36) were empirical, one was a review, and two were conceptual or commentary articles. The articles used numerous data sources, including the AHRQ Compendium of U.S. Health Systems, the Health Systems and Providers Database, the National Survey of Healthcare Organizations and Systems, RAND case studies, and other primary and secondary data, such as the CMS Master Beneficiary Summary File.

Of the 39 articles, 16 focused on health systems, 11 focused on ACOs, 7 focused on hospitals, 3 focused on medical groups, and 2 focused on other types of organizations or did not specify a level of focus. For example, in the *New England Journal of Medicine*, Beaulieu, et al. (2020) examined how acquired hospitals' performance changed from the time before to the time after acquisition.

> "Hospital mergers and acquisitions from 2009 through 2013 were associated with modest deterioration in performance on patient-experience measures and no detectable changes in readmission or mortality rates at acquired hospitals. Effects on performance on clinical-process measures at acquired hospitals were inconclusive. Taken together, these findings provide no evidence of quality improvement attributable to changes in ownership."
>
> – Beaulieu, et al. (2020)

Also, in *Health Affairs,* Fisher, et al. (2020) compared differences in the adoption of care delivery and payment reforms for hospital and physician practices under different ownership structures.

> "Scores varied widely across hospitals and practices, but little of this variation was explained by ownership status…Greater financial integration was generally not associated with better quality."
>
> – Fisher, et al. (2020)

Sixteen articles assessing system performance included AHRQ priority populations. Eight focused on people with special healthcare needs (with one article also focused on older patients), four focused on low-income populations, two focused on racial and ethnic minorities, and one focused on rural populations.

Seven articles about system performance focused on specific disease populations, including patients with lumbar fusion, hip and knee osteoarthritis, diabetes, and cardiovascular and comorbid mental health conditions, as well as those with at least three Hierarchical Condition Categories. For example, in *Health Services Research*, Colla, et al. (2020) assessed the relationships between clinical and financial integration and utilization and health-related outcomes in cohorts of complex and noncomplex patients.

III. Implications

Before the CHSP Initiative, research on health systems was limited, with many unanswered questions related to health systems' structure, financing, performance, responsiveness to policy, and application of new evidence to achieve more patient-centered care. Furthermore, the absence of data to comprehensively identify, describe, and examine health systems limited efforts to address these gaps (Casalino, 2014). In turn, this state of knowledge impeded effective action by policymakers, healthcare leaders, and researchers wishing to improve dissemination and implementation of evidence from PCOR.

AHRQ recognized that to increase the use of evidence in care delivery, diverse stakeholders needed a deeper understanding of the types of organizations that deliver care, the way they use evidence, and how they affect providers' and patients' decisions. Building on its expertise in dissemination and implementation, AHRQ invested in Centers of Excellence that could study health systems as potential loci for improving healthcare delivery and provide rigorous evidence to help drive concrete action.

In the past 5 years, CHSP research has made considerable progress addressing the evidence gaps identified by Casalino (2014). Related to the prevalence of different organizations in the health system and structures within those organizations, the CHSP Initiative advanced knowledge of the methods needed to identify health systems and their member hospitals and practices.

The CHSP Initiative has also empirically cataloged health systems throughout the United States using secondary data. For example, CHSP researchers used diverse data sources to develop the AHRQ Compendium of U.S. Health Systems to identify, enumerate, and characterize the diverse health systems operating in the United States (Furukawa, et al., 2020a). The RAND Center of Excellence also used case studies to identify different types of organizations that operate within health systems as well as relationships between those organizations (Ridgely, et al., 2019).

CHSP researchers generated policy-relevant information about financial and other incentives that aim to promote healthcare improvements. For example, using Dartmouth's National Survey of Healthcare Organizations & Systems, CHSP researchers found that physician practices participating in ACOs were more likely to collect and use information about physician performance for quality improvement compared with practices that were not part of ACOs; however, these performance data had little impact on overall physician compensation (Rosenthal, et al., 2019).

CHSP researchers also analyzed data from interviews and a survey of provider organizations affected by a statewide value-based payment program. They found that the program led a significant portion of organizations to invest in primary care redesign and efforts to control hospital costs (Damberg, et al., 2019).

In addition, the CHSP Initiative advanced methods for measuring provider and organizational performance. For example, one research team constructed and evaluated a composite measure of health system ambulatory care quality using publicly reported data (Agniel, et al., 2020), which other researchers can leverage to support future analyses on health system performance.

CHSP researchers also examined different publicly available summary measures of provider performance to determine how differences between measures affect which medical groups would be classified as high performers. They found that classification of medical groups is sensitive to the approach used and suggested that "an agreed-upon standard definition of high performance and approach to measurement is needed" to facilitate future payment and delivery system reform (Ahluwalia, et al., 2020).

Finally, the CHSP Initiative provided information on the effectiveness of interorganizational or interprovider processes for improving care quality and reducing hospital readmissions. For example, using the NBER's Health Systems and Providers Database, CHSP researchers found that hospitals acquired by health systems experienced a decline in patient experience measures and no significant change in hospitals readmissions or mortality rates (Beaulieu, et al., 2020).

Another group of CHSP researchers used the AHRQ Compendium of U.S. Health Systems to show that health system–affiliated hospitals participating in an episode-based payment model might be able to more effectively lower healthcare costs without reducing quality compared with hospitals not affiliated with health systems (Machta, et al., 2020a). Although questions remain in each of the domains Casalino (2014) identified, by advancing the data and methods available to study systems, CHSP will continue to facilitate future research. In turn, this effort will improve the speed, adoption, and diffusion of comparative effectiveness research–recommended practices through those systems.

Researchers outside the CHSP Initiative have already begun to use the Compendium and its linkage files to examine key issues related to health system performance. For example, scholars have used the Compendium to:

- Examine clinicians' performance under the Merit-based Incentive Payment System (Johnston, et al., 2020a, 2020b);
- Quantify health systems' investment in programs addressing housing, employment, education, food security, and other social determinants of health (Horwitz, et al., 2020);
- Understand safety net hospitals' sepsis policies (Barbash and Kahn, 2019);
- Examine variation in surgical outcomes (Sheetz, et al., 2019); and
- Understand data breaches of protected health information (Ronquillo, et al., 2018).

In conclusion, the CHSP Initiative advanced knowledge by investing in enduring resources and foundational analyses to better understand and characterize the diversity of health systems' composition and performance in the United States. The Centers of Excellence and the Coordinating Center have identified increases in health system consolidation over time, cataloged different dimensions of variation among and within systems (including their composition, types of integration, and change over time), and revealed their complexity.

The Centers of Excellence and Coordinating Center have also demonstrated that system affiliation is not in and of itself the key to improving healthcare outcomes. In doing so, the CHSP Initiative created actionable evidence and a launching point for future work to inform policymakers, healthcare organization leaders, researchers, and other public stakeholders on which health system features best help disseminate and implement patient-centered evidence. This contribution enables future AHRQ-funded initiatives to better facilitate the use of PCOR information by patients, clinicians, and other stakeholders to improve healthcare decision making.

References

Note: All web pages in this list were accessed May 27, 2021.

Agniel D, Haviland A, Shekelle P, Scherling A, Damberg CL. Distinguishing High-Performing Health Systems Using a Composite of Publicly Reported Measures of Ambulatory Care. Ann Intern Med 2020;173(10):791–8. https://www.acpjournals.org/doi/10.7326/M20-0718?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org& rfr_dat=cr_pub%20%200pubmed.

Ahluwalia SC, Damberg CL, Haas A, Shekelle P. How Are Medical Groups Identified as High-Performing? The Effect of Different Approaches to Classification of Performance. BMC Health Serv Res 2019;19(500). https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6639957/.

Barbash IJ, Kahn JM. Sepsis Quality in Safety-Net Hospitals: An Analysis of Medicare's SEP-1 Performance Measure. J Crit Care 2019;54:88–93. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6901718/

Barrett K, Peckham K, Jones D, Machta RM, Heeringa J, Rich EC, Kimmey L. Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2016, Hospital Linkage File, Technical Documentation. Rockville, MD: Agency for Healthcare Research and Quality; October 2018. https://www.ahrq.gov/ sites/default/files/wysiwyg/chsp/compendium/chsp_linkage_file_tech_doc.pdf.

Barrett K, Peckham K, Jones D, Machta RM, Heeringa J, Rich EC. Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2016, Technical Documentation. Rockville, MD: Agency for Healthcare Research and Quality; January 2019. https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/ compendium/techdocrpt_0.pdf.

Beaulieu ND, Dafny LS, Landon BE, Dalton JB, Kuye I, McWilliams JM. Changes in Quality of Care After Hospital Mergers and Acquisitions. New Engl J Med 2020;382(1);51–9. https://www.nejm.org/doi/full/10.1056/ NEJMsa1901383?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed.

Brewster AL, Fraze TK, Gottlieb LM, Frehn J, Murray GF, Lewis VA. The Role of Value-Based Payment in Promoting Innovation To Address Social Risks: A Cross-Sectional Study of Social Risk Screening by U.S. Physicians. Milbank Q 2020 Dec;98(4):1114–33. https://pubmed.ncbi.nlm.nih.gov/33078875/.

Briggs ADM, Alderwick H, and Fisher ES. Overcoming Challenges to U.S. Payment Reform: Could a Place-Based Approach Help? JAMA 2018;319(15):1545–6. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5944326/.

Casalino LP. Identifying Key Areas for Delivery System Research. Rockville, MD: Agency for Healthcare Research and Quality; 2014. AHRQ Publication No. 14-0024-EF. https://www.ahrq.gov/practiceimprovement/delivery-initiative/casalino/paper/index.html.

Colla CH, Yang W, Mainor AJ, Meara E, Ouayogode MH, Lewis VA, Shortell S, Fisher E. Organizational Integration, Practice Capabilities, and Outcomes in Clinically Complex Medicare Beneficiaries. Health Serv Res 2017;55(s3):1085–97. https://pubmed.ncbi.nlm.nih.gov/33104254/.

Dafny L, Lee SS. Designating Certain Post-Acute Care Facilities as COVID-19 Skilled Care Centers Can Increase Hospital Capacity and Keep Nursing Home Patients Safer. Health Aff blog, April 15, 2020. https://www.hbs.edu/ faculty/Pages/item.aspx?num=58028.

Damberg CL, Silverman M, Burgette L, Vaiana ME, Ridgely MS. Are Value-Based Incentives Driving Behavior Change To Improve Value? Am J Manage Care 2019;25(2):e26–e32. https://pubmed.ncbi.nlm.nih.gov/30763040/.

Dartmouth. Comparative Health System Performance: About NSHOS. 2020. https://sites.dartmouth.edu/coe/nshos/.

Dartmouth. National Survey of Healthcare Organizations & Systems: Improving Care for All. Practice Level Questionnaire. n.d.a. https://cpb-us-e1.wpmucdn.com/sites.dartmouth.edu/dist/3/2083/files/2019/05/Practice-MailFormat-FINAL.pdf.

Dartmouth. National Survey of Healthcare Organizations & Systems: Improving Care for All. Hospital Level Questionnaire. n.d.b. https://cpb-us-e1.wpmucdn.com/sites.dartmouth.edu/dist/3/2083/files/2019/05/Hospital-MailFormat-FINAL.pdf.

Dartmouth. National Survey of Healthcare Organizations & Systems: Improving Care for All. Systems Level Questionnaire. n.d.c. https://cpb-us-e1.wpmucdn.com/sites.dartmouth.edu/dist/3/2083/files/2019/05/System-MailFormat-FINAL.pdf.

Desai S, McWilliams JM. Consequences of the 340B Drug Pricing Program. New Engl J Med 2018;378:539–48. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6073067/.

Diaz-Perez MJ, Hanover R, Sites E, Rupp D, Courtemanche J, Levi E. Producing Comparable Cost and Quality Results From All-Payer Claims Databases. Am J Manage Care 2019;25(5):e138–e144. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6613782/.

Fisher ES, Shortell SM, O'Malley AJ, Fraze TK, Wood A, Palm M, Colla CH, Rosenthal MB, Rodriguez HP, Lewis VA, Woloshin S, Shah N, Meara E. Financial Integration's Impact on Care Delivery and Payment Reforms: A Survey of Hospitals and Physician Practices. Health Aff (Millwood) 2020;39(8):1302–11. https://pubmed.ncbi.nlm.nih.gov/32744948/.

Fowler AC, Grabowski DC, Gambrel RJ, Huskamp HA, Stevenson DG. Corporate Investors Increased Common Ownership in Hospitals and the Postacute Care and Hospice Sectors. Health Aff (Millwood) 2017;36(9):1547–55. https://pubmed.ncbi.nlm.nih.gov/28874480/.

Fraze TK, Brewster AL, Lewis VA, Beidler LB, Murray GF, Colla CH. Prevalence of Screening for Food Insecurity, Housing Instability, Utility Needs, Transportation Needs, and Interpersonal Violence by U.S. Physician Practices and Hospitals. JAMA Netw Open 2019 Sep 4;2(9):e1911514. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6752088/.

Furukawa MF, Machta RM, Barrett KA, Jones DJ, Shortell SM, Scanlon DP, Lewis VA, O'Malley AJ, Meara ER, Rich EC. Landscape of Health Systems in the United States. Med Care Res Rev 2020a;77(4):357–66. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7187756/.

Furukawa MF, Kimmey L, Jones DJ, Machta RM, Guo J, Rich EC. Consolidation of Providers Into Health Systems Increased Substantially From 2016 to 2018. Health Aff (Millwood) 2020b;39(8):1321–5. https://www.healthaffairs.org/doi/abs/10.1377/hlthaff.2020.00017.

Horwitz LI, Chang C, Arcilla HN, Knickman JR. Quantifying Health Systems' Investment in Social Determinants of Health, by Sector, 2017–19. Health Aff (Millwood) 2020;39(2):192–8. https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2019.01246.

Johnston KJ, Hockenberry JM, Wadhera RK, Joynt Maddox KE. Clinicians With High Socially At-Risk Caseloads Received Reduced Merit-Based Incentive Payment System Scores. Health Aff (Millwood), 2020a;39(9):1504–12. https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2020.00350.

Johnston KJ, Wiemken TL, Hockenberry JM, Figueroa JF, Joynt Maddox KE. Association of Clinician Health System Affiliation With Outpatient Performance Ratings in the Medicare Merit-based Incentive Payment System. JAMA 2020b;324(10):984–92. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7489823/.

Jones D, Machta RM, Rich EC, Peckham K, Nelson S. Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2016, Group Practice Linkage File, Technical Documentation. Rockville,

MD: Agency for Healthcare Research and Quality; October 2019. https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/compendium/CHSP_2016_GPLF_tech_Dec2020.pdf.

Jones DJ, Peckham K, Nelson S, Machta RM, Rich EC. Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2018, Group Practice Linkage File, Technical Documentation. Rockville, MD: Agency for Healthcare Research and Quality; December 2020. https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/compendium/2018-chsp-tin-linkage-file-tech-doc.pdf.

Kimmey L, Machta R, Peckham K, Jones D, Whicher D, Farid M, Rich E. Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2018, Technical Documentation. Washington, DC: Mathematica; November 2019a. https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/compendium/2018-Compendium-TechDoc-update.pdf.

Kimmey L, Peckham K, Jones D, Machta R, Rich E. Comparative Health System Performance Initiative: Compendium of U.S. Health Systems, 2018, Hospital Linkage File, Technical Documentation. Washington, DC: Mathematica; November 2019b. https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/compendium/2018-hospital-linkage-techdoc-cx.pdf.

Lewis VA, Joynt Maddox K, Austin AM, Gottlieb DJ, Bynum JPW. Developing and Validating a Measure To Estimate Poverty in Medicare Administrative Data. Med Care 2019;57(8):601–7. https://pubmed.ncbi.nlm.nih.gov/31295189/.

Machta RM, Furukawa MF, Heeringa J, Jones DJ, Timbie J, Kranz AM, Lewis VA, Rich EC. Safety Net Hospitals in Health Systems: Variation in ACO Participation and Other Characteristics. Mathematica Health Research Brief. Washington, DC: Mathematica; July 3, 2019. https://www.mathematica.org/our-publications-and-findings/publications/safety-net-hospitals-in-health-systems-variation-in-aco-participation-and-other-characteristics.

Machta RM, Reschovsky J, Jones DJ, Furukawa MF, Rich EC. Can Vertically Integrated Health Systems Provide Greater Value?: The Case of Hospitals Under the Comprehensive Care for Joint Replacement Model. Health Serv Res 2020a;55(4):541–7. https://pubmed.ncbi.nlm.nih.gov/32700385/.

Machta RM, Reschovsky JD, Jones DJ, Kimmey L, Furukawa MF, Rich EC. Health System Integration With Physician Specialties Varies Across Markets and System Types. Health Serv Res 2020b;55(s3):1062–72. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7720709/.

National Bureau of Economic Research. The Health Systems and Provider Database Technical Documentation. Cambridge, MA: NBER; May 2020. http://data.nber.org/hspd_method/links/HSPD_method.pdf.

Nguyen CA, Chernew ME, Ostrer I, Beaulieu ND. Comparison of Healthcare Delivery Systems in Low-and High-Income Communities. Am J Accountable Care 2019;7(4). https://www.ajmc.com/journals/ajac/2019/2019-vol7-n4/comparison-of-healthcare-delivery-systems-in-low-and-highincome-communities.

O'Malley AJ, Park S. A Novel Cluster Sampling Design That Couples Multiple Surveys To Support Multiple Inferential Objectives. Health Serv Outcomes Res Methodol 2020;20:85–110. https://pubmed.ncbi.nlm.nih.gov/33613088/.

Ridgely MS, Duffy E, Wolf L, Vaiana M, Scanlon D, Buttorff C, Leitzell B, Ahluwalia S, Hilton L, Agniel D, Haviland A, Damberg CL. Understanding U.S. Health Systems: Using Mixed Methods To Unpack Organizational Complexity. eGEMs (Generating Evidence & Methods to Improve Patient Outcomes) 2019;7(1):39. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6676926/.

Ridgely MS, Buttorff C, Wolf LJ, Duffy EL, Tom AK, Damberg CL, L, Scanlon DP, Vaiana ME. The Importance of Understanding and Measuring Health System Structural, Functional, and Clinical Integration. Health Serv Res 2020;55(S3):1049–61. https://pubmed.ncbi.nlm.nih.gov/33284525/.

Roberts ET, Mehrotra A, McWilliams JM. High-Price and Low-Price Physician Practices Do Not Differ Significantly on Care Quality or Efficiency. Health Aff (Millwood) 2017;36(5): 855–64. https://www.healthaffairs.org/doi/full/10.1377/hlthaff.2016.1266.

Ronquillo JG, Winterholler JE, Cwikla K, Szymanski R, Levy C. Health IT, Hacking, and Cybersecurity: National Trends in Data Breaches of Protected Health Information. JAMIA Open 2018;1(1):15–19. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6951874/.

Rosenthal M, Shortell S, Shah ND, Peiris D, Lewis VA, Barrera JA, Usadi B, Colla CH. Physician Practices in Accountable Care Organizations Are More Likely To Collect and Use Physician Performance Information, yet Base Only a Small Proportion of Compensation on Performance Data. Health Serv Res 2019;54(6):1214–22. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6863236/.

Sheetz KH, Ibrahim AM, Nathan H, Dimick JB. Variation in Surgical Outcomes Across Networks of the Highest-Rated U.S. Hospitals. JAMA Surgery 2019;154(6):510–5. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6583390/.

Shortell SM, Poon BY, Ramsay PP, Rodriguez HP, Ivey SL, Huber T, Rich J, Summerfelt T. A Multilevel Analysis of Patient Engagement and Patient-Reported Outcomes in Primary Care Practices of Accountable Care Organizations. J Gen Intern Med 2017;32(6):640–7. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5442008/.

Zhou RA, Beaulieu ND, Cutler D. Primary Care Quality and Cost for Privately Insured Patients In and Out of U.S. Health Systems: Evidence From Four States. Health Serv Res 2020;55(Suppl. 3):1098–1106. https://pubmed.ncbi.nlm.nih.gov/33118177/.

This page intentionally left blank.

Appendix A. Table of Publications

Authors	Year	Title	Journal	Research Focus	Link
Furukawa M, Kimmey L, Jones D, Machta R, Guo J, Rich E	2020	Consolidation of Providers Into Health Systems Increased Substantially From 2016 to 2018	Health Affairs	Characterizing systems	https://www.healthaffairs.org/doi/abs/10.1377/hlthaff.2020.00017
Machta R, Jones D, Kimmery L, Furukawa M, Rich E	2020	Health System Integration With Physician Specialties Varies Across Markets and System Types	Health Services Research (Special Issue)	Characterizing systems	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7720709/
Niedzwicki M, Machta R, Reschovsky J, Furukawa M, Rich E	2020	Characteristics of Academic-Affiliated Health Systems	Academic Medicine	Characterizing systems	https://pubmed.ncbi.nlm.nih.gov/31913879/
Singer S, Sinaiko A, Tietschert M, Kerrissey M, Phillips R, Veruttipong D, Martin V, Joseph G, Bahadurzada H	2020	Care Integration Within and Outside Health System Boundaries	Health Services Research (special issue)	Characterizing systems	https://pubmed.ncbi.nlm.nih.gov/33284521/
Furukawa M, Kimmey L, Jones D, Machta R, Guo J, Rich E	2019	Consolidation and Health Systems in 2018: New Data From the AHRQ Compendium	Health Affairs Blog	Characterizing systems	https://www.healthaffairs.org/do/10.1377/hblog20191122.345861/full/
Furukawa M, Machta R, Barrett K, Jones D, Shortell S, Scanlon D, Lewis V, O'Malley A, Meara E, Rich E	2019	Landscape of Health Systems in the United States	Medical Care Research and Review	Characterizing systems	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7187756/
Kimmey L, Jones D, Machta R, Furukawa M, Miller D, Rich E	2019	Provider-Offered Insurance Products Among U.S. Health Systems, 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/insurance-products.pdf
Kimmey L, Jones D, Machta R, Furukawa M, Miller D, Rich E	2019	Provider-Offered Medicare Advantage Plans Among U.S. Health Systems, 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/ma-plans.pdf
Machta R, Furukawa M, Heeringa J, Jones D, Timbie J, Kranz A, Lewis V, Rich E	2019	Safety Net Hospitals in Health Systems: Variation in ACO Participation and Other Characteristics	Mathematica Research Brief	Characterizing systems	https://mathematica.org/publications/safety-net-hospitals-in-health-systems-variation-in-aco-participation-and-other-characteristics
Machta R, Jones D, Furukawa M, Miller D, and Rich E	2019	Health System Participation in Accountable Care Organizations (ACOs), 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/aco-participation.pdf
Machta R, Jones D, Furukawa M, Miller D, and Rich E	2019	Health System Participation in Medicare Bundled Payment Models, 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/chsp/bundled-payments.pdf
Kennedy G, Lewis VA, Kundu S, Mousqués J, Colla CH	2018	Accountable Care Organizations and Post-Acute Care: A Focus on Preferred SNF Networks	Medical Care Research and Review	Characterizing systems	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6312742/

Authors	Year	Title	Journal	Research Focus	Link
Fowler A, Grabowski D, Gambrel R, Huskamp H, Stevenson D	2017	Corporate Investors Increased Common Ownership in Hospitals and the Postacute Care and Hospice Sectors	Health Affairs	Characterizing systems	https://www.ncbi.nlm.nih.gov/pubmed/28874480
Heeringa J, Jones D, Machta R, Furukawa M, Miller D, Rich E	2017	Snapshot of U.S. Health Systems, 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/snapshot-of-us-health-systems-2016v2.pdf
Heeringa J, Jones D, Machta R, Furukawa M, Miller D, Rich E	2017	U.S. Health System Characteristics, 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/us-health-system-characteristics-2016v2.pdf
Heeringa J, Jones D, Machta R, Furukawa M, Miller D, Rich E	2017	Variation in Health System Characteristics Across States, 2016	AHRQ Data Brief	Characterizing systems	https://www.ahrq.gov/sites/default/files/wysiwyg/variation-in-health-system-characteristics-across-states-2016v2.pdf
Colla CH, Lewis VA, Bergquist SL, Shortell SM	2016	Accountability Across the Continuum: The Participation of Post-Acute Care Providers in Accountable Care Organizations	Health Services Research	Characterizing systems	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4946026/
Briggs ADM, Alderwick H, Fisher ES	2018	Overcoming Challenges to U.S. Payment Reform: Could a Place-Based Approach Help?	JAMA	External environment	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5944326/
Brewster A, Fraze T, Gottlieb L, Lewis V, Frehn J, Murray G	2020	The Role of Value-Based Payment in Promoting Innovation To Address Social Risks: A Cross-Sectional Study of Social Risk Screening by U.S. Physicians	Millbank Quarterly	Internal processes	https://pubmed.ncbi.nlm.nih.gov/33078875/
Dafny L, Lee S	2020	Designating Certain Post-Acute Care Facilities as COVID-19 Skilled Care Centers Can Increase Hospital Capacity and Keep Nursing Home Patients Safer	Health Affairs Blog	Internal processes	https://www.hbs.edu/faculty/Pages/item.aspx?num=58028
Fischer S, Rudin R, Shi Y, Scanlon D, Shekelle P, and Damberg CL	2020	Trends in the Use of Computerized Physician Order Entry by Health-System Affiliated Ambulatory Clinics in the United States, 2014–2016	BMC Health Services Research	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7487802/
Fraze, T, Briggs, A, Meara, E, Peck, K, Whitcomb L	2020	Roles of Nurse Practitioners in Caring for Patients With Complex Health Needs	Medical Care	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7552908/
Harvey JB, Vanderbrink J, Wolf L, Shaw B, Shi Y, Ridgely S, Damberg CL, Scanlon DP	2020	Understanding How Health Systems Facilitate Primary Care Redesign	Health Services Research (special issue)	Internal processes	https://pubmed.ncbi.nlm.nih.gov/33284524/
King A, Schwartz L, Woloshin S	2020	A National Survey of the Frequency of Drug Company Detailing Visits and Free Sample Closets in Practices Delivering Primary Care	JAMA Internal Medicine	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6990750/
Ridgely MS, Timbie JW, Wolf LJ, Duffy EL, Buttorff C, Tom A, Vaiana ME	2020	Consolidation by Any Other Name: The Emergence of Clinically Integrated Networks	RAND Website	Internal processes	https://www.rand.org/pubs/researchreports/RRA370-1.html
Ridgely MS, Wolf L, Buttorff C, Duffy E, Tom A	2020	The Importance of Understanding and Measuring Health System Structural, Functional, and Clinical Integration	Health Services Research (special issue)	Internal processes	https://pubmed.ncbi.nlm.nih.gov/33284525/

Authors	Year	Title	Journal	Research Focus	Link
Rudin R, Friedberg M, Shekelle P, Shah N, Bates D	2020	Getting Value From Electronic Health Records: Research Needed To Improve Practice	Annals of Internal Medicine	Internal processes	https://www.acpjournals.org/doi/full/10.7326/M19-0878
Shi Y, Rudin R, Fischer S, Shekelle P, Scanlon D, Damberg C	2020	Health Information Technology for Ambulatory Care in Health Systems	American Journal of Managed Care	Internal processes	https://doi.org/10.37765/ajmc.2020.42143
Briggs A, Fisher E, Shortell S, Fraze T	2019	How Do Accountable Care Organizations Deliver Preventive Care Services? A Mixed-Methods Study	Journal of General Internal Medicine	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6848496/
Damberg CL, Silverman M, Burgette L, Vaiana ME, Ridgely S	2019	Are Value-Based Incentives Driving Behavior Change To Improve Value?	American Journal of Managed Care	Internal processes	https://pubmed.ncbi.nlm.nih.gov/30763040/
Huber T, Rodriguez HP, Shortell SM	2019	The Influence of Leadership Facilitation on Relational Coordination Among Primary Care Team Members of Accountable Care Organizations	Health Care Management Review	Internal processes	https://pubmed.ncbi.nlm.nih.gov/30908316/
Norton PT, Rodriguez HP, Shortell SM, Lewis VA	2019	Organizational Influences on Healthcare System Adoption and Use of Advanced Health Information Technology Capabilities	American Journal of Managed Care	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6581444/
Rosenthal M, Shortell S, Shah N, Peiris D, Lewis V, Barrera J, Usadi B, Colla C	2019	Physician Practices in Accountable Care Organizations Are More Likely To Collect and Use Physician Performance Information, yet Base Only a Small Proportion of Compensation on Performance Data	Health Services Research	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6863236/
Rudin R, Fischer S, Shi Y, Scanlon D, Shekelle P, and Damberg CL	2019	Trends in the Use of Clinical Decision Support by Health System Affiliated Ambulatory Clinics in the U.S., 2014-2016 [title updated]	American Journal of Accountable Care	Internal processes	https://www.ajmc.com/journals/ajac/2019/2019-vol7-n4/trends-in-the-use-of-clinical-decision-support-by-health-system-affiliated-ambulatory-clinics-in-the-united-states-20142016
Timbie JW, Kranz AM, Mahmud A, Damberg CL	2019	Federally Qualified Health Center Strategies for Integrating Care With Hospitals and Their Association With Measures of Communication	The Joint Commission Journal on Quality and Patient Safety	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6997610/
Ahluwalia SC, Harris BJ, Lewis VA, Colla CH	2018	End-of-Life Care Planning in Accountable Care Organizations: Associations With Organizational Characteristics and Capabilities	Health Services Research	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5980135/
Haverkamp MH, Peiris D, Mainor AJ, Westert GP, Rosenthal MB, Sequist T, Colla CH	2018	ACOs With Risk-Bearing Experience Are Likely Taking Steps To Reduce Low-Value Medical Services	American Journal of Managed Care	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6594369/
Lewis VA, Murray G, Colla CH	2018	The Hidden Roles That Management Partners Play in Accountable Care Organizations	Health Affairs	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5905409/
McDonald K, Rodriguez HP, Shortell SM.	2018	Organizational Influences on Time Pressure, Chaos, and Potential Patient Safety Consequences in Primary Care	Medical Care	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6402989/
Mishra MK, Saunders CH, Rodriguez HP, Shortell SM, Fisher E, Elwyn G	2018	How do Healthcare Professionals Working in Accountable Care Organisations Understand Patient Activation and	BMJ	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6252703/

Authors	Year	Title	Journal	Research Focus	Link
		Engagement? Qualitative Interviews Across Two Time Points			
Rumball-Smith J, Shekele P, Damberg C	2018	Electronic Health Record 'Super-Users' and 'Under-Users' in U.S. Ambulatory Care Practices	American Journal of Managed Care	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6556122/
Miake-Lye IM, Chuang E, Rodriguez HP, Kominski GF, Yano EM, Shortell SM	2017	Random or Predictable?: Adoption Patterns of Chronic Care Management Practices in Physician Organizations	Implementation Science	Internal processes	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5571615/
Agniel D, Haviland A, Shekelle P, Scherling A, Damberg CL	2020	Distinguishing High-Performing Health Systems Using a Composite of Publicly Reported Measures of Ambulatory Care	Annals of Internal Medicine	Methods	https://www.acpjournals.org/doi/10.7326/M20-0718?url_ver=Z39.88-2003&rfr_id=ori:rid:crossref.org&rfr_dat=cr_pub%20%200pubmed
Heeringa J, Mutti A, Furukawa M, Lechner A, Maurer K, Rich E	2020	Horizontal and Vertical Integration of Health Care Providers: A Framework for Understanding Various Provider Organizational Structures	International Journal of Integrated Care	Methods	https://www.ijic.org/articles/10.5334/ijic.4635/
O'Malley AJ, Park S	2020	A Novel Cluster Sampling Design That Couples Multiple Surveys To Support Multiple Inferential Objectives	Health Services and Outcomes Research Methodology	Methods	https://pubmed.ncbi.nlm.nih.gov/33613088/
Ahluwalia SC, Damberg CL, Haas A, Shekelle PG	2019	How Are Medical Groups Identified as High-Performing? The Effect of Different Approaches to Classification of Performance	BMC Health Services Research	Methods	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6639957/
Diaz-Perez MJ, Hanover R, Sites E, Rupp D, Courtemanche J, Levi M	2019	Producing Comparable Cost and Quality Results From All-Payer Claims Datasets	American Journal of Managed Care	Methods	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6613782/
Lewis V, Joynt Maddox K, Austin A, Gottlieb D, Bynum J	2019	Developing and Validating a Measure To Estimate Poverty in Medicare Administrative Data	Medical Care	Methods	https://www.ncbi.nlm.nih.gov/pubmed/31295189
Ridgely S, Duffy E, Wolf L, Vaiana M, Scanlon D, Buttorff C, Leitzell B, Ahluwalia S, Hilton L, Agniel D, Haviland A and Damberg C	2019	Understanding U.S. Health Systems: Using Mixed Methods To Unpack Organizational Complexity	AHRQ's special issue of eGEMS	Methods	https://egems.academyhealth.org/articles/10.5334/egems.302/
Rudin RS, Shi Y, Fischer SH, Shekelle P, Amill-Rosario A, Shaw B, Ridgely MS, Damberg C	2019	Level of Agreement on Health Information Technology Adoption and Use Across Different Data Sources: A Mixed-Methods Analysis of Ambulatory Providers in One U.S. State	JAMIA	Methods	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6951962/
Barr P, Bonasia K, Verma K, Dannenberg M, Cameron Y, Andrews E, Durand A	2018	Audio-/Videorecording Clinic Visits for Patient's Personal Use in the United States: Cross-Sectional Survey	Journal of Medical Internet Research	Methods	http://www.jmir.org/2018/9/e11308/
Singer S, Kerrissey M, Friedberg M, Phillips R	2018	A Comprehensive Theory of Integration	Medical Care Research and Review	Methods	https://www.ncbi.nlm.nih.gov/pubmed/29606036
Ahluwalia SC, Damberg CL, Silverman M, Motala A, Shekelle PG	2017	What Defines a High-Performing Health System: A Systematic Review	Joint Commission Journal on Quality and Patient Safety	Methods	https://www.ncbi.nlm.nih.gov/pubmed/28844231

Authors	Year	Title	Journal	Research Focus	Link
Cohen GR, Jones DJ, Heeringa J, Barrett K, Furukawa MF, Miller D, Mutti A, Reschovsky J, Machta R, Shortell S, Fraze T, Rich E	2017	Leveraging Diverse Data Sources To Identify and Describe U.S. Healthcare Delivery Systems	eGEMs	Methods	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5983023/
Fisher E, Shortell SM, Savitz L	2016	Implementation Science: A Potential Catalyst for Delivery System Reform	JAMA	Methods	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5656984/
Morden NE, Woloshin S, Brooks CG, Schwartz LM	2019	Trends in Testosterone Prescribing for Age-Related Hypogonadism in Men With and Without Heart Disease	JAMA Internal Medicine	Not CHSP relevant	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6440228/
Ruddy KJ, Sangaralingham L, Freedman RA, Mougalian SS, Neuman H, Greenberg C, Jemal A, Duma N, Haddad TC, Lemaine V, Ghosh K, Hieken TJ, Hunt K, Vachon C, Gross CP, Shah ND	2018	Adherence to Guidelines for Breast Surveillance in Breast Cancer Survivors	Journal of the National Comprehensive Cancer Network	Not CHSP relevant	https://www.ncbi.nlm.nih.gov/pubmed/29752327
Woloshin S, Schwartz LM, Bagley PJ, Blunt BH, White B	2018	Characteristics of Interim Publications of Randomized Clinical Trials and Comparison With Final Publications	JAMA	Not CHSP relevant	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5833570/
Chien A, Pandey A, Lu S, Bucholz E, Toomey S, Cutler D, Beaulieu N	2020	Pediatric Hospital Services Within a One-Hour Drive: A National Study	Pediatrics	Patient factors, patient engagement, and PCOR	https://pediatrics.aappublications.org/content/146/5/e20201724
Fraze T, Beidler L, Briggs A, Colla C	2020	Translating Evidence Into Practice: ACOs' Use of Care Plans for Patients With Complex Health Needs	Journal of General Internal Medicine	Patient factors, patient engagement, and PCOR	https://pubmed.ncbi.nlm.nih.gov/33006083/
Kandel Z, Rittenhouse D, Bibi S, Fraze T, Shortell S, Rodriguez H	2020	The CMS State Innovation Models Initiative and Improved Health Information Technology and Care Management Capabilities of Physician Practices	Medical Care Research and Review	Patient factors, patient engagement, and PCOR	https://pubmed.ncbi.nlm.nih.gov/31967494/
Fraze TK, Brewster AL, Lewis VA, Beidler LB, Murray GF, Colla CH	2019	Prevalence of Screening for Food Insecurity, Housing Instability, Utility Needs, Transportation Needs, and Interpersonal Violence by U.S. Physician Practices and Hospitals	JAMA Network Open	Patient factors, patient engagement, and PCOR	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6752088/
Nguyen CA, Chernew ME, Ostrer I, Beaulieu ND	2019	Comparison of Delivery Systems in Low- and High-Income Communities	American Journal of Accountable Care	Patient factors, patient engagement, and PCOR	https://www.ajmc.com/journals/ajac/2019/2019-vol7-n4/comparison-of-healthcare-delivery-systems-in-low-and-highincome-communities
Fraze T, Meara E, Tomaino M, Peck K, Fisher E	2018	Comparison of Populations Served in Hospital Service Areas With and Without Comprehensive Primary Care Plus Medical Homes	JAMA Open Access	Patient factors, patient engagement, and PCOR	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6324508/

Authors	Year	Title	Journal	Research Focus	Link
Ouayogode M, Meara E, Chang CH, Raymond S, Bynum J, Lewis V, Colla CH	2018	Forgotten Patients: ACO Attribution Omits Low-Service Users and the Dying	American Journal of Managed Care	Patient factors, patient engagement, and PCOR	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6089367/
Shortell SM, Poon BY, Ramsay PP, Rodriguez HP, Ivey SL, Huber T, Rich J, Summerfelt T	2017	A Multilevel Analysis of Patient Engagement and Patient-Reported Outcomes in Primary Care Practices of Accountable Care Organizations	Journal of General Internal Medicine	Patient factors, patient engagement, and PCOR	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5442008/
Beaulieu N, Dafny L, Dalton J, Landon B, Kuye I, McWilliams JM	2020	Changes in Quality of Care After Hospital Mergers and Acquisitions	New England Journal of Medicine	System performance	https://www.nejm.org/doi/full/10.1056/NEJMsa1901383?url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&rfr_dat=cr_pub%3Dpubmed
Colla, C, Yang W, Mainor A, Meara E, Ouayogode M, Lewis V, Shortell S, Fisher E	2020	Organizational Integration, Practice Capabilities, and Outcomes in Clinically Complex Medicare Beneficiaries	Health Services Research (special issue)	System Performance	https://pubmed.ncbi.nlm.nih.gov/33104254/
Fisher ES, Shortell SM, O'Malley AJ, Fraze TK, Wood A, Palm M, Colla CH, Rosenthal MB, Rodriguez HP, Lewis VA, Woloshin S, Shah N, Meara M	2020	Financial Integration's Impact on Care Delivery and Payment Reforms: A Survey of Hospitals and Physician Practices	Health Affairs	System performance	https://pubmed.ncbi.nlm.nih.gov/32744948/
Geng F, Mansouri S, Stevenson DG, Grabowski DC	2020	Evolution of the Home Health Care Market: The Expansion and Quality Performance of Multi-Agency Chains	Health Services Research (Special Issue)	System performance	https://pubmed.ncbi.nlm.nih.gov/33284527/
Hurley V, Rodriguez H, Shortell S	2020	Decision Aid Implementation and Patients' Preferences for Hip and Knee Osteoarthritis Treatment: Insights From the High Value Healthcare Collaborative	Patient Preference and Adherence	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6954078/
Kranz A, DeYoreo M, Eshete-Roesler B, Damberg C, Timbie J	2020	Health System Affiliation of Physician Organizations and Quality of Care for Medicare Beneficiaries Who Have High Needs	Health Services Research (special issue)	System performance	https://pubmed.ncbi.nlm.nih.gov/33020920/
Kranz AM, Mahmud A, Agniel D, Damberg C, Timbie JW	2020	Provision of Social Services and Healthcare Quality in U.S. Community Health Centers, 2017	American Journal of Public Health (AJPH)	System performance	https://ajph.aphapublications.org/doi/abs/10.2105/AJPH.2019.305519
Kranz A, Ryan J, Mahmud A, Setodji CM, Damberg CL, Timbie JW	2020	Association of Primary and Specialty Care Integration on Communication and Cancer Screening in Safety Net Clinics	Preventing Chronic Disease	System performance	https://www.cdc.gov/pcd/issues/2020/20_0025.htm
Machta R, Reschovsky J, Jones D, Furukawa M, Rich E	2020	Can Vertically Integrated Health Systems Provide Greater Value? The Case of Hospitals Under the Comprehensive Care for Joint Replacement Model	Health Services Research	System performance	https://pubmed.ncbi.nlm.nih.gov/32700385/
Ouayogode M, Peck M, Fraze T, Rich G, Colla C	2020	Association of Organizational Factors and Physician Practices' Participation in Alternative Payment Models	JAMA Network Open	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7118519/
Reid R, Mafi J, Baseman L, Fendrick M, Damberg CL	2020	Waste in the Medicare Program: A National Cross-Sectional Analysis of 2017 Low-Value Service Use and Spending	Journal of General Internal Medicine	System performance	https://link.springer.com/article/10.1007/s11606-020-06061-0

Authors	Year	Title	Journal	Research Focus	Link
Rudin R, Fischer S, Ridgely MS, Shi Y, Khodyakov D, Xenakis L, Shekelle P, Damberg C	2020	Optimizing Health IT To Improve Health System Performance: A Work in Progress	Healthcare: The Journal of Delivery Science and Innovation	System performance	https://pubmed.ncbi.nlm.nih.gov/33068915/
Sabety A, Jena A, Barnett M	2020	Changes in Health Care Use and Outcomes After Turnover in Primary Care	JAMA Internal Medicine	System performance	https://pubmed.ncbi.nlm.nih.gov/33196767/
Scanlon D, Harvey J, Wolf L, Vanderbrink J, Shaw B, Shi Y, Ridgely MS, Damberg C	2020	Are Health Systems Redesigning How Health Care Is Delivered?	Health Services Research (special issue)	System performance	https://pubmed.ncbi.nlm.nih.gov/33284520/
Timbie J, Kranz A, DeYoreo M, Eshete-Roesler B, Elliot M, Damberg C	2020	Racial and Ethnic Disparities in Quality of Care for Health System-Affiliated Physician Organizations and Non-Affiliated Physician Organizations	Health Services Research (special issue)	System performance	https://pubmed.ncbi.nlm.nih.gov/33094846/
Zhou A, Beaulieu N, Cutler D	2020	Primary Care Quality and Cost for Privately Insured Patients In and Out of U.S. Health Systems: Evidence From Four States	Health Services Research (special issue)	System performance	https://pubmed.ncbi.nlm.nih.gov/33118177/
Hurley VB, Rodriguez HP, Shortell SM, Kearing S, Savitz LA	2019	The Impact of Decision Aids on Adults Considering Hip or Knee Surgery	Health Affairs	System performance	https://www.healthaffairs.org/doi/abs/10.1377/hlthaff.2019.00100?rfr_dat=cr_pub%3Dpubmed&url_ver=Z39.88-2003&rfr_id=ori%3Arid%3Acrossref.org&journalCode=hlthaff
Machta R, Maurer K, Jones D, Furukawa M, Rich E	2019	A Systematic Review of Vertical Integration and Quality of Care, Efficiency, and Patient-Centered Outcomes	Health Care Management Review	System performance	https://pubmed.ncbi.nlm.nih.gov/29613860/
Ody C, Msall L, Dafny LS, Grabowski DC, Cutler DM	2019	Decreases in Readmissions Credited to Medicare's Program To Reduce Hospital Readmissions Have Been Overstated	Health Affairs J	System performance	https://www.ncbi.nlm.nih.gov/pubmed/30615522
O'Hanlon C, Kranz A, Timbie J, DeYoreo M, Mahmud A, Damberg C	2019	Access, Quality, and Financial Performance of Rural Hospitals Following Health System Affiliation	Health Affairs' December 2019 issue on Rural Health	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7004480/
Ouayogode M, Mainor A, Meara E, Bynum J, Colla C	2019	Association Between Care Management and Outcomes Among Complex Patients in Medicare Accountable Care Organizations	JAMA Network Open	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6628588/
Reid R, Damberg CL, Friedberg MF	2019	Primary Care Spending in the Fee-for-Service Medicare Population	JAMA Internal Medicine	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6583869/
Ridgely S, Ahluwalia S, Tom A, Vaiana M, Motala A, Silverman M, Kim A, Damberg C, Shekelle P	2019	What Are the Determinants of Health System Performance? Findings From the Literature and a Technical Expert Panel	The Joint Commission Journal on Quality and Patient Safety	System performance	https://pubmed.ncbi.nlm.nih.gov/31837990/
Timbie JW, Kranz AM, Mahmud A, Damberg CL	2019	Specialty Care Access for Medicaid Enrollees in Expansion States	American Journal of Managed Care	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6986199/
Comfort L, Shortell SM, Rodriguez HP, Colla C	2018	Medicare Accountable Care Organizations of Diverse Structures Achieve Comparable Quality and Cost Performance	Health Services Research	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6052017/

Authors	Year	Title	Journal	Research Focus	Link
Desai S, McWilliams JM	2018	Consequences of the 340B Drug Discount Program	New England Journal of Medicine	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6073067/
Fraze TK, Lewis VA, Tierney E, Colla CH	2018	Quality of Care Improves for Patients With Diabetes in Shared Savings Accountable Care Organizations: Organizational Characteristics Associated With Performance	Population Health Management	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6425920/
Ivey S, Shortell SM, Rodriguez HP, Wang Y	2018	Patient Engagement in ACO Practices and Patient-Reported Outcomes in Adults With Co-Occurring Chronic Disease and Mental Health Conditions	Medical Care	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6170192/
Kranz AM, Dalton S, Scanlon DP, Damberg CL, Timbie JW	2018	Using Health IT To Coordinate Care and Improve Quality in Safety Net Clinics	The Joint Commission Journal on Quality and Patient Safety	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6996474/
Ly DP, Cutler DM	2018	Factors of U.S. Hospitals Associated With Improved Profit Margins: An Observational Study	Journal of General Internal Medicine	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6025663/
Colla CH, Fisher ES	2017	Moving Forward With ACOs: Some Answers, More Questions	JAMA	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5504469/
Lewis V, Fisher E, Colla C	2017	Perspective: Explaining Sluggish Savings Under Accountable Care	New England Journal of Medicine	System performance	https://www.nejm.org/doi/full/10.1056/NEJMp1709197
Lewis VA, Fraze TK, Fisher ES, Shortell SM, Colla CH	2017	Accountable Care Organizations Serving High Proportions of Racial and Ethnic Minorities Lag in Quality Performance	Health Affairs	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5269600/
Ouyagode MH, Colla CH, Lewis VA	2017	Determinants of Success in Shared Savings Programs: An Analysis of ACO and Market Characteristics	Healthcare	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5368036/
Poon BY, Shortell S, Rodriguez HP	2017	Physician Practice Transitions to Health Care System Ownership Do Not Result in Diminished Practice Responsiveness to Patients	Health Services Research	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6051990/
Colla CH, Lewis VA, Kao L-S, O'Malley AJ, Change C-H, Fisher ES	2016	Association Between Medicare Accountable Care Organization Implementation and Spending Among Clinically Vulnerable Beneficiaries	JAMA	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4969198/
Martin BI, Lurie JD, McGuire KJ	2016	Early Effects of Medicare's Bundled Payment Program for Lumbar Fusion on Episode Costs, Volume, and Safety	Spine	System performance	https://doi.org/10.1016/j.spinee.2016.07.280
Peiris D, Phipps-Taylor MC, Stachowski CA, Kao LS, Shortell SM, Lewis VA, Rosenthal MB, Colla CH	2016	ACOs Holding Commercial Contracts Are Larger and More Efficient Than Noncommercial ACOs	Health Affairs	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5116911/
Roberts E, Mehrotra A, McWilliams JM	2016	High-Price and Low-Price Physician Practices Do Not Differ Significantly on Care Quality or Efficiency	Health Affairs	System performance	https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5544918/