NEJM Catalyst | Innovations in Care Delivery

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Important articles highlighting innovative and emerging ideas in care delivery

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NEJM Catalyst | Innovations in Care Delivery

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Dear Valued Reader,

NEJM Catalyst brings innovations and practical applications for enhancing the value of health care delivery to our global audience of clinicians, clinical leaders, executives, and researchers. Throughout the year, we publish articles, case studies, commentaries, and Insights Reports that provide real-life learnings to solve the problems facing health care today.

This collection of previously published content exemplifies our breadth of authors, organizations, and topics. In "The Whole PERSON Health Score: A Patient-Focused Tool to Measure Nonmedical Determinants of Health," leaders from Riverside University Health System recount their development of a novel and holistic patient-centered assessment tool to prioritize nontraditional upstream patient needs.

"Making Sense of New Approaches to Primary Care Delivery: A Typology of Innovations in Primary Care" by Harvard Medical School researchers examines the plethora of innovative primary care organizations to help evaluate their impact from policy, practice, and patient perspectives.

Clinicians from Mass General Brigham describe their experience with two hospital-at-home programs in "Technology-enabled Hospital at Home: Innovation for Acute Care at Home." They find that these technologies are safe and acceptable to patients and clinicians and that they show significant promise in enhancing clinical resource efficiency and coordination.

With mental health a growing concern for frontline workers during the Covid-19 pandemic, a Mayo Clinic team rapidly developed a comprehensive plan for the emotional well-being of all its employees. "Methodology for a Mental Health Plan for Health Care Workers" outlines how this approach substantially increased the use of mental health services within one year.

"Health Care Is Confronting the Social Determinants of Health," an Insights Report based on a survey of the NEJM Catalyst Insights Council — our qualified group of executives, clinical leaders, and clinicians at organizations worldwide that are directly involved in health care delivery — shows widespread awareness of the need to address the social determinants of health and improve data collection on health-related social needs.

We invite you to turn to NEJM Catalyst to find actionable solutions to the complex challenges of your organization, and be inspired by the potential to transform health care.

The Editors,
NEJM Catalyst

781.893.3800 | CATALYST@NEJM.ORG
860 WINTER STREET, WALTHAM, MA 02451-1413 USA | catalyst.nejm.org

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EDITORS' PICKS OF 2022

TABLE OF CONTENTS

NEJM Catalyst | Innovations in Care Delivery

IN DEPTH

The Whole PERSON Health Score: A Patient-Focused Tool to Measure Nonmedical Determinants of Health

Dhruv Khurana, MS, MA, PhD, Geoffrey Leung, MD, EdM, Bijan Sasaninia, Diep Tran, MPH, MA, Mahbuba Khan, MD, Anthony Firek, MD, MS

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The development of a plan to deliver health care in America often ignores the nonmedical deficits in patients' socioeconomic resources, well-being, and quality of life, all of which contribute to patient dissatisfaction, poor clinical outcomes, and higher health care costs and utilization. Social determinants of health have been recognized as significant contributors to health, well-being, and, ultimately, longevity, but have been largely unaddressed in primary care because clinicians lack the tools and training to incorporate them while delivering routine care. Riverside University Health System developed a novel and holistic patient-centered assessment tool named the *Whole PERSON Health Score* (WPHS) to address these critical needs. This article discusses the framework involved in developing, implementing, and evaluating the WPHS in a multidisciplinary, primary care, safety-net setting. The assessment tool consists of 28 questions (or elements) across six domains of health (one for each letter in the PERSON score [**P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle]) that were chosen on the basis of a literature review of factors that affect lifespan, mortality, and longevity. The patient receives a letter grade ranging from A (the best) to Z (the worst) in each domain. The A–Z letter assignment is not based on a normalized calculation. Rather, letter assignment is based on anticipated impact on life expectancy. The grades are classified into three colors — red, yellow, and green — on the basis of the severity of the

Return to TOC

intervention needed. This color-coding system highlights the areas of critical need and prompts the provider to engage with the patient to act. Riverside administered 10,166 WPHS assessments from August 2020 to October 2021, out of which 9,809 were completed, representing 8,829 unique patients. In this article, analysis focuses on the 7,926 unique patients who completed a single assessment, to avoid any confusions pertaining to longitudinal analysis. Overall, the greatest need was in the Nutrition and Lifestyle domain (15.22% of the patients assessed, but 49.79% of all red-zone triggers). That domain was followed by Emotional Health (10.59% of patients, 34.64% of red-zone triggers), and Socioeconomics (9.35% of patients, 30.59% of red-zone triggers). In contrast, the least-triggered need for intervention was the Physical Health domain (1.35% of patients, 4.42% of red-zone triggers). On the basis of a provider survey, the value of the WPHS in providing care differed by discipline. The value was greatest for the Probationer Care Management team, which focuses on the needs of recently released probationers (84.61%), followed by the Behavioral Health integration team (66.67%), the Complex Care Management team (50%), and the Primary Care team (44.82%). The WPHS nudges health care teams to prioritize nontraditional upstream patient needs, including emotional health, ownership, and social determinants of health. Completing the WPHS assessment did lead to a recognition of the nonmedical needs of the patient.

Health-related measures that drive medical care and payment decisions focus primarily on physical health, clinical biomarkers, and medical outcomes. This focus often overlooks important underlying nonmedical needs of patients, including deficits in material and socioeconomic resources and suboptimal aspects of a patient's overall well-being and quality of life. The inability to address these real patient needs contributes to patient dissatisfaction, uncontrolled clinical outcomes, and higher health care costs and utilization.[1-5] Nevertheless, there is a growing recognition that nonmedical issues — such as poverty, inadequate housing, and lack of food access — are strong determinants of health, well-being, and longevity.[6-9] These social determinants of health (SDOH) represent an essential but largely unaddressed aspect of primary care. According to the County Health Rankings Model, SDOH, such as health behaviors, socioeconomic factors, and physical environment, contribute to 80% of clinical outcomes in a community. In contrast, clinical care contributes to the remaining 20% of clinical outcomes.[10-12]

In general, health care personnel, including clinicians, are not formally trained to consider the impacts of SDOH on health outcomes while delivering routine care.[13,14] Clinicians rely heavily on biomarkers and diagnostic test results to guide their decision-making. As a result, a primary care provider (PCP) caring for a low-income patient with diabetes may not realize that the patient's access to nutritious food is limited because of overall socioeconomic status. Some health systems, community health centers, and nonprofit organizations have developed and implemented survey tools to identify and address SDOH factors.[15-19] While these SDOH tools may help uncover critical nonmedical needs, the lack of a simultaneous measurement tool

Return to TOC

makes it difficult to track SDOH changes over time. The lack of an overall interpretation or summary also limits patients' understanding of their SDOH status. This may explain why — despite the existence and deployment of SDOH survey tools — health care personnel continue to operate under a narrower and more traditional paradigm of biomedical health rather than adopting a more holistic and expansive perspective of patient health.

To support a more holistic paradigm of health, Riverside University Health System (RUHS) — a public system with a staff of 6,000 operated by the County of Riverside that consists of a 439-bed medical center and 13 community health centers and provides public health and behavioral health services — developed an innovative measurement tool called the *Whole PERSON Health Score* (WPHS), which quantifies a person's health in six domains: **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle (PERSON).

In short, the WPHS generates a six-letter PERSON score that provides an overall snapshot of a person's holistic health. Each letter within the score represents one of the PERSON domains, and color coding each letter (red, yellow, or green) provides a visual signal of the level of need associated with each domain. The letters are derived from the weighted answers in a 28-question assessment tool, and the related color-coding schema is based on a 26-unit alphanumeric scoring system in which A–F is 1–6, green/low need; G–O is 7–15, yellow/moderate need; and P–Z is 16–26, red/high need (Figure 1).

Integrated within the electronic health record (EHR) system, the WPHS guides vital holistic signs for patients. The color-coded letter system helps to make critical health information transparent and accessible for patients and helps clinical staff quickly identify strengths and opportunities in a patient's health and life, allowing for more tailored and collaborative approaches to care.

We believe the tool can be integrated easily into the EHR. The letter scores are based on a simple alphanumeric conversion. For some EHR vendors, the color coding of letters may require some additional work. Furthermore, as new health care team member types (e.g., registered dietitians or licensed clinical social workers) and clinical locations (e.g., outpatient behavorial health, outpatient specialty, or inpatient setting) join the project, there may be additional EHR-related work involved in "turning on" access to the WPHS tool for these new groups.

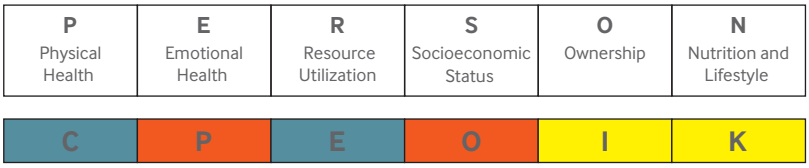
> *"The WPHS results may reveal that patients deemed to be 'noncompliant' are, in fact, people with unaddressed holistic needs."*

From the perspective of the health care provider and team, having the results of a WPHS at the beginning of a clinic visit can help with priority setting, collaborative care planning, and nonmedical resource referrals. The WPHS results may reveal that patients deemed to be "noncompliant" are, in fact, people with unaddressed holistic needs. From the perspective of the

FIGURE 1

Sample Whole **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle (PERSON) Health Score Assessment

In this example, a PERSON score was generated from a completed Whole PERSON Health Score assessment, which is derived from a 28-question survey that assesses each of the six health-associated domains on a 26-letter rating system (A–Z). In this case, the individual is in the green zone for the Physical Health and Resource Utilization domains, in the yellow zone for the Ownership and Nutrition and Lifestyle domains, and in the red zone for the Emotional Health and Socioeconomic domains. The color coding facilitates a nudge for the clinician to discuss with and refer the patient for appropriate care and creates a clear visual message for the patient to appreciate areas of concern. The letter grades provide an opportunity for greater granularity within the broader three-color range. Key: A–F: good; little need or opportunity for improvement. G–O: fair; this is an area that is likely impacting the patient's overall well-being; consider seeking additional support or help for the patient. P–Z: needs improvement; this is an area of health that is already impacting a patient's overall well-being and needs immediate or continued attention.



Source: The authors

patient or client, the WPHS tool represents an opportunity to understand better one's overall health, including how nontraditional and nonmedical factors impact longevity and health. When a health care team discusses and reviews WPHS results with patients/clients, the patients/clients may feel that their nonmedical concerns are validated and acknowledged. It may also enable them to raise similar concerns with their health care providers and teams in the future. Indeed, preliminary data suggest that clinic visits incorporating the WPHS are associated with higher patient satisfaction ratings (which we plan to explore in a separate study).

In addition to serving as a prioritization tool for health care teams and as a communication and engagement tool for patients and clients, the WPHS can be leveraged to support patient care coordination. Color-coded letter scores nudge health care teams and providers to have conversations with patients and clients about holistic health issues that may require more immediate attention or referrals to nonmedical resources. More specifically, the six-letter WPHS composite score can highlight a patient's holistic health gaps and opportunities for improvement in a way that is easy to understand for both staff and patients. This display also allows clinical staff and patients to track change over time regarding staff-initiated interventions (e.g., referrals,

Return to TOC

counseling, motivational interviewing, medication therapy, procedures, etc.) or patient-initiated interventions (e.g., lifestyle changes, mindfulness, meditation, stress reduction, etc.).

In recognition of the unmet need in primary care health care delivery, several survey tools have been developed and are summarized in Table 1 and compared with the WPHS. It is essential to compare the WPHS with other similar tools to find gaps in its feasibility and efficacy in providing significantly meaningful results.

Table 1 provides a comparison of the WPHS tool with other prominent screening tools, including: EveryONE by the American Academy of Family Physicians; Accountable Health Communities by the U.S. Centers for Medicare & Medicaid Services (CMS); Patient Centered Assessment Method by the Universities of Minnesota, Stirling, Glasgow, and Aberdeen; Protocol

Table 1. Comparing SDOH-Related Screening/Assessment Tools

Characteristic	EveryONE	AHC	PCAM	PRAPARE	WellRx	WPHS
Provides an Overall Summary Score?	No	No	No	No	No	Yes
Can be Self-Administered?	Yes	Yes	No	Yes	No	Yes
Is the Assessment Validated?	No	No	Yes	Yes	No	Yes*
Is the Assessment Designed to Track Change over Time?	No	No	No	No	No	Yes
Provides Risk Stratification?	No	No	Yes	No	No	Yes
Integrated into the EHR?	No	No	Yes	Yes	No	Yes
No. of questions?	15	26	12	21	11	28
No. of domains?	10	13	4	5	N/A	6
Available in Other Languages?	Yes	Yes	Yes	Yes	Yes	Yes
Scope of Assessment?	Screen for social determinants of health and connect to resource	Screen for unmet social needs to inform treatment plan and refer to community resource	Assess patient complexity to improve response to patient biopsychosocial needs	Standardize patient social risk assessment protocol	Screen and address patient social need at primary care	Universal measurement tool to holistically quantify health, strategic support, and care

The social determinant of health (SDOH)–related tools reviewed are: EveryONE Project (American Academy of Family Physicians); ACH, or Accountable Health Communities (U.S. Centers for Medicare & Medicaid Services); PCAM, or Patient Centered Assessment Method (Universities of Minnesota, Stirling, Glasgow, Aberdeen); PRAPARE, or Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences (National Association of Community Health Centers, Association of Asian Pacific Community Health Organizations, Oregon Primary Care Association, and Institute for Alternative Futures); WellRx/I-PaCS, or Integrated Primary Care and Community Support (University of New Mexico Office for Community Health); and WPHS, or Whole PERSON Health Score (Riverside University Health System). EHR = electronic health record, N/A = not applicable, PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. *Question selection included some that are open source and publicly available and have been validated by previous research. In the absence of existing validated questions, we developed our questions through an iterative refinement process based on the feedback of patients and stakeholders. The tool has been validated qualitatively via face validity checks. A statistical validation process for the tool itself is underway. Source: The authors

Return to TOC

for Responding to and Assessing Patients' Assets, Risks, and Experiences by the National Association of Community Health Centers, Association of Asian Pacific Community Health Organizations, Oregon Primary Care Association, and Institute for Alternative Futures; and WellRx/Integrated Primary Care and Community Support by the University of New Mexico Office for Community Health. These tools/programs were selected on the basis of the criteria developed for safety-net populations and administered in a clinical setting. Several other programs/screening tools were explored to compare with the WPHS, including the tools used by the Inland Empire Health Plan, the Institute of Medicine, Health Leads, Kaiser Permanente, West Health, the American Hospital Association, and HealthBegins. However, these were excluded because they were either restricted to only insured patients and/or are not an assessment or questionnaire.

Framework of the WPHS

The RUHS Primary Care Environment

The 13 primary care clinics at RUHS consist of three types of care teams: medical home teams composed of PCPs, medical assistants (MAs), and licensed vocational nurses (LVNs); behavioral health specialists, including psychiatrists, licensed clinical social workers, and licensed marriage and family therapists; and registered dietitians and health coaches trained in motivational interviewing and the basics of chronic disease management.

Eight clinic sites also have Probationer Care Management teams (internally called *Whole Person Care* teams), staffed by registered nurses. These teams focus on the behavioral, physical, substance use, housing, and social service needs of recently released probationers to reduce recidivism and reincarceration.

Eleven clinic sites also have Complex Care Management teams (internally called *Enhanced Care Management Teams*) that help reduce unnecessary hospital and ER visits for medically complex patients; each of these teams consists of a registered nurse, a behavioral health specialist, a care coordinator, and a community health worker.

Historically, the Primary Care, Probationer Care Management, and Complex Care Management teams operated independently, with different metrics and goals for each group, resulting in siloed decision-making. The WPHS was developed, in part, to address this type of fragmentation by providing an integrative, unifying, and universal measurement tool and assessment process for patient needs.

The WPHS was designed as a holistic patient assessment tool that would:

- Be easy to understand by patients (patient-centric)
- Be easy to adopt by care teams (i.e., primary care, behavioral health, and care management) within a multidisciplinary primary care setting

- Nudge health care teams to approach health holistically
- Highlight areas of greatest need for targeted and meaningful interventions

We also established guidelines for implementing and evaluating this tool in a multidisciplinary primary care setting and have collected preliminary results.

Conceptualizing the WPHS

In designing the assessment tool, we first conducted a literature review to identify modifiable factors that affect patient well-being and longevity. We narrowed down this list with input from patients and health care professionals to a set of 28 elements across six domains, which included Physical Health, Emotional Health, Resource Utilization, Socioeconomics, Ownership, and Nutrition and Lifestyle (PERSON). The WPHS generally contains more questions than do existing SDOH assessment tools and contains different domains. Three of the six domains (Physical Health, Resource Utilization, and Ownership and Activation) contained within the WPHS are not a routine part of existing SDOH tools. This is part of the reason why the WPHS survey is approximately twice as long. In addition, unlike the existing SDOH tools, the WPHS serves as a universal holistic measure that could be useful across disciplines and sectors.

> *"Historically, the Primary Care, Probationer Care Management, and Complex Care Management teams operated independently, with different metrics and goals for each group, resulting in a siloed decision-making. The WPHS was developed, in part, to address this type of fragmentation by providing an integrative, unifying, and universal measurement tool and assessment process for patient needs."*

Physical Health reflects elements from the traditional medical model of health, such as body mass index (BMI), blood pressure, and chronic condition load. Emotional Health includes factors related to mood, sleep, and social support. Resource Utilization contains utilization management elements often followed by payers and health plans, such as frequency of ER visits and hospitalization. Ownership incorporates self-efficacy, attitudes, self-confidence, and self-management behaviors. Finally, Nutrition and Lifestyle encompasses behaviors that range from healthy eating and regular exercise to smoking and substance use.

Selecting and Developing Questions (Matching Questions to the Elements Determined Above)

After identifying 28 elements across six health domains representing modifiable factors that affect well-being and longevity, we selected patient-facing questions to represent each element.

Return to TOC

Question selection was guided by three criteria: (1) questions are open source, publicly available, and validated by previous research; (2) questions are appropriate to the level of patients' knowledge so they can be self-administered; and (3) questions are at a 5th-grade reading level or less. In the absence of existing validated questions, we developed our questions through an iterative refinement process based on the feedback of patients and stakeholders. At least four answer choices typically accompanied selected questions to capture a range of graded responses. Eventually, we had 28 questions with a minimum of four and a maximum of six questions for each of the six domains (Table 2).

The WPHS elements and questions were developed with input from multiple stakeholders, including epidemiologists, behavioral health specialists, health plan administrators, quality experts, public health researchers, providers, health care support staff, and, most importantly, patients. This multidisciplinary process was critical to ensuring that the contributing questions and elements, along with the resulting metric or PERSON score, are meaningful, accessible, and understandable by patients, health care team members, and other stakeholders.

Formulating a Patient-Centered WPHS or PERSON Score

The WPHS is intended to provide an immediate signal to health care team members and patients about the holistic domains that may be impacting that patient's health. A patient must answer all 28 questions to generate a six-letter score representing the six health domains. Each letter score ranges from A (being the best) to Z (being the worst). Using a letter scoring system from A to Z as opposed to A to F allows health care providers to determine relative needs and to assess small changes within each domain. The letter scoring system may prompt or *nudge* health care teams to implement interventions and allow researchers to evaluate the effectiveness of interventions over time.

Each question on the assessment corresponds to a dimension listed in Table 2. Each question comes with a set of responses, and the patient selects the most appropriate/suitable/accurate/applicable response among the given set of options. Each question is scored on a scale of 0 (no cause for concern) to 3/4/6/8/12 (the maximum number of points on a given question, indicating a serious cause of concern). The weights allocated to each question vary depending on the contribution of the dimension assessed in the question on longevity/mortality/life expectancy. For instance, the question based on the dimension of social support will have a different weight than the question based on the dimension covering the individual's education level.[20]

These scores are added up to calculate a composite score for each domain, ranging from 0 to 26/28 (depending on the domain). However, for the purposes of assigning a letter grade, any number above 26 is assigned the same letter, Z.

We acknowledge that choosing a 26-letter scoring system in health care is unusual. In deciding on the format for reporting the WPHS score to both patient and provider, we found in development that the use of a letter scoring system was more intuitive than a simple number scale. We may need to study this more formally in the future; however, we did get regular feedback from patients

Return to TOC

Table 2. The 28 Themes Associated with the Six Domains of the PERSON Score

Domain	Theme
Physical This is a measure of your current physical condition and takes into account any physical medical conditions that you may have.	Blood pressure
	Body mass index
	Chronic condition load
	Functional activity
Emotional This is a measure of your emotional, mental, and spiritual well-being.	Depression
	Anxiety
	Social support
	Prayer/meditation/relaxation
	Meaning/purpose
Resource Utilization This is a measure of how much you use the health care system, including how often you seek care at the clinic, ER, or hospital.	ER, hospital visits
	Outpatient visits
	Prescription medications
	ZIP code
Socioeconomics This is a measure of your housing, food access, transportation, employment, and financial status.	Finances
	Housing
	Education
	Employment
	Food access
	Transportation
Ownership and Activation This is a measure of your own perception of your health. It is also a measure of your confidence, knowledge, and ability to make positive changes for your health.	Self-rating
	Knowledge
	Self-efficacy
	Self-management
Nutrition and Lifestyle This is a measure of your health habits, including how well you exercise, eat, and sleep.	Diet
	Physical activity
	Sleep
	Smoking
	Alcohol, substance use

PERSON = Physical Health, Emotional Health, Resource Utilization, Socioeconomics, Ownership, and Nutrition and Lifestyle. Source: The authors

during the testing and piloting phase to make sure that the tool and score made sense to them. We collected some qualitative data through patient interviews on this topic that showed patients found the WPHS meaningful and helpful. The decision to use an A-to-Z system versus an A-to-F system was made by the development team in order to be able to capture small changes over time.

Return to TOC

> *"Using a letter scoring system from A to Z as opposed to A to F allows health care providers to determine relative needs and to assess small changes within each domain."*

Health metrics and measurements that are inaccessible and opaque to patients exacerbate health information asymmetry,[21,22] which negatively impacts patient safety, discourages collaborative care planning, and can unintentionally disengage and disempower patients in health-related decision-making.[23,24] The WPHS score explicitly aims to reduce health information asymmetry between health care providers and patients and was deliberately designed to be patient centered, patient accessible, and patient relevant. During the multidisciplinary development process of the WPHS tool, patients indicated a preference for letters rather than numbers or percentages in the overall score. Patients shared that letters were easier to understand than numbers, and this sentiment was also true for patients whose first language was not English.

To make the PERSON score more actionable, the letter scores are classified into three colors: red to convey the urgent need for intervention, yellow to indicate opportunities for improvement, and green to convey no need for intervention. Letter ranges for each of these color-coded categories (green for A through F, yellow for G through O, and red for P through Z) were developed by health care providers and validated with patient and stakeholder input. A statistical validation process for the tool is underway.[25]

A traffic-light color-coded system has been shown to influence decision-making and trigger action. For example, in a study, researchers labeled food items in a hospital cafeteria as red (unhealthy), yellow (less healthy), or green (healthy). Respondents who noticed the colored labels reported a higher likelihood of purchasing more nutritious items than those who did not see the colored labels.[26] Refer to Figure 1 for a sample score with the color-coded system displayed in our EHR system.

From our qualitative study of nine patients, their assessment of the tool was that it was easy to complete; the score was easy to understand, looked accurate, and reflected current health; and the questions generally motivated patients to improve their health. These interviewed patients did find the letter grade helpful in initiating conversations about self-management of health and motivation.

We do not have direct data on patient perception of the benefits of the referral process. However, we do have data that show that when care teams use the WPHS tool, patient experience scores are higher in every subcategory and at every clinic site, compared with instances in which care teams do not use the WPHS.

Using the WPHS to Support Care Coordination

In practice, once a six-letter PERSON score is generated, the multidisciplinary team reviews and discusses the score with the patient. The tool provides a recommended referral guide for quick

Return to TOC

action for patients who may benefit from additional care coordination. A green zone score generally requires no referrals; a yellow zone score will prompt the health care team to consider a referral; and a red zone score indicates an urgent need for intervention or referral (Table 3).

On the basis of the scores obtained in the pilot survey of our assessments, we conducted face validity checks by comparing the answers to individual questions and the eventual letter grades with the individuals' reported health measures obtained previously in our EHR system. This is consistent with the validation process used for other existing SDOH assessment tools.[25] This iterative process included comparisons with BMI, number and types of comorbidities, Patient Health Questionnaire-2/9 scores, adherence rate, continuity of care rates, etc. We found that the scores obtained from the WPHS assessment were consistent with the scores derived from these universally accepted, prevalidated measures. This provided further evidence that our face validity checks were, indeed, measuring what we intended to measure.

For the purposes of internal consistency, we calculated the coefficient of consistency/reliability or Cronbach alpha for each domain. Cronbach alpha is expressed as a number between 0 and 1, with higher values preferred. Both the descriptive terminology and the associated range of values vary, but a threshold of 0.6 has been described as acceptable.[27-29] The following Cronbach alpha calculations are based on 7,926 unique assessments as previously described: Physical Health, 0.15; Emotional Health, 0.622; Resource Utilization, 0.496; Socioeconomics, 0.612; Ownership, 0.693; and Nutrition and Lifestyle, 0.612.

We do not expect the Physical Health domain to have an acceptable Cronbach alpha, given how widespread the scope of the domain is. Cronbach alpha measures how well items in a scale hang together. Given that the Physical Health domain covers elements such as cancer, hypertension, BMI, and chronic obstructive pulmonary disease, it is intuitive that the definition of Cronbach alpha will not work in this case.

Table 3. Referral Recommendations

Domain	Grade between G and Z
Physical Health	Primary Care team (physician, nurse, medical assistant)
Emotional Health	Behavioral Health team (clinical therapist, psychiatrist)
Resource Utilization	Complex Care Management team (registered nurse, behavioral health specialist, care coordinator, and community health worker)
Socioeconomics	Complex Care Management team
Ownership	Complex Care Management team, health coach, Behavioral Health team (clinical therapist, psychiatrist)
Nutrition and Lifestyle	Dietitian, health coach, clinical therapist (substance use disorder)

When a patient's Whole PERSON Health Score includes yellow- or red-zone scores, a referral is indicated for the care team specialists best suited to address the need for that domain. This "cheat sheet" referral guide is embedded in the electronic health record system underneath the patient's score, which is shown in Figure 1. PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

Return to TOC

The WPHS as a Health Care Team Nudge

Given the busy nature of primary care clinic settings, it is essential to note that the WPHS is designed to naturally nudge health care team members to initiate collaborative care conversations with patients and to consider interventions for highlighted holistic health needs. In so doing, the WPHS may facilitate organic collaboration within multidisciplinary teams. Interestingly, the use of nudge theory in health care delivery is relatively new. Nudging patients has been shown to improve health-related decision-making by patients.[30] However, our approach also intends to nudge health care teams and providers to consider a patient's health in a comprehensive, holistic fashion. There is also a growing body of literature that shows the usefulness and favorability of nudges in health care delivery.[31]

> "*The goal was to ensure that the providers had the WPHS letter score available* before *the visit with the patient.*"

Nudges can be viewed as strategies for presenting choices and information that alter people's behavior in predictable ways.[32] Nudges target automatic thinking processes in ways outside of conscious awareness. The usage of the traffic-light color-coded system has been empirically shown to influence decision-making and trigger action.[26,33-36] The use of a salience nudge to influence provider decision-making for holistic patient assessment has been relatively unexplored, thus making the WPHS framework innovative in its approach. Usage of the color-coded system coupled with convenient access to a patient's most recent PERSON score in the EHR system can be categorized as a *salience nudge*.[37] More specifically, salience nudges require voluntary participation with no significant alteration of economic incentives. In our implementation of the WPHS, we neither require providers to act on the PERSON score nor offer financial incentives. Instead, our approach was to use the PERSON score to nudge multidisciplinary care team members to proactively support patients' holistic health and coordinate care across nontraditional disciplines.

WPHS Implementation

Staff Training

Staff training of the WPHS assessment tool at RUHS consisted of three main components: (1) enduring educational materials, (2) weekly workgroup meetings, and (3) patient case study discussions. Enduring educational materials consisted of:

- A WPHS overview slide deck
- A WPHS Toolkit (including workflows; scripting; local referral resources; and instructions on how to interpret, explain, and co-manage WPHS results with patients)
- A WPHS EHR guide (with quick-start instructions)

Return to TOC

Weekly workgroup meetings provided implementation teams with a regular venue to raise questions, solve problems, and make improvements in a rapid cycle manner. Patient case study discussions offered implementation teams an alternative opportunity to share, reflect, and brainstorm more challenging patient cases with peers and colleagues. As we put the tool into practice, we included various patient case studies in our training meetings to discuss the usefulness of the WPHS in multiple settings.

Implementation

To determine the optimal point of administration for the WPHS tool, RUHS clinical teams administered the tool at different points during the clinic visit workflow, including at check-in and registration, during rooming and collection of patient vital signs, during the provider portion of the visit, after the provider portion of the visit (before checkout), and in between clinic visits. On the basis of feedback from patients and staff, we found that the most patient-centric and least disruptive approach was to administer the WPHS assessment tool either at check-in and registration or during the patient rooming and "vitaling" process. In addition to administering the WPHS assessment tool at various points during the traditional in-person clinic visit workflow, we implemented the WPHS assessment tool as part of telephone visits, video visits, and previsit chart preparation efforts. We continue to learn from and optimize these additional modalities.

The amount of time for the process of assessment administration varies by the approach taken by the staff. In the primary care setting, the WPHS assessment had been administered by staff (MA/LVNs) in conjunction with patients during the rooming process as part of vital collections. Alternatively, patients are able to take the assessment in isolation within 3 days of their appointment through MyChart, an online patient portal that is linked directly to the patient's electronic medical record. If the staff has additional down time, they can also call patients during the preregistration/precharting process (in which the medical chart is prepped for information to save time during the visit) to either complete the assessment over the phone with the patient or to inform the patient of the MyChart option.

Verbal administration of the assessment in person took about 5–10 minutes. Telephone calls can take up to 20 minutes. Length of administration is dependent on the patient's understanding of the question and the staff ability to read out the questions and responses. It was first identified to leverage the rooming process to administer the WPHS as the rooming staff (MA/LVNs) were collecting vitals, which takes 5–10 minutes. The total time allotted for a usual scheduled patient is about 20 minutes for the entire visit. Feedback on the time length has been reported to vary on the basis of the staff's degree of familiarity and comfort with the WPHS assessment or whether patients are late, for example. If a patient did begin to prompt discussion on questions on specific topics in the moment of administration, the rooming staff would take note of the question and instruct the patient to discuss these concerns with the provider during their visit and to return to finishing the questions. Rooming staff will let the provider know the specific topics discussed during assessment administration. If patients had taken the assessment before the encounter (via phone encounter or MyChart), then no time was added during the visit. The goal was to ensure that the providers had the WPHS letter score available *before* the visit with the patient.

Return to TOC

Integrating into an Electronic Platform

From 2017 to 2019, we offered the WPHS assessment tool through a third-party Web-based platform. For many reasons, in 2019, we incorporated the WPHS assessment tool into the EHR system: integrating SDOH documentation into EHR platforms can support shared decision-making for patient care by allowing stakeholders to access social and behavioral determinants metrics easily,[38] and SDOH data can prompt clinicians to rethink the care encounter.[39] Furthermore, integration into the EHR can support improved communication between clinicians and service providers, resulting in better follow-up care and closing of the loop on referrals.[38,40,41]

> *"The WPHS score explicitly aims to reduce health information asymmetry between health care providers and patients and was deliberately designed to be patient centered, patient accessible, and patient relevant."*

In addition to supporting communication, care coordination, and point-of-care decision-making, incorporating the WPHS assessment tool into the EHR system enables real-time data capture and data transparency (among care team members and patients alike) while supporting the spread and sustainability of the WPHS assessment tool.

Evaluation of the WPHS

The WPHS in the EHR enables our pilot team to extract reports to track dates, survey administrators, departments, method of administration, documentation, and other data elements related to the WPHS. The WPHS assessment and score are embedded in provider and staff charting spaces. Our standardized workflow training educates staff on how to navigate the WPHS in the EHR. Smartphrases, which are automated fillable documentation texts in the electronic medical record, had been developed for providers to demonstrate activity with the WPHS and can serve as an indicator of the WPHS conversation in the chart and can be audited. Our pilot team is currently optimizing the established documentation and Smartphrase tools in the EHR.

As we are gathering feedback from implementation, we have learned that context does influence the administration of the assessment (e.g., a health coach who has a 1-hour visit with a patient will have a better experience verbally administering the assessment in person than will an MA who has 10 minutes with a patient).

We acknowledge that the assessment is longer than other assessments; however, developing scripting for staff that explains the importance of the assessment and its value in helping patients get better care does promote patient buy-in to take and complete the assessment.

Return to TOC

During the training and initial implementation with the staff, it is important to provide continued "elbow-support" with staff. Essentially, if members of the pilot team can be on site during implementation, staff can receive real-time feedback and enhance support to provide consistent administration and documentation of the assessment. Staff has varying degrees of education and interest in holistic assessments, so to provide consistent visibility and messaging of the importance of the WPHS is instrumental for adoption.

From a health system perspective, we recommend the following ways to evaluate the utility and efficacy of the WPHS assessment tool. First, it is essential to examine patient and staff experience with the tool. It will help create customized and more nuanced training material that will help enhance the feasibility and usability of the tool. Second, we recommend a comprehensive analysis of the results obtained from the assessments to understand the nonmedical deficits in population health. Third, we suggest that health systems evaluate the efficacy of the WPHS as a nudge in coordinating care and generating referrals.

Results

The Riverside County population is about 2.4 million, with approximately 8.7% uninsured, 24.2% with Medicaid, 10.5% with Medicare, 43.6% with employer coverage, and 11% with nongroup coverage. The Medical Center at RUHS primarily serves the population with Medicare and Medicaid (Medi-Cal). Our patient population of approximately 80,000 comprises 46.5% Hispanic, 30.1% non-Hispanic white, 8.3% non-Hispanic African American, 4% non-Hispanic Asian, about 0.6% American Indian, Alaska Native, Native Hawaiian, or Pacific Islander (AI/AN/NH/PI), and 10.5% others/mixed/unknown.

We administered 10,166 WPHS assessments from August 2020 to October 2021, out of which 9,809 were completed. When a patient completes all questions in a given domain, a letter score for that domain is generated. If the patient skips a question in a particular domain, no score for that domain is generated. For this analysis, we only consider the fully completed assessments; of 9,809, 239 were initiated and completed by behavioral health providers, 8,483 through our federally qualified health centers, and 1,087 through our Probationer Care team.

> *"Given the busy nature of primary care clinic settings, it is essential to note that the WPHS is designed to naturally nudge health care team members to initiate collaborative care conversations with patients and consider interventions for highlighted holistic health needs."*

These 9,809 completed assessments belonged to 8,829 unique patients; seven patients completed the assessment four times, 63 patients did it three times, 833 completed it twice, and 7,926 completed it once.

Return to TOC

We restrict the following analysis to the 7,926 unique patients who completed a single assessment to avoid any confusion pertaining to longitudinal analysis. Also, because completing the WPHS itself can be considered an intervention, including individuals who have taken the test more than once could confound the summary statistics because of spillover.

Out of the 7,926 patients, 2,056 patients (25.94%) identified as non-Hispanic white, 364 (4.59%) as Asian, 785 (9.90%) as African American, 52 (0.66%) as AI/AN/NH/PI, 367 (4.63%) as others/unknown/mixed, and 4,302 (54.28%) as Hispanic.

Identifying Nonmedical Deficits

Table 4 presents the count and percentage of the WPHS letter scores at or above *P* (red zone) in each domain by race/ethnicity. The red zone indicates a need for immediate or continued intervention for the individual.

Among the 7,926 individuals assessed, 5,504 had zero red-zone triggers. The remaining 2,422 individuals triggered a combined 3,775 red-zone alerts: 911 had triggers for two or more of the six domains. The distribution is as follows:

- No triggers: 5,504
- One domain only: 1,514 individuals (1,514 triggers)
- Any two domains simultaneously: 583 individuals (1,166 triggers)
- Any three domains simultaneously: 227 individuals (681 triggers)
- Any four domains simultaneously: 79 individuals (316 triggers)

Table 4. Proportional Representation in the Red Zone by Race/Ethnicity of the WPHS-Administered Sample

	Total	AI/AN/NH/PI	Asian	Black/African American	Hispanic	Non-Hispanic white	Other/Unknown
WPHS-Administered: No. (% of whole)	7,926 (100.0)	52 (0.66)	364 (4.59)	785 (9.90)	4,302 (54.28)	2,056 (25.94)	367 (4.63)
Red Zone Subset: No. (% of red zone)	2,422 (100)	21 (0.87)	71 (2.93)	281 (11.60)	1,124 (46.41)	826 (34.10)	99 (4.09)
Proportional Representation (red zone percentage vs. race/ethnicity percentage)	0.00	0.21 ppt (124.13)	−1.66 ppt (43.35)	1.7 ppt (114.65)	−7.87 ppt (83.04)	8.16 ppt (123.92)	−0.54 ppt (86.79)

In this table, we see that some segments of the population, by race/ethnicity, are overrepresented in the red zone compared with their share of the sample size. For example, while the Hispanic segment represents 54.28% of the sample size, they are associated with just 46.41% of the red-zone indicators. The non-Hispanic white segment, by contrast, represents 25.94% of the sample but 34.10% of the red-zone indicators. WPHS = Whole PERSON Health Score, AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/Pacific Islander, ppt = percentage point, PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

Return to TOC

- Any five domains simultaneously: 16 individuals (80 triggers)
- All six domains simultaneously: three individuals (18 triggers)

In addition, as we see in Table 4, segments of the sample, by race/ethnicity, are either over- or underrepresented as being triggered for a red-zone intervention. For example, while the Hispanic segment represented 54.28% of individuals assessed, it was associated with just 46.41% of the red-zone subset. By comparison, the non-Hispanic white segment made up 25.94% of assessed individuals but was associated with 34.10% of the red-zone triggers.

There is also variation within the red-zone domains (Table 5).

Overall, the greatest need was in the Nutrition and Lifestyle domain (1,206 triggers, which represent 15.22% of the patients assessed, but 49.79% of all red-zone triggers). That domain was followed by Emotional Health (839; 10.59% of the pool, 34.64% of red-zone triggers), and Socioeconomics (741; 9.35% of the pool, 30.59% of the red-zone triggers). In contrast, the least-triggered need for intervention was the Physical Health domain (107; 1.35% of the pool, 4.42% of red-zone triggers). The Physical Health domain was the lowest across the race/ethnicity categories; however, there was variation among the race/ethnicity categories in the share of red-zone triggers for each domain. For socioeconomic needs, we see the greatest number of triggers associated with the Hispanic demographic (324 of 741, or 43.72% of the socioeconomic triggers), but that 324 represents just 7.53% of the entire Hispanic segment of the study pool and just 28.82% of the red-zone triggers associated with the Hispanic segment. For comparison, the Black demographic had fewer socioeconomic triggers (97 of 785, or 13.09%), whereas that 144 represented 12.35% of the entire Black segment of the study pool and 34.51% of the red-zone triggers associated with the Black segment.

These differences by race in each domain are significant at the 1% level using the Pearson χ^2 test (with the exception of the Physical Health domain, in which the results are significant at the 5% level using Fisher's exact test).

Provider Feedback

In implementing any new intervention that requires active engagement from providers, it is crucial to elicit their experiences. Toward that aim, we administered a survey to gauge feedback from our providers regarding the usability and feasibility of the WPHS in delivering care. Of 98 surveys deployed, we received 56 responses. This included 29 (51.79%) from Primary Care, eight (14.29%) from Complex Care Management, 13 (23.21%) from Probationer Care Management, and six (10.71%) from Behavioral Health. Although the sample size and the individual segment sizes are small, insights can be developed on the basis of the results. Selected results are shown in Tables 6, 7, 8, and 9.

As we see in Table 6, the majority of Behavioral Health providers (66.67%) found the WPHS to be valuable in providing care to their patients, compared with 44.82% of Primary Care,

Return to TOC

Table 5. Red-Zone Triggers by Domain and by R/E of the WPHS-Administered Sample Population

	Total	AI/AN/ NH/PI	Asian	Black/ African American	Hispanic	Non-Hispanic white	Other/ Unknown
WPHS administered, No. (%)	7,926	52 (0.66)	364 (4.59)	785 (9.90)	4,302 (54.28)	2,056 (25.94)	367 (4.63)
Red-zone individuals, No. (%)	2,422	21 (0.87)	71 (2.93)	281 (11.60)	1,124 (46.41)	826 (34.10)	99 (4.09)
Total red-zone triggers	3,775	33	98	459	1,733	1,308	144
P (Physical Health)	107	1	1	22	51	29	3
Percent red triggers in P domain		**0.93**	**0.93**	**20.56**	**47.66**	**27.10**	**2.80**
Percent red triggers by R/E group		4.76	1.41	7.83	4.54	3.51	3.03
E (Emotional Health)	839	9	32	86	410	280	22
Percent red triggers in E domain		**1.07**	**3.81**	**10.2**	**48.87**	**33.37**	**2.62**
Percent red triggers by R/E group		42.86	45.07	30.60	36.48	33.90	22.22
R (Resource Utilization)	422	4	9	46	207	149	7
Percent red triggers in R domain		**0.95**	**2.13**	**10.90**	**49.05**	**35.31**	**1.66**
Percent red triggers by R/E group		19.05	12.68	16.37	18.42	18.04	7.07
S (Socioeconomics)	741	7	24	97	324	254	35
Percent red triggers in S domain		**0.94**	**3.24**	**13.09**	**43.72**	**34.28**	**4.72**
Percent red triggers by R/E group		33.33	33.80	34.52	28.83	30.75	35.35
O (Ownership)	460	3	16	37	272	120	12
Percent red triggers in O domain		**0.65**	**3.48**	**8.04**	**59.13**	**26.09**	**2.61**
Percent red triggers by R/E group		14.29	22.54	13.17	24.20	14.53	12.12
N (Nutrition and Lifestyle)	1,206	9	16	171	469	476	65
Percent red triggers in N domain		**0.75**	**1.33**	**14.18**	**38.89**	**39.47**	**5.39**
Percent red triggers by R/E group		42.86	22.54	60.85	41.73	57.63	65.66

In this table, we present two pieces of data for each demographic category and each domain category. The regular type shows the number of red-zone triggers for unique patients of that race/ethnic category and the share of all the red-zone individuals for that race/ethnic group. The boldface type shows the same number of the red-zone triggers for unique patients of that race/ethnic group, but instead shows its share of the red-zone triggers for that domain. For example, for the Black segment, there are 22 triggers in the Physical Health domain. Although that 22 represents just 7.83% of all the 281 red-zone individuals for that demographic group (regular type), it also represents 20.56% of all the 107 red-zone triggers for the Physical Health domain (bold type). The regular type percentage is particularly relevant to the demographic group; the bold type is especially useful to the organization, which must consider staffing and resources specific to each domain. R/E = race/ethnicity, WPHS = Whole PERSON Health Score, AI/AN/NH/PI = American Indian/Alaska Native/Native Hawaiian/ Pacific Islander, PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

Return to TOC

Table 6. Provider Feedback: Value in Care Delivery

Question: On the basis of your experience with the WPHS, how valuable is it to you in providing care to your patients?					
Provider Team	**Highly Valuable**	**Somewhat Valuable**	**Neutral (I'm not sure)**	**I see no real value**	**Grand Total**
Behavioral Health	2	2	1	1	6
Complex Care Management	3	1	3	1	8
Primary Care	6	7	8	8	29
Probationer Care Management	7	4	1	1	13
Grand total	18	14	13	11	56

WPHS = Whole PERSON Health Score. PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

84.61% in Probationer Care Management, and 50% in Complex Care Management. Those who found no value were 16.67% of Behavioral Health providers, 27.58% in Primary Care, 7.7% in Probationer Care Management, and 12.5% in Complex Care Management. Using two-way analysis of variance (ANOVA; bidirectional ANOVA), these differences are significant at a 5% level ($P = .0385$).

In terms of disruption in daily practice (Table 7), 66.67% of the surveyed Behavioral Health providers found no disruption while using the WPHS, compared with 24.13% in Primary Care and 69.23% in Probationer Care Management. However, only 33.33% of Behavioral Health found some disruption in daily practice while using the WPHS compared with 62.01% of Primary Care, who found at least some degree of disruption in using the WPHS. Using two-way ANOVA, these differences are significant at a 5% level ($P = .0115$). Our team is currently addressing the issue of disruption to identify root causes.

Table 7. Provider Feedback: Opinion of the WPHS Tool

Question: Which of the following best reflects your opinion of the WPHS?					
Provider Team	**I do not use the WPHS**	**Using it has been highly disruptive to my practice**	**Using it has been somewhat disruptive to my practice**	**Using it has not disrupted my practice**	**Grand Total**
Behavioral Health	0	0	2	4	6
Complex Care Management	5	0	0	3	8
Primary Care	4	5	13	7	29
Probationer Care Management	0	1	3	9	13
Grand total	9	6	18	23	56

WPHS = Whole PERSON Health Score. PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

Return to TOC

Table 8. Provider Feedback: Ease of Use

Question: Thinking about the usability of the WPHS, which of the following best reflects your opinion?					
Provider Team	**It is very difficult to use in practice**	**It is moderately difficult to use**	**It is somewhat easy to use**	**It is very easy to use in practice**	**Grand Total**
Behavioral Health	0	2	1	3	6
Complex Care Management	0	1	3	2	6
Primary Care	6	8	11	4	29
Probationer Care Management	0	3	5	5	13
Grand total	6	14	20	14	54

WPHS = Whole PERSON Health Score. PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

As we see in Table 8, there were differences in ease of use; 50% of surveyed Behavioral Health providers found the tool very easy to use compared with only 33.3% of Complex Care, 13.79% of Primary Care, and 38.4% of Probationer Care Management. For our Behavioral Health providers, 33.3% found the tool moderately difficult compared with 27.59% of Primary Care and 23.08% of Probationer Care Management. Using two-way ANOVA, these differences are significant at a 5% level ($P = .01$).

When asked about integration into the Epic EHR (Table 9), 83.33% of Behavioral Health providers found access to the WPHS through Epic easy and convenient, compared with 34.48% of Primary Care providers, 61.54% of Probationer Care Management providers, and 12.5% of Complex Care Management providers. More than one-quarter of Primary Care providers (27.59%) found access to the WPHS in Epic inconvenient, compared with 30.77% of Probationer Care Management. These results are significant at a 5% level ($P = .03$) using two-way ANOVA.

Table 9. Provider Feedback: EHR Integration

Question: Which of the following best reflects your opinion about the convenience of the WPHS in Epic?					
Provider Team	**Access through Epic is easy and convenient**	**Access through Epic is somewhat convenient**	**Access through Epic is not very convenient or efficient**	**I do not use the WPHS in my daily practice**	**Grand Total**
Behavioral Health	5	1	0	0	6
Complex Care Management	1	2	0	5	8
Primary Care	10	7	8	4	29
Probationer Care Management	8	1	4	0	13
Grand total	24	11	12	9	56

EHR = electronic health record, WPHS = Whole PERSON Health Score, PERSON = **P**hysical Health, **E**motional Health, **R**esource Utilization, **S**ocioeconomics, **O**wnership, and **N**utrition and Lifestyle. Source: The authors

Return to TOC

> *"On the basis of feedback from patients and staff, we found that the most patient-centric and least disruptive approach was to administer the WPHS assessment tool either at check-in and registration or during the patient rooming and 'vitaling' process."*

It is of interest that there are differences between the multidisciplinary care teams and PCPs in terms of integration of the WPHS. Multidisciplinary care teams are more likely to accept integrating the assessment tool (WPHS) into practice than are PCPs. The surveyed PCPs expressed more difficulty finding value usability and experienced more significant disruption than did other care teams. These findings are consistent with a growing body of research on challenges physicians face in incorporating and addressing SDOH assessments as part of routine care delivery, including the ideas that nonphysicians are more likely than physicians to think social needs are an issue for most of their patients than they are for physicians and that outpatient clinicians experienced the greatest difficulty using SDOH screening tools because of perceived time restraints, lack of training, and lack of resources.[42] Our survey results prompt us to consider the need to identify the appropriate care teams that can champion care coordination of the WPHS and initiate a concerted effort to train PCPs on upstream efforts in care and to streamline screening with their current clinic workflows.

The main feedback we received after speaking with providers and staff was usually centered around the added time to take the initial assessment. Providers had let us know the color scheme of the scale allowed for easier interpretation and that the assessment captured information that was important for care. We have not heard, at least anecdotally, that the content and design of the tool was problematic. To address providers who may perceive the tool as having limited value, we had established routine clinic operation meetings dedicated to the WPHS to allow providers to learn in greater detail the scope of the WPHS and the goals of the assessment and to have an opportunity to hear or share patient case studies and discuss the insight gained from discussing the WPHS and lessons learned from using the tool. We also recognize and do not minimize that physician buy-in of the assessment is a gradual and ongoing process.

Evaluation of the Nudge

To determine if the WPHS promotes multidisciplinary collaboration within the primary care clinics, we established a patient-chart auditing process to capture documented referrals generated from the tool. The process was carried out in two steps: a preliminary audit to determine if individuals with a letter score in the red zone received a referral after their WPHS assessment and a second audit to establish causality of the referral with the WPHS assessment.

For our primary audit, we audited 1,391 charts with WPHS assessments. These were randomly drawn from the total sample of those who had a grade in the red zone. Of this group, 711 charts

Return to TOC

originated from PCP visits; 200 (28.13%) received a referral, whereas 433 (60.9%) did not. (We were unable to access the health record for the remaining 78.) During our secondary audit process to establish causality between the WPHS assessment and referral generation, we focused on the dates when the WPHS was documented and when a referral was created. *Successful events* consisted of referrals made and executed within 3 months of completing a WPHS with detailed documentation. *Uncertain events* consisted of referrals made and executed within 3 months but without detailed documentation to indicate a referral was initiated because of the WPHS. *Unsuccessful events* consisted of referrals made 3 or more months after the onset of the WPHS with no explicit documentation.

Out of the 200 referrals from primary care, 36% resulted in successful events, 50% were deemed uncertain, and 14% were considered unsuccessful. There were some limitations in accessing specific charts because of privacy limitations.

The results did indicate that our nudge was successful in generating referrals. However, we can expect more referrals once we address the concerns raised during the Provider Feedback survey in more extensive and comprehensive training sessions.

One major hurdle is integrating the EHR and the workflow for the PCP. The EHR system has traditionally been built to capture medical needs and has limited capacity to capture nonmedical, social, and behavioral needs. This concern remains contemporary. An emerging and growing literature discusses the benefits of leveraging the EHR to have systematic clinical strategies to screen for nonmedical needs and to enable providers to close the loop on referrals.[40,41,43]

Cost-Benefit Analysis as Assessed by a Back-of-the-Envelope Approach

We estimate that initial training costs (before the tool was implemented), such as weekly team meetings and office supplies to print materials related to training, to be around $10,000. However, implementing the WPHS included the purchase of laptops, smartphones, etc., with a ballpark amount estimated to be $20,000. Implementation costs are modified by the fact that the assessment tool is used during *downtime* (i.e., when the patient is waiting to be seen by the provider), and there is no additional cost related to hiring or charging the staff member's time. The interactions of the patient and provider discussing the PERSON score occur during the routine clinic time with no particular time needed for the WPHS. For this back-of-the-envelope approach, these costs have been estimated to be zero.

> *"The use of a salience nudge to influence provider decision-making for holistic patient assessment has been relatively unexplored, thus making the WPHS framework innovative in its approach."*

Return to TOC

For intervention costs, the interventions created and offered because of the PERSON score will vary from patient to patient, and it is difficult to estimate the costs of such interventions. Given that our preliminary analysis reported the generation of 172 referrals and assuming a 45% intervention intake and complete adherence rate, the total cost based on existing literature for Medicaid patients comes to $770,000.[44]

Possible benefits include decreased clinic utilization, more intake of preventive care, decreased ED utilization (due to early interventions), and decreased mortality and morbidity, etc. Of course, in terms of research analysis, even administering the WPHS can be considered an intervention because it provides new information that would otherwise not pop up during a regular primary care visit. This would influence the interaction between the patient and the provider, thereby influencing the decision made by the provider regarding the patient's health and well-being.

The Implications of Implementing the WPHS

The WPHS as a measurement tool and strategy is consistent with recent guidance from the CMS. On January 7, 2021, the CMS issued guidance to state health officials to encourage the inclusion of strategies that address the SDOH in Medicaid and the Children's Health Insurance Program to improve beneficiary health outcomes cost-effectively.[45]

One of the limitations of this study is that it was a single-center study within a safety-net primary care system. Results may not be generalizable to other settings. However, given that we implemented the WPHS tool with a variety of care teams and care team members (including Primary Care teams, Behavioral Health teams, and dietitians), we are hopeful that the WPHS tool will prove effective in other settings. Within our own system, we will soon be implementing the WPHS tool in the outpatient specialty setting and inpatient setting.

The potential usability and holistic design of the WPHS as a quantifying metric allows researchers to compare and rank the impact of interventions and programs targeting different aspects of health. For example, a behavioral health support group and a housing support intervention can now be compared and even ranked on the basis of return on investment (or relative change in the WPHS) and relative cost. When faced with limited resources, this allows health care provider organizations, health plans, and policymakers to prioritize programs and strategies that yield the most cost-effective outcome.

In addition to highlighting opportunities to address SDOH, the WPHS helps quantify the impact of lifestyle, behavior, attitudes, and socioeconomic conditions on health outcomes. This can further allow decision-makers to bolster and reinforce health interventions previously viewed as ancillary or peripheral. Because the WPHS is designed to capture spillover or the indirect effects of interventions in other unintended health elements, it provides a potential opportunity to recognize and financially quantify the contributions of nonbillable health care providers and stakeholders. For instance, an ownership-related intervention that improves emotional and physical health could allow health coaches, nursing, nonlicensed social workers, support groups,

Return to TOC

health educators, etc., to receive their due credit through reimbursement based on the efforts of the care team. It offers nonbillable providers and stakeholders a pathway to receive and be eligible for reimbursement through health plans and payers. A 2020 survey of health care experts reported that 85% of respondents believed the lack of direct reimbursement to hospitals is the prime cause of failure to implement programs and services that address SDOH.[46] Without direct reimbursement for services, hospitals cannot significantly influence socioeconomic and lifestyle conditions to reduce the burden of SDOH-related issues on the system. Effectively deploying and implementing the WPHS offers an important pathway for reducing the gap between the wide-ranging known determinants of health and the limited range of health care services currently provided.

Dhruv Khurana, MS, MA, PhD
Health Economist, Riverside University Health System, Moreno Valley, California, USA

Senior Economist-Statistician, Division of Addiction Psychiatry, Department of Psychiatry and Biobehavioral Sciences, David Geffen School of Medicine, University of California, Los Angeles, Los Angeles, California, USA

Geoffrey Leung, MD, EdM
Ambulatory Medical Director and Public Health Officer, Riverside University Health System, Moreno Valley, California, USA

Health Sciences Clinical Professor, University of California, Riverside School of Medicine - Family Medicine, Riverside, California, USA

Bijan Sasaninia
Program Coordinator, Whole PERSON Health Score, Riverside University Health System, Moreno Valley, California, USA

Diep Tran, MPH, MA
Administrative Services Officer/Program Manager, Riverside University Health System, Moreno Valley, California, USA

Mahbuba Khan, MD
Medical Director, Riverside University Health System, Moreno Valley, California, USA

Anthony Firek, MD, MS
Director of Medical Research, Comparative Effectiveness and Clinical Outcomes Research Center (CECORC), Riverside University Health System, Moreno Valley, California, USA

Health Sciences Associate Clinical Professor of Internal Medicine, University of California, Riverside, School of Medicine, Riverside, California, USA

Return to TOC

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COMMENTARY

Making Sense of New Approaches to Primary Care Delivery: A Typology of Innovations in Primary Care

Bruce E. Landon, MD, MBA, MSc, Gabe Weinreb, BA, Asaf Bitton, MD, MPH

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As concerns about the sustainability of the U.S. primary care system grow, an era of innovation is emerging in response to both the challenges and the opportunities in the field. Numerous new models of primary care financing and delivery are rapidly arising throughout the country, and some see this as a possible savior for primary care. But, in many ways, these changes could either fail to meet the hype around them, or in some cases even hasten the end of the independent primary care practices that once dominated the physician landscape. How do we evaluate these myriad developments and their implications from a policy, practice, and patient perspective? Given the lack of a systematic assessment of where these models differ and where they are the same, as well as their early results, here the authors develop a typology of new innovative primary care organizations — spanning comprehensive care providers, limited-service providers, and value-based care enablers — to provide a useful conceptual framework for classifying these emerging approaches along relevant dimensions and characteristics. The typology provides what might be considered modal types, but also recognizes the potential for substantial overlap among the different approaches, especially as innovative primary care organizations scale and diversify. The typology's goal is to define subgroups in which the constituent organizations have similar characteristics, and that this framework will allow for more meaningful comparison, evaluation, and discussion of the range of innovations occurring in the primary care sector today, both within archetypes and between them.

Return to TOC

Many health care system stakeholders have voiced major concerns about the sustainability of the U.S. primary care system.[1,2] Even as primary care physicians (PCPs) and their teams are asked to assume ever greater responsibilities, payment rate increases have not kept pace with those in other specialties or with the increasing expenses required to run a modern primary care practice.[3] The PCP workforce is aging,[1] with many approaching retirement age, and the rate of medical school graduates entering primary care specialties is not high enough to meet the needs of an aging population.[4] For these and other reasons, recent data suggest that U.S. patients are accessing primary care less frequently, and the proportion of the population with an identified PCP is falling, particularly among younger and healthier populations.[5,6] Notably, only three-quarters of Medicare beneficiaries have a regular primary care physician, and the rate of primary care visits for those with a PCP has decreased over 20 years, while specialty visits have increased by 20%.[7] The median number of specialists that already-busy PCPs need to coordinate with just for their Medicare patients doubled over the past 2 decades to 95.[7]

Despite these trends, or potentially because of them, primary care delivery has become an area of intense focus and innovation as numerous models of primary care financing and delivery emerge throughout the country. Many see such new models as a potential savior for primary care, but it is notable that in many ways such models also might further challenge the viability of independent primary care practices that once dominated the physician landscape in the United States.[8] These new models take myriad sizes and shapes and have adopted a dizzying array of strategies, but to our knowledge there has been no systematic assessment of where these models differ and where they are the same, let alone how their outcomes differ.

To promote a common understanding among clinicians, researchers, administrators, policy makers, and other stakeholders in the health care system, in this paper, we develop a typology of new innovative primary care organizations in the United States to provide a useful conceptual framework for classifying these emerging models along the dimensions most relevant to policy makers and the broader health care system. This classification system also may add clarity and consistency to considerations of the merits and outcomes of each of these models, as well as their areas of potential application or extension, and will allow for comparison among like approaches. We, therefore, review and describe the landscape of emerging primary care models and analyze them from the perspective of their potential partners, patients, and regulators. We do not evaluate the outcomes or results of these models, nor judge their putative utility for various stakeholders across health care.

Conceptual Framework

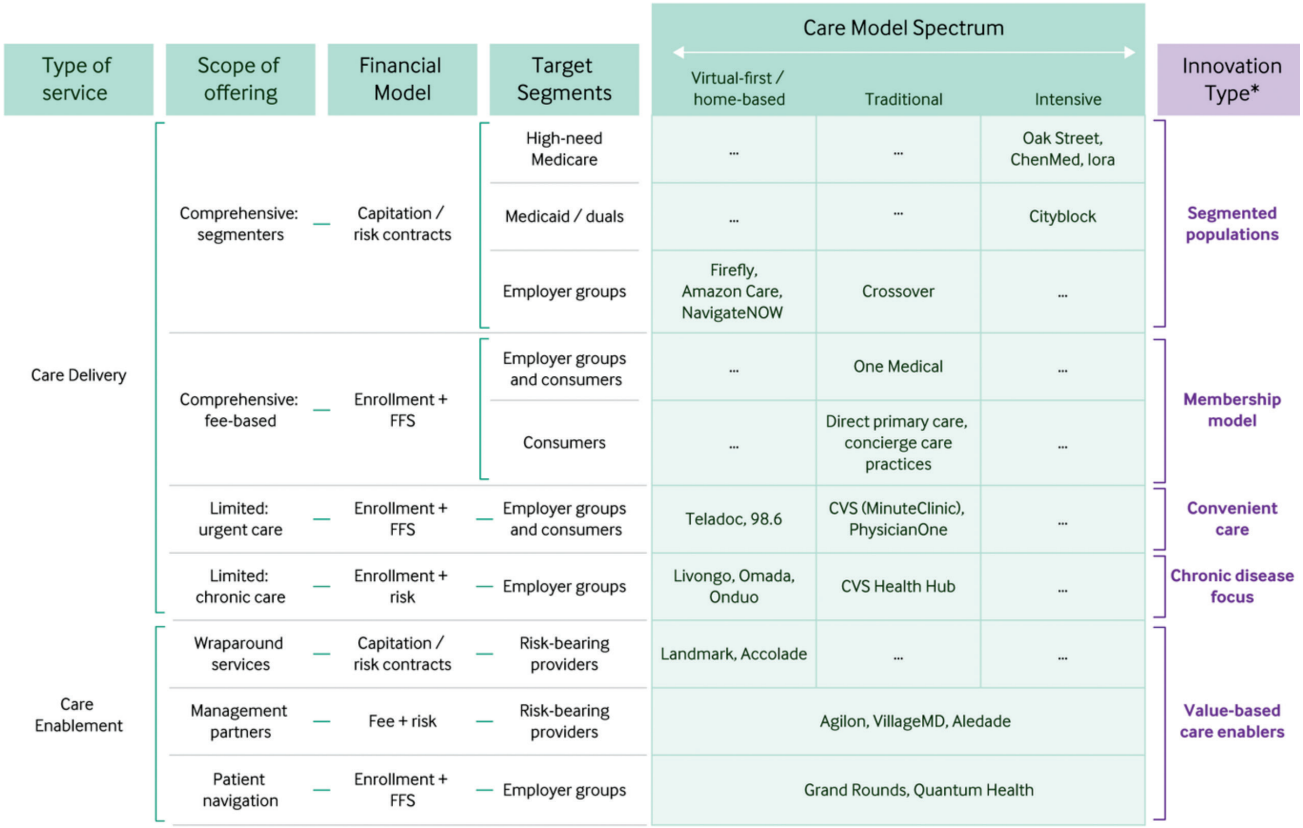
There is a wide breadth of innovation in the primary care space that we capture in our typology (Figure 1).

Return to TOC

FIGURE 1

A Typology of Innovations in Primary Care

This figure presents a classification system for primary care models, as well as care enablement mod
We offer a non-exhaustive list of representative firms and practices based on the authors' understanc
of the organizations' strategies at time of publication. Where no example is listed, the ellipses (...) indi
that none exists or is known to the authors.



FFS = Fee for service

The organizations listed are representative of the type, not called out for any other special reason.

*Our typology provides what might be considered modal types, but also recognizes the potential for substantial overlap among the different approaches, especially as innovative primary care organizations scale and diversify.

Source: The authors' analysis

Importantly, though we begin with the holistic model of primary care characterized by the 4Cs of *first-contact care that is continuous, comprehensive, and coordinated*, the breadth of innovation in primary care extends beyond this relatively narrow conception of traditional primary care functions. We, therefore, include more focused innovations that either support the core primary care function or serve as targeted solutions for narrower aspects of care, population, and practice management. The goal of our typology is to define subgroups in which the constituent organizations have similar characteristics that allow for more meaningful discussion and comparison of the range of innovations occurring in the primary care sector today, both within

Return to TOC

archetypes and between them. Below we describe the different types we identified that encompass the full spectrum of models currently being implemented.

We believe that innovative primary care delivery models in the United States can be distinguished by a number of characteristics. The first (under the Type of Service column in Figure 1) is whether they are *direct care providers* or provide *care enablement services* that can be practice-facing, like analytic and regulatory support, or patient-facing, like home-based care or navigation involving wraparound services including nonmedical elements such as social work or transportation that impact health and well-being.[9]

Second, (Scope of Offering column) for direct care delivery providers, it is important to distinguish organizations that provide *comprehensive* primary care services versus *focused* services for specific use cases. The former includes innovative organizations that provide enhanced services to specific population segments (Target Segments column), often under full-risk contracts as well as fee-based arrangements that supplement traditional fee-for-service (FFS) revenue to support provision of enhanced services (Financial Model column). Within *focused* providers (Scope of Offering column), there are those that provide *convenient* or *urgent care* services, usually for relatively minor or self-limited problems, and those that are focused on providing enhanced care for patients with specific *chronic medical conditions*. Across all types there is a spectrum of care delivery models ranging from *virtual-first* platforms to *intensive* models, though all these models often employ multiple methods to access care (Care Model column).

Challenges to Constructing a Typology

Though we believe it will be helpful to policy makers and others to have a useful, formal classification for these innovative models, a challenge to constructing one is that the various types we describe may overlap in some areas and are not necessarily fixed in time, role, or function. Thus, our typology provides what might be considered modal types, but also recognizes the potential for substantial overlap among the different approaches, especially as innovative primary care organizations scale and diversify. For example, risk-bearing contracts are becoming more common, particularly among those providing comprehensive primary care, but there also is potential for these types of contracts to be used across the entire spectrum that we consider. Similarly, focused delivery models are slowly expanding their scope of services and more traditional comprehensive primary care organizations are expanding their care models to incorporate virtual and asynchronous care, leading to some convergence in care models. Nonetheless, by focusing on the predominant strategies used by leading primary care organizations, our typology helps to distinguish organizations pursuing different strategies as well as distinct strategies adopted within a single organization.

Finally, our purpose is not to exhaustively identify and categorize all existing models and organizations that are either in development or already implemented. Instead, through review of the published and gray literature, reviews of company websites, press searches, discussions with select organizations, and focused interviews with leaders in the field, we identify representative organizations for each segment of our typology to provide concrete examples.

Return to TOC

> *"By focusing on the predominant strategies used by leading primary care organizations, our typology helps to distinguish organizations pursuing different strategies as well as distinct strategies adopted within a single organization."*

Typology of Innovative Primary Care Models

Comprehensive Primary Care

We begin with innovative primary care models that seek to provide comprehensive primary care, usually to a defined population of patients enrolled or affiliated with the practice organization. A key aspect of these models is their financial model, which often involves some degree of prospective payment with risk-based contracting, but this is not a required component. The two major categories of comprehensive primary care models are what we term *segmented population models* (or *segmenters*) and *membership models*, which we elaborate on below.

Segmented Population Models

One group of primary care innovators that has received much attention offers comprehensive primary care services targeted to specific segments of the population. Though there is nothing in concept that limits these models to these specific population segments, we classify these models as *segmenters* because they generally have adopted features designed to meet the broad care needs and financial opportunities presented by some of the specific population segments that they target. In general, these organizations are designed around comprehensive primary care models using intensive primary care–based services that aim to deliver high-value care, typically in the context of a full-risk financial arrangement and prospective payment. These *segmenters* are targeting each of the three most common coverage segments within the U.S. health care system: commercial, Medicaid, and Medicare.[10]

Medicare-focused organizations such as (but not limited to) ChenMed, Iora (now part of One Medical), and Oak Street Health all target the elderly population enrolled in private Medicare Advantage (MA) health plans. Usually, these organizations partner with an insurance carrier in order to participate in MA, though some insurance carriers are also rolling out their own models (e.g., CenterWell by Humana, which is described as payer agnostic). Some entities also are expanding into the Medicare FFS population through accountable care organizations and direct contracting entities, which is transitioning to the ACO REACH (Realizing Equity, Access, and Community Health) model. These organizations are characterized by a focus on intensive primary care that include team-based care, enhanced access and support, and navigation and referral services. They frequently include important additional nonmedical services such as transportation to ensure that patients make it to their appointments. These organizations are supported by a robust and often novel technology infrastructure that undergirds their care model, but also provides enhanced capabilities for population health management regarding both quality and cost outcomes.

Return to TOC

The financial model also is key to this segment. Medicare *segmenters* generally take on full risk under the MA program and stand to earn returns if they are able to provide high-value care within the confines of a capitated budget paid prospectively. Crucially, however, because MA payment rates currently are directly determined by diagnostic coding, these organizations also have invested heavily in tools and infrastructure to maximize the thoroughness of coding for their population to achieve the highest possible payment rates.

A prominent example of a *segmenter* serving the Medicaid population is Cityblock Health, which offers comprehensive care to the Medicaid population, as well as wraparound services in some markets that we distinguish elsewhere. Medicaid *segmenters* also have adopted a comprehensive approach similar to the Medicare *segmenters* above, but designed it to meet the specific needs of the Medicaid population, which generally is poor with a significant chronic disease burden.[11] Community health workers help serve as navigators for their population and offer a broad array of services in the home and virtually to meet their needs. Though Medicaid payment amounts are substantially lower than rates for Medicare, Medicaid *segmenters* also focus on capitated care for a defined population and coding is an important part of their strategy. Some are also starting to offer overlay services to help practices that serve significant populations of patients on Medicaid (as opposed to building new care delivery offerings de novo for Medicaid patients only).

Finally, a number of *segmenters* have emerged that target the often more affluent commercial population. Many of these commercial *segmenters*, such as Firefly Health, are virtual-first or offer an enhanced suite of virtual and asynchronous services in addition to traditional in-person care when needed. This combination of capabilities is designed to meet the needs of busy professionals and their employers who might prioritize convenience when obtaining care. These plans offer technology-enabled virtual solutions that also incorporate team-based care. Though some of these organizations take on full risk or even become health plans themselves, they also use cost savings and enhanced convenience for employees as selling points to self-insured employers and thus have the flexibility to use a variety of financial models. Some of these models have evolved from traditional, limited telemedicine companies now seeking to expand into comprehensive primary care, while others began by focusing solely on the comprehensive care strategy.

> *"To the extent that these models serve to bring more resources into primary care (both for team-based or intensive care delivery and to bolster PCP take-home pay), they also might serve to shore up a primary care system that is at risk of fiscal collapse from the Covid-19 pandemic."*

A final set of commercial *segmenters* is represented by innovative iterations of on-site employee health clinics. These clinics provide on-site convenient and/or comprehensive care that can be either virtual or in-person by entering into subscription-fee arrangements with employers (though not necessarily taking risk for the full cost of care).

Membership Models

Return to TOC

In contrast to the *segmenters* described above that mainly receive (nearly) fully capitated payments with downside risk, *membership models* provide primary care physicians or teams with an additional, predictable, prospective revenue stream to supplement an underlying base of FFS payment. In return, they provide additional components of comprehensive care that are not necessarily reimbursable under current payment schemes, such as prolonged visits or access to 24-7 virtual or phone services. Even for models that do not continue to bill insurance, members generally retain insurance for services outside the scope of primary care including specialty, acute emergency department or hospital, and rehabilitative care, as well as diagnostics and lab procedures. Most *membership models* both charge enrollment fees and utilize FFS billing to existing insurers.

In *membership models* targeted toward employer groups, entities such as One Medical similarly charge a monthly or annual membership fee that finances enhanced primary care services. These enhancements might include upgraded clinic facilities, apps to enable 24-7 virtual care, improved access for acute issues, and enhanced opportunity for chronic condition self-management. Employers may provide membership as a benefit to their employees in addition to their standard health insurance in order to increase uptake of primary care services. Employers also may frame such memberships as a premium service to compete with other employers on benefits.

Consumer-oriented *membership models* fall into two categories. The first is targeted toward more affluent patients and involves membership fees that can range from relatively modest payments of several hundred dollars per year up to $25,000 per year (most commonly a few thousand dollars yearly) in return for access to a concierge physician who provides comprehensive care for a very small panel of patients, guarantees high levels of access 24-7 and unlimited lengthy visits, as well as care coordination and navigation with specialists. As noted above, One Medical has a similar team model that also is available to consumers, though the level of their membership fees is substantially lower than a typical concierge practice.

A second consumer-oriented model, known as *direct primary care*, involves primary care practices taking payment directly from consumers on a prospective monthly basis for comprehensive primary care services.[12] These primary care practices generally accept no insurance payments and can charge additional fees for providing services such as acute or preventive visits, but their fees tend to be much lower than those paid by traditional insurance. Patients generally still maintain wraparound insurance for non–primary care and lab/diagnostic services. The practices are able, therefore, to ensure a stream of predictable payment for their panel of patients and have relatively low overhead because most do not bill insurance. A second version of direct primary care is based more on an FFS model without prospective enrollment fees wherein the practice maintains its own fee schedule, which generally is much lower than typical insurance payments.

Focused Models

We next elaborate on focused, or limited, care models. In contrast to comprehensive primary care solutions, focused care models aim to provide one or more aspects of primary care in a siloed function that works alongside conventional primary care. Focused models generally target *urgent* or *convenient care* for relatively simple, urgent problems such as sore throats or sprains or specific chronic medical conditions like diabetes. In contrast to the comprehensive models noted above,

Return to TOC

these models do not seek to provide 4C care that is first contact, comprehensive, coordinated, and continuous.

Convenient Care

Convenient care models focus on filling the gaps in access for patients who have urgent, often minor acute care needs. They fall into two main categories. First, brick-and-mortar offerings in traditional clinics (e.g., PhysicianOne) and nontraditional retail settings (e.g., CVS Minute Clinic) have become nearly ubiquitous around the country, and for many patients (especially younger, rural, and underinsured) are a main source of acute primary care. They are often staffed primarily by advanced practice providers, although some have physicians, and focus on acute, non–life threatening common ailments as well as common preventive care (e.g., vaccine administration) and selected simple procedures.

In the second category, virtual offerings connect Web-enabled patients to providers over virtual platforms to meet acute needs. Many traditional telemedicine firms (e.g., Teladoc) offer such services, as well as newer entrants like 98point6. These services can be covered by insurance or may be offered as a benefit by employers. In many instances, patients pay for these services out-of-pocket, though the prices generally are much lower than for accessing traditional brick-and-mortar primary care.

> *"If instead of resulting in more resources for primary care, these additional funds are siphoned off to investors or others who seek to profit from these care models, then these desired effects might not materialize."*

Chronic Disease Focused

A number of innovators have emerged that seek to offer care for a limited set of chronic medical conditions. Brick-and-mortar focused models include the recently launched CVS HealthHUBs, which are clinics designed to provide screening and monitoring services for important chronic medical conditions such as diabetes and hypertension, on top of a suite of existing preventive and urgent care services, including in collaboration with CVS Minute Clinics. These programs can range from complete management of such conditions to adjunctive screening and monitoring. This place-based *chronic disease–focused model* offers technology-enabled algorithmic care, usually from advanced practice providers working under the supervision of physicians. Part of the appeal is that these locations are convenient and do not require time-intensive or costly appointments. The reimbursement model for these options is still evolving but may vary from FFS to monthly capitated payments and risk-based payments linked to disease outcomes rather than total costs of care.

A second set of emerging virtual *chronic disease–focused models* focus on intensive management of chronic conditions, with an early emphasis from companies such as Onduo, Omada, and Livongo on offering intensive telehealth and online care and counseling services for conditions such as diabetes and hypertension. These organizations work with employers and health plans to offer

Return to TOC

these enhanced services, usually on a subscription basis with upside potential related to either cost savings or achieving quality or outcome targets. Importantly, these programs serve as augmented complements to — rather than replacements for — primary care.

Care Enablement Models

As commercial and government payers increasingly demand greater value from their provider partners, a group of organizations has emerged to provide services that support more traditional primary care practices to enhance their capabilities in managing populations under risk-based contracts. These organizations do not offer most primary care services directly themselves, but rather enter into vendor relationships with physician practices and health plans to provide a range of back-end administrative services (e.g., care management analytics), front-end administrative services (e.g., care navigation) and, in some cases, limited supplemental clinical services such as home-based care or discharge planning.

Many *enablers* — especially those with more limited control over care delivery — rely solely on subscription pricing while others share risk on total cost of care with their customers. As payer demand for risk-based payments outpaces providers' and benefit managers' willingness to accept them, enablers also are moving up the value chain to directly own risk-based payer contracts and then convene downstream networks of physician practices willing to share in some of the risk.

Value-Based Care Enablers

One type of *value-based care enabler*, including such companies as Landmark, offer wraparound services that supplement traditional primary care offerings with specific patient care capabilities such as in-home care, remote monitoring, and telephonic support targeted to maximize the value of risk-based contracts. By bundling advanced analytics with some focused direct care delivery in a single offering, *wraparound enablers* are not totally reliant on their clinician partners to deliver value and can operate more independently within a health plan or ACO, though typically they partner with existing primary care teams. They may, therefore, be more willing to take on risk and to partner with a broader range of organizations.

The signature capability of wraparound *enablers* is routing toward, or providing, a lower-cost alternative to emergency and urgent care, typically through home visits and better benefits or specialty decisions. *Enablers* use these home visits to reduce the use of higher-cost sites of care, and also as a platform to deliver other high-value services or nudge patients toward them. An important additional area is risk coding, which combines advanced analytics to identify under-coded patients with actual care delivery to document diagnoses. They also may combine analytics and delivery to offer care management (prediction of high-risk patients plus interventions to manage them), address social determinants of health (prediction of vulnerability plus case work to address it), manage transitions of care (identification of patient admission plus post-discharge planning), and close quality metric gaps. Wraparound *enablers* may enable practices and smaller health plans to provide similar services as national carriers that can build or buy their own supplemental care capabilities by virtue of their scale.

Return to TOC

> *"Private equity and other organizations that are purchasing primary care practices at a rapid pace may, at one level, be trying to build strong long-term organizations to manage and profit from risk contracts. They also might be quickly preparing to sell these practices to vertically integrating organizations looking for market share or predictable management of health care costs over time."*

A second type of value-based care enabler, including such entities as Agilon and Aledade, function as management partners. *Management partner enablers* offer many of the same analytics capabilities as *wraparound enablers*, but generally are not involved in the direct provision of care. This division of responsibilities allows providers to retain control over patient care delivery but can pose operational, technological, and contractual challenges to maximizing the value of risk-based contracts.

To deliver similar value as their wraparound competitors, management partners may adopt some strategies characteristic of enterprise software vendors like Epic or Salesforce: an upfront investment in software implementation and integration, a focus on provider experience and workflow optimization, and ongoing advisory support. They may also handle additional back-end functions such as negotiating with payers or meeting Centers for Medicare & Medicaid Services (CMS) requirements under the Medicare Shared Savings Program. These services often are offered on a subscription basis, though these organizations also can share risk with provider organizations. Some of these new management partners are backed by private equity, venture capital, or growth equity organizations, who are investing in primary care at an increasingly rapid pace.[13]

A final type, *patient navigation enablers* like Grand Rounds and Accolade, offer patient-facing services like wraparound providers but eschew direct patient care like management partners. These players, usually contracting with self-insured employers, take on a limited set of traditional front-end health plan capabilities like care navigation, second opinions, expert advice, coordination for high-risk members, and patient advocacy in billing disputes. *Patient navigation enablers* may allow employers using a direct-to-employer contracting approach or a third-party administrator with limited patient-facing capabilities to offer comparable experiences to their employees as employers with traditional health plan partners.

Implications for Patients, Payers, and Policy Makers

The emergence of innovations in primary care has important implications for the U.S. health care system. Importantly, to the extent that such models enhance the delivery of 4C primary care for some or most patients, these innovations could strengthen the primary care system, enhance patient experience, and, potentially, result in lower total spending as seen in other health systems with more robust primary care infrastructure. They could also become an important route for attracting new professionals into primary care roles, and retaining existing cadres of primary care providers, many of whom are beleaguered and burned out by existing models.

Return to TOC

A key challenge to primary care that these new models may address is that the provider workforce is aging or leaving and fewer medical students are choosing careers in primary care.[4] Thus, to the extent that team-based models of care — which expand the care team to include additional team members such as advanced practice providers, nurses, nutritionists, behavioralists, or community health workers — can leverage the ability of PCPs to care for larger numbers of patients and provide attractive new models of practice and compensation, these models also might help with workforce challenges. Similarly, relatively low payment for primary care relative to most specialties is a major challenge for attracting new physicians and other providers to the profession. To the extent that these models serve to bring more resources into primary care (both for team-based or intensive care delivery and to bolster PCP take-home pay), they also might serve to shore up a primary care system that is at risk of fiscal collapse from the Covid-19 pandemic.[14]

However, if instead of resulting in more resources for primary care, these additional funds are siphoned off to investors or others who seek to profit from these care models, then these desired effects might not materialize. Thus, policy makers and payers must closely monitor the extent to which additional resources directed toward primary care are supporting additional or new partner organizations with an as-yet-unproven benefit, which could end up diverting much needed resources from traditional primary care. Alternatively, new entrants backed by private equity or venture capital into the primary care market can potentially provide important additional resources to fund extended functionality and sustainability of primary care teams. What will be very important to understand from the marketplace is what the exit strategy for these funders might look like, and whether they align with the long-term viability of team-based, population-oriented primary care.

Regarding both types of comprehensive models, there remains a dearth of evidence about their true effectiveness. In the case of *membership models* such as concierge medicine, patients and their employers are making their own choices and the very success of these models confirms that they offer a service that is valued by patients who can afford them. However, there is little evidence of benefit regarding the impact on total spending and quality of care. Moreover, though entering a membership model practice is a strategy by which primary care physicians can regain control over their practice lives while also substantially boosting their pay, from a policy point of view these models effectively decrease the supply of primary care physicians (because of limited panels) and are inherently inequitable as they are largely available only to those who can afford to pay. In many ways, these models can be seen as a symptom of what currently ails the primary care system, not as a scalable, viable solution. There is little evidence that these membership models integrate often or well with existing value-based policy initiatives like accountable care organizations or state/federal primary care demonstration models.

The *segmented population models* are clearly showing initial financial success and have attracted substantial interest from investors. Whether these initial results have been driven by their improved care model, more intensive coding (resulting in higher payment), patient cherry-picking, or some combination remains an open question, and rigorous evaluation will be required before policy makers can understand the full impact of these models. In particular, any increased investment such organizations make into coding should be considered an unintended consequence of current policy. Much as these concerns have been raised for MA plans in general,[15] risk adjustment systems

Return to TOC

in this context may not be working in the way they were intended. Whether and how well these segmented offerings integrate, and feed, into future Center for Medicare & Medicaid Innovation (CMMI) and state models is also unclear.

> *"Previous planning has been hampered by an often-oversimplified view of practice arrangements — making distinctions mainly around practice size and ownership arrangements — and imagining a monolithic view of a 'standard' doctor-driven model of office-based care fueled by visits-volume over population health needs."*

The potential impact of focused care providers (*urgent care* and *convenient care models*) may raise more concerns as well as opportunities. To the extent that these organizations siphon away care from traditional primary care, they may undermine the ability of primary care practices to deliver 4C care with sufficient predictable revenue streams (and staff) to stay open. Urgent care is one of the primary functions of primary care and an important part of providing whole-person comprehensive care. Conversely, others have argued that carving out treatment of relatively simple one-off urgent conditions such as sore throats or urinary tract infections may provide more timely care while not importantly impacting the other functions, or may even augment the ability of general practices to focus on more longitudinal, complex diagnostic and therapeutic management of patient needs.

Alternatively, we may see traditional primary care do a better job at offering such services in ways that are convenient to patients (e.g., through their own provision of telehealth services or asynchronous modalities). Similarly, chronic disease–focused services might serve to replace primary care management of specific conditions or enhance their management by allowing for better incorporation of data from outside the care setting. How this segment of the market will evolve remains an open question, as does the extent to which the proliferation of these models will undermine the relationship between primary care physicians and their patients.

Patients are voting with their feet, often unhappy with the current state of primary care provision in the United States. For particular functions like timely access, they are willing to pay extra for convenient and efficient delivery options that meet their needs, harkening the potential growth of these models. This is true particularly for virtual-first offerings for tech-enabled segments whose expectations for easy, quick problem resolution grows relentlessly. Moreover, other patient segments who have high care needs may continue to opt for high-touch, comprehensive models offered by these new entrants. Whether overlaid options for chronic disease management can integrate effectively with existing practice infrastructure to serve patient needs effectively remains to be seen. And the range of employer-based wraparound services are likely to be taken up heterogeneously as are most employer offerings in the United States.

Other policy implications of these different models are quite variable and hard to predict as well. Most likely, though, all signals point to the continued growth of these models given existential

Return to TOC

pressures on traditional primary care, widespread interest and venture funding behind these new models, the policy push toward value-based care, and shifting consumer demand.

Segmented population entrants in the MA and Medicaid markets may find durability through CMS-led federal or state level programs and demonstrations that shift risk and change payment in service of value-based care and alternative payment model (APM) model growth. The alignment between these business and policy models is far from certain, though, as many *segment models* depend on coding investments within MA to generate the margins from which they can share savings. This coding-driven margin potential may not be a permanent feature of the payment landscape for these entrants, leaving open the possibility that their business model may be at risk over the long term. Private equity and other organizations that are purchasing primary care practices at a rapid pace[13] may, at one level, be trying to build strong long-term organizations to manage and profit from risk contracts. They also might be quickly preparing to sell these practices to vertically integrating organizations looking for market share or predictable management of health care costs over time.

Convenient care offerings will likely continue to grow given access challenges for patients in current primary care offerings as well as modern consumer demand expectations, despite the fact that they most likely add to total cost as opposed to substituting lower-cost care.[16] Their growth may continue, given the limited primary care workforce, so it will be important to see if large corporate entrants like pharmacies and retailers will expand these offerings toward more comprehensive services needed by the population. In many low primary care–density areas, retail and urgent care offerings are already playing a large role in the provision of routine primary care, so expanded comprehensive and integrated care offerings may be quite welcome.

Finally, it is clear that policy makers and workforce planners will need to continue to incorporate an understanding of these new types of market entrants into future payment, delivery, and training models. Previous planning has been hampered by an often-oversimplified view of practice arrangements — making distinctions mainly around practice size and ownership arrangements — and imagining a monolithic view of a "standard" doctor-driven model of office-based care fueled by visits-volume over population health needs. This rapidly changing view of primary care provision, such as that highlighted by an important National Academies of Sciences, Engineering, and Medicine report on the future of primary care,[17] must be taken into account by key stakeholders as they plan for ways to make key primary care functions and services more equitably and effectively available to all people. Moreover, the extent to which investor-owned organizations are proliferating within certain of these segments might suggest that some of these organizations are arising to take advantage of regulations or other payment system quirks that create opportunities for investors to realize substantial returns without fundamentally improving care or outcomes. Further alignment of recently articulated federal policy goals around increasing the number of beneficiaries in a care relationship with accountability for both costs and quality of care supporting care innovation, advancing equity, and enhancing affordability will require a more granular and nuanced view of primary care innovation inclusive of the array of types discussed in this paper.

Bruce E. Landon, MD, MBA, MSc
Professor, Harvard Medical School, Department of Health Care Policy, Boston, Massachusetts, USA Physician and Professor of Medicine, Beth Israel Deaconess Medical Center, Division of Primary Care and General Internal Medicine, Boston, Massachusetts, USA

Gabe Weinreb, BA
Research Assistant, Harvard Medical School, Department of Health Care Policy, Boston, Massachusetts, USA

Asaf Bitton, MD, MPH
Executive Director, Ariadne Labs, Boston, Massachusetts, USA Associate Professor of Health Care Policy, Department of Health Care Policy, Harvard Medical School and Harvard T.H. Chan School of Public Health, Boston, Massachusetts, USA Physician and Associate Professor of Medicine, General Medicine, Brigham and Women's Hospital, Boston, Massachusetts, USA

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Return to TOC

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Return to TOC

NEJM Catalyst | Innovations in Care Delivery

ARTICLE

Technology-enabled Hospital at Home: Innovation for Acute Care at Home

Jared Conley, MD, PhD, MPH, Gregory D. Snyder, MD, MBA, David Whitehead, MD, MBA, David M. Levine, MD, MPH, MA

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Since 2016, two hospital at home programs at Mass General Brigham have cared for more than 2,000 patients and have developed significant experience leveraging technology to improve clinical outcomes, operational efficiency, and the care experience for both patients and clinicians. These technologies have spanned from supporting remote visits and facilitating remote patient monitoring to enhancing clinical team coordination and supply chain management. Key lessons have been learned along these verticals, and there have been several important interoperability/integration and health equity implications, as the patient population and technology portfolio have expanded. Early experience points toward the use of these technologies in hospital at home as being safe and acceptable to patients and clinicians, as well as holding significant promise in enhancing clinical resource efficiency and coordination that will be critical to the scaling of acute care delivery in the home.

With the U.S. Centers for Medicare & Medicaid Services (CMS) announcement of the Acute Hospital Care at Home (AHCaH) waiver[1] and with growing private payer interest, hospitals and health care systems are strategically evaluating and often engaging in this newer model of acute care delivery.[2] Health care delivery science has demonstrated that hospital at home (HaH) care is safe, high quality, and cost saving.[3–7] Yet understanding how to best operationalize such care in the setting of rapid technological innovation is still evolving. Technological advancements have long enabled enhancements to acute care delivery, through both improved safety and

Return to TOC

improved quality, and acute hospital care at home is no different. In this article, we explore our experience at the Mass General Brigham (MGB) health care system in the use of technologies to better enable and enhance acute hospital care at home.

MGB started two HaH programs in 2016 — one at Massachusetts General Hospital (MGH) and one at Brigham and Women's Hospital (BWH). Each focused initially on caring for patients who required hospital-level care after management in the ED. The patient population of interest included those with a variety of acute medical conditions, including heart failure, pneumonia, cellulitis, chronic obstructive pulmonary disease, and complicated urinary tract infections. The programs have evolved over the years, adding more conditions (both medical and postsurgical) and new entry pathways (including direct admit from home, as well as a transfer model that enrolls patients directly from the inpatient ward for those who require continued hospital-level care). As of December 2021, more than 2,000 patients have been enrolled in these two HaH programs, and a randomized controlled trial showed reduced cost and lower 30-day readmission rates for patients cared for at home, compared with similar patients managed in the traditional brick-and-mortar hospital.[7] In addition, the HaH programs' efforts to better match site of care with provision of care has led to increased inpatient capacity of more than 10,000 bed-days since inception.

> *"The HaH programs' efforts to better match site of care with provision of care has led to increased inpatient capacity of more than 10,000 bed-days since inception."*

Over these past 5 years, technologies to enhance our hospital-level care at home have been critical to enabling care across several key domains:

1. Telemedicine
2. Remote patient monitoring (RPM)
3. Distributed clinical team coordination
4. Distributed supply chain coordination

In this article, we highlight our journey in understanding the technological opportunities and challenges inherent in each of these domains and their impact on enhanced HaH care (Table 1). Additionally, we explore the topics of interoperability/integration and health care equity and their cross-cutting impact on technology implementation in HaH care.

Return to TOC

Table 1. Key Domains of Technology-Enabled Solutions for HaH Care

	Domains of Technology-Enabled HaH			
	Telemedicine	**Remote patient monitoring**	**Distributed clinical team coordination**	**Distributed supply chain coordination**
Challenge(s)	Clinicians cannot urgently evaluate patients in person to assess change in clinical status, and remote-visit connectivity is not always reliable. There are varying levels of technical literacy and physical/cognitive impairments of HaH patients.	HaH patients are a lower-risk hospitalized population, but there is still some risk of decompensation, requiring consistent evaluation of vital signs and falls.	Geographically distributed clinical teams can lead to coordination challenges, inefficiencies, and overlooked tasks.	Robust supply chain is needed to deliver HaH care, but a lack of centralization of resources and transparency of order fulfillment can make this difficult to achieve.
Hardware response	• Tablet for video-based, remote-visit platform placed in patients' homes • Hot spot routers, 4G/5G antenna, and portable broadband satellite to bolster reliability of network connectivity	• Vital signs monitoring devices (wearable vs. ambient) for qualifying patients • Continuous monitoring device for telemetry/falls for select patients • Broadband hub for device connectivity	• Tablet or smartphone device to enable mobile task management • GPS device to locate team members • EHR downtime procedures for manualized processes	• Portable diagnostic devices (point-of-care labs, X-ray, ultrasound, ECG) • Medication-dispensing technology vs. pill box • Novel transportation vendors • GPS device to track supply chain
Software response	• Audio, video, and text message communication tools • Cybersecure, HIPAA-compliant telemedicine software that minimizes maze to the digital front door of HaH care	• Vital signs transmittance, visualization, and alerts • Telemetry/falls transmittance, visualization, and alerts for select patients • Smartphone/tablet app to enable data transmission to Cloud/EHR	• HIPAA-compliant, Cloud-based task management system accessible anywhere on mobile devices • Mobile EHR specific to HaH workflows • GPS-enabled real-time team coordination and route optimization	• e-Prescribing (e.g., medications, imaging, DME) and transparency in order fulfillment • Pharmacy medication verification in mobile EHR • Geotracking of supply chain components • AI guidance of ultrasound image acquisition by external technicians
Key design considerations	• Carefully develop and support a hybrid model of virtual and in-person daily MD/APP patient evaluation with virtual-first focus when safe/feasible • Determine ideal frequency of scheduled virtual synchronous and asynchronous communication • Weaning of in-person visits and transition to virtual care over episode of care when safe	• Ascertain criteria for passive vs. active monitoring: assess patient and social/environmental factors • Maximize clinically actionable alerts and minimize false alarms using human- and machine-based methods • Degree of integration with other data streams/data capture • Patient/family awareness of vital sign abnormalities	• Develop task management system that enables access and communication across mobile team • Consider technology-supported inclusion of additional personnel in care delivery and coordination • EHR downtime procedures for distributed team members	• Focus on portable-first and virtual-first supply chain technologies • Focus on internal, system-first integration capabilities • Transparency in the status of orders in their fulfillment process • Decision-support tools to clarify logistical management of distributed service partners, allowing visibility into which partner should perform a given service
Interoperability considerations	• Integration of telemedicine software with EHR to facilitate care and documentation • Ability to perform telemedicine on phone, tablet,	• EHR integration for vital signs, telemetry, and fall monitoring • Alert integration into clinical workflow and ability to reliably notify a	• HIPAA-compliant, Cloud-based task management system integration with EHR to facilitate care workflows and documentation	• Image transfer to EHR from external vendor (and consideration of internal radiology read) • Laboratory result integration to EHR

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Return to TOC

Table 1. Key Domains of Technology-Enabled Solutions for HaH Care (cont.)

	Domains of Technology-Enabled HaH			
	Telemedicine	**Remote patient monitoring**	**Distributed clinical team coordination**	**Distributed supply chain coordination**
	computer without connectivity issues	clinician (including during overnight hours)	• Automated clinical task alerts based on new EHR clinical data	from any external vendor
Equity considerations	• Perform early needs assessment of sensory or cognitive impairment • Hearing and visually impaired augmentation devices (pocket talkers and external speakers) • Interpreter service availability/integration with video conferencing software	• As indicated, employ passive monitoring systems that require minimal or no input from patient • Guaranteeing delivery of connected devices to all RPM-indicated patients and not relying on their own smartphone-based transmission of data to the Cloud • RPM device form factor facilitates use for all populations (especially geriatrics)	• Monitoring for equitable response time of clinical teams for urgent evaluations across service area	• Leverage and build upon health systems' existing infrastructure for case management and social work • Monitoring for equitable response time of supply chain for both scheduled and urgent evaluations across service area

HaH = hospital at home, GPS = Global Positioning System, EHR = electronic health record, ECG = electrocardiogram, HIPAA = Health Insurance Portability and Accountability Act of 1996, DME = durable medical equipment, AI = artificial intelligence, MD/APP = Doctor of Medicine/advanced practice provider, RPM = remote patient monitoring. Source: The authors

Key Domains of Technology-Enabled HaH Care

As we explore each of the domains, we provide a *case thread* and associated patient journey map (Figure 1) to further contextualize technology-enabled HaH.

Telemedicine

Case thread (adapted from a real patient experience): Mrs. S presented to the ED with a heart failure exacerbation, is deemed by her emergency physician to benefit from intravenous (IV) diuresis, and is enrolled in HaH care. At the time of admission to HaH, Mrs. S's HaH team provided her with a 4G Long-Term Evolution (LTE)–enabled tablet preloaded with software for convenient video check-ins with her clinical team. A few hours after Mrs. S's first video check-in, she develops a new cough. She alerts her care team, and they are able to perform a rapid video-based, remote evaluation of Mrs. S through the tablet to determine the need for in-home evaluation or further interventions.

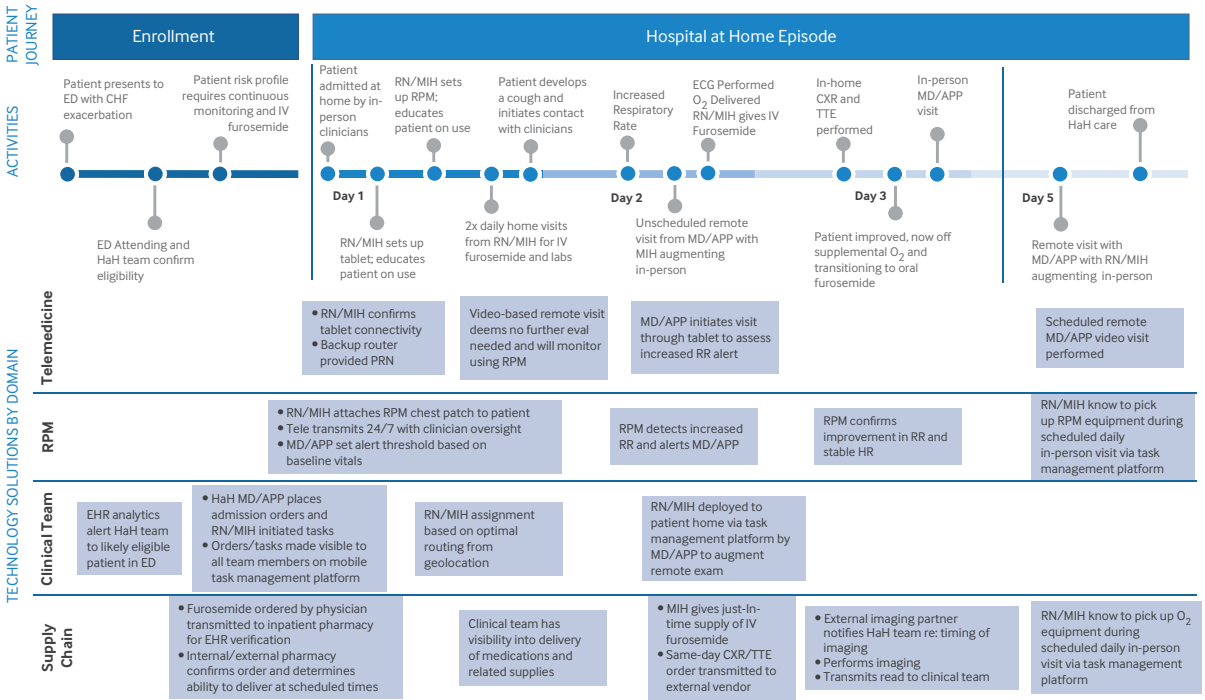
> *"Our experience has taught us that HaH patients with hearing impairment (despite assistive devices), cognitive impairment, or who have insufficient caregiver support are better served with a higher proportion of in-person visits."*

Return to TOC

FIGURE 1

Technology-Enabled Hospital at Home (HaH) Patient Journey

This process map shows an example of a patient's hospital at home journey across the key technology domains and aligns with the case thread described in the accompanying article.



APP = advanced practice provider, CHF = congestive heart failure, CXR = chest X-ray, ECG = electrocardiogram, EHR = electronic health record, HaH = hospital at home, HR = heart rate, IV = intravenous, MD = doctor of medicine, MIH = mobile integrated health, PRN = as needed, RN = registered nurse, RPM = remote patient monitoring, RR = respiratory rate, TTE = transthoracic echocardiogram.
Source: The authors

While the practice of telemedicine has been advancing for several years now and was further accelerated by the Covid-19 pandemic, there has been relatively less attention given to the application of telemedicine to the acute care at home environment. There are unique challenges associated with this care setting, but also opportunities at play, including:

- The acute nature of pathological changes during the episode of care, leading to video-based, remote visits that are both scheduled and unscheduled.
- Predominance of geriatric population with limited technology literacy.
- Telemedicine hardware can be delivered, easily taught, and then collected by HaH staff during the acute episode of care.

Return to TOC

- Video-based remote visits may be enhanced by the presence of bedside clinicians — e.g., registered nurse (RN), advanced practice provider (APP), and mobile integrated health (MIH) paramedic — who can assist in the physical examination, medication administration, physical therapy, or wound care.

Our MGB experience to date has provided some important insights as we have worked through the opportunities and challenges of video-based remote visits in the acute care at home setting.

Carefully Develop and Support a Hybrid Model of In-Person and Remote Visits

Approximately 1 year before the Covid-19 pandemic, our team began experimenting with remote physician care, facilitated by a nurse or paramedic in the patient's home. Preliminary data from our randomized controlled trial show that neither patient safety nor experience are sacrificed when a remote physician visit occurs, although we found that about one in five patients required additional in-person physician care.[8] Since the pandemic began, we have transitioned to a hybrid model in which each day we ask our HaH clinical teams to decide which patients could be cared for with a remote physician or APP visit in lieu of an in-person visit. Nonetheless, we have found it sometimes challenging to know when it is appropriate to do so (especially in the setting of limited scientific inquiry); we are mindful about deciding to lean on in-person visits when there is uncertainty as to what will be best for the patient.

Currently, our MD/APPs clinicians can perform up to 50% of their acute care visits remotely by video. This requires a skilled blend of remote and in-person facilitated care, and we train clinicians to make this remote versus in-person decision on the basis of several factors (Table 2).

Our experience has taught us that HaH patients with hearing impairment (despite assistive devices) or cognitive impairment or who have insufficient caregiver support are better served with a higher

Table 2. Factors to Consider When Choosing Modality of HaH Visits, Remote Patient Monitoring, and Alarm Sensitivity*

	MD/APP visit type	Remote patient monitoring**	Alarm sensitivity#
Patient-level factors			
Complex acute care needs	In-person	Passive	Higher
Stable acute care needs and static examination	Remote	Active	Lower
Hearing impairment (despite assist device)	In-person	Passive	N/A
Cognitive impairment	In-person	Passive	Higher
Fall risk	In-person	Passive	Higher
Insufficient caregiver support	In-person	Passive	Higher
Program-level factors			
High census	Remote	N/A	N/A
High Covid-19 case rate	Remote	Passive	N/A

HaH = hospital at home, MD/APP = Doctor of Medicine/advanced practice provider, N/A = not applicable. *We acknowledge that clinicians must navigate a multitude of factors when making these decisions, which could differentially affect each modality choice and do not suggest these to be prescriptive. **When remote patient monitoring is indicated: (1) passive: data flow occurs without end-user input; and (2) active: data flow requires patient or caregiver to obtain data. #A higher sensitivity alarm will identify more patients who are true positive but will also result in more false positives. Source: The authors

Return to TOC

proportion of in-person visits. We have also found that video-based, remote visits are more easily embedded into care after the first one or two in-person visits are completed and a baseline familiarity with a patient's history and physical examination is readily known. In addition, we have further appreciated the reality that lower-acuity HaH patients (e.g., those with cellulitis requiring IV medications) are best suited for a higher proportion of remote visits. We are also actively working to enhance the capacities of the remote physical examination by trialing various devices and hope to make remote visits more and more achievable in acute care at home.

Ensure Reliable Network Connectivity for Acute Care at Home Including Backup Device

A strong and secure broadband network is crucial to reliable remote visits in acute care at home. When a video-based virtual visit is planned but the connection turns out to not be viable in the moment, efficient and effective care is compromised. We have experienced this firsthand even in the Greater Boston Area, where we come across homes/locales that do not always guarantee reliable connectivity on our contracted LTE wireless network. As such, we have invested in the use of best-of-class hot spot routers as a backup when needed. These can be used both in patient homes and in the transportation vehicles of on-the-go clinicians (if not driving). We have learned that troubleshooting connectivity challenges can sometimes tie up and frustrate clinical staff, so we are consistently working to solve this issue, including actively trialing the use of FirstNet — the federal high-speed wireless broadband network dedicated to public safety and health care. Still, rare locales exist where low bandwidth disrupts our video-visit connectivity, and, subsequently, in-person and audio-only are the only available options for care.

Minimize the Maze to the Digital Front Door of Remote HaH Care

We have explored a variety of telemedicine vendors to ensure the most seamless patient and clinician communication. Often, there are too many steps required to enable a telemedicine visit, particularly with the predominance of geriatric patients in HaH care. Minimizing the maze to get to the digital front door and engage in a telemedicine visit with clinicians is imperative; we have current experience working with two different approaches to make this a reality. The first approach is a Health Insurance Portability and Accountability Act of 1996 (HIPAA)–compliant system that allows a patient to initiate and receive audio, video, and text communication 24/7 with a simple tap of the tablet. Clinicians can initiate and receive communications via their smartphone or desktop, which is imperative given the need for in-the-field communication. In addition, our patients have the option to wear an alert bracelet that sends a distress signal to the clinical team and prompts an immediate remote response.

> *"Currently, our MD/APP clinicians can perform up to 50% of their acute care visits remotely by video. This requires a skilled blend of remote and in-person facilitated care, and we train clinicians to make this remote versus in-person decision on the basis of several factors."*

Return to TOC

The second approach is using tablets and a HIPAA-compliant software platform that allows the clinician team to seamlessly access the patient without the need for the patient to do anything. These tablets are always plugged in and in *Guided Access* mode continuously, enabling the clinician team to access the patient at any time, for both scheduled and unscheduled visits. Given this seamless access, patient privacy is furthered by placing a webcam cover over the tablet camera lens for video access only when the patient permits it. We continue to learn from each approach and to refine our processes.[9]

As we look to the future of telemedicine in HaH, there remain great technology opportunities to further enable such acute care in the home. One area is realizing 100% connection reliability in video-based remote visits regardless of home/locale, and we look to emerging technologies (e.g., low Earth orbit satellites) or further distribution of existing technologies (e.g., 5G) that enhance such connectivity. We also anticipate further innovation to enhance the virtual examination, including improved image resolution for visual diagnosis and better digital stethoscopes that transmit full-fidelity heart and lung sounds remotely. We also expect software enhancements to enable a more seamless telemedicine visit for patients and HaH team members, as well as for medical and surgical consultants and interpreters.

RPM

Case thread: In the setting of her heart failure exacerbation and history of atrial fibrillation with rapid ventricular rate, Mrs. S. is deemed to benefit from IV diuresis, as well as close vital sign monitoring. On the basis of the acuity of her condition and comorbidities, she is deemed to benefit from continuous monitoring of telemetry, heart rate, and respiratory rate. At the time of the patient's arrival home from the ED, the HaH RN performs an initial evaluation and places a wearable vital sign sensor on the patient and provides brief device education. On day 2 of admission, the RPM device alerts the medical doctor/advanced practice provider (MD/APP) of an increased respiratory rate.

Delivering hospital-level care in the home requires the monitoring of patient vital signs (heart rate, oxygen level, blood pressure, etc.), as well as falls, to ensure safety and high-quality care. For HaH patients who are less likely to benefit from continuous monitoring, monitoring can be performed by nurses and paramedics with twice-daily in-home visits. For moderate- and higher-acuity hospitalized patients who often require more frequent monitoring, advances in RPM technologies unlock opportunities for HaH programs to geographically and economically scale, because RPM technologies have been shown to enhance patient safety by alerting clinicians to early signs of clinical deterioration for hospitalized floor patients.[10]

> *"It is important to note that the implementation science of remote patient monitoring is still maturing, and we are working along with others to best define it for HaH care."*

Over the past decade, out-of-hospital RPM devices have improved significantly, with increasing numbers of vital signs available from a single device, and have enabled better patient compliance with enhanced form factors. We at MGB have explored and trialed a variety of these RPM technologies in

Return to TOC

an effort to best support and enhance acute care in the home. Stemming from this work, we have operationally instituted a few of them and anticipate more such opportunities as the industry becomes more focused on acute care in the home. RPM devices that measure the key variables of interest (vital signs abnormalities, arrhythmias, and falls) can be divided into three main classifications:

1. Ambient
2. Wearable
3. Intermittent

Ambient devices use technologies such as radar; RGB wavelength color cameras; and light laser imaging, detection, and ranging. Wearable (e.g., chest patch or arm band) and intermittent (e.g., blood pressure cuff or pulse oximeter) devices employ technologies such as photoplethysmography, electrocardiogram (ECG) electrodes, accelerometers, and thermistors. Through our experience, we have developed an evaluation framework to better understand which RPM devices can best enable safe and high-quality care for our HaH patient population (Figure 2).

In vetting these technologies, we have learned a few key lessons along with way:

- There is currently no perfect device that accurately and reliably monitors all vital signs without requiring third-party additions to existing devices. We anticipate that this could change soon, given the pace of technological innovation and new industry focus on HaH care.
- Many of these RPM technologies have the highest degree of signal fidelity when the patient is at rest. In the more active patient population of HaH care (compared with inpatient care), reliable data can be occasionally compromised.
- Ambient monitoring technologies are in the earlier stages of development for HaH care and might be best only for lowest-acuity cases and/or fall detection.
- It is imperative to work carefully with the RPM company to ensure the sensor alert pathway to the clinician is robust and even able to wake them from sleep given the nature of acute care.

Beyond exploring and trialing these technologies, we have also gained operational experience in using RPM devices in our MGB HaH programs for the past 5 years. In the process, we have discovered several additional lessons, which we outline below.

Tailor the RPM Technology to the Individual Patient Need

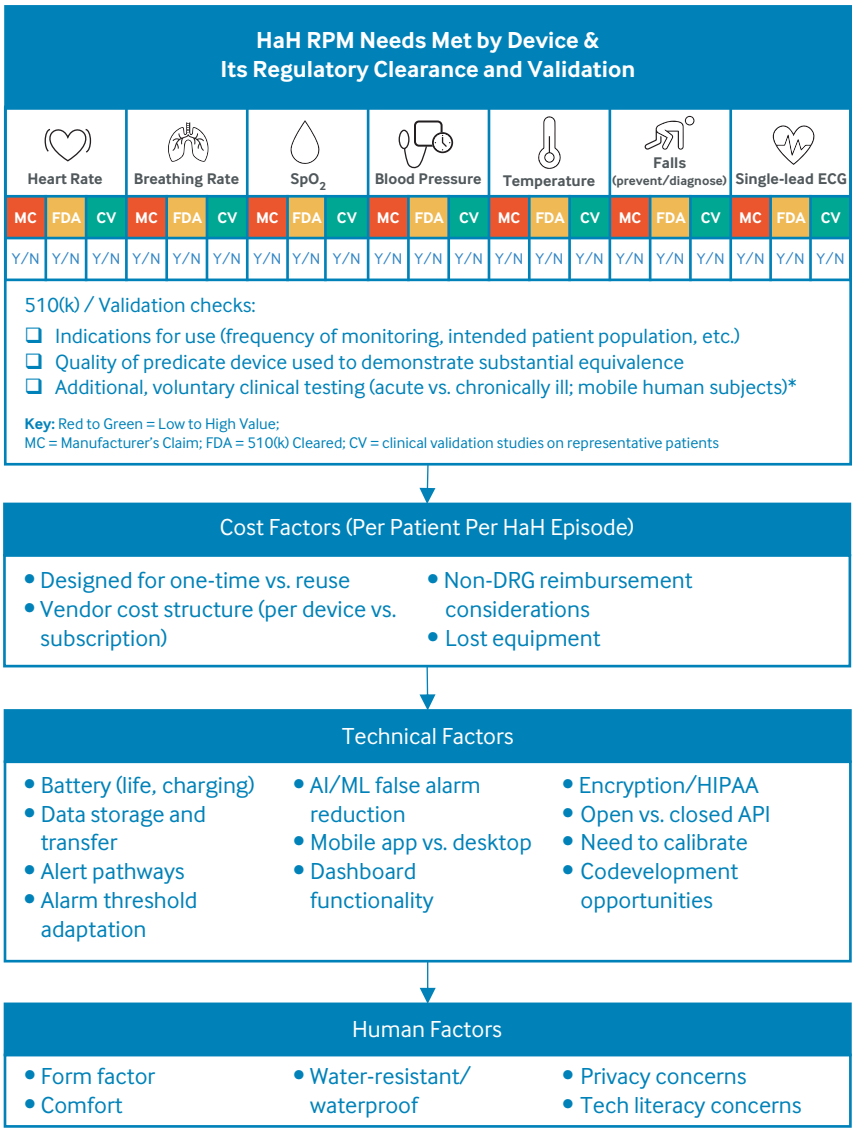
There are a variety of patient populations who are well suited for HaH. Higher-acuity cases (e.g., heart failure requiring IV diuresis) may benefit from RPM technologies that generate continuous vital sign monitoring, as well as from telemetry. However, some less-acute cases (e.g., cellulitis

Return to TOC

FIGURE 2

Evaluation Framework for Remote Patient Monitoring Devices in HaH Care

*In 510(k) performance testing, clinical studies are not required to demonstrate the safety and effectiveness of a new device; instead, device manufacturers are only required to demonstrate that the new device is substantially equivalent to a legally marketed predicate device, solely on the basis of benchtop performance testing.



AI = artificial intelligence, API = application programming interface, DRG = diagnosis-related group, ECG = electrocardiogram, HaH = hospital at home, HIPAA = Health Insurance Portability and Accountability Act of 1996, ML = machine learning, SpO_2 = saturation of peripheral oxygen (pulse oximeter).
Source: The authors

Return to TOC

requiring IV antibiotics) likely only require twice-daily vital signs monitoring by nurses and paramedics. For some lower-acuity patients who still meet HaH criteria, continuous monitoring of falls might be the only clinical need that RPM technologies might best fulfill. At MGB, we have developed and continue to refine inclusion/exclusion criteria that allow us to best match our specific HaH patient populations with the right RPM technologies that will benefit them most while also being cost conscious. We are actively furthering our RPM methodology of using passive versus active monitoring depending on several clinical, environmental, and social factors (Table 2). It is important to note that the implementation science of remote patient monitoring is still maturing and that we are working along with others to best define it for HaH care.

Maximize Clinically Actionable Alerts of Vital Sign Abnormalities, Arrhythmias, and Falls, but Beware of False Alarm Burden

The HaH model of care requires robust accuracy in vital signs monitoring because of the acuity of disease management, as well as the physical separation of patient and clinician. It is uniquely different from both chronic outpatient management and inpatient floor/ICU care, because vital sign abnormalities require immediate attention, which could include sending a team virtually or in person to the patient's home. To date, however, most RPM technologies have not been inherently designed for the HaH environment. Given these realities, it is important to carefully vet the RPM technologies used in HaH care, particularly in the context of the long-standing literature outlining false alarm burdens for inpatient continuous monitoring.[11]

> *"Through our experience, we have developed an evaluation framework to better understand which RPM devices can best enable safe and high-quality care for our HaH patient population."*

In our MGB experience, we have noted a variance in accuracy and alerting functions across vendors that can both facilitate and interrupt appropriate clinical care. Depending on the patient population within HaH, the key variables of interest to monitor include vital signs abnormalities, arrhythmias, and falls. Another important consideration is whether to monitor continuously or intermittently. To avoid the negative effects of false alarm burden, we have had success testing and employing both manual and machine-based approaches:

- Manual
    - Setting alert thresholds on the basis of what is known of the patient's baseline vital signs range.[12]
    - Adjusting the duration of time that a vital sign has to be abnormal to set off an alert[11,13] (we prefer approximately 5 minutes for most patients when continuous monitoring is indicated).

Return to TOC

    - Utilizing, as indicated, a combination of abnormal vitals (rather than a single vital sign) to set off an alert.[14]
- Machine centered
    - Employing vendor-developed or codeveloped artificial intelligence (AI) or machine-learning (ML) algorithms to perform the initial screening of abnormal vital signs, arrhythmias, and falls and to send a clinician alert only as indicated.[15,16]
    - Contextualizing patient vitals in the setting of patient position, posture, activity intensity, and time of day.

The integration of multiple approaches to improving alarm sensitivity and specificity is likely to lead to the best performance.[17] With our experience to date in RPM technologies in HaH (including initial challenges with false alarm burden on both our patients and our staff), we have explored various approaches and have developed the following method to improving alarm sensitivity and specificity:

1. Use the above manual approaches;
2. Turn off certain continuous vital signs (e.g., respiratory rate) that are not clinically indicated; and
3. Codevelop and pilot ML algorithms to better screen out false-positive alarms.

During the entire HaH episode of care, we have one (albeit alternating) HaH responding clinician (MD/APP) responsible 24/7 for the care of the patient, and RPM alerts fall under their responsibility. However, we also partner with an emergency medical services (EMS) dispatch team to augment the ML monitoring of our continuous RPM data. This provides an extra layer of safety and interpretation. Last, we consider adjusting alarming features to higher versus lower sensitivity, on the basis of several factors (Table 2).

The implementation of RPM as an additional layer of safety in HaH care and the inherent false alarm burden despite performance-enhancing adjustments raise questions of legal implications. Patients must be educated on the benefits and risks of such RPM, including the risk of a remote device failing and the potential for malfunction if worn or handled improperly. Fortunately, several RPM companies have alerting functions built in to notify clinicians of device transmission failure. To mitigate patient harm, we use this functionality with patients whose clinical risk requires RPM and who have 24/7 clinical monitoring to follow up on all alerts with a remote clinical assessment. If we are unable to follow up on an alert with a patient through a remote visit, an HaH clinician or EMS will visit in person within the response time of 30 minutes as mandated by CMS. All RPM companies are vetted rigorously for compliance with federal and state privacy and confidentiality regulations.

As we look to the future of RPM in HaH, we note exciting technology opportunities to further enable such acute care in the home. With increasing numbers and types of RPM devices being

Return to TOC

used in HaH care, we anticipate advanced work in AI/ML algorithms that will improve the utility of the terabytes of data streaming to clinicians. We look forward to further innovation in ambient and wearable device-derived vital signs and fall detection that permits greater accuracy (including with patient motion), as well as increased patient comfort and ease of use. Last, the ongoing work in RPM science (in HaH care and other care models/settings) will continue to inform us on the best application of these technologies for the benefit of our patients.

Distributed Clinical Team Coordination

Case thread: The MD/APP makes the team aware of the RPM alert and the need for unscheduled urgent visit. She has a visit from the HaH's MIH paramedic coupled with a simultaneous video visit by the HaH MD/APP, and just-in-time IV furosemide is administered by the MIH paramedic. A 12-lead ECG is obtained by the paramedic and transmitted to the HaH MD and interpreted as normal sinus rhythm and nonischemic. The patient's RN joins the video visit as well to help guide the daily plan of care. No matter where they are located, the entire clinical team easily visualizes and efficiently notes all of their orders and tasks via the task management platform. The appropriate team member is assigned to each on the basis of geographic location, skill, and bandwidth.

> *"The two core unmet needs we have recognized include shared task management and a seamless mobile experience for in-the-field team members."*

Because of their distributed and mobile nature, technological advancements create a unique opportunity to better enable HaH care through enhanced team coordination. Our early and continued MGB experience has emphasized that HaH team coordination needs go beyond current electronic health record (EHR) capabilities. It is not unusual for care delivery innovation to require new EHR functionalities.[18] The two core unmet needs we have recognized are shared task management and a seamless mobile experience for in-the-field team members. Several care tasks (such as infusion medication administration and admission assessment) can be innately collaborative and often require multiple people to complete. To better facilitate this, users need to be able to tag text updates, tasks, and media to specific team members or groups on a per-patient basis, all from a mobile or desktop device. Additionally, as HaH scales, the number of tasks will increase exponentially; this creates utility in having a centralized dashboard for a nurse or operational manager to use to monitor progress against tasks and reassign resources as needed to complete priority or delayed tasks.

Leverage a HIPAA-Compliant, Cloud-Based Task Management System

Our HaH teams, who collectively manage patient enrollment, admission, and daily care, can range upwards of a dozen personnel for any one admission, making streamlined communication vital for timely and efficient patient care, as well as for safe pass-offs between clinical staff. For years, our

Return to TOC

team has used a HIPAA-compliant, Cloud-based task management system for clinical and care coordination tasks and logistics management. We estimate a typical clinician uses it more than 40 times a day. It allows nurses, for example, to task doctors or APPs to place an order or allows a team member in the field to task the operations team in the hospital to prepare a key supply for the next visit. It also serves as a place for clinical reminders, such as "goals of care conversation," or simple team notifications such as "best parking is located at ...." It facilitates pharmacy instructions and inventory distribution and can operate as the team's visit calendar. It also creates push notifications, alerting clinicians to a new admission or newly assigned task, reducing the need for additional text messages or calls. As our daily census has risen, this technology-based task management system increasingly supports safe care delivery.

Use Available Technology to Best Geographically Coordinate Clinical Team Efforts

Technology can also facilitate care coordination in this dispersed care model through enhanced geographic organization. With HaH admissions occurring across the Greater Boston area, our teams have seen challenges in best coordinating/scheduling care visits and optimizing driving routes. While we have not fully solved this dilemma yet, our teams have made some progress through the use of GPS-based visualization software by using the GPS locator on each clinician's smartphone, which has allowed a team member at the hospital to visualize the positioning of various clinicians in the field. This enables the care team to better deploy the most proximate, available clinicians for a task such as an admission. As with our task system, this also reduces the number of "where are you?" messages within our core clinical team and reduces the inefficiencies of the nurse or physician wondering when each other might arrive. As we grow our census, the importance of geographic coordination and route efficiency is heightened, and we are actively investigating external partners who have expertise in transportation logistics and route optimization.

HaH Care Through MIH Paramedics with Technology-Enabled MD/APP Medical Direction

Acute care has traditionally been provided by physicians and nurses, and scheduled care at home has traditionally been serviced by nonacute, in-home visits. Our team has had the opportunity to experiment with novel uses of personnel through the use of technology. Three years ago, we began experimenting with MIH paramedics on our HaH team; today, many of our visits are made by MIH paramedics (especially in the evenings). These specially trained paramedics take medical direction from our HaH physicians and APPs through the use of both our HIPAA-compliant telemedicine and our care coordination platforms. They can perform the daily plan of care (with further guidance from the patient's nurse), including advanced infusions, respiratory therapies, and patient education.

As we anticipate the future of distributed care team coordination for HaH care, we note excellent opportunities for technology to further enable this domain of acute care in the home. The EHR functionality for HaH care is still in its infancy, and, as HaH clinicians engage more and more with software engineers, there could be significant improvements in matching clinical processes and function with software infrastructure and features.

Return to TOC

Distributed Supply Chain Coordination

Case thread: During the urgent, unscheduled visit on day 2, Mrs. S is noted to have developed a minimal oxygen requirement. An oxygen concentrator and all related supplies are delivered successfully from our internal durable medical equipment (DME) provider. She has a chest X-ray performed in the home by an external partner, which shows a minimal pleural effusion. She responds appropriately to 2 liters nasal canula of oxygen and subsequently receives another dose of IV furosemide from a programmable infusion pump that was initiated in the early evening by the HaH APP. Mrs. S also has a transthoracic echocardiogram performed in her home, which fortunately shows no significant changes to her heart anatomy or function.

Given the acuity and complexity of hospital-level care in the home, a robust supply chain of clinical goods and services is required to ensure timely delivery of diagnostic and therapeutic interventions. For timely care, clinicians in brick-and-mortar hospitals have benefited from centralized clinical resources, just-in-time operational supply management, and staffing redundancies in clinical service lines. In Mrs. S's case thread above, her home infusion medication and home-based imaging must meet the same timeliness and reliability expectations as for all hospitalized patients. HaH redistributes hospital beds into the community away from centralized clinical resources, such that *last mile* supply chain complexity increases with patient census and acuity, as well as with certain service lines (e.g., postsurgical HaH care). Given these realities, there is a crucial need to provide transparency and to successfully manage redundancy in HaH supply chain coordination. Our MGB experience to date has highlighted the need for the technology enablement of HaH supply chain management, particularly as our programs have grown in terms of geography, patient volume, and clinical services.

> *"During the entire HaH episode of care, we have one (albeit alternating) HaH responding clinician (MD/APP) responsible 24-7 for the care of the patient, and RPM alerts fall under their responsibility. However, we also partner with an EMS dispatch team to augment the ML monitoring of our continuous RPM data."*

Like others, our HaH programs have focused our clinical supply chain on those service categories clearly defined by the CMS AHCaH waiver:

1. Pharmacy
2. Infusion medication and administration
3. Respiratory care, including oxygen delivery
4. Diagnostics (labs, radiology)

Return to TOC

5. Monitoring/vitals
6. Transportation
7. Food services
8. DME
9. Physical, occupational, and speech therapy
10. Social work and care coordination

We are fortunate to partner with an internal MGB home care provider for such services as skilled nursing, physical and occupational therapy, and DME/oxygen. Community paramedicine, home health aides, home infusion pharmacy, and mobile imaging are examples of service categories in which we have sought external partnership. With our system's internal resourcing of several key supply chain categories, we have had some increased ability in meeting the needs of the unique HaH order entry–to–fulfillment process to date, including troubleshooting and tracking fulfillment status of in-home service delivery on the basis of care plan orders (Figure 3).

As we have grown, our HaH clinical supply chains increasingly include non-MGB entities, which are variably able to ingest EHR orders and communicate synchronously on our common platform. Given that these providers bring clinical goods and services to the home, our core clinical team needs these services partners to act on EHR orders and respond to care plan updates in real time. This can become a significant barrier to scaling HaH care, because the potential multitude of external partners complicates the order entry–to–fulfillment process and customer relationship management systems that enable streamline ordering and logistics tracking.

In supply chain management across both MGB and non-MGB partners, we have experienced varied challenges that would benefit from technology enablement along the dimensions of reliability, transparency, efficiency, and communication with supply chain partners. First, our clinicians require a high degree of reliability in the fulfillment of services in their care plans. In our partnership with MIH paramedics, we occasionally encounter difficulty scheduling MIH paramedic visits to the home when their services are required elsewhere for emergency response or other home-based care programs. In these scenarios and after hours, we have at times leveraged our internal MD/APP teams to provide in-home assessments and/or infusion medication administration that could otherwise be offered by our MIH paramedic partners, highlighting the need for redundancy in maintaining reliability.

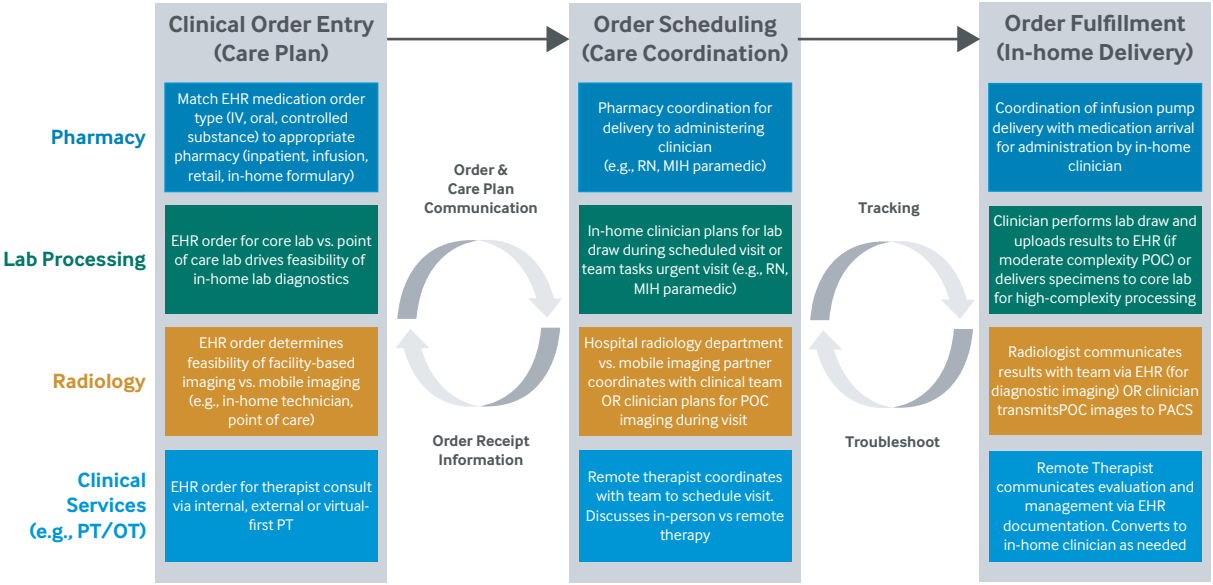
Second, our clinical teams need increased transparency in expected arrival times for various services, such as mobile imaging or infusion medication. For instance, when our clinicians have faced lack of visibility into arrival time for in-home X-ray, they have altered care planning to instead consider in-home MD/APP assessment, coupled with portable ultrasound for evaluation of possible worsened pleural effusion in the setting of a heart failure exacerbation.

Return to TOC

FIGURE 3

Mass General Brigham Hospital at Home Services and Supply Chain, Order Entry to In-Home Fulfillment

Supply chain clinical goods and services as defined by the U.S. Centers for Medicare & Medicaid Services Acute Hospital Care at Home waiver categories of requirements for in-home care represent MGB's experience and significant internal resourcing for varied home-based services. These example services do not represent an exhaustive list of needs and will likely adapt to greater levels of supply chain network redundancy as our programs scale.



EHR = electronic health record, IV = intravenous, MIH = mobile integrated health, OT = occupational therapy, PACS = picture archiving and communication system, POC = point of care, PT = physical therapy, RN = registered nurse.
Source: The authors

Transparency in timeliness of care fulfillment in the home encourages HaH clinicians to feel that turnaround times for services are comparable to brick-and-mortar diagnostic and therapeutic interventions.

Third, efficiency is sometimes compromised because currently available point-of-care labs are limited in their diagnostic reach, and it is sometimes necessary for the internal/external clinical team to spend the time bringing patients' blood samples back to the hospital for analysis.

Finally, our inability at times to communicate synchronously with supply chain providers during in-home visits has limited our ability to request new service orders, such as an additional blood draw for new biomarkers by an MIH paramedic who had initially planned to perform an infusion medication administration. This not only detracts from opportunities to update care plan needs in real time, but also limits our distributed clinical care team's ability to help troubleshoot clinical or technical concerns with distributed supply chain providers.

Return to TOC

Our recommendations for technology enablement in supply chain coordination are driven by our experience of challenges in this arena. As our volume continues to increase, we are actively working toward technology enablement of supply chain coordination that focuses on several core needs and design principles:

- All clinicians in our HaH programs, both core clinical team members and non-MGB partners or ancillary services, need the ability to enact EHR orders that are directed to them, on the basis of skill level and licensure, while in a patient's home.
- HaH clinicians benefit from transparency in the status of orders in their fulfillment process, akin to our geotracking of core clinical team members, to coordinate their care.
- Prioritize portable-first clinical technologies (e.g., point-of-care testing, mobile imaging, and programmed infusion pumps) and virtual-first clinical services (e.g., physical therapy and specialty consultation) given the complexity of managing distributed services to the home.
- HaH clinicians benefit from decision support tools to clarify the logistical management of distributed service partners, allowing them visibility into which partner should enact a given service on the basis of time of day, geographic location, license of partner, and skill required.

As our HaH programs expand into new clinical applications, logistics management will need to continually improve in addressing clinical supplies and personnel across system-owned and contracted entities. Supply chain coordination technologies must integrate seamlessly with clinical EHR workflows and produce analytics of end-to-end supply chain fulfillment processes. Ideally, these solutions would be a part of the unified provider interface for HaH that includes patient communication and remote monitoring technology. Given our experience in increasing supply chain complexity for MGB HaH, we strongly recommend that clinicians and technology innovators tend to these design principles for enablement of HaH supply chain coordination, because this will be integral to providing timely care at scale for a high census of HaH patients.

> *"As HaH scales, the number of tasks will increase exponentially; this creates utility in having a centralized dashboard for a nurse or operational manager to monitor progress against tasks and reassign resources as needed to complete priority or delayed tasks."*

As we envision the future of distributed supply chain coordination for HaH care, there are several opportunities for technology to further enable this domain of acute care in the home. HaH programs will significantly benefit from the emerging technologies in point-of-care labs, making them faster, easier, and cheaper. Additional work in point-of-care imaging (including ultrasound with AI assistance image capture and interpretation) could ease supply chain management. Innovation in infusion medication and administration (including remotely programmable infusion pumps) represents another emerging technology that could enhance

Return to TOC

coordination of the distributed supply chain. Additionally, technologies such as Ultra-WideBand and Bluetooth Low Energy could grant better visibility into tracking the supply chain across the distributed geography of HaH care.

Implementation Considerations for Technology-Enabled HaH

Interoperability and Integration

Case thread: On day 2, Mrs. S's continuous monitoring demonstrates an increased respiratory rate, firing an alarm in the vendor's proprietary system, sending an unencrypted Short Message Service message to a member of the clinical team. The clinician checks a different vendor's platform to note concurrent heart rate and respiratory rate. The clinician then manually documents all values and clinical management in the EHR.

Acute care at home is a burgeoning field, with industry partners working to create or tailor their technology solutions across telemedicine, RPM, clinical team coordination, and supply chain management technologies to better enable hospital-level care in the home. As with most other health care areas, few of these industry partners allow for a plug-and-play environment, resulting in proprietary hardware that talks only to proprietary software. This creates a conundrum for the clinician who may need pieces of various hardware or software solutions as they work to tailor technology solutions for their particular patient populations. As an example, prior to a shift to a streamlined platform, our HaH teams at one MGB hospital used nine software platforms each day to manage data flows. This has been a challenging burden to the clinical team and has caused us to pursue a different approach. Already, one of our MGB teams has moved to an integrated platform built specifically for HaH that has allowed us to migrate away from the inefficiencies of different applications and logins.

Centralize the HaH's Technology Needs Under an Integrated Platform

Pursuing an integrated platform that is hardware agnostic and allows one's clinical data to flow where one desires is crucial. From an informatics perspective, such platforms should allow for seamless piloting of a new sensor or data flow before complete integration with the EHR. In this way, various acute care at home programs have integrated mobile imaging and phlebotomy with their software platform or EHR. Others have sensor data that integrate with existing EHR dashboards, directly or via RPM middleware. Given the burden we have experienced in navigating various current piecemeal solutions, we are working toward a future state of an end-to-end ecosystem for acute care at home telemedicine, RPM, clinical team coordination, and supply chain management that remains hardware agnostic, integrating various tools in a plug-and-play manner on the basis of clinical utility.

At MGB, we still operate without direct EHR integration. This has allowed us significant flexibility in piloting and testing multiple different RPM and clinical team coordination platforms but comes with the drawback of some manual entry of clinical data into the EHR. In our early experience, the need to pilot different RPM and clinical team coordination platforms outweighed the benefit of direct integration, given the novelty of these needs for HaH. Other institutions have halted their

Return to TOC

launch of HaH, awaiting EHR integration, and we recommend against this. However, with higher patient census and acuity, we look to EHR integration to drive more efficient clinical workflows, requiring middleware that is hardware agnostic for RPM devices.

Adopt and Adapt an Inpatient EHR for HaH

Although most HaH programs will have little control over EHR data flows, the standard functions of an EHR can certainly facilitate acute care at home. Working closely with the MGB EHR team, our HaH teams designed an acute care at home build within our EHR to allow access to crucial patient safety data and organizational features. This facilitated EHR allows workflows such as admission order entry for HaH from the ED, streamlining site of care transfers for HaH clinicians while maintaining standard ED clinical workflows. Before this build, burdensome HaH admission processes caused ED teams to often prioritize traditional brick-and-mortar hospital admission given the efficiency requirements of ED care. Similarly, we designed discharge navigation from HaH to adhere to standard inpatient workflows, which has also assisted in case management and coordination of postacute services. This has allowed for transitional care pathways that clearly demarcate a patient's home hospitalization from their longitudinal outpatient care, with similar postacute referral pathways, even though the majority of our discharged HaH patients remain in their homes.

Furthermore, our inpatient HaH EHR build adapted critical workflows for safe HaH care in technical arenas that will undoubtedly benefit from further development. For instance, we enabled medication ordering that maintains standard clinical decision support and best-practice advisories for medication-interaction checking and dose alerting, so that our pharmacy partners can efficiently dispense medications after inpatient pharmacy verification. Moreover, we built several dynamic clinical reports to facilitate identification of eligible HaH patients in the ED and on medical-surgical floors. This has aided our efforts to identify patients early in their hospital stay with the goal of providing them safer care in the home, while liberating hospital facility beds for patients who need brick-and-mortar hospitalization. We understand that EHR vendors are currently developing HaH modules that will likely build on these efforts to drive clinical efficiencies across an integrated technology platform.

Health Care Equity

Case thread: Mrs. S's daughter worries that the HaH team will need broadband Internet and use a tablet for video that her mother cannot hear. Mentions of "daily digital check-ins" worry her that Mom's care will be compromised because she cannot easily use new technology.

Crucial to HaH's success is the seamless integration of technology for those who traditionally may not interface with technology because of issues of access, cost, language, or literacy.[19,20] For those who do have access to care through technology, user experience is just as crucial to facilitate equity, as in the case of sensory, functional, or mobility impairment.[21,22] To succeed, the default paradigm for HaH patients should be passive independent systems or those that function with minimal or no input from the patients or caregivers and do not presuppose

Return to TOC

technical infrastructure in the home. In delivering HaH care equitably at MGB, our primary challenges have come in ensuring technology access to all patients, irrespective of their prior access to technology-enabled care, while attempting to improve technology literacy and access during the HaH episode.

Ensure Required LTE-Connected Devices Are Brought to a Patient's Home

Our experience is that 20%–30% of our patients' homes lack adequate devices to support technology-enabled HaH care. We, therefore, always bring our own dedicated LTE-connected tablet so that we can be agnostic to whether a connected device (smartphone or tablet) exists in a patient's home. For purposes of cybersecurity, we generally do not use a patient's own broadband connection (except in cases in which our devices are appropriately locked down by our information systems team to prevent against data breach). We also always look at weather forecasts and strive to prepare homes for power outages with a battery backup system.

> *"Our teams have made some progress through the use of GPS-based visualization software using the GPS locator on each clinician's smartphone, which has allowed a team member at the hospital to visualize the positioning of various clinicians in the field."*

Prioritize Passive and Tailored Technology Systems

Passive technology ensures usability, data capture, and efficient and safe clinician decision-making. Some patients — even those who readily send text messages, check email, and use standard apps on their phone — will be overwhelmed by the introduction of new RPM devices. For patients with lower technical literacy or physical/cognitive impairments (Table 2), devices that require active data inputs or have counterintuitive user interfaces may reduce data integrity or decrease personnel efficiency, particularly when data capture is performed by in-home clinicians. For example, manual spot checking of a patient's temperature by an in-home clinician requires active personnel resources to maintain data transmission, as compared with an axillary temperature sensor that passively transmits core temperature. Overall, our experience with passive wearable technologies has been very positive, irrespective of technical literacy.

Often, the technical literacy of patients is extended by tailoring the technology interface, adding assistive technology, or through brief technology instruction during the HaH episode of care.[23] Early in the HaH episode of care, we perform a needs assessment through discussion with the patient/family and exploration of their medical history as it relates to sensory or cognitive impairment. We bring pocket talkers (sound-amplification devices) into the homes of patients with hearing impairment. Other interventions to tailor for sensory deficits include external speakers, Bluetooth hearing aids, and casting to larger screens with large font size and color contrast in order to provide technically equitable care that takes into account and respects our

Return to TOC

patients' unique abilities. On the basis of our experience, we estimate that 50% of older adults benefit from these tailored devices during HaH care. Given the predominance of older patients in our programs even before the CMS waiver, we are actively evaluating audio-based, health care–focused virtual navigation systems that directly integrate with RPM sensor technology.

Leverage and Build upon Health Systems' Existing Infrastructure

Because our HaH programs are a natural extension of the MGB health system — which includes academic and community hospitals; a health insurance plan; a physician network; community health centers; urgent care centers; home care; and other health-related services — we are fortunate to deploy system resources for patients with specific needs that can be addressed by our hospital and clinic facilities. For patients whose primary language is not English, our MGB programs leverage both internal (facility-based) and external (virtual) interpreter services depending on the language and time of day. This ensures that both scheduled and just-in-time interpretation is available through audio or video capabilities. Given our partnership with existing case management and social work resources, we are also able to connect these facility-based personnel to our patients (including via video-based remote visits) and to address care coordination needs in a holistic manner that is consistent with existing inpatient practices, albeit delivered in a technology-enabled fashion.

As our HaH programs expand to care for more patients with diverse socioeconomic needs and payer types, our definition of the means through which we equitably care for patients is augmented by our presence in their homes. Our HaH teams witness firsthand patients' caregiver support and social drivers of health. We continue to promote technical literacy as a part of our care but advocate for those technologies that augment connectivity regardless of existing access, and we promote seamless user experience of RPM or telemedicine and allow for patients of all functional abilities to participate in this model of care.

Looking Ahead

Case thread: Mrs. S is ready for discharge. She has received all of her acute care at home through a mix of in-person and remote modalities, much to her liking. She did not have to worry because the various passive sensors fed directly to the EHR, and she received tailored technology with a pocket talker and Bluetooth speaker to facilitate her remote care. In the background, her care team used Cloud-based task and inventory management to bring her hospital-level care home.

Thoughtful and robust implementation of technology to support HaH programs holds significant promise for improving patient safety, operational efficiency, and the care experience for both patients and clinicians. While rigorous studies are still needed to further evaluate the full impact of these supportive technologies, our initial experience has signaled a positive impact across all of these domains. It is our belief that we are just beginning to realize the potential for technology to assist acute care at home. Rapid hardware innovations — specifically in the realm of RPM devices that enhance device form factors and vital signs signal fidelity — will improve the ability of clinicians to trust and act on data streams.

Return to TOC

> *"Given the burden we have experienced in navigating various current piecemeal solutions, we are working toward a future state of an end-to-end ecosystem for acute care at home telemedicine, RPM, clinical team coordination, and supply chain management that remains hardware agnostic, integrating various tools in a plug-and-play manner on the basis of clinical utility."*

Future analysis should inform which patients benefit most from each of these devices, on the basis of clinical factors (including admission diagnosis and comorbid acute conditions), as well as environmental and social factors. Software solutions are nearing the point of much improved integration across middleware and the EHR, facilitating more efficient clinical team and supply chain coordination. As more data are captured on the HaH patient population, AI, ML, and clinical informatics will continue to be leveraged to aid in patient selection, clinical monitoring, and prediction of clinical deterioration.[24] Additionally, as assistive device interfaces improve, we anticipate wide adoption in the predominantly older HaH population to overcome visual, memory, and tactile barriers that could otherwise limit effective user experience.

HaH is inherently an operationally complex endeavor and, although early HaH initiatives have succeeded with limited technology enablement, it is our belief that purpose-fit technologies to enhance clinical resource efficiency and coordination will be critical for this model of acute care delivery to scale, including to higher-acuity patients, as well as geographic regions with lower population density.[25,26]

Jared Conley, MD, PhD, MPH
Associate Director, Healthcare Transformation Lab, Massachusetts General Hospital, Boston, Massachusetts, USA

Attending Physician, Emergency Medicine, Massachusetts General Hospital, Boston, Massachusetts, USA

Leadership Team, Home Hospital, Massachusetts General Hospital, Boston, Massachusetts, USA

Instructor of Emergency Medicine, Harvard Medical School, Boston, Massachusetts, USA

Gregory D. Snyder, MD, MBA
Attending Physician, Adult Inpatient Medicine, Newton-Wellesley Hospital, Newton, Massachusetts, USA

Senior Medical Director, Medically Home, Boston, Massachusetts, USA

Return to TOC

Entrepreneur in Residence, Healthcare Transformation Lab, Massachusetts General Hospital, Boston, Massachusetts, USA

Clinical Assistant Professor, Tufts University School of Medicine, Boston, Massachusetts, USA

David Whitehead, MD, MBA
Resident Physician, Emergency Medicine, Massachusetts General Hospital, Boston, Massachusetts, USA

Clinical Fellow, Emergency Medicine, Harvard Medical School, Boston, Massachusetts, USA

David M. Levine, MD, MPH, MA
Medical Director for Strategy and Innovation, Brigham Home Hospital, Boston, Massachusetts, USA

Associate Physician, Medicine, Division of General Internal Medicine and Primary Care, Brigham and Women's Hospital, Boston, Massachusetts, USA

Assistant Professor, Medicine, Harvard Medical School, Boston, Massachusetts, USA

Associate Faculty, Ariadne Labs, Boston, Massachusetts, USA

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Return to TOC

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Return to TOC

NEJM Catalyst | Innovations in Care Delivery

CASE STUDY

Methodology for a Mental Health Plan for Health Care Workers

Kaisa C. Wieneke, MPH, Gretl C. Kruse, MHA, Allyssa M. Stevens, MHA, Beba Shensi Tata-Mbeng, MS, MDiv, BCC, Debra S. Lafferty, MS, Craig N. Sawchuk, PhD, LP, Scott A. Breitinger, MD

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The risk and prevalence of mental health concerns for health care workers has been exacerbated by the Covid-19 pandemic. Frontline health care workers are particularly vulnerable to professional burnout, anxiety, depression, substance use, and trauma. Although health care organizations have responded rapidly to the health and well-being needs of the patients and communities they serve, swiftly adapting to increased patient volumes, new protocols, resource shortages, and other needs as driven by the volatile environment, a similarly agile and robust effort is essential to support the mental and emotional well-being of health care workers. This article outlines the agile methodology used to mobilize a multidisciplinary team at a large academic medical center to amplify mental health support options for its workers and address barriers that prevent them from seeking that help. With the support of the Mayo Clinic Board of Governors and the People and Culture Committee through active executive sponsorship and funding, an internal team strategized and swiftly activated procedures to deal with urgent mental health barriers for frontline workers, despite the compounding challenges caused by the pandemic. This systematic approach to modeling a mental health strategic plan for health care workers featured engaging stakeholder teams through active listening, collective goal setting, and delineated short-term and long-term objectives while leveraging values-aligned and employee-centric principles. After 1 year, employees have increased the use of mental health services by as much as 14%–26%.

Return to TOC

KEY TAKEAWAYS

- A mental health plan to address workforce well-being for health care organizations should combine not only pandemic-related drivers, but also factors such as social unrest, economic instability, and social isolation. As well, the effort must holistically consider the effects of increased risk to health care staff, delay in care owing to access and affordability issues and ongoing stigma and concerns for employment, plus high workloads and long workdays.
- The proactive effort to improve timely access to needed services and preventive care can potentially lead to reductions in health-related leaves of absence, staff shortages, and employee turnover.
- A comprehensive approach that challenges social and institutional norms will require the work of a multidisciplinary team and active executive sponsorship as an institutional priority.
- As strategy is developed and tactics adopted, the voices of stakeholders, experts, and employees should be sought and leveraged.
- Initial implementation focus areas should bring visible, tangible support to colleagues while further addressing the more complex barriers to realizing success of the long-term strategy.
- There is, and should be, an ongoing effort to decrease stigma, to address issues of access and cost of care for mental illness, and to influence behaviors in a workplace culture that supports the mental health of employees.

The Challenge

In June 2020, the Centers for Disease Control and Prevention reported a threefold increase in the prevalence of anxiety symptoms (25.5% vs. 8.1%) and a nearly fourfold increase in the prevalence of reported symptoms of depressive disorder (24.3% vs. 6.5%) compared with 2019 second-quarter base rates.[1] The Covid-19 pandemic taxed employee mental health and amplified barriers to accessing evidence-based resources and care. Of the people in the workforce, 51% reported deterioration in mental health since the pandemic began.[2] In a survey by an employee services company completed in June 2020, more than half of respondents (54%) said they felt uncomfortable talking to their managers and supervisors about mental health, and roughly the same percentage of respondents said they did not disclose their mental state to anyone at work. Of those who did discuss their mental health with someone at work, those most likely to be confided in were coworkers (35%); just 21% confided in a supervisor, and only 5% said they spoke with an HR representative.[3]

Furthermore, 30% of respondents cited fear that disclosing mental health struggles may increase their vulnerability to being furloughed or fired from their positions.[3] The pandemic has created new levels of stress, uncertainty, and risks for negative functional outcomes within the workforce that will likely extend beyond the end of the pandemic.[4]

Return to TOC

Rates of anxiety, depression, stress, insomnia, trauma, and substance abuse have all increased among health care workers.[5] Health care workers have experienced stressors, losses, uncertainties, and levels of isolation similar to those of the patients they serve, while concurrently assuming the responsibilities of managing the physical, emotional, and social consequences of the pandemic on patients. In addition to these cascading problems, multiple barriers exist in accessing evidence-based wellness and formal mental health resources for health care workers owing to stigma, lack of knowledge, and limitations in service availability.

The consequences of undertreated and untreated stress and mental health within this sector — particularly at a time of health care worker shortage — is dangerous for professionals and the patients they serve. This case study describes a multilevel approach to creating new pathways to mental health and well-being resources and services at Mayo Clinic for its workforce. We discuss the challenges faced and how they were addressed, critical decision points and investments that were made, and next steps for supporting the mental health of frontline health care workers.

The Goal

Like other health care organizations, Mayo Clinic faces the challenge of identifying, developing, designing, implementing, and assessing the policies, services, and resources needed to more effectively address the emotional toll of the Covid-19 pandemic on its workforce. Employee health, well-being, and performance are interrelated, so a comprehensive strategy that protects and promotes employee health and well-being was confirmed as an urgent institutional priority in November 2020. Initially, the goals were to develop strategies to mitigate the increasing prevalence of mental illness and then to proceed to reduce barriers to support through tangible and visible efforts. Results of these efforts would then be used to create a robust and validated long-term approach as the pandemic progressed and to prepare for anticipated postpandemic needs.

> *"The focus of the interviews was to understand gaps in support, target barriers to address, and identify opportunities for improvement. For consistency, the same interviewers, the assessment team, conducted the interviews with each of the 30 different stakeholders across the enterprise."*

The Team

Mayo Clinic is a patient-focused academic medical center that has more than 74,000 employees, including 3,000 physicians and scientists. Our care teams help more than 1.3 million patients every year from all 50 states and more than 130 countries. Mayo Clinic College of Medicine & Science has more than 4,000 core learners annually.

Mitigation of the mental health issues of our employees and learners in our College (allied health, graduate, and medical students; residents and fellows) was established as an institutional priority

Return to TOC

in November 2020 with sponsorship from the People and Culture Committee (PCC) and endorsement by the Mayo Clinic Board of Governors. A multidisciplinary team of more than 30 internal experts and stakeholders mobilized to assess the current state of support and opportunities to collectively address known barriers and gaps. The multidisciplinary team members had expertise in several fields and represented Benefits, Employee Assistance Program, Employee Well-Being, People Consulting, Division of Integrated Behavioral Health, Mayo Clinic College of Medicine and Science, Legal Department, Department of Nursing, Employee Occupational Health, Office of Staff Services, Program on Physician Well-Being, Department of Psychiatry and Psychology, Recovery and Claims Services, Section of Social Work, Spiritual Care, Strategic Talent Communications, and Strategy Department. An intentional effort was also made to ensure that all Mayo Clinic geographic locations in the United States were represented. This representation highlighted the breadth and diversity of employee experiences, including education level, maturity within a professional class, and individual job type.

The support of the PCC and the Mayo Clinic Board of Governors, along with HR leadership driving the effort, was a crucial catalyst for change as existing staff and resources were redirected from other efforts to address this priority. At the outset in January 2021, the team met every 2 weeks, as convened by the director of Employee Well-Being; by September 2021, the frequency decreased to every other month as tactics were confirmed and focused project teams were formed. Executive sponsors were the chief HR officer and the chair of the PCC. The PCC provided seed funding allocated to this effort from an existing budget to address cost obligations, simplifying funding approvals for rapid execution.

The Execution

Identifying and Inviting Key Stakeholders

The first step for strategy development and tactic prioritization was to interview key stakeholders who comprised the multidisciplinary team for their perspectives on assisting employees and learners in emotional distress. This was informed by two important ideas: identifying opportunities within the workplace to build more robust employee mental health programs and enabling strategic stakeholders to ensure that programs could be developed. An assessment team was assembled to conduct interviews and operated from the perspective that an extensive mental health initiative could not be created in isolation, so the multidisciplinary team members were engaged as stakeholders to offer diverse perspectives and ensure that the needs of frontline teams were considered.

Conducting Stakeholder Interviews

With this identification of key stakeholders, the assessment team conducted interviews using questions based on the roles of the stakeholders. A standard set of open-ended questions was used to elicit candid responses and opportunities to pursue regarding current efforts underway across the enterprise to address employee mental health, as well as key themes for opportunities for future efforts (e.g., "What would your three wishes be for mental health resources/programs at Mayo Clinic?").

Return to TOC

> *"The emerging themes from the stakeholder interviews informed our strategic plan, with an emphasis on short-term execution rather than on additional research that would be needed to establish the long-term strategy."*

Additional questions were asked on the basis of the unique roles of the stakeholders and the populations they serve. For example, the assessment team asked the education stakeholders how mental health was being incorporated into the existing curriculum for all students. This allowed the team to gain greater insight into initiatives being integrated within silos of the organization and to monitor specific concerns trending in some areas but not others. The results of the interviews were compared with current organizational change readiness for large-scale mental health initiatives amid a global pandemic. The focus of the interviews was to understand gaps in support, target barriers to address, and identify opportunities for improvement. For consistency, the same interviewers, the assessment team, conducted the interviews with each of the 30 different stakeholders across the enterprise. Throughout the interviews, the assessment team tracked the interview responses using interview worksheets and then translated those responses onto an Excel document to complete the SWOT (strengths, weaknesses, opportunities, and threats) analysis to categorize the top themes to address from the key stakeholder interviews (Table 1).

Table 1. Mental Health Themes from Key Stakeholder Interviews

Theme	Supporting comments
The stigma around mental health goes deep.	• The stigma can vary by profession. • Testimonials would be beneficial to open the conversation. • The rationale for time away for mental health may not be understood in some areas.
There is a need to centralize our mental health resources.	• Many complex entry points to mental health services are present. • An opportunity exists to consolidate resource information into one centralized place.
We need to assess our employees' experiences.	• Anecdotal feedback is valued. • An opportunity exists to quantify employee experiences and preferences.
Methods of care delivery and source/affiliation of care providers are important.	• Consider various perspectives for human connection and technologic support. • Consider various perspectives for internal and external care delivery.
How can interpersonal support be leveraged?	• Consider group debriefings, a peer support–battle buddy approach, and support groups.
Our employees need access to high-quality professional care.	• Timely access is an opportunity. • Quality of care is important.
Our leaders should be equipped to adequately respond to employees in emotional distress.	• Microlearnings for manager education and training are necessary. • Incorporate resources for support, including disability, paid time off, and leave benefits. • Develop skills related to listening, trust, and psychological safety.
There is a lack of awareness of mental health resources available.	• Create awareness to reduce stigma around mental health. • Distinguish the message according to job type and resource eligibility.

Source: The authors

Return to TOC

The assessment team then conducted an external benchmarking exercise against the results to identify external factors and opportunities for developing a holistic strategy. The external benchmarking exercise was conducted by first completing a literature and market assessment review of other companies, not exclusive to health care, instituting large-scale mental health initiatives. Then, the assessment team completed candid conversations with health care industry colleagues to understand their approach to creating comprehensive mental health programs. This approach validated the themes and opportunities identified within the interviews through both internal and external criteria by confirming the existence of similar opportunities within other organizations. Additionally, external benchmarking provided the multidisciplinary team with proven successful tactics to use as a platform for building new programs and restructuring existing offerings.

The emerging themes from the stakeholder interviews informed our strategic plan, with an emphasis on short-term execution rather than on additional research that would be needed to establish the long-term strategy. Our goal was to execute the short-term strategy within 4–12 months and to quickly achieve results that would benefit employees.

Short-Term Strategy

The Stigma Around Mental Health

Stakeholder discussions informed the assessment team about the seriousness of the stigma associated with health care workers who seek mental health resources. Sensitivities to the perception of mental health stability run deep in society, including our institution. Furthermore, when employees of a health care organization seek mental health care that is facilitated or provided by the employer, employees can feel uneasy about the boundaries between employee–employer relationships and patient–provider relationships. To combat the stigma associated with seeking help, a comprehensive awareness campaign was developed to increase the visibility of mental health initiatives and to promote open dialogue, positive engagement, and use of the services. Publicly sharing the institution's strategic efforts and highlighting personal employee stories of mental health challenges were key components of normalizing open dialogue and removing negative perceptions.

The Need to Centralize Our Mental Health Resources

Mental health resources can be disjointed with various entry points, and challenges in navigation to available resources were identified as barriers to seeking mental health assistance. Through the project's problem identification phase, the need to create a user-centered design was identified as a necessary step in reducing barriers to navigation and engagement with mental health care resources. By improving navigation to resources through a centralized external mental health website, positive changes in accessibility can occur simultaneously with improved perceptions of care resources.

Awareness of Existing Mental Health Resources

When this website became available, we publicized its existence to employees and learners so they could benefit from engaging with support services. The measured increase in awareness

Return to TOC

and new conversations through sharing personal experiences helped to decrease the stigma associated with seeking mental health assistance. Additionally, there was an expressed need for mental health education and training for supervisors and employees to learn how to empathize with others, assess situations, and refer colleagues appropriately. Results from a survey of supervisors showed that several individuals were not confident in their ability to respond appropriately to distressed employees. These findings led to the creation of on-demand virtual training content for supervisors and employees. Those efforts were sustainable and helped prepare the organization for future challenges.

> *"Publicly sharing the institution's strategic efforts and highlighting personal employee stories of mental health challenges were key components of normalizing open dialogue and removing negative perceptions."*

Long-Term Strategy Considerations

With initial efforts underway to respond rapidly to challenges, in July 2021, the team transitioned its focus to define and address additional long-term barriers to mental health support. The strategy included attempting to provide access to high-quality professional care through new models of care delivery, refining the definition of who delivers care and at what point in the mental health continuum, and identifying new tools for interpersonal support. Although the concept of clinical quality evaluation is a broad and nuanced domain of mental health care research, our initial priorities upholding rigorous quality standards were in assessing proposed clinical programs for appropriate credentialing of clinicians, routine and structured clinical supervision sessions for practitioners, quantitative patient outcome tracking, and general adherence to evidence-based practices and models of care. In addition, we completed informal workflow and operational program reviews drawing on our team's clinical and operational judgment and expertise to help ensure that there were no logical shortcomings in implementation planning and operational deployment.

To inform the long-term strategy, an expanded assessment team developed a well-being survey that was sent to a representative sample of the staff in August 2021. The survey had a 39% response rate (5,114 completed surveys of 13,007 sent) and provided the baseline knowledge for employee perceptions about access, navigation to existing resources, stigma, awareness of existing programs, and support for mental health and overall well-being, which could then inform the assessment team in long-term strategy development. This survey tool yielded valuable information in guiding efforts toward alleviating mental health concerns, including information on the top barriers to employees seeking mental health services. Figure 1 outlines the strategic framework identified from data accumulated across project activities.

Metrics

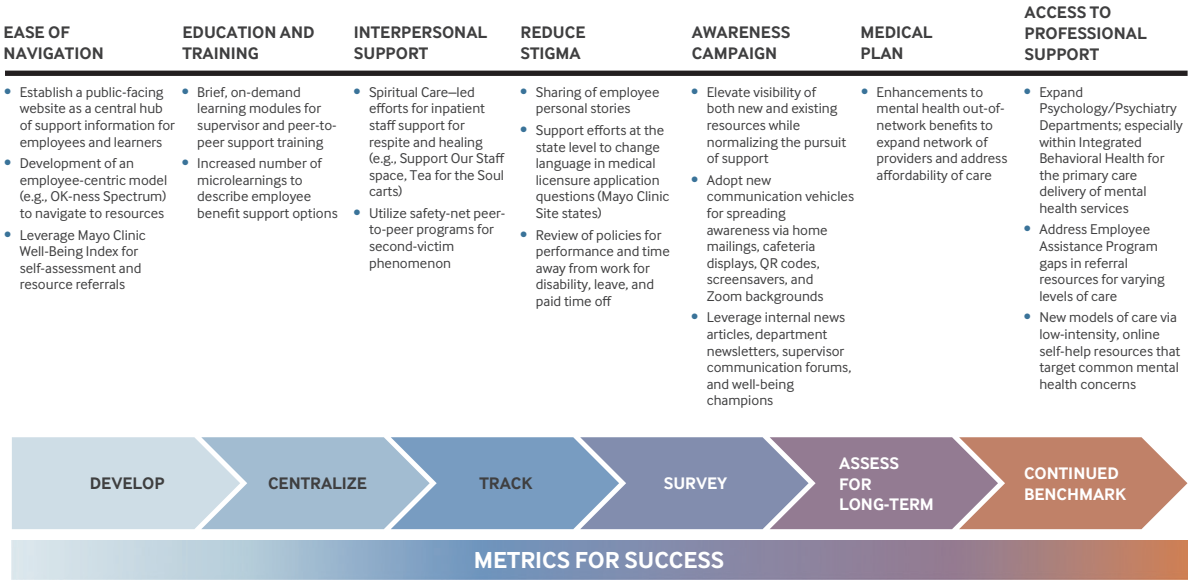
The team strategy for metrics included balancing rapid implementation needs while building a metrics structure that could be iterated as teams worked together to define short- and long-term tactics.

Return to TOC

FIGURE 1

Mental Health Strategic Framework for Implementation

This describes the seven mental health components addressed by the framework, along with some bulleted examples of topic-specific programs. The six-step metrics components show the process from discovery through benchmarking. Notes: The OK-ness Spectrum is a tool to help Mayo Clinic employees identify resources for help. *Learners* refers to Mayo Clinic College of Medicine and Science allied health, graduate, and medical students, residents, and fellows.



QR = quick response.
Source: Used with permission from the Mayo Foundation for Medical Education and Research
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Table 2 outlines the metrics that allowed feedback for validating the strategic framework and for informing the adaptation of future offerings. Interpersonal support, part of the strategic framework shown in Figure 1, included encouraging employees to take breaks while at work and away from work to restore their energy and prevent burnout; the quality of those breaks impacts their benefits.[6] The Support Our Staff initiative and the Tea for the Soul program were designed to offer such support.[7,8]

As part of the ongoing effort to serve our institution's employees, the team developed a comprehensive dashboard as a structure for measuring progress in all avenues in which services are offered to employees. Because this structure did not exist before, the team needed to take inventory of the existing data being tracked by the various departments within the organization responsible for employee mental health. The team was then able to develop a process for aggregating and translating these deidentified data into a unified dashboard to track all emotional well-being services available to the employees. Likewise, the team needed to incorporate data reflecting the unique program use by Mayo Clinic learners, so a stand-alone view for learner data was integrated

Return to TOC

Table 2. Metrics, Early Indicators, and Key Findings

Strategic Framework	Metrics and Early Indicators (June 1, 2021 through May 30, 2022)	Key Findings
Ease of Navigation and Centralization	Website use • Total page views: 78,312 (2.1 pages per session) • Total unique users: 23,884 (32.3% of all employees)*	• A centralized public-facing website for employees and learners to access information on resources available to them outside the firewall was useful and allowed them to access information at their convenience. • QR codes and home mailers (which included the QR code) were useful for directing people to the website. • Users accessed the website at all hours to find information on resources. • The benefits page had the most views, so the resource information on that page should probably be expanded.
Education and Training	Number of training views • Supervisor version (learning modules): 821 (17.5% of 4,700 supervisors) • All-staff version (learning modules): 1,113 (1.5% of 74,000 employees)	• The training videos could be included in other communication channels (e.g., manager checklists for newly hired employees, EAP newsletters, direct links from partnership group internal websites). • Hosting the training videos on the external website (instead of within a learning management system) helped to make them more accessible. • Most viewers watched training videos in their entirety and indicated that short videos (5–7 minutes) are adequate when time is limited.
Interpersonal Support**	HELP program (results from January 1 through May 30, 2022) • Number of activations: 268 • Number of employees who accessed the HELP program is undetermined. Of those who activated and received support through the HELP program and completed a survey (n = 25), 100% found that peer support from the program was beneficial (strongly agreed, 79%; and agreed, 21%). TFS program • Approximate number of employees served: 2,415 • Survey results (n = 411): 99% either strongly agreed (85%) or somewhat agreed (14%) that interacting with the TFS cart helped them feel less stressed. SOS initiative • Number of work units served: 118 (number of employees per work unit varies from 10 to 50) • Number of employees who accessed the SOS space is undetermined. Of those who accessed and completed a survey (n = 280), 92% either strongly agreed or somewhat agreed that the SOS space is one way that shows that Mayo Clinic cares about me. The mean stress score decreased an average of 2.49 points on a sliding scale from 0 (no stress) to 10 (extremely stressed) after use of items in the SOS space.	• Working with organizational leaders was helpful to continuously invest in and expand programming for interpersonal support. • Offering interpersonal support programs can help employees recognize and appreciate organizational support. • Employees reported benefits of interpersonal support programs, including feelings of less stress.
Reduce Stigma and Awareness Campaign	Average number of views per article for the personal stories shared on the internal news delivery platform: 5,287 for the eight articles shared June 2021 through May 2022 • A reader's comment: "Thank you so very much for sharing your story. A lot of people do not want to talk about suicide or suicidal ideation. It's unpleasant for people to think about, but it is important that we talk about it to help reduce stigma and increase understanding, awareness, and empathy. Best wishes from another suicide attempt survivor."	• A platform and process for employees and learners to share their personal stories of living with a mental illness helped create a culture of acceptance, belonging, and purpose. • Directing readers to available resources through personal story articles was an excellent way to increase awareness of mental health resources. • Each story shared through the internal communications intranet site exceeded the internal benchmark of 4,000 average views per article.

Return to TOC

Table 2. Metrics, Early Indicators, and Key Findings (*Continued*)

Strategic Framework	Metrics and Early Indicators (June 1, 2021 through May 30, 2022)	Key Findings
Access to Professional Support	Total number of instances a user (deidentified) accessed a program: 8,584	• Our findings confirmed that prioritizing efforts to reduce barriers to mental health care for employees is the right thing to do. • Use of the EAP and the medical plan for behavioral health services increased for both employees and their family members with the efforts listed above.

QR = quick response, EAP = Employee Assistance Program, HELP = Healing the Emotional Lives of Peers, TFS = Tea for the Soul, SOS = Support Our Staff. *Because the website is public facing, the number of users may have included nonemployees. **The Mayo Clinic Interpersonal Support infrastructure includes the HELP program (https://mentalhealthandwellbeing.mayo.edu/2021/05/27/healing-the-emotional-lives-of-peers-help-program/), the TFS program (pilot), and the SOS initiative (pilot). These programs provide opportunities to connect with colleagues and safe spaces to relax. Source: The authors

into the larger employee mental health dashboard to create an overarching view of the use of emotional well-being services.

Despite the limitations associated with any new effort, the use of established programming increased from the previous year, ranging from a 14% increase to 26%. This includes a 26% increase in the use of Employee Assistance Program services from April 2021 (before the launch of the awareness campaign and external website) to April 2022. There was also a 14% increase in the number of medical plan members receiving mental health services from February 2021 (before the announcement of enhancements to the medical plan to expand out-of-network coverage for mental health services to decrease out-of-pocket costs) to February 2022.

Hurdles

Taking steps to improve mental health support encountered barriers. There was a need for urgency at a time when health care workers and the contributing stakeholders were already strained. Therefore, the structure had to be nimble and had to leverage existing stakeholder input, employee data, and feedback. New tactics were proposed that historically had not been leveraged for our organization, thus challenging the status quo. For example, home mailings had been eliminated previously as a communication channel to enhance protection of employee data. With appropriate safeguards and approvals, this method was reintroduced. An external Web page with details on employee resources increased the risk of confusion for those not eligible for Mayo Clinic mental health resources, including patients. Again, with appropriate safeguards and priority given to ease the navigation by being available outside the firewall, this was overcome and, thus far, has not generated inquiries from noneligible audiences.

> *"Results from a survey of supervisors showed that several individuals were not confident in their ability to respond appropriately to distressed employees. These findings led to the creation of on-demand virtual training content for supervisors and employees."*

Return to TOC

Finally, sharing personal stories of mental illness brought hesitation by internal teams owing to the perceived sensitive nature of the stories. This was overcome through internal education and the use of a consistent process for review as managed by a communication specialist. In each of these scenarios, potential risks were considered against the hypothesized benefits and endorsed by executive sponsors. In the first year, the potential risks have not been realized. In addition, anecdotally, some employees have found the shared stories to be important contributions to diminish stigma and increase use. The following are examples:

- "The only way we're going to minimize the stigma is with courageous sharing like this. Thank you, for your willingness to be vulnerable. This story reminded me of our humanity. Thank you." — Comment from a News Center article.

- "I cannot tell you how many times I have heard colleagues talking about your story since it hit the News Center; even more amazing is the impact it has had on men talking about mental health and resources." — From a personal letter by a colleague to an employee who shared their story.

Another hurdle experienced was the transition of pilot programs and short-term projects to long-term operations within the relevant departments. This has been overcome on a situational basis by sharing impact data and engaging department and organizational leaders to commit ongoing staff time and resources.

Where to Start

The pandemic increased the need to support the mental health and well-being of health care workers. Early in the pandemic, our organization invested in enhancements to the medical plan to expand out-of-network coverage for mental health services to decrease out-of-pocket costs. The barriers are complex and require an accelerated response to keep up with the growing number of concerns. We recommend an agile approach that empowers a multidisciplinary team to think big, start small, and move quickly.[9]

Confirming this effort as an institutional priority was critical in mobilizing a multidisciplinary team to redirect existing staff and resources to this effort. Remaining gaps could then be addressed through the established seed funding. This is feasible through the early establishment of simplified approval and funding processes in combination with direct access to executive sponsors, and established seed funding is also critical to a rapid response, particularly in a large academic medical center. Further assessment for the long-term sustainability of programs was conducted throughout the short-term phase efforts and pilot initiatives to both demonstrate impact and measure effort needed in the long term. Continuous feedback informs this assessment and identifies the long-term value of efforts that are actionable, sustainable, and proactive with regard to future potential challenges.

Kaisa C. Wieneke, MPH
Director of Employee Well-Being, Department of Human Resources, Mayo Clinic, Rochester, Minnesota, USA

Assistant Professor of Health Care Administration, Mayo Clinic, Rochester, Minnesota, USA

Return to TOC

Gretl C. Kruse, MHA
Human Resources Senior Analyst, Department of Human Resources, Mayo Clinic, Jacksonville, Florida, USA

Allyssa M. Stevens, MHA
Senior Management Consultant, Strategy Department, Mayo Clinic, Rochester, Minnesota, USA

Beba Shensi Tata-Mbeng, MS, MDiv, BCC
Chaplain Services Manager, Spiritual Care, Mayo Clinic, Jacksonville, Florida, USA

Debra S. Lafferty, MS
Director, Visitors Program, Office of Continuous Accreditation, Licensure, and Compliance, Mayo Clinic College of Medicine and Sciences, Mayo Clinic, Rochester, Minnesota, USA

Assistant Professor of Medical Education, Mayo Clinic, Rochester, Minnesota, USA

Craig N. Sawchuk, PhD, LP
Professor of Psychology, Mayo Clinic, Rochester, Minnesota, USA

Chair, Division of Integrated Behavioral Health, Department of Psychiatry and Psychology, Mayo Clinic, Rochester, Minnesota, USA

Scott A. Breitinger, MD
Assistant Professor of Psychiatry, Mayo Clinic, Rochester, Minnesota, USA

Consultant, Division of Integrated Behavioral Health, Department of Psychiatry and Psychology, Mayo Clinic, Rochester, Minnesota, USA

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Return to TOC

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NEJM Catalyst | Innovations in Care Delivery

INSIGHTS REPORT

Health Care Is Confronting the Social Determinants of Health

With **Damon Francis, MD**
Medical Director, Homeless Health Center, Alameda Health System, Alameda, California, USA;
Chief Clinical Officer, Health Leads, Boston, Massachusetts, USA

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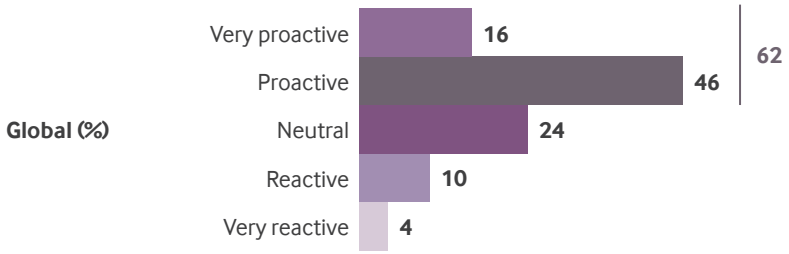
A survey of the NEJM Catalyst Insights Council finds widespread awareness of the importance of addressing SDOH, and increased data collection on health-related social needs.
Now including global data.

Increasingly, health care providers seek to address the impact of social determinants of health (SDOH) on patient health. Driven by the mounting evidence of the effect of SDOH on individual health outcomes and population health, leaders and clinicians are ramping up their data collection efforts to undertake the difficult task of addressing health-related social needs that extend beyond traditional health care.

In an April 2022 survey of NEJM Catalyst Insights Council members — who are clinicians, clinical leaders, and executives at organizations around the world that are directly involved in care delivery — 62% of respondents globally say that their organization is taking a proactive approach to addressing SDOH. Collection of SDOH data is an area of emphasis for Council members' organizations, led by health insurance status (indicated by 68% of respondents), concerns about emotional or physical personal safety (62%), and housing status (52%).

To what extent is your organization addressing social determinants of health (SDOH)?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)

Return to TOC

Damon Francis, MD, is Medical Director for the Homeless Health Center at Alameda (California) Health System and Chief Clinical Officer for Health Leads, a national nonprofit organization based in Boston that focuses on addressing health inequities. He says that, while many of the survey results are positive, the reality on the ground may be quite different.

"I think there's probably a little bit of rose-colored glasses on the high response rate for being proactive," says Francis. "If you look at it from the perspective of the patients we serve and ask them how proactive their health care organization is in addressing social determinants of health, I doubt we would see anywhere near these numbers."

> *If you look at it from the perspective of the patients we serve and ask them how proactive their health care organization is in addressing social determinants of health, I doubt we would see anywhere near these numbers.*

Health care organizations are increasing their efforts to collect SDOH data, according to survey results. For example, compared with a previous NEJM Catalyst survey on SDOH conducted in January 2020 (among U.S.-based respondents only), data collection on housing status is up 20 percentage points; for food security, up 19 percentage points; and for concerns about emotional or physical personal safety, up 13 percentage points.

"I think the optimistic view is that health care organizations are increasing their work on SDOH as part of the longer arc of what their institutions are doing in the community," Francis says. "The particular domains that are increasing have been emphasized by CMS [the Centers for Medicaid & Medicare Services] in their initiatives, so this is a sign that those efforts may be paying off."

> *I think the optimistic view is that health care organizations are increasing their work on SDOH as part of the longer arc of what their institutions are doing in the community.*

Fully 59% of Insights Council members globally say their organizations' SDOH initiatives have improved patient health. Executives are notably more positive on the impact of SDOH programs than other respondents, with 71% of U.S. executives saying patient health has been improved, against 58% of clinicians and 55% of clinical leaders.

The top two challenges to successful implementation of SDOH initiatives are lack of resources to address patient needs, indicated by 58% of respondents globally, and lack of coordination

with community-based organizations, tabbed by 47%. Working with partner organizations is important, Francis says, because no single organization has the resources or full understanding of the unique challenges of their local community to go it alone. The top three partners for health care organizations to tackle health-related social needs are nonprofit community organizations (65% of respondents), social services agencies (57%), and governmental agencies (53%).

While 57% of survey respondents globally report that their organization involves partners to some degree in decision-making to address SDOH, 42% say that these partner organizations are not very or not at all involved.

Francis suggests that it is critical for providers to understand how their local communities are being impacted by SDOH, and the only way to do that is by directly engaging with them. "The challenge with many SDOH initiatives is that we are trying to study and implement them like pharmaceuticals. But unlike pharmaceuticals, these interventions don't have predictable impacts in different social contexts. We need to be working in our communities in ways that they tell us are helping, and allow them to provide feedback on the things that are actually working. And that's missing from a lot of this work right now."

> *"We need to be working in our communities in ways that they tell us are helping, and allow them to provide feedback on the things that are actually working. And that's missing from a lot of this work right now.*

While addressing SDOH is a difficult undertaking, its connection with racial inequities adds another layer of complexity for health care leaders and clinicians. Two-thirds of survey respondents globally report that their organizations' SDOH initiatives are connected to initiatives to improve racial health equity, while the other third are either not very or not at all connected.

Francis says that it is very difficult to separate health-related social needs from challenges derived from racial inequities in health care. "The range of circumstances that people face and that influence their health have been shaped by a pretty brutal history, just looking at it from the point of view of diseases and deaths. That history is baked into our current laws and institutions, and continues to harm some racial groups much more than others. We need to address this reality head on if we want to change it."

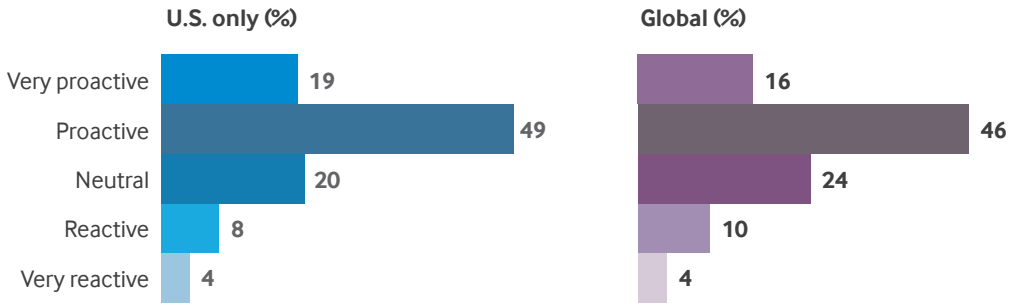
"I think a lot of the implicit theory of health care is that individually oriented interventions are going to change the reality of social determinants of health and health equity," he adds. "But the fundamental theory that's been developed over the years about social determinants of health, which is based on mounds of public health evidence, is that these are primarily social challenges, that they're about policy and investment and the environment."

Charts and Commentary

NEJM Catalyst surveyed health care executives, clinical leaders, and clinicians in April 2022 about social determinants of health (SDOH). Specifically, respondents were asked about: the extent to which their organization is addressing SDOH; the collection and use of health-related social needs data when providing individual patient care; improvement of patient health through SDOH initiatives at their organization; the effect of the Covid-19 pandemic on provider awareness of the need to address SDOH; the impact of Covid-19 on the health of patients with health-related social needs; the connection between SDOH and health equity initiatives; challenges to SDOH interventions; parties responsible for SDOH investment costs; the use of partner organizations to address SDOH; and the extent of partner organization involvement in decision-making. A total of 982 completed surveys are included in the analysis for all respondents globally, including 597 from U.S.-based respondents. Results for U.S. responses are compared to NEJM Catalyst's January 2020 study (751 completed surveys) where applicable.

Health Care Organizations Are Actively Addressing Social Determinants of Health

To what extent is your organization addressing social determinants of health (SDOH)?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)

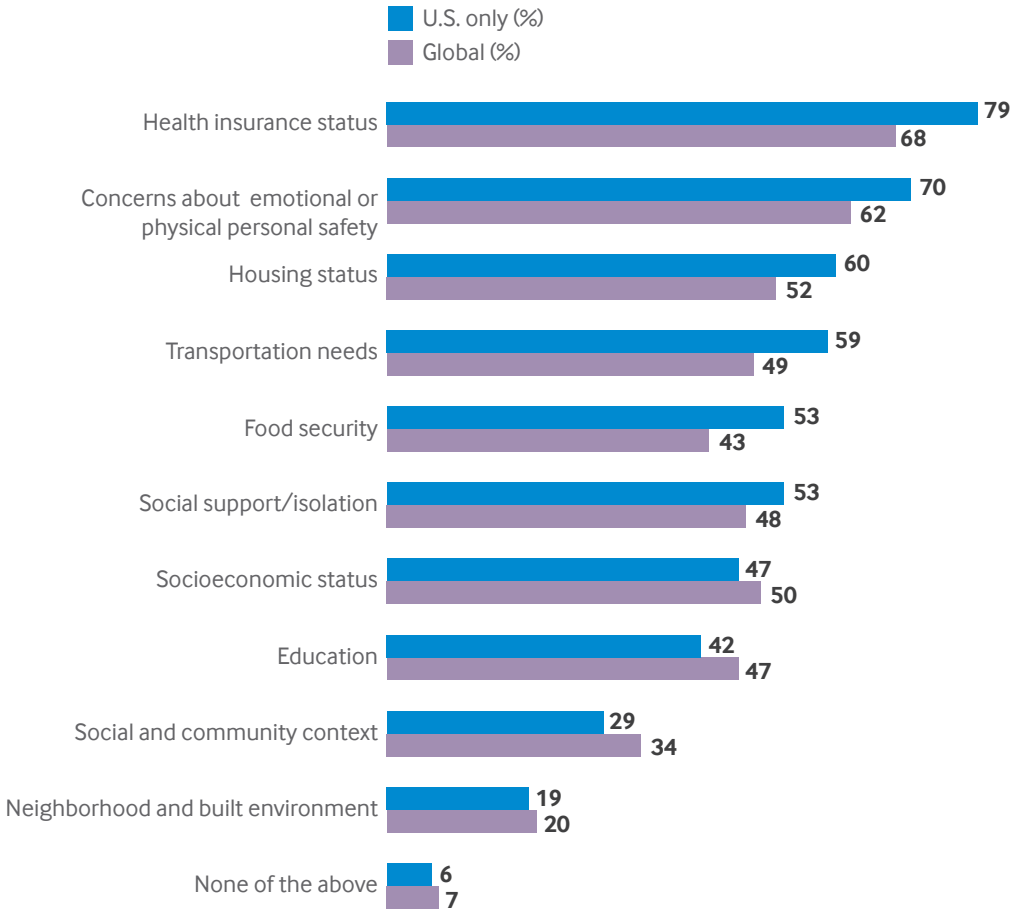
Sixty-two percent of Insights Council members globally say that their organization is taking a proactive approach to addressing SDOH. A higher percentage of U.S. respondents (68%) than non-U.S. respondents (54%) say this. A higher percentage of U.S. executives (77%) than clinical leaders (68%) and clinicians (62%) say that their organization is taking a proactive approach to addressing SDOH.

In written comments from respondents, a U.S. executive says the most pressing question facing providers is "achieving equity and being proactive to reach the most vulnerable populations. Why are the poor elderly being allowed to become less healthy, and have major illness and injury from lack of care and support?"

Return to TOC

A Wide Range of Health-Related Social Needs Data Is Collected and Used for Patient Care

Does your organization collect and incorporate any of the following data about patients' health-related social needs when providing individual patient care?



Base: U.S. only – 597; Global – 982 (multiple responses)

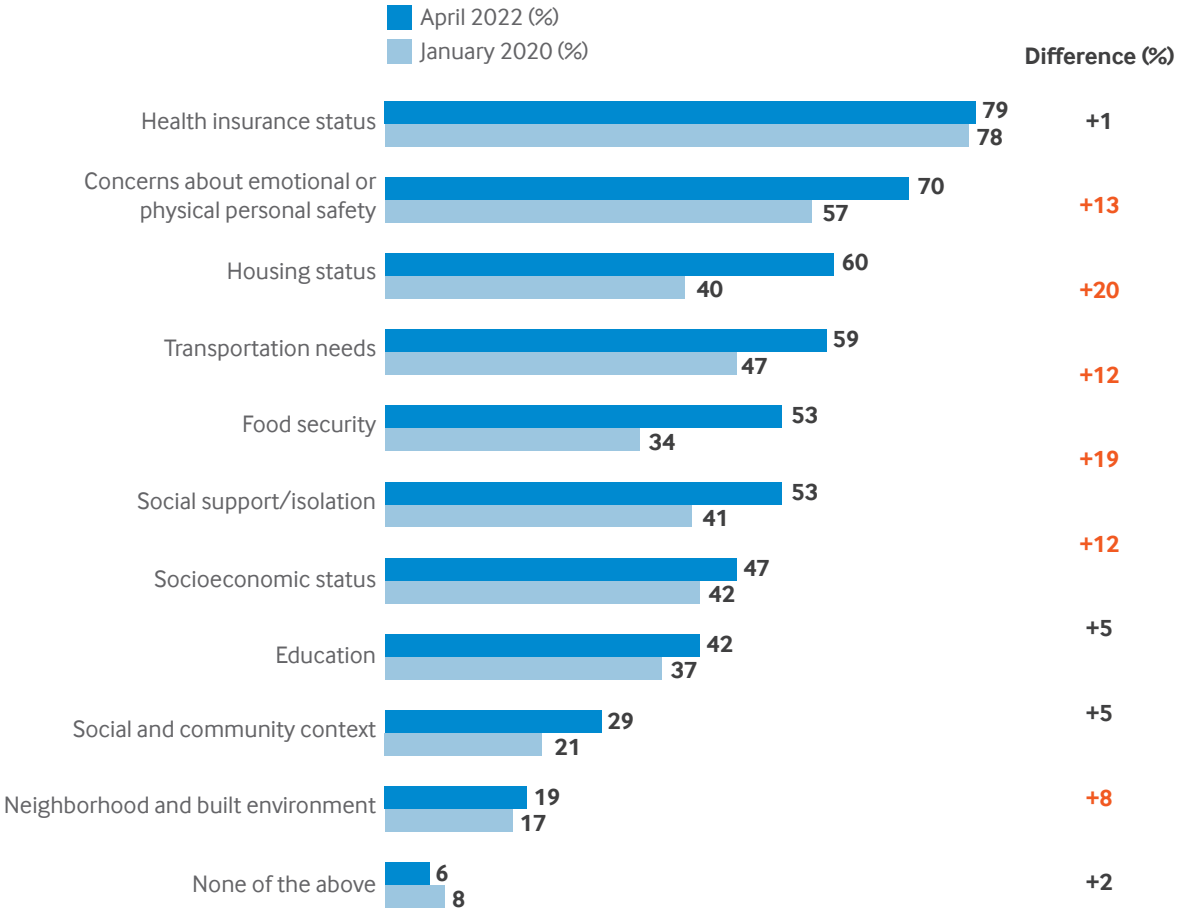
Three types of data about patients' health-related social needs are collected by more than half of respondents' organizations globally: health insurance status (68%), concerns about emotional or physical personal safety (62%), and housing status (52%). U.S. respondents say their organizations collect this data at a higher rate than non-U.S. respondents: health insurance status (79% versus 50%), concerns about emotional or physical personal safety (70% versus 51%), and housing status (60% versus 39%).

An executive from the U.S. says of collecting SDOH data, "We seem stuck in just collecting SDOH versus trying to do something about it. Collecting SDOH now is like when we started collecting REAL data [race, ethnicity, and language] over 10 years ago. We spent too much time on the how to collect and still don't do much with the data to improve outcomes. SDOH today is being used to describe the problem. We need to focus on fixing the problem."

Return to TOC

Collection and Use of Health-Related Social Needs Data Has Grown Sharply in the Last 2 Years

Does your organization collect and incorporate any of the following data about patients' health-related social needs when providing individual patient care?



Statistically significant differences are noted in red.

Base: U.S. only: April 2022 – 597; January 2020 – 751 (multiple responses)

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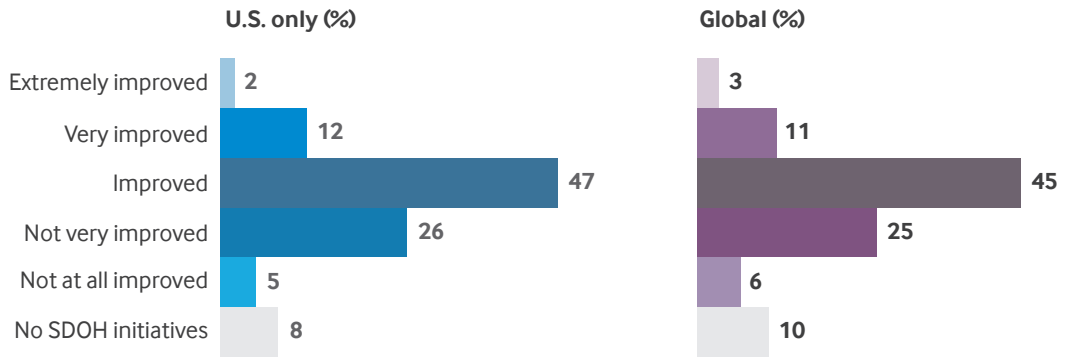
Collection of data on health-related social needs has changed substantially compared with an NEJM Catalyst survey conducted in January 2020 among U.S. respondents. The biggest increases are for housing status (up 20 percentage points) and food security (up 19 percentage points). Collection of the top data type, health insurance status, is nearly unchanged.

An executive from the U.S. says of the challenge of collecting SDOH data, "While data acquisition and screening is important, the current industry ecosystem is not equipped to manufacture positive change. No financial incentive for providers to improve on identified health-related social needs due to the degree of difficulty in quantifying ROI of spend."

Return to TOC

SDOH Initiatives Improve Patient Health

To what extent has the health of patients with health-related social needs been improved by SDOH initiatives at your organization?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)

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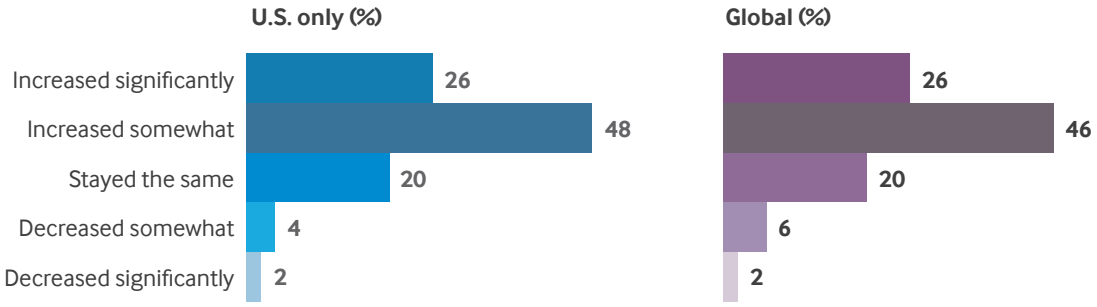
Fifty-nine percent of Insights Council members globally say that SDOH initiatives at their organization have improved patient health. A higher percentage of non-U.S respondents (14%) than U.S. respondents (8%) say their organization has no SDOH initiatives.

A higher percentage of U.S. executives (71%) than clinicians (58%) and clinical leaders (55%) say that patient health has been improved by SDOH initiatives at their organization.

Return to TOC

The Covid-19 Pandemic Increased Providers' Awareness of the Need to Address SDOH

How has the Covid-19 pandemic affected health care providers' awareness of the need to address SDOH?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)
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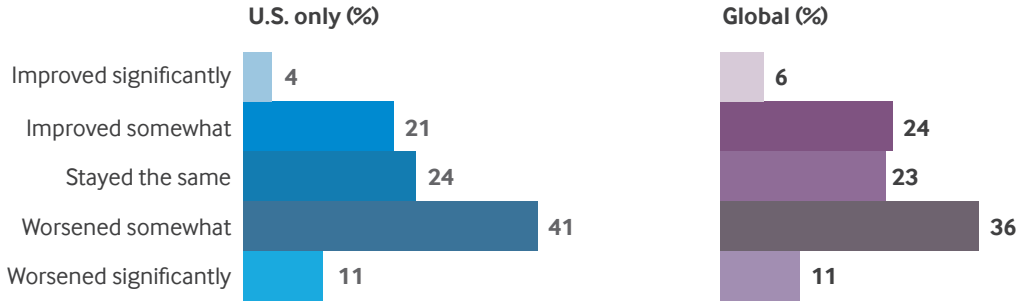
Nearly three-quarters (64%) of Insights Council members globally say that the Covid-19 pandemic has affected provider awareness of the need to address SDOH. A higher percentage of U.S. respondents from nonprofit (77%) than for-profit (63%) organizations say the Covid-19 pandemic affected provider awareness.

An executive from Canada says the most pressing question that health care providers face is "lack of awareness and understanding about the social and economic backgrounds [of patients] and delivering appropriate cost-effective t/t and management with precision."

The Covid-19 Pandemic Worsened the Health of Patients with Social Needs

How has the Covid-19 pandemic affected the health of your organization's patients with health-related social needs?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)

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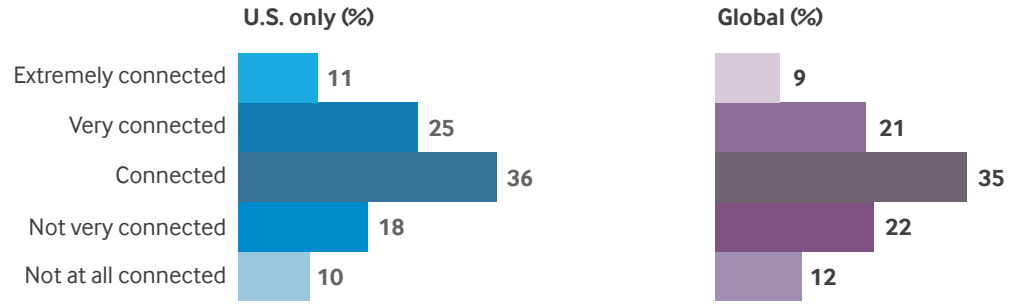
Nearly half (47%) of survey respondents globally report that the Covid-19 pandemic has worsened the health of their organizations' patients with health-related social needs. A higher percentage of U.S. respondents (52%) than non-U.S. respondents (39%) say this.

A clinical leader from Canada says, "In the midst of a pandemic, with staff shortages, burnout, and profound decreases in access to care in the community at crisis levels, SDOH is an afterthought in my organization of three publicly funded hospitals in Canada."

SDOH and Health Equity Initiatives Are Connected

To what extent are your organization's SDOH initiatives connected to initiatives to improve racial health equity?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)

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Two-thirds of survey respondents globally indicate that their organizations' SDOH initiatives are connected to initiatives to improve racial health equity. A higher percentage of U.S. respondents (72%) than non-U.S. respondents (56%) say this.

A clinician from the U.S. says, "Value-based care will also need to address SDOH and look at patient outcomes and health equity. Also, providers and systems should be held accountable if outcomes are worse for one [population] group versus another (i.e., 10% maternal mortality for Black patients versus white or Asian) to begin to address implicit bias and racism. More capital and people are needed to do this and to get more information and data on why this is occurring."

A higher percentage of U.S. respondents from nonprofit (75%) than for-profit (62%) organizations say that their organizations' SDOH initiatives are connected to initiatives to improve racial health equity.

Return to TOC

Lack of Resources Leads a Wide Range of Challenges to SDOH Interventions

What are the top three challenges to successful implementation of interventions designed to address patients' health-related social needs?

Base: U.S. only – 597; Global – 982 (multiple responses)

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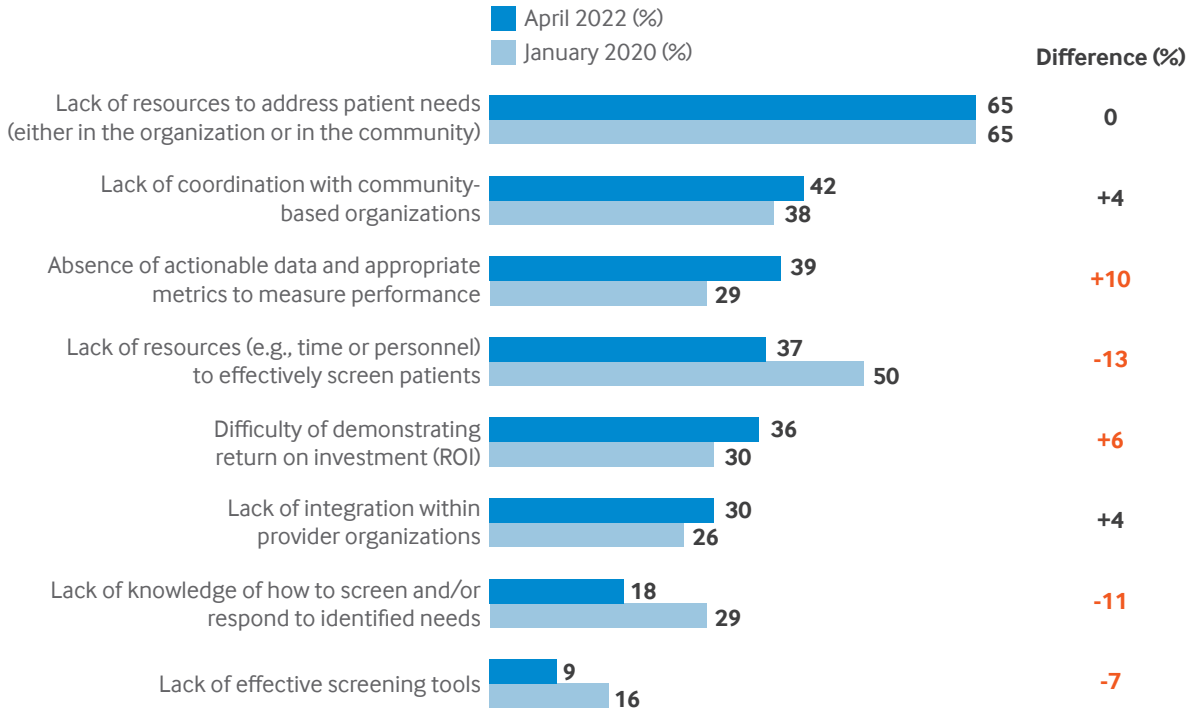
Lack of resources to address patient needs, either in the organization or in the community, leads the challenges to successful implementation of SDOH interventions. For respondents outside the U.S., the top challenge is lack of coordination with community-based organizations (cited by 54%).

A clinical leader from the U.S. describes SDOH challenges this way: "From the provider perspective, lack of sufficient resources to address patient's social needs. The challenge for executives is different, their challenge is to operationalize social care within the workflows of the health care delivery system."

A higher percentage of U.S. respondents from nonprofit (42%) than for-profit (31%) organizations mention absence of actionable data and appropriate metrics to measure performance as a challenge to successful implementation of SDOH interventions.

The Challenges to SDOH Interventions Are Changing

What are the top three challenges to successful implementation of interventions designed to address patients' health-related social needs?



Statistically significant differences are noted in red.

Base: U.S. only: April 2022 – 597; January 2020 – 751 (multiple responses)

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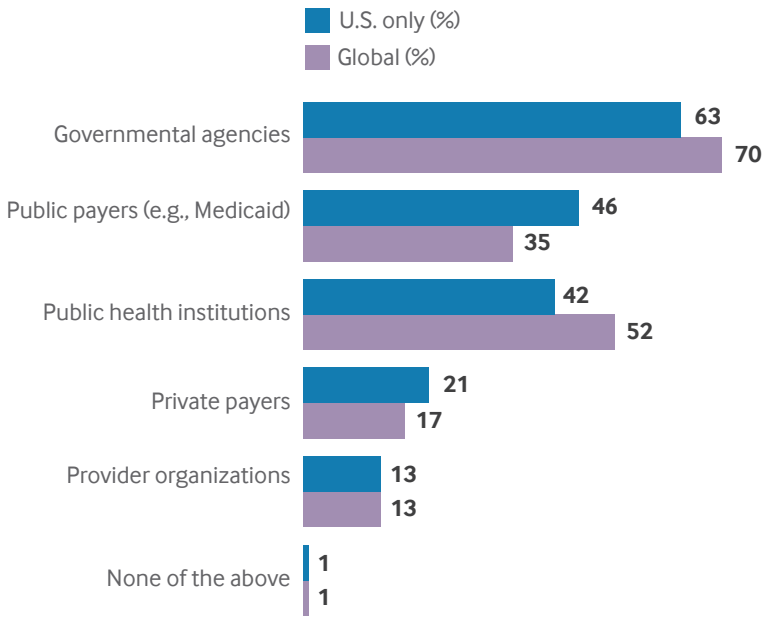
Compared with a January 2020 NEJM Catalyst survey on SDOH among U.S. respondents, two challenges to implementation of SDOH interventions have increased: absence of actionable data and appropriate metrics to measure performance (up 10 percentage points) and difficulty of demonstrating ROI (up 6 percentage points). The two biggest decreases are for lack of resources (e.g., time or personnel) to effectively screen patients (down 13 percentage points) and lack of knowledge of how to screen and/or respond to identified needs (down 11 percentage points).

A clinician from the U.S. comments, "We KNOW these problems exist. We KNOW the disparities are real. We KNOW the people that need the resources the most are not getting things allocated equitably. We DON'T KNOW how to effectively address the problems we see. By the time a patient is in a hospital, this challenges the scope of what a hospital offers for individuals. We need to redefine the scope of hospital services OR we need to create institutions that are equipped to support SDOH effectively."

Return to TOC

Government Leads Responsibility for SDOH Investment Costs

What are the top two parties that should be responsible for the majority of investment costs in addressing patient health-related social needs?



Base: U.S. only – 597; Global – 982 (multiple responses)

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Survey respondents globally say governmental agencies and public health institutions should be most responsible for investment costs in addressing health-related social needs. Note that provider organizations receive the lowest response.

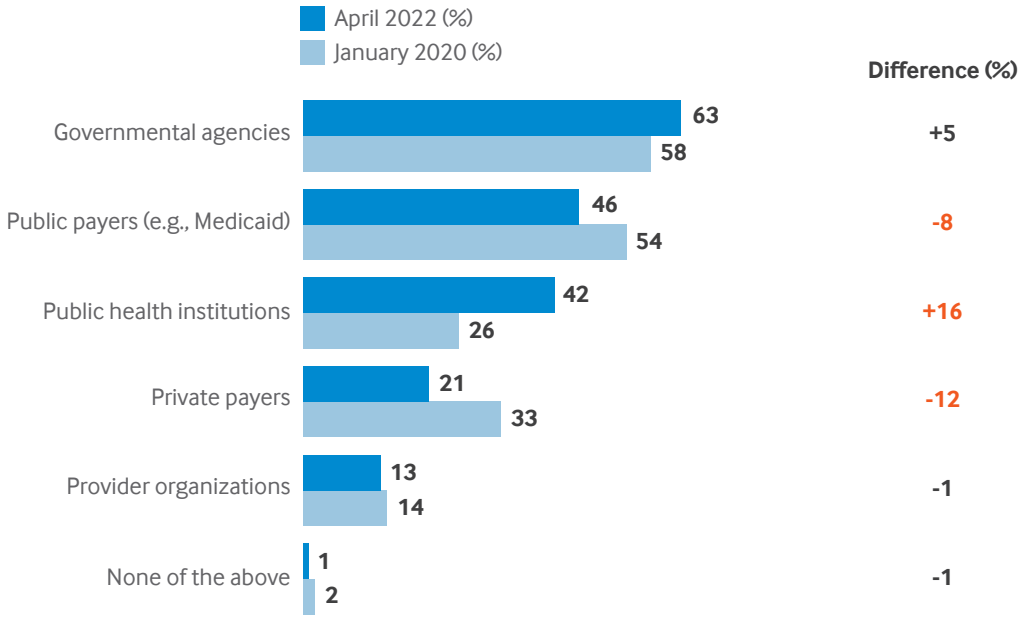
A U.S. clinical leader asks, "Why does this responsibility fall on health care providers who were not trained to address these issues? Wouldn't it make more sense for the government to step up and invest in solving these problems?"

A higher percentage of non-U.S. respondents than U.S. respondents mention governmental agencies (79% versus 63%) and public health institutions (68% versus 42%) as parties that should be most responsible for investment costs.

Return to TOC

The Public Health Responsibility for SDOH Investment Costs Has Grown

What are the top two parties that should be responsible for the majority of investment costs in addressing patient health-related social needs?



Statistically significant differences are noted in red.

Base: U.S. only: April 2022 – 597; January 2020 – 751 (multiple responses)

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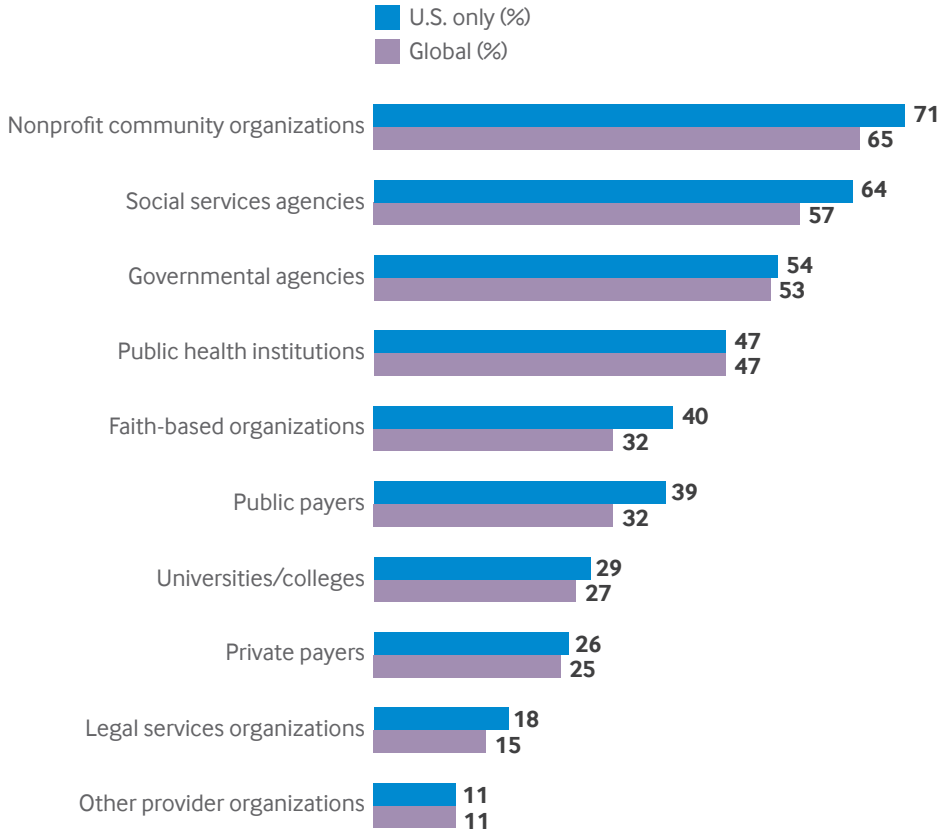
Compared with a January 2020 NEJM Catalyst survey, U.S. respondents emphasize public health institutions' responsibility for investment costs in addressing patient health-related social needs. The biggest decrease is for private payers.

A clinician from Australia says the most pressing question that health care providers face as they work to address patients' health-related social needs is "recognition of the personal and community responsibility to save and set aside funds for health access and provision."

Return to TOC

Health Care Organizations Have Many Partners in Addressing SDOH

Which other organizations does your organization partner with to address SDOH?



Base: U.S. only – 597; Global – 982 (multiple responses)

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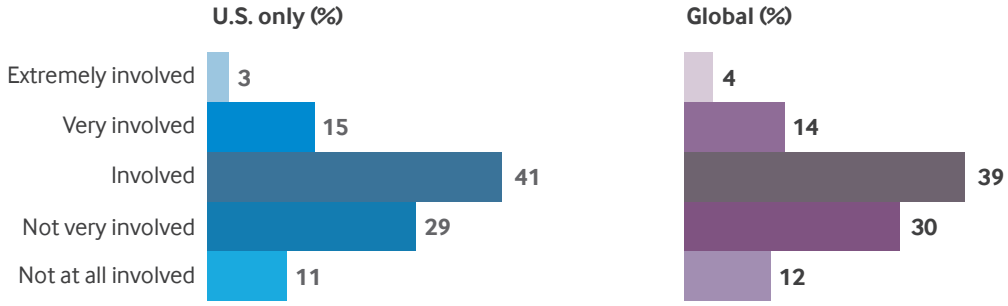
Insights Council members globally say their organizations work with a range of partners to address SDOH, led by nonprofit community organizations. A higher percentage of U.S. respondents than non-U.S. respondents say their organizations partner with nonprofit community organizations (71% versus 55%), social services agencies (64% versus 46%), faith-based organizations (40% versus 19%), and public payers (39% versus 21%) to address SDOH.

A clinician from Portugal says the biggest SDOH challenge is "connection with the social sector in order to find a social response to those needs. If we don't know what the community has to offer, we cannot even suggest it to the patients. For example, I don't live in the city where I work. And my organization has never told what resources I have...not even within the private group I work for."

Partner Organizations Are Somewhat Involved in SDOH Decisions

To what extent does your organization involve partner organizations in decision-making to address SDOH (e.g., investments)?



Base: U.S. only – 597; Global – 982 (may not total 100 due to rounding)

Fifty-seven percent of survey respondents globally say that their organization involves partner organizations to some degree in decision-making to address SDOH, while 42% say that these organizations are either not very or not at all involved.

A U.S. clinician suggests that "public health agencies should be expanded and resourced to participate in public decisions on housing, education, social services, development of jobs in communities (and safety provisions for workers), and environmental decisions. ACOs [accountable care organizations] and other for-profit institutions should be required to contribute to these services."

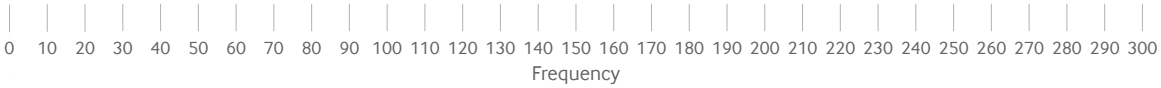
A higher percentage of U.S. respondents from nonprofit (64%) than for-profit (47%) organizations say that their organization involves partners to some degree in decision-making to address SDOH.

Return to TOC

Verbatim Comments from Survey Respondents

What is the most pressing question that health care providers face as they work to address patients' health-related social needs?

Response Theme	Frequency	Percentage
Acquiring funding to address SDOH	260	34%
Finding time and personnel to address SDOH	113	15%
Effective patient screening that leads to actionable interventions	105	14%
Connecting and coordinating patients with resources	96	13%
Achieving stakeholder commitment to SDOH	86	11%
Tracking and measuring benefits of SDOH interventions	53	7%
Navigating challenges of proactivity with vulnerable populations	45	6%
Availability of and access to community resources	41	5%
Assisting uninsured and underinsured patients	47	6%
Engaging patients and their families in addressing SDOH	37	5%
Advancing health equity	36	5%
Vision for the role of health care organizations regarding SDOH	35	5%
Helping to address housing needs	33	4%
Improving education and training	31	4%
Receiving better government support and resources	27	4%
Integrating SDOH tools into workflows	26	3%
Providing behavioral health services to patients	25	3%
Achieving effective data collection and access	21	3%
Improving patient access	19	3%
Other	96	13%



Base: 984 Global (multiple responses)

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Return to TOC

Acquiring funding to address SDOH

> *Availability of resources. Competing priorities to address patients' needs. Misconception that health is absence or presence of diseases so most community and public organizations focus on curative interventions.*

— Clinician at a for-profit clinic in Ethiopia

> *From the provider perspective, lack of sufficient resources to address patients' social needs. The challenge for executives is different, their challenge is to operationalize social care within the workflows of the health care delivery system.*

— Program director at a teaching hospital in the U.S.

> *I found that we implied overpromising with our screening when there were NO services available to support our findings on the screen. It is like ordering a lab test when you have no plan for a positive result. Social determinants of health came into the fore during Covid. Covid took away most of our resources — most of the programs we depended upon lost funding and staffing — so we had no way to provide action on the truly important information we found. We let our patients down.*

— Clinician at a for-profit clinic in the U.S.

Finding time and personnel to address SDOH

> *A lack of personnel to directly address this issue. It would be VERY beneficial to have a social worker embedded in every one of our primary care clinics in the system, but there aren't enough social workers to meet this need. Moreover, third-party reimbursement for social services is limited and I don't think the not-for-profit organization for which I work has the money to pay for this many social workers. It's challenging.*

— Clinician at a for-profit health system in the U.S.

> *How am I supposed to have time to do this in addition to all the other parts of care I'm supposed to be managing? (We currently ask up to 67 regulatory screening questions in a primary care visit.) There is no way to address all those screenings and take care of what the patient came in for. Let alone addressing health maintenance, HCC [Hierarchical Condition Category] recapture, and other priorities. It's all important, there is just so much, and staffing, reimbursements, and time per visit haven't increased to accommodate all these.*

— Vice President at a nonprofit health system in the U.S.

Return to TOC

> *How do you do it all? That is the most pressing question to me. As a health system, how are we going to do it all — to manage acute and chronic medical conditions and all of the social factors that lead to or exacerbate those same acute and chronic medical conditions? It seems a bit overwhelming.*

— Executive at a nonprofit health system in the U.S.

> *Where can we find the resources that the patients need but are not available due to socioeconomic disparities?*

— Dean of medical school at a nonprofit teaching hospital in Malaysia

Effective patient screening that leads to actionable interventions

> *How to train clinical support staff to be sensitive when screening — not to speed through a checklist and then not be able to offer effective solutions to patients who disclose dire needs. This often sets unrealistic expectations and frustrates patients.*

— Director of service line at a nonprofit health system in the U.S.

> *SDOH has become a hot topic. However, as provider on the front lines, we have no resources to screen, assess, and provide assistance. We have no means of effectively and efficiently capturing in our EMR [electronic medical record]. We have no means of effectively and efficiently finding and referring patients for assistance. We have no effective or efficient means of tracking and receiving feedback from the patient or the organization assisting us. In summary, SDOH is a hot topic and a "politically correct topic;" however, there are no practical tools, methods, processes, systems in place to actually "do" SDOH.*

— Clinician at a for-profit teaching hospital in the U.S.

> *We have been working toward improved screening for SDOH over the last year. In the Children's Hospital where I work, we have developed a mechanism to match needs with community resources. So, that is working better. And yet, there is still a fairly large gap between needs and resources. And it appears that some believe that hospitals should invest the resources to bridge that gap. The financial effects, CARES Act notwithstanding, are still acutely felt in our financial status, and we have gone from a position of modestly positive net revenue to a financial loss position in the last 2 years. Discovering health-related social needs and then not addressing them is like making a diagnosis and then not treating the disease. Health systems are not in a financial position to do both, but can definitely function as partners in a larger social system.*

— Chief Medical Officer at a nonprofit teaching hospital in the U.S.

Return to TOC

> *Awareness and screening tools. Asking the right questions is difficult and once a risk is detected, there are no adequate tools available to handle.*

— Vice department chair at a nonprofit health system in Brazil

Connecting and coordinating patients with resources

> *Care coordination and integration into overall health care delivery. SDOH is still not an integral part of the physician's final prescription being given out the patient.*

— Vice President at a for-profit hospital in India

> *Health care professionals need easy and reliable resources/agencies with whom to collaborate at transitions of care.*

— Clinician at a nonprofit teaching hospital in the U.S.

> *What is available in the community to connect with the patient? The environment is very siloed and disconnected.*

— Executive at a nonprofit clinic in Canada

Achieving stakeholder commitment to SDOH

> *How can the importance of the effects of social determinants of health be made convincingly apparent to decision-makers and the voting public?*

— Vice President at a nonprofit health system in New Zealand

> *How to get the patient, family, and team invested in maximizing health through education and motivation.*

— Clinician at a for-profit health plan in the U.S.

> *While health care providers strive to address the social needs of their patients for the overall improvement in the management of their diseases and health status, the question remains — why do providers have limited say in the administrative and financial aspects which play a major role in strategic planning and limit their ability to take action because they have limited decision-making capacity at the executive level?*

— Clinician at a nonprofit clinic in the U.S.

> *To what extent does the public health institution support the social needs of patients?*

— Clinician at a nonprofit government organization in Iraq

Return to TOC

Tracking and measuring benefits of SDOH interventions

> *Ability to know best referral sources; track whether intervention occurred and its effectiveness.*

— Executive at a nonprofit community hospital in the U.S.

> *How to efficiently refer to appropriate community-based resources. The need is not only which resource to refer to, but how to close the loop on the referral and track against patient/family-centered goals over time.*

— Vice President at a nonprofit health system in the U.S.

> *Deficit of systematic, long-term studies on the result of the efficiency of the improvement proposals.*

— Clinician at a for-profit teaching hospital in Peru

Navigating challenges of proactivity with vulnerable populations

> *Achieving equity and being proactive to reach the most vulnerable populations. Why are the poor [and] elderly being allowed to become less healthy, have major illness and injury from lack of care and support?*

— Vice President at a for-profit allied provider in the U.S.

> *How to address the significant lack of visibility and resources in poor rural areas with little or no access to care.*

— Vice President at a nonprofit health plan in the U.S.

> *To what degree can patients focus on their health in their day-to-day lives, considering their other challenges and limitations?*

— Vice President at a nonprofit teaching hospital in Canada

Availability of and access to community resources

> *Educating providers to collect the data, THEN offering the providers action plans to address the SDOH issue: i.e., specific LOCAL resources. This takes continuous curation of local resources by someone in my organization. Once done the resources need to be incorporated into decision support tools in our EHR [electronic health record].*

— Clinician at a nonprofit teaching hospital in the U.S.

Return to TOC

> *Knowledge and integration of services between medical care and community agencies.*

— Chief Medical Officer at a for-profit physician organization in the U.S.

> *What to do when you uncover an unmet social need that impacts health outcomes.*

— Vice President at a nonprofit college or university in the U.S.

Assisting uninsured and underinsured patients

> *Financial needs are critical in dealing with chronic health issues, and the lack of resources to get coverage for care without having a major hospitalization that can be financially devastating to the patient and the patient's family. If you have universal coverage, you would get care before the need for significant disruption of the patient's finances and life.*

— Clinician at a for-profit clinic in the U.S.

> *How can we address patients' physical and mental health needs as the demands become higher and we continue to get less resources, staffing and support, and have to battle with insurance agencies that create further barriers to care?*

— Clinician at a nonprofit clinic in the U.S.

> *We need to integrate medical care with social care. There should be no wrong door. In order to do this we need guaranteed universal health coverage and guaranteed basic incomes.*

— Executive at a nonprofit government organization in the U.S.

Engaging patients and their families in addressing SDOH

> *Funding and continued provision of relevant services. How to make the target population realize the importance of health-related social needs.*

— Executive at a nonprofit medical school program in the Philippines

> *Getting to the people and dispelling their lack of trust in the system.*

— Clinician at a nonprofit teaching hospital in the U.S.

> *How to improve patient engagement/build trust with underserved communities.*

— Clinician at a nonprofit government organization in the U.S.

Return to TOC

> *TELL THE RELIABLE EVIDENCE TO MY PATIENTS.*

— Executive at a nonprofit clinic in Taiwan

Advancing health equity

> *All of my work involves patients on public programs. The inability to reach patients due to information such as current phone numbers, current addresses, and lack of racial information to identify issues of equity make reaching those that may be most in need nearly impossible. We have the screening tools, we have a well-organized number of resource organizations, have partnered with a company providing easy access, but the providers we partner with are so fatigued from Covid or uninterested in this that work is progressing at a snail's pace.*

— Clinician leader a nonprofit health system in the U.S.

> *How to provide equitable care in institutions driven and incentivized by revenue generation.*

— Clinician at a nonprofit teaching hospital in the U.S.

> *We KNOW these problems exist. We KNOW the disparities are real. We KNOW the people that need the resources the most are not getting things allocated equitably. We DON'T KNOW how to effectively address the problems we see. By the time a patient is in a hospital, this challenges the scope of what a hospital offers for individuals. We need to redefine the scope of hospital services OR we need to create institutions that are equipped to support SDOH effectively. This gray area for hospitals is not effective.*

— Clinician at a nonprofit community hospital in the U.S.

Vision for the role of health care organizations regarding SDOH

> *After convincing them that it is important to address these issues, trying to explain in credible terms what can actually be done.*

— Chief Medical Officer at a for-profit health organization in the U.S.

> *Do they understand (really and thoroughly) that health is more than absence of disease.*

— Chief Medical Officer at a nonprofit hospital in the Netherlands

Return to TOC

> *Educating and convincing health care providers and hospitals about the fundamental ways in which social needs determine health and illness.*
>
> — Clinician at a nonprofit clinic in the U.S.

> *Is there a solid solution to solve patients' health-related social needs?*
>
> — Executive at a nonprofit community hospital in Indonesia

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Methodology

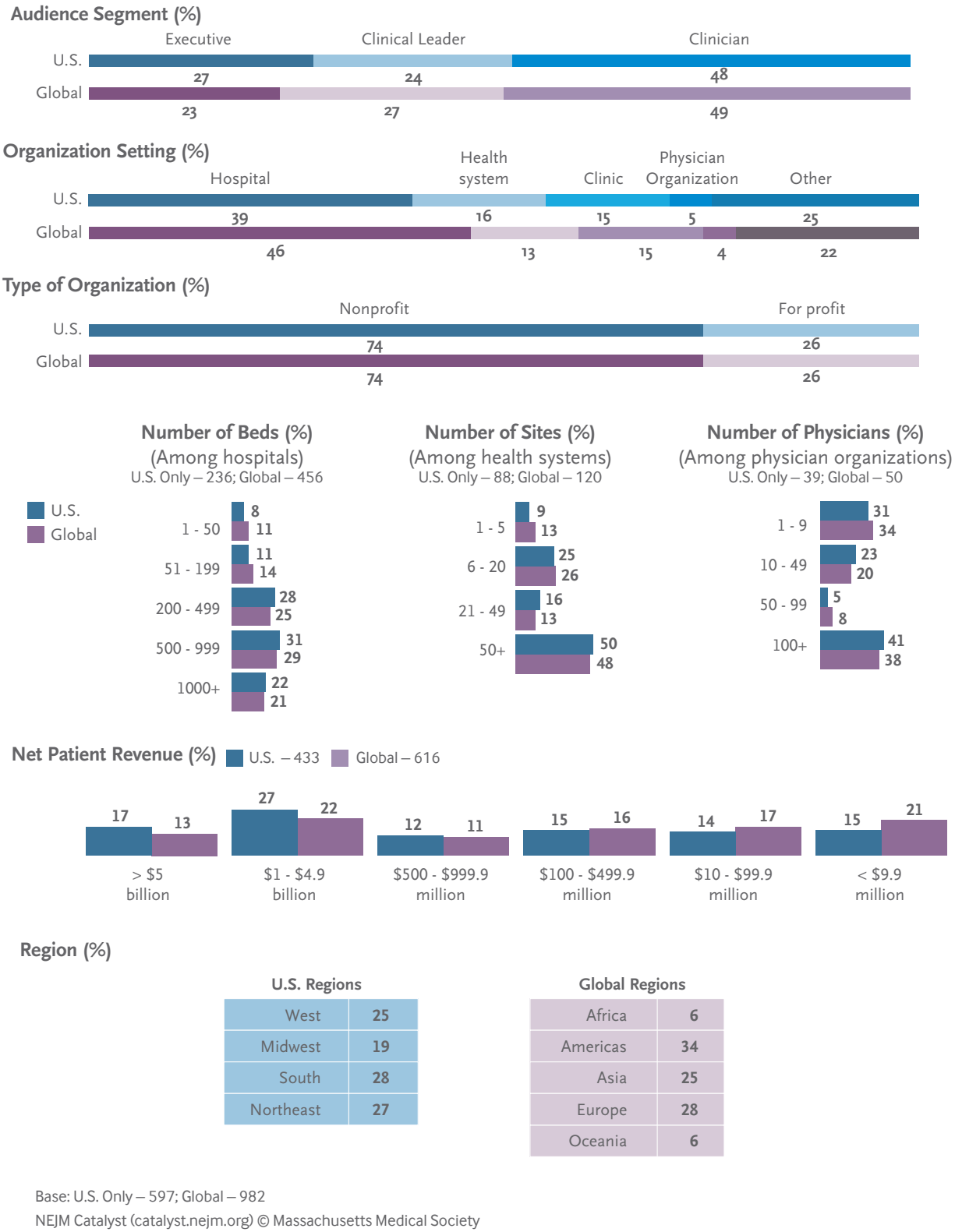
- The *Social Determinants of Health* survey was conducted by NEJM Catalyst, powered by the NEJM Catalyst Insights Council.
- The NEJM Catalyst Insights Council is a qualified group of executives, clinical leaders, and clinicians at organizations worldwide who are directly involved in health care delivery.
- In April 2022, an online survey was sent to the NEJM Catalyst Insights Council.
- A total of 982 completed surveys are included in the analysis for all respondents worldwide (Global). The margin of error for a base of 982 is +/- 3.1% at the 95% confidence interval. U.S.-only results include 597 completed surveys with a margin of error of +/- 4.0% at the 95% confidence interval.
- Results for U.S. responses are compared to a January 2020 study (751 completed surveys) where applicable. Statistical differences are noted in red.

NEJM Catalyst Insights Council

We'd like to acknowledge the NEJM Catalyst Insights Council. Insights Council members participate in monthly surveys with specific topics on health care delivery. These results are published as NEJM Catalyst Insights Reports, such as this one, including summary findings, key takeaways from NEJM Catalyst leaders, expert analysis, and commentary.

It is through the Insights Council's participation and commitment to the transformation of health care delivery that we are able to provide actionable data that can help move the industry forward. To join your peers in the conversation, visit **https://catalyst.nejm.org/insights-council**.

Respondent Profile



Region (%)

U.S. Regions	
West	25
Midwest	19
South	28
Northeast	27

Global Regions	
Africa	6
Americas	34
Asia	25
Europe	28
Oceania	6

Base: U.S. Only – 597; Global – 982

Return to TOC

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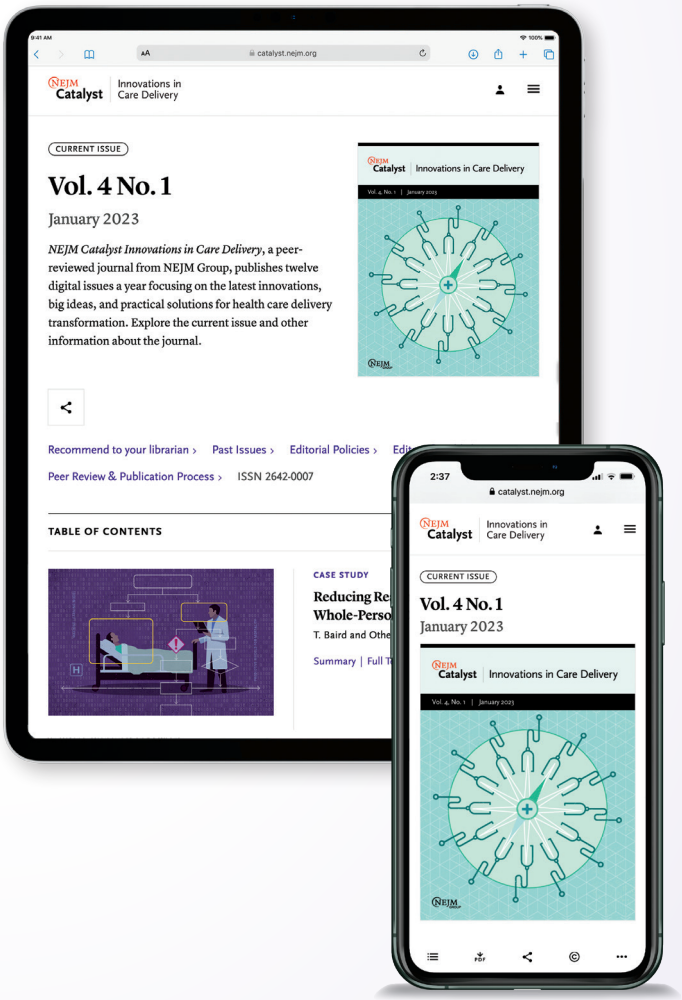

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