Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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RESEARCH

Transformational strategies for optimizing use of medications and related therapies through us pharmacists and pharmacies: Findings from a national study

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ABSTRACT

Setting: Nonoptimized medication therapies (NOMTs) are associated with likely avoidable illnesses and mortality affecting millions of people and costing an estimated $528 billion per year in excess health spending in the United States. The coronavirus disease 2019 (COVID-19) pandemic brought into focus barriers limiting the ability of U.S. pharmacists and pharmacies to provide services that can reduce NOMTs and improve U.S. population health.

Objectives: This National Science Foundation Center for Health Organization Transformation study explored potential strategies that U.S. pharmacists, pharmacies, and their partners could implement to reduce NOMTs while also delivering other forms of value to U.S. populations from 2021 to 2025 (during and after the COVID-19 pandemic).

Design: A panel of senior leaders representing the U.S. pharmacist and pharmacy sector participated in a 4-round Delphi process to identify unmet needs, barriers, change drivers, and priority strategies for meeting those needs. Data were gathered and analyzed by public health researchers, most of whom are outside the pharmacist and pharmacy sector.

Results: A comprehensive set of evidence-based strategies with potential to reduce NOMTs, protect and improve population health and well-being, and strengthen the sector were identified. Four transformational strategies were recommended: comprehensive payment and practice transformation, strengthening pharmacy data interoperability infrastructure, development of unifying measurement and management mechanisms, and development of a more robust national research infrastructure. Strengthening health equity was a cross-cutting strategy affecting all areas.

Conclusion: The results may be of interest to policy makers, pharmacists, pharmacies, physicians, nurses and other clinicians, pharmaceutical firms, plan sponsors, plans, health systems, clinics, aging care, digital technology companies, and others interested in optimizing outcomes from medications and related therapies for U.S. populations.

Nonoptimized medication therapies (NOMTs)—medications, vaccines, and related therapies that are not used in a way that optimizes patient health and well-being)—are associated with likely avoidable illnesses and mortality affecting millions of U.S. residents.[1] They affect approximately 2 million hospital stays each year and account for more than 3.5 million

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Key Points

Background:

- Nonoptimized medication therapies (NOMTs) affect millions of U.S. residents and cost the U.S. health system hundreds of billions of dollars in likely avoidable spending per year.
- Delivery of innovative comprehensive medication management, vaccines, testing, and other value-driven services by pharmacists and pharmacies can reduce NOMTs while improving the health and well-being of patients, but they are not widely adopted.
- Rapid changes in the business of pharmacy, including ones related to the coronavirus disease 2019 (COVID-19) pandemic, are creating new pressures and opportunities for change for the sector.

Findings:

- This study provides a review of the strategic landscape for the U.S. pharmacist and pharmacy sector during and after the COVID-19 pandemic.
- Conducted by health system researchers in the National Science Foundation Center for Health Organization Transformation at the University of Louisville School of Public Health and Information Sciences and grounded in implementation, collaboration, information, and population health sciences, this study provides an "outside-in" view of the strategic landscape for the sector.
- Four evidence-based strategies for U.S. pharmacists, pharmacies, and their key partners including policy makers are recommended: comprehensive payment and practice transformation, strengthening pharmacy data interoperability infrastructure, development of unifying measurement and management mechanisms, and development of a more robust national research infrastructure.

physician office visits, an estimated 1 million emergency department visits, and approximately 125,000 hospital admissions.[1] NOMTs were estimated to cost the U.S. health sector from $495.3 billion to $672.7 billion in potentially avoidable spending in 2016, with direct costs of the medications costing an additional $308 billion in 2020.[2,3] These factors, combined, make NOMTs one of the largest population health challenges and opportunity areas in the U.S. health sector.

NOMTs are not a new problem. Since the 1980s, there have been repeated efforts to understand and reduce medication errors,[4] adverse drug events,[5-9] and medication misadventuring,[10] as part of an effort to reduce errors in medicine[11] and increase value in health care.[12,13] Efforts have included work to improve adherence, prescribing and monitoring.[6] Pharmacists are adept at helping patients with adherence and monitoring,[14] yet incentives and reimbursements to leverage pharmacist capabilities have not been standardized.[15] Efforts to reduce medication errors through electronic health records (EHRs), e-prescribing, and other digital technologies show promising results, but are in early stages of development and implementation.[16] Top drugs leading to hospitalizations require regular monitoring, but effective monitoring is not routine in many settings.[17] Many opioid addictions are associated with nonoptimized prescribing and monitoring.[18,19] A growing body of literature points to opportunities to reduce NOMTs through more systematic, team-based approaches, in which pharmacists and pharmacies work in collaboration with physicians, plans, pharmaceutical firms, and other care team members, to optimize medications use.[20-26] New treatment models including medication therapy management and comprehensive medication management (CMM) have opened promising new pathways for reducing NOMTs.[20,27-30] However, despite these efforts, progress in reducing NOMTs at a national scale had been limited as of 2019.

In early 2020, with the onset of the coronavirus disease 2019 (COVID-19) pandemic, the NOMT challenge came into sharper focus as it became clear that gaps in patient care were likely to grow because of clinic closures and people afraid to access emergency care and that pharmacists and pharmacies were likely to be a critically important part of delivering tests and vaccines to patients. The situation raised important questions. How could delivery of existing medication therapies be optimized in this environment, even as new tests, vaccines, and therapies were developed and delivered? How might emerging patient needs be most effectively addressed by pharmacists, pharmacies, physicians, providers, and others? What additional resources might pharmacists and pharmacies need to succeed? To help answer these questions, the researchers conducted a systematic study from May to December 2020, focused on the following research question: Based on conditions in the U.S. environment in the summer and fall of 2020, including the COVID-19 pandemic, what prioritized strategies could be implemented to maximize ability of the U.S. pharmacist and pharmacy sector to act to protect and improve the health and well-being of the U.S. population from fall 2020 to year-end 2025?

This study makes a unique contribution to the literature by developing a systematic, evidence-based framework for strengthening the U.S. pharmacist and pharmacy sector's capacity to protect and improve population health and well-being during and after the COVID-19 pandemic.

Methods

Participants

The inclusion criterion for study participation was nationally recognized leaders, experts, and scholars representing a balance of perspectives from across the U.S. pharmacist and pharmacy sector. Participants included national pharmacist associations (a majority of the members of the Joint Commission of Pharmacy Practitioners), national pharmacy associations, large chain drug stores, patient advocates, pharmacist leaders from a large pharmaceutical firm, a few health systems, and academic scholars from leading pharmacy schools. Recruiting occurred using emails and follow-up phone calls. Senior association leaders and other respondents were then asked: "What other national groups and leaders should be included to ensure all major viewpoints are considered?" Several strategic referrals were made. Sixty-six individuals

from 42 organizations (more than 90% of invited participants) participated. No participants received funding to participate.

Procedures

The study was approved as exempt (University of Louisville institutional review board #20.0402). A 4-stage Delphi process was used to develop near-consensus answers to the research questions.[31-34] The process began with a literature review in Web of Science using key words including pharmacist, pharmacy, implementation science, collaboration, and population health science. More than 100 highly cited pharmacist/pharmacy practice, policy, technology, and patient experience–related papers were selected and reviewed by the 4 researchers to provide a baseline of evidence for the study.[35-50] An open-ended questionnaire #1 (Figure 1) was then developed asking the following questions: What important unmet patient needs have potential to be addressed by pharmacists and pharmacies from 2020 to 2025; what key barriers are blocking ability to meet those needs; what priority strategies are recommended; and what are the priority next steps for moving forward?

Round 1, Brainstorming, involved a virtual kickoff meeting in June 2020, followed by completion of questionnaire #1. Round 1 results were then compiled, analyzed, summarized, and sent back out to panelists as questionnaire #2. This was formatted similarly to Table 1. It included spaces to vote on each element and add comments.

Round 2, Refine, occurred in July 2020. Participants completed and discussed questionnaire #2. Feedback was compiled, analyzed, summarized, and sent back out to panelists as a draft final report.

Round 3 was held in August 2020. Participants reviewed, discussed, and provided feedback on the draft final report. Comments and concerns were identified.

Round 4, Finalize, held from September to December 2020, involved private meetings with most participant organizations to gather additional feedback on the draft final report. A semi-structured interview format was used. Participants were asked the following: "What additional changes could be made to this draft report and strategies so that they are as helpful as possible to you and those you serve?" Responses were analyzed to identify key implications of the findings for different stakeholder groups. Report findings were further validated by creating crosswalks with strategic frameworks that had previously been published on the websites of several of the largest national associations.[51-57] If a new strategy could be "mapped" to an existing published strategy, it was counted as validated. In some cases, language was refined to better match published terminology. Feedback obtained during the private meetings also highlighted the need for a few high-level overarching strategies. This led the research team to craft 4 *transformational strategies* (TS) with a potential to have the most impact based on the findings. In February 2021, a final report with consensus strategy recommendations was posted on a project website at www.rapidalliance.org.

Data analysis

Data were assembled, coded, and reviewed by 4 researchers from the National Science Foundation Center for Health Organization Transformation at the University of Louisville School of Public Health using established methods for coding qualitative data in mixed methods studies.[32,58,59] Three were professors with national health systems expertise, a PhD (he), MD (he), and PharmD (she); one was a PhD candidate (he). An emergent approach to categorizing data was used. Answers provided by panelists were entered into excel spreadsheets and then interpreted, coded, combined, refined, and categorized over multiple meetings and e-mail exchanges. Each combined element was then "ranked" in order of importance using 4 criteria: (1) number of mentions by panelists, (2) estimated size of affected population (1-5, 50,000-300 million), (3) estimated severity of impact on population's health (1-5, low to high), and (4) implementation feasibility based on the literature (1-5, low to high). For example, a lack of access to CMM services was mentioned frequently, affected most people in the United States, could have severe health impacts if not provided (e.g., hospitalizations), and seemed feasible to address based on the literature. Thus, it ranked high. If debate about scoring emerged, source documents and relevant literatures were reviewed and discussed until consensus was reached. The resulting lists of needs, barriers, change drivers, and strategies were refined (but not substantively changed) through participant feedback and analysis in rounds 3-4.

Key measures

Key measures used to assess the reliability and validity of findings presented in this study were (1) participation rates from invited organizations and individuals ($\geq$80% target), (2) participant consensus that the final report accurately reflects panelist input ($\geq$80% target), (3) validity verification through crosswalks with existing strategic frameworks ($\geq$70% validation target), and (4) levels of researcher consensus (80% target).

Confidentiality

All identifiable information is kept confidential by the research team. Identities of participants are not shared publicly without separate consent.

Results

Panel characteristics

All invited associations and most other invited groups and individuals accepted the invitation. As presented in Table 2, a total of 66 panelists from 42 organizations participated. Most participants had PharmD or BSPharm credentials. The panel included broad representation from leaders representing the U.S. pharmacist and pharmacy ecosystem at a national level.

Risks of bias

The researchers carefully considered potential for participant and researcher bias. The panel included a higher than planned number of academics, but a number of these also represented associations (e.g., as board members). In addition, most academics were actively engaged in practice in their local health systems and provided a detailed local "color" that

Delphi Brainstorming Worksheet (Round 1)

INSTRUCTIONS

Please use this worksheet to brainstorm your (and your team's) ideas about

1.) Unmet Patient/Personal Needs U.S. Pharmacies/Pharmacists Could Help Address

2.) Barriers to Meeting the Needs

3.) Strategies to Address the Needs.

Feel free to share "out of the box" ideas. There are no wrong ideas at this stage. We will be voting on and refining them in July and August.

Please e-mail your completed worksheet to__no later than July 6. 2020, 5:00pm ET.

NEEDS BRAINSTORM

What do you think are the most significant unmet patient/personal health related needs U.S. pharmacies and pharmacists could help address in the coming years (2020 -2025?)

List top 5.

BARRIERS BRAINSTORM

What do you think are the most significant barriers limiting U.S. pharmacies and pharmacists from satisfying those needs?

List top 5.

STRATEGIES BRAINSTORM

What do you think are the most significant strategies U.S. pharmacies and pharmacists could take to overcome those barriers and address those needs? In thinking about this, consider:

- **Change Drivers:** COVID-19? | Precision Medicine? | Personalized Healthcare? | Retail Medicine? | Increased Share of Health Spending by Pharmacy Sector? | New Digital Technologies/AI? | Social Determinants?
- **Types of Strategies:** Strategic Principles? | Policies (Federal, State)? | Best Practices/Standards? | Technologies? | Pilots/Research? | Publicity

List top 5.

Figure 1. Questionnaire #1.

Table 1
Results

Category	Key findings
Unmet U.S. health needs (addressable by pharmacists and pharmacies in collaboration with care team partners)	1. Comprehensive medication management 2. Vaccines, tests, screening, and support including for COVID-19 3. Health education to maximize personal health and well-being 4. Social support for low SES and at-risk populations
Barriers to meeting needs	1. Payment barriers 2. Policy barriers (federal and state) 3. Health IT and HIE barriers 4. Profession-related barriers (need to strengthen profession) 5. Public awareness barriers (unaware of pharmacist capabilities) 6. Service delivery barriers (lack of capacity to deliver enhanced services) 7. Lack of collaboration across sector (pharmacist and pharmacy silos) 8. Legacy barriers—for example, traditional community pharmacy physical setup
Why now? (change drivers)	1. COVID-19 pandemic needs 2. Value-based care trends 3. Political landscape 4. Telehealth trends 5. IT innovations 6. Personalized and precision medicine innovations 7. "Last mile" logistics and delivery innovations
Scope of opportunity	1. approximately 330 million people in United States affected (directly or indirectly) 2. Billions of COVID-19 tests and immunizations needed through 2022 3. Opportunities for measurable increases in U.S. "healthy days" through U.S. pharmacists/pharmacies 4. Up to $528 billion in annual health spending on likely avoidable hospitalizations, emergencies, and doctor visits associated with nonoptimized medication and vaccine use.
COVID-19 response strategies (2021–2022)	1. *Payment:* All plans reimburse for pharmacy-based COVID-19 tests, vaccines, cognitive services, telepharmacy, and at-risk and low SES support 2. *Policies:* Federal and state policy makers support pharmacy provider status, vaccine authority, increase reimbursements, reduce practice barriers 3. *Health IT and sharing:* Strengthen pharmacy standards, support patient access rights, support COVID-19 technology innovation
General strategies (2021–2025) (7 strategic areas; 42 strategies)	1. Expand offerings of valuable pharmacy services (8 strategies) 2. Policy reform to increase payments and strengthen practice (7 strategies) 3. Position pharmacists and pharmacies for the future (4 strategies) 4. Collaborative action (12 strategies) 5. Develop Health IT and HIE platforms and services (2 strategies) 6. Strengthen and disseminate evidence of pharmacist and pharmacy value (5 strategies) 7. Advance the profession (4 strategies)
One cross-cutting strategy	1. Prioritize action to address health equity and access barriers in every strategy
Four transformational strategies	1. Develop transformational pharmacy payment and practice models 2. Develop person-centered, pharmacy-connected data sharing platforms 3. Develop unified measurement and management mechanisms 4. Develop national "big tent" research consortia
Align sector around unifying goals	1. For people and patients: Increase CDC Healthy Days and related overarching population health measures 2. For U.S. health care: Lower spending while increasing quadruple aims 3. For pharmacy practices (all kinds): Grow value-driven services business 4. For pharmacists and practitioners (all kinds): Strengthen reputation measures

Abbreviations used: CDC, Centers for Disease Control and Prevention; COVID-19, coronavirus disease 2019; HIE, health information exchange; IT, information technology; SES, socioeconomic status.

helped strengthen the study. After consideration, the researchers felt comfortable that the level of academic representation did not unduly bias the findings. One panelist had a professional conflict of interest. None of the panelists other than the sponsor were known to 3 of the investigators before the study; a few were known to the PharmD researcher. These and other potential biases were considered when analyzing the data.

Validity and reliability measures

The study exceeded targeted measures for validity and reliability. Participation rates from invited organizations and individuals were 90% or better; consensus support for the results exceeded 90%; crosswalks of resulting strategies with external strategic frameworks yielded 80%-85% alignment; and the 4 researchers had 100% consensus on interpretations.

Ranking of elements

Results are detailed in Table 1. Needs, barriers, change drivers, and strategies are presented in rank order based on number of times mentioned, estimated size of affected population, severity of health impact on affected population, and estimated feasibility of implementation. Being ranked lower does not imply a lack of importance. Each element identified was of high importance to some stakeholder groups.

Table 2
Participant organizations and credentials

Organizations (N = 42)	%	Participants (N = 66)	%
National association (pharmacists and pharmacies)[a]	32.8	PharmD[b]	52.7
Academic (school of pharmacy)	27.9	BSPharm	10.8
Chain pharmacy	11.5	PhD	10.8
Patient advocates	6.6	MS	10.8
Pharmaceutical firm	3.3	MBA	6.8
Other (distributor, multisector collaborative, consulting, government)[c]	17.9	JD	2.7
		Other (MPH, MHA, etc.)	5.4

Abbreviation used: CEO, chief executive officer.
[a] Some academic participants had dual roles as association board members; factoring this in, association representation was approximately 50%.
[b] Each listed masters or terminal degree provided by participants was counted separately. For example, a person with a PharmD and JD was counted twice. Participants were either at senior management levels (director, vice president, president or CEO) or established researchers or both.
[c] Includes a pharmacy services distribution firm, multisector collaborative, consulting firm, and relevant government agency (represented by a recently retired leader).

Priority unmet health needs

Four priority unmet health needs addressable by U.S. pharmacists and pharmacies were identified: CMM with patient health advice and consultations; vaccines, tests, screening, and support for infectious diseases including for COVID-19; health education to maximize personal health and well-being; and social support for low socioeconomic status (SES) and at-risk populations including primary care services in underserved areas. CMM was identified as the most significant unmet need by a high margin.

Barriers to meeting needs

Eight barriers limiting U.S. pharmacist and pharmacy ability to meet these needs were identified: payment barriers limiting ability to pay pharmacists for providing CMM and related services; policy barriers (federal and state) limiting pharmacists' and pharmacies' ability to practice and be paid for providing needed services to patients; health information technology (IT) and health information exchange (HIE) barriers limiting ability to access and share accurate, complete timely medications data across the care spectrum; profession-related barriers; public awareness barriers; service delivery barriers; a lack of collaboration across sector; and legacy barriers.

Change drivers

Seven change drivers with potential to be leveraged to overcome barriers were identified: COVID-19 pandemic needs, value-based care trends, political landscape, telehealth trends, IT innovations in areas including interoperability and digital therapeutics, personalized and precision medicine innovations, and "last mile" logistics and delivery innovations.

Scope of opportunity

The strategies identified had a potential to affect U.S. health in broad areas including improving health and well-being measures for all U.S. residents; quadruple aims (care, health, cost and meaning in work)[60]; last mile delivery of COVID-19 vaccines, tests, and related services; and other tests and immunizations.

General strategies (2021-2025)

The study identified 42 general strategies in 7 strategy areas for optimizing medications and related therapies through U.S. pharmacists and pharmacies: expand offerings of valuable pharmacist and pharmacy services (8 strategies), policy reform to increase payments and strengthen practice (7 strategies), position pharmacists and pharmacies for the future (4 strategies), collaborative action (12 strategies), develop health IT and HIE platforms and services (2 strategies), strengthen and disseminate evidence of value (5 strategies), and advance the profession (4 strategies).

Health equity as a cross-cutting strategy

Advancing health equity was identified as a cross-cutting strategy that touched each of these areas.

COVID-19 response strategies (2021-2022)

The study identified 3 COVID-19 response strategies to optimize patient health and well-being: payments (plans should reimburse pharmacies for COVID-19 tests and vaccines, related cognitive services, telepharmacy, and at-risk and low SES support). policies (federal and state policy makers should support provider status for pharmacists, vaccine authority, increase reimbursements for services, and reduce practice barriers for delivering tests and vaccines), and digital health (multiple parties should look for ways to improve digital health infrastructure to strengthen COVID-19 related data sharing).

Need for unifying strategies

The study identified high levels of perceived pharmacist and pharmacy sector fragmentation going back 40 plus years. Fragmentation was identified by virtually all panel participants as a critical challenge. Many panel participants stated that "We need to speak with one voice to move forward." Others expressed sentiments like "Over the last 40 years, we have repeatedly failed to come together in unified ways sufficient to create changes needed to strengthen our profession and its ability to serve patients."

In service ecosystems, specialization and fragmentation are 2 sides of a coin.[61] Pharmacy practice is a collaborative team-

based activity with many subspecialties. Pharmacists and pharmacies work closely with physicians, nurses, technicians, dentists, pharmaceutical firms, health systems, hospitals, clinics, aging care providers, specialty care groups, and chronic-disease providers. They collaborate with health plans, government agencies, technology firms, researchers, and others in a myriad of settings. They support treatment for a wide range of consumer and patient types and medical conditions in outpatient, acute, and long-term care settings. Thus, it makes sense that the sector could be perceived as highly specialized. However, in identifying fragmentation as an issue, the panelists indicated that there were unduly high levels of fragmentation in the sector. Several panelists made this point by comparing the U.S. pharmacist profession with other professions, commenting, for example, that nursing had done better than pharmacists in recent decades in creating a strong, unified national voice, strengthening ability to prescribe medications, and solidifying roles as trusted members of physician-led care teams. These comments led the researchers to identify excessive levels of fragmentation in the pharmacist and pharmacy sector as an important factor limiting the nation's ability to address NOMTs. Fragmentation challenges were identified in areas of policy, payment, practice, technology, measurement, and research.

Four TS

Perception or reality of fragmentation in external environments can limit organizational capacity to adopt health improving innovations.[38,62,63] *Triggering mechanisms* such as new legislation or widespread stakeholder agreement can help reduce such fragmentation.[46] The 4 TS offer potential to bring the sector together in new ways to reduce fragmentation (see Figure 2).

The first TS is development and spread of transformational payment and practice models. There are several advanced practice models (including CMM) that show value in specific contexts, but nationally scalable payment and practice models able to support pharmacists working as members of care teams to optimize medication therapies across the care spectrum are not yet in place in the United States. Data gathered suggest that progress in this area will require some changes in some federal and state policies. It will also require cross-sector collaboration with physicians, providers, plans and plan sponsors, pharmaceutical firms, digital technology platforms, and government programs to create win-win models. Innovative practice and payment models focused on value, team-based care processes, and models in which consumers pay as much as $15.00 per pharmacy visit for value-added premium services[64] may have particular promise.

The second TS is development and spread of person-centered pharmacy-connected data sharing infrastructures to strengthen interoperable data sharing across multiple systems (e.g., plans, EHRs, pharmacy systems, retail systems, personal applications). Such infrastructures will need to support emerging technologies including digital therapeutics, pharmacogenomics, precision medicines, and artificial intelligence–driven services. A growing body of evidence suggests that transformational progress can be made by embracing a paradigm shift in data ownership and management, to one in which individuals play an increasingly central role in accessing, owning, and resharing their data across their lives.[65,66] The pharmacy sector may have an opportunity to help lead in developing these new types of person-centered data markets by providing initial use cases (e.g., medication-related data) and by distributing these services through community pharmacy channels. We believe that for this model to work, leading firms in other sectors, including banking, big technology, and data brokerage field, will need to collaborate with large pharmacy sector organizations to organize a "visa-like" infrastructure for personal data, in which multiple parties compete on a shared platform. The infrastructure needs to expand well beyond just pharmacy and medications. A general approach for exploring this opportunity is described in a working paper.[67]

The third TS is the development of more unified measurement and management systems for managing medication therapies across the United States. Four unifying measures were identified for consideration: for population impact, the Centers for Disease Control and Prevention (CDC) "Healthy Days"[68,69]; for U.S. health care, quadruple aims (care, health, cost, and meaning in work)[12,60,70,71]; for pharmacy practices (all kinds), levels of adoption of new value-driven services such as CMM or digital therapeutics; and for pharmacists, trust and reputation measures in both public and professional domains. Each of these measurement areas will require further work to develop and scale for the pharmacist and pharmacy sector.

The fourth TS is the development of one or more national research consortia capable of providing research to support changes along the lines noted earlier. Consortia should focus on providing evidence to support transformational change. They should be organized using a "big tent" model, in which all key stakeholders in the U.S. medication therapy ecosystem interested in reducing NOMTs can participate collaboratively. They should offer rapid research cycles, and they should support research by many different universities, research institutions, and researchers, to support many specialty areas of research that will need to be conducted over time.

Implications for stakeholders

The implications for key stakeholder groups are summarized in Table 3. In general, implications are that all key stakeholder groups should work together, collaboratively, to cocreate and implement the TS identified in the study.

Discussion

U.S. pharmacists and pharmacies are at the center of a complex, rapidly evolving medication services ecosystem[72,73] that also includes patients, physicians, nurses, health plans, plan sponsors, pharmaceutical firms, health systems and clinics, aging care providers, associations, technology firms, standards and measures firms, state and federal government agencies, and policy makers engaged in researching, developing, testing, manufacturing, distributing, paying for, administering, prescribing, filling, delivering, ingesting, educating about, monitoring, evaluating, and disposing of medications and related therapies including vaccines, pharmacogenomics, and digital therapeutics. Medications touch every population, from newborns to hospice patient. They are used to treat many types of

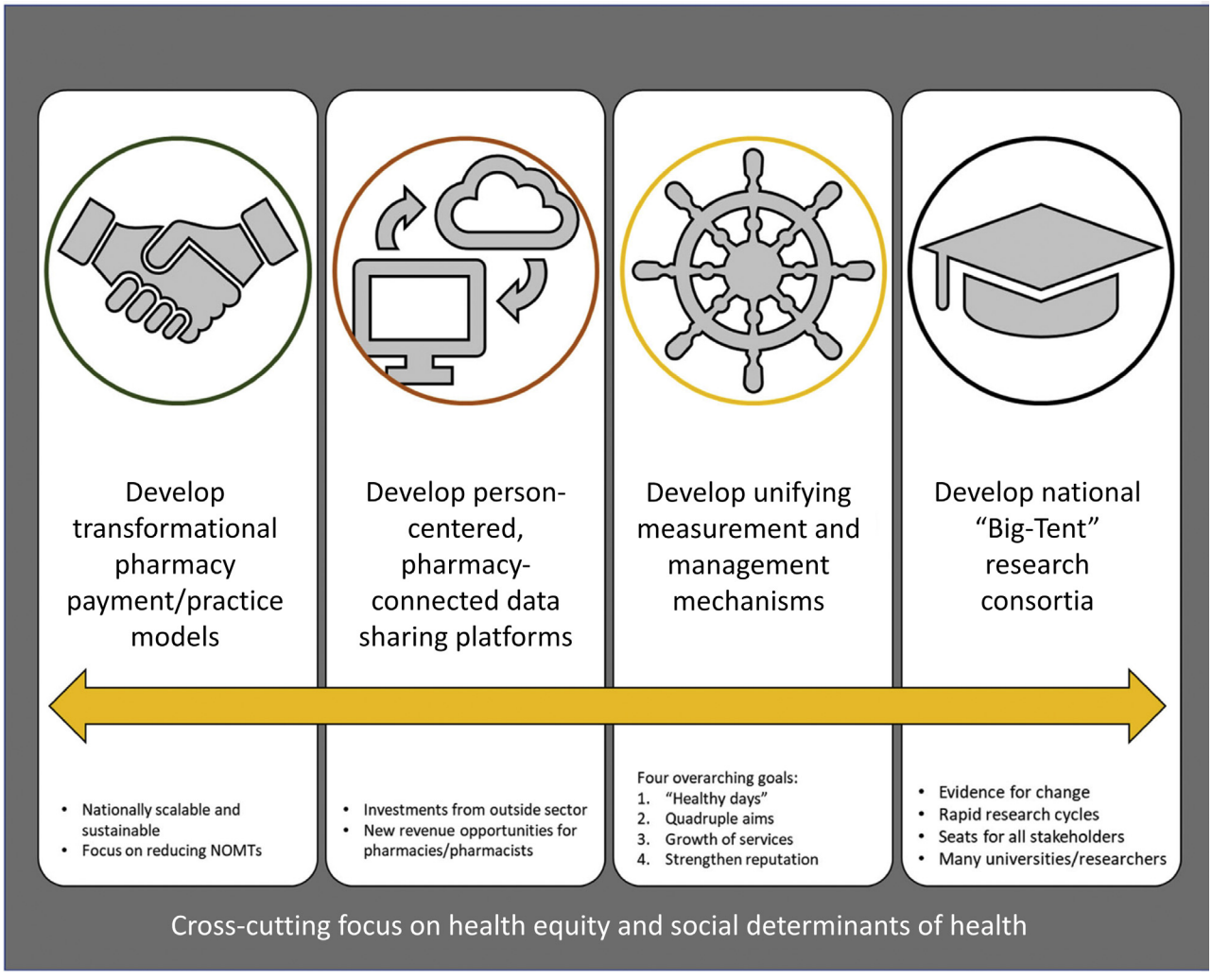

Figure 2. Four transformational strategies. Abbreviations used: NOMTs, Nonoptimized medication therapies.

illness from sprained ankles to chronic diseases such as cancer, heart disease, and diabetes and affect as much as a trillion dollars of health spending annually.[3] The field is rapidly changing, highly technical, and complex because of advances in pharmacogenomics, precision medicine, big data and analytics, digital therapeutics, value-based care, and other areas; therefore, effective medication optimization does and will require specialized expert skills.

This study explored opportunities to strengthen the capacity of U.S. pharmacists and pharmacies to improve population health and well-being in this complex, changing environment. A comprehensive set of strategies were identified with a potential to strengthen the ability of the U.S. pharmacist and pharmacy sector to act to protect and improve the health and well-being of the U.S. population from fall 2020 to year-end 2025. This paper reports only the findings related to the question of what potential impact pharmacists and pharmacies have on the health and well-being of the U.S. population. The data collected reflected several pharmacy practice-related themes, including pharmacist burnout, the need for professional development and training to meet the demands of enhanced pharmacy practice, and other topics that are beyond the focus of this paper but could also be of interest to the pharmacy sector.

There were a few surprising results. First was the large number of discrete strategies identified, second was the unified concern about fragmentation, third was the high level of consensus around priority strategies, and fourth was the longer-term outlook of the strategies. Although shorter-term COVID-19 pandemic—related strategies were viewed as important, the longer-term strategies were, in the end, viewed as most important.

The most important result of the study was the development of the 4 TS. The most important of these is payment and practice transformation. Pharmacists must be paid adequately to provide advanced medication services such as CMM. However, more work needs to be done to demonstrate the utility of standardized practice and payment models that generate enough value to justify such increases in spending. Strengthening health IT to support interoperable data sharing among pharmacists, care team partners, and patients is a second TS. Interoperable data sharing is a prerequisite for achieving

Table 3
Recommendations by stakeholder group

Stakeholder group	Recommendations
Patient advocates and U.S. populations	1. Encourage action to increase access to medication management therapies for people at every level of the health care system, paid for by Medicare, Medicaid, and private plans. 2. Support person-centered health IT systems, and demand access for people to their own medications and related data from all sources. 3. Increase use of pharmacists and pharmacies as trustworthy sources of medications, vaccines, and advice and guidance about simpler primary care matters. 4. Encourage policy makers and politicians to support the same.
U.S. policy makers (federal and state)	1. Support payment and practice reform for pharmacists and pharmacies in Medicare, Medicaid, and commercial plan contexts. 2. Reduce practice barriers at federal and state levels. 3. Support person-centered health IT data sharing services at every level. 4. Support development of unified measures and strategies across the sector. 5. Support strategic research to develop evidence-based practice changes that measurably reduce NOMTs. 6. Support delivery of vaccines including COVID-19 through pharmacies and pharmacists.
U.S. health care organizations	1. Increase use of pharmacists as key care team members to provide CMM and related services. 2. Strengthen funding support in all health plans for pharmacists and pharmacies to provide value-driven services. 3. Support federal and state policy changes to reduce pharmacist payment and practice barriers. 4. Support person-centered health data sharing services at every level, including pharmacies. 5. Support development of unified medication-related measures and strategies. 6. Support strategic research to develop evidence-based changes that measurably reduce NOMTs. 7. Support delivery of vaccines including COVID-19 ones through pharmacies and pharmacists.
Pharmaceutical firms	1. Support inclusion of pharmacists as care team members providing CMM and related services. 2. Support person-centered health IT data sharing services at every level, including with pharmacies and patients with patient consent. 3. Support development of unified medication-related measures and strategies for the sector. 4. Support strategic research to develop evidence-based changes that measurably reduce NOMTs. 5. Support delivery of vaccines including COVID-19 through pharmacies and pharmacists.
Pharmacists, pharmacies, and schools of pharmacy	1. Strengthen role of pharmacists as care team members providing CMM and related services. 2. Advocate to increase plan funding for value-driven services and reduce practice barriers. 3. Support innovation in person-centered health IT data sharing services. 4. Lead development of unified medication-related measures and strategies across the sector. 5. Support strategic research to develop an evidence base for practice changes to reduce NOMTs.
Researchers	1. Conduct additional research studies to address knowledge gaps related to NOMTs. 2. Develop and participate in research consortia supporting larger-scale studies. 3. Focus on research priorities identified in this report and future studies. 4. Provide education and training to students, professionals, and the broader community. 5. Provide students with new opportunities to conduct research.

Abbreviations used: CMM, comprehensive medication management; COVID-19, coronavirus disease 2019; IT, information technology; NOMT, nonoptimized medication therapy.

payment and practice transformation. Actionable strategies for achieving this were identified. Third is the development of standardized measures that the pharmacist and pharmacy sector can unify around to focus its efforts and demonstrate value. Four candidates were identified: CDC Health Days, quadruple aims, New Service Revenues for Pharmacies, and Pharmacist Reputation Scores. Fourth was the development of one or more research consortia in which many universities and research groups participate to do much more to generate and disseminate evidence needed to guide transformational change at national and state levels of scale.

Strategies identified in this study, if implemented successfully, offer new pathways for improving the health and well-being of the U.S. population, increasing the efficiency and effectiveness of the U.S. health care system, and strengthening the capacity of U.S. pharmacists and pharmacies to deliver value.

For patient and population advocates, the study identifies substantial health risks associated with medication therapies as they are delivered today, especially for populations with chronic illnesses, lacking transportation, and lacking ability to pay for medications or in vulnerable, underserved, and low SES categories. Conversely, broad access to CMM and similar services delivered through pharmacists and pharmacies have the potential to reduce illness and mortality.

For federal and state policy makers, the results point to opportunities to act strategically to increase health and well-being measures of the U.S. population while reducing health spending by tens or even hundreds of billions of dollars nationally.

For the U.S. health care sector, including physicians, dentists, nurses, critical care providers, clinics, senior care providers, plan sponsors, plans, digital technology firms, and others, the results point to new pathways for advancing the quadruple aims through CMM and other services that reduce NOMTs at scale.

For pharmaceutical firms, the findings point to new pathways to reduce risks of patient harm, improve adherence and outcomes, strengthen the capacity to access and share patient-related data related to medications, and expand capabilities for surveillance, research, and delivery of personalized products and services.

For U.S. pharmacists, pharmacies, and pharmacy schools, the findings open new doors for action to improve population health and well-being in the United States, while also increasing professional standing and opportunities. This can be accomplished by developing and delivering CMM and other value-driven services and by implementing other strategies identified in the study.

For researchers, the findings point to new research opportunities studying payment and practice reform, person-centered health data sharing, unifying measures, COVID-19 and other vaccine delivery mechanisms, and other areas identified in the report.

Limitations

This study analyzed data gathered during a time of rapid change in 2020 as the COVID-19 pandemic spread across the United States and globally and then as the 2020 presidential election occurred and results sorted out. During this time, there was much uncertainty about the future. These dynamics clearly shaped the study. The study captures thoughtful input from a national panel of senior leaders and researchers representing a diversity of views from the U.S. pharmacist and pharmacy sector. In addition, the findings are grounded in existing literatures. Established methodologies for this kind of qualitative research were used. However, findings should be interpreted cautiously given the small size of the panel and dynamics at play during the study. In addition, the study design excluded physicians, nurses, health plans, purchasers, health IT, and other stakeholders who are also stakeholders in the medications space. Findings would, likely, be different had these other stakeholders been included.

Conclusion

This study sought to evaluate potentially unrealized opportunities to optimize medications, vaccines, and other therapies for U.S. populations through U.S. pharmacists and pharmacies working in collaboration with care team partners including physicians, during and after the COVID-19 pandemic. With its unique and diverse embeddedness in a variety of communities and settings, plus pharmacists' unique training and capabilities in medication management, the pharmacy sector seems to have a sizeable unrealized potential to improve patient access, quality, and outcomes related to medications and vaccines. Pharmacy sector fragmentation is a key barrier limiting utilization of pharmacists and pharmacies. Priority strategies for reducing fragmentation and unlocking unrealized capabilities of pharmacists and pharmacies were identified.

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