

Clinician engagement in research as a path toward the learning health system: A regional survey across the northwestern United States

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Abstract

Introduction: Increased research engagement of frontline, community-based clinicians could result in greater research relevancy, increased likelihood of implementation into practice, and improved health care for patients. Establishment of learning health systems within health-care organizations may facilitate this process.

Methods: In 2016, the U.S. Northwest Participant and Clinical Interactions Network conducted a region-wide survey in four community-based health systems to identify barriers to clinician involvement in research and understand clinician interest and levels of engagement.

Results: Survey responses indicated broad interest in research's value to patients (77% of respondents), contribution to clinical evidence (79%), and fulfillment of intellectual curiosity (77%). Engagement was not always correlated with interest. Top barriers included time (65%), support (34%), and getting started (32%).

Conclusion: In community health systems in the northwestern United States, clinician interest in research exists but with several significant barriers. Leveraging the learning health system movement may be one way to increase focus on research and address identified barriers.

Keywords

clinical trials, health services research, learning organizations, organizational learning, research

Introduction

More than 75% of Americans receive health care in community settings where research is not a consistent priority.¹ Patients receiving care in community settings receive only 55% of recommended evidence-based care for the prevention and treatment of chronic conditions.² These data underscore the urgent need to expedite the translational process of research³ to ensure patients receive timely, evidence-based care. Collaboration with frontline clinicians is one way to enhance research relevance and increase the likelihood and timeliness of implementation of new knowledge. However, evidence suggests both a lack of interest in, and appreciation of, translational research, by clinicians.³ This is not surprising, given the lack of prioritization of research in

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community settings with many competing priorities. Health-care organizations are struggling to survive financially and adjust to new value-based payment systems.⁴ Community-based health-care organizations often look for research programs to reduce or eliminate costs, since research is typically considered a non-revenue generating activity.^{5,6} Continuing decreases in extramural research funding contribute to low investment in research.⁷

Paradoxically, as cuts to research programs are being considered, there is an international movement toward health-care organizations becoming learning health systems (LHSs). LHSs are defined as places “in which progress in science, informatics, and care culture align to generate new knowledge as an ongoing, natural by-product of the care experience, and seamlessly refine and deliver best practices for continuous improvement in health and healthcare.”^{8,9} The Agency for Healthcare Research and Quality adds to this definition that the result of LHSs is that “patients get higher quality, safer, more efficient care, and health care organizations become better places to work.”¹⁰ Speed and timeliness of learning are emphasized in this new conceptualization of the ideal health system.¹¹ This movement creates a potential tension between the simultaneous retreat from research based upon revenue pressure and promotion of learning cultures within health-care systems.

Studies on research engagement within community-based health-care organizations have been limited by small sample sizes and a sole focus on physicians or medical students.^{12–16} This study, which focused on research engagement, surveyed a broad variety of clinicians, including advance practitioners, allied health professionals, and non-physician behavioral health specialists, at four U.S.-based community-based health-care organizations of varying sizes. The results provide an example of what organizations may find when surveying their own clinicians. Better understanding of clinician level of interest in, barriers to, and engagement in research may help health-care organizations learn how to support clinicians’ spirit of inquiry, both in research and as they seek to become LHSs.

Materials and methods

Study setting

This study was conducted with four health-care systems in three states that participate as members of the Institute of Translational Health Sciences’ (ITHS) Northwest Participant and Clinical Interactions (NW PCI) Network in the United States. This research study was deemed exempt by all reviewing institutional review boards.

Participating sites ranged in size, with between 1 and 12 affiliated hospitals, and 15 to 181 owned ambulatory clinics. Research activity in 2016 varied by site, with a range of 165 to 174 active studies and 538 to 1194 research participants. All sites had the capacity to conduct inpatient and ambulatory-based studies; three of the four had capacity to conduct pediatric studies and have conducted studies in the home setting. All four sites conducted phase II–IV research as well as device, imaging, and health services research. Two of the four participating sites conducted phase I research studies.

The ITHS, funded by a Clinical and Translational Science Award (CTSA),¹⁷ is a partnership between the University of Washington (UW), Fred Hutchinson Cancer Research Center, and Seattle Children’s Hospital. Building on the decades-long relationships established by the UW in medical education and clinical care across the Washington, Wyoming, Alaska, Montana, and Idaho region,^{18–21} the ITHS has fostered research collaborations with clinical and academic institutions and provider and community-based organizations. NW PCI was established in 2013 to build successful research collaborations between clinical and academic investigators; increase opportunities for patients to participate in local, high-quality research; expand the capacity for investigator-initiated research; and ensure availability of best practices, standard operating procedures for research and research training opportunities in clinical settings.²²

Study sample

The four participating sites compiled clinician e-mail lists based on institutional permissions and availability of contact information. All sites included primary and specialty care providers. In addition to physicians, three sites included advance practitioners and allied health professionals such as pharmacists, occupational therapists (OTs), and physical therapists (PTs). One site included non-physician behavioral health providers. Overall, the four sites invited 2784 clinicians to participate in the survey.

Study survey

The survey was developed collaboratively with participating study sites. An extensive evidence-based literature review was conducted to inform the development process.^{3,12–16,23–30} Based on this review, a group of four experienced investigators met monthly over a four-month period to develop the initial survey. The draft survey, along with the larger project, was then presented to the NW PCI Steering Committee for approval and feedback. Once the project was approved, a working group was formed to complete the survey

development process. The working group, made up of representatives from ITHS and seven health systems in the PCI Network, met to review, iterate, and test the questions. Questions were reviewed, one-by-one, and discussed in-depth. Revisions and refinements were made, and the final revised survey was sent to the working group for final approval. The ITHS Evaluation Director also reviewed and approved the final survey. The final nine-item survey is available in Online Appendix.

The NW PCI Coordinating Center set up the final nine-item survey in REDCap, a secure, web-based data capture system,³¹ and trained each site to administer the survey. The NW PCI Coordinating Center then transferred survey administration permissions to each site and only retained access to only the de-identified data in order to preserve privacy. Data were collected between April and November 2016. Sites sent an average of three reminders at one-week intervals after the initial questionnaire was sent. Once data collection was complete, the NW PCI Coordinating Center downloaded and analyzed all sites' de-identified data.

Study variables

The survey asked participants to differentiate themselves by clinician type: primary care physician, specialty physician, nurse practitioner, physician assistant, allied health professional, e.g., Doctor of Pharmacy (PharmD), OT, or PT, and non-physician behavioral health provider, e.g., psychologist, mental health counselor, or social worker, or other. The survey categorized years in practice as 0–5, 6–10, 11–20, and ≥ 21 years. Respondents identified all roles they had held in research in the past five years. These included principal investigator (PI), site PI, co- or sub-investigator, site champion, consultant, recruiter, and other. The survey provided definitions for each of these roles. During analysis, roles were further aggregated into high, medium, or low engagement. PI and site PI were considered high engagement roles; co- or sub-investigator and site champion were considered medium engagement roles; all other roles, i.e., consultant, recruiter, and other, were considered low engagement roles. This stratification was created to differentiate responses between highly participatory roles like PI and site PI from lower engaged roles like study recruiter. Respondents were asked to identify funding mechanisms for their research: federal agency, other research grant, institutional support, industry-sponsored research, or other. They could also respond that their research was unfunded or that the funding source was unknown. Respondents indicated their level of interest in research as extremely, moderately, slightly, or not at all interested. Finally, clinicians were asked to identify up to three barriers to

doing research and up to three reasons why they participate or would like to participate in research.

Data analyses

Descriptive analyses were conducted using frequencies to compare practice and clinician characteristics, and research experience, roles, and funding, both overall, and by clinician type. Current level of interest as well as barriers to research participation were stratified by clinician level of engagement in research, as determined by research roles during the past five years, as well as by clinician type. Reasons for research interest were also stratified. Allied health professionals, non-physician behavioral health providers, and “other” responses were combined for analysis, given the small numbers of the latter two groups. Extremely and moderately interested and slightly and not at all interested responses were further collapsed to “yes” (interested in research) and “no” (not interested in research), respectively. The chi-square test of independence was used to test for statistically significant differences in study outcomes by levels of engagement and clinician type.

Results

Of the 2784 clinicians invited to participate, 23% (647) responded. Approximately a third of the clinician respondents were specialty care physicians; 30.4% were allied health professionals, non-physician behavioral health providers, or other provider types; 21.6% were primary care physicians; and 10.5% and 4.8% were nurse practitioners and physician assistants, respectively (Table 1). Years in clinical practice since completing professional training were fairly evenly distributed with 24.6% practicing 5 years or less, 18.7% practicing 6–10 years, 28.3% practicing 11–20 years, and 28.3% having practiced over 20 years since training.

A total of 41% (247 of 614) of respondents had worked on a research project since completing

Table 1. Survey respondent characteristics (n = 647).

| | |
|---|------|
| Type of clinician (%) | |
| Primary care physician | 21.6 |
| Specialty care physician | 32.6 |
| Nurse practitioner | 10.5 |
| Physician assistant | 4.8 |
| Allied health provider and other ^a | 30.4 |
| Years in practice since completing medical training (%) | |
| 0–5 years | 24.6 |
| 6–10 years | 18.7 |
| 11–20 years | 28.3 |
| 21+ years | 28.3 |

^aAllied health and other includes pharmacists, occupational therapists, physical therapists, and non-physician behavioral health providers.

Table 2. Research experience by clinician type (n = 614).

| | All positions ^a | Primary care physician | Specialty care physician | Nurse practitioner | Allied health and other ^b | p |
|--|----------------------------|------------------------|--------------------------|---------------------|--------------------------------------|-------|
| Any research since professional training, n (%) | n = 614 247 (41.4) | n = 140 42 (30.0) | n = 209 122 (58.4) | n = 68 22 (32.4) | n = 197 61 (31.0) | 0.000 |
| One or more research roles, past five years, n (%) | n = 247 190 (76.9) | n = 42 32 (76.2) | n = 122 95 (77.9) | n = 22 20 (90.9) | n = 61 43 (70.5) | 0.270 |
| Reported roles in the past five years, n | 190 | 32 | 95 | 20 | 43 | |
| Principal investigator, % | 28.4 | 25.0 | 35.8 | 25.0 | 16.3 | 0.114 |
| Site principal investigator, % | 19.5 | 31.3 | 24.2 | 15.0 | 2.3 | 0.006 |
| Co- or sub-investigator, % | 32.6 | 28.1 | 24.2 | 30.0 | 55.8 | 0.003 |
| Site champion, % | 5.3 | 6.3 | 5.3 | 10.0 | 2.3 | 0.636 |
| Consultant, % | 3.7 | 0.0 | 3.2 | 0.0 | 9.3 | na |
| Recruiter, % | 4.2 | 0.0 | 4.2 | 15.0 | 2.3 | na |
| Other, % | 6.3 | 9.4 | 3.2 | 5.0 | 11.6 | 0.239 |
| Funding by different types of organizations, n | 190 | 32 | 95 | 20 | 43 | |
| Federal agency, % | 28.4 | 34.4 | 28.4 | 30.0 | 23.3 | 0.766 |
| Other research grant, ^c % | 22.6 | 15.6 | 26.3 | 35.0 | 14.0 | 0.156 |
| Institutional support, % | 28.4 | 34.4 | 27.4 | 20.0 | 30.2 | 0.711 |
| Industry-sponsored research, % | 34.7 | 21.9 | 50.5 | 25.0 | 14.0 | 0.000 |
| Research project was unfunded, % | 36.3 | 34.4 | 34.7 | 40.0 | 39.5 | 0.927 |
| I don't know, % | 3.7 | 0.0 | 1.1 | 5.0 | 11.6 | na |
| Other, % | 2.1 | 9.4 | 0.0 | 0.0 | 2.3 | na |

Note: na: not applicable.

^aDue to small numbers of responses, physician assistants were excluded.

^bAllied health and other includes pharmacists, occupational therapists, physical therapists, and non-physician behavioral health providers.

^cOther research grants include those from organizations such as foundations and the Patient-Centered Outcomes Research Institute.

professional training (Table 2). This experience varied by clinician type with specialists reporting the highest participation since training. Of those reporting any research activity since completing professional training, most had participated in research in the past five years. The most frequently reported research role was that of co- or sub-investigator (32.6%). Overall, about one-quarter of the respondents reported serving as either PI or site PI. Of all clinician types, allied health professionals and others had the lowest proportion that reported having been PIs or site PIs (16.3% and 2.3%, respectively). The proportion of different clinician types that served as site PIs differed significantly, with primary care physicians most likely to have been site PIs (31.3%, $p = 0.006$); the proportion of different clinician types that served as co- or sub-investigators also differed significantly, with allied health professionals most likely to have been co- or sub-investigators (55.8%, $p = 0.003$).

About one-quarter of all respondents reported receipt of funding from each of the following sources: federal agencies, other research grants, or their institution (Table 2). Approximately one-third of the respondents reported industry-sponsored research and one-third unfunded research. Physician specialists were most likely to report industry-sponsored research (50.5%, $p < 0.001$).

Approximately half (333, 51.7%) of the respondents reported being extremely or moderately interested in participating in research (Table 3). Those clinicians with the highest level of research engagement in the past five years also reported the highest rate of interest in research (87.9%). However, substantial proportions of clinicians with lesser levels of engagement in research also reported extreme or moderate interest in research participation: 71.4% of those with low research engagement and 53.3% of those who had not participated in research within the past five years. Almost 40% of respondents who had not engaged in research since completing professional training reported extreme or moderate interest in research ($p < 0.0001$). Nurse practitioners reported the highest rates of interest in research (66.2%) followed by specialty care physicians at 54.0% ($p = 0.016$).

The most frequently reported barrier to research participation was time, regardless of level of engagement, with 64.7% of respondents reporting this barrier (Table 4(a)). Specialists were the clinician type that reported this barrier the most often (75.0%, $p < 0.0001$) (Table 5(a)). Not knowing how to get started in research was reported by 31.5% of respondents overall, although this was largely driven by clinicians who

Table 3. Interest in research by level of engagement^a and clinician type.

| | Total n | Interested in research n (%) |
|---|------------|------------------------------------|
| Level of engagement* | | |
| High | 91 | 80 (87.9) |
| Medium | 75 | 48 (64.0) |
| Low | 28 | 20 (71.4) |
| None in last five years | 60 | 32 (53.3) |
| None since completing medical training | 390 | 153 (39.2) |
| Overall | 644 | 333 (51.7) |
| Clinician type** | | |
| Primary care physician | 140 | 59 (42.1) |
| Specialty care physician | 211 | 114 (54.0) |
| Nurse practitioner | 68 | 45 (66.2) |
| Physician assistant | 30 | 13 (43.3) |
| Allied health and other ^b | 197 | 102 (51.8) |
| Overall | 646 | 333 (51.5) |

^aHigh level of engagement = principal or site principal investigator; medium level of engagement = co- or sub-investigator or site champion; low level of engagement = consultant, recruiter, and other.

^bAllied health and other include pharmacists, occupational therapists, physical therapists, and non-physician behavioral health providers.

* $p < 0.0001$. ** $p = 0.016$.

had not participated in research since training (52.3%, $p < 0.0001$). Nurse practitioners were the clinician type that reported this barrier the most (48.6%, $p < 0.0001$). Those who had not participated in research since training also reported the greatest lack of access to a research mentor (33.1%, $p < 0.001$). Specialists were most likely to report that research does not sufficiently reimburse them for their time (47.9%, $p < 0.001$). About one-quarter of the respondents overall reported barriers of not being sufficiently reimbursed for time while working on research, unclear, or burdensome research-related processes and procedures, or lack of mentorship.

The three most commonly reported reasons for participating in research were contribution to evidence, value to patients, and intellectual curiosity (76.5%–79.2%) (Table 4(b)). Nearly one-third of the respondents reported adding variety to current positions and professional advancement as reasons to participate in research. Few respondents reported participating in research for financial compensation or as a requirement of their position. Reasons for participating in research were fairly consistent, regardless of level of engagement in research in the past five years and since professional training. Specialists were most likely to report intellectual curiosity (86.0%, $p < 0.05$); physician assistants were most likely to report participating in research for professional advancement (53.8%, $p < 0.05$) (Table 5(b)).

Discussion

This survey of four community-based health-care organizations across the northwestern United States provides a snapshot of research engagement and interest as well as barriers to, and reasons for, participating in research by a diverse set of clinicians. At these four organizations, there were relatively high levels of engagement and interest in research. This cross-section of interested and many currently unengaged clinicians represents an untapped opportunity for expanding current research activities and connecting to the international movement toward organizations' interests in becoming LHSs.³² Addressing identified barriers to research may help bridge this gap to increase the number of clinicians engaged in research. Locally conducted surveys may illuminate organization-specific levels of engagement in research, as well as barriers and facilitators, to help organizations better understand their own research environments and help pave the way toward LHS attainment and ultimately to improved patient care, population health, reduced cost, and satisfied clinicians.

While engaging clinicians in research is a step toward LHS attainment, transformation of research into action is needed. Taking action involves iterative cycles of assembling and analyzing data, interpreting results, feeding findings back into the system, making changes to practice, and repeating the process.³³ It is a continuous improvement process that requires infrastructure and a cultural commitment across the health system. This paper addresses the early steps to building this infrastructure, which may start with engaged researchers.

This study improves upon previous research engagement studies characterized by small sample sizes, inclusion of few study sites, narrow clinician types, or targeted focus, such as medical residents,¹³ practice-based research networks,^{14,26,27,29} or patient-centered comparative effectiveness research.³ The relatively large group of clinicians responding to this survey across four diverse organizations increases its generalizability, especially with the inclusion of nurse practitioners, physician assistants, allied health professionals, and others.

Survey respondents overwhelmingly reported patient-centric reasons for wanting to conduct research such as providing value to patients and contributing to clinical evidence. Few reported conducting research as a requirement or for reasons of compensation. Reported barriers such as time, support, and mentorship, while not insurmountable, may be challenging given the current research environment characterized by reduced federal funding and support. This survey provided site specific data on perceived barriers that clinicians experience, which may be used to develop tailored solutions, such as providing highly research-motivated clinicians with dedicated research time. In addition, recognizing the

Table 4(a). Barriers to participating in research by LOE among those reporting interest in research.

| Barriers to participating in research | High LOE (n = 61) | Medium LOE (n = 35) | Low LOE (n = 14) | No research in last five years (n = 28) | No research since medical training (n = 151) | Total (n = 289) | p-value |
|---|----------------------|---------------------------|---------------------|---|---|--------------------|---------|
| I don't have time, % | 72.1 | 82.9 | 64.3 | 75.0 | 55.6 | 64.7 | 0.010 |
| Research support staff are not available or easily accessible, % | 47.5 | 40.0 | 7.1 | 39.3 | 27.8 | 33.6 | 0.011 |
| I don't know how to get started in research, % | 3.3 | 8.6 | 21.4 | 14.3 | 52.3 | 31.5 | 0.000 |
| Research activities do not sufficiently reimburse me for my time, % | 44.3 | 20.0 | 35.7 | 28.6 | 25.8 | 29.8 | 0.059 |
| Research-related processes and procedures are <i>unclear</i> or <i>overly burdensome</i> , % | 27.9 | 37.1 | 42.9 | 32.1 | 18.5 | 25.3 | 0.051 |
| I do not have access to <i>mentorship</i> from colleagues experienced in research, % | 8.2 | 8.6 | 28.6 | 17.9 | 33.1 | 23.2 | 0.000 |
| Institutional <i>leadership</i> doesn't think that research is important, % | 29.5 | 17.1 | 7.1 | 17.9 | 14.6 | 18.0 | 0.099 |
| Training requirements are onerous, % | 13.1 | 20.0 | 21.4 | 14.3 | 6.6 | 11.1 | 0.094 |
| I haven't or don't often find research opportunities that <i>interest</i> me, % | 0.0 | 5.7 | 21.4 | 0.0 | 10.6 | 7.3 | na |
| Other, % | 8.2 | 0.0 | 0.0 | 0.0 | 6.6 | 5.2 | na |
| Post research experience did not go well, % | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.3 | na |

LOE: level of engagement; na: not applicable.

Table 4(b). Reasons for participating in research by LOE among those reporting interest in research.

| Reasons for participating in research | High LOE (n = 80) | Medium LOE (n = 48) | Low LOE (n = 19) | No research in last five years (n = 32) | No research since medical training (n = 153) | Total (n = 332) | p |
|--|-------------------------|---------------------------|------------------------|---|---|--------------------|-------|
| Contribution to new evidence, % | 85.0 | 85.4 | 78.9 | 68.8 | 76.5 | 79.2 | 0.233 |
| Value to patients, % | 81.3 | 68.8 | 84.2 | 78.1 | 75.8 | 76.8 | 0.503 |
| Intellectual curiosity, % | 80.0 | 77.1 | 68.4 | 75.0 | 75.8 | 76.5 | 0.857 |
| Adds variety to my current position, % | 28.8 | 22.9 | 36.8 | 46.9 | 32.0 | 31.6 | 0.224 |
| Professional advancement, % | 25.0 | 33.3 | 21.1 | 15.6 | 35.3 | 29.8 | 0.129 |
| Financial compensation, % | 7.5 | 12.5 | 5.3 | 9.4 | 4.6 | 6.9 | 0.400 |
| Requirement of my current position, % | 2.5 | 0.0 | 5.3 | 6.3 | 1.3 | 2.1 | na |
| Other, % | 0.0 | 0.0 | 0.0 | 0.0 | 0.7 | 0.3 | na |

LOE: level of engagement; na: not applicable.

Table 5(a). Barriers to participating in research by clinician type among those reporting interest in research.

| Barriers to participating in research | Primary care physician (n = 56) | Specialty care physician (n = 96) | Nurse practitioner (n = 37) | Physician assistant (n = 11) | Allied health and other ^a (n = 89) | Total (n = 289) | p-value |
|---|---------------------------------|-----------------------------------|-----------------------------|------------------------------|---|-----------------|---------|
| I don't have time, % | 60.7 | 75.0 | 54.1 | 36.4 | 64.0 | 64.7 | 0.000 |
| Research support staff are not available or easily accessible, % | 41.1 | 36.5 | 27.0 | 18.2 | 30.3 | 33.6 | 0.397 |
| I don't know how to get started in research, % | 41.1 | 13.5 | 48.6 | 27.3 | 38.2 | 31.5 | 0.000 |
| Research activities do not sufficiently reimburse me for my time, % | 17.9 | 47.9 | 27.0 | 18.2 | 20.2 | 29.8 | 0.000 |
| Research-related processes and procedures are unclear or overly burdensome, % | 26.8 | 30.2 | 29.7 | 36.4 | 15.7 | 25.3 | 0.152 |
| I do not have access to mentorship from colleagues experienced in research, % | 25.0 | 15.6 | 27.0 | 27.3 | 28.1 | 23.2 | 0.309 |
| Institutional leadership doesn't think that research is important, % | 16.1 | 28.1 | 5.4 | 0.0 | 15.7 | 18.0 | na |
| Training requirements are onerous, % | 12.5 | 9.4 | 10.8 | 18.2 | 11.2 | 11.1 | 0.915 |
| I haven't or don't often find research opportunities that interest me, % | 5.4 | 3.4 | 10.8 | 27.3 | 9.0 | 7.3 | 0.035 |
| Other, % | 5.4 | 2.1 | 2.7 | 9.1 | 9.0 | 5.2 | 0.258 |
| Past research experience did not go well, % | 1.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.3 | na |

Note: na: not applicable.

^aAllied health and other include pharmacists, occupational therapists, physical therapists, and non-physician behavioral health providers.

Table 5(b). Reasons for participating in research by clinician type among those reporting interest in research.

| Reasons for participating in research | Primary care physician (n = 59) | Specialty care physician (n = 114) | Nurse practitioner (n = 45) | Physician assistant (n = 13) | Allied health and other ^a (n = 101) | Total (n = 332) | P |
|--|---------------------------------|------------------------------------|-----------------------------|------------------------------|--|-----------------|-------|
| Contribution to new evidence, % | 72.9 | 78.9 | 84.4 | 84.6 | 80.2 | 79.2 | 0.648 |
| Value to patients, % | 67.8 | 73.7 | 77.8 | 69.2 | 86.1 | 76.8 | 0.069 |
| Intellectual curiosity, % | 78.0 | 86.0 | 75.6 | 69.2 | 66.3 | 76.5 | 0.018 |
| Adds variety to my current position, % | 33.9 | 29.8 | 33.3 | 15.4 | 33.7 | 31.6 | 0.708 |
| Professional advancement, % | 25.4 | 20.2 | 35.6 | 53.8 | 37.6 | 29.8 | 0.012 |
| Financial compensation, % | 11.9 | 7.9 | 4.4 | 15.4 | 3.0 | 6.9 | 0.151 |
| Requirement of my current, % position | 6.8 | 0.0 | 2.2 | 0.0 | 2.0 | 2.1 | na |
| Other, % | 0.0 | 0.0 | 0.0 | 0.0 | 1.0 | 0.3 | na |

Note: na: not applicable.

^aAllied health and other include pharmacists, occupational therapists, physical therapists, and non-physician behavioral health providers.

broad interest in research within an organization may result in reorganizing research processes and procedures, including integrating research into efforts to become LHSs. For example, organizational leadership might increase support for research training and mentorships as the benefits of translational research to the provision of higher quality care becomes clear, in part through increased uptake of evidence-based medicine.

This study's findings are consistent with published reports that have demonstrated that even clinicians who value research and its connection to improving patient care face seemingly insurmountable barriers that prevent them from fully participating in research at their local clinic sites.^{3,13,16,24,27,28} Identified barriers across several studies included lack of time and resources,^{3,12,13,16,24,28} lack of research training,^{12,28} a need for collaborators,^{12,27,28} scarcity of mentors,^{12,28} and the need for more infrastructure support.^{12,24,27}

The study was limited by geography as the four organizations surveyed were located in one region of the United States. While it is possible that health-care professionals in other regions experience different challenges, this research was conducted in three states, increasing the likelihood of generalizability. Second, the focus of this research was community-based health systems; clinicians at academic health-care systems, by definition, are likely more engaged in research.^{23,30} The response rate of 23% may introduce responder bias. Non-responders may be less engaged in research and therefore less willing to respond to a survey about research engagement. This is another reason surveys should be locally conducted and participation should be strongly encouraged. Relatedly, this study found a relatively high proportion of clinicians who were not active in research but were interested in research. The survey did not explore the degree to which these clinicians understood what research truly entails. Future surveys could benefit from probing on this point.

Another limitation is that sampling strategies differed and therefore not all clinician types were represented across the four sites. For example, at one site only primary and specialty care physicians, and no advanced practice providers, behavioral health, or allied health professionals were surveyed. However, when combined, a broad range of health-care professionals' perspectives was represented, and a substantial proportion of clinicians was interested, yet not participating in research. To ensure that these results are locally representative, health-care organizations are encouraged to survey their own clinical staff and providers to identify challenges unique to their systems to enable targeted interventions. The survey process followed by this research network can serve as a model for other CTSA and their affiliated community-based health systems across the United States and similar international systems.

The quadruple aim summarizes the ultimate goal in health care: improving population health and the patient experience, reducing costs, and improving care team well-being.^{34,35} Combining focus on the LHS and other research activities may provide the necessary synergy to reach this common goal. The untapped resource of clinicians interested in research may support organizational efforts toward becoming an LHS and help shape research priorities that meet the needs, interests, and goals of both efforts. Clinicians who participate in research may be happier and more engaged in their work given their interest in providing value to patients, contributing to new evidence, and achieving intellectual curiosity, as long as they have sufficient resources, including time, support, and mentorship. This clinician interest and engagement, in an LHS designed to transform research into practice, and through an interactive continuous improvement model, may ultimately improve patient care and cost efficiency. Realization of these outcomes by key stakeholders in this process, i.e., clinicians, staff, and patients, may further inspire them to continue to engage in a fulfilling process that helps reach a common end goal of health for all.

Whether research, learning, or both, addressing barriers and capitalizing on identified interest among health-care professionals may further the path toward a healthy research environment and culture of learning within health-care systems, ultimately leading to better health, better health care, lower costs, and joy in the workplace.

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