Sparking and Sustaining the Essential Functions of Research:
Group Health’s Experience Translating Research into Care

Eric B. Larson, MD, MPH
Christine Tachibana, PhD
Edward H. Wagner, MD, MPH

A chapter from Enhancing the Professional Culture of Academic Health Science Centers:
The Organizational Environment and Its Impact on Research (2012)
Thomas Inui, MD, and Richard M. Frankel, PhD, editors
Sparking and sustaining the essential functions of research: Group Health's experience translating research into care

The case for learning health systems
Changes in health care can be perceived as threatening and disruptive. The public reaction in 2010 to President Obama's Patient Protection and Affordable Care Act (PPACA) is a memorable example, but is not unique. Comprehensive health care reform proposed by President Clinton was so threatening that it was abandoned. In spite of the political challenges, changes in US health care are inevitable. In 2001, the Institute of Medicine (IOM) reported in *Crossing the Quality Chasm* that health care quality, access, value, affordability and safety were at crisis levels. In fact, the US health system has long spent twice as much per capita for care than other industrialized countries, with evidence showing that care and outcomes are not better, and patients are not more satisfied. Market-driven health care has led to unsustainable rises in costs, massive increases in people without access to care, and a failure of the US to keep up with quality improvements achieved in other countries. The claim that the US has the best care in the world is no longer tenable. Private and public institutions, including academic health science centers, must work together to reduce the rate of rise in health care expenditures to sustainable levels.

The good news is that we can do better for less if we make smart decisions about how to allocate our health care resources—a process compared to thinning instead of clear-cutting a forest. Rather than eliminating entire programs or therapies in an attempt to cut costs, we can choose to meet our health care challenges by following population-based guidelines based on the most rigorous evidence available, with refinement and improvement as new evidence develops. This makes large-scale clinical research with design, testing, and surveillance in real-world populations particularly urgent. Group Health Cooperative, an integrated health care and delivery system with an embedded research center, is a model for this type of translational health research.

Group Health as a model
Three main factors have facilitated the development of Group Health as a learning health system. The first is close and enduring relationships among its clinical arm, its served community, and its non-proprietary, public-interest research center, Group Health Research Institute (GHRI). Another is strategic use of the advantages and resources that come with being an integrated health care and coverage system. Finally, Group Health is increasingly employing collaborations and national networking, including with academic health centers, to expand its capabilities and broaden its translational impact.
Innovative, game-changing translational health research is possible when health research centers embedded in health delivery systems form collaborative networks and work with academic partners. These types of networks are generating datasets with a wealth of clinical and coverage information on diverse populations for large, population-based health studies and analysis of the comparative effectiveness of therapies. Health researchers are developing the expertise to link these databases to biologic data from analysis of biobank samples, including genomic, transcriptomic, proteomic and metabolomic data. In 2009, when Francis Collins became director of the National Institutes of Health (NIH), he made these types of studies a priority. Perhaps even more noteworthy was his emphasis that research in health care delivery systems provides unique opportunities for improved efficiency through comparative effectiveness research, previously called outcomes research, including pragmatic clinical trials.

Figure 1

Health care change will always be both challenging and promising. Group Health, based in Seattle, is recognized for more than 60 years of disruptive innovation in health care. Many of the changes it has implemented—ranging from group practice in the 1940s to broad-based Chlamydia screening in the 1990s—are now so common that we almost forget that such things were once rare. Academic health science centers have been vital to these advances. Evidence supporting Chlamydia screening came from collaborative research between Group Health and the University of Washington (UW), which have a long history of partnership and in fact, have grown up together. The UW medical school opened the same year as Group Health, also over objections from the medical establishment, which feared a surplus of physicians. Over the decades, Group Health and its research programs have developed a variety of ongoing research affiliations with the UW.

Becoming a learning health system with mutually beneficial, productive connections to academic partners and other health systems is challenging and it doesn't happen automatically. Communication between research and delivery is a constant work in progress, with continuous improvement as the operating principle. Nonetheless, the Group Health experience is informative in an exploration of the organizational elements of learning health systems on a national scale, and this model could provide solutions to our health care problems. From this perspective,
we present our journey towards effective translational research by focusing on our development as a high-performing learning health system.

A research commitment and a culture of change
The founding of Group Health was rooted in change8,9 (Figure 2). Created as Group Health Cooperative in 1947, it offered the radical option of prepaid care from a group of doctors employed by the cooperative, back when the only game in town was fee-for-service medicine from private hospitals and individual physicians. The founders faced considerable opposition from established practitioners and Seattle hospitals; their survival in an openly hostile environment is chronicled in Paul David Starr’s The Social Transformation of American Medicine10. The consumer-governed organization persisted in introducing group practice, prepaid health coverage, and other innovations, and in 2011 had more than 650,000 members in an integrated care and coverage system. With HealthPartners of Minnesota, Group Health is one of the country's only large, consumer-governed, nonprofit health systems. Even as the prevailing approaches to health care delivery have changed, Group Health has maintained a goal of improving health care quality while exploring ways to safely contain costs.

Research has always been in the Group Health mission. The preamble of the Group Health Cooperative bylaws, written in 1946, includes support for "projects in the interest of public health" and special attention to preventive medicine. In 1956, the first Group Health research project was initiated under the leadership of Werner Schaie, then a UW graduate student. The Seattle Longitudinal Study on aging is still collecting data on Group Health members and is likely the longest continuous study of aging in the US11. In the 1970s, Group Health began addressing basic issues related to the ethical conduct of research: patient privacy, access to medical records, and informed consent. This era also saw nascent efforts to implement evidence-based standards of practice and protocols while balancing the need for individualized patient care and promoting ongoing patient-provider relationships.

Group Health was also an early adopter of computerized data systems, an important resource for both management and research. In the 1970s, it began computerizing pharmacy records. The resulting database captures the vast majority of member prescription fills, making it particularly valuable for research on pharmacoepidemiology, adherence to medication recommendations, variations in prescribing practices, and other pharmacy-related topics. Stand-alone electronic databases also hold computerized laboratory, admission, discharge and transfer records, and registries for vaccine and preventive care. In fact, one reason that integrated health systems with stable enrollments such as Group Health are ideal research settings is their access to data on large populations, which facilitates population-based analysis and longitudinal studies. In addition, learning health systems such as Group Health have been leaders in health information technology (IT) with innovations such as development of electronic health records (EHRs), patient Web portals with secure messaging that facilitates doctor-patient communication, and online tools to manage chronic illness. The Group Health patient Web portal allows patients to see parts of their own medical records, communicate with physicians and other providers online and since 2011, access these resources through a mobile phone application.

Group Health Research Institute begins
In its early development, Group Health did not have a formal research group to take advantage of the accumulating comprehensive, non-proprietary clinical data on its members. In 1969, the Group Health Research Department was established, led by
Richard Handschin, and in 1975, the Department of Preventive Care Research was founded with Robert S. Thompson as its leader. Research activities were not coordinated, but independently conducted by investigators, most of whom were based in academic institutions. In 1981, Gail Warden became the Chief Executive Officer of Group Health. Under his guidance, in 1983, GHRI was founded under its original name, the Center for Health Studies. Ed Wagner was brought in to head the new research center, and with investigator Michael Von Korff, Thompson and a few other stalwarts, formed the nucleus of a group that established the collegial and ambitious culture that endures today.

Partnerships with the UW and the Fred Hutchinson Cancer Research Center (FHCRC) were clearly mutually beneficial and actively promoted by Gilbert S. Omenn, then Dean of the UW School of Public Health; Maureen Henderson, then head of FHCRC’s Cancer Prevention Research Program; and other senior faculty. In GHRI’s early years, when its faculty consisted of a handful of relatively young investigators, collaborations with senior investigators based at the UW and the FHCRC through large center grants helped build a financial and scientific foundation, eventually cemented with formal affiliation agreements. Nonetheless, in spite of joint faculty appointments and other institutional measures, tensions have occasionally and perhaps inevitably developed, especially as GHRI matured and grew. As it sought to solidify its own funding base, competition over funding was occasionally an issue with its academic partners. However, many of the research collaborations developed in the early years have endured, and GHRI’s population and data are a major and sometimes primary research source for UW and FHCRC investigators in cancer, cardiovascular disease, mental health, infectious disease, Alzheimer’s disease, geriatric care and other areas. Active involvement with the UW and FHCRC continues. For example, UW graduate students and research fellows such as Robert Wood Johnson (RWJ) Clinical Scholars and trainees at the UW Institute of Translational Health Sciences (the UW’s Clinical and Translational Science Awards program), have found GHRI an attractive place for their research. In addition to enhancing the intellectual climate, they provide a steady stream of talented candidates for new faculty positions.

By 2011, GHRI, located in Seattle, had grown to more than 300 employees including 60 faculty members, most with UW joint appointments. GHRI also contains the Center for Community Health and Evaluation, which designs and evaluates health-promoting programs across the country; the Group Health Department of Preventive Care, which is part of Group Health Physicians and provides a link to the clinical practice group; and the MacColl Center for Health Care Innovation, which develops, tests and disseminates strategies that improve health care quality.

The work of GHRI is aligned with the fundamental principles of the health system in which it is embedded, and we believe this is crucial to its translational successes. GHRI reflects two Group Health priorities: research to improve the quality of health and health care, and a mission to serve the community as a not-for-profit health care organization. In addition, GHRI was intended from the beginning to contribute to the larger American health system, conducting independent, nonproprietary public interest research, not as a Group Health think tank, but as an open-source health research institute. The relationship between Group Health and its research organization is still evolving but is grounded in a common mission of transforming health and health care through research and innovations in clinical practice and health care delivery. Our advantage in moving toward this goal is our ability to study populations receiving comprehensive care in integrated delivery systems. An integrated system means that researchers have access to clinical, cost and claims data, expanding the resources for cost-effectiveness research. On the delivery side,
being responsible for both care and coverage gives Group Health a strong incentive to safely control costs—an issue that is a high priority with national policy makers and funding agencies.

**Health system, researcher, and community connections**

Before the advent of GHRI, most research using Group Health data was conducted by non-Group Health researchers, typically scientists at major US universities for whom Group Health was just a place that collected data for their scientific observations. Outside researchers can perform capable analyses that yield interesting results, but these types of studies are unconnected to the people who provide the data and are disengaged from the health system that serves them. This is not optimal for either research or translation.

Without a connection to the health system, scientists might pursue questions that are not aligned with the goals of the health system. They do not have an in-depth understanding of the community from which the data came, the context in which the data were collected, or optimal familiarity with the data or the tools for analyzing the particular datasets. Clinical data have unique features such as health system-specific coding and other characteristics influenced by local factors such as changes in health system policy. These can cause problems for scientists who are using the data without understanding the health care system, its history and its policies. In short, outside researchers do not understand the nuances of the data that might affect how it should be mined, processed, and interpreted.

For translation, researchers who are not connected to the health system and its members who provided the data are limited in the impact their findings can have on clinical practice. Doctors might not learn of results that are relevant for their patients until they are published in medical journals, often years after completion of a study in which they participated. Without a link to a health system that is involved in the study and will be moving relevant findings into practice, researchers are cut off from valuable translational guidance from clinicians. The practice of exporting large amounts of data for outside research projects without close collaboration of Group Health staff was a concern in the early days of GHRI, and led to at least one example of poorly executed translational science.

In 1981, a study by outside researchers using Group Health data showed a possible connection between vaginal spermicides, birth defects and spontaneous abortions. The study design was criticized by a Food and Drug Administration expert panel and investigators not involved in the study. Richard Watkins, a GHRI investigator and co-author, examined some of the medical records used in the study more closely and found evidence that the presumption of spermicide use in women whose infants had birth defects was faulty. Specifically, a number of these infants appeared to be the result of planned pregnancies, suggesting spermicides were not used. Subsequent studies by other researchers did not support the original findings. In the original study, the results were described as tentative. However, their publication was controversial, and the public received confusing and ultimately inaccurate information. We believe that scientists who partner with a health care delivery system on study design, data collection and analysis are likely to consider the translational impact their findings will have on the patients who are contributing data. Although this type of collaboration does not guarantee good study design and accurate interpretation, researchers in a learning health system are more aware of the context of their work than researchers who merely import data from a health system to which they have no connection.
Group Health-GHRI successes

The translational advantages of a research institute with a close relationship to a health system were clear soon after the founding of GHRI (Table 1). An early example of a study that influenced health care within the system and eventually nationwide was the 1983 publication of Group Health research showing the cost-effectiveness of a Group Health campaign to reduce unnecessary chest x-rays and certain lab tests19. Another example came in 1985, when Group Health established the nation's first population-based breast cancer screening program, supported by federal funding. Thompson realized that the program was an opportunity for Group Health investigators to study the risks, benefits and harms of screening20. His team's findings contributed to widespread insurance coverage for breast screening and led to risk-based strategies to improve screening outcomes, as well as ongoing research analyzing the effectiveness of screening for breast and other cancers. This remains a major research area at GHRI. Since 1994, Group Health has been a member of the Breast Cancer Surveillance Consortium, funded by the National Cancer Institute, which links seven mammography registries at academic and health research institutes nationwide for collaborative research on breast screening effectiveness. GHRI serves as the consortium's Statistical Coordinating Center with Diana Miglioretti as principal investigator.

Also in 1985, Group Health began a collaborative research and intervention effort on telephone-based counseling for smoking cessation, initially funded by the National Cancer Institute. Group Health's Center for Health Promotion provided the staff to implement the intervention and GHRI investigators collaborated in the randomized evaluation21. GHRI research demonstrated the effectiveness of the implementation22, 23 and the increased effectiveness associated with making smoking cessation services a covered benefit24. In 2005, the Center for Health Promotion became the independent commercial tobacco cessation program Free & Clear, Inc. GHRI investigators continue to work with Free & Clear (renamed Alere Wellbeing in 2011) to use telephone-based counseling as a cost-effective method for providing a large population with behavior change interventions.

The Free & Clear initiative highlights several elements that are important for successful health research translation. One is that projects must be closely aligned with health care system goals—Group Health was one of the first smoke-free workplaces in the country and continues to aggressively promote tobacco cessation in its members and staff. Another is that effective interventions are developed and refined over time, supported by evidence, through many rounds of collaborative work. The Free & Clear self-help intervention has required a concerted and long-term effort by research teams, working with health delivery experts and users, all of whom are necessary for the program's success. This underscores the importance in a translational research project of long-term relationships between partners with diverse expertise, but a common objective.

Research in learning health systems has several features that facilitate national and global implementation. Studies often focus on current major public health issues, and interventions such as telephone-based counseling that are designed to be practical and relatively inexpensive. For example, in 1989, research at GHRI on the effectiveness of bike helmets on preventing cyclists' brain injuries accelerated use of helmets nationwide. Annual traumatic brain injury deaths from cycling in US children aged 5-14 decreased from about 12 per million in 1988 to less than 4 per million in 199825.

A 1995 population-based, case-control study and resulting intervention at Group Health illustrates the translational efficiency that is possible in a learning health system in collaboration with an academic health science center. Bruce Psaty and
UW colleagues found that use of short-acting calcium channel blockers such as nifedipine in hypertensive patients is associated with an increased risk of heart attack. This led to a 1996 US Food and Drug Administration recommendation to discourage use of nifedipine for treating high blood pressure. A few months later, Group Health began providing physicians with a summary of evidence about nifedipine, current guidelines about hypertension medication, and patient letters to distribute, advising either a new medication or a physician visit. In a follow-up study of the intervention, Psaty and colleagues found that almost 80% of patients taking short-acting nifedipine had discontinued use within 6 months. Within a year of publication, evidence from a Group Health-UW study influenced national recommendations and led to safer drug use in its member population.

A more recent example of a learning health system using a practical intervention to confront a national health problem comes from a group led by GHRI's Michael Von Korff. First, the team showed that opioid prescriptions for non-cancer chronic pain were increasing at Group Health and other health systems in the US at the same time that overdoses involving prescribed opioids were rising. Fatal overdoses tripled nationally between 1999 and 2006 to almost 14,000 annual deaths—more than cocaine and heroin overdoses combined. As a result of this and other findings, Group Health began a primary care-based initiative in 2010, working with clinical staff to create care plans for patients who receive opioids for 90 days or longer. Involvement and education of both patients and providers are crucial elements of the initiative, which resulted in care plans for 85 percent of the target population within nine months. The strategy, which is currently being evaluated, preceded a 2011 US nationwide action plan to reduce prescription drug abuse. The results demonstrate how a learning health care system—which facilitates the active involvement of clinical administrators and staff in designing and carrying out studies—can conduct translational research that might be impossible in other settings. Feedback from the care delivery system and input from patients informs interventions based on study results, easing implementation and acceptance by practitioners.

The history of Group Health also contains examples of translational research challenges that we have been slow to address, or for which we are still searching for the best approach. In 1985, investigators working with Group Health published work showing that cost increases at HMOs like Group Health were similar to the fee-for-service sector. Even today, the rate of rise in health care costs is not appreciably different at Group Health compared to other providers, although Group Health does provide more comprehensive care and benefits. After 27 years, Group Health continues to find that the full value of an integrated delivery system has not yet been achieved and cost savings do not always follow translational successes. In addition, like all research programs, GHRI has projects that have yielded results likely to improve care, but have been slow or even failed to reach patients. An example is a study from the 1990s showing the value of shared decision making, which achieved follow-up field testing, evaluation and dissemination only beginning in 2009.

**Partnerships beyond Group Health**

To speed the transformation of health care delivery, Group Health is increasingly looking to partnerships, collaborations, and networks. These have always been a part of GHRI; the first director, Ed Wagner, cultivated relationships with the nearby UW academic health science center and FHCRC and encouraged faculty to establish collaborations. Academic departments, especially in the areas of biostatistics, epidemiology, health services, and social sciences are ready-made partners for learning health systems. They often have faculty who have expertise in
population-based research, but lack access to the extensive data of a health system with a focus on health IT, such as Group Health. Faculty at academic institutions can contribute leading-edge expertise in research methods, for example in population sciences, human biology and clinical specialties; and they have infrastructure and resources such as wet labs that are often lacking in research centers within health systems.

For academic researchers, the connection to a learning health system such as Group Health provides a conduit to moving results into practice. A good example is the collaboration of Delia Scholes and her GHRI colleagues with Walter Stamm and his infectious disease group at UW. Among other accomplishments, in the 1990s this collaboration discovered the importance of Chlamydia as a cause of sexually transmitted disease, especially pelvic inflammatory disease, which can lead to infertility and other complications. This research is generally credited with forming the evidence base that changed national medical practice to make screening for Chlamydia routine for sexually active women.

Also in the 1990s, in an example of early networking, Group Health became part of the collaborative Vaccine Safety Datalink (VSD) of the Centers for Disease Control and Prevention (CDC). In 2005, the VSD was collecting data on about 2% of the US population. Participation of GHRI researchers led to the ability to work with Group Health data in a local "data warehouse" while combining it with clinical data from other sites. VSD work has been groundbreaking in protecting patient confidentiality, for example through compliance with the 1996 Health Insurance Portability and Accountability Act (HIPAA), while making data available for research. The VSD demonstrates the power of national data linking, as a large population provides the possibility of identifying rare events associated with vaccines. Results with a national impact include contributing timely information on the safety of new vaccines and developing evidence in areas of public controversy such concerns about mercury-based preservatives in vaccines and claims about a relationship between childhood immunization and autism. In these prominent cases, this capability for surveillance helped to allay public worries about vaccination, working against groups whose fears about vaccine safety can lack scientific rigor.

As an outgrowth of GHRI’s contribution to vaccine safety, a group led by Lisa Jackson was selected after competitive review by the National Institute of Allergy and Infectious Diseases as a US center to investigate vaccine effectiveness. Working with partners at Seattle Children’s Hospital, the UW and FHCRC, GHRI is now one of eight NIH-funded Vaccine and Treatment Evaluation Units in the country that conduct field clinical trials on new or modified vaccines for infectious disease. GHRI was one of the first programs to administer the swine flu vaccine in the US during 2009 trials—at a time when rigorous trials needed to be performed quickly because of a predicted global epidemic.

A continuous improvement and progress example: chronic care

A theme in these examples is a long-term focus on population health, with research conducted through multidisciplinary teams whose members come from local and national academic organizations, the health care delivery system, patient groups, and public and private funding agencies (Figure 1). This increasingly connected organizational model is important because translational research is not a one-time transfer of information from research institute to clinic, but an ongoing conversation between researchers, funders, and the community. In this type of relationship, research results that improve health care and the patient experience can have a ripple effect, influencing other research projects and clinical practices. Research
informs practice and practice informs research in a cycle analogous to the continuous improvement in the quality-control method plan, do, check, adjust (PDCA).

The organizational benefits of this cycle are seen in improvements at Group Health in common chronic disease treatment, a major research area for many decades. Facing projections of growing chronic illnesses in the US and worldwide, with many people having multiple conditions, Group Health researchers began a series of trials and observational studies to learn more about the needs of people with chronic diseases such as diabetes, asthma, and cardiovascular disease, to develop ways to more effectively manage their conditions in everyday community settings. The early studies led to observations of shortcomings in care as well as opportunities for improvement. Many of these studies were cited in the influential and inspirational IOM Crossing the Quality Chasm report1.

From 1992, much of the GHRI work to improve management of common chronic illnesses has been through the MacColl Center for Health Care Innovation. GHRI researchers have been converting chronic care from a reactive response by busy practitioners to proactive management by teams that empower patients who are trained to manage and monitor their own conditions. This team-based, patient-centered chronic care model (CCM) grew out of a series of studies predominantly led by Ed Wagner, David McCulloch, Brian Austin, Michael Von Korff and others35-37. Their work received important, long-term stimulus from the RWJ Foundation, which funded GHRI’s MacColl Center for more than ten years as the national office for the Improving Chronic Illness Care (ICIC), one of RWJ’s signature programs. ICIC used CCM principles to lay the groundwork for other projects that address the challenge of long-term, effective management of conditions that are a constant and lifelong concern for affected patients.

The chronic care model and health IT improve access

The CCM is a prime example of the multidirectional benefit that can occur in a learning health system. Group Health’s patient-centered medical home (PCMH) model draws on the CCM and Group Health’s efforts in health informatics, among other influences. The PCMH shows how health care changes are supported by a long-term commitment to evidence-based improvement and continuous cycles of PDCA. In 2002, based on findings that patients needed convenient, patient-centered access to their physicians, and to dispel the misperception that managed care meant barriers to access, Group Health’s care delivery team launched the Access Initiative to redesign primary care. This increased the availability of same-day appointments; allowed patient self-referral to specialists; and through a newly launched, secure patient Web portal (MyGroupHealth), encouraged patient communication and medical record review over the Internet. Evaluation of the Access Initiative program by GHRI and researchers in the UW Health Services Department showed that the program increased access and patient satisfaction. Unfortunately, the hoped-for improvement in quality did not materialize, continuity of care actually deteriorated, and the redesign had an overwhelming effect on clinical staff workload38, 39.

Back at the Group Health drawing board, lessons learned from the Access Initiative sensitized leadership to the importance of a system that had effective primary care as its first principle of design. The challenge was achieving the project goals without burning out primary care physicians and their teams. The solution that was developed is based in the CCM, which identifies specific responsibilities across a team of coordinated but diverse health care providers and includes patients, families and community resources. Evidence from GHRI studies demonstrated the effectiveness of collaborative care not only for chronic conditions but for the
everyday demands of routine primary care. Based on this understanding, Group Health decided in 2005 to pilot the PCMH, a primary care model that addresses the complexity of 21st-century medicine while supporting the principles of good primary care. This model was recommended by the major primary care professional organizations of the time.

**Putting it all together in the patient-centered medical home**

The Group Health PCMH model builds on the successful features of the Access Initiative that improved patient access while accommodating longer in-person appointment times. This is balanced by smaller patient panels, care management by clinical teams headed by the primary care physician, and increased use of telephone and electronic contact between patients and the health care team. Additional provider support comes from Web-based technology for patient communication, outreach and follow-up; and system support for patient involvement in chronic illness care. Physicians are scheduled for “desk time” in addition to direct contact with patients. Among other goals, the PCMH strives to promote continuity and to strengthen ongoing patient-physician relationships. This model is feasible in a setting where physicians are paid per patient or by salary instead of by number of visits or procedures, a feature that is a key element in discussions about reforming the US health care system to shift the focus from volume to effective care. In this way, Group Health's work on the PCMH matches national priorities such as the establishment through the 2010 PPACA of the Patient-Centered Outcomes Research Institute (PCORI) and the Center for Medicare and Medicaid Innovation (CMMI). PCORI supports research to help patients and providers make informed, evidence-based care decisions. CMMI, part of the Center for Medicare and Medicaid Services, evaluates innovative models of health care payment and delivery for efficiency and effectiveness, with a goal of improving our national health programs.

Analyses of the PCMH in 2009 by GHRI showed that compared to control clinics, the changes saved money by reducing emergency care and hospitalizations. The analysis also showed improvements in quality, patient experience, and clinician burnout. In 2010, Group Health implemented the PCMH at all 26 of its medical clinics. Evaluation of this project is ongoing. In the meantime, GHRI has become a bellwether and leader in the PCMH movement, which has become an important element in the country’s efforts to improve care, contain costs and increase health care access. Acting CMMI director Richard J. Gilfillan visited GHRI to learn about the PCMH as an example of a timely evaluation of an intervention that allowed Group Health to make an opportune, evidence-based decision about system-wide implementation. The PCMH is also one of the best examples of how a learning health system can be successful only if it strives for ongoing improvement, with the understanding that this also requires evaluation and adjustment.

Group Health's successful transition to the PCMH model relied heavily on health informatics advances already implemented by our organization. In 2006, when EHRs and Web-based patient communication technology had been sufficiently developed, Group Health launched a personalized health risk appraisal, The Health Profile, in its online patient records. The Health Profile uses evidence-based, self-reported measures of health risk combined with measures of “stages of change,” derived from behavior-change theory, to provide individual recommendations for positive lifestyle changes, such as weight-loss. Recommendations are based on regular patient updates and are tailored to the patient's readiness and interest in making changes and are linked to relevant resources. The profile provides a starting point for a dialog between patient and physician, made possible through the continuity of care established through the PCMH. It can also be used for studies.
that require clinical information that is difficult to obtain through other sources, such as patient-reported health behavior. In this way, it serves as a database for research analogous to GHRI’s widely used breast cancer risk database and could be linked to biobanks for personalized medicine research.

National networking: HMORN

Our health care problems are national in scope, so our solutions must be as well. The problems and challenges facing US healthcare are complex, requiring multidisciplinary input from traditional researchers as well as experts on health-related communication, economics, informatics, and dissemination. As Barbara Alving points out in her foreword to this book, creative collaboration and networking between the public and private sectors, research institutions, universities and funders can amplify the advantages of each contributor. At the same time, individual partners must have autonomy in conducting health research and implementing findings, since they are in the best position to work with their scientists, clinical staff, and served population. These factors must be considered in establishing collaborations and networks, whether they are of health research organizations or academic research centers.

As an organizational model, the benefits of national networks are greater access to broader scientific expertise and larger and more diverse populations for increased generalizability, statistical power, and ability to detect rare events. As a result, studies that compare different care systems can be performed. In addition, study findings often have a broader impact, as results are shared through national networks. For these reasons, Ed Wagner worked to create the Health Maintenance Organization Research Network (HMORN), of which Group Health is an original member. Founded in 1995, HMORN grew to a consortium of 19 research centers in 2011, including HealthPartners described above, and regional Kaiser Permanente health systems among others across the country. All are nonproprietary, public interest research centers within health care systems with a commitment to doing science in the public domain.

With its academic collaborators and funding partners, which include the NIH, the AHRQ, the CDC and private foundations, HMORN hopes to facilitate national translation through enduring, mutually beneficial partnerships. HMORN expands the learning health system to an enterprise with national and international potential to improve care through population-based, delivery system research. Pathbreaking epidemiology and health services research networks resulting from the HMORN include the VSD, the Cancer Research Network (CRN) originally funded by the National Cancer Institute in 1999, and others (Table 2).

The impact of national networks

HMORN data management innovations provide an excellent example of a networking organizational model. First, GHRI scientists developed methods to convert data that had been collected for clinical purposes into datasets suitable for research. When GHRI began collaborating with other embedded research centers, differences in data definitions and management practices became apparent. To ease sharing while preserving patient privacy and keeping control of the data in the hands of the people who best understand them, the CRN created the Virtual Data Warehouse (VDW). The VDW standardizes data, and at the same time gives each participating site stewardship over its own resources. Data from multiple sites are combined into datasets as needed for research. This eliminates the need for a single massive database, and allows studies that would not have been possible if conducted by scientists working individually43. This organizational model
illustrates how each site views its data—not as something that the researchers own, but something they are responsible for—and ensures that use is open source, non-proprietary and in the public interest. Sharing is facilitated but autonomy is maintained.

In addition to providing greater access to data, national consortia like the HMORN have several specific advantages. For example, HMORN members have extensive experience in mining, processing and interpreting their own data, and sharing information accurately and securely—simply put, researchers in integrated delivery systems know what to do with data derived from ongoing care in their systems. As well, national health research networks increase the types of studies possible. In addition to conducting traditional observational studies, which have been the mainstay of delivery system surveillance research, a health system network has the ability to conduct the types of pragmatic, real-world clinical studies that the IOM, in a 2006 roundtable workshop on evidence-based medicine suggested could benefit translation of research findings into clinical practice. Finally, membership in HMORN care systems is reasonably stable, allowing long-term analysis of the entire picture of the health and health care experiences of a large, real-world population over time. This includes screening, treatment, prescriptions and costs. Rather than relying on convenience samples or referral-filtered groups, the HMORN can conduct longitudinal, population-based studies on subjects more representative of their communities. Natural experiments can be particularly valuable for HMORN researchers, when practice changes or simple variability in practice or coverage provide an opportunity to examine effects on outcomes and perform surveillance studies. The network can also conduct randomized controlled trials—both traditional efficacy trials and so-called pragmatic or real-life trials—in community populations, using methods to detect and adjust for non-randomness of participants.

Health research consortia also have the potential to conduct novel health research aimed at individualizing diagnoses and therapies. HMORN sites are already developing ways to securely link data from EHRs and biobanks and are looking to combine local expertise about each site's clinical datasets and samples with the growing genomic, proteomic, and metabolomic databases. Combining this capability with health systems providing everyday ongoing care is an opportunity for national mega-epidemiology studies.

The importance of local ties

While expanding its reach nationally through the HMORN, Group Health also works to ensure its research remains locally relevant. We have learned that effective translation is greatly enhanced when relationships between a health research organization and a health delivery system that is committed to evidence-based improvements in health care are bidirectional. As well, both the research and clinical arms must also be closely tied to the community. GHRI study participants are typically members of the cooperative health plan, and ideally see their involvement as a partnership between themselves and Group Health. For example in cohort studies, we aim to create a relationship between participants and researchers that helps participants experience the satisfaction of “giving” to a research effort and understand how their contribution will benefit others.

A 2010 study from the eMERGE network within the HMORN demonstrates the benefits of fostering an ongoing, trust-based relationship with study participants—the kind of relationship that is possible through researchers’ connection to a membership-based health plan. Participants in the Group Health Adult Changes in Thought (ACT) study were asked about re-consenting to having their medical and
genetic data included anonymously in a federal database. Of respondents, 90 percent thought it was important to be asked again, even though they had already consented to participation in ACT. Participants said that improving patient care and contributing to knowledge were important factors in the consent decision. They named their relationship with the researchers they were working with as a strong, positive influence. Negative influences were concerns about privacy, and especially use of their data for profit. As a demonstration of the loyalty of the Group Health community, the ACT study has been ongoing with good retention since 1994, and although participants are randomly selected, several are among the original Group Health founders.

A solid relationship between participants who provide clinical data and the research institution collecting the data fulfills an important ethical obligation of good data stewardship. GHRI studies aim to inform participants of study progress and findings as a way of recognizing their contributions to improving health care for everyone. In the best case, participants will have trust and confidence in the research team and its parent institution. From a practical standpoint, this benefits the health system and researchers interested in developing the most robust research, because a good participant-research relationship encourages ongoing participation, avoiding excessive study disenrollment that can threaten study validity.

We have also found that a healthy, mutually beneficial relationship between researchers and participants, developed and maintained over time, improves study enrollment and allows for more robust study designs. For example, the Kame project was a study on aging initiated in 1992 and affiliated with the ACT study. Participants were older Japanese Americans who resided in King County, which includes Seattle. The study benefited from direct community input. Members of the Kame project’s Community Advisory Board early on alerted researchers to the community’s heightened sensitivity to an everyday census. This was based in the registration of Japanese community members at the start of World War II and their subsequent forced internment—a concern other research projects had failed to appreciate. Researchers developed recruitment materials with this consideration in mind and enjoyed a long-term relationship with the community that continued even after the study ended. To “give back” to the study population, all Kame participants and their family members received a comprehensive summary of the Kame project’s results and also a print of a traditional-style original woodcut donated by one of the study’s participants.

The longitudinal cohort ACT study, initiated in 1994, follows Group Health participants over age 65 to identify risk factors associated with cognitive decline. Results are returned to the participants in a quarterly newsletter that translates the results of recent research, for example on the benefits of exercise, into health tips about common problems of aging, such falling or joint aches. Earlier results from Group Health research led to programs like Silver Sneakers and Lifetime Fitness that promote exercise in older persons. Study results also led Group Health and other insurers to include coverage of senior exercise programs as part of the Medicare Advantage program. ACT findings have supported regular exercise to possibly prevent or delay onset of dementia in older persons\textsuperscript{46-48} and this has been advanced as a powerful motivator for the behavior change required to achieve regular physical activity.

As with other elements of GHRI studies, community involvement works because it is aligned with Group Health priorities. Rather than simply advancing one-time-only changes with no evaluation or attempt for continuous improvement, learning health systems aim for progressive improvements to health care quality. This is aided by studies in which trial participants and their families are equal partners with
health care research organizations from the beginning, a concept called community-based participatory research⁴⁹. Patient and family involvement provides momentum and motivation to follow through on study findings, creating a "culture of results" that strives to get results into practice as quickly as possible, according to Maria T. Britto, Director, Center for Innovation in Chronic Disease Care, Cincinnati Children's Hospital.

**The benefits to the public**

Members of the public might benefit from learning health systems even if they do not belong to the care system. An example is the innovative Group Health e-BP program, designed to improve treatment of hypertension, which is the most commonly diagnosed condition in primary care but is controlled in only 50 percent of people with the diagnosis. Elements of the program are at-home self-monitoring of blood pressure with results tracked and reviewed online through Group Health's secure patient portal (MyGroupHealth) by a pharmacist who provides medication and self-management support. Effectiveness was demonstrated in a randomized trial in 2008⁵⁰, which found improved overall blood pressure control, especially among those with poor control before the program. GHRI and the NIH Clinical Translational Science Awards program at the UW funded pilot projects to move e-BP beyond the Group Health system into rural communities in Washington and Idaho.

The e-BP project is an example of the sophisticated translational accomplishments that are possible when a collaboration is based on long-term relationships between learning health systems, funding agencies, and academic health science centers. These partnerships are fruitful when they are based in a shared vision, principles, and expectations. These start with individuals working together on local and regional projects, but can have national impact when successful models are disseminated through networks such as the HMORN. The challenge for both learning health systems and academic centers is fostering an environment in which individuals can flourish across institutional boundaries and tribal loyalties.

**What’s next for learning health systems**

The fundamental principle of a learning health system is to be constantly improving, which makes stating organizational ground rules difficult. Nonetheless, at Group Health, the relationship between GHRI and the health plans’ larger organization is trending toward increasing integration. In 2011, the position of Associate Medical Director of Health Services Research and Knowledge Translation was created to strengthen the relationship between GHRI and Group Health operations. GHRI investigator Rob Reid, who led the evaluation of the PCMH, was appointed to the position. Also in 2011, GHRI Executive Director Eric Larson was appointed Vice President for Research at Group Health. These administrative events point to the commitment by Group Health leadership to support a strong, nonproprietary public interest research operation that enjoys a long-term relationship built on learning health system principles that naturally join the research arm and delivery system. Already, these closer ties have facilitated the planning of pilot research projects by GHRI researchers to be conducted at Group Health Medical Centers. To enhance bidirectionality, the Group Health Foundation has launched the Partnership for Innovation program to solicit novel ideas from frontline providers who will work with research faculty and staff to refine projects and produce evaluations. These collaborations will provide leadership with evidence for decisions on the most important step of an innovation: what happens after the research.
Evolution of the HMORN into a truly national learning health system is a possibility, in light of HMORN growth from 13 members in 2004 to 19 members in 2011. A national learning health system will allow population-based research that is informed and guided by community input, and can take advantage of high-throughput systems biology methods. Results, when appropriate, can move more efficiently and quickly into practice and will facilitate more informed decisions by patients and providers. This vision is supported by national leaders, such as NIH Director Francis Collins, who emphasized projects in epidemiology and translational medicine with a goal of advancing more personalized medicine\textsuperscript{6}.

The health care challenges we currently face are complicated by global economic events and the politicization of health care reform. We believe that now is the time to push for changes in the way we do health care research. Specifically, we must wring all possible advantages out of the expertise in our academic, government and research institutions; we must fully explore our resources such as EHRs, databases and the algorithms developed to work with them, and our physical resources such as biobanks. We must work with our human resources such as patients and communities that share our goal of improving health care. In fact, we believe that maintaining a relationship based on mutuality among researchers, providers, and health system members will demonstrate the value of health research and favorably alter public opinion of evidence-based medicine.

In summary, we need to make ongoing national research based in learning health systems a priority. Selected leaders at the NIH and in government understand this vision, but additional senior leadership and policymakers must be convinced of the value of this organizational model. Our experience with translational research has taught us that close relationships among academic health science centers and health care systems can be valuable part of this model. These start with long-term collaborative relationships between researchers with mutual scientific interests and goals and a shared commitment to implementing their findings as evidence-based care. Local and regional partnerships benefit from a connection to the same community, and research networks are vital for disseminating successful findings nationwide. Trusting relationships among providers, researchers, funders and communities can help convince governments and the public of the enduring value of this model of health care improvement.
References


<table>
<thead>
<tr>
<th>Program and Selected Projects</th>
<th>Examples of translational impact</th>
<th>Related References</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Aging and geriatrics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seattle Longitudinal study (1956-)</td>
<td>Cognitive training positively affects function; health, environment and personality factors affect risk of cognitive decline. Results shape national efforts on healthy aging.</td>
<td>51</td>
</tr>
<tr>
<td>Alzheimer’s Disease Patient Registry (1986-2000), Adult Changes in Thought, ACT (1994-)</td>
<td>Evidence for beneficial behaviors and clinical practices for healthy aging, including delaying dementia. Leads to Group Health patient resources on preventive care, exercise, smart eating, maintaining memory, chronic condition care.</td>
<td>13, 46, 52-56</td>
</tr>
<tr>
<td>Exercise and aging</td>
<td>Exercise programs reduce risk of falls and fractures. Group Health's Medicare Advantage care covers senior exercise programs.</td>
<td>57-59</td>
</tr>
<tr>
<td><strong>Alternate approaches to healing</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Complementary and alternative medicine for back pain</td>
<td>Yoga, acupuncture and massage can be effective for back pain. National guidelines recommend these therapies for back pain and Group Health covers massage for certain types of pain and offers complementary therapy discounts.</td>
<td>60-62</td>
</tr>
<tr>
<td>Herbal alternatives for menopause symptoms</td>
<td>Some herbal treatments are not effective for menopause symptoms. Findings incorporated into Group Health patient information.</td>
<td>63</td>
</tr>
<tr>
<td><strong>Behavior Change</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Smoking cessation</td>
<td>Effectiveness and cost of telephone-based tobacco cessation counseling and integrated phone + Web programs. Effectiveness and safety of drugs. Free &amp; Clear (Alere Wellbeing) established nationwide. Results change Group Health medication policies and program coverage.</td>
<td>21, 24, 64-66</td>
</tr>
<tr>
<td>Bicycle helmets and head injuries</td>
<td>Helmets are effective at promoting head injuries and promoting helmet use is cost-effective. Helmet use increases nationwide.</td>
<td>67, 68</td>
</tr>
<tr>
<td>Home blood pressure monitoring (e-BP)</td>
<td>Web-based at-home blood pressure monitoring helps control hypertension. Testing and piloting moves to communities.</td>
<td>50</td>
</tr>
<tr>
<td>Weight loss</td>
<td>Interventions in real-life situations (families and workplaces). Development of practical weight control interventions.</td>
<td>69, 70</td>
</tr>
<tr>
<td><strong>Biostatistics</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Statistical support for networks</td>
<td>Statistical methods development for the Breast Cancer Surveillance Consortium, Cancer Intervention and Surveillance Modeling Network (CISNET) for colorectal cancer, Centers for Disease Control and Prevention's National Vaccine Safety Datalink project and Food and Drug Administration’s Sentinel Initiative. Methods used nationally in safety and effectiveness research.</td>
<td>71-78</td>
</tr>
<tr>
<td>Cancer control</td>
<td>Early study results show cost-effectiveness, leading to acceptance of insurance coverage for risk-based breast cancer screening. Ongoing research explores screening safety and effectiveness with findings influencing national guidelines.</td>
<td>20, 79-85</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------------------------------------</td>
<td>-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>Population-based breast cancer screening</td>
<td>Cancer research on etiology, prevention, detection, treatment, survivorship, clinical care, health services and costs, and translational and implementation science using diverse population-based data and in collaboration with national networks. Projects include breast, lung, colorectal, ovarian, prostate, pancreatic cancer and myeloma, among others for pediatric and adult populations. Results influence local policies and national guidelines.</td>
<td>86-90</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cardiovascular health</th>
<th>New ways to monitor and treat heart disease and comprehensive analysis of multiple risk factors. Clinical awareness of patient risk factors increases at Group Health and nationally.</th>
<th>91, 92</th>
</tr>
</thead>
<tbody>
<tr>
<td>Links between heart disease, lifestyle, genetics, medication use</td>
<td>Some hypertension medications linked to higher heart attack risk. Leads to additional trials, Food and Drug Administration review, and an intervention at Group Health motivating changes to safer drug alternatives.</td>
<td>14, 26, 27</td>
</tr>
<tr>
<td>Safety of drugs for chronic conditions</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Child and adolescent health</th>
<th>Children have specific preventive care needs. Studies on boosting parenting skills, enhancing safety and improving care for chronic conditions such as asthma and depression. Interventions developed to encourage lifelong healthy behavior.</th>
<th>93-95</th>
</tr>
</thead>
<tbody>
<tr>
<td>Healthy families and preventive care</td>
<td>Cultural competence improves youth care. Impact on research at GHRI and elsewhere on obesity, asthma and other conditions.</td>
<td>96</td>
</tr>
<tr>
<td>Improving health care for disadvantaged youth</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Chronic Illness Management</th>
<th>Model for team-based, patient-centered care improves management of diabetes and other chronic conditions. National implementation through MacColl Center and Robert Wood Johnson-funded Improving Chronic Illness Care.</th>
<th>36, 35, 37, 97</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chronic care model</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Health Informatics

| Secure websites for patients and providers | Patient-focused health IT assists communication and streamlines clinical practice. MyGroupHealth has health-risk assessment profiles, electronic health records and other health IT used in the patient-centered medical home. | 98 |

## Health Services and Economics

| Studies on health care and economics | Health promotion programs (e.g. smoking cessation) are an effective use of health care dollars. Findings comparing fee-for-service and Group Health model inform national health care decisions. | 24, 38, 99, 100 |
| Patient-centered medical home | Clinical care model that emphasizes preventive care and chronic disease management, improves collaboration and communication among medical team members, and gives patients greater access. Implemented at Group Health medical centers. | 38-42 |

## Immunization and Infectious Disease

| Primary care and AIDS | Primary care management increases survival. Leads to improved care for AIDS patients. | 101 |
| Vaccine safety datalink (1990-) | Post-market surveillance of vaccines. Results improve detection of vaccine effectiveness and adverse events. | 102 |
| Vaccine and treatment evaluation unit (2007-) | Clinical trials of nationally used vaccines and therapies including flu vaccines. Results disseminated through the National Institute of Allergy and Infectious Diseases. | 103 |
| Vaccine hesitancy | Study and intervention features developed. Pilot programs launched to address parent concerns about vaccination. | 104 |

## Medication Use and Patient Safety

| Centers for Education and Research on Therapeutics (CERTS) | Studies to optimize safe use of medication and medical products funded by the Agency for Healthcare Research and Quality working with the Food and Drug Administration. Dissemination through the HMO Research Network. | 105 |
| Opioid safety | Risk of overdose linked to higher doses. Group Health initiates primary care-based individualized patient care plans to standardize opioid use for chronic non-cancer pain. | 28, 29 |

## Mental Health

| Depression and mood disorders | New models for evidence-based patient-centered and collaborative care. At Group Health, individualized depression programs use new communication technology and are integrated with primary care. | 106 |
| Mental health care management | Simple, inexpensive care options (team-based primary care, telephone-based treatment) can improve mood disorders and treatment adherence. Findings integral to chronic care and patient-centered care models. Dissemination through national and international advisory boards. | 12, 107, 108 |
### Obesity

<table>
<thead>
<tr>
<th>Cost-effectiveness and safety of obesity treatments</th>
<th>Multipronged analysis of intervention programs and shared decision-making for bariatric surgery. Results used to design optimal research and implementation methods for obesity treatment. Group Health implements shared decision-making patient aids.</th>
</tr>
</thead>
</table>

### Preventive Medicine

<table>
<thead>
<tr>
<th>Department of Preventive Care</th>
<th>Health promotion in clinical settings and investigations of surveillance systems and screening tests through a subspecialty in Group Health's medical staff. Physician-scientists conduct studies and develop innovations in care. Translation through collaboration with Group Health clinical quality improvement activities.</th>
</tr>
</thead>
</table>

### Women's Health

<table>
<thead>
<tr>
<th>Osteoporosis and bone health</th>
<th>Identification of factors that affect bone health (diet, hormone therapy, oral contraceptive use). Findings influence global health guidelines.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Menopause symptoms</td>
<td>Rigorous analysis of the effectiveness of alternative treatments. Evidence-based information available for Group Health members.</td>
</tr>
<tr>
<td>Chlamydia screening</td>
<td>Results on Chlamydia screening for at-risk women and pelvic inflammatory disease risk provide evidence for national guidelines.</td>
</tr>
</tbody>
</table>
### Table 2. HMORN-affiliated research networks

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Study period</th>
<th>Funding Agency</th>
<th># HMORN Sites</th>
<th>Focus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vaccine Safety Datalink (VSD)</td>
<td>1990- current</td>
<td>CDC</td>
<td>10</td>
<td>Vaccine effectiveness, outcomes</td>
</tr>
<tr>
<td>Cancer Research Network (CRN)</td>
<td>1999- current</td>
<td>NCI</td>
<td>14</td>
<td>Cancer prevention, control, outcomes</td>
</tr>
<tr>
<td>Centers for Education and Research in Therapeutics (CERT)</td>
<td>2000-2011</td>
<td>AHRQ</td>
<td>13</td>
<td>Safety, effectiveness, appropriateness of use of drugs, biologics, devices</td>
</tr>
<tr>
<td>Integrated Delivery System Research Network (IDSRN)</td>
<td>2000-2005</td>
<td>AHRQ</td>
<td>11</td>
<td>Care delivery and research diffusion in integrated healthcare systems</td>
</tr>
<tr>
<td>National Bioterrorism Surveillance Project</td>
<td>2000-2004</td>
<td>CDC</td>
<td>8</td>
<td>Syndromic surveillance methods</td>
</tr>
<tr>
<td>Cancer Care and Outcomes Research Surveillance Consortium (CanCORS)</td>
<td>2001- current</td>
<td>NCI</td>
<td>5</td>
<td>Experience of newly diagnosed lung or colorectal cancer patients</td>
</tr>
<tr>
<td>Coordinated Clinical Studies Network (CCSN)</td>
<td>2004-2008</td>
<td>NHLBI</td>
<td>10</td>
<td>Creation of a shared, sustainable infrastructure to facilitate research</td>
</tr>
<tr>
<td>Developing Evidence to Improve Decisions about Effectiveness (DEcIDE) -1 Network</td>
<td>2005- current</td>
<td>AHRQ</td>
<td>12</td>
<td>Comparative treatment effectiveness and safety</td>
</tr>
<tr>
<td>Cardiovascular Research Network (CVRN)</td>
<td>2007- current</td>
<td>NHLBI</td>
<td>14</td>
<td>Cardiovascular disease epidemiology, management, and outcomes</td>
</tr>
<tr>
<td>Developing Evidence to Improve Decisions about Effectiveness (DEcIDE)-2 Network</td>
<td>2008- current</td>
<td>AHRQ</td>
<td>14</td>
<td>Comparative treatment effectiveness and safety</td>
</tr>
<tr>
<td>Research Program in Medication Use and Outcomes in Pregnancy (MEPREP)</td>
<td>2009- current</td>
<td>FDA</td>
<td>11</td>
<td>Medication exposure during pregnancy and maternal/fetal outcomes using linked data</td>
</tr>
<tr>
<td>Mini Sentinel Network (MSN)</td>
<td>2009- current</td>
<td>FDA</td>
<td>13</td>
<td>Development of an active surveillance systems for FDA safety monitoring</td>
</tr>
<tr>
<td>Accelerating Change and Transformation in Organizations and Networks (ACTION II)</td>
<td>2010- current</td>
<td>AHRQ</td>
<td>14</td>
<td>Practice-based, implementation-oriented, rapid cycle research</td>
</tr>
<tr>
<td>Mental Health Research Network (MHRN)</td>
<td>2010- current</td>
<td>NIMH</td>
<td>10</td>
<td>Conduct rapid and efficient effectiveness trials in mental health</td>
</tr>
<tr>
<td>Population-based Effectiveness in Asthma and Lung Diseases (PEAL) Network</td>
<td>2010- current</td>
<td>AHRQ</td>
<td>4</td>
<td>Accelerate comparative effectiveness research in asthma and other lung diseases in diverse populations</td>
</tr>
<tr>
<td>Project Name</td>
<td>Study period</td>
<td>Funding Agency</td>
<td># HMORN Sites</td>
<td>Focus</td>
</tr>
<tr>
<td>------------------------------------------------------------------------------</td>
<td>--------------</td>
<td>----------------</td>
<td>---------------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Surveillance, Prevention, and Management of Diabetes Mellitus (SUPREME-DM)</td>
<td>2010 - current</td>
<td>AHRQ, ARRA</td>
<td>12</td>
<td>Study trends in diabetes incidence and prevalence, and diabetes treatment patterns and outcomes</td>
</tr>
<tr>
<td>Scalable PArtnership Network (SPAN) for Comparative Effectiveness Research</td>
<td>2010 - current</td>
<td>AHRQ, ARRA</td>
<td>10</td>
<td>Distributed data network to support CER</td>
</tr>
</tbody>
</table>

CDC, Centers for Disease Control and Prevention
NCI, National Cancer Institute
AHRQ, Agency for Healthcare Research and Quality
NHLBI, National Heart, Lung and Blood Institute
FDA, US Food and Drug Administration
NIMH, National Institute of Mental Health
ARRA, American Recovery and Reinvestment Act
Figure 1: Group Health and Group Health Research Institute timeline

Group Health Cooperative

1946 and 1947 Founded

- Seattle Longitudinal Study starts
- Department of Preventive Care Research
- Computerized pharmacy records begin

1980

- Population-based breast cancer screening begins
- Smoke-free workplace
- Discounted coverage for non-smokers

1990

- Local bicycle helmet laws begin in Washington State
- Clinton health care reform proposed
- CDC recommends chlamydia screening
- FDA review, Group Health intervention for safer hypertension drugs

2000

- MyGroupHealth patient Web portal launched
- Institute of Medicine Crossing the Quality Chasm published
- Access Initiative begins
- Electronic health records implemented
- WHO declines warning about depo-provera and bone loss

2010

- Patient Protection and Affordable Care Act
- Patient-centered medical home implemented
- Opioid care plans implemented

Group Health Research Institute

1983 Founded

- Cost effectiveness of fewer x-rays and some lab tests
- HMO and FFS cost increases are comparable
- NCI funds phone-based tobacco cessation research

1990

- Effectiveness of risk-based breast cancer screening
- Bicycle helmets linked to reduced head injuries
- CDC Vaccine Safety Datalink begins
- Effectiveness of telephone-based tobacco cessation
- Breast Cancer Surveillance Consortium begins
- HMORN founded
- Collaborative care effective for depression
- Some hypertension drugs linked to higher heart attack risk
- Chlamydia screening effective against PID
- Chronic Care Model published
- Coverage for smoking cessation improves quit rates

2000

- Alternative care can help back pain
- Improved diabetes care reduces costs
- Bone density loss from depo-provera is reversible
- Exercise linked to later dementia onset
- Access Initiative evaluated
- Vaccine and Treatment Evaluation Unit
- H1N1 flu vaccine trials

2010

- Patient-centered medical home improves care, costs
- Opioid care plans developed

★ EVENTS  ★ RESULTS  ★ TRANSLATIONAL IMPACT