

Infrastructure for Large-Scale Quality-Improvement Projects: Early Lessons From North Carolina Improving Performance in Practice

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Introduction: Little is known regarding how to accomplish large-scale health care improvement. Our goal is to improve the quality of chronic disease care in all primary care practices throughout North Carolina.

Methods: Methods for improvement include (1) common quality measures and shared data system; (2) rapid cycle improvement principles; (3) quality-improvement consultants (QICs), or practice facilitators; (4) learning networks; and (5) alignment of incentives. We emphasized a community-based strategy and developing a statewide infrastructure. Results are reported from the first 2 years of the North Carolina Improving Performance in Practice (IPIP) project.

Results: A coalition was formed to include professional societies, North Carolina AHEC, Community Care of North Carolina, insurers, and other organizations. Wave One started with 18 practices in 2 of 9 regions of the state. Quality-improvement consultants recruited practices. Over 80 percent of practices attended all quarterly regional meetings. In 9 months, almost all diabetes measures improved, and a bundled asthma measure improved from 33 to 58 percent. Overall, the magnitude of improvement was clinically and statistically significant ($P = .001$). Quality improvements were maintained on review 1 year later. Wave Two has spread to 103 practices in all 9 regions of the state, with 42 additional practices beginning the enrollment process.

Discussion: Large-scale health care quality improvement is feasible, when broadly supported by statewide leadership and community infrastructure. Practice-collected data and lack of a control group are limitations of the study design. Future priorities include maintaining improved sustainability for practices and communities. Our long-term goal is to transform all 2000 primary-care practices in our state.

Key Words: education, continuing, quality improvement, primary care, regional planning, regional extension centers, Medicaid, practice facilitators

Introduction

Health care reform is on the national agenda, but little is known about how to accomplish large-scale health care system change. Most health care reform proposals recognize

the need to improve quality across the continuum of care;^{1,2} most support development of a primary care foundation for health care,³⁻⁵ and some recognize the importance of regional and community-based infrastructure for care. To address these challenges, the American Board of Medical Specialties, working with the Boards and Specialty societies of Family Medicine, Internal Medicine and Pediatrics, launched the Improving Performance in Practice (IPIP) initiative in 2005. The goal of IPIP is to improve the quality of care in all primary-care practices across entire states. North Carolina and Colorado were chosen as pilot states, with a focus on diabetes and asthma.

The national IPIP design combined many strategies used in prior quality-improvement work.⁶ The framework for change in individual practices was the Chronic Care Model,⁷⁻⁹ with emphasis on key drivers of improvement, including registries, information at the point of care, standing orders, self-management, support, and outreach.^{10,11} Improving Performance in Practice defined common quality measures tied to national measures and established a data system that would allow rapid cycle quality techniques to be used. Another key

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strategy was the development of learning networks to improve care across many clinical settings.^{12–15} To facilitate learning networks and to work with practices on office system improvement, IPIP included quality-improvement consultants (QICs), or practice facilitators, for which there is extensive experience in quality improvement.^{16–19} The final component strategy was to align as many incentives for practices as possible, offering practice-based continuing medical education (CME) and Maintenance of Certification Part IV (MOC IV) to all participating physicians.

This paper describes the operationalization of these strategies across an entire state, with emphasis on infrastructure development and early results. North Carolina IPIP is distinctive for its bottom-up community-based strategy, emphasis on enduring infrastructure and broad public–private coalition, including all major insurers and the state government. The quality outcomes of the first wave of practices and the design and recruitment of the second wave of practices are reported. The Biomedical Institutional Review Board at the University of North Carolina determined that this study is exempt from Institutional Review Board (IRB) approval.

Methods

North Carolina Coalition and Initial Funding

The first phase was to form a broad coalition of providers and organizations to drive the initiative. The state’s medical specialty societies (North Carolina Medical Society, North Carolina Academy of Family Physicians [NCAFP], North Carolina Pediatric Society, and the North Carolina Chapter of the American College of Physicians) launched the process; other key partners included NC Medicaid, the NC Division of Public Health, Community Care of North Carolina (CCNC), and the North Carolina Area Health Education Centers (NC AHEC) program. Initial funding was received from the Robert Wood Johnson Foundation, the NC Division of Public Health, NC AHEC, and in-kind contributions such as time, staff support, and continuing medical education credit for participants. In-kind contributions, such as project leadership at state and regional level, staff time, and meeting space were the largest single component of the resources needed for the project. Physician organizations and all funders were represented in the statewide NC IPIP Steering Committee, which developed the specific interventions, developed consensus on quality measures after review of the national measures,²⁰ and then reviewed outcomes and made adjustments in the program. The NC IPIP hired an Executive Director and engaged a separate 501(c)3, the NCAFP Foundation, to manage funds.

The foundation of NC IPIP was the collaboration of NC AHEC and CCNC. Both are statewide organizations with a mission of supporting primary-care practices and improving quality of care, particularly for the underserved, and both have regional offices and staff across the whole state. FIGURE 1 depicts Wave One and Wave Two geographic re-

gions, with partnering AHEC regions and CCNC networks. The mission of NC AHEC has been education for physicians and other health professionals; approximately 6 years ago, it established quality improvement as a new strategic goal. Community Care of North Carolina has built 14 community networks,^{21,22} which require participation by the physicians who take care of 75% of the Medicaid patients in a county, as well as all hospitals and county health departments and departments of social services. Community Care of North Carolina networks include over 4200 primary care physicians who care for over 1 000 000 Medicaid enrollees, and receive a per/member, per/month fee from Medicaid to support medical homes through case management and other network activities.²² As FIGURE 1 shows, we assigned each AHEC region to at least 1 CCNC network.

Target Population and Spread Strategy

The ultimate target for NC IPIP is all primary care practices in the state. North Carolina maintains excellent workforce data, but it was nevertheless difficult to estimate the number of practices. Medicaid requires patients to choose their medical home and thus identified over 1350 practices. Specialty societies, however, estimated 4000 separate practices. After review, our best estimate was that there were 2000 primary care practices. A spread strategy was then developed based on this estimate, the footprints of AHEC and CCNC, and diffusion theory.²³ Wave One consisted of 18 practices in 2 regions, with horizontal (across the state) and vertical spread (within each region) planned over 4 waves in 4–5 years and a planned 5-fold increase in practices each wave. Wave One regions were chosen for their differences: the eastern region encompasses the poorest part of the state, with a majority minority population, whereas the western region is relatively more affluent and had a long track record of prior quality-improvement (QI) work within practices. Assuming that the “tipping point”²⁴ for practice transformation is the onset of the “early majority,” or 40 percent, of the practices, the initial goal was to spread IPIP to 800 practices.

Our recruitment strategy emphasized CCNC and AHEC social networks, personal contacts by regional CCNC medical directors and AHEC directors and word-of-mouth rather than formal advertising or formal public relations. Incentives for practices included practice support (QICs); help with data systems, including, if necessary, installation of Chronic Disease Electronic Management System (CDEMS); Performance Improvement Continuing Medical Education (PI CME) credit and MOC IV credit for physicians; and \$2000 for direct costs in 2 payments as pay for participation, defined as submitting data and coming to the regional meetings.

Quality-Improvement Consultants, Data Systems, and Regional Collaborative Meetings

Quality-improvement consultants (QICs) were hired to facilitate improvement in practices. Practices chose whether

North Carolina

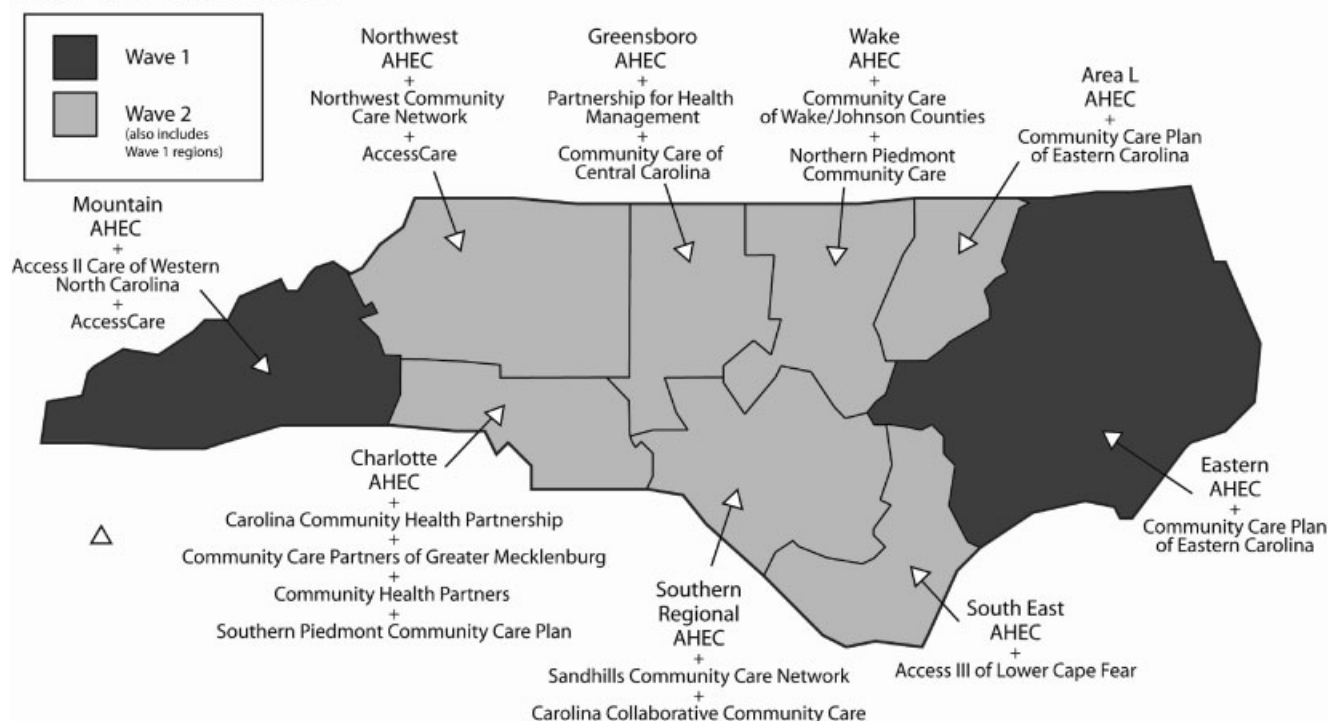


FIGURE 1. North Carolina Wave One and Wave Two Regions, showing partnerships between AHEC regions and CCNC networks.

they wanted to work on diabetes or asthma. The overall goal of QICs was to develop an ongoing relationship with each of the practices in IPIP, living locally, visiting frequently, and getting to know not only clinicians but also practice managers, nurses, and other staff. Quality-improvement consultants helped practices set priorities for practice change, taught improvement of office systems and trained staff. It should be emphasized that the overall IPIP strategy with practices was pragmatic, based on a practice's office systems and personnel, what the practice wanted to focus on, and what resources the practice had.

Quality-improvement consultants first worked to develop systems for monthly data reporting. Each practice signed a business associates' agreement that gave QICs data access. If the practice had an electronic health record (EHR), every effort was made to use the EHR to obtain data; if practice records were paper based, CDEMS or another registry tool was provided. The long-term goal was a monthly total population or random sample pull, but some practices were allowed to take convenience samples while developing their registries. A secure Internet site was developed for program data and to track office system changes. Practices were responsible for collecting and submitting data on a monthly basis to the secure site. Practice clinical data was used; QICs worked with practices to develop data systems, but there was no effort to verify systematically data. Quality measures²⁰ were simple ratios

with denominators of the patients with diabetes or asthma in the practice and included no protected personal information. Control of data was very important for the participating physicians; a formal policy of transparency was developed within the community networks and giving physicians use of their data for board certification and other purposes, but requiring special permission before data transfer to outside agencies.

Regional collaborative learning networks were the final component of the project. Concerned about the practice cost of overnight learning sessions, we modified the IHI "breakthrough series curriculum"²⁵ to improve feasibility for practicing physicians. Practices were asked to identify interdisciplinary teams and attend quarterly meetings with their teams. The agenda included the Model for Improvement, key drivers of practice change for diabetes and asthma, and emphasized interactive teaching based on the practices' data and having practices share successful office system changes. The QICs and local CCNC/AHEC leadership ran the meetings, and each regional collaborative had a sponsor from statewide leadership who attended each meeting. North Carolina Area Health Education Centers buildings were used, and weekday evenings were chosen so that office practice would be compromised as little as possible; most practices were within an hour's travel time of the evening meeting. Quality-improvement consultants facilitated CME credit and MOC IV credit.

Evaluation Strategy and Framework

The NC IPIP used an explicitly adaptive strategy, piloting each aspect of the strategy and adjusting based on the results of the pilot. We considered concurrently quality-improvement data, evaluation forms from regional meetings, QIC reports on practices, and explicit review of pilots (after-action reviews) with members of the statewide leadership. In addition, at the end of the first wave, the steering committee conducted a major review with national consultants of Wave One in order to plan for Wave Two. Finally, as an analytic framework, we constructed an inception cohort to correct for different start times and variability of data during initial submission. Time T0 was defined as the month the application was signed, T1 as the end of the first 3 months of data submission, with the measures averaged, T2 at 9 months after T1, and T3 at 2 years after first submission of data. Overall improvement of measures for Wave One practices from T1 to T2 and T3 was assessed with a sign test.

Results

Wave One Recruitment

From September 2006 to January 2007, 18 Wave One practices were recruited and enrolled. TABLE 1 describes the practices. Over half were family physicians, and 2/3 were private practices or community health centers; there was diversity of size and location. The 12 practices choosing diabetes had a total of more than 8000 diabetic patients. Sixteen of 18 had EHRs but only 1/3 could pull total population data.

Experience of Wave One Practices

Feedback from regional meetings was very positive, and practices in both regions requested continuation of quarterly meetings. Over 80 percent of practices attended all meetings, and the large majority of all the engaged practices submitted data regularly. There was no indication that economic competition between these local practices impaired participation or sharing of data. Quality-improvement consultants typically visited practices once a week initially, and the visits and the relationships with the practices were extremely popular. Practices improved their systems in the areas of registry function, standing orders, implementing disease protocols, and other key office systems; in addition, some practices expanded past a 1-disease focus and were using IPIP methods to address many aspects of practice design, including peer review of clinical interventions, medical-group visits, and advanced access scheduling. Barriers to change included ineffective practice leadership, resistant culture, and limited organizational capacity for change. Reimbursement for participation was attractive, with 14 of 17 teams applying, although many had to be reminded to ask for the money. The money was generally used by the practices to pay for food during meetings and to compensate staff who collected

TABLE 1. Description of all North Carolina Improving Performance in Practice Wave 1 and Wave 2 Practices

	Wave 1 N (%) (n = 18)	Wave 2 ^a N (%) (n = 95)
Quality focus		
Diabetes	72%	66%
Asthma	28%	34%
Practice type		
Private practice	39%	64%
Community health center	28%	18%
Health department	6%	2%
Residency program	5%	12%
Academic medical center	22%	4%
Service area ^b		
Rural	33%	23%
Urban	67%	77%
Size		
>=5 providers	56%	32%
< 5 providers	44%	68%
Practice specialty ^c		
Family medicine	56%	57%
Pediatric medicine	28%	28%
Internal medicine	16%	15%
Electronic health record		
Yes	89%	64%
No	11%	36%
Data-pull capability		
Convenience	17%	0%
Random	44%	22%
Total population	33%	53%
Not pulling data	6%	25%

^aNew fully engaged practices.

^bBased on metro/nonmetro designations based on core-based statistical area (CBSA) definitions from the US Census Bureau and US Office of Management and Budget. Core-based statistical area can be metropolitan, micropolitan, and “not a CBSA” (aka rural). For our analysis purposes, we combined micropolitan and not a CBSA into rural, whereas metropolitan stays metropolitan/urban.

^cIncludes community health centers and health departments as family medicine.

and entered practice data. We made PI CME credit very easy to obtain, but only 2 providers asked for it, and only 1 asked for MOC IV.

Quality Improvement in Wave One

Three practices withdrew because of tension within their group. TABLE 2 shows diabetes and asthma individual

TABLE 2. Quality-of-Care Measures for Diabetes and Asthma in Wave 1 at Baseline (Time 1), 9 Months (Time 2), and 2 Years (Time 3)

Diabetes Practices (n = 11)	Time 1 Mean (%)	Time 2 Mean (%)	Time 3 Mean (%)
a1c > 9	15	10	9
a1c ≤ 7	48	54	49
On aspirin	51	55	67
BP ≤ 130/80	43	41	52
BP ≤ 140/90	65	61	68
Dilated eye exam	37	38	26
Flu vaccine	32	46	46
Foot exam	36	66	64
LDL ≤ 100	33	41	44
LDL ≤ 130	51	60	60
Nephropathy screen	43	65	59
Smoking cessation counseling	31	78	79
≥ 1 LDL	66	74	76
Asthma Practices (n = 4)	Time 1 Mean (%)	Time 2 Mean (%)	Time 3 Mean (%)
Action plan	48	71	67
Three care components	33	58	56
Controller med	93	94	89
Control assessed	78	80	78
Flu vaccine	44	67	59
Emergency department visit	10	5	4
Hospitalization	4	8	6
Smoking counseling	43	75	85

P = 0.001 (T1 vs T2) *P* = 0.001 (T1 vs T3)

measures at T1, T2, and T3 in the remaining 15 Wave One practices. Almost all clinical and process measures for diabetes improved by T2 ($P = 0.001$) and the improvement continued through the second year (T3) ($P = 0.001$). Blood-pressure control measures improved by T3. Overall, the magnitude of change was moderate; by 9 months, it was clinically significant. Asthma measures also showed significant improvement across all measures except hospitalization by T2. There was an increase in the bundled measure for asthma (disease staging + controller med + flu shot) from about 25 to 58 percent by T2. As TABLE 2 shows, almost all of the improvements in practices were largely sustained a year later at T3.

Wave Two Design and Spread

Review of Wave One by stakeholders found that recruitment, collaboration between AHEC and CCNC, regional

meetings, and the QICs were major strengths. As noted herein, the NC IPIP plan had been to spread to several new regions in Wave 2, but, because of the great interest across the state, the Steering Committee endorsed spread to all regions of the state and hiring and training of QICs for each of these regions. Between September 2007 and June 2009, a total of 103 practices were enrolled in Wave Two; this number includes the practices from Wave One, continuing to participate. TABLE 1 compares the new Wave Two practices to original Wave One practices. The percentage of practices with EHRs dropped somewhat; the proportion of urban and smaller practices increased, reflecting the state demographics.

To increase the speed and amplitude of quality improvement, more emphasis was placed on the key drivers of improvement in practices, particularly registries, information at the point of care, standing orders, and self-management support. Also important was a change of the overall emphasis by the QICs and in the regional meetings. In Wave One, the stance of IPIP was “We help with any aspect of practice design if you also work on chronic disease”; whereas for Wave Two, the stance was “If you want us to work with you, you have to commit to implement these 4 high-leverage changes in your practice.” It also was clear that office data systems and EHRs were a significant obstacle to improvement. Sixteen of 18 Wave One practices had EHRs from 6 different companies, and none could pull quality data at first. With QIC support, however, 10 could pull data with a few keystrokes by T2. In Wave Two, we emphasized registry support and QICs were able to share knowledge about how to pull data from specific EHRs.

A more systematic training and supervision of QICs was implemented for Wave Two. With expansion across the state, more QICs were hired to a total of 11 QICs for 8.5 full-time equivalents. NC AHEC had previously developed a week-long, twice-yearly Quality Institute to train physicians, nurses, and program and hospital leaders across the state in quality improvement. New QICs attended this course to develop a common language and approach to improvement. Additionally, all QICs had an apprenticeship with tandem visits to practices with the IPIP director, supplemented by weekly one-on-one calls with the director and weekly conference calls with all the QICs. To tighten data systems, QICs were required to submit a monthly report detailing progress on the key drivers of office system change.

There were also major changes in the statewide organization of IPIP. As Wave One was being organized, the North Carolina Governor’s office took leadership of the statewide effort. With the help of the governor, the 2 largest commercial insurers in North Carolina, Blue Cross and Blue Shield (BCBS) of North Carolina and the State Employees Health Plan, were brought into the project. Along with Medicaid and the NC Health and Wellness Trust Fund, both contributed substantial financial and other resources to the initiative. Standing committees on quality measures, practice support and communications, and a clinicians’ advisory group were formed, and a new 501(c)3, the North Carolina Health

Quality Alliance (NCHQA), was chartered. Finally, the state legislature gave partial permanent financial support to NC AHEC to support the program.

Long-Term Sustainability

An important policy issue is long-term sustainability of quality gains. FIGURE 2 depicts the experience of Wave One practices. Two-thirds of the practices sustained their quality improvement at 2 years, and several have been dramatically successful, with extension to new diseases and new office processes such as billing. Importantly, however, 3 practices dropped out in the first year as the result either of conflict between partners or because there were higher-priority challenges facing the practice. In the next year, 2 other practices merged into 1, and a third practice closed altogether. A total of 3 had major challenges with their EHRs requiring them to pause with the IPIP process. Taken together, the attrition rate underscores the fiscal and organizational fragility of contemporary primary care.

Discussion

Our results demonstrate that it is possible to develop a statewide public-private coalition that includes all primary care providers, key provider organizations such as AHEC and CCNC, insurers for almost 75% of North Carolina’s covered lives, and state government. The NC IPIP developed a community-based regional strategy that has succeeded in improving care in 2 very different regions of the state, drove its spread across the whole state, and established permanent infrastructure. We have also succeeded in continuous evolution of our program, continuously adjusting both curriculum and organization. Our approach is suited to small practices that care for the large majority of

the US population, and it is generalizable to other states that are willing to commit social and financial capital to improving the health of their populations.

It is important to keep in mind the limitations of our project. Designed as a quality-improvement project rather than pure research, we used a practice clinical data system, without independent verification, reflecting our emphasis on “real world” conditions. There was no explicit control group nor control for other statewide and national quality-improvement initiatives—indeed, the intent of the project was to align as many of these initiatives as possible. Our approach was pragmatic, adapting to practices’ current systems and priorities, which makes precise translation to other practices and regions difficult. Our study reflects a test of a custom-fit strategy rather than a standard intervention imposed on practices. Another threat to the generalizability is the major role played by the well-developed NC AHEC system and the unique CCNC system. However, other states have regional structures, such as large health systems, and many are adapting Medicaid reforms paralleling CCNC. We believe that a key step in health care reform is to develop functional regional structures in parallel with state planning.

Development of the statewide coalition took substantial time and effort. Although there was little difficulty in bringing physician groups together, developing functional integration between AHEC and CCNC required numerous meetings. Developing trust between physicians and commercial insurers also required numerous meetings. It is important to underscore that, despite similar commitments to improving quality of care, there was still the need for substantial numbers of meetings (eg, biweekly for a year) to develop consensus around interventions, metrics, and financing. Finally, it is clear that involvement of the North Carolina Governor’s Office added substantial momentum and brought in the commercial insurers. The subsequent

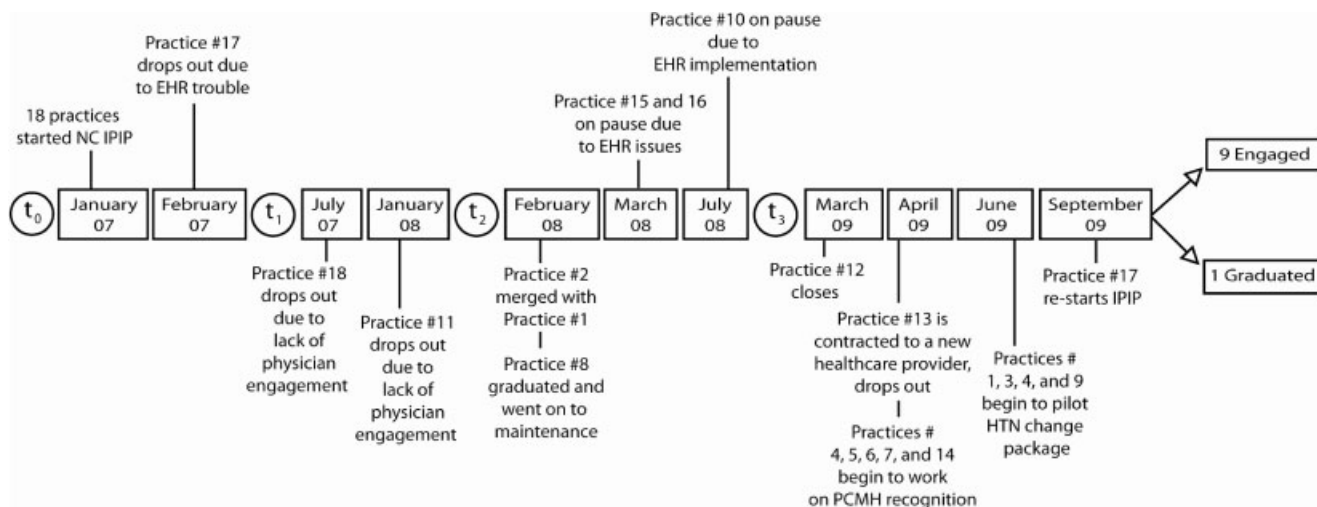


FIGURE 2. Sustainability: Fate of North Carolina Wave One practices.

economic downturn, however, has underscored the risks of the connection to state government, as support has been partially cut. A public–private coalition involving the government, physicians, other organizations, and insurers may be the most stable structure over time.

Another key learning is the development of the QIC role. Improving Performance in Practice has had to learn how to recruit, train, and manage QICs on a large scale. We found QIC recruitment was not difficult. Previous experience with QI is important, and hospital QI experience translates well to office practice. Good interpersonal skills, personal organization, and flexibility are critical, and specific educational background—nursing versus social work—is less important. Because candidates have had different QI backgrounds, standardization of terminology has been important. The NC IPIP has also had to address QIC turnover, as they have become sought after by other health care organizations. The right ratio of QICs to practices remains uncertain. Currently, we target 20 practices to 1 experienced QIC. This ratio may increase as EHRs improve and practices and QICs become more experienced.

Incentives are critical to changing and maintaining office systems. There are substantial direct and indirect costs to redesigning practices to improve quality of care,²⁶ and previous studies have shown lack of durability of improvements in quality.^{27–29} With Wave One practices, we found that the modest incentives (cash, CME, MOC IV) we offered were not critical to initial recruitment. We believe that this represents an “early adopter” effect. The modest pay for participation incentive helped encourage data submission and attendance, which we believe are behaviors necessary for success, and were very important symbolically, both at the practice level and at the level of the statewide coalition. Wave Two practices have been more interested in MOC IV, and, as we spread to our target of 800 practices, we will continue all incentives offered previously. More broadly, we believe that incentives offered by the federal government for health information technology adoption³⁰ and by commercial insurers for Patient-Centered Medical Home (PCMH) will help drive practice redesign.

Alignment of all current initiatives around practice redesign and quality will be challenging. Since IPIP began, PCMH³¹ has become a major focus of specialty societies,⁵ employers,³ insurers, and policy makers. The National Committee for Quality Assurance has developed a recognition program,³² and many insurers have begun pilot incentive programs. North Carolina Blue Cross and Blue Shield has just announced a substantial incentive based largely on PCMH.³³ With respect to Electronic Health Records, the Office of the National Coordinator has defined “meaningful use”³⁴ and will fund regional extension centers³⁰ to support widespread adoption of EHRs. Of course, there is substantial complementarity among adoption of EHRs with meaningful use, developing Patient Centered Medical Homes, and improvement of care, but there are also many opportunities for distraction and inconsistency. An explicit focus of our

Lessons for Practice

- Clinically significant quality improvement on a large scale is possible in 9 months provided there are community supports and aligned incentives.
- Quality-improvement consultants experienced in hospital quality-improvement campaigns can adapt to office settings.
- Regional meetings should be held within driving distance and after hours so that practices need not close in order to attend.
- For this project, the greatest single obstacle to sustainable quality improvement may be the challenges and costs of acquiring data from EHR systems.
- In this early phase, there was positive movement with modest use of incentives.
- Some practices did not avail themselves of PI CME credit, and many were not aware of MOC Part IV.

planning now is to integrate curriculum and data collection around all these themes.

Conclusions

The NC IPIP has been successful in establishing statewide community-based infrastructure for quality of care and in improving care in its first wave of practices. The care improvements are of moderate magnitude, took about 9 months, are clinically significant, and are stable over time. Our experience thus represents a “proof of concept” for the proposed regional extension centers for health information technology dissemination. Our results suggest that regional, community-based support can greatly facilitate care improvement, as does a statewide public–private collaboration of providers, insurers, and government. Finally, given large new incentives for practices to adopt PCMH and advanced EHRs, there is a continuing and increasing need to align initiatives at state and regional levels across a wide variety of organizations, even as quality improvement itself must begin to address multiple comorbidities and high-cost patients. This will become even more important in an era of rapid changes in the organization of health care.

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