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Assessment of the Eighth Scope of Work of the Medicare Quality Improvement Organization Program

Draft Report

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EXECUTIVE SUMMARY

The Quality Improvement Organization Program of the Centers for Medicare & Medicaid Services is a key component of the agenda of the Centers for Medicare & Medicaid Services (CMS) for assuring and improving quality of care for Medicare beneficiaries. CMS executes three-year contracts (each called a Scope of Work or SOW) with a nationwide network of independent Quality Improvement Organizations (QIOs) to help health care providers deliver high-quality care to Medicare beneficiaries. The Eighth SOW ended in July 2008; the Ninth SOW began on August 1, 2008. With budgets of roughly $1.2 and $1.1 billion for the Eighth and Ninth SOWs, respectively, the QIO program is the single largest investment in quality improvement infrastructure—public or private—in the nation.

As evidenced by several recent federal agency reports, members of Congress and federal policy analysts have become increasingly interested in studying the effectiveness and value of the QIO Program. These reports include a congressionally mandated assessment of the QIO program by the Institute of Medicine (IOM) published in 2006; CMS' response to the IOM report in a 2006 Report to Congress; a Government Accountability Office (GAO) review requested by Congress of the QIO Program's efforts to improve nursing home quality during the Seventh SOW; and a report sponsored by the Assistant Secretary for Planning and Evaluation (ASPE) on future directions for evaluating the QIO Program published in 2007. In addition, researchers have published many articles studying various aspects of the QIO Program in the academic medical and health policy literature.

CMS has contracted with Mathematica Policy Research, Inc. (MPR) to conduct an independent limited study of the already completed Eighth SOW, followed by the design and implementation of a full evaluation of the Ninth SOW. This report presents the findings of our study of the Eighth SOW.

STUDY METHODS

The study included three components: (1) an analysis of Medicare Compare data, (2) case studies of five states' experiences with the Surgical Care Improvement Project (SCIP), and (3) an analysis of survey data on provider satisfaction with QIOs.

Analyses of Medicare Compare Data

We analyzed Medicare Compare data for nursing homes, home health agencies (HHAs), and hospitals. The data available to us encompassed these three provider settings. Federal regulations on QIO data precluded our access to any data that identified providers' involvement with QIOs; only the proportions of providers participating with each state's QIO were available. For the upcoming Ninth SOW evaluation we are working on accessing these data in a way that satisfies these regulations.

Descriptive Trend Analyses. We produced descriptive statistics of magnitudes and directions of changes in quality measures in the Medicare Compare data between the beginning and the end of the Eighth SOW. The baseline and follow-up periods for the three provider settings varied because of differences in the data collection schedules for Medicare Compare; for nursing homes data collection occurred in the second quarter of 2005 and the first quarter of 2008; for home health agencies it took place from September 2004 through August 2005 and March 2007 through February 2008; and for hospitals data collection occurred from July 2004 through June 2005 and October 2006 through September 2007. We performed analyses at both the provider and state levels, weighting by provider size.

Correlation Analyses. We assessed the correlations between quality measures within each of the three measure sets (for nursing homes, HHAs, and hospitals) at both the provider and state levels. If measures are highly correlated with one another, quality improvement efforts might be able to focus on the limited number of providers and states that tend to perform poorly in several measures. There might also be a group of providers performing well in several measures that have developed a set of best practices worth replicating. If there is little correlation across measures, however, quality improvement efforts will need to work with a larger set of providers and be prepared to assist each provider with its specific handful of measures that need improvement.

Impact Analyses. Using multiple regression we estimated the association between changes in quality measures and the IPG penetration rate, the percentage of providers in each state that participated with QIOs as Identified Participant Groups (IPGs). The percentage of providers that each QIO was to recruit as IPGs under the Eighth SOW was a function of the numbers of providers in each state. QIOs in states with few providers were expected to work with a high percentage of providers; QIOs in large states were expected to work with only a fraction of all providers. We can reasonably assume IPG penetration to be independent of underlying provider capabilities or likelihoods of good or bad outcomes, and thus to represent a measure of QIO intervention that is not confounded by unobserved provider characteristics or selection bias. (That is, when the very providers with the strongest interests and capacity for quality improvement are those most likely to sign up to work with QIOs, we run the risk of mistakenly attributing their improvements to the QIO, when the QIO might in fact have had very little effect.) IPG penetration rates ranged from 8 percent to 100 percent for nursing homes, 14 percent to 55 percent for home health agencies, and 12 percent to 100 percent for hospitals. Where possible, we controlled for changes in quality measures that were *not* the focus of QIO interventions, thus controlling for underlying trends separate from any QIO effects. To assess the impacts of selected *statewide* efforts by QIOs to improve specific HHA measures for all providers in the state (as opposed to efforts focused on IPG providers), we compared states in which QIOs had chosen to pursue such projects with states in which QIOs had not.

Case Study Analysis

We selected for study three states that started out with low SCIP measures and had large improvements, and two states that started out with high SCIP measures and had modest improvements. Following a prespecified discussion guide, we interviewed national experts in hospital quality improvement as well as staff in both QIOs and state hospital associations in the selected states.

Provider Satisfaction Survey Analysis

We analyzed a nationally representative survey of all providers on their perceptions of QIOs, conducted by Westat, Inc. in mid-2007, under contract to CMS. We analyzed results for nursing homes, HHAs, and hospitals, categorizing providers into (1) IPGs, (2) non-IPGs that reported receiving quality improvement assistance from their local QIO, and (3) non-IPGs that said they had received no such help.

SUMMARY OF FINDINGS

Descriptive Analyses of Medicare Compare Data

National averages for nearly all of the quality measures studied showed improvement. In national averages of provider-level changes in quality measures, three of the four nursing home measures (the exception being the percentage of residents with worsening depression or anxiety), all home health measures, and both of the hospital indexes improved.

Most states also showed improvement in most measures. State-level averages of the changes in the nursing home measures showed that all states improved in the pain measure, all but two improved in the physical restraint measure, and more than two-thirds improved in the pressure ulcer measure, but there was little movement in the anxiety/depression measure. Forty-eight states improved in the home health patient functioning index and 35 improved in the acute care hospitalization (ACH) measure. All states improved in both of the hospital indexes. Improvements in most states on the nursing home and home health measures were modest (generally one or two percentage points); the improvements in the hospital index scores were somewhat larger. No states showed noteworthy worsening in any of the quality measures.

In general, few states had large improvements in measures for more than one provider type. One state did well on both nursing home and home health measures, and two did well on both nursing home and hospital measures. Two other states did well on both home health and hospital measures. Only one state did well in all three sets of measures.

Correlational Analyses of Medicare Compare Data—Providers and States

Home health agencies tended to do well across several measures; this was not true for nursing homes and hospitals. For HHAs, the correlation coefficients for the seven patient functioning measures were moderately sized, ranging from 0.26 to 0.57 with a mean of 0.43. The patient functioning measures did not correlate highly with the discharge to community or ACH measures, however. The four nursing home measures had small correlation coefficients (all less than 0.06), as did the two hospital indexes (around 0.25).

States also tended to do well on several home health measures, but not across several nursing home measures nor across several hospital measures. State-level correlations exhibited patterns similar to the provider-level ones described above.

Analysis of Medicare Compare Data—Impact Results

Higher rates of IPG penetration are associated with larger improvements in quality measures for nursing homes and home health agencies, but not for hospitals. For example, for the nursing home measures, a one percentage point increase in the IPG penetration rate (the percentage of all providers in a state that are IPGs) was associated with a roughly 0.03 percentage point greater reduction in pressure ulcers, a 0.02 percentage point greater reduction in physical restraints, and a 0.01 percentage point greater reduction in chronic pain (with no association for the depression or anxiety measure). Among HHAs, a one percentage point increase in the IPG rate was associated with a 0.13 percentage point larger reduction in the ACH measure. However, there was no significant association between IPG penetration and the hospital appropriate care measure (ACM) index.

QIO statewide efforts on home health measures are associated with larger improvements. States in which the QIO opted to focus on the home health measure of dyspnea saw a nearly two percentage point greater improvement in dypsnea than states that did not. Likewise, states focusing on management of oral medications had a one percentage point larger improvement in that measure than other states.

Table 1 summarizes these findings for the impact analyses and also summarizes those for the descriptive analyses discussed above. Although nearly all measures improved nationwide, not all improvements could be tied to QIO efforts.

Case Study Results

The quality improvement environment is complex, and both QIO and non-QIO activities might contribute to observed improvements. Among the three states that started out with low SCIP measures and had large improvements and the two states that started out with high SCIP measures and had modest improvements, QIOs undertook a wide range of activities to improve perioperative care. These included engaging the dominant local health system to foster improvement; convening a hospital collaborative; and pursing a complex intervention of intensive site visits, regional in-person meetings, and a letter from an influential surgeon to all surgeons statewide to encourage support for the SCIP initiative. States also noted many other concurrent influences, however, including the 100,000 Lives Campaign conducted by the Institute for Health Improvement (IHI); the Reporting Hospital Quality Data for Annual Payment Update (RHQDAPU) initiative; public reporting of the SCIP measures; and quality improvement efforts by state hospital associations, health system organizations, and the Voluntary Health Association (VHA). Finally, many of the states noted how Seventh SOW activities and their results could affect both the starting points for the Eighth SOW and the effectiveness of Eighth SOW interventions. These case studies demonstrate the complexity of the quality improvement environment and the challenges of disentangling QIO effects from the multitude of other influences, as well as distinguishing the effects from any specific SOW from preceding SOWs. The case studies also pointed out specific QIO interventions that might warrant further study in the evaluation of the Ninth SOW.

TABLE 1

SUMMARY OF STATISTICALLY SIGNIFICANT RESULTS FROM DESCRIPTIVE
AND IMPACT ANALYSES OF MEDICARE COMPARE DATA

	Average Improvement	Estimated Impact of IPG Penetration	Estimated Impact of Statewide Efforts
Nursing Homes			
Pressure Ulcers	-0.6***	-0.034***	n.a.[a]
Physical Restraints	-2.0***	-0.022***	n.a.
Worsening Depression/Anxiety	0.1**	--[b]	n.a.
Moderate to Severe Pain	-1.5**	-0.011**	n.a.
Home Health Agencies			
Acute Care Hospitalization	-0.5***	-0.13***	n.a.
Improvement in Bathing	2.4***	n.a.	n.a.
Improvement in Transferring	1.4***	n.a.	n.a.
Improvement in Ambulation/Locomotion	5.4***	n.a.	n.a.
Improvement in Management of Oral Medications	6.5***	n.a.	1.3***
Improvement in Pain Interfering with Activity	3.0***	n.a.	--[b]
Improvement inDyspnea	2.7***	n.a.	1.8***
Improvement in Urinary Incontinence	1.7***	n.a.	n.a.
Discharge to Community	0.6***	n.a.	n.a.
Hospitals			
ACM Index	7.1***	--[b]	n.a.
SCIP Index	16.6***	n.a.	n.a.

Source: Medicare Compare Data.

Note: IPG penetration is the proportion of providers in a state who are identified participant group (IPG) providers working with their QIO to improve quality. Estimated impacts are the coefficients on the IPG penetration variable from multiple regression analyses in which changes in the quality measures are regressed upon the IPG penetration rate.

Estimates of statewide efforts (relevant only for home health care measures) compare states in which QIOs chose to work with all home heath agencies in the state on improving a quality measure, to states in which QIOs did not choose to do so.

[a]Statewide analyses could only be conducted for selected measures for home health agencies—this was the only setting in which states could choose a quality measure on which to focus in a statewide project, and in which the design of the Eighth SOW permitted these analyses.

[b]Statistically insignificant result.

  *Significantly different from zero at the .10 level, two-tailed test
 **Significantly different from zero at the .05 level, two-tailed test.
***Significantly different from zero at the .01 level, two-tailed test.

Provider Satisfaction Results

IPG providers are highly satisfied with QIOs, non-IPGs that received no QIO assistance are least satisfied, and non-IPGs that received QIO assistance fall between these two. In the provider survey, all three types of IPG providers (nursing homes, HHAs, and hospitals) were highly satisfied with their state QIOs and found QIO assistance valuable. Non-IPG providers that had received no QIO assistance generally showed little awareness of their QIOs and of CMS initiatives such as pay for performance (P4P); they were generally neutral toward their QIOs (neither satisfied nor dissatisfied, and neither strongly agreeing nor disagreeing with various positive statements about QIOs). Respondents also named many different sources of information for quality improvement, confirming the case study findings that there are many influences on providers' quality of care.

A substantial portion of non-IPG providers received QIO assistance, complicating comparisons between IPGs and non-IPGs. The percentages of non-IPG providers that reported receiving assistance from their QIOs was 71 percent for nursing homes, 82 percent for HHAs, and 94 percent for hospitals. This means that the control, comparison, or "untreated" provider group has actually received some of the intervention being evaluated (QIO assistance) and thus complicates any interpretation of the IPG indicator as a "treatment" indicator. If this engagement of non-IPG providers with QIOs improves their performance, this spillover or contamination effect will lead to underestimates of QIOs' real impact.

CONCLUSIONS

Our limited assessment of the Eighth SOW found overall improvements in quality measures over the period of the Eighth SOW, and some evidence that QIO efforts contributed to these improvements. Interviews of key stakeholders made clear the complicated context in which QIOs operate and highlighted specific potential QIO interventions for further study. Providers, especially IPG providers, were generally quite satisfied with QIOs, although we found that the IPG and non-IPG distinction is quite indistinct. These preliminary findings point out the importance of detailed data, both qualitative and quantitative, for the upcoming evaluation of the Ninth SOW, and will help guide us in the design of the evaluation.

I. INTRODUCTION

The Quality Improvement Organization Program of the Centers for Medicare & Medicaid Services (CMS) is a key component of the agenda of the Centers for Medicare & Medicaid Services (CMS) for assuring and improving quality of care for Medicare beneficiaries. As required by Sections 1152 through 1154 of the Social Security Act, CMS contracts with a nationwide network of independent Quality Improvement Organizations (QIOs) to help health care providers deliver high quality care to Medicare beneficiaries. [1] The contracts last for three years, with each contract cycle called a scope of work, or SOW. The Eighth SOW ended in July 2008, and the Ninth SOW began on August 1, 2008. With budgets of roughly $1.2 billion and $1.1 billion for the Eighth and Ninth SOWs, respectively, the QIO program is the single largest investment in quality improvement infrastructure—public or private—in the nation.

CMS has contracted with Mathematica Policy Research, Inc. (MPR) to independently conduct a limited study of the Eighth SOW, followed by the design and implementation of a full evaluation of the Ninth SOW. This report presents the findings of our study of the Eighth SOW.

In conducting this study of the Eighth SOW, we encountered the same statutory and regulatory restrictions on release of QIO data that others have identified as a major challenge to a full evaluation of the QIO Program (Institute of Medicine 2006; U. S. Government Accountability Office 2007; Sutton et al. 2007). These restrictions prohibit a QIO from disclosing any data identifying individual health care providers to any outside organization (including CMS or even other QIOs) except under a very limited set of circumstances (Section

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[1] The current report focuses on the impacts of the QIO Program on quality improvement.Other missions of the QIO Program include protecting beneficiaries' rights by reviewing and investigating complaints and appeals and protecting the Medicare Trust Funds by ensuring that Medicare pays only for services and goods that are reasonable, necessary, and provided in the most appropriate setting.

1160 of the Social Security Act; 42 CFR Parts 480; Chapter 10 of the QIO Manual). The proscription thus applies to information on whether a provider was working with the QIO on any quality improvement projects. Our Eighth SOW study thus uses either publicly available or aggregated and de-identified data. As described later, we are working with CMS and the QIO community on how we can access QIO data with identifiable provider-level data in a way that satisfies the regulatory requirements.

A. BACKGROUND AND POLICY CONTEXT

The importance of the QIO Program's functions and the magnitude of its budget make evaluation of its effectiveness essential. Understanding the program's overall effectiveness and identifying its most successful components or activities are prerequisites to improving the program as a whole. Moreover, given the influence of the Medicare program on the Amercian health care system, the QIO Program can lead to better care not only for Medicare beneficiaries but for all Americans.

In the Medicare Prescription Drug, Improvement, and Modernization Act of 2003 (P.L. 108-173), Congress mandated the Institute of Medicine (IOM) to conduct an overview of the QIO Program, including a review of "the extent to which quality improvement organizations improve the quality of care for Medicare beneficiaries" (Institute of Medicine 2006). Following an extensive review of scientific literature published between 1995 and 2005, the IOM concluded that "although the quality of care received by Medicare benficiaries has improved somewhat, researchers have been unable to attribute these changes to the QIO program." The IOM could not determine whether this lack of evidence for QIO impacts was due to the methodological limitations of many of the studies reviewed, to the difficulty of disentangling the effects of QIO activities from the many other concurrent quality improvement efforts, or to a true lack of program effectivness (IOM 2006). The IOM report also recommended that CMS periodically

commission independent, external evaluations of the QIO Program, and in its 2006 Report to Congress responding to the IOM's recommendations, CMS agreed on the need for strengthened methods of program evaluation.

At about the same time that IOM was preparing its report, the Assistant Secretary for Planning and Evaluation (ASPE) was studying options for evaluating the effectiveness of the QIO Program. ASPE contracted with the National Opinion Research Center (NORC) to develop a richer inventory and description than previously available of QIOs' activities and strategies, and to assess alternative designs for potential future evaluations of the QIO Program. NORC's literature review for this project on the impacts of the QIO program reached the same conclusions as IOM's, namely, that the literature is ambiguous on the effectiveness of the program and that previous studies have suffered from a variety of methodological problems. NORC's report concluded with several design options and recommendations for further research on the QIO Program (Sutton et al. 2007).

B. BRIEF DESCRIPTION OF THE EIGHTH SCOPE OF WORK

QIO Program activities in the Eighth SOW were carried out by 43 QIO contractors under 53 contracts (one for each of the 50 states, the District of Columbia, Puerto Rico, and the U.S. Virgin Islands).[2] The QIOs' mandate was to help health care providers in their catchment areas improve quality of care through technical assistance—assisting them with "root-cause analysis, implementation of interventions and systems changes, … knowledge transfer, … data collection, and [coordination of] efforts with other stakeholders" (IOM 2006).

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[2] Throughout the remainder of this report we will use the term "QIO" interchangeably with "state," even though a few QIOs in the Eighth SOW held contracts for more than one state, and the District of Columbia

With the data available to us, we were able to study three of the quality improvement areas that the QIOs worked on during the Eighth SOW: (1) nursing homes (NHs), (2) home health agencies (HHAs), and (3) hospitals.[3] For each of these areas, the QIOs were to work with two main groups of providers: (1) all providers statewide on certain quality measures; and (2) "identified participant group providers" (IPGs or IPs), which were recruited by the QIOs and voluntarily agreed to receive intensive technical assistance and engage in a number of quality improvement projects.[4] The SOW specified the numbers of IPG providers the QIOs were expected to recruit, which were based mainly on the number of providers in a state.

1. Nursing Homes

a. Statewide Activities

Each QIO had to set statewide improvement targets for two required quality measures—pressure ulcers and use of physical restraints—but could choose to set targets for more. The QIOs were also to assist all nursing homes statewide in setting their own improvement targets for at least the same two quality measures, and for more if the nursing homes desired. The assistance consisted of information on how to set targets and referral to the Nursing Home STAR (Setting Targets, Achieving Results) website (http://www.nhqi-star.org/STAR_index.aspx) for submitting targets.

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[3] We will not study the subtasks of Critical Access & Rural Hospitals, Physician Practices, Underserved Populations, and Part D Prescription Drug Benefits, either because they were not a focus of the our evaluation or because data are not available.

[4] QIOs were also required to help any providers that requested assistance in improving quality in any of the topics covered by the SOW. We call providers that were not IPGs "non-IPGs."

b. IPGs

IPG nursing homes could be recruited by QIOs through channels such as previous collaborations in prior SOWs or professional or trade associations.[5] The QIOs were to work with the IPG facilities on four measures: (1) depressive symptoms management, (2) pain management, (3) pressure ulcers among high-risk residents, and (4) physical restraints.[6] The required number of IPG nursing homes was: in states with 30 or fewer nursing homes, all nursing homes; in states with 31 to 300 nursing homes, 30 to 45 nursing homes; and in states with more than 300 nursing homes, 10 to 15 percent of homes.

2. Home Health Agencies

a. Statewide Activities

The Eighth SOW listed statewide targets in improvement for all HHA quality measures. All QIOs had to work on the Acute Care Hospitalizations measure (the percentage of patients in home health care who had to be admitted to the hospital) and one other of their choosing.

b. IPGs

QIOs were also to work with individual IPG HHAs on the Acute Care Hospitalizations measure (in addition to the QIOs' statewide efforts on this measure) plus one other measure selected by each agency.[7] Table I.1 shows the required numbers of IPG home health agencies for QIOs to recruit.[8]

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[5] There was actually a second nursing home IPG, called IPG2, which consisted of a much smaller group (a minimum of one to three per state, depending on the number of facilities in the state) of "persistently poor performing nursing homes" that was not to overlap with IPG1. QIOs were to identify these nursing homes in collaboration with state survey agencies.

[6] In addition, QIOs were also expected to work with IPG nursing homes on staff/resident satisfaction, employee turnover, resident experience of care/satisfaction, and staff experience of care/satisfaction.

[7] There was also a second IPG, called Systems Improvement and Organizational Culture Change (SIOC), which QIOs were to help with implementation and use of home telehealth and promotion of organizational culture

TABLE I.1

REQUIRED NUMBER OF HOME HEALTH AGENCY IPGs, EIGHTH SOW

Number of HHAs in the State	Number of IPG HHA QIOs Required to Work With
14 or fewer	6
15 to 25	8
26 to 45	10
46 to 65	14
66 to 90	16
91 or more	20 percent

HHA = Home Health Agency; IPG = identified participant group providers; SOW = scope of work; QIO = quality improvement organization.

3. Hospitals

a. Statewide Activities

The QIOs were to work with all acute care hospitals to (1) increase hospital participation in clinical performance measurement *reporting* and (2) improve hospital performance on clinical performance measurement *results*. For the reporting subtask, the QIOs were to encourage hospitals statewide to submit data on a set of 22 process-of-care measures for four clinical conditions: (1) acute myocardial infarction, (2) heart failure, (3) pneumonia, and (4) surgical care.

b. IPGs

The QIOs were required to recruit and work with two main IPGs: (1) one focused on the first three clinical conditions listed above—acute myocardial infarction, heart failure, and pneumonia—also called the Appropriate Care Measure or ACM IPG; and (2) one focused on the

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(continued)

change. Interested HHAs could choose to participate in the clinical IPG only (focusing on the clinical quality measures), the SIOC IPG only, or both.

[8] There were also requirements for the distribution of small, medium, and large agencies.

fourth condition, surgical care (the Surgical Care Improvement Project or SCIP IPG).[9] Each IPG

was to be the same size. Table I.2 shows the required IPG sizes.

TABLE I.2

REQUIRED NUMBER OF HOSPITAL IPGS, EIGHTH SOW

Number of Hospitals in the State/Jurisdiction	ACM IPG	SCIP
6 or fewer	All hospitals	All hospitals
7 to 40	6	6
41 to 240	15 percent	15 percent
241 or more	36	36

ACM = acute care measure; IPG = identified participant group providers; SCIP = Surgical Care Improvement Project; SOW = scope of work.

4. QIOs' Activities

Both the IOM and NORC noted that the activities that QIOs pursue to achieve both

statewide and IPG-level quality improvement targets are not well documented (Institute of

Medicine 2006; Sutton et al. 2007). The two reports developed descriptions of QIO activities

only by sifting through many websites, brochures, and so on, and by conducting telephone

interviews and site visits. The reports described the wide range of activities that QIOs perform to

accomplish their quality improvement objectives—developing and disseminating educational

publications to providers; conducting conferences or workshops for providers in person, by

telephone, or online; organizing provider quality improvement collaboratives; and providing

one-on-one technical assistance consultations.

C. OVERVIEW OF STUDY COMPONENTS AND RESEARCH QUESTIONS

We pursued three main study components: (1) an analysis of Medicare Compare data, (2) a

case study analysis of telephone interviews with key informants, and (3) an analysis of de-

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[9] There was a third hospital IPG, the organization culture IPG, whose membership could overlap with those of the first two IPGs.

identified data from a national survey of providers. The Medicare Compare datasets (Nursing Home Compare, Home Health Compare, and Hospital Compare) are publicly available and contain data on the performance of individual providers on quality measures that are also used by the QIO program. Under contract to CMS, Westat surveyed providers in 2007 on their perceptions of their local QIOs. We outline the broad research questions addressed by each of these components.

1. Analysis of Medicare Compare Data

Our analysis of Medicare Compare data included both descriptive analyses and impact analyses. Some of the analyses study all providers nationally; others aggregate providers to the state level and present these state-level results.

a. Descriptive Study Questions

1. **Have quality-of-care measures improved nationwide?** Given the nationwide scope of the Medicare program and of the quality measure reporting system put in place over the past several years, it is important to document that quality measures are, in fact, improving over time, regardless of whether we can tie any such changes to the QIO Program.

2. **Did most states improve over the Eighth SOW?** The QIO Program operates through state-level organizations, and it is important to know whether most states are, in fact, improving.

3. **Does provider- and state-level performance in one set of measures correlate with performance in other measures?** This question is important for two reasons. First, the answer to this question might be useful in designing and targeting quality improvement initiatives. If several different sets of measures are highly correlated with one another, providers and states with low performance in one group of measures will tend to perform poorly in all measures. Quality improvement efforts will then need to (1) focus on that limited set of poor performers and (2) address the entire range of measures. Conversely, if there is little correlation, quality performance efforts will need to (1) work with a larger set of providers and (2) assist each provider with the specific handful of measures with which a provider needs help. Second, if different measures are highly correlated, high performers in one set of measures will also tend to do well across all measures, and studying these high performers might help to identify best practices that can then be disseminated to providers and states.

b. Impact Analyses: Do QIO efforts appear to lead to greater quality improvements?

This is the basic program impact evaluation question—whether or not a specific program or initiative leads to the intended favorable effects. Lacking provider-level data on providers' participation with QIOs, we addressed this question using cross-state variations in measures of QIO activities.

2. Mechanisms and Case Study Analysis for Improvements in Hospital SCIP Measures

For five states with two contrasting patterns of state-level improvement over the Eighth SOW in the hospital SCIP measures, we explored possible QIO contributions to these patterns. We selected states that either had (1) relatively poorer baseline performance but had among the largest improvements (three states) or (2) high baseline performance but had relatively small improvements (two states). We examined the following questions:

1. Did states' rates of improvement appear to be associated with QIO actions?

2. Were there differences in the timing of how hospitals participated in or viewed other national-level surgical infection-prevention initiatives that might help explain the different pattern of improvement?

3. Did hospitals in the states with poorer baseline performance face barriers to improvement that were overcome?

4. What other factors might explain the different patterns of improvement in the two groups of states (those with poorer baseline performance but larger improvements versus those with strong baseline performance and modest improvements?)

5. What factors do the QIOs and hospital associations say are associated with improvements at the hospital level?

3. Analysis of Provider Survey Data

Finally, the analysis of provider survey data addressed questions on providers' awareness and knowledge of their local QIOs and providers' perceptions of their QIOs:

1. Are providers aware of their QIOs, and have they worked with a QIO?

2. Are providers satisfied with their QIOs, and do they view QIO services and information as valuable?

3. What types of training or assistance do providers desire from their QIOs?

4. Besides QIOs, what other resources on quality improvement do providers consult and which do they prefer?

D. CHALLENGES TO THE CURRENT ASSESSMENT OF THE EIGHTH SOW

Although there were limitations to each of the study components, we note two major challenges to the impact analyses of the Medicare Compare data. First, our lack of individual provider-level data on which providers worked or did not work with their QIOs precluded many analytic approaches for isolating program impacts from quasi-experimental data. We were able to develop estimates of QIO impacts from state-level variations in QIO efforts, however, that are valid under certain assumptions. Second, as described in the chapter on the provider survey results (Chapter IV), a substantial proportion of *non*-IPGs reported receiving assistance from QIOs, in effect "contaminating" the group of providers against which the IPGs are being compared. This contamination complicates interpretation of estimated IPG and non-IPG effects.

E. THE REMAINDER OF THIS REPORT

Chapter II presents the results of the analyses of the Medicare Compare data. Chapter III describes our findings from the mechanisms and case study analysis. Chapter IV contains the descriptive analysis of provider satisfaction data. Chapter V summarizes our conclusions. Each chapter briefly outlines the study methods for that component; the appendixes contain detailed descriptions of study methodology.

II. RESULTS OF DESCRIPTIVE AND IMPACT ANALYSES

In this chapter we present results by provider type for each of the research questions for the descriptive and impact analyses of the Medicare Compare data. We analyzed *changes* in quality measures (that is, the difference between follow-up values collected toward the end of the Eighth Scope of Work (SOW) and initial values collected near the beginning of the Eighth SOW contract).[1] There were four quality measures for nursing homes; nine measures for home health agencies (seven measures of patient functioning, one measure for whether the home health episode ended with an acute care hospitalization (ACH), and one measure for whether the home health episode ended with a discharge from home health care with the patient at home); and 12 measures of hospital care (10 Appropriate Care Measures [ACMs] for treatment of heart attacks, heart failure, and pneumonia, and two measures of perioperative care from the Surgical Care Improvement Project or SCIP). For home health agencies, the seven patient functioning measures were combined into a single index. For hospitals, the 10 ACM measures and two SCIP measures were each combined into two indexes by averaging measures in each set together. Table II.1 lists the measures.

Provider-level results for nursing homes and hospitals were weighted by the number of patients in each facility (information contained in the Nursing Home Compare and Hospital Compare datasets). Home health agency results are not weighted, because Home Health Compare contains no information on numbers of patients served or numbers of home health

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[1] The baseline and follow-up periods for the three provider settings varied because of differences in the data collection schedules for Medicare Compare; for nursing homes data collection occurred in the second quarter of 2005 and the first quarter of 2008; for home health agencies it took place from September 2004 through August 2005 and March 2007 through February 2008; and for hospitals data collection occurred from July 2004 through June 2005 and October 2006 through September 2007.

TABLE II.1

STUDY QUALITY MEASURES

Measure Name	Description
Nursing Homes	
Percent of High-Risk Long-Stay Residents who have Pressure Ulcers	Pressure sores are skin wounds that usually develop on bony parts of the body. They may be painful, and may take a long time to heal or cause other complications, such as skin and bone infections.
Percent of Long-Stay Residents who were Physically Restrained	A physical restraint is any device, material, or equipment that keeps a resident from moving freely. A resident who is restrained daily can become weak and develop other medical complications.
Percent of Long-Stay Residents who Experience Depression	Depression is a medical problem of the brain that can affect how you think, feel, and behave. Anxiety is excessive worry and can include trembling, muscle aches, and irritability. Nursing home residents are at a high risk for developing depression and anxiety for many reasons, such as loss of a spouse, separation from family members, illness, chronic pain, difficulty adjusting to the nursing home, and frustration with memory loss.
Percent of Long-Stay Residents who Experience Chronic Pain	Residents in pain may become depressed or have an overall poor quality of life. In most cases, a resident in pain can be made more comfortable.
Home Health Agencies	
Acute Care Hospitalization	Percentage of patients who were admitted to the hospital
Improvement in Bathing	Percentage of patients who get better at bathing
Improvement in Transferring	Percentage of patients who get better at getting in and out of bed
Improvement in Ambulation/Locomotion	Percentage of patients who get better at walking or moving in a wheelchair safely
Improvement in Management of Oral Medications	Percentage of patients who get better at taking their medicines correctly (by mouth)
Improvement in Pain Interfering with Activity	Percentage of patients who have less pain when moving around
Improvement in Dyspnea	Percentage of patients whose level of shortness of breath has improved
Improvement in Urinary Incontinence	Percentage of patients who get better at getting to and from the toilet
Discharge to Community	Percentage of patients who are discharged and continue to live at home
Hospitals	
Heart Attack (ACM Measures)	
Aspirin at Arrival	Patients without aspirin contraindications who received aspirin within 24 hours before or after hospital arrival.
Aspirin Prescribed at Discharge	Patients without aspirin contraindications who are prescribed aspirin at hospital discharge.
ACE Inhibitor or ARB for LVSD	Patients with left ventricular systolic dysfunction (LVSD) and without both ACE inhibitor and ARB contraindications who are prescribed an ACE inhibitor or ARB at hospital discharge. For purposes of this measure, LVSD is defined as chart documentation of a LVEF less than 40% or a narrative description of left ventricular systolic (LVS) function consistent with moderate or severe systolic dysfunction.
Beta Blocker Prescribed at Discharge	Patients without beta blocker contraindications who are prescribed a beta blocker at hospital discharge.
Beta Blocker at Arrival	Patients without beta blocker contraindications who received a beta blocker within 24 hours after hospital arrival.
Heart Failure (ACM Measures)	
Evaluation of LVS Function	Patients with documentation in the hospital record that LVS function was evaluated before arrival, during hospitalization, or is planned for after discharge.

TABLE II.1 *(continued)*

Measure Name	Description
ACE Inhibitor or ARB for LVSD	Patients with LVSD and without both ACE inhibitor and ARB contraindications who are prescribed an ACE inhibitor or ARB at hospital discharge. For purposes of this measure, LVSD is defined as chart documentation of a LVEF less than 40% or a narrative description of LVS function consistent with moderate or severe systolic dysfunction.
Pneumonia (ACM Measures)	
Oxygenation Assessment	Patients whose arterial oxygenation was assessed by arterial blood, gas, or pulse oximetry within 24 hours prior to or after hospital arrival.
Pneumococcal Vaccination	Patients, age 65 and older, who were screened for pneumococcal vaccine status and vaccinated prior to discharge, if indicated.
Initial Antibiotic Received within 4 Hours of Hospital Arrival	Patients who received their first dose of antibiotics within 4 hours after arrival at the hospital.
Surgical Care Improvement (SCIP)/Surgical Infection Prevention	
Receipt of Prophylactic Pre-operative Antibiotic	Percent of surgery patients who were given an antibiotic at the right time (within one hour before surgery) to help prevent infection
Discontinuation of Prophylactic Pre-operative Antibiotic	Percent of surgery patients whose preventive antibiotics were stopped at the right time (within 24 hours after surgery)

Source: Centers for Medicare and Medicaid Services. (2006, January). *Medicare Quality Improvement Organization Program Priorities*.

ACE = angiotensin-converting enzyme; ARB = angiotensin receptor blocker; LVEF = left ventricular ejection fraction; ACM = appropriate care measure.

episodes (each home health agency is thus given a weight of one). We calculated state level descriptive results by averaging the provider-level results, weighted by number of patients in the case of nursing homes and hospitals. Appendix A contains a detailed description of the study sample, study measures, and analytic approaches.

A. HAS THE QUALITY OF CARE RECEIVED BY PATIENTS SERVED BY MEDICARE PROVIDERS IMPROVED NATIONWIDE?

As detailed below, there was substantial improvement nationwide across the three provider settings in the great majority of measures.

1. Nursing Homes

Three of the four nursing home change measures—reduction in the prevalence of pressure ulcers, reduction in the use of physical restraints, and reduction in the percentage of patients experiencing chronic pain—improved nationwide during the period covered by the Eighth SOW (Table II.2). A negative change in any of these measures is an improvement, as it means there is a smaller percentage of patients with one of these adverse outcomes in the follow-up period.

At the beginning of the SOW (baseline), relatively small proportions of patients—between 5 and 14 percent—were experiencing these outcomes. The largest reductions occurred for use of physical restraints and prevalence of chronic pain. Those raw reductions were 2.0 and 1.5 percentage points respectively, from corresponding baseline levels of 6.5 percent and 5.4 percent. The reduction in pressure ulcer prevalence was substantially smaller—0.56 percentage points—from a baseline level of 13.3. No reduction was observed in the fourth measure, the percentage of residents experiencing worsening depression or anxiety. In fact, that figure increased slightly, about 0.15 percentage points, from a baseline level of 13.6 percent.[2]

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[2] All results were produced by weighting providers by the total number of residents in their facilities. Results are similar if each provider is weighted equally, regardless of size.

TABLE II.2

NATIONAL AVERAGES OF NURSING HOME QUALITY MEASURES, QIO 8TH SOW

Quality Measure—Percentage of Long-Stay Residents:	Baseline	Followup	Change	Percentage of Providers Improved/Declined[b]	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile
Who Have Pressure Ulcers[a]	13.33	12.77	-0.56***	50.7/43.0	-9	-5	-1	4	8
(St. Dev.)	(7.05)	(6.88)	(7.31)						
Number	7,594	7,594	7,594						
Who Were Physically Restrained	6.54	4.51	-2.04***	53.0/25.0	-9	-4	-1	1	3
(St. Dev.)	(7.34)	(5.68)	(6.02)						
Number	10,676	10,676	10,676						
With Worsening Depression/Anxiety	13.62	13.76	0.14**	47.0/47.0	-10	-5	0	5	11
(St. Dev.)	(8.47)	(8.83)	(8.94)						
Number	10,537	10,537	10,537						
Who Experience Moderate to Severe Pain	5.40	3.85	-1.54***	56.5/29.2	-7	-3	-1	1	3
(St. Dev.)	(5.09)	(3.88)	(5.10)						
Number	10,548	10,548	10,548						

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: Results weighted by each nursing home's total number of patients. Negative changes are improvements; for example, a -2.0 percentage point change in the restraint measure means a *smaller* proportion of patients were physically restrained at followup than at baseline. Percentiles refer to the distributions of the change variables.

**p<.05; ***p<.01 (Two-tailed tests of change between baseline and follow-up.)

[a] High-risk residents only.

[b] Figures do not sum to 100 percent because some providers had no change between baseline and followup. The percentage with no change is particularly high for physical restraints. Most of those reported no use of physical restraints at either point in time. Rates in Nursing Home Compare are rounded to the nearest one percent.

QIO = quality improvement organization.

SOW = statement of work.

St. Dev. = standard deviation.

To provide a better sense of the magnitudes of change and the proportion of nursing homes experiencing change, Table II.2 also presents selected quantiles of the change distributions. For example, for the pain measure, 10 percent of nursing homes had improvements of seven percentage points or more, 25 percent had improvements of three points or more, half had improvements of (the median) one point or more, 25 percent had worsening of one percentage point or more, and 10 percent had worsening of three percentage points or more. Because the median was at a one percentage point improvement, slightly more than half (57 percent) of the facilities had any improvement (that is, a non-zero change).

2. Home Health Agencies

Nationwide, improvement occurred on all measures studied: acute care hospitalization (ACH), discharge to community from the home health agency (HHA), and patient functioning measures (Table II.3). Note that each of the patient functioning measures represents the percentage of patients who improved in the specified area of functioning between admission and discharge from home health care. We then analyzed these agency-level data reported by agencies during the study baseline and follow-up periods (that is, toward the beginning and end of the Eighth SOW).[3] To say that an *HHA* improved on the improvement in bathing measure, for example, means that a higher proportion of the agency's patients in the study follow-up period made progress in bathing while in home health care than did so in the study baseline period.

Average improvements were larger for the functioning measures than for ACH and discharge to community (note that lower scores are better for ACH, and higher scores are better for the remaining measures), ranging from 1.4 to 5.4 percentage points. Those scores represent gains of 0.11 to 0.58 standard deviations relative to the baseline distribution. The improvements

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[3] The study baseline period was September 2004 through August 2005. The study follow-up period was March 2007 through February 2008.

TABLE II.3

NATIONAL AVERAGES OF HOME HEALTH QUALITY MEASURES, QIO 8TH SOW (PERCENTAGES)

Quality Measure—Percentage of Long-Stay Residents:	Baseline	Followup	Change	Percentage of Providers Improved/Declined[b]	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile
Acute Care Hospitalization	31.06	30.58	-0.48***	48.0/46.1	-11	5	0	4	9
(St. Dev.)	(11.00)	(9.46)	(8.67)						
Number	6,308	6,308	6,308						
Improvement in Bathing	60.18	62.57	2.39***	59.0/36.9	-10	-4	2	8	15
(St. Dev.)	(10.60)	(10.87)	(10.95)						
Number	5,767	5,767	5,767						
Improvement in Transferring	50.26	51.69	1.43**	52.5/43.9	-13	-6	1	8	17
(St. Dev.)	(12.31)	(12.38)	(12.82)						
Number	5,532	5,532	5,532						
Improvement in Ambulation/Locomotion	36.84	42.40	5.36***	72.1/23.9	-6	0	5	11	17
(St. Dev.)	(9.28)	(8.84)	(9.97)						
Number	5,751	5,751	5,751						
Improvement in Management of Oral Medications	37.79	41.26	3.46***	62.0/34.4	-10	-3	3	10	17
(St. Dev.)	(10.48)	(10.98)	(11.59)						
Number	5,329	5,329	5,329						
Improvement in Pain Interfering with Activity	60.05	63.01	2.96***	58.0/37.9	-12	-4	2	10	19
(St. Dev.)	(12.46)	(13.01)	(13.22)						
Number	5,603	5,603	5,603						
Improvement in Dyspnea	55.76	58.44	2.68***	57.9/38.3	-13	-5	2	10	19
(St. Dev.)	(13.60)	(14.07)	(13.82)						
Number	5,539	5,539	5,539						
Improvement in Urinary Incontinence	45.68	47.39	1.70***	50.8/46.1	-17	-8	1	11	21
(St. Dev.)	(14.88)	(14.95)	(15.73)						
Number	4,869	4,869	4,869						

TABLE II.3 *(continued)*

Quality Measure— Percentage of Long-Stay Residents:	Baseline	Followup	Change	Percentage of Providers Improved/ Declined[b]	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile
Discharge to Community	64.71	65.31	0.60***	49.0/45.9	-10	-5	0	5	12
(St. Dev.)	(11.89)	(10.28)	(9.21)						
Number	6,298	6,298	6,298						

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: Results weighted by each nursing home's total number of patients. With the exception of Acute Care Hospitalization, positive changes are improvements; for example, a 2 percentage point change in the improvement in bathing measure means that more patients improved in their ability to bathe during their home health care episode in the follow-up period than in the baseline period. In contrast, a negative change in Acute Care Hospitalization measure is an improvement, as it means fewer patients were hospitalized in the follow-up period than in the baseline period.

*p<.10; **p<.05; ***p<.01 (Two-tailed tests of change between baseline and follow-up.)

[a] High-risk residents only.

[b] Figures do not sum to 100 percent because some providers had no change between baseline and followup. The percentage with no change is particularly high for physical restraints. Most of those reported no use of physical restraints at either point in time. Rates in Nursing Home Compare are rounded to the nearest one percent.

QIO = quality improvement organization.

SOW = statement of work.

St. Dev. = standard deviation.

in ACH and discharge were each only about 0.5 percentage points—gains of roughly 0.05 standard deviations relative to the baseline distributions of each.

Although average performance did improve on all measures, outcomes for a substantial number of HHAs did not improve during the Eighth SOW, as shown in the far right-hand column of Table II.3. Nearly three-quarters of HHAs reported higher levels of the patient ambulation/locomotion measure at followup. But on each of the other measures, at least one-third of HHAs reported lower levels at followup than they had at baseline. For acute care hospitalization, 48 percent of HHAs improved, 46 percent declined, and 6 percent reported no change; as expected, the median is around zero.

3. Hospitals

Table II.4 presents data on quality of care as measured by the 10-item index of ACM items and the two item SCIP index—timely provision of antibiotics before and after surgery. Substantial improvement occurred nationwide on both the ACM and SCIP indexes, with the magnitude of the average change during the three-year period equaling roughly one standard deviation of the baseline distribution (Table II.4). The variance in levels of performance on each outcome also narrowed between baseline and followup. This is partially due to ceiling effects, as performance on several of the component items surpassed 95 percent by the end of the SOW, and performance on all items was at least 80 percent (see Appendix Table D.4 for descriptive statistics on individual items). Improvement was widespread across providers, with nearly 95 percent reporting a better ACM index at followup than at baseline. The corresponding figure for the SCIP index was 93 percent.

These numbers are calculated by weighting providers by the total number of relevant patients. In analyses in which hospitals are weighted equally, the levels at both baseline and

TABLE II.4

PROVIDER-LEVEL NATIONAL AVERAGES OF HOSPITAL QUALITY MEASURES, QIO 8TH SOW (PERCENTAGES)

Quality Measure	Baseline	Followup	Change	Percentage of Providers Improving/Declining	10th Percentile	25th Percentile	Median	75th Percentile	90th Percentile
ACM	85.71	92.79	7.09***	94.8/4.6	1.5	4.7	9.4	85.0	98.0
(St. Dev.)	(6.20)	(4.46)	(5.19)						
Number	2,377	2,377	2,377						
SCIP	70.65	87.21	16.56***	93.1/6.0	0.0	6.5	15.0	27.5	61.0
(St. Dev.)	(14.53)	(8.31)	(12.74)						
Number	1,257	1,257	1,257						

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: The ACM (Appropriate Care Measure) scale is a summative index of the percentage of relevant patients receiving each of 10 treatments, respectively, for acute myocardial infarction, heart failure, and pneumonia (see list in Table II.1). The SCIP (Surgical Care Improvement Project) index is the average of two measures: the percentage of cases in which an antibiotic was provided within an hour prior to surgical incision, and the percentage in which antibiotics were discontinued in a timely manner after the end of surgery. Providers are weighted by the average number of patients whose records were used to create the component outcome measures of the each index.

***p<.01 (two-tailed tests).

[a] Figures do not sum to 100 percent because some providers had no change between baseline and followup. Rates in Hospital Compare are rounded to the nearest one percent.

ACM = appropriate care measure

SCIP = Surgical Care Improvement Project

SOW = statement of work

St. Dev. = standard deviation.

followup are slightly (one or two percentage points) lower, suggesting that larger hospitals might have had somewhat higher performance.

B. DID MOST STATES IMPROVE OVER THE EIGHTH SOW?

Most states did, in fact, improve in state-level averages of the measures although improvement was not universal.

1. Nursing Homes

The state-level changes show improvement on the same three measures as in the preceding provider-level analyses, and slight deterioration in worsened depression or anxiety, where state-level changes were calculated by averaging across all providers in a state (Table II.5). The average improvements differ slightly from the averages presented in Table II.2 because each state is weighted equally, so smaller states have relatively more influence; however the results are similar in both cases.

The largest average improvements were observed in the rate of moderate-to-severe pain and use of physical restraints. Nursing homes in all states improved on the pain measure, and facilities in all but two states lowered the prevalence of physical restraint use. In both measures there was relatively little state-to-state variation around the average value, as the interquartile range was only one to two percentage points. Two-thirds of the states (35 of 51) experienced a reduction in pressure ulcers, again with a relatively narrow interquartile range of one percentage point reduction to a quarter point increase, suggesting that few states made any substantial progress.

There was lack of overall progress across states in reducing worsened depression and anxiety among nursing home residents, with only 24 of 51 states improving. States tended to show little movement in either direction, with all states in the interquartile range experiencing changes of less than one percentage point in either direction.

TABLE II.5

STATE-LEVEL AVERAGES OF NURSING HOME QUALITY MEASURES, QIO 8TH SOW (PERCENTAGES)

Quality Measure	Baseline Level, Average	Follow-Up Level, Average	Change, Average	RFR Average[c]	25th Percentile of Change Distribution	75th Percentile of Change Distribution	Number of States Improving (Out of 51)[b]
Pressure Ulcers[a]	12.24	11.96	-0.29	0.02	0.23	-1.05	35
(St. Dev.)	(2.73)	(2.39)	(1.61)				
Physical Restraints[a]	5.98	3.97	-2.01**	0.34	-0.96	-2.19	49
(St. Dev.)	(3.46)	(2.16)	(1.66)				
Depression/Anxiety[a]	14.93	14.95	0.02	-0.001	0.81	-0.56	24
(St. Dev.)	(0.95)	(5.09)	(1.64)				
Pain[a]	5.79	3.99	-1.80**	0.31	-1.06	-2.35	51
(St. Dev.)	(1.88)	(1.33)	(0.85)				

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (follow-up).

Note: Sample size is 51 (50 states plus the District of Columbia). State averages are calculated as averages of provider-level change, weighted by number of patients. States are weighted equally in national averages across states. As a result of the equal weighting, providers in smaller states have proportionally greater influence on the averages, causing the figures to differ slightly from the provider-level calculations in Table III.1.

**p<.05 (two-tailed tests).

[a] Pressure Ulcers = percentage of high-risk long-stay residents with pressure sores; Physical Restraints = percentage of long-stay residents who were physically restrained; Depression/Anxiety = percentage of long-stay residents who have become more depressed or anxious; Pain = percentage of long-stay residents who have moderate to severe pain.

[b] Reflects the number of states in which average performance on the measure was higher at followup than at baseline.

[c] RFR is the reduction in the failure rate. It represents the average change as a proportion of the total possible improvement. For outcomes such as those in this table in which lower levels are better, it is calculated as change divided by baseline level and multiplied by (-1).

St. Dev. = standard deviation.

2. Home Health Agencies

Quality generally improved across states, as measured by the HHA summary index of patient functioning (that combined the seven individual items) and by the ACH measure (Table II.6). The improvements were widespread across states, especially for the patient functioning index, which improved in 48 of 51 states. Across the interquartile range, increases were between 1.9 and 4.0 percentage points. Most states experienced improvements in the ACH measure, although roughly one-third—16 of 51—did not.

3. Hospitals

When aggregated to the state level, hospitals' performance improved on both the ACM and SCIP indexes in all 51 states (Table II.7). Improvement did vary somewhat across states, but substantial progress was observed in nearly all. On average, performance on the ACM index rose by 6.7 percentage points, with the 25th and 75th percentiles for growth being 5.9 and 7.5 percentage points, respectively. Average improvement on the SCIP index was 15.4 percentage points, with an interquartile range of 11.9 to 18.6 percentage points. Results are similar whether or not providers are weighted by size to create state-level aggregates (results not shown). When the aggregate figures were produced for each state, all states were weighted equally when averaging across states. That equal weighting causes the means in Table II.7 to differ slightly from those in Table II.4 (the provider-level national averages for hospitals).

C. WHICH STATES DID WELL IN MEASURES FOR ONE SETTING AND FOR MULTIPLE SETTINGS?

1. States with High Performance in Nursing Home Measures

Although the states' performance across areas was generally not strongly correlated, some states did establish a fairly strong record of improvement. Table II.8 lists the 12 states that

TABLE II.6

STATE-LEVEL AVERAGES OF HOME HEALTH QUALITY MEASURES,
QIO 8TH SOW (PERCENTAGES)

Quality Measure	Baseline Level, Average	Follow-Up Level, Average	Change, Average	RFR, Average[a]	25th Percentile Distribution of Change	75th Percentile Distribution of Change	Number of States Improving (Out of 51)[c]
Acute Care Hospitalization	29.42	28.84	-0.58*	0.02	-1.47	1.10	35
(St. Dev.)	(5.05)	(4.07)	(2.27)				
Patient Functioning[b]	49.55	52.33	2.78**	0.06	1.88	4.02	48
(St. Dev.)	(2.75)	(2.68)	(1.99)				

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: These figures might differ from the provider-level calculations. All states are weighted equally; as a result, smaller states have proportionally more influence than they do on the averages presented in Table II.3.

*p<.10; **p<.05 (two-tailed tests).

[a] RFR is the reduction in the failure rate. It represents the average change as a proportion of the total possible improvement. The RFR for acute care hospitalization equals the average change divided by the average baseline level, multiplied by (-1). The RFR average for patient functioning equals the average change level divided by 100 minus the baseline average level.

[b] *Patient functioning* is a scale capturing the mean of the items measuring improvement in bathing, transferring, ambulation/locomotion, management of oral medications, pain interfering with activity, dyspnea, and urinary incontinence.

[c] Reflects the number of states whose average performance on the measure was higher at followup than at baseline.

St. Dev. = standard deviation.

QIO = quality improvement organization.

TABLE II.7

STATE-LEVEL AVERAGES OF HOSPITAL QUALITY MEASURES, QIO 8TH SOW
(PERCENTAGES)

Quality Measure	Baseline Level, Average	Follow-Up Level, Average	Change, Average	RFR, Average[a]	25th Percentile Distribution of Change	75th Percentile Distribution of Change	Number of States Improving (Out of 51)[b]
ACM	86.23	92.88	6.65	0.48**	5.91	7.47	51
(St. Dev.)	(2.56)	(1.96)	(1.34)				
SCIP	70.82	86.26	15.44	0.53**	11.89	18.59	51
(St. Dev.)	(7.65)	(4.27)	(4.85)				

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: Sample size equals 51 (50 states plus the District of Columbia). State averages are calculated as averages of provider-level change, weighted by numbers of patients. States are weighted equally in national averages across states. As a result of the equal weighting, providers in smaller states have proportionally greater influence, causing the figures to differ slightly from the provider-level calculations in Table II.4.

**$p<.05$ (two-tailed tests).

[a] RFR is the "reduction in the failure rate." It represents the average change as a proportion of the total possible improvement. For outcomes such as SCIP and ACM, in which higher scores represent more positive outcomes, the RFR is calculated as the average change level divided by 100 minus the baseline average level.

[b] Reflects the number of states whose average performance on the measure was higher at followup than at baseline.

ACM = appropriate care measure; SCIP = Surgical Care Improvement Project; SOW = statement of work; St. Dev. = standard deviation.

TABLE II.8

ADJUSTED *z*-SCORES OF QUALITY CHANGE IN CONSISTENTLY HIGH
IMPROVING STATES, 8TH SOW NURSING HOME OUTCOMES

| State | Improvement (Standardized) in Percentage of Long-Stay Residents: | | | | Average Across Measures |
	With Pressure Ulcers[a]	Who Were Physically Restrained	With Worsening Depression/ Anxiety	With Moderate to Severe Pain	
Nevada	-0.97	-1.60	-2.43	0.17	-1.21
Delaware	-2.29	-0.36	-1.22	-0.84	-1.18
North Carolina	-0.44	-2.25	-0.16	-1.03	-0.97
Arkansas	0.78	-2.00	-0.89	-1.75	-0.97
Nebraska	-0.97	-0.38	0.35	-1.30	-0.57
Arizona	-0.08	-2.02	-0.38	0.22	-0.56
New Hampshire	-0.93	-1.34	0.39	-0.37	-0.56
South Carolina	0.06	-0.59	-0.14	-1.08	-0.44
New Mexico	-0.40	1.79	-1.66	-1.40	-0.42
Wyoming	-1.12	-0.93	0.65	-0.21	-0.40
Alabama	-0.45	-0.35	0.17	-0.81	-0.36
Connecticut	-0.74	-0.56	-0.25	0.17	-0.34

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: Performance is calculated using three-year change adjusted for baseline. The adjusted change measure is then standardized to have a mean of zero and a standard deviation of one. "Consistently high improving" is defined as performing above the mean on at least three of the four outcomes of pressure ulcers, physical restraints, depression, and chronic pain, and whose average improvement across all four was at least one-fifth of a standard deviation better than the mean (average *z*-score of -0.2 or below). State-level means are calculated by weighting nursing homes by their total number of residents.

[a] High-risk residents only.

SOW = statement of work.

(1) had above-average improvement (across all states) on at least three of the four measures and (2) saw average improvement at least one-fifth of a standard deviation above the mean for all states across the four measures. The table also shows the standardized performance of these 12 states relative to the mean on each of the four measures, as well as the overall average. The states vary in size and region of the country. Several mountain west states (Arizona, Nevada, New Mexico, and Wyoming) are near the top of the list, however. Five states—Arizona, Florida, Nevada, North Carolina, and Tennessee—experienced above-average improvement on every measure.

2. States with High Performance in Home Health Agency Measures

Table II.9 lists 11 states whose improvement was above the mean for all states' averages on both the patient functioning index and ACH. The average performance on the two measures was also at least one-fifth of a standard deviation above the cross-state mean. The states are geographically dispersed and vary from large to small in population. The District of Columbia stood out with particularly large improvement on both indicators, moving from a middle-to-low-ranked performer at baseline to the top 10 at followup.

3. States with High Performance in Hospital Measures

Table II.10 lists consistently high-improving states in the hospital measures. The fifteen states each experienced above-average growth—adjusted for baseline—on both the ACM and SCIP indexes, and their mean growth on the two was at least one-fifth of a standard deviation above average. States on the list represent a range of regions. Large states—including California, Florida, Illinois, Pennsylvania, and Texas—are disproportionately represented on the list. South Carolina is on the list of highest-improving states for hospitals and is the only state to be among the consistently high improvers for all three provider types.

TABLE II.9

ADJUSTED *z*-SCORES OF QUALITY CHANGE IN CONSISTENTLY HIGH
IMPROVING STATES, 8TH SOW HHA OUTCOMES

| State | Improvement (Standardized) | | |
	Acute Care Hospitalization[a]	Patient Functioning[b]	Average Across Measures
District of Columbia	-4.29	2.30	3.29
Utah	-2.01	1.10	1.56
South Carolina	-0.83	1.52	1.18
Georgia	-0.73	1.46	1.10
New Jersey	-0.02	1.29	0.66
Arkansas	-0.35	0.82	0.58
North Dakota	-0.88	0.27	0.57
Massachusetts	-0.44	0.70	0.57
Idaho	-0.84	0.19	0.51
Missouri	-0.28	0.64	0.46
Michigan	-0.10	0.34	0.22

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: State-level means are calculated weighting all providers equally. Performance is calculated using change adjusted for baseline. The adjusted change measure is then standardized to have a mean of zero and standard deviation of one. "Consistently high improving" is defined as performing above the mean on both outcomes, and having average improvement on both outcomes of at least one-fifth of a standard deviation above the mean (average *z*-score of 0.2 or above).

[a]Acute care hospitalization is reversed (multiplied by -1) in calculating the average, so that a higher figure represents greater improvement on both measures and on the average.

[b]*Patient functioning* is an index capturing the mean of the items measuring improvement in bathing, transferring, ambulation/locomotion, management of oral medications, pain interfering with activity, dyspnea, and urinary incontinence.

HHA = home health agency

SOW = statement of work

QIO = quality improvement organization.

TABLE II.10

ADJUSTED *z*-SCORES OF QUALITY CHANGE IN CONSISTENTLY
HIGH-IMPROVING STATES, 8TH SOW HOSPITAL OUTCOMES

State	Improvement (Standardized)		Average Across Measures
	ACM	SCIP	
Vermont	2.24	1.19	1.72
Minnesota	0.17	2.16	1.16
California	1.28	0.85	1.07
Texas	1.65	0.25	0.95
New Hampshire	0.10	1.78	0.94
Pennsylvania	0.31	1.20	0.76
Florida	0.97	0.40	0.68
North Carolina	0.47	0.82	0.64
Massachusetts	0.17	1.09	0.63
South Carolina	1.06	0.06	0.56
Oregon	0.37	0.41	0.39
Oklahoma	0.61	0.07	0.34
Illinois	0.33	0.32	0.32
Georgia	0.03	0.58	0.31
Ohio	0.11	0.33	0.22

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: State-level means are calculated by weighting hospitals by their average total number of patients used to report each component item in the measure. Performance is calculated using three-year change regression-adjusted for baseline levels. The adjusted change measure is then standardized to have a mean of zero and standard deviation of one. "Consistently high improving" is defined as (1) improving more than the nationwide average on both the ACM and SCIP indexes and (2) having average improvement across the two that was at least one-fifth of a standard deviation greater than the mean (average *z*-score of 0.2 or above).

ACM = appropriate care measure.

SCIP = Surgical Care Improvement Project.

SOW = statement of work.

4. States with High Performance in Measures for More Than One Setting

Among the states identified above that were high performing in one of the settings, five had high performance in two settings, and one was a high-performing state in all three (Table II.11). Table II.11 also lists the states that were high performing in only of the settings.

D. DO PROVIDERS AND STATES THAT DID WELL IN ONE SET OF MEASURES ALSO DO WELL IN OTHERS?

Correlations across measures depended on provider setting and measure. For some measures, there were at most moderate-sized correlations; other measures exhibited little correlation.

1. Provider Level

a. Did nursing homes that did well in one measure also do well in others?

Improvement on one measure does little to predict improvement on others. Although not strong, the correlations of improvement across the four measures are positive in all but one case (Table II.12). The average correlation is 0.03 and the largest (between pressure ulcers and depression) is 0.057. This suggests that the measures are essentially independent of each other. Measurement error or imprecision in the measures can also reduce correlations between the measures.[4]

b. Do home health agencies that did well in one measure also do well in others?

Improvement on one measure of patient functioning was moderately associated with improvement on other functioning measures. All pairs of measures are correlated in the direction expected, with an average magnitude of 0.43 (Table II.13). The ACH and patient discharge measures are very highly correlated ($r = -0.93$). This might be expected because a patient is not

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[4] Results are substantively unchanged by the choice to weight or not weight providers by size.

TABLE II.11

HIGH-PERFORMING STATES IN MORE MULTIPLE PROVIDER SETTINGS
AND IN ONE SETTING ONLY

State	High-Performing in Nursing Home Outcomes	High-Performing in Home Health Outcomes	High-Performing in Hospital Outcomes
AR	X	X	
NC	X		X
NH	X		X
GA		X	X
MA		X	X
SC	X	X	X
AL	X		
AZ	X		
CT	X		
DE	X		
NE	X		
NM	X		
NV	X		
WY	X		
DC		X	
ID		X	
MI		X	
MO		X	
ND		X	
NJ		X	
UT		X	
CA			X
FL			X
IL			X
MN			X
OH			X
OK			X
OR			X
PA			X
TX			X
VT			X

Source: Medicare Compare data

Note: State-level means of measures for each provider setting were calculated weighting all providers equally. Performance was calculated using change adjusted for baseline. The adjusted change measures were then standardized to have a mean of zero and standard deviation of one. "Consistently high improving" was defined as performing above the mean on all outcomes for the provider setting, and having average improvement on all outcomes of at least one-fifth of a standard deviation above the mean (average z-score of 0.2 or above).

TABLE II.12

PROVIDER-LEVEL CORRELATIONS OF CHANGE ACROSS
8TH SOW NURSING HOME OUTCOMES

	Percentage of High-Risk Residents with Pressure Ulcers[a]	Percentage of Residents Physically Restrained[a]	Percentage of Residents with Worsening Depression/ Anxiety[a]	Percentage of Residents who Experience Chronic Pain[a]
Pressure Ulcers	1.00			
Physical Restraints	-0.005	1.00		
Depression/ Anxiety	0.057	0.019	1.00	
Pain	0.042	0.030	0.055	1.00

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: Sample size for each pair depends on the number of nonmissing observations. The least reported measure is rressure ulcers; sample sizes for correlations between pressure ulcers and other measures range from 7,579 to 7,591. Sample sizes used to produce the other correlations range from 10,492 to 10,676. Providers are weighted by total numbers of patients.

[a] All outcomes are for long-stay residents.

SOW = statement of work.

TABLE II.13

PROVIDER-LEVEL CORRELATIONS OF CHANGE ACROSS
8TH SOW HOME HEALTH OUTCOMES

	Ambulation	Transferring	Urinary Incontinence	Pain	Bathing	Oral Meds	Dyspnea	Discharge	ACH
Improvement in Ambulation/ Locomotion	1.00								
Improvement in Transferring	0.55	1.00							
Improvement in Urinary Incontinence	0.26	0.35	1.00						
Improvement in Pain Interfering with Activity	0.37	0.36	0.34	1.00					
Improvement in Bathing	0.59	0.51	0.37	0.44	1.00				
Improvement in Management of Oral Medications	0.47	0.42	0.39	0.35	0.57	1.00			
Improvement in Dyspnea	0.41	0.43	0.43	0.48	0.50	0.41	1.00		
Discharge to Community	0.13	0.12	0.11	0.09	0.16	0.12	0.11	1.00	
Acute Care Hospitalization	-0.09	-0.09	-0.10	-0.01	-0.12	-0.09	-0.09	-0.93	1.00

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: Sample size for each pair depends on the number of nonmissing observations, and ranges from 5,145 to 6,027. All providers are weighted equally.

ACH = acute care hospitalization.

SOW = statement of work.

QIO = quality improvement organization.

discharged from HHA care to home if he or she is hospitalized. However, the functioning measures are only weakly correlated with the ACH and discharge measures, with coefficients around 0.10. This suggests the ACH and discharge measures and the patient functioning measures assess two distinct domains of HHA quality, with performance on one not necessarily translating to performance on the other.c.   Did hospitals that performed well in one measure also do well in others?

There was only a modest association across hospitals in improvement among different measures of quality of care. The correlation between improvement on the ACM index and the SCIP index was 0.25. Correlations between the individual items from both indexes were also nearly all positive, though generally not large (see Appendix Table D.5).

2. State Level

a. Nursing homes: Did states that did well in one domain of quality also do well in others?

There was also little correlation at the state level between improvement in one measure and improvement in others (Table II.14). These are state-level correlations between rates of improvement for the different measures adjusted for baseline levels, weighted by providers' total number of patients. None of the correlations are large and some are negative, demonstrating that there was little consistency across measures in which states improved most. Equal weighting of providers produces slightly larger correlation coefficients (bottom of Table II.14),[5] but the magnitudes all are still less than 0.25, with an average coefficient of only 0.14. Overall, the results suggest that, as with the provider-level results, state-level improvement in one area is not a strong predictor of improvement in others.

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[5] We present the unweighted results here to show the differences from the weighted results. In other cases we omit the unweighted results because they are qualitatively the same as the weighted results.

TABLE II.14

STATE-LEVEL CORRELATIONS OF CHANGE ACROSS
8TH SOW NURSING HOME OUTCOMES

Weighted Correlations

	Percentage of High-Risk Long-Stay Residents Who Have Pressure Ulcers	Percentage of Long-Stay Residents Who Were Physically Restrained	Percentage of Long-Stay Residents with Depression/ Anxiety	Percentage of Long-Stay Residents with Moderate to Severe Pain
Pressure Ulcers	1.00			
Physical Restraints	0.164	1.00		
Depression/ Anxiety	-0.090	-0.076	1.00	
Pain	0.113	0.115	0.117	1.00

Unweighted Correlations

Pressure Ulcers	1.00			
Physical Restraints	0.166	1.00		
Depression/ Anxiety	0.132	0.100	1.00	
Pain	0.248	0.137	0.072	1.00

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: Sample size is 51 (50 states plus the District of Columbia). State averages used in top panel are calculated as averages provider-level change, weighted by total numbers of patients. Those in the bottom panel weight all providers equally when creating state averages. States are weighted equally in calculating the correlations in both cases.

SOW = statement of work.

b. Did states that did well in one domain of home health quality also do well in others?

Across states, increases in patient functioning were modestly associated with reductions in ACH. The state-level correlation between the two measures was -0.28. State-level correlations between the individual items were broadly similar to the correlations at the provider level in Table II.13 and are not shown. The fact that the composite measures are more highly correlated than the individual items suggests that the composite measures have less variability than the individual items.

c. Did states that improved more in one domain of quality also improve more in others?

As with the correlations at the provider level, improvement on ACH and SCIP between baseline and followup were positively, but not strongly, correlated (r = 0.21). This suggests that gains in one area of care do not necessarily translate to gains in others.

E. WAS THERE AN IMPACT OF QUALITY IMPROVEMENT ORGANIZATIONS' WORK WITH IDENTIFIED PARTICIPANT GROUP PROVIDERS ON IMPROVEMENT IN QUALITY MEASURES?

We find that results, again, vary by provider setting. There is some evidence that Quality Improvement Organizations (QIOs) had favorable effects on nursing home and HHA measures, but we found no evidence for a QIO effect on hospital measures.

The IPG penetration rate for each state is the percentage of providers in that state that have agreed to work with the QIO on quality improvement; the providers are called identified participant group (IPG) providers. The IPG penetration rates differ by provider setting (nursing homes, home health agencies, and hospitals), and for nursing homes, by measure, since nursing homes could agree to work with the QIO on pressure ulcers and physical restraints, or on depression and pain (or both).

The Eighth SOW specified the minimum numbers of IPG providers each QIO was to recruit in each provider setting and group of quality measures; these were a function of the numbers of

providers in each state. QIOs in smaller states were thus to work high a higher proportion (or even all) providers whereas QIOs in larger states were to work with only a fraction of providers. The IPG penetration rate might then provide an indicator of the intensity of QIO activity not confounded by underlying provider willingness or ability to improve quality of care, and possibly not fraught with the selection problems bias inherent in direct comparisons of IPGs with non-IPGs.[6] However, the validity of the IPG penetration rate as a treatment indicator, though reasonable, remains an untestable assumption. Table II.15 shows the IPG penetrations of individual states for the different settings and measures.

1. Nursing Homes

Higher identified participant group provider (IPG or IP) penetration[7] is associated with significantly greater reductions in pressure ulcers, physical restraints, and chronic pain among nursing home residents (Table II.16). Those estimates are obtained from seemingly unrelated regression analyses (SUR) controlling for a range of provider- and county-level characteristics, including provider performance on nonfocus outcomes.[8] A one percentage point increase in IPG penetration is associated with a 0.034 percentage point decrease in pressure ulcers, a 0.022 percentage point decrease in use of physical restraints, and a 0.011 percentage point reduction in the prevalence of moderate-to-severe pain. No significant association is observed with worsening depression and anxiety. The joint test of association between IPG penetration and all four outcome measures is, however, statistically significant ($p < 0.01$).

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[6] In addition, we did not have access to individual providers' IPG status for this analysis.

[7] As noted in Chapter II, the IPG penetration rate for nursing homes ranged from roughly 10 percent to 100 percent across states, with the majority clustered between 10 and 20 percent.

[8] Details on the associations among the various control variables and nursing home quality measures are provided in Appendix Table D.1. SUR is a technique for jointly estimating several regression models which reduces the likelihood of Type II or false positive results from multiple statistical tests. Appendix Table D.9 shows the means of the control variables used in the regressions.

TABLE II.15

IPG PENETRATION RATES FOR PROVIDER SETTINGS AND MEASURES

Nursing Homes	Pressure Ulcers and Physical Restraints	Nursing Homes	Depression and Pain	Home Health Agencies	ACH Measure	Hospitals	
State	IPG Penetration Rate	State	IPG Penetration Rate	State	IPG Penetration Rate	State	IPG Penetration Rate
AK	100.0	AK	100.0	DE	54.6	VT	100.0
DC	85.0	DC	75.0	VT	50.0	WY	92.0
DE	78.6	DE	73.8	HI	47.1	SD	90.0
VT	78.1	VT	73.2	AK	46.2	AK	84.0
HI	71.7	HI	67.4	DC	46.2	ND	80.0
NV	68.1	NV	63.8	WY	40.0	DE	77.0
WY	56.4	WY	51.3	ND	38.5	MT	69.0
NM	42.3	NM	38.5	RI	38.1	DC	66.0
ID	40.0	ID	37.5	ME	34.5	HI	56.0
NH	39.0	NH	36.6	NH	31.3	NH	53.0
ND	38.6	ND	36.1	MT	29.4	RI	51.0
UT	38.0	UT	35.9	ID	28.6	NE	49.0
RI	35.9	RI	32.6	NJ	28.0	ME	43.0
MT	32.0	MT	30.0	NM	26.9	AR	38.0
WV	30.5	WV	29.0	WA	26.4	NV	38.0
SD	28.8	SD	27.0	SD	25.0	OK	38.0
AZ	28.4	AZ	26.1	OR	24.6	SC	36.0
ME	27.6	ME	25.9	SC	23.9	MN	35.0
OR	25.4	OR	23.2	WV	23.7	ID	33.0
SC	19.9	SC	18.8	NE	23.3	WV	33.0
MS	18.6	MS	17.7	NV	23.3	IA	32.0
OK	16.6	OK	15.8	MD	22.7	KS	31.0
MA	15.7	MA	15.2	UT	22.7	MO	31.0
PA	15.6	PA	15.0	AZ	21.9	TX	31.0
VA	15.5	VA	14.9	MS	20.7	MS	30.0
CO	15.4	CO	14.9	GA	20.4	AL	29.0
FL	15.3	FL	14.8	TN	20.3	MD	29.0
TX	15.3	TX	14.5	AR	20.2	NM	29.0
AL	14.9	AL	13.4	MN	20.2	UT	29.0
NE	14.2	NE	13.3	PA	20.2	IL	28.0
CT	14.2	CT	13.1	IN	20.1	IN	28.0
AR	14.0	AR	13.1	VA	20.1	PA	28.0
TN	13.7	TN	12.8	IA	20.1	WA	28.0
MD	13.4	MD	12.6	NY	20.1	AZ	27.0
WA	13.4	WA	12.6	FL	20.1	FL	27.0
NJ	13.0	NJ	12.2	AL	20.0	GA	25.0
LA	12.8	LA	12.0	CA	20.0	MA	24.0
MN	12.7	MN	11.7	CO	20.0	NJ	23.0
NC	12.6	NC	11.6	KY	20.0	TN	22.0
KS	12.6	KS	11.5	OH	20.0	CO	21.0
GA	12.4	GA	11.3	OK	20.0	MI	21.0
KY	12.2	KY	10.9	TX	20.0	OH	21.0
IN	11.9	IN	10.9	IL	19.9	OR	21.0
IA	11.4	IA	10.8	MI	19.9	VA	21.0
MI	11.4	MI	10.5	NC	19.9	NY	20.0

TABLE II.15 (*continued*)

Nursing Homes	Pressure Ulcers and Physical Restraints	Nursing Homes	Depression and Pain	Home Health Agencies	ACH Measure		Hospitals
State	IPG Penetration Rate	State	IPG Penetration Rate	State	IPG Penetration Rate	State	IPG Penetration Rate
IL	11.4	IL	10.4	CT	19.8	WI	20.0
MO	11.0	MO	10.4	MO	19.7	KY	19.0
NY	10.8	NY	10.3	KS	19.7	LA	18.0
WI	10.8	WI	10.1	WI	19.6	NC	17.0
CA	10.6	CA	10.0	MA	19.6	CA	13.0
OH	10.4	OH	8.2	LA	13.7	CT	12.0

Source: CMS de-identified QIO Dashboard Data.

Note: The IPG penetration rate for each state is the percentage of providers in that state that have agreed to work with the QIO on quality improvement; the providers are called identified participant group (IPG) providers. The IPG penetration rates differ by provider setting (nursing homes, home health agencies, and hospitals), and for nursing homes, by measure, since nursing homes could agree to work with the QIO on pressure ulcers and physical restraints, or on depression and pain (or both).

ACH=Acute Care Hospitalization

TABLE II.16

SUR ESTIMATES OF ASSOCIATION BETWEEN IPG PENETRATION AND CHANGE IN NURSING HOME
OUTCOMES DURING THE 8TH SOW

Quality Measure (Dependent Variable)	(1) Baseline Outcome Control Only	(2) All Provider and County Baseline Controls[a]	(3) Add Controls for Nonfocus Quality Measures[b]
Pressure Ulcers[c]			
B	-0.034**	-0.032**	-0.034**
(St. Err)	(0.012)	(0.008)	(0.009)
[R^2]	[0.29]	[0.32]	[0.34]
Number	7,594	7,507	6,854
Physical Restraints[c]			
B	-0.022**	-0.023**	-0.022**
(St. Err)	(0.007)	(0.006)	(0.007)
[R^2]	[0.43]	[0.43]	[0.44]
Number	10,676	10,574	8,547
Depression/Anxiety[c]			
B	0.006	0.009	-0.011
(St. Err)	(0.023)	(0.015)	(0.016)
[R^2]	[0.24]	[0.28]	[0.32]
Number	10,537	10,434	8,545
Chronic Pain[c]			
B	-0.007	-0.008	-0.011*
(St. Err)	(0.007)	(0.005)	(0.006)
[R^2]	[0.50]	[0.51]	[0.52]
Number	10,548	10,445	8,546
Joint Statistical Significance	0.0014***	0.0000***	0.0000***

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: Results weighted by facilities' total number of patients. Results were estimated simultaneously using seemingly unrelated regression (SUR). All analyses controlled for baseline levels of the measure. Inclusion of other controls varies across models. The coefficients indicate the average percentage point change in the dependent variable for a one percentage point change in IPG penetration. If that association is causal then the results imply that QIO work with IPs led to an average change in the outcome for each IP equal to the coefficient multiplied by 100.

*p<.10; **p<.05; ***p<.01 (two-tailed tests).

[a] Controls for binary indicators of ownership type (for-profit; government; nonprofit, corporate; nonprofit, religious; nonprofit, other—for-profit is omitted category); facility size (indicator for being in the largest quartile of nursing homes); whether situated within a hospital; and presence of both resident and family councils. Specification also controls for county-level characteristics: whether or not the provider's county is part of a metropolitan area; number of active physicians per 1,000 population; number of nurses per 1,000 population; (log) per capita income; poverty rate; and percentage of the population ages 0 to 19, ages 65 or more, with four or more years of college, Hispanic, non-Hispanic black, and without health insurance, respectively.

[b] Specification includes all controls from the preceding model in the second column, plus baseline and change measures of percentage of residents (1) whose ability to move about independently has declined, (2) whose daily

TABLE II.16 *(continued)*

need for help with daily activities has increased, (3) who spent most of their time in a bed or chair; and who had a urinary tract infection, respectively.

[c]Pressure Ulcers = percentage of high-risk long-stay residents with pressure sores; Physical Restraints = percentage of long-stay residents who were physically restrained; Depression/Anxiety = percentage of long-stay residents who have become more depressed or anxious; Chronic pain = percentage of long-stay residents who have moderate to severe pain.

B = Beta coefficient on the IPG penetration variable from the regression model.

IP = Identified participant.

IPG =Identified participant group.

SOW = statement of work.

St. Err. = standard error.

QIO = quality improvement organization.

If the observed associations do, in fact, reflect causal impacts of QIO work with IPs, the results suggest that, for individual providers, working with a QIO reduces the prevalence of pressure ulcers by more than three percentage points and the use of physical restraints by more than two percentage points—each a substantial fraction of the mean baseline rates (13.3 percent and 6.5 percent on those two measures, respectively) (Table II.2). The implied per-IP impact on reduction in chronic pain is somewhat smaller, 1.1 percentage points, though still a substantial fraction of the 5.4 percent baseline average rates.

2. Home Health Agencies

a. Effects of IPG Penetration

Changes in ACH (Table II.17) were strongly and negatively associated with IPG penetration rates. ACH rates are estimated to decline by about 0.13 percentage points for every one percentage point increase in the proportion of HHAs that are in IPGs.[9] Thus, all else being equal, a state with a 20 percentage point higher IPG penetration than another state would be expected to have experienced 2.6 percentage points fewer hospitalizations. If the observed association does reflect a causal impact, then this implies that, for individual HHAs, being an IP led to an average reduction in ACHs of 13 percentage points over what their ACH rates would have been otherwise. This seems like a large point estimate. The confidence interval is fairly wide, however, ranging from 0.066 to 0.200, and includes values that are substantially smaller.

b. Impacts of QIOs' Statewide Efforts on Improvements in Home Health Quality Measures

The design of the Eighth SOW for the home health care setting also permitted a comparison of QIOs that chose a quality measure for which to undertake statewide efforts to improve care

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[9] Descriptive statistics for the control variables included in the regression models are in Appendix D.10.

TABLE II.17

OLS ESTIMATES OF ASSOCIATION BETWEEN IPG PENETRATION AND CHANGE IN ACUTE
CARE HOSPITALIZATION RATES OF HHAs, 8TH SOW

Quality Measure (Dependent Variable)	(1) Controls Only for Baseline ACH Level	(2) All Provider and County Controls[a]
Acute Care Hospitalization	-0.156**	-0.133**
(St. Err)	(0.037)	(0.034)
R^2	0.32	0.33
N	6,308	6,265

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: Results are estimated using ordinary least squares (OLS). Providers are weighted equally. Coefficients reflect percentage point change in outcome associated with a one percentage point change in IPG penetration. If that association is causal then the results imply that QIO work with IPs led to an average change in the outcome for each IP equal to the coefficient multiplied by 100.

[a] Includes controls for binary indicators of ownership type, date of certification (pre-1990, 1990s, 2000s), and provision of medical social services. The specification also includes controls for county-level characteristics, including whether or not the provider's county is part of a metropolitan area; active physicians per 1,000 population; number of nurses per 1,000 population; per capita income; the poverty rate; and the percentage of the population: ages 19 or younger, ages 65 and over, with four or more years of college, who are Hispanic, who are black, and without health insurance, respectively.

**p<.05 (two-tailed tests).

HHA = home health agency

IP = Identified participant

IPG Penetration= Percent of Providers in a State Who are in an Identified Participant Group (i.e., who are IPs)

St. Err. = standard error.

with QIOs that did not choose to do so. We also found evidence that QIOs' statewide efforts were associated with improvement in at least some of the quality measures we were able to examine. As described in Chapter I, QIOs were required to engage in statewide efforts to improve one selected measure; each QIO chose one measure from among the nine available. We estimated impacts of those efforts for the most commonly selected outcomes: management of oral medications (selected by 30 QIOs), pain interfering with activity (10 QIOs), and dyspnea (9 QIOs). Table II.18 suggests that there is at least a simple bivariate relationship between QIO selection of an outcome and greater improvement on that outcome. The greatest improvements on each outcome were achieved by HHAs in states in which that outcome was selected for improvement.

Holding constant provider- and county-level characteristics—including improvement on other quality outcomes—QIOs' statewide efforts were associated with a statistically significant improvement in both dyspnea and management of oral medications. As shown in the third column of Table II.19, HHAs in states in which the QIO selected dyspnea for statewide improvement averaged 1.8 percentage points greater improvement than HHAs in states without that focus, adjusting for all other factors. For management of oral medications the estimated impact is 1.3 percentage points. We observed no impact of statewide efforts on improvement in pain interfering with activity. The association of QIO measure selection with improvement across the three measures is jointly statistically significant.

3. Hospitals

Although hospital quality measures improved across all states, we found no evidence of QIOs being effective in improving appropriate care through their work with IP providers. Associations between the IPG penetration and the ACM index were small and not significantly different from zero (Table II.20), regardless of the set of control variables included. Control

TABLE II.18

AVERAGE IMPROVEMENT ON ELECTIVE HOME HEALTH OUTCOMES, BY QIOS' MEASURE
SELECTED FOR STATEWIDE IMPROVEMENT

| | Improvement | | | |
Statewide Measures Selected	Dyspnea	Management of Oral Medications	Pain Interfering with Activity	Average
Management of Oral Medications	2.12	3.60	2.68	2.80
Pain Interfering with Activity	2.12	3.53	3.71	3.12
Dyspnea	4.12	3.05	3.21	3.46

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: The number of providers in states selecting each of the above measures is 1,916, 4,278, and 761 for dyspnea, management of oral medications, and pain, respectively. Of the providers in states for which the QIOs selected dyspnea, improvement data were available for and calculated on 1,513 providers for dyspnea; 1,474 providers for oral medications; and 1,526 providers for pain. Of the providers in states for which the QIOs selected management of oral medications, improvement data were available for and calculated on 3,238 providers for dyspnea; 3,148 providers for oral medications; and 3,324 providers for pain. Of the providers in states for which the QIOs selected management of oral medications, improvement data were available for and calculated on 530 providers for dyspnea; 519 providers for oral medications; and 542 providers for pain.

QIO = quality improvement organization.

TABLE II.19

SUR ESTIMATES OF EFFECTS OF QIO STATEWIDE WORK ON HHA OUTCOMES

Quality Measure (Dependent Variable)	(1)	(2)	(3)
Management of Oral Medications			
B^a	0.79	1.17**	1.25**
(St. Err)	(0.72)	(0.041)	(0.048)
$[R^2]$	[0.26]	[0.28]	[0.58]
Number	5,539	5,498	5,490
Pain Interfering With Activity			
B^a	-0.03	0.45	0.31
(St. Err)	(0.64)	(0.44)	(0.39)
$[R^2]$	[0.24]	[0.25]	[0.46]
Number	5,329	5,289	5,287
Dyspnea			
B^a	2.02*	2.09**	1.83**
(St. Err)	(0.92)	(0.76)	(0.37)
$[R^2]$	[0.23]	[0.26]	[0.54]
Number	5,603	5,562	5,562
Model Includes Controls for:			
Baseline Level of Selected Quality Measure	Yes	Yes	Yes
All Provider and County Baseline Characteristics[b]	No	Yes	Yes
Nonfocus Quality Measures[c]	No	No	Yes
Joint Statistical Significance[d]	0.0026***	0.0000***	0.0001***

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: Results weighted all providers equally. Results estimated simultaneously using seemingly unrelated regression (SUR). Coefficients indicate the average percentage point difference in change in the outcome measure between providers in states in which that measure was selected for statewide improvement, compared with states in which the measure was not chosen (holding other observables constant). All specifications control for baseline levels of the outcome measure.

[a]SUR coefficient for the indicator of whether the provider is in a state where the QIO selected the outcome in question to focus on for statewide improvement efforts. It captures the average difference in baseline-to-follow-up change in the outcome between providers in states where the outcome was selected by the QIO for quality improvement vis-à-vis providers in states that did not, holding other covariates constant.

[b]Controls for binary indicators of ownership type (for-profit; government; nonprofit, private; nonprofit, religious; nonprofit, other); date of certification (pre-1990, 1990s, 2000 or later); and whether the agency

TABLE II.19 *(continued)*

provides medical social services. The specification also includes controls for county-level characteristics: whether or not the provider's county is part of a metropolitan area; active physicians per 1,000 population; number of nurses per 1,000 population; per capita income; the poverty rate; and the percentage of the population ages 19 or younger, ages 65 or over, with four or more years of college, who are Hispanic, who are black, and without health insurance, respectively.

[c]Includes all controls in Model 2, plus average baseline and change in nonselected measures of percentages of patients improving in bathing, transferring in and out of bed, urinary incontinence, and moving around independently; and the percentage discharged from HHA care and living at home.

[d]Joint Significance = P-value of joint significance of the three statewide measure selection indicator coefficients.

*p<.10; **p<.05; ***p<.01 (two-tailed tests).

IP = Identified Participant

IPG Penetration = Percent of providers in a state who are in an Idendified Participant Group (i.e., who are IPs)

B = Beta coefficient on the IPG penetration variable from the regression model.

HHA = home health agency

QIO = quality improvement organization.

St. Err. = standard error.

TABLE II.20

ESTIMATES OF ASSOCIATION BETWEEN IPG PENETRATION AND CHANGE ON THE
APPROPRIATE CARE MEASURE INDEX

Quality Measure	(1) Controls Only for Baseline ACM	(2) All Provider and County Controls[a]
ACM	-0.0008	0.0013
(St. Err.)	(0.0102)	(0.0097)
R^2	0.499	0.532
Number	2,377	2,353

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected
           October 2006-September 2007.

Note: Results estimated using ordinary least squares (OLS). Providers weighted by total numbers of
           patients. Coefficients indicate the average percentage point change in the dependent variable
           for a one percentage point change in IPG penetration. If that association is causal then the
           results imply that QIO work with IPs led to an average change in the outcome for each IP
           equal to the coefficient multiplied by 100.

[a]Controls for binary indicators of ownership type (for-profit; government; nonprofit, private; nonprofit,
religious; nonprofit, other); hospital type (acute care or critical access); and hospital size (indicator for
being in the largest quartile of facilities). The specification also includes controls for county-level
characteristics: whether or not the provider's county is part of a metropolitan area; active physicians per
1,000 population; number of nurses per 1,000 population; per capita income; the poverty rate; and the
percentage of the population ages 19 or younger, ages 65 and over, with four or more years of college,
who are Hispanic, who are black, and without health insurance, respectively.

*$p<.05$; **$p<.01$; ***$p<.10$ (two-tailed tests).

ACM = appropriate care measure.

IP = identified participant.

IPG = identified participant group.

St. Err. = standard error.

variable descriptive statistics are presented in Appendix Table D.11.[10] Note that in addition to the lack of an association between IPG penetration and the composite ACM scale, we also found no association between IPG penetration and any of the individual ACM items (see Appendix Table D.7).

F. CONCLUSIONS

Nursing homes' performance improved during the Eighth SOW for three of the four focus outcomes—pressure ulcers, physical restraints, and pain. The percentage of patients with the fourth outcome, becoming more anxious or depressed, changed little. At the state level, nearly all states saw improvements in the physical restraint and pain measures, and about two-thirds of states had reductions in the prevalence of pressure sores. As in the provider level results, there was little change across states in the depression/anxiety measure. The IPG penetration analyses provided evidence that QIOs contributed to the improvements in the pressure ulcer, physical restraints, and pain measures.

Home health agencies improved performance on most publicly reported outcomes during the Eighth SOW. The provider level improvements translated to the state level as well, with nearly all states experiencing improvements in the index of patient functioning measures and more than two thirds in the ACH measure. Increasing IPG rates were associated with larger improvements in the ACH measure. We also found evidence to support favorable effects from QIOs' statewide efforts; these were associated with improvements in two of the three outcomes examined (the measures of oral medication management and of dyspnea, the exception being the pain measure).

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[10] Appendix Table D.6 contains ordinary least squares (OLS) regression results for associations between those outcomes and change in ACM during the Eighth SOW. Results are also provided for SCIP improvement. Corresponding results for predictors of improvement on individual ACM and SCIP items are presented in Appendix Tables D.7 and D.8, respectively.

Hospitals made large gains in hospital care as gauged by the indexes of the ACM and SCIP measures. Improvement occurred in all states and in all but a small fraction of facilities. However, we found no evidence that those improvements were attributable to QIOs' work with identified participants.

There are potential limitations to our analyses. Providers missing data at either the baseline or followup points could introduce bias of unknown size or magnitude into both the descriptive and impact analyses. The rates of incomplete data ranged from 40 to 50 percent for nursing homes, and roughly 10 to 30 percent for home health agencies. For hospitals, rates of missing data were very low for the ACM measures, but somewhat higher for the SCIP measures, as these had only been recently introduced during the baseline period. The nursing homes and hospitals missing data tended to be smaller providers, and thus represented fewer patients.

Although we had measures of provider size for the nursing home and hospital analyses, we lacked such weights for the home health analyses. Performing unweighted analyses (that is, weighting each agency with a weight of one) tends to give more weight to smaller agencies; the effect of this is unknown. The results for the home health and hospital analyses did not differ much between the weighted and unweighted analyses.

Another potential limitation is the validity of the assumption underlying the impact analyses based on IPG penetration rates, namely that they are measures of QIO involvement that are independent of other unobserved factors that might also influence quality improvement. Table II.15 showed that, as expected, smaller and more sparsely populated states had higher IPG penetration rates; whether such states also tend to have providers that are more highly motivated and capable of improving quality, or have healthcare enviroments more conducive to quality improvement, is unclear. If such associations exist, it is also unclear whether the several regional characteristic variables in our regressions would completely control for such effects (though it

seems unlikely). In most nonexperimental study designs the key assumptions may be highly plausible or reasonable, but generally cannot be confirmed with certainty.

A limitation of our data is that there are only 51 observations for variation in IPG penetration rates. Table II.15 reveals little variability in IPG penetration rates at lower rates of IPG penetration some of the provider settings; for example, for home health agencies, there are 18 states with IPG penetration rates ranging from 20.0 to 20.7, and at higher rates of IPG penetration, a few states with very high rates. Our estimates are thus subject to these distributions of the IPG penetration rates.

Finally, as described further in the discussion of the provider survey analysis in Chapter IV, providers' IPG status is not a sharp indicator of involvement with their QIOs. Many non-IPGs in the provider survey indicated they had worked with their QIO. Others have noted the potential for measurement error when using IPG status as a binary indicator of exposure to the QIO program (Jencks 2005). Although the effects of substantial QIO involvement on non-IPGs on our results are unknown, in general, such "contamination" or "spillover" of the intervention to the control or comparison group tends to bias the estimated effects downward (that is, the intervention effects appear smaller than they truly are).

In summary, our analyses of the Medicare Compare data found widespread and substantial improvement in the quality measures nationwide for providers and states. Although the magnitudes of our estimates may be affected by study and data limitations, we do find evidence that QIOs have contributed to at least some of these improvements.

III. MECHANISMS AND CASE STUDY ANALYSIS

The key research question addressed in this chapter is "What mechanisms might underlie performance improvement in selected states?" Case studies of five states with different patterns of improvement during the Eighth Scope of Work (SOW) on two measures of hospital surgical infection prevention provide insights on this question (details of how the states were selected are contained in Appendix B). We present our results by specific research questions after a brief summary.

In analyzing the discussions with the Quality Improvement Organizations (QIOs) and hospital associations that participated in the case studies, the reported timing of actions in relation to a state's pattern of improvement was a critical factor that enabled us to distinguish more and less likely explanations for a state's pattern of improvement. In other words, states with high baseline performance and relatively less improvement during the Eighth SOW (high-baseline states) should be able to point to actions prior to the start of the Eighth SOW that likely contributed to the high baseline we observed. States with low baselines (low-baseline performance) but substantial improvements of 14 percentage points or more (high-improving states) should be able to point to reasons for their substantial improvements during the Eighth SOW period.

A. SUMMARY

Although the story in each state was unique, respondents helped us identify several factors likely to have influenced the state-level trends in the surgical care measures, namely QIO actions, hospital association activities, and actions of large health systems. More active use of Institute for Health Improvement (IHI) resources, such as educational teleconferences during its 100,000 Lives Campaign, in the high-improving states also might have been a factor. In addition,

many of the respondents noted that inclusion of the two surgical infection prevention measures of interest in the set of measures required to be publicly reported in order for hospitals to receive their full Medicare payment update led to near-universal reporting by the middle of the Eighth SOW. Respondents believed that this public reporting had boosted improvement both in their states and nationally during the Eighth SOW.

Each QIO pointed to some actions it took that logically might have contributed to improvement on the relevant time frame (pre-Eighth SOW for the high-baseline states and during the Eighth SOW for the high-improving states), but the nature of the actions varied widely. These actions ranged from encouraging the dominant local health system to use its own relatively sophisticated quality improvement infrastructure to foster improvement on surgical measures; to convening a hospital collaborative; to an effort consisting of several parts, including intensive site visits to hospitals, regional in-person meetings with/open to all hospitals, and instigating letters to be sent from a highly respected surgeon to all surgeons in the state urging their support for the measures.

QIO actions were not the only relevant factors contributing to improvement in these states, we were told. All five had active hospital associations, and in three cases hospital association activities had likely played a role in the measure improvement—that is, one or more of the respondents told us of relevant hospital association activities targeted to these measures that preceded the high rate. Also, health system organizations and/or the Voluntary Health Association (VHA) were credited with a role in measure improvement during the relevant periods in three states. In two cases, the hospital associations did not believe the QIOs' efforts were likely to have been a major reason for the improvement; although this casts some doubt on the QIOs' belief that their actions contributed to the improvement, the hospital associations did not seem to be specifically aware of the activities that the QIOs told us about that they believed

had contributed. Therefore we draw no conclusion either way and all the activities that were mentioned by respondents as potentially contributing to the improvements are considered below.

The relatively low baselines in the high-improving states were not likely due to differences in the barriers they faced to improvement. Rather, it seems likely that the high baselines in those states were the result of quality improvement-related activities by QIOs and others that occurred earlier than activities in other states.

The discussions might provide helpful insights into possible reasons for improvement, but they are not foolproof, as some other perceptions of the respondents do not seem to be reflected in the data. For example, one hospital association from a high-baseline state explained that state-based public reporting pushes hospitals to improve more than the national public reporting effort because the media more frequently reports on quality on the basis of state-produced data. However, given the timing of the state's public reporting initiative, we would have expected to see more improvement during 2005-2007 than we did (the state's rate of improvement was unremarkable during this period). A high-improvement state's QIO described with great pride the Surgical Care Improvement Project (SCIP) collaborative undertaken in the Seventh SOW, when in fact their baseline prior to the Eighth SOW was relatively low.

B.   RESULTS BY RESEARCH QUESTION

1.   Did QIO actions play a role in some states' rates of dramatic improvement?

A QIO role in improvement is plausible (although not proven) in each of the states; that is, some QIO actions were consistent in timing with improvements prior to the high baseline or consistent with improvement from the low baseline in all five states. The more modest improvements of high-baseline performers corresponded with a shift of QIO efforts toward fostering improvement on other quality measures in the Eighth SOW.

a. High-Improving States: Actions During the Eighth SOW

During the Eighth SOW, the QIO in high-improving State A made site visits to 30 hospitals with relatively high surgical volume (at least 200 cases per year) and in which staff performed a concurrent chart review on the surgical infection prevention measures. The visits were meant to convince the hospitals of the value of this type of review and to discuss the measures that represent current performance and are based on patients whom the relevant staff can still recall. Although this QIO also engaged in other quality improvement activities around the surgical measures, the other activities were similar to those in the Seventh SOW, which might not have been very effective because the state's baseline at the start of the Eighth SOW was relatively low. The QIOs actions are not the only factor that might have encouraged improved performance on these measures in the state; for example, the hospital association's efforts might also have played a role.

The QIO in high-improving State B took advantage of the unusual structure of the state's health care system, in which more than 40 percent of the state's hospitals are owned by a single health system. At the start of the Eighth SOW, the QIO met with officials at the major health system to request that they work with their hospitals on improving performance on the surgical infection-prevention measures. The health system agreed and established a bimonthly surgical care improvement program work group that began in 2006 and continues today. This particular health system is nationally known for its improvement capabilities. Nevertheless, the QIO's communication with the health system at the start of the Eighth SOW might have been key to its quality improvement emphasis on the surgical measures. It accounts for two-thirds of the hospitals that were included in our analysis.

The strategy for improvement used by the QIO in high-improving State C during the Eighth SOW combined several components: site visits to 40-45 hospitals, regional meetings, and a letter

to convince the state's surgeons to support the surgical infection-prevention measures. The QIO indicated that physician resistance to the measures was a major barrier to improvement. Therefore the QIO brought a prominent physician (a former president of the American Medical Association) with them on the site visits and reported that the visits were fairly successful in enticing physicians as well as quality improvement personnel in the hospitals to attend the presentation they made. They also suggested to a well-respected surgeon that he write a letter to all the surgeons in the state, asking them to support the measures. He did so. The QIO also worked with its hospital association to hold four regional meetings in the state; the meetings were reportedly well-attended and participants received notebooks of best practices and toolkits for improvement. Of the 40-45 hospitals visited, two-thirds are included in our analysis.

b. High-Baseline States: QIO Actions Prior to the Eighth SOW

The QIO in high-baseline State D began asking hospitals to abstract data on the surgical care improvement measures of interest as well as other measures during the Sixth SOW. It is plausible that hospitals' early experience with seeing their performance on the measures might have better prepared them to make meaningful changes sooner than hospitals in other states. Meaningful changes were reported to be observed by the middle of the Seventh SOW. The idea that this early data-abstraction effort might have contributed to the state's high baseline prior to the start of the Eighth SOW is supported by the fact that State D's baseline scores were in the top quartile for 10 of 15 measures. However, other factors in this state were also likely to have been important (discussed below).

The QIO in high-baseline State E convened a collaborative in 2002-2003 focused on surgical improvement, including the two measures of interest. Because of the state's small size, the collaborative included all 10 large hospitals in the state. The QIO developed the collaborative just after receiving training by the IHI (through its "Breakthrough Series College") on how to

convene effective collaboratives for improvement. (Other QIOs nationally also received this training.) The idea that this effort focused on surgical improvement might have contributed to the state's high baseline is supported by the fact that State E was not high at baseline across all the hospital measures; rather, it was below the national median for 4 of 15 measures.

2. **Were there differences in the timing of how hospitals participated in or viewed other national-level surgical infection-prevention initiatives that might help explain the different pattern of improvement?**

It is possible that some of the improvement in high-improving states could have been related to more active use of IHI resources during its 100,000 Lives Campaign, which ran for 18 months ending in June 2006. One of the campaign's six components was preventing surgical site infections, including specific actions to improve perioperative antibiotic timing (captured by the two measures of interest). Respondents in each of the three high-improving states mentioned connecting hospitals to IHI speakers (two by encouraging hospitals to participate in upcoming IHI web-based seminars and one that cited surgical-specific teleconferences with area hospitals). In addition, the campaign "node" in one of the high-improving states was said to be quite active, and the QIO even found hospitals citing their involvement with IHI as they expressed reluctance to participate in yet another improvement activity with the QIO. Respondents in the high-baseline states noted that most hospitals participated, but participation was sometimes in name only.

The national-level SCIP is perceived to have focused on the quality measurement aspects of surgery rather than on quality improvement, and no respondent thought it played a role in improvement.

3. **Did hospitals in the states with low initial rates face barriers to improvement that were overcome?**

Hospitals in states with initially low baselines did not appear to face any unique barriers that were then overcome to result in the high improvement. High-baseline State D and high-improving State C both reported some closures and serious financial difficulties in some of their hospitals over the past three years, which continue.

All states reported that physician disagreement with guidelines on which the measures were based was a barrier and remains so to some degree, particularly with respect to the Prophylactic Antibiotic Discontinued After Surgery measure.[1] It appears that actions to overcome this barrier might have occurred at a later time in the states that had low baselines. Consistent with later timing of improvement in the low-baseline, high-improving states, one state's letters from the prominent surgeon to all the surgeons in the state (noted above) might have had an effect; in another state, the hospital association's quality expert has held five to seven calls with key anesthesiologists over the past five years to try to persuade them to support the measures. In contrast, high-baseline State D reports it was lucky to have had surgeons who were "on the cutting edge" early on and advocated for antibiotics to be given one hour prior to surgery.

4. **What other factors might explain the different patterns of improvement in the high-improving versus high-baseline states?**

Health System Organizations. Two of the three high-improving states credited some of the improvement to the actions of one or more health system firms or the VHA within their state. In high-improving State B, actions by a single health system representing a high proportion of the state's hospitals were said to explain most of the improvement. In high-improving State C,

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[1] For example, physicians were reportedly concerned about the possibility, albeit remote, that patients could develop infections if antibiotics were stopped on the recommended time line.

respondents noted that hospitals often belonged to the VHA, or were Hospital Corporation of America (HCA) hospitals, both of which were said to have significant ongoing quality initiatives. One of the high-baseline states also pointed to VHA and other system-run actions as potentially important, although the timing of these groups' activities targeting surgical infection prevention was unknown.

Media Showing Poor Quality. A report in 2001 that ranked quality in high-baseline State D hospitals 48th in the country likely contributed to statewide motivation to improve early this decade; the hospital association set up an institute for patient quality and safety in 2002 which has since been active in working with hospitals to improve quality on all the relevant measures.

Active Hospital Associations. In addition to the hospital association in a high-baseline state setting up an institute for quality and safety as just noted, two of the three high-improving states had hospital associations that were active in attempting to foster improvement on the surgical infection-prevention measures as well as others; in one, the hospital association's senior director for Quality and Research Initiatives, a registered nurse by background, works full time with hospitals to help them improve their quality performance, primarily on Centers for Medicare & Medicaid Services (CMS) core measures. In another, the QIO worked with the hospital association to achieve high attendance at regional meetings held in four locations around the state and to disseminate best practices and other quality improvement information; in addition, the hospital association holds an annual awards program at which it recognizes quality improvement achievements at top hospitals in the state. (The two other states had hospital associations that were active in quality improvement in specific niches, but their actions were not relevant to explaining the patterns discussed here.)

Individual Physician Champions. In two states a prominent physician champion for the surgical infection prevention measures might have contributed to the improvements. In one case,

the physician champion sent a letter to the other surgeons in the state;, in another case the physician champion met with physicians, sometimes at their offices, for the purpose of persuading them to follow the guidelines on which the measures were based and encouraging others at their organizations to do so.

5. What factors do the QIOs and hospital associations say are associated with improvements at the hospital level?

Factors mentioned by respondents[2] as important influences on improvement on the surgical measures at the hospital level included:

Motivation

- Public reporting. Reports indicate that when the measures became part of the set that hospitals had to publicly report in order to receive their full payment update, a great deal of hospital attention to improving on the measures resulted.

- Talking about the cost of not discontinuing antibiotics in a timely manner after surgery was said to get hospitals' attention toward improving on this measure.

- Quality awards programs might boost some hospitals' efforts toward improving on the measures.

- Leadership commitment. Although some hospitals' leaders might be motivated by public reporting, cost discussions, and the potential for a quality award, others might have been motivated by other factors; for example, critical access hospitals are said to be fiercely interested in protecting against the idea that they might be second-rate hospitals because of their limited services and size.

Resources

- Adequate staff resources. Staff resources must be available to facilitate improvements; most hospitals in serious financial difficulties were not included in our analysis because they did not report these measures in the baseline period.

- Access to best practices and helpful information resources. One hospital association runs a mentoring program that links high performers to those that need more help.

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[2] All of these items were discussed by both hospital associations and QIOs.

Physician Support

- Presence of a physician champion. One respondent noted that in her state, hospitals that had a physician champion with a good relationship with hospital "C-suite" leadership improved the most. The QIOs required hospitals that participated in an identified participant group provider (IPG) with them to designate a team to work on improvement, in which the team must include a physician champion (from a surgical specialty or anesthesiology).

- Anesthesiologists who support the timely initiation of antibiotics measure. One respondent said the chair of anesthesiology needs to provide guidance to the others, and if the anesthesiologists agree to take ownership of the antibiotic administration process, that is a method that works to support the timely initiation of antibiotics measure.

- Support from all the various surgical specialties. Respondents often noted certain specialties that were resistant to stopping antibiotics within 24 hours after surgery; the specifics varied by state, but orthopedics, general surgeons, and colorectal surgeons were mentioned in at least one state as particularly resistant to discontinuation on this time frame.

Solving System Issues and Ensuring Reliability

- Operational system issues vary by hospital and must be analyzed and solved. For example, the location and process of getting an antibiotic to the bedside at the right time is often a reason for failing to administer antibiotics in a timely manner prior to surgery.

- Protocols are often helpful to solving system issues and ensuring the reliability of measure compliance As one respondent noted, performance tends to plummet when measurement stops (or key individuals leave) in hospitals that rely on people paying close attention to measure compliance rather than on changing a standard process.

IV. PROVIDER SATISFACTION

As explained in Chapter I, we focus only on hospitals, nursing homes, and home health agencies (HHAs), although Westat also surveyed physician practices, Medicare Advantage health plans, beneficiaries, and stakeholder organizations. Furthermore, among hospitals, we analyzed only those listed under the Eighth Scope of Work (SOW) task in which the Quality Improvement Organizations (QIOs) helped hospitals with care for heart attacks, heart failure, pneumonia, perioperative patients, and systems and organizational change (Task 1c1). We did not analyze hospitals listed under the Rural Organization Safety Culture Change task (Task 1c2). As described in Appendix C, we lacked information with which to calculate standard survey response rates; we thus defined a completed survey as one in which at least one question was answered and calculated response rates using this definition. As with the analyses of the Medicare Compare data, we limited the sample to providers in the 50 states and the District of Columbia, excluding providers in Puerto Rico, Guam, and so on.

Nationwide survey response rates varied by provider type and identified participant group provider (IPG or IP) status. Across all provider types at the national level, IPGs responded at a higher rate than non-IPGs (Table IV.1). Despite the constraints on our ability to calculate standard response rates, the nonresponse gaps between IPGs and non-IPGs in Table IV.1 are similar to those reported by Westat.[1]

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[1] The response rates reported by Westat for IPGs and non-IPGs, respectively, were: nursing homes, 93 percent and 83 percent; home health agencies, 97 percent and 87 percent; and hospitals, 94 percent and 86 percent.

TABLE IV.1

NUMBER OF RESPONSES AND RESPONSE RATES (PERCENTAGES),
BY PROVIDER TYPE AND IPG STATUS

	Number of IPG Responses (Percentage);	Number of Non-IPG Responses (Percentage)
Nursing Homes	2,388 (96)	2,853 (83)
Home Health Agencies	1,866 (99)	2,397 (88)
Hospitals	1,495 (96)	1,843 (89)

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: A complete survey is defined as one having a response to at least one survey question; the response rate is calculated as the number of completes divided by the number of providers in the dataset.

CMS = Centers for Medicare & Medicaid Services; IPG = identified participant group provider; MPR = Mathematica Policy Research, Inc.

A. TOPIC AREAS AND GROUPING OF PROVIDERS

We examine the individual survey questions within each of the six main survey topics developed by Westat, which covered providers' (1) use of email and the internet to receive, circulate, or access quality information and QIO resources; (2) knowledge of Centers for Medicare & Medicaid Services (CMS) programs; (3) satisfaction with their local QIO; (4) perceptions of the value of their local QIO; (5) interactions with their QIO; and (6) sources of quality information (Table IV.2). For the topic areas with many questions (for example, Providers' Satisfaction with Local QIO and Providers' Perceptions of QIO's Value), we present results for selected questions here with results for the remaining questions in Appendix E.

We used responses to the question "Since August 2005, have you received assistance from [your state QIO]?" to organize providers into three groups: (1) IPGs, (2) non-IPGs that reported receiving QIO help, and (3) non-IPGs that reported no help (the number of IPGs that reported receiving no help was very small and is grouped together with IPGs that received help). We

TABLE IV.2

PROVIDER SATISFACTION SURVEY TOPICS AND QUESTIONS

Survey Topics and Questions	Response Categories
Providers' Use of Internet to Access Quality Information	
Use of e-mail to receive or circulate quality improvement information	Yes/no
Use of internet to access information from QIO websites	Yes/no
Providers' Knowledge of QIO and CMS Programs	
Heard of the local QIO	Yes/no or not sure
Aware of CMS pay-for-performance programs	Yes/no or not sure
Aware that QIOs work with many different health care providers and organizations	Yes/no or not sure
Heard of Medicare Compare (Nursing Home, Home Health, and Hospital Compare)	Yes/no or not sure
Providers' Satisfaction with Local QIO	
Whether since August 2005 had received assistance from their QIO[a]	Yes/no
Whether since August 2005 had received information from their QIO	Yes/no
Whether since August 2005 had contacted their QIO for assistance	Yes/no
Usefulness of information from QIO	Very useful, useful, somewhat useful, not at all useful
Satisfaction with way in which information presented	Satisfaction scale—very satisfied, somewhat satisfied, neither satisfied nor dissatisfied, somewhat dissatisfied, very dissatisfied
Methods by which QIO provided help	Endorsement with each of a list of items[b]
Frequency of interactions with QIO	Once a week or more, once every two weeks, once per month, less than once per month
Satisfaction with amount of contact with QIO	Satisfaction scale as above
Satisfaction with ease of access to QIO	Satisfaction scale as above
Ability to get through to QIO	Always, usually, sometimes, never
Satisfaction with QIOs' timeliness of response to requests for help	Satisfaction scale as above
Satisfaction with professionalism, courtesy, and respectfulness of QIO staff	Satisfaction scale as above
Overall satisfaction with QIO	Satisfaction scale as above
Providers' Perceptions of QIO's Value	
Whether assistance was key to providers' quality improvement efforts	Agreement scale—strongly agree, somewhat agree, neither agree nor disagree, somewhat disagree, strongly disagree
Used the information provided by the QIO	Agreement scale as above
Service from QIO was worth time or effort of provider staff	Agreement scale as above
Provider feels better off for having received QIO services	Agreement scale as above
Whether provider feels it could not have gotten to current state of quality improvement without the QIO	Agreement scale as above

TABLE IV.2 *(continued)*

Survey Topics and Questions	Response Categories
Rating of QIO's contribution	Zero to 10 scale, 0 = "QIO did not contribute at all" and 10 = "QIO contribution indispensible"
Provider's Preferred Means of Interacting with QIO	
Preferred methods of receiving QIO help	Endorsement with each of a list of items[b]
Most preferred method of receiving QIO help	Selection of one of the listed items
Provider's Sources of Quality Improvement Information	
Prefer another source of information or assistance besides QIO	Yes/no/would depend on cost and other factors
Which sources does the provider use	Endorsement of each of a list of potential sources[c]
Which source does the provider find most useful	

Source: Westat survey instruments for nursing homes, home health agencies, and hospitals.

Note: The survey also asked providers whether since August 2005 they had received help from their QIO, had received information from their QIO, or whether they had contacted their QIO for help.

[a] Assistance from the QIO was defined in the survey to include site visits, one-on-one telephone communication, conference calls, training workshops, emails, or listservs.

[b] Such as site visits, training workshops or seminars, one-to-one communication, or telephone conferences.

[c] For example, the Agency for Healthcare Research and Quality (AHRQ), the Institute for Health Improvement (IHI), or provider or trade associations.

CMS = Centers for Medicare & Medicaid Services

QIO = Quality Improvement Organization.

focus on national-level averages because state-level sample sizes for many states are relatively small.

B. RESULTS

1. Awareness of the Local QIO and of Other CMS Initiatives

As mentioned, nearly all (94 percent to 99 percent) IPG providers reported receiving assistance from their QIO, but large proportions of non-IPG providers also reported receiving help, ranging from 70 percent for nursing homes to 94 percent for hospitals (Table IV.3), so that the sample sizes of non-IPG providers receiving no help were relatively small, especially for hospitals. Providers that received QIO assistance, whether IPG or non-IPG, were more likely than those receiving no assistance to use email to send and receive quality improvement information and to visit the website of their local QIO for such information.

Furthermore, nursing homes and home health agencies exhibited a gradient, with IPGs more likely to use email and the web than non-IPGs who received QIO help; non-IPGs receiving help were in turn more likely to use these electronic resources than non-IPGs receiving no help (Table IV.3). Non-IPG hospitals receiving QIO help had about the same rate of using these tools as IPG hospitals, however.

Compared with non-IPGs who received no QIO help, IPGs and non-IPGs receiving help had greater familiarity with the local QIO, CMS' pay-for-performance (P4P) programs, and Medicare Compare tools (Table IV.4). Awareness of CMS' P4P programs was lowest among nursing homes (ranging from 43 percent to 70 percent across the three groups). Awareness of P4P was high among HHAs and hospitals that were IPGs and non-IPGs receiving help (91 percent to 96 percent for HHAs and 95 percent to 98 percent for hospitals), but considerably lower for non-IPGs receiving no help (60 percent for HHAs and 76 percent for hospitals).

TABLE IV.3

PROVIDERS' REPORTED RECEIPT OF QIO ASSISTANCE AND USE
OF INTERNET TO ACCESS QUALITY INFORMATION

Question	Number	Percentage Answering Yes
Received Assistance from the Local QIO		
Nursing Homes		
IPG	2,277	94.3
Non-IPG	2,751	70.5
Home Health Agencies		
IPG	1,802	98.3
Non-IPG	2,273	81.4
Hospitals		
IPG	1,417	98.8
Non-IPG	1,756	94.1
Use E-mail to Receive or Circulate Information About Quality Improvement		
Nursing Homes		
IPG	2,261	92.5
Non-IPG received QIO help	1,933	83.3
Non-IPG received no QIO help	809	66.3
Home Health Agencies		
IPG	1,787	92.8
Non-IPG received QIO help	1,845	86.1
Non-IPG received no QIO help	419	56.3
Hospitals		
IPG	1,408	99.2
Non-IPG received QIO help	1,647	97.5
Non-IPG received no QIO help	103	80.6
Use Internet to Access Information from QIO Website About Quality Improvement		
Nursing Homes		
IPG	2,260	92.5
Non-IPG received QIO help	1,932	90.0
Non-IPG received no QIO help	810	66.3

TABLE IV.3 *(continued)*

Question	Number	Percentage Answering Yes
Home Health Agencies		
IPG	1,789	97.3
Non-IPG received QIO help	1,753	95.2
Non-IPG received no QIO help	305	73.1
Hospitals		
IPG	1,408	97.4
Non-IPG received QIO help	1,646	97.6
Non-IPG received no QIO help	102	70.6

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at $p<0.001$, chi-squared test.

CMS = Centers for Medicare & Medicaid Services

IPG = identified participant group provider

MPR = Mathematica Policy Research, Inc.

QIO = Quality Improvement Organization.

TABLE IV.4

PROVIDERS' KNOWLEDGE OF QIO AND CMS PROGRAMS

Question	Number	Percentage Answering Yes
Heard of the Local QIO		
Nursing Homes		
IPG	2,268	98.4
Non-IPG received QIO help	1,932	96.7
Non-IPG received no QIO help	809	85.9
Home Health Agencies		
IPG	1,800	99.1
Non-IPG received QIO help	1,848	98.0
Non-IPG received no QIO help	421	80.1
Hospitals		
IPG	1,414	99.9
Non-IPG received QIO help	1,652	99.7
Non-IPG received no QIO help	103	89.3
Aware of CMS Pay-for-Performance Programs		
Nursing Homes		
IPG	2,268	71.1
Non-IPG received QIO help	1,933	63.9
Non-IPG received no QIO help	809	43.3
Home Health Agencies		
IPG	1,799	96.1
Non-IPG received QIO help	1,844	91.4
Non-IPG received no QIO help	421	60.1
Hospitals		
IPG	1,415	97.7
Non-IPG received QIO help	1,648	94.7
Non-IPG received no QIO help	103	77.7
Heard of Medicare Compare (Nursing Home, Home Health, and Hospital Compare)		
Nursing Homes		
IPG	2,264	92.7
Non-IPG received QIO help	1,933	89.6
Non-IPG received no QIO help	809	72.2
Home Health Agencies	1,799	97.6
IPG	1,846	92.4

TABLE IV.4 *(continued)*

Question	Number	Percentage Answering Yes
Non-IPG received QIO help	418	64.4
Non-IPG received no QIO help		
Hospitals		
IPG	1,415	96.3
Non-IPG received QIO help	1,650	92.4
Non-IPG received no QIO help	103	59.2

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at *p*<0.001, chi-squared test.

CMS = Centers for Medicare & Medicaid Services

IPG = identified participant group provider

MPR = Mathematica Policy Research, Inc.

QIO = Quality Improvement Organization.

2. Providers' Satisfaction with Their QIOs

Frequency of contacts and satisfaction with QIO information and with QIO relations were highest among IPGs, next highest among non-IPGs receiving QIO help, and lowest among non-IPGs with no QIO assistance (Table IV.5). About a quarter of IPG nursing homes, nearly half of IPG hospitals, and 38 percent of IPG HHAs reported having contact with their QIO at least once every two weeks. The majority of providers across all three groups, even among non-IPGs receiving no help, felt information from the QIO was either useful or very useful, and those providers reported satisfaction with ease of access to the QIO and with their overall relationship with the QIO (Table IV.5).

3. Perceived Value of QIO Assistance Among Providers

The same order—most favorable ratings among IPGs, next most favorable among non-IPGs receiving help, and least favorable among non-IPGs with no help—held again for providers' perceptions of the value of QIO services (Table IV.6). HHAs responded most favorably to the statement "we could not have gotten to where we are with quality improvement without [our state] QIO's help," with 90 percent of IPG agencies either somewhat or strongly agreeing. About one quarter of IPG hospitals and nursing homes did not agree with this statement.

When asked to rate QIO contributions to their own quality improvement efforts on a scale ranging from 0 to 10, with 10 being the greatest contribution, more than three-quarters of IPG nursing homes and hospitals and 90 percent of IPG HHAs gave ratings of 7 or greater (Table IV.6). The proportion of non-IPG home health agencies receiving QIO help who gave a rating of 7 or more was also relatively high (79 percent); the proportions for non-IPG nursing homes and hospitals receiving help were somewhat lower (59 percent and 71 percent, respectively). Finally, non-IPG providers receiving no help had the lowest rates of giving a score

TABLE IV.5

PROVIDERS' SATISFACTION WITH THEIR LOCAL QIOs
(Percentages Unless Otherwise Noted)

Question How Frequently in Contact with QIO	Number	Once a Week or More	Once Every Two Weeks	Once per Month	Less than Once per Month
Nursing Homes					
IPG	2,043	9.7	15.9	48.6	25.8
Non-IPG received QIO help	1,739	0.5	1.1	25.9	72.5
Non-IPG received no QIO help	498	0.0	0.2	10.8	89.0
Home Health Agencies					
IPG	1,544	18.0	20.0	43.6	18.5
Non-IPG received QIO help	1,611	10.5	10.0	35.1	44.4
Non-IPG received no QIO help	236	3.4	1.7	13.1	81.8
Hospitals					
IPG	1,111	21.3	27.2	38.4	13.1
Non-IPG received QIO help	1,414	12.1	19.2	36.9	31.8
Non-IPG received no QIO help	58	3.5	5.2	6.9	84.5
How useful was information received from QIO?		Very Useful	Useful	Somewhat Useful	Not at All Useful
Nursing Homes					
IPG	2,225	61.7	25.7	11.3	1.4
Non-IPG received QIO help	1,932	40.3	39.3	18.9	1.5
Non-IPG received no QIO help	498	13.1	40.6	39.6	6.8
Home Health Agencies					
IPG	1,787	77.5	16.8	5.4	0.3
Non-IPG received QIO help	1,848	62.0	27.7	9.7	0.7
Non-IPG received no QIO help	234	19.2	43.6	34.6	2.6
Hospitals					
IPG	1,412	68.6	22.1	8.9	0.5
Non-IPG received QIO help	1,648	61.4	28.2	10.1	0.3
Non-IPG received no QIO help	61	13.1	37.7	41.0	8.2
How Satisfied with Ease of Access to QIO		Very Satisfied	Somewhat Satisfied	Neither Satisfied Nor Dissatisfied	Somewhat or Very Dissatisfied
Nursing Homes					

TABLE IV.5 (*continued*)

Question				
IPG	2,213	76.0	17.3	5.2	1.6
Non-IPG received QIO help	1,885	49.4	29.9	18.3	2.3
Non-IPG received no QIO help	478	20.5	27.4	47.3	4.8
Home Health Agencies					
IPG	1,783	82.5	13.6	2.9	1.1
Non-IPG received QIO help	1,820	67.0	22.0	8.4	2.6
Non-IPG received no QIO help	234	22.7	28.6	38.5	10.3
Hospitals					
IPG	1,408	75.9	19.8	2.3	2.0
Non-IPG received QIO help	1,647	68.0	23.1	5.3	3.6
Non-IPG received no QIO help	65	29.2	27.7	32.3	10.8

How Satisfied with Relationship with QIO		Very Satisfied	Somewhat Satisfied	Neither Satisfied Nor Dissatisfied	Somewhat or Very Dissatisfied
Nursing Homes					
IPG	2,220	80.2	14.4	3.6	1.8
Non-IPG received QIO help	1,912	58.1	30.3	9.5	2.2
Non-IPG received no QIO help	492	28.9	34.2	33.9	3.1
Home Health Agencies					
IPG	1,783	87.7	10.3	1.2	0.7
Non-IPG received QIO help	1,837	74.1	19.9	4.2	1.8
Non-IPG received no QIO help	232	36.2	30.6	24.1	9.1
Hospitals					
IPG	1,407	83.0	13.6	1.9	1.6
Non-IPG received QIO help	1,643	74.6	19.9	3.0	2.5
Non-IPG received no QIO help	64	37.5	32.8	23.4	6.3

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at $p<0.001$, chi-squared test. Percentages may not sum to 100 because of rounding.

CMS = Centers for Medicare & Medicaid Services

IPG = identified participant group provider

MPR = Mathematica Policy Research, Inc.

QIO = Quality Improvement Organization.

TABLE IV.6

PROVIDERS' PERCEPTIONS OF QIOs' VALUE
(Percentages Unless Otherwise Noted)

Question	Number	Strongly Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat or Strongly Disagree
QIO Assistance Was Key to Efficient Implementation of Quality Improvement Projects					
Nursing Homes					
IPG	2,215	46.7	39.9	8.2	5.2
Non-IPG received QIO help	1,914	26.5	48.9	17.7	7.0
Non-IPG received no QIO help	501	13.2	34.5	39.3	13.0
Home Health Agencies					
IPG	1,783	65.3	29.2	3.5	1.9
Non-IPG received QIO help	1,832	49.2	38.2	9.0	3.7
Non-IPG received no QIO help	243	20.2	38.7	26.8	14.4
Hospitals					
IPG	1,404	43.3	40.8	10.6	5.3
Non-IPG received QIO help	1,644	36.3	43.6	14.1	6.1
Non-IPG received no QIO help	64	10.9	31.3	39.1	18.8
Service Received from QIO Was Worth Time/Effort on Part of Our Staff					
Nursing Homes					
IPG	2,216	65.0	24.6	5.1	5.3
Non-IPG received QIO help	1,908	45.0	39.5	10.7	4.7
Non-IPG received no QIO help	494	21.1	36.2	33.6	9.1
Home Health Agencies					
IPG	1,782	78.8	17.3	1.9	2.0
Non-IPG received QIO help	1,827	64.9	27.3	5.1	2.7
Non-IPG received no QIO help	240	25.8	37.9	29.2	7.1
Hospitals					
IPG	1,403	66.1	26.0	5.4	2.5
Non-IPG received QIO help	1,640	58.1	31.4	6.8	3.8
Non-IPG received no QIO help	64	20.3	31.3	34.4	14.1
Could Not Have Gotten to Where We Are with Quality Improvement Without QIO's Help					
Nursing Homes					
IPG	2,218	32.6	42.9	13.2	11.4
Non-IPG received QIO help	1,916	18.1	41.7	23.5	16.7

TABLE 1V.6 (*continued*)

Question	Number	Strongly Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat or Strongly Disagree
Non-IPG received no QIO help	502	10.8	26.3	33.9	29.1
Home Health Agencies					
IPG	1,784	58.0	31.8	5.9	4.3
Non-IPG received QIO help	1,828	44.9	35.3	11.5	8.2
Non-IPG received no QIO help	243	18.1	30.5	30.9	20.6
Hospitals					
IPG	1,404	33.1	40.8	15.5	10.6
Non-IPG received QIO help	1,640	30.6	38.9	18.2	12.3
Non-IPG received no QIO help	65	7.7	27.7	29.2	35.4

Average Rating of QIO Contributions to Quality Improvement Projects (0 to 10 scale)		Rating of 7 or Greater (percentage)	Rating from 4 to 6 (percentage)	Rating less than 4 (percentage)	Average Rating (numeric average)
Nursing Homes					
IPG	2,215	77.6	15.7	6.7	7.5
Non-IPG received QIO help	1,911	58.5	30.7	10.9	6.4
Non-IPG received no QIO help	496	30.0	35.3	34.7	4.5
Home Health Agencies					
IPG	1,783	90.0	8.1	1.9	8.4
Non-IPG received QIO help	1,828	78.7	15.9	5.5	7.6
Non-IPG received no QIO help	235	41.7	27.2	31.1	5.2
Hospitals					
IPG	1,403	75.5	19.3	5.2	7.5
Non-IPG received QIO help	1,639	70.8	21.2	8.0	7.1
Non-IPG received no QIO help	65	32.3	26.2	41.5	4.5

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at $p<0.001$, chi-squared test. Percentages may not sum to 100 because of rounding.

CMS = Centers for Medicare & Medicaid Services

IPG = identified participant group provider

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QIO = Quality Improvement Organization.

of 7 or higher (30 percent, 42 percent, and 32 percent for nursing homes, HHAs, and hospitals, respectively). Table IV.6 also shows numeric averages of the rating scale for the different groups.

4.   Providers' Preferences for Interactions with Their QIO

Site visits seemed to be the least popular mode of QIO assistance, and training workshops the most popular, with interest in site visits decreasing from IPGs to non-IPGs receiving assistance to IPGs without assistance. Even non-IPGs receiving no help were open to training workshops, with 86 percent to 91 percent of providers expressing willingness to attend workshops (Table IV.7).

When asked to state a favorite form of contact (including choices not asked about earlier, such as conference calls, email, and the web) most providers chose email. Preference for site visits and training workshops was highest among IPGs and lowest among non-IPGs without help; conversely, preference for email was lowest among IPGs and highest among non-IPGs without help.

5.   Providers' Sources for Quality Improvement Information

Finally, the majority of providers, even non-IPGs without help, said they did *not* want to use an alternative organization (rather than their QIO) as a source for quality improvement assistance (Table IV.8). For all three provider types, more than 80 percent of IPGs and non-IPGs with assistance said they would not want to seek help from another organization, regardless of cost and other factors (Table IV.8). Substantial proportions of providers considered their local QIO the most useful source of information and assistance, ranging from 13 percent among non-IPG nursing homes without assistance to 50 percent among IPG nursing homes. Among nursing

TABLE IV.7

PERCENTAGES OF PROVIDERS EXPRESSING PREFERENCES FOR TYPES
OF INTERACTIONS WITH QIOs

	IPG (total number)	Non-IPG Received QIO Help (total number)	Non-IPG Received No QIO Help (total number)
Would Like to Receive or Continue to Receive Information or Assistance from QIO Through			
Nursing Homes			
Site visits	81.8 (2,153)	53.5 (1,843)	36.6 (470)
Training workshops	96.4 (2,205)	96.2 (1,905)	86.1 (490)
One-to-one telephone calls	85.3 (2,131)	72.5 (1,861)	53.6 (476)
Home Health Agencies			
Site visits	82.2 (1,711)	60.6 (1,753)	47.0 (232)
Training workshops	96.7 (1,760)	95.5 (1,823)	89.9 (238)
One-to-one telephone calls	91.7 (1,723)	85.7 (1,779)	74.6 (236)
Hospitals			
Site visits	71.2 (1,321)	53.0 (1,546)	32.8 (58)
Training workshops	97.3 (1,385)	96.0 (1,621)	90.8 (65)
One-to-one telephone calls	92.8 (1,351)	92.8 (1,602)	81.0 (58)
Most Preferred Method			
Nursing Homes			
Number	2,198	1,900	491
Site visits	19.3	7.0	3.9
Training workshops	27.8	23.3	19.6
One-to-one telephone calls	5.2	4.6	3.9
Telephone conference calls	5.4	4.2	4.3
E-mail	37.6	48.6	48.7
Website	2.5	6.3	6.3
Other	2.2	6.1	13.4
Home Health Agencies			
Number	1,774	1,827	246
Site visits	14.9	9.6	6.5
Training workshops	22.7	19.6	17.1
One-to-one telephone calls	8.2	7.4	7.3
Telephone conference calls	7.6	5.6	4.9
E-mail	39.7	46.0	44.7
Website	4.9	6.4	7.3
Other	2.1	5.3	12.2
Hospitals			
Number	1,399	1,631	65
Site visits	7.0	5.2	4.6
Training workshops	22.7	18.6	26.2
One-to-one telephone calls	8.9	10.4	6.2
Telephone conference calls	9.4	8.2	7.7
E-mail	49.7	53.6	47.7
Website	1.6	3.3	3.1
Other	0.6	0.8	4.6

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at $p<0.001$, chi-squared test. Percentages may not sum to 100 percent due to rounding.

CMS = Centers for Medicare & Medicaid Services; IPG = identified participant group provider; MPR = Mathematica Policy Research, Inc.; QIO = Quality Improvement Organization.

TABLE IV.8

PROVIDERS' SOURCES OF INFORMATION FOR QUALITY IMPROVEMENT (PERCENTAGES)

	IPG	Non-IPG Received QIO Help	Non-IPG Received No QIO Help
Would Prefer to Use Alternate Organization for Quality Improvement Assistance			
Nursing Homes			
Number	2,205	1,831	672
Yes	2.9	7.5	9.1
No	88.0	84.8	78.3
Would depend on cost and other factors	4.8	5.0	7.0
Don't know	4.3	2.7	5.7
Home Health Agencies			
Number	1,771	1,788	316
Yes	1.8	3.9	8.2
No	91.9	90.3	75.3
Would depend on cost and other factors	2.9	3.3	10.4
Don't know	3.4	2.6	6.0
Hospitals			
Number	1,384	1,615	87
Yes	6.8	8.5	20.7
No	80.3	80.1	59.8
Would depend on cost and other factors	8.6	7.7	10.3
Don't know	4.3	3.7	9.2
What other organizations do you turn to when you need information or assistance for quality improvement initiatives?[a]			
Nursing Homes, percentage (Total N)[b]			
CMS	90.1 (2,208)	92.5 (1,902)	81.6 (772)
NH Compare	86.9 (2,198)	86.2 (1,885)	72.6 (765)
Local QIO	95.0 (2,228)	90.3 (1,898)	58.2 (761)
MedQIC	40.0 (2,074)	21.4 (1,821)	9.1 (739)
AHRQ	25.7 (2,038)	24.0 (1,818)	10.6 (744)
IHI	21.4 (2,029)	20.9 (1,813)	10.9 (736)
AHQA	34.2 (2,054)	34.5 (1,825)	20.7 (744)
NQF	25.5 (2,035)	26.2 (1,814)	12.1 (737)
Other association websites	69.2 (2,170)	68.9 (1,875)	49.4 (770)
Other organizations	45.4 (1,879)	46.8 (1,773)	41.1 (733)
Hospitals, percentage (number)[b]			
CMS	90.7 (1,370)	92.0 (1,605)	83.5 (91)
NH Compare	48.3 (1,348)	39.6 (1,587)	22.2 (90)
Local QIO	95.5 (1,388)	94.6 (1,613)	65.9 (88)
MedQIC	57.0 (1,281)	42.3 (1,524)	15.7 (83)
AHRQ	81.0 (1,329)	71.0 (1,574)	44.4 (93)
IHI	91.0 (1,370)	80.6 (1,590)	51.7 (91)
AHQA	55.4 (1,271)	52.8 (1,527)	44.4 (91)
AHA	73.3 (1,303)	75.3 (1,548)	63.3 (90)
Premier	41.4 (1,248)	30.7 (1,501)	17.9 (84)
VHA	40.8 (1,243)	33.0 (1,488)	18.6 (86)
Other	40.9 (1,070)	41.4 (1,392)	55.6 (90)

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TABLE IV.8 (*continued*)

	IPG	Non-IPG Received QIO Help	Non-IPG Received No QIO Help
Which organization provides the most useful information and assistance?[a]			
Nursing Homes[b]			
Number	2,133	1,766	649
CMS	13.4	19.4	26.8
NH Compare	7.1	11.3	15.9
Local QIO	49.9	29.4	13.3
MedQIC	4.3	1.8	1.2
AHRQ, IHI, AHQA, or NQF	1.6	2.0	2.3
Other association websites	9.9	13.8	14.0
Other organizations	13.7	22.3	26.7
Hospitals[b]			
Number	1,316	1,551	84
CMS	8.3	11.0	23.8
Hospital Compare	1.4	1.9	3.6
Local QIO	35.0	33.6	14.3
MedQIC	3.4	3.2	0.0
AHRQ	4.6	3.1	8.3
IHI	27.8	24.8	15.5
AHQA	0.8	0.9	2.4
AHA	1.4	1.5	2.4
Premier	3.8	2.0	1.2
VHA	3.0	2.8	2.4
Other	10.4	15.2	26.2

Source: Westat de-identified survey of providers May-September 2007; dataset provided to Mathematica Policy Research, Inc. by Centers for Medicare & Medicaid Services (CMS).

Note: All differences statistically significant at $p<0.001$, chi-squared test. Percentages may not sum to 100 percent because of rounding.

[a]Home health agencies were not asked this question.

[b]The nursing home and hospital questionnaires listed slightly possible sources of quality improvement information.

AHA = American Hospital Association

AHQA = American Health Quality Association

AHRQ = Agency for Healthcare Quality and Research

IHI = Institute for Health Improvement

MedQIC = Medicare Quality Improvement Community website (http://www.medqic.org)

NH Compare = Nursing Home Compare

NQF = National Quality Forum; Premier = Premier, Inc. (Premier Healthcare Alliance)

QIO = Quality Improvement Organization

VHA = VHA, Inc.

homes, other important sources of information were CMS itself, associations, other websites, and other organizations. Among hospitals, the Institute for Health Improvement (IHI) and other organizations were the other two choices most frequently selected, as well as the local QIO (Table IV.8). CMS was the most commonly selected source among non-IPGs receiving no QIO assistance.

C. DISCUSSION

IPGs and non-IPGs receiving assistance were generally very positive about their QIO, reporting high degrees of satisfaction and providing high ratings of value of QIO services. Non-IPG providers not receiving assistance were generally neutral or somewhat favorable toward their QIOs. Few providers gave clearly negative ratings. Most providers, even non-IPGs without assistance, were willing to receive assistance from QIOs, and considered the QIO a major resource for quality improvement information. These results are consistent with previous results (Bradley et al. 2005).

The survey results bolster one of the case study findings that the quality improvement environment is complex, with many different sources of information and assistance in addition to local QIOs. Different types of providers likely turn to their QIO or to other sources depending on their prior experiences with various organizations, their network of contacts, characteristics of the QIO, and features of the local health care market.

It is noteworthy that substantial proportions of non-IPG providers in all three settings reported receiving assistance from their local QIO (especially hospitals); non-IPG providers who received such help had more favorable perceptions of their QIOs than non-IPGs who had not received help. We cannot tell from these survey data if IPG providers and non-IPGs who worked with QIOs had greater satisfaction because of positive experiences with QIOs during the Eighth SOW, or because providers who already held favorable views of their QIO (possibly as a result

of good relationships from prior SOWs) were more likely to agree to be IPGs or to work with QIOs as non-IPGs.

The substantial involvement of QIOs with non-IPGs suggests that the IPG variable might not be a straightforward binary indicator of exposure to QIO interventions, and consequently, the meaning of our proxy variable for this study, the IPG penetration rate, also becomes unclear. In general, if the untreated or comparison group is "contaminated" with the intervention under study, the treatment estimates tend to be biased downward (that is, they underestimate the true treatment effect).

V. CONCLUSIONS

We conducted a limited assessment of the Quality Improvement Organization (QIO) Eighth Scope of Work (SOW) using a variety of methods. We analyzed Medicare Compare data for nursing homes, home health agencies (HHAs), and hospitals to answer a series of descriptive and impact questions; we conducted a case study analysis of a small number of states to explore differences in improvement in hospital surgical care measures; and we performed descriptive analyses of a national survey of providers.

A. SUMMARY OF RESULTS

The analyses of the Medicare Compare data document improvements across the three settings on most measures focused on by QIOs during the Eighth SOW. Our results are consistent with other descriptive studies in the academic or lay press documenting general improvements in quality measures (Agency for Healthcare Research and Quality 2008 ; Jencks et al. 2003; Appleby and Gillum 2009).

Previous nationwide studies of QIO impacts have had mixed results. Rollow et al. (2006) performed a direct comparison between IPG and non-IPG providers in the Seventh SOW and found that IPG providers had better performance on the quality measures. However, the authors acknowledged the possibility that the results could have been due to selection, in which providers that were more highly motivated, more capable of improving quality, and would have performed better anyway were those that volunteered to be IPGs. Snyder and Anderson (2005), in contrast, compared IPG and non-IPG hospitals in four states during the Sixth SOW and found no evidence of a QIO effect; however, their study was criticized for measurement error in the intervention or treatment measure (that is, the IPG indicator) and for lack of statistical power (Jencks 2005). Measurement error in the treatment or IPG indicator remains a problem. The

literature reviews by the Institute of Medicine (2006) and the National Opinion Research Center (NORC) (Sutton et al. 2007) concluded that there was insufficient evidence either for or against the effectiveness of QIOs.

To our knowledge, the current study is the first to use the IPG penetration rate as a measure of QIO exposure of effect. Our IPG penetration analyses suggest positive impacts of QIO activities with IPGs on most quality measures in the nursing home and home health care settings. In addition, we found evidence for favorable effects from QIOs' statewide efforts to improve care provided by HHAs. However, we found no evidence of impacts of QIOs activities on reduction of worsening depression and anxiety among nursing home residents, and no evidence that QIO activities improved performance on the heart attack, heart failure, and pneumonia appropriate care measures (ACM) in hospitals.

Our case study respondents mentioned many possible factors that might have contributed to state-level trends in the Surgical Care Improvement Project (SCIP) measures, including previous activities in the Seventh SOW, QIO actions in the Eighth SOW, hospital association activities, the actions of large health systems, public reporting of hospital quality measures, the implementation of the Reporting Hospital Quality Data for Annual Payment Update (RHQDAPU) program, and the 100,000 Lives Campaign conducted by the Institute for Health Improvement (IHI). Specific QIO actions for the Eighth SOW perceived by our interviewees as particularly effective included engaging a dominant local health system; convening a hospital collaborative; and complex efforts consisting of intensive site visits, regional in-person meetings, and letters from surgical opinion leaders sent statewide to all surgeons.

Our analyses of provider survey data indicated that most providers with experience working with QIOs (IPGs and non-IPGs receiving QIO assistance) had highly favorable perceptions of QIOs. Non-IPG providers receiving no assistance tended to be neutral toward their QIOs.

Providers of all types were interested in receiving technical assistance from QIOs, with particular interest in training workshops and email contacts. A substantial proportion of non-IPG providers reported receiving assistance from QIOs, blurring the distinction between IPGs and non-IPGs.

B. POTENTIAL LIMITATIONS

The main potential limitation of the impact estimates is the possibility that states with high IPG penetration rates also have unobserved characteristics that are the true causes of their greater gains in quality. We might then mistakenly attribute the larger observed gains in the quality measures to the IPG penetration rate rather than to these other underlying factors. Although we include a variety of control variables in the regressions, the assumption that the IPG penetration rate is unrelated to other potential causes of quality improvement, though plausible, remains essentially untestable. In addition, the data on IPG penetration for some of the measures and provider settings are constrained by the sample size (the 51 states) and the limited variation of the penetration rates across the states.

C. CONCLUSIONS

Our limited assessment of the Eighth SOW finds generally favorable results for quantitative estimates of QIO impacts, qualitative analyses of interview data, and descriptive tabulations of provider satisfaction survey data. However, for the reasons noted above, the quantitative estimates should be viewed with caution.

Our results (as well as their limitations and the difficulties encountered interpreting them) highlight the importance of having detailed quantitative provider-level data so that we are better able to model and address the many potential biases. We are currently working with CMS and the QIO community to execute agreements through which Mathematica Policy Research, Inc. (MPR) will become a subcontractor under each of the 53 QIO contracts. It is clear from the regulations that the QIOs are permitted to release provider-identified data to a subcontractor. Our

results also highlight the need for our planned, detailed interviews with CMS, QIOs, and provider respondents; the results also demonstrate the need for our surveys of QIOs and providers. These data collection efforts will help us understand the selection processes through which providers become IPGs (or non-IPGs who do or do not receive QIO assistance); such an understanding is in turn essential for our quantitative impact analyses.

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APPENDIX A

**METHODS FOR ANALYSES OF MEDICARE
COMPARE DATA**

The evaluation of the QIO program's 8th SOW uses data from multiple sources to document changes in measures of the quality of care over the three year course of the 8th SOW. The results cover outcomes for three provider types: nursing homes, home health agencies, and hospitals. The approaches vary somewhat across provider-types due to variation in the types of data available and in the design of the QIO program across the three types. Table A.1 provides an overview of the analytic approach.

A. SAMPLE AND DATA SOURCES

The analyses are based on provider-level data. For some analyses, those data are aggregated to the state level. The primary data sources are CMS's Compare databases (Nursing Home Compare, Home Health Compare, and Hospital Compare), which contain data reported by nursing homes, home health agencies (HHAs), and hospitals nationwide. As described further below, nursing homes and home health agencies are required to report these data. Hospital reporting is voluntary, though reimbursement rates are now tied to reporting, giving providers an incentive to submit data. The sample for each analysis consists of all providers for which data are available in the 50 states and the District of Columbia.[1]

The study outcomes are all measures of change between the baseline period near the beginning of the 8th SOW and the follow-up period towards the end of the 8th SOW. Baseline and follow-up periods vary slightly across the three provider settings because of differences in data collection schedules. The analyses include only providers with measurements at both time points, from which we can calculate the change measures. Additional data sources include the

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[1] We will hereafter refer to all QIO jurisdictions as "states," even though the District of Columbia is technically not a state.

TABLE A.1

OVERVIEW OF ANALYSES OF MEDICARE COMPARE DATA

Nursing Homes	Home Health Agencies	Hospitals
Study measures: Four focus measures of change[a]	Study measures: A single patient functioning index created by averaging seven individual patient functioning change measures, and two measures of the disposition of the home health episode[b]	Study measures: One ACM index created by averaging 10 individual ACM measures and one SCIP index created by averaging the 2 SCIP measures[c]
Has the quality of care received by patients improved nationwide		
Average of raw provider-level changes, weighted by provider size[d]	Average of raw provider-level changes, *un*weighted (each agency receives a weight of one)[e]	Average of raw provider-level changes, weighted by provider size[f]
Average of standardized, provider-level changes, weighted by provider size[g]		
Do providers who do well in one domain of measures also do well in others?		
Correlations of provider-level changes across measures, weighted by provider size	Correlations of provider-level changes across measures, unweighted	Correlations of provider-level changes across measures, weighted by provider size
Are most states improving over the Eighth SOW		
Average of state-level changes, where state-level changes are state averages of provider-level change, weighted by provider size. Presentation of interquartile ranges and reductions in failure rate (RFR).	Average of state-level changes, where state-level changes are state averages of provider-level change, unweighted. Presentation of interquartile ranges and reductions in failure rate (RFR).	Average of state-level changes, where state-level changes are state averages of provider-level change, weighted by provider size. Presentation of interquartile ranges and reductions in failure rate (RFR).
Do states that do well in one domain of quality also do well in others		
Correlations of state-level changes, where state-level changes are state averages of provider-level change, weighted by provider size. Adjustment for baseline.[h]	Correlations of state-level changes, where state-level changes are state averages of provider-level change, unweighted. Adjustment for baseline.	

TABLE A.1 (*continued*)

Nursing Homes	Home Health Agencies	Hospitals
Which states do well in multiple domains		
State-level means were calculated by aggregating individual nursing home means to the state level, weighting by their total number of residents. These means (which were of the changes in measures) were then regression adjusted for baseline performance. The adjusted change measures were then standardized to have a mean of zero and a standard deviation of one (that is, they were converted to *z*-scores). Consistently high improving" states were defined as those performing above the mean on at least three of the four outcomes of pressure ulcers, physical restraints, depression, and chronic pain, and whose average improvement across all four was at least one-fifth of a standard deviation better than the mean (average z-score of -0.2 or below).	State-level means were calculated by aggregating home health agency means to the state level, unweighted. These means (which were of the changes in measures) were then regression adjusted for baseline performance. The adjusted change measures were then standardized to have a mean of zero and a standard deviation of one (that is, they were converted to *z*-scores). "Consistently high improving" states were defined as those performing above the mean on both the patient functioning composite index and the ACH measure, and where the improvement was $\geq$0.2 s.d. above the mean	State-level means were calculated by aggregating hospital means to the state level, weighted by numbers of patients. These means (which were of the changes in measures) were then regression adjusted for baseline performance. The adjusted change measures were then standardized to have a mean of zero and a standard deviation of one (that is, they were converted to *z*-scores). "Consistently high improving" states were defined as those performing above the mean for both the ACM and SCIP indexes, and whose improvement was $\geq$0.2 s.d. above mean
Is there an impact of QIOs' work with IPs on improvement in quality measures		
Regression of provider-level changes (four change measure) on IPG penetration rates (51 different values), controlling for provider and region characteristics, weighted by number of patients. Control for non-focus measures.[i] Use seemingly unrelated regression (SUR) to simultaneously estimate the four models and control Type II error.	Regression of provider-level changes in ACH measure on IPG penetration rates (51 different values), controlling for provider and region characteristics, unweighted. Use seemingly unrelated regression (SUR) to simultaneously estimate four models and control Type II error.	
	Is there an impact of QIOs' statewide efforts on improvement in home health quality measures	
	Analyze changes in three home health measures chosen by some states for statewide improvement projects.[j] Create a new control variable of five other home health measures[k] by first standardizing each to means of zero and standard deviations of one (that is, conversion to *z*-scores) and then averaging them. Regress the three home health measures of interest on average baseline levels, the new control variable for the five other measures, other standard control variables, and a dummy indicating whether the home health agency is in a state where the state chose the dependent variable as a statewide focus measure. Estimate three regressions simultaneously using SUR.	

TABLE A.1 (*continued*)

Note: Outline of analysis of Medicare Compare data.

[a](1) Percent of High-Risk Long-Stay Residents who have Pressure Ulcers, (2) Percent of Long-Stay Residents who were Physically Restrained, (3) Percent of Long-Stay Residents who Experience Depression, and (4) Percent of Long-Stay Residents who Experience Chronic Pain

[b]Patient functioning measures: (1) Improvement in Bathing, (2) Improvement in Transferring, (2) Improvement in Ambulation/Locomotion, (3) Improvement in Management of Oral Medications, (4) Improvement in Pain Interfering with Activity, (5) Improvement in Dyspnea, (6) Improvement in Urinary Incontinence. Disposition of home health episode measures: (1) Acute Care Hospitalization and (2) Discharge to Community.

[c]Acute care measures (ACM): (Heart Attack) (1) Aspirin at Arrival, (2) Aspirin Prescribed at Discharge, (3) ACE Inhibitor or ARB for LVSD, (4) Beta Blocker Prescribed at Discharge, (5) Beta Blocker at Arrival; (Heart Failure) (6) Evaluation of LVS Function, (7) ACE Inhibitor or ARB for LVSD; (Pneumonia) (8) Oxygenation Assessment, (9) Pneumococcal Vaccination, and (10) Initial Antibiotic Received within 4 Hours of Hospital Arrival. Surgical Care Improvement Project (SCIP) Measures: (1) Receipt of Prophylactic Pre-operative Antibiotic, and (2) Discontinuation of Prophylactic Pre-operative Antibiotic

[d]Nursing home measure of provider size is number of beds from Nursing Home Compare.

[e]Measure of home health agency size not available in Home Health Compare or OSCAR.

[f]Hospital measure of provider size is number of patients for whom the measure is reported, from Hospital Compare.

[g]Standardized measures are standardized to have a mean of zero and a standard deviation of 1 (a *z*-score).

[h]For each state, the adjusted levels are calculated by regressing the state-level changes in improvement on baseline performance, then taking the residual for each state (that is subtracting the observed change from the predicted change).

[i]The four non-focus measures were changes in (1) Improvement in Ambulation, (2) Improvement in Pain Interfering with Activity, (3) Improvement in Transferring, and (4) Improvement in Urinary Incontinence.

[j]The three measures were (1) Improvement in Management of Oral Medications, (2) Improvement in Pain Interfering with Activity, or (3) Improvement in Dyspnea. The number of QIOs selecting each of these were, respectively, 30, 10, and 9.

[k]These were improvement in (1) bathing, (2) transferring, (3) ambulation, and (4) incontinence; and (5) discharge to community.

RFR = Reduction in Failure Rate.

Area Resource File, OSCAR, and QIO administrative data. Details of the measures derived from each dataset are provided below.

1. Nursing Home Compare

The database includes information on nursing homes that are certified to participate in Medicaid and/or Medicare and provide "skilled" care—meaning skilled nursing or rehabilitation staff is required for care. Those data originate in the Minimum Data Set (MDS), a standardized assessment that collects data on residents, their medical/functional condition, and the care they receive. Nursing homes are required to report the information as part of Medicare's nursing home prospective payment system. We used baseline data collected in the second quarter of 2005. Follow-up values were collected in the first quarter of 2008. Quality measures included in the database describe both measures of patient well-being and of care received. 15,979 providers are in the baseline data and 15,773 providers in the follow-up data. There are 12,511 nursing homes that have data for both baseline and follow-up and included in the analyses, and for which we were able to calculate change in quality outcomes.

2. Home Health Compare

The data set contains quality measures for home health patients whose care is covered by Medicare or Medicaid and provided by a Medicare-approved Home Health Agency. Quality of care data in Home Health Compare are drawn from the Outcome and Assessment Information Set (OASIS). HHAs are required to report OASIS data to Medicare as part of its prospective payment system. Baseline data were collected during the period September 2004 through August 2005. Follow-up data cover the period March 2007 through February 2008. The quality measures describe various aspects of daily patient functioning and well-being, prevalence of needing to be hospitalized, and prevalence of being able be discharged from HHA care and remain living at

home. At baseline, 7,740 providers are included in the database, and 9,143 providers are included at follow-up. There are 7,275 HHAs that have data for both baseline and follow-up.

3. Hospital Compare

Hospital baseline data come from the collection period July 2004 through June 2005 and the follow-up data come from the collection period October 2006 through September 2007. For the period we studied, the Compare database contained information on acute care general hospitals and critical access hospitals. Hospitals, unlike or nursing homes and home health agencies, volunteered to submit data to the Compare database, although since 2004, the year before the start of the 8th SOW, reporting has been tied to Medicare reimbursement levels.[2] The quality measures in Hospital Compare are measures of processes of care and focus on four clinical conditions: heart attack, heart failure, pneumonia, and surgical infection prevention. The measures are derived from individual patient records. Data are available for 4,238 hospitals at baseline and 4,469 hospitals at follow-up. There are 4,027 hospitals that have data for both baseline and follow-up.

4. CMS/QIO Administrative Data

The analyses also use data provided by CMS related to QIO activities. Those include the number of providers that the QIOs in each state recruited to collaborate with individually to improve specific quality-related outcomes, and which measures they worked on. Those providers are known as identified participants (IPs). The CMS measures are used to identify QIO impacts, using methods described further on in this report.

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[2] The Reporting Hospital Quality Data for Payment Update (RHQDAPU) initiative was first included in the Medicare Prescription Drug, Improvement and Modernization Act (MMA) of 2003—initially just incentive payments, but starting in 2006, after the Deficit Reduction Act (DRA) of 2005, hospitals that did not participate in the RHQDAPU initiative saw their Medicare payments reduced by two percent.

5. Area Resource File

The Area Resource File (ARF) is published by the Health Resources and Services Administration. It contains a wide range of county-level data, including information on health care providers, personnel, and utilization, along with information on the economic and demographic characteristics of the population. Because quality of care varies across different populations and contexts, we adjust for several measures derived from the ARF in our impact analyses.

B. QUALITY MEASURES USED AS OUTCOMES IN IMPACTS ANALYSES

The 8th SOW contract required QIOs to concentrate on working with providers to improve specific measures (which we call "focus measures"). As described further on, we take advantage of the differences in improvement between focus measures and the other quality measures that QIOs were *not* required to concentrate on ("non-focus measures") to tease out the QIOs' contribution to observed improvement. Due to a lack of reporting of some measures at baseline, certain focus outcomes could not be included in the analyses.

All measures are percentages of patients, either of eligible patients receiving a recommended process of care (such as the percentage of hospital patients with a heart attack receiving aspirin) or experiencing a health outcome (such as the percentage of a nursing home's patients suffering a pressure ulcer), thus range from zero to 100. The change in a measure (follow-up minus baseline) can thus range from -100 to +100. The change measures, though theoretically bounded, all have symmetrical distributions with tails that do not reach those bounds.

1. Nursing Homes

QIOs were to work with all IPs on reducing the prevalence of pressure ulcers among high-risk, long-stay patients and to reduce the number of patients who are physically restrained. They

also had the option of working with IP nursing homes on averting worsening psychological distress (depression and anxiety) and chronic pain among long-stay residents. The measures reflect the percentage of residents in the facility that experience the particular condition. Lower values reflect better outcomes.

2. Home Health Agencies

As described in Chapter I, QIOs were tasked to undertake activities both statewide and with IPs to reduce the proportion of home health episodes that end with the adverse event of acute care hospitalization (ACH). Statewide activities include disseminating information on methods of improving care through conferences and printed materials. They engage with IPs in activities such as setting targets for improvement, redesigning care processes, and increasing the use of health information technology (CMS 2006; Essey 2008).

ACH are costly events that reflect deterioration in patients' physical conditions that may be preventable by high quality home health care. CMS also presented QIOs with a list of optional outcomes to work on. Those outcomes are listed in Table II.1. Each QIO selected one of those measures to work on in their statewide activities. They also selected one or more to work on with IPs. For all but ACH, higher values represent better outcomes.

We describe statewide improvement using a summative scale combining seven measures of patient functioning. Those include all measures other than ACH and discharge from home care. Those items create a scale with strong internal consistency ($\alpha = .84$).[3]

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[3] α refers to Cronbach's alpha. Internal consistency is measured at baseline. Results are similar for both follow-up and change.

3. Hospitals

QIOs were required to work on improving hospital performance in two broad areas of care: specific acute medical conditions [acute myocardial infarction (AMI), heart failure (HF), and pneumonia (PN)] and surgical care safety (the two Surgical Care Improvement Project or SCIP measures). The five AMI, two HF, and three PN measures were combined into a single Appropriate Care Measure (ACM) score (see Table II.1 for the 10 component measures).

A hospital's ACM score reflects whether every patient with any of the three conditions received each one of the processes of care for which he or she was eligible (Nolan and Berwick 2006). Hospital ACM scores were not publicly reported in Hospital Compare during the 8th SOW. Since the Hospital Compare data for the study period only contain provider-level measures of the percent of patients who received each of the 10 procedures, respectively, among those who should have received them, we could not compute hospital ACMs.

However, to reduce the number of separate measures analyzed we averaged the 10 ACM component measures into a single index, which we call the average of ACM measures, to distinguish it from the actual ACM score. Higher (more positive) values represent better outcomes.

The SCIP seeks to reduce negative post-operative side-effects of surgical infections, adverse cardiac events, and deep vein thrombosis. CMS began collecting surgical care measures relatively recently and only two are available at both baseline and follow-up in the Compare database: provision of antibiotic within an our prior to surgical incision, and discontinuing antibiotics in a timely manner after the end of surgery. The proportion of hospitals reporting each of those measures (≈30%) is relatively low however. We averaged those two measures to create a single average SCIP score.

C. MEASURES OF QIO ACTIVITY

Our multiple approaches to estimating impacts—which are described further on in this chapter—rely on two key types of measures of QIO involvement or activity. Both are derived from QIO administrative data provided by CMS. They are state-level data—the lowest level of data that were available for our analyses—on how many providers QIOs worked with as IPs and, in the case of HHA outcomes, the specific measures that QIOs selected to work on in their statewide activities.

1. IPG Penetration

We call the first measure, IPG penetration (%IPG). For nursing homes and home health agencies, we define IPG penetration is as the percentage of providers in a state who are IPs. For hospitals, we define IPG penetration as the percentage of patients who are in IPG facilities. The difference across provider types results from differences in data availability. As will be described later, one is not necessarily preferable to the other.

For nursing homes, IPG penetration varies across measures. All IPs were required to work on reducing the use of physical restraints and the prevalence of pressure ulcers. Most (94%), though not all, also worked to reduce psychological distress (depression and anxiety) and pain among residents.

Our data allowed us to define IPG penetration for only one HHA outcome—acute care hospitalization. QIOs were required to work with all IP HHAs on reducing ACH. The administrative reports also indicated that QIOs selected a subset of other outcomes to work on, but they did not specify whether QIOs worked with all IPs on every one of these additional selected measures, nor were we able to clarify this issue after speaking with CMS staff. We thus did not create a measure of IPG penetration for those other outcomes.

For hospitals we faced a situation similar to that for HHAs in that IPG penetration data are available only for ACM, not SCIP outcomes. IPG penetration varies by individual item across the three conditions (AMI, HF, PN) because it is measured at the patient-level and the proportion of hospital patients who were treated in IP hospitals varies somewhat by condition. We use an IPG penetration measure that is an average of the IPG penetration rates for the three individual conditions. As might be expected, however, IPG penetration is very similar across the measures, with rates between pairs of conditions correlated between .94 and .99.

2. QIO-Selected Outcomes for Home Health Agencies.

In their statewide work to improve care in home health agencies, QIOs selected one from among a list of nine measures to work on, in addition to acute care hospitalization. In our impact analyses of that statewide work, we documented the extent to which providers, on average, improved disproportionately on the particular measure selected by their state QIO. Those analyses incorporate binary indicators for individual quality outcomes, indicating whether the QIO in the provider's state selected the given outcome to work on.

D. CONTROL VARIABLES

Observed associations between measures of QIO activities and quality improvement could potentially be the result of other characteristics that are associated with both. We conducted multivariate analyses that adjust for a number of provider and county-level characteristics that may be associated with quality outcomes.

1. Provider Characteristics

We used a number of baseline provider traits that are drawn from the Compare databases. These are similar across provider types, though there is some variation. In all regressions we controlled for baseline levels of the outcome in question as baseline levels are the strongest

predictor of improvement and their inclusion adjusts for both underlying performance and regression toward the mean (in which greater improvement tends to occur among providers with lower baseline levels and vice-versa). Other traits, by provider type include:

- **Nursing Homes:** Binary indicators of ownership type (for-profit, corporate; for-profit, individual or partnership; government; non-profit, corporate; non-profit, religious; non-profit, other), facility size (indicator for being in the largest quartile of nursing homes[4]); whether situated within a hospital, and presence of both resident and family councils.

- **HHAs:** Binary indicators of ownership type (for-profit; government; non-profit, private; non-profit, religious; non-profit, other), date of certification (pre-1990, 1990s, 2000 or later), and whether the agency provides medical social services.[5]

- **Hospitals:** Binary indicators of ownership type (for-profit; government; non-profit, private; non-profit, religious; non-profit, other), hospital type (acute care or critical access), and hospital size (indicator for being in the largest quartile of facilities).[6]

2. Local Area Characteristics

Quality of care is known to vary across geographic regions by such regional factors as population socioeconomic status and race/ethnicity. Other work has suggested variation by community characteristics such as local supply of nurses or doctors (Jencks, Jencks, and McGann 2004). The impact analyses control for a range of characteristics of the county in which the provider is located. The list of controls is identical across provider types and consists of:

- The number of active physicians per 1,000 population, and the number of nurses per 1,000 population,

- The percentage of the population aged 0 to 19 and the percentage 65 years or older,

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[4] Those facilities account for roughly 45% of the total patient population in the sample.

[5] The Home Health Compare data contain a range of indicators of service sub-type, including nursing care, physical therapy, occupational therapy, speech pathology, and home health aide services. But the overwhelming majority of HHAs (>90%) report providing each of those, so those traits do little to differentiate providers. Most also report providing medical social services, but nearly 20% do not.

[6] Note that those large hospitals serve over half of all patients.

- The percent of county residents without health insurance,

- Two indicators of economic well-being: the log of per capita income and the poverty rate,

- The percent of the population with four or more years of college,

- The percentage of the population who are Hispanic and the percentage who are Black/African American,

- And an indicator for whether the provider's county is part of a metropolitan area.

3. Non-Focus Quality Measures

The variables noted above control for a range of observable provider and community characteristics that might correlate with quality of care. However, unobserved causes of quality improvement may remain. In order to capture unobserved provider propensities toward quality improvement, we adjusted for provider performance on measures that were not focused on by the QIOs. We used these non-focus measures as indicators of the "background" improvement in quality that might have occurred without QIO intervention. Such outcomes are available for only for nursing homes and home health agencies. All of the outcomes in the Hospital Compare data, however, were targeted for improvement through QIO initiatives that we examine, so it was not possible to use non-focus comparison outcomes for that provider type. We briefly describe the non-focus outcomes for the other two provider types below. The measures and their use are described further in the discussion of methods.

a. Nursing Homes

The Nursing Home Compare data contain a range of measures that QIOs did not focus on improving during the 8th Statement of Work. However, the specific actions taken to improve care captured by the four focus measures could also lead to improvement on some of the non-focus measures. In order to determine the set of measures for which performance would be most independent of performance on the focus outcomes, we created a matrix of specific continuous

quality improvement (CQI) activities and the quality outcomes that they would be expected to influence (see Table A.2). We used that matrix to calculate the extent to which activities to improve performance on each non-focus measure overlapped with those used to improve focus measures.

All non-focus outcomes shared a moderate number of CQI activities with focus outcomes. On average each activity used to improve a non-focus outcome would also be relevant for between two or three of the four focus outcomes. We identified four non-focus measures whose CQI activities overlap least with those used to improve focus activities. Those four are: reduction in daily activity, being bed/chairfast, worsening mobility, and the presence of urinary tract infection. We entered both the change and baseline levels of those measures as controls in the multivariate analyses. Note that to the extent that efforts to improve focus activities also improve our non-focus outcomes, this "spillover" will tend to produce underestimates of QIO impacts because some of those impacts are absorbed by the non-focus outcome controls.

b. Home Health Agencies.

We also incorporated controls for non-focus measures in the analyses of impacts of QIO *statewide* efforts to improve health care. Each state QIO selected one optional measure to work on out of a list of nine. Forty-nine of the 51 QIOs selected either improvement in management of oral medications (30 QIOs), pain interfering with activity (10 QIOs), or dyspnea (9 QIOs). As noted above, we examined impacts of statewide activities on those three outcomes. Those analyses include specifications that control for average baseline levels and improvement in the other five available outcomes (bathing, transferring, ambulation, incontinence, and discharge to

TABLE A.2

CARE QUALITY IMPROVEMENT ACTIVITIES AND THE QIO FOCUS AND NON-FOCUS
NURSING HOME OUTCOME MEASURES THEY INFLUENCE

	CQI Activities											
	Incontinence Care	Frequent Monitoring	Nutrition/ Hydration	Medication Management	Fall Prevention	Increased Mobility	Turning/ Repositioning	Comprehensive Assessment	Management Philosophy	Restorative/ Rehab	Family/Staff Education	Behavioral/ Psychosocial Interventions
Focus Quality Measures (QM)[a]												
Long-stay												
Physical restraint use	✓	✓			✓	✓	✓	✓	✓	✓	✓	✓
High risk pressure ulcers	✓	✓	✓				✓	✓		✓		
More depressed/anxious		✓		✓				✓				✓
Moderate-severe pain		✓		✓				✓		✓	✓	✓
Other Available QMs (Non-Focus)[a]												
Long-stay												
Late-loss ADL worsening					✓	✓		✓		✓		
Bedfast					✓	✓	✓	✓		✓		
Mobility worsening					✓	✓		✓		✓		
Low-risk bowel/bladder incontinence	✓	✓						✓	✓	✓	✓	
Indwelling catheter	✓	✓						✓	✓		✓	
Urinary tract infections	✓	✓	✓	✓				✓			✓	
Low-risk pressure ulcers	✓	✓	✓				✓	✓		✓		
Weight loss		✓	✓	✓				✓		✓	✓	✓

[a]High-Risk Pressure Ulcers = percent of high-risk long-stay residents with pressure sores; Physical Restraint Use = percent of long-stay residents who were physically restrained; More Depressed/Anxious = percent of long-stay residents who have become more depressed or anxious; Moderate-Severe Pain = percent of long-stay residents who have moderate-to-severe pain. Late-loss ADL Worsening = percent of residents whose need for help with daily activities has increased; Bedfast = percent of long-stay residents who spent most of their time in a bed or chair; Mobility Worsening = percent of long-stay residents whose ability to move about in and around their room got worse; Low-Risk Bowel/Bladder Incontinence = percent of low-risk, long-stay residents who lose control of their bowels or bladder; Indwelling Catheter = percent of long-stay residents who have/had a catheter inserted and left in their blader; Urinary Tract Infections = percent of long-stay residents with a urinary tract infection; Low-Risk Pressure Ulcers = percent of low risk residents with pressure sores; Weight Loss = percent of residents who lose too much weight.

community).[7] In order to assure that each of the items had equal weight, we standardized the measures to have a mean of zero and standard deviation of one prior to averaging them.

E. ANALYTIC METHODS

The report contains both descriptive and impact analyses. Below we describe our approaches to answering each of the research questions in the study. For the nursing home and hospital analyses, we conducted all provider-level analyses weighted by facility size, as measured by the number of patients/residents. This weighting produces results for quality of care that are reflective of the care received by the average patient, rather than the care provided by the average facility. For comparison purposes we also describe unweighted results (results where each provider is given equal weight).[8] The two sets of analyses generally yield substantively identical results. The home health agency data do not contain information on the number of patients served by each agency, so all HHA analyses were conducted without weights.

The measures we use differ somewhat by the particular question. When we examine the amount of improvement overall, we focus on raw changes. When we want to compare improvement across states or providers, we adjust for factors, such as levels of performance at the beginning of the Statement of Work because further improvement can be harder to make when starting at an already high level. The adjustments avoid penalizing states or providers in comparative analyses for their already high performance.

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[7] The sixth measure, *improvement in the status of surgical wounds*, was not available in the Compare data at baseline, so it cannot be included.

[8] In comparison to the analyses weighted by provider size, by giving all providers an equal weight, these unweighted analyses implicitly weight small providers more heavily and larger providers less heavily.

1. **Has the quality of care received by patients improved nationwide?**

   For these descriptive analyses we present measures of average performance at the beginning and end of the Statement of Work. We measured change using both raw changes and changes relative to baseline standard deviations to enhance comparability of magnitudes of change across outcomes.

2. **Do providers who do well in one domain of measures also do well in others?**

   To answer this question we present correlations of performance across measures. High correlations suggest that quality of care tends to be an institutional characteristic that produces positive outcomes across domains and that the measures of quality are precise. Low correlations suggest that either quality of care is very domain-specific or that the available outcome measures are imprecise as indicators of quality.

3. **Are most states improving over the Eighth SoW?**

   We present several indicators of state-level change in quality, including average improvement, interquartile ranges, and counts of how many states did and did not improve on each measure. These quantities reflect the absolute improvement occurring in provision of quality of care.

4. **Do states that do well in one domain of quality also do well in others?**

   We calculated correlations between state-level improvement on different outcomes to assess the extent to which states that tend to do well in one area also do well in others. Because improving by a given amount becomes more difficult when starting from a higher baseline, we calculated these correlations using improvement adjusted for baseline in order to not penalize states who started the SOW at a higher performance level. For each state, the adjusted levels are calculated by regressing the state-level changes in improvement on baseline performance, then

taking the residual for each state (that is subtracting the observed change from the predicted change). This adjustment is more important for the next research question—assessments of which states performed best—than it is for the correlations across measures.

5. Which states do well in multiple domains?

We averaged z-scores of improvement, adjusted for baseline, across multiple outcomes for each provider type—and converted the resulting composite measures to *z*-scores—to identify states that demonstrated consistent improvement during the years of the 8th SOW. For each provider type, the criteria we used to define "consistently high performing" for each provider type are as follows.

a. Nursing Homes

For nursing homes we list states that performed above the mean on at least three of the four outcomes of pressure ulcers, physical restraints, depression, and chronic pain, and whose average improvement across all four was at least one-fifth of a standard deviation above the mean (average *z*-score of at least .2).

b. Home health agencies

For HHAs we list the states that performed an average of at least one-fifth of a standard deviation above the mean on acute care hospitalization and a composite of seven other elective outcomes related to patient functioning/well-being. To be included providers also had to have above-average improvement on both outcomes—poor performance on one outcome could not be outweighed by far above-average performance on the other. We used the patient functioning composite because of the large number of outcomes. We omit the outcome *discharge to the*

community (where discharge indicates discharge from agency care) because it is nearly collinear with acute care hospitalization, and is only weakly correlated with the other outcomes.[9]

c. Hospitals

We defined high-performing states to be those that (1) improved more than the nationwide average on both the ACM and SCIP indexes and (2) had an average improvement across the two that was at least one-fifth of a standard deviation greater than the mean.

6. Is there an impact of QIOs' work with IPs on improvement in quality measures?

The main challenge to deriving accurate estimates of those impacts of QIOs' work with individual providers is that IPs and non-IPs may differ from one another in ways that impact their quality of care improvement, other than whether or not they participated with a QIO. For example, QIOs target participants based, in part, on perceived ability to improve, using information that the QIO believes it knows about specific providers' capabilities and interests. In turn, it is difficult to disentangle whether differences in performance between IPs and non-IPs is due to the work of the QIOs or to other characteristics that were related to their selection status.

We used an approach to estimating impacts of QIOs' IPG work that relies on comparisons of performance across states rather than comparing performance of IPs and non-IPs. In order to further assure that our impact estimates are not driven by unobserved provider characteristics, we also conducted analyses that control for providers' improvement in measures that QIOs did not work with IPs to improve.

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[9] It should be noted that the OASIS manual specifically instructs HHAs that discharge to the community and acute care hospitalization are two separate and distinct outcomes.

a. IPG Penetration Approach

Our approach relies on cross-state variation in the percent of providers that are IPs. The problem with using comparisons of IP providers to non-IP providers to estimate impacts of QIO efforts is that IPs and non-IPs are likely to differ in ways that influence quality outcomes other than through their QIO participation. The selection of individual providers to be IPs is based partially on QIOs' perceptions of a providers' need and capacity for improvement. Similarly, providers' willingness to be an IP is likely to be a function of their underlying motivation and ability to improve quality.

However, the design of the QIO program introduces one important influence on the probability that a provider will end up as an IP that is independent of individual providers' characteristics. As described earlier, the fraction of providers that QIOs are contractually able and expected to work with varies substantially across states. This is reflected in variation in the IPG penetration rates. Consequently, the probability that any given provider will be an IP in one state may be several times greater than the probability for a similar provider in a different state. We used the IPG Penetration rate as a proxy instrument for individual IPG status.

A typical regression examining impacts of work with IPs, based on differences in performance between IPs and non IPs would be estimated using an equation such as the following.

$$\Delta y_i = \alpha + \beta T_i + \gamma X_i + \varepsilon_i \tag{II.1}$$

The outcome on the left-hand side is the change in the quality outcome, y, for each provider i. T_i is a binary indicator of being in an IPG, and X_i is a set of control variables, including baseline level of the quality outcome. β is a parameter that captures the average difference in improvement between IPs and non-IPs.

We replace the dichotomous IP indicator with the IPG penetration rate for each state, *s*, a measure that has a potential range from zero to one. For each provider, this represents the probability of being an IP. As opposed to the binary IP status indicator, that probability is conditioned solely on this program design element, not on potentially endogenous provider characteristics.[10]

$$\Delta y_i = \alpha + \lambda P_{si} + \gamma X_i + \varepsilon_i \tag{II.2}$$

The value of the parameter λ has the same interpretation as β, but the estimate is unconfounded by unobserved provider characteristics that may affect both selection status and quality improvement. Because all providers in a state have the same value for the %IP variable, the estimated impacts of QIO work with IPs are identified by cross-state variation. If QIOs are effective in their work with individual IPs, then overall improvement should be greater in states where QIOs are able to work with a higher percentage of providers.[11]

This approach does not distinguish between impacts on different types of providers, nor whether per-provider impacts vary for states with low or high levels of IPG penetration. The actual levels of IPG penetration vary across states from roughly 10 to 100 percent for nursing homes and hospitals, and 15 to 55 percent for home health agencies. Most states tended to have rates in the bottom half of those ranges. Because no states had HHA IPG penetration rates much above 50 percent, the results provide no information on what impacts might be for that half of HHAs that were unlikely to work with QIOs as IPs. The results also only reflect estimates of average impacts across states. It is possible, that there is variation in effectiveness across QIOs.

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[10] The original design of the study called for this approach. However, we had expected to be able to obtain indicators of IP status for individual providers to conduct analyses such as those in II.1 for comparison. We were ultimately unable to obtain those indicators, however.

[11] Note that we adjust our standard errors for clustering at the state level, which is important given the lack of within-state variation in the IPG penetration measure. The clustering correction is applied to standard errors in all of our impact analyses.

The IPG penetration instrument is a source of variation in providers' probability of being selected as an IP that is not obviously related to potential causes of improvement in quality of care, other than QIO efforts themselves. But as with any instrument, it not possible to guarantee that there are no unobserved characteristics that are associated both with the instrument and the outcome (but are not caused by the instrument), and that could consequently cause the results to be biased.

The primary determinant of IPG penetration is state population size, with IPG penetration rates tending to increase as state size decreases. It is possible that smaller states differ systematically from larger states in ways that would affect quality of care. We controlled for a range of characteristics that might differentiate states of different sizes, including urbanicity, economic characteristics, and demographic traits. We also controlled for baseline differences in quality of care—so even if smaller states did tend to have systematically higher or lower levels of quality of care, that is accounted for as well, and any bias would have to result from systematic differences related to states size that emerged after baseline, such as quality improvement efforts led by other organizations that also happened to be more strongly concentrated in smaller states during the same time period.

b. QIO Focus Measures vs. Those Not Focused On

In order to address potential confounding due to unobserved causes of quality improvement, we adjusted for baseline performance and change in quality measures that QIOs did not focus on in their work with IPs in the nursing home analyses.[12] If such confounders exist, they would be expected to influence quality outcomes broadly, not just those focused on by QIOs. The impact

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[12] We did this for nursing homes only because adequate measures were unavailable for the other provider types.

estimates obtained after adjusting for non-focus quality measures reflect improvement on QIO focus outcomes over and above what would be expected given improvement on other outcomes. Because some QIO activities aimed at improving quality on one outcome could have impacts across other outcomes, adjusting for improvement on non-focus outcomes could net out some improvement that is actually due to QIOs. As a result, these estimates would be expected to, if anything, underestimate actual impacts.

Where there were multiple outcomes for a given provider type, we estimated impacts jointly using a technique called seemingly unrelated regression. Estimating equations simultaneously rather than one-by-one permits adjustment of standard errors for correlation across outcomes, and also provides a better means of determining whether QIOs' efforts across all outcomes for a provider type were statistically significant. As the number of statistical tests increases, so does the probability of finding some statistically significant outcomes by chance, what is known as the problem of multiple comparisons.[13] Tests of joint significance across outcomes allow us to establish whether we can, on the whole, be confident that there are true impacts in instances where we have more than one outcome measure.

7. Is there an impact of QIOs' statewide efforts on improvement in home health quality measures?

In general it is difficult to assess the impact of statewide activities because they affect all providers and all QIOs engage in them, so there are no comparison groups not exposed to the statewide activities. However, the design of the home health task does present a good opportunity to assess statewide efforts aimed at improving care in the HHA setting. In their statewide work with home health agencies, all QIOs were required to promote reduction in acute

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[13] Concluding an observed difference is statistically significant when in fact there is no underlying difference is also called a false positive, Type I, or alpha error

care hospitalization, but as noted in the Measures section above, each also chose one additional measure from among a list of nine. QIOs did not all choose the same measure, which allows us to test whether providers tended to improve more on a given measures if their state QIO selected that measure for statewide improvement, compared to providers in other states.

We estimated equations of the following form:

$$\Delta y_i = \alpha + \phi C_s + \gamma X_i + \varepsilon_i \tag{II.3}$$

where C_s is an indicator that the provider is in a state where the state chose the outcome measure in the equation to focus on for state-wide improvement. As described earlier, nearly all state QIOs (49 out of 51) chose one of three outcomes—management of oral medications, pain interfering with activity, or dyspnea. We simultaneously estimated impacts (ϕ) on those three outcomes using seemingly unrelated regression. This specification not only avoids selection bias on unobservable characteristics of providers, but also—on the whole—on unobservable characteristics of states because nearly all states, regardless of whether they are high or low performing, selected at least one of the three outcomes in question.

Of the remaining six outcomes, Home Health Compare contains baseline and follow-up data for five (bathing, transferring, ambulation, incontinence, and discharge to community). We standardized and then averaged measures of improvement on those five outcomes and added those to the equation above to adjust for differences in improvement across providers that likely would have occurred in the absence of QIO intervention.

APPENDIX B

METHODS FOR CASE STUDY ANALYSIS

On November 10, 2008, Mathematica Policy Research, Inc. (MPR) sent a memorandum to the Centers for Medicare & Medicaid Services (CMS) that described the patterns in statewide improvement in hospital performance measures, as measured by the patient-weighted mean scores in each state. That analysis showed substantial variation among states in the rates of improvement on two Surgical Care Infection Prevention Program (SCIP) measures that were part of the Eighth scope of work (SOW). We focused on the SCIP measures because they are the only hospital measures that are also part of the Ninth SOW. The baseline period for analysis was July 2004 through June 2005 (just prior to the start of the Eighth SOW), and the follow-up period was October 2006 through September 2007. The follow-up period thus fell about two-thirds of the way through the Eighth SOW, and represented the most recent data available at the time of the analysis. To be included in the analysis, hospitals must have had data in both the baseline and follow-up periods. Therefore, only a fraction of hospitals were included in the analysis, as discussed below. To understand the variation in state improvement patterns consistent with the study time frame and resources, we selected a small number of states and conducted telephone discussions with their Quality Improvement Organizations (QIOs) and hospital associations to identify any differences in the provider environment and/or the QIO's approach that might help explain the different patterns.

A. SELECTION OF CASE STUDY STATES

Although all states improved on the SCIP measures during the Eighth SOW, we identified five states for case study that followed one of two patterns in improvement: high improvement from a low baseline (high-improving states), or lesser improvement from a high baseline (high-baseline states). The three high-improving states began the study period with relatively low rates on both of the SCIP measures but then improved dramatically—more than 14 percentage points—on the two measures in the follow-up period. The three states were selected to provide

geographic diversity from among eight states that were in the bottom quartile on both measures at baseline. The two states that were high performers at baseline had lower rates of improvement, roughly matching average improvement on these measures across all states. We selected these two states to provide one urban and one rural state in different parts of the country from the eight states that were in the top quartile at baseline for both of the SCIP measures. The data for the selected states along with the national average are shown in Table B.1.

B. DATA COLLECTION

We developed a discussion guide aimed at exploring a number of potential factors in state SCIP trends: QIO activities, hospital association activities, the SCIP program, the 100,000 Lives Campaign conducted by the Institute for Health Improvement (IHI), hospitals' public reporting of core SCIP measures as part of the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) accreditation, barriers to improvement, and whether reporting hospitals were representative of hospitals in the state overall. We used four slightly different versions of this guide, depending on the entity we were speaking with and the pattern of improvement in the state (copies of the guides are included in this appendix).

Prior to holding telephone calls with QIOs and hospital associations, we interviewed several national-level experts from the IHI, representatives of the quality improvement organization support center (QIOSC), and an expert involved during the study time frame with the national SCIP program. The purpose of these calls was to identify and prioritize likely explanations, and to identify any measurement issues pertaining to the SCIP measures that might have affected the relative rates among states.

From December 2008 through February 2009, we held telephone discussions of about 45 minutes each with the QIO task leaders and separate calls with knowledgeable hospital

association representatives in each state[1] in order to identify what approaches or provider characteristics might help explain the different patterns on these measures between the high- and low-baseline states.

TABLE B.1

PERFORMANCE TRENDS OF FIVE CASE STUDY STATES ON THE TWO SCIP MEASURES

State	Number of Hospitals Whose Patients Were in Analysis	Baseline Level	End Level	Percentage Point Change
High-Improving States that Were Low Performers at Baseline				
Antibiotics one hour before incision				
State A	58	69.9	88.4	18.5
State B	18	70.1	85.3	15.2
State C	32	70.3	84.5	14.2
Antibiotics stopped within 24 hours after surgery				
State A	54	66.1	88.3	22.2
State B	17	56.4	76.0	19.6
State C	32	56.0	77.5	21.5
High Performing States at Baseline				
Antibiotics one hour before incision				
State D	57	86.3	92.0	5.7
State E	20	88.6	93.2	4.6
Antibiotics stopped within 24 hours after surgery				
State D	54	77.4	89.7	12.3
State E	19	76.9	86.5	9.6
National (Median of States)				
Antibiotics one hour before incision	1,281	79.3	88.6	9.2
Antibiotics stopped within 24 hours after surgery	1,259	66.7	83.4	16.7

SCIP = Surgical Care Improvement Project.

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[1] In State C, the hospital association was not responsive to our attempts to schedule a call; however, we included this state in the analysis because the hospital association and the QIO worked closely and thus the QIO was able to tell us about the full range of relevant activities.

DISCUSSION GUIDE FOR QIOS IN HIGH-IMPROVING STATES

In examining the trends in two Hospital Compare measures of surgical care improvement between June 2004-July 2005 and October 2006-September 2007, we noticed that [state] had one of the largest improvements in the country. Specifically, for the __ measure, this state showed positive improvement of __ percentage points, rising from __% meeting the guideline in [time period] to __ meeting the guideline by ___. For the __ measure, this state showed positive improvement of __ percentage points, rising from __% meeting the guideline in [time period] to __ meeting the guideline by September 2007.

1) The trend I just described was based on the __ percent of [state] hospitals that reported these measures to Hospital Compare in both years. So please look at the list of hospitals that reported Hospital Compare data on these measures in your state….

   a) How many of these hospitals were in your SCIP IPG during the 8th SOW? Did your SCIP IPG include any hospitals that do not appear on this list? If so, how many?

   b) What could you tell us about the hospitals on the attached list in the following areas?

      i. Are their information systems fairly sophisticated as they pertain to quality measurement?

      ii. How committed does their leadership appear to be to improving quality? How can you tell?

      iii. Do they tend to stand out with respect to leadership in the *surgical* quality improvement area—e.g. having a head surgeon who is a particular believer in measures and/or particularly committed to reducing infections?

      iv. Do many of them have an overall philosophy on improving such as six sigma or Lean

      v. Do most of them have sophisticated quality improvement departments including a highly skilled quality improvement director?

      vi. Was there anything that made them more committed to improving on these measures than other hospitals around the country might be? For example, a particular champion, or some organization subsidizing their participation in 100,000 lives campaign?

      vii. Do the hospitals on the Hospital Compare list tend to be those who are more interested in collaborating on quality relative to others in the state?

c) How large a gap do you think there is between the hospitals on the list and other hospitals on the state in terms of:

    i.   performance on these measures

    ii. ability to improve

2) Does the positive trend we described for the Hospital Compare-reporting hospitals differ in size much from the trend you saw in the SCIP IPG data abstracted by CDAC for the Medicare population between baseline—first quarter 2005—and remeasurement—first quarter 2007?

3) We assume by definition the hospitals in your SCIP IPG were participating in SCIP. Attachment B lists hospitals that were participants in SCIP in your state. Can you tell us about what percent of the hospitals on this SCIP list were not part of your SCIP IPG?

4) Were you aware of the Hospital Compare improvement trend we've been discussing before we contacted you?

5) If yes, when and how did you know hospitals were improving very well on these measures?

6) Why do you think we see this positive trend?

7) Could you tell us about what you did with your SCIP IPG during the 8th SOW?

a) Did you provide direct technical assistance or facilitate a collaborative? (If so, please describe.)

b) Did you offer a monitoring tool to the IPG hospitals for tracking quarterly SCIP measures performance? To any other (non-IPG) hospitals? Do you know to what extent they used it?

c) What else, if anything, did you do?

8) Are hospitals reporting the SCIP measures as a part of any state or regional initiative, in addition to Hospital Compare? (If yes, please describe.)

9) Are there any payment incentives that you are aware of that would have caused hospitals to focus on improving on these measure? [Specifically discuss any apparently high participation in Premier Hospital Quality Improvement Demonstration based on list of Premier-participating hospitals by state, since these measures are incentivized, albeit for CABG and hip/knee surgery only.]

10) How would you characterize the extent to which hospitals in this state are interested in working with each other to improve on quality measures? In other words, does quality improvement in this state tend to happen through collaboration, or competition, or both?

a) Please confirm that this general pattern applies for surgical infection-related measures?

11) Summary: To sum up our discussion, please briefly recap which if any of the following likely played a positive role, and how so:

a) QIO activities

b) The SCIP program more generally

c) IHI's 100,000 lives campaign

d) Hospitals' public reporting of core SCIP measures as part of JCAHO accreditation

e) The Hospital Quality Alliance/Hospital Compare

f) Other things?

DISCUSSION GUIDE FOR QIOS IN LOW-IMPROVING STATES

Through this discussion, we are hoping to gain insights into the trends in Hospital Compare data drilling down to study two Hospital Compare measures of surgical care improvement between a baseline period of July 2004-June 2005 and a follow-up period of October 2006-September 2007. During that period, we noticed that [state] did not show as much improvement as most other states did on the antibiotics one hour before incision measure. For this measure, this state showed positive improvement of only __ percentage points, where the average for the nation was __%. The ending percentages for this measures were not particularly high either relative to other states, with this state ending at __%, below average for the nation. We note that there was also little improvement compared to other states on the antibiotic stopped within 24 hours after surgery measure, however we recognize the ending percentage was about average for the nation.

Characteristics of Hospitals on the Hospital Compare List

1) The trend I just described was based on the __ percent of [state] hospitals that reported these measures to Hospital Compare in both years. So please look at the list of hospitals that reported Hospital Compare data on these measures in your state….

    a) How many of these hospitals were in your SCIP IPG during the 8th SOW?

        i. Did your SCIP IPG include any hospitals that do not appear on this list?

        ii. If so, how many?

    b) What could you tell us about the hospitals on the attached list in the following areas?

        i. Organizational characteristics—generally large, urban, nonprofit..?

        ii. Are their information systems fairly sophisticated as they pertain to quality measurement?

        iii. How committed does their leadership appear to be to improving quality? How can you tell?

        iv. Do they tend to stand out with respect to leadership in the *surgical* quality improvement area—e.g. having a head surgeon who is a particular believer in measures and/or particularly committed to reducing infections?

        v. Do many of them have an overall philosophy on improving such as six sigma or Lean

        vi. Do most of them have sophisticated quality improvement departments including a highly skilled quality improvement director?

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vii. Do the hospitals on the Hospital Compare list tend to be those who are more interested in collaborating on quality relative to others in the state?

c) How large a gap do you think there is between the hospitals on the list and other hospitals on the state in terms of:

i. performance on these measures

ii. ability to improve

2) Does the relatively stable trend we described for the Hospital Compare-reporting hospitals differ in size much from the trend you saw in the SCIP IPG data abstracted by CDAC for the Medicare population between baseline (first quarter 2005) and remeasurement (first quarter 2007)?

3) We assume by definition the hospitals in your SCIP IPG were participating in SCIP. Attachment B lists hospitals that were participants in SCIP in your state. Can you tell us about what percent of the hospitals on this SCIP list were not part of your SCIP IPG?

Awareness of Performance Trend

4) Were you aware of the Hospital Compare improvement trend we've been discussing before we contacted you?

5) If yes, how did you know how hospitals were doing on these measures?

6) Could you tell us about what you did with your SCIP IPG during the 8th SOW?

a) Did you provide direct technical assistance or facilitate a collaborative? (If so, please describe.)

b) Did you offer a monitoring tool to the IPG hospitals for tracking quarterly SCIP measures performance? To any other (non-IPG) hospitals? Do you know to what extent they used it?

c) What else, if anything, did you do?

7) Are hospitals reporting the SCIP measures as a part of any state or regional initiative, in addition to Hospital Compare? (If yes, please describe.)

8) Are there any payment incentives that you are aware of that would have caused hospitals to focus on improving on these measure? [Specifically discuss any apparently high participation in Premier Hospital Quality Improvement Demonstration based on list of Premier-participating hospitals by state, since these measures are incentivized, albeit for CABG and hip/knee surgery only.]

9) How would you characterize the extent to which hospitals in this state are interested in working with each other to improve on quality measures? In other words, does quality improvement in this state tend to happen through collaboration, or competition, or both?

   a) Please confirm that this general pattern applies for surgical infection-related measures?

Barriers to Improvement

10) What if any barriers are you aware of that hospitals on the Hospital Compare list faced in trying to improve on these measures during the 2005-2008 time period? [or hospitals in general if Hospital Compare list is too precise, but be sure to clarify which]

   a) Financial barriers—were most hospitals doing OK during this period financially?

   b) Other foci—were hospitals pre-occupied with other concerns during this period? If so, what types?

   c) Lack of leadership in the hospital community around surgical infection measures—or around QI more generally?

   d) Were there other barriers to improvement?

11) To what extent do you think these barriers persist going forward?

Summary of Influences on Improvement

12) To sum up our discussion, please briefly recap which if any of the following played a positive role, and whether you think of anything that may have limited the effectiveness of their role in this state compared with others when it came to the surgical infection prevention measures:

   a) QIO activities

   b) Hospital association activities

   c) The SCIP program more generally

   d) IHI's 100,000 lives campaign

   e) Hospitals' public reporting of core SCIP measures as part of JCAHO accreditation

   f) The Hospital Quality Alliance/Hospital Compare

   g) Other things?

**DISCUSSION GUIDE FOR HOSPITAL ASSOCIATIONS
IN HIGH-IMPROVING STATES**

In examining the trends in two Hospital Compare measures of surgical care improvement between __ and ___, we noticed that [state] had one of the largest improvements in the country. Specifically, for the __ measure, this state showed positive improvement of __ percentage points, rising from __% meeting the guideline in [time period] to __ meeting the guideline by ___. For the __ measure, this state showed positive improvement of __ percentage points, rising from __% meeting the guideline in [time period] to __ meeting the guideline by ___.

Characteristics of Hospitals on the Hospital Compare List

1) The trend I just described was based on the __ percent of [state] hospitals that reported these measures to Hospital Compare in both years. So please look at the list of hospitals that reported Hospital Compare data on these measures in your state…what could you tell us about the hospitals on the attached list?

    i.   Organizational characteristics—generally large, urban, nonprofit?

    ii.   Are their clinical information systems fairly sophisticated?

    iii.   Are there many that see quality improvement as a key part of their business strategy?

    iv.   Are many of them using Six Sigma or Lean, or other paradigms to improve quality?

    v.   Do most of them have sophisticated quality improvement departments including a highly skilled quality improvement director?

    vi.   Can you think of anything that may have made them more committed to improving on these measures than other hospitals around the country might be? For example, a particular champion, or some organization subsidizing their participation in 100,000 lives campaign?

    vii.   Do you know if the hospitals on the Hospital Compare list tend to be those who are more interested in collaborating on quality relative to others in the state?

  a) Do you have a sense for whether there is much of a gap between the hospitals on the list and other hospitals on the state in terms of:

    i.   performance on these measures and/or

    ii.   ability to improve

Awareness of Performance Trend

2) Were you aware of the Hospital Compare improvement trend we've been discussing before we contacted you?

3) If yes, when and how did you know hospitals were improving very well on these measures?

Hospitals' Involvement in Various Related Initiatives

4) Do you have any ideas about why we see this positive trend? To the extent you can, please tell us which if any of the following may have played a positive role, and how so:

   a) Medicare's Quality Improvement Organization in the state - [name it]

   b) The SCIP program more generally

   c) IHI's 100,000 lives campaign

   d) The Hospital Quality Alliance/Hospital Compare

   e) Hospitals' public reporting of core SCIP measures as part of JCAHO accreditation

   f) Other things?

5) Did the hospital association have much interaction with its members around the issue of quality improvement during 2005-2008? Surgical care improvement specifically? (Please explain.)

6) Are you aware of the work the QIO in the state [name] was doing with some hospitals during 2005-2008 around surgical infection prevention?

   If yes:

   a) What was your impression of how things went with that work?

   b) Is there anything you think the QIO could have done better?

7) Were hospitals during that time involved in any state or regional initiative that might have affected their improvement on the SCIP measures? (If yes, please describe.)

8) Are there any payment incentives that you are aware of that would have caused hospitals to focus on improving on these measure? [Specifically discuss any apparently high participation in Premier Hospital Quality Improvement Demonstration based on list of Premier-participating hospitals by state, since these measures are incentivized, albeit for CABG and hip/knee surgery only.]

Barriers to Improvement

9) What if any barriers are you aware of that hospitals on the Hospital Compare list faced in trying to improve on these measures during the 2005-2008 time period? [or hospitals in general if Hospital Compare list is too precise, but be sure to clarify which]

   a) Financial barriers—were most hospitals doing OK during this period financially?

   b) Other foci—were hospitals pre-occupied with other concerns during this period? If so, what types?

   c) Lack of leadership in the hospital community around surgical infection measures—or around QI more generally?

   d) Were there other barriers to improvement?

10) To what extent do you think these barriers persist going forward?

Summary of Influences on Improvement

11) To sum up our discussion, please briefly recap which if any of the following played a positive role, and whether you think of anything that may have enhanced the effectiveness of their role in this state compared with others when it came to the surgical infection prevention measures:

   a) QIO activities

   b) Hospital association activities

   c) The SCIP program more generally

   d) IHI's 100,000 lives campaign

   e) Hospitals' public reporting of core SCIP measures as part of JCAHO accreditation

   f) The Hospital Quality Alliance/Hospital Compare

   g) Other things?

DISCUSSION GUIDE FOR HOSPITAL ASSOCIATIONS
IN LOW-IMPROVING STATES

Through this discussion with you, we are hoping to gain insights into the trends in Hospital Compare data specifically for two measures of surgical care improvement between July 2004 through June 2005 as the baseline period and October 2006 through September 2007 as the follow-up period. We noticed that on the measure antibiotics one hour before incision, [state] did not show as much improvement as most other states did. Specifically, for the __ measure, this state showed positive improvement of only __ percentage points, where the average for the nation was __%. The ending percentage for the state's hospitals on this measure was also below average. For the other measure we are reviewing--antibiotics stopped within 24 hours after surgery--the state also showed less than average improvement (__ percentage points), where the average for the nation was __%. However, on this measure we recognize that the ending percentage was about the same as the average other states.

Characteristics of Hospitals on the Hospital Compare List

1) The trend I just described was based on the __ percent of [state] hospitals that reported these measures to Hospital Compare in both years. So please look at the list of hospitals that reported Hospital Compare data on these measures in your state…what could you tell us about the hospitals on the attached list?

    i.   Organizational characteristics—generally large, urban, nonprofit..?

    ii.   Are their clinical information systems fairly sophisticated?

    iii.   Are there many that see quality improvement as a key part of their business strategy?

    iv.   Are many of them using Six Sigma or Lean, or other paradigms to improve quality?

    v.   Do most of them have sophisticated quality improvement departments including a highly skilled quality improvement director?

    vi.   Can you think of anything that may have made them more committed to improving on these measures than other hospitals around the country might be? For example, a particular champion, or some organization subsidizing their participation in 100,000 lives campaign?

    vii.   Do you know if the hospitals on the Hospital Compare list tend to be those who are more interested in collaborating on quality relative to others in the state?

  a) Do you have a sense for whether there is much of a gap between the hospitals on the list and other hospitals on the state in terms of:

   i. performance on these measures and/or

   ii. ability to improve

Hospitals' Involvement in Various Related Initiatives

2) To the extent you can, please tell us how involved the state's hospitals were in the following:

 a) Collaborative work on SCIP with Medicare's Quality Improvement Organization in the state - [name it]

 b) The SCIP program more generally

 c) IHI's 100,000 lives campaign

 d) Hospitals' public reporting of core SCIP measures as part of JCAHO accreditation

 e) The Hospital Quality Alliance/Hospital Compare

 f) Anything else that might have influenced hospitals' work on surgical infection prevention?

3) Are you aware of the work the QIO in the state [name] was doing with some hospitals during 2005-2008 around surgical infection prevention?

 If yes:

 a) What was your impression of how things went with that work?

 b) Is there anything you think the QIO could have done better?

4) Did the hospital association have much interaction with its members around the issue of quality improvement during 2005-2008? Surgical care improvement specifically? (Please explain.)

5) Are there any payment incentives that you are aware of that would have caused hospitals to focus on improving on these measure? [Specifically discuss any apparently high participation in Premier Hospital Quality Improvement Demonstration based on list of Premier-participating hospitals by state, since these measures are incentivized, albeit for CABG and hip/knee surgery only.]

Barriers to Improvement

6) What if any barriers are you aware of that hospitals faced in trying to improve on these measures during the 2005-2008 time period?

 a) Financial barriers—were most hospitals doing OK during this period financially?

b) Other foci—were hospitals pre-occupied with other concerns during this period? If so, what types?

c) Lack of leadership in the hospital community around surgical infection measures—or around QI more generally?

d) Unwillingness to collaborate to improve on these measures? (If there was unwillingness, did this extend to other measure types or something unique about surgical infections?)

e) Others?

7) To what extent do you think these barriers persist going forward?

Awareness of Performance Trend

8) Were you aware of [state]'s hospitals' performance on Hospital Compare measures related to surgical care before we contacted you? More generally were you aware of Hospital Compare trends in performance?

9) If yes, how did you learn about hospitals' performance?

10) Do you have any ideas about why we do not see as much of a positive trend here as elsewhere on these measures? (For Montana—did the fact that you were higher than average at the start cause you to focus your efforts on other measures instead?)

[add specific probes based on earlier discussions with IHI, hospital improvement QIOSC, and high-improving states' QIOs and hospital associations]

Summary of Influences on Improvement

11) To sum up our discussion, please briefly recap which if any of the following played a positive role, and whether you think of anything that may have limited the effectiveness of their role in this state compared with others when it came to the surgical infection prevention measures:

a) QIO activities

b) Hospital association activities

c) The SCIP program more generally

d) IHI's 100,000 lives campaign

e) Hospitals' public reporting of core SCIP measures as part of JCAHO accreditation

f) The Hospital Quality Alliance/Hospital Compare

g) Other things?

APPENDIX C

**METHODS FOR ANALYSIS OF PROVIDER
SATISFACTION SURVEY**

Provider satisfaction data are from a nationwide survey of providers (nursing homes, home health agencies, and hospitals), conducted by Westat in 2007, on their experiences with QIOs during the 8th Scope of Work.[1] CMS provided us the de-identified survey data as a SAS dataset, and two reports from Westat describing the survey methodology and descriptive results (Giambo et al. 2007; Narayanan et al. 2008).

A. ANALYSIS SAMPLE

The target population consisted of 100 percent of IPG providers (identified by the QIOs), and a simple random sample (SRS) of non-IPG providers drawn from the CMS provider data files that list all Medicare participating providers. Since the IPG sample is a census of IPG providers, and the non-IPG sample is a straightforward systematic sample (in which the lists of non-IPGs were sorted by provider characteristics and the samples selected by an "every Nth" approach after a random start), Westat did not develop any sampling weights." Westat also did not calculate any nonresponse adjustments.[2]

The survey dataset we received contained no information on "status codes" that indicate survey eligibility and disposition,[3] and we were thus unable to calculate standard response rates or to duplicate the response rate results reported by Giambo et al. (2007). For the purposes of this report, we defined a "completed survey" record as one in which there was at least one non-

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[1] The survey also included Medicare Advantage plans but we do not analyze those results here.

[2] Westat stated that since any nonresponse adjustments would be defined using QIO State, 8th SOW task (that is, provider type), and IPG status, and that these variables would be the same for all respondents in any given stratum, the net effect would be to apply an adjustment factor of "1" to all respondent (Giambo). It is unclear whether Westat considered using other provider characteristics from CMS' provider enrollment files for possible nonresponse adjustments.

[3] Status codes indicate information on the results of each interview attempt, such as whether the provider was ineligible for the survey upon further screening, or the respondent refused the interview, or a respondent was unable to be located, or the interview was successfully completed. Status code information is necessary to calculate response rates (American Association for Public Opinion Research 2008).

missing response to a survey question. Our survey response rates were thus calculated as the number of completes (as defined above), divided by the number of providers.

As explained in Chapter I, we focus only on hospitals, nursing homes, and home health agencies, although Westat also surveyed physician practices, Medicare Advantage health plans, beneficiaries, and stakeholder organizations. Furthermore, among hospitals, we only analyzed those listed under the 8th SOW task in which the QIOs helped hospitals with care for heart attacks, heart failure, pneumonia, perioperative patients, and systems and organizational change (Task 1c1). We did not analyze hospitals listed under the Rural Organization Safety Culture Change task (Task 1c2). We only included providers in the 50 states and the District of Columbia, excluding providers in Puerto Rico.

B. OUTCOME MEASURES AND ANALYSIS

We examine the individual survey questions within each of the six main survey topics developed by Westat, which covered providers': (1) use of email and the internet to receive, circulate, or access quality information and QIO resources, (2) knowledge of CMS programs, (3) satisfaction with their local QIO, (4) perceptions of the value of the QIO, (5) interactions with the QIO, and (6) sources of information for quality information (Table V.2). Our approach to analyzing the survey data differs from that used by Westat. Westat's contract with CMS called for it to compute overall satisfaction scores for each QIO, using an algorithm specified by CMS. The algorithm combined responses from all respondents (stakeholders who worked with QIOs, IPG providers, and non-IPG providers) and across all topic areas (provider knowledge, satisfaction, and perceived value) into a single score. CMS used this score in its evaluation of the QIOs' contract performance.

In addition to examining providers' responses by their IPG or non-IPG status, we also studied the association of QIO provision of assistance with responses. We thus used the question

on whether providers reported receiving help from their QIO (the first question listed under the "Providers' Satisfaction with Local QIO" topic in Table V.2). Although there were four potential categories (whether or not received help, and IPG and non-IPG status), as discussed below only a small proportion of IPG providers did *not* report receiving QIO help, so we instead formed three groups: (1) IPGs, (2) non-IPGs that reported receiving QIO help, and (3) non-IPGs that reported no help. The other two questions on QIO help—whether or not providers reported receiving information, and whether or not providers said they asked the QIO for help—displayed too little variation in the responses to be useful for further grouping.

We combined response categories with few responses into the adjacent category (for example, combining "strongly disagree" with "somewhat disagree," and "very dissatisfied" with "somewhat dissatisfied"). For the numeric 0 to 10 ratings of usefulness of QIO help, we calculated average values. We tested the statistical significance of differences between group means with simple analysis of variance tests, t-tests, and chi-square tests. For some of the topics with many questions, we present results for a few illustrative questions; the Appendix contains full results for all questions. We focus on national level averages, in which providers are the units of analysis, each weighted equally, as sample sizes for many states were limited.

APPENDIX D

**SUPPLEMENTAL TABLES FOR CHAPTER II
(ANALYSES OF MEDICARE COMPARE DATA)**

TABLE D.1

PREDICTORS OF CHANGE IN NURSING HOME QUALITY,
FROM IPG IMPACT ESTIMATE REGRESSIONS

	Quality Measure			
Variable	(1) Pressure Ulcers	(2) Physical Restraints	(3) Depression	(4) Chronic Pain
IPG Penetration, State Level	-0.034**	-0.022**	-0.011	-0.011*
County-Level Characteristics				
MDs per 1,000 Population	-0.10	-0.04†	0.02	0.06†
RNs per 1,000 Population	0.03	-0.01	-0.04	-0.01
Per Capita Income (natural logarithm)	3.41**	1.04*	-1.46	0.22
Located in a Metropolitan Area	-0.07	0.23	-0.58*	0.34**
Percentage of Population				
Ages 0 to 19	-0.038	0.009	0.218**	0.064*
Ages 65 and Over	-0.0002	-0.006	-0.031	0.012
With Four Years College	-0.02	-0.01	0.02	-0.02
Uninsured	0.04	-0.01	-0.40**	-0.02
At or Below Poverty Level	0.09	0.08*	0.16*	0.04
Hispanic	0.03	-0.002	-0.03†	-0.01†
Black	0.05**	-0.02**	-0.03*	-0.02**
Provider-Level Characteristics				
Ownership Type				
For Profit, Individual or Partnership	-0.06	-0.19	-0.81**	0.08
Government	-0.74†	-0.01	0.49	0.13
Nonprofit, Corporation	-0.86**	-0.51**	0.77*	-0.24*
Nonprofit, Church	-1.10**	-0.36	1.46*	-0.35*
Nonprofit, Other	-0.19	0.36	1.26*	-0.24
Large Nursing Home	0.30†	0.04	-0.02	-0.29**
Located Within a Hospital	0.61	-0.38*	-0.20	0.34
Resident and Family Councils Present	-0.21	0.13	-0.23	-0.31**
Baseline Level of Outcome	-0.62**	-0.55**	-0.61**	-0.73**
Baseline Nonfocus Quality Measures				
Improvement in Ambulation	0.03	-0.02†	0.12**	-0.002
Improvement in Pain Interfering with Activity	-0.02	-0.002	0.13**	-0.02†
Improvement in Transferring	0.08**	0.02	0.004	0.08**

DRAFT   D.3

	Quality Measure			
Variable	(1) Pressure Ulcers	(2) Physical Restraints	(3) Depression	(4) Chronic Pain
Improvement in Urinary Incontinence	0.10**	0.04*	0.06*	0.04**
Change in Nonfocus Quality Measures				
Improvement in Ambulation, Change	0.03	0.003	0.13**	0.01†
Improvement in Pain Interfering with Activity, Change	0.01	-0.003	0.12**	-0.004
Improvement in Transferring, Change	0.15**	0.01	0.02	0.08**
Improvement in Urinary Incontinence, Change	0.15**	0.03**	0.08**	0.05**
Number	**6,854**	**8,547**	**8,545**	**8,546**

Source: Nursing Home Compare, second quarter of 2005 and first quarter of 2008 collection periods.

Note: Results are coefficients estimated jointly through simultaneously seemingly unrelated regression (from models in Column 3, Table III.7). Providers weighted by total number of patients. Standard errors are adjusted for geographic clustering. Each model also includes an IPG penetration measure.

*$p<.05$; **$p<.01$; ***$p<.10$ (two-tailed tests).

IPG = Identified participant group.
MD = medical doctor.
RN = registered nurse.

TABLE D.2

PREDICTORS OF CHANGE IN HHA ACUTE CARE HOSPITALIZATION,
FROM IPG IMPACT ESTIMATE REGRESSION

	Outcome
Variable	Acute Care Hospitalization
IPG Penetration, State Level	-0.133**
County-Level Characteristics	
MDs per 1,000 Population	-0.17***
RNs per 1,000 Population	-0.01
Per Capita Income (natural logarithm) [?]	-0.12
Located in a Metropolitan Area	-0.15
Percentage of Population	
Ages 0 to 19	0.115
Ages 65 and Over	0.011
With Four Years College	0.04
Uninsured	-0.11
At or Below Poverty Level	0.12***
Hispanic	0.01
Black	-0.0004
Provider-Level Characteristics	
Baseline ACH Rates	-.47**
Ownership Type	
Government	-1.06*
Nonprofit, Other	-0.88**
Nonprofit, Private	-0.89**
Nonprofit, Religious	-1.16*
Date of Certification, 1990s	0.55***
Date of Certification, 2000s	0.52
Provides Medical Social Services	-0.79*
Number	**6,265**

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TABLE D.2 *(continued)*

ACH = acute care hospitalization.
HHA = home health aide.
IPG = identified participant group.
MD = medical doctor.
OLS = ordinary least squares.
RN = registered nurse.

TABLE D.3

PREDICTORS OF CHANGE IN HHA QUALITY, FROM IMPACT ESTIMATE REGRESSIONS
OF STATEWIDE EFFORTS (TABLE IV.8, COLUMN 3)

	Outcome		
Variable	(1) Management of Oral Medications	(2) Pain Interfering with Activity	(3) Dyspnea
Indicator – State QIO Selected the Measure for Statewide Efforts	1.25**	0.31	1.83**
County-Level Characteristics			
MDs per 1,000 Population	-0.17	-0.19	0.06
RNs per 1,000 Population	0.06***	0.03	0.03
Per Capita Income (natural logarithm)	3.95**	2.96***	-2.04***
Located in a Metropolitan Area	-0.24	-1.09**	-0.48
Percentage of Population			
Ages 0 to 19	0.267**	-0.134	-0.056
Ages 65 and Over	0.167**	-0.079	0.018
With Four Years College	0.02	-0.08*	0.02
Uninsured	0.10	-0.23***	-0.27**
At or Below Poverty Level	0.07	0.05	-0.15*
Hispanic	-0.01	0.08*	0.05***
Black	0.05*	0.10**	0.06**
Provider-Level Characteristics			
Baseline Level of Outcome	-0.68**	-0.64**	-0.68**
Ownership Type			
Government	0.12	1.04***	1.11***
Nonprofit, Other	0.34	0.52	1.51**
Nonprofit, Private	-0.06	0.31	1.41**
Nonprofit, Religious	-0.12	-0.69	1.78**
Date of Certification, 1990s	0.52***	0.05	-0.22
Date of Certification, 2000s	0.39	0.54	-1.88**
Provides Medical Social Services	-0.08	-1.12*	0.21
Unselected Outcomes, Baseline	7.54**	6.97**	9.45**
Unselected Outcomes, Change	10.94**	10.33**	12.25**
Number	**5,490**	**5,287**	**5,562**

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: All providers weighted equally. Results estimated simultaneously using seemingly unrelated regression (see Table IV.8, Column 3). Standard errors are adjusted for geographic clustering.

*p<.05; **p<.01; ***p<.10 (two-tailed tests).

HHA = home health aide.
MD = medical doctor.
QIO = quality improvement organization.
RN = registered nurse.

TABLE D.4

AVERAGE LEVELS AND IMPROVEMENT ON INDIVIDUAL HOSPITAL ITEMS

Outcome	Baseline	End	Change
Heart Attack			
ACE Inhibitor or ARB for LVSD	81.8	89.2	7.5
(St. Dev.)	(17.1)	(12.5)	(18.9)
Aspirin at Arrival	94.4)	96.4)	2.1
(St. Dev.)	(6.1)	(6.6)	(7.1)
Aspirin Prescribed at Discharge	92.3	95.3	2.9
(St. Dev.)	(10.0)	(8.6)	(10.1)
Beta Blocker at Arrival	90.1	93.3	3.2
(St. Dev.)	(10.1)	(8.9)	(10.0)
Beta Blocker Prescribed at Discharge	91.5	95.7	4.1
(St. Dev.)	(10.5)	(7.8)	(10.1)
Heart Failure			
ACE Inhibitor or ARB for LVSD	81.5	88.4	6.9
(St. Dev.)	(13.0)	(9.1)	(13.1)
Evaluation of LVS Function	88.6	94.4	5.8
(St. Dev.)	(11.0)	(7.8)	(8.4)
Pneumonia			
Pneumococcal Vaccination	54.1	80.9	26.8
(St. Dev.)	(23.3)	(15.0)	(21.2)
Oxygenation Assessment	99.2	99.8	0.6
(St. Dev.)	(2.0)	(0.8)	(1.9)
Initial Antibiotic Received within Four Hours of Hospital Arrival	78.3	89.6	11.2
(St. Dev.)	(9.4)	(6.0)	(8.9)
SCIP			
Preventative Antibiotics Received One Hour Before Incision	77.0	90.4	13.4
(St. Dev.)	(15.9)	(7.6)	(14.9)
Preventative Antibiotics are Stopped Within 24 Hours After Surgery	64.4	84.0	19.7
(St. Dev.)	(20.0)	(11.8)	(17.9)

TABLE D.4 *(continued)*

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: Means for each measure are calculated using the sample providers that had data available at both points in time. Sample size varies across measures. For the ACM items, sample sizes range from 2,637 to 3,558. The SCIP items have sample sizes of 1,281 and 1,259 for the preoperative and postoperative measures, respectively.

ACE = angiotensin-converting enzyme.
ACM = appropriate care measure.
ARB = angiotensin receptor blocker.
LVSD = left ventricular systolic dysfunction.
SCIP = Surgical Care Improvement Project.
St. Dev. = standard deviation.

TABLE D.5

CORRELATIONS BETWEEN IMPROVEMENT ON INDIVIDUAL
ACM AND SCIP ITEMS

	ACE/ ARB (HA)	Aspirin Arrival (HA)	Aspirin Dischrg (HA)	Beta Arrival (HA)	Beta Discharge (HA)	ACE/ ARB (HF)	LVEF (HF)	Pneum Vaccine (P)	Oxygen- ation (P)	Timely Antibio (P)	Antibio Before (SCIP)	Antibio Stopped (SCIP)
ACE/ ARB for LVSD (HA)	1.00											
Aspirin at Arrival (HA)	0.18	1.00										
Aspirin at Discharge (HA)	0.22	0.31	1.00									
Beta Blocker at Arrival (HA)	0.19	0.36	0.22	1.00								
Beta Blocker at Discharge (HA)	0.26	0.29	0.43	0.47	1.00							
ACE/ ARB for LVSD (HF)	0.31	0.16	0.20	0.20	0.24	1.00						
[LVEF? Function (HF)	0.18	0.18	0.22	0.22	0.29	0.30	1.00					
Pneumococcal Vaccination (P)	0.12	0.09	0.09	0.11	0.11	0.18	0.22	1.00				
Oxygenation Assessment (P)	0.04	0.08	0.13	0.00	0.10	0.08	0.21	0.10	1.00			
Timely Antibiotic (P)	0.06	0.02	0.04	0.04	0.05	0.07	0.13	0.18	0.10	1.00		
Antibiotics 1 hour before incision (SCIP)	0.07	0.09	0.15	0.09	0.13	0.08	0.24	0.19	0.14	0.13	1.00	
Preventative Antibiotics Stopped w/in 24 hours (SCIP)	0.04	0.08	-0.0004	0.07	0.01	0.06	0.09	0.12	0.02	0.01	0.17	1.00

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: Providers weighted by average total number of patients across all the measures.

ACE = angiotensin-converting enzyme.
ACM = appropriate care measure.
ARB = angiotensin receptor blocker.
HA = heart attack.
HF = heart failure.
LVEF = left ventricle ejection fraction
P = pneumonia.
SCIP = Surgical Care Improvement Project.

TABLE D.6

OLS ESTIMATES OF PREDICTORS OF CHANGE IN HOSPITAL QUALITY

Variable	Outcome	
	Acute Care Hospitalization	SCIP
IPG Penetration, State Level	0.0013	
County-Level Characteristics		
MDs per 1,000 Population	0.02	-0.11
RNs per 1,000 Population	0.02	0.09
Per Capita Income (natural logarithm)	-0.05	-3.64*
Located in a Metropolitan Area	0.05	-0.29
Percentage of Population		
Ages 0 to 19	-0.017	-0.012
Ages 65 and Over	-0.053	0.062
With Four Years College	0.004	0.12*
Uninsured	-0.04	-0.38*
At or Below Poverty Level	-0.06	0.007
Hispanic	2.22*	5.93
Black	0.85	5.68**
Provider-Level Characteristics		
Baseline of Outcome	-0.65**	-0.74**
Large Hospital	0.81**	1.16*
Acute Care Hospital	1.33	0.69
Ownership Type		
Nonprofit, Church	-0.45	-0.19
Nonprofit, Other	-0.64	1.28
Nonprofit, Private	-0.94*	1.05
Government	-1.11*	-1.05
Number	**2,353**	**1,196**

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: Providers weighted by number of patients. Results estimated using ordinary least squares. Standard errors are adjusted for geographic clustering.

p<.05; **p*<.01; ****p*<.10 (two-tailed tests).

IPG = identified participant group.
MD = medical doctor.
OLS = ordinary least squares.
RN = registered nurse.
SCIP = Surgical Care Improvement Project.

TABLE D.7

PREDICTORS OF CHANGE, INCLUDING IPG PENETRATION, FROM SUR ANALYSES ACM ITEMS

	ACE/ ARB (AMI)	Aspirin at Arrival (AMI)	Aspirin at Discharge (AMI)	Beta Blocker at Arrival (AMI)	Beta Blocker at Discharge (AMI)	ACE/ ARB (HF)	LVS Evaluation (HF)	Pneu Vaccine (P)	Oxygen- ation (P)	Timely Antibiotic (P)
IPG Penetration Rate, State Level	0.003	-0.004	-0.004	0.003	0.0008	0.009	-0.009	0.016	0.0004	-0.004
Baseline Level of Outcome										
County-Level Characteristics										
MDs per 1,000 Population	0.02	0.14**	0.16**	0.11*	0.07***	0.15***	0.06	-0.20	-0.0002	0.02
RNs per 1,000 Population	0.06	0.03*	0.05*	0.01	0.05**	0.06	0.05**	0.16*	-0.002	0.05*
Per Capita Income (natural logarithm)	3.21	0.04	-1.22***	-0.65	-2.41*	-2.84	-0.32	-2.26	-0.05	0.38
Located in a Metro Area	-0.18	1.43**	1.23**	1.27**	0.97**	1.20**	0.52***	-1.24***	0.05†	0.58*
Percentage of Population										
Ages 0 to 19	0.117	0.029	-0.054	0.026	-0.120*	0.081	-0.065	-0.003	-0.007***	-0.129***
Ages 65 and Over	-0.101	-0.026	-0.062	-0.036	-0.081	-0.026	-0.130**	0.009	-0.005***	-0.128**
With Four Years College	0.08	0.004	0.04*	0.04	0.02	0.07*	-0.02	-0.05	0.001	-0.01
Uninsured	0.16	-0.12**	-0.13*	-0.19**	-0.22**	0.03	-0.16**	-0.27*	-0.004	-0.22**
At or Below Poverty Level	-0.02	-0.041	-0.07	-0.12**	-0.13*	-0.23**	0.02	-0.20	0.001	-0.05
Hispanic	-0.062	0.033**	0.0301**	0.057**	0.0524**	0.0161	0.0323**	0.0831**	-0.0002	0.062**
Black	-0.0453	0.0005	0.004	0.031*	0.0243*	0.0376*	0.010	0.0089	-0.0032**	0.0193
Provider-Level Characteristics										
Large Hospital	2.71	1.27**	2.47**	1.78**	1.93**	1.17**	0.99**	3.17**	0.07**	0.36***
Acute Care Hospital	-1.65	4.72**	4.30**	6.70**	2.13**	0.24	6.13**	1.41*	0.25**	0.78*
Ownership Type										
Nonprofit, Church	-0.74	0.12	0.39	0.48	0.29	-0.21	-0.60*	-1.78*	-0.02	0.84***
Nonprofit, Other	-0.92	0.16	0.28	0.14	-0.33	-0.32	-1.15**	-3.54**	-0.02	1.01**
Nonprofit, Private	-1.82*	0.15	-0.14	0.05	-0.35	-0.65	-1.00**	-3.15**	-0.04***	0.51
Government	-1.50	-0.35	-0.86***	-0.49	-0.75***	-0.96	-1.42**	-6.62**	-0.13**	0.55***
Number	**2,613**	**3,368**	**3,271**	**3,355**	**3,282**	**3,394**	**3,531**	**3,517**	**3,524**	**3,137**

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Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: Providers weighted by number of patients. Results estimated jointly using seemingly unrelated regression. Standard errors are adjusted for geographic clustering.

*p<.05; **p<.01; ***p<.10 (two-tailed tests).

ACE = angiotensin-converting enzyme.
ACM = appropriate care measure.
AMI = [acute myocardial infarction.
ARB = angiotensin receptor blocker.
HF = heart failure.
IPG = Identified participant group.
LVS = left ventricle systolic.
MD = medical doctor.
P = pneumonia.
RN = registered nurse.
SUR = seemingly unrelated regression.

TABLE D.8

PREDICTORS OF CHANGE FROM SUR ANALYSES OF SCIP ITEMS

Variable	Outcome	
	Antibiotic-Timely Start	Antibiotic-Timely Stop
County-Level Characteristics		
MDs per 1,000 Population	-0.03	-0.09
RNs per 1,000 Population	0.09	0.09
Per Capita Income (natural logarithm)	-3.39	-3.75***
Located in a Metropolitan Area	0.11	-0.61
Percentage of Population		
Ages 0 to 19	-0.201	0.156
Ages 65 and Over	-0.130	0.261
With Four Years College	0.04	0.20*
Uninsured	-0.26	-0.54
At or Below Poverty Level	-0.003	-0.04
Hispanic	0.045	0.074
Black	0.070	0.054
Provider-Level Characteristics		
Baseline of Outcome	-0.085**	-0.75**
Large Hospital	0.41	2.07*
Acute Care Hospital	0.01	2.23
Ownership Type		
Nonprofit, Church	0.43	-0.58
Nonprofit, Other	1.15	1.14
Nonprofit, Private	1.29	1.00
Government	-1.06	-0.89
Number	**1,218**	**1,198**

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected October 2006-September 2007.

Note: Providers weighted by number of patients. Results estimated simultaneously using seemingly unrelated regression. Standard errors are adjusted for geographic clustering.

*$p<.05$; **$p<.01$; ***$p<.10$ (two-tailed tests).

MD = medical doctor.
RN = registered nurse.
SCIP = Surgical Care Improvement Project.
SUR = seemingly unrelated regression.

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TABLE D.9

DESCRIPTIVE STATISTICS, 8TH SOW, CONTROL VARIABLES USED IN
PROVIDER-LEVEL NURSING HOME IMPACTS ANALYSIS

Variable	Mean	Standard Deviation
County-Level Characteristics		
MDs per 1,000 Population	2.61	1.90
RNs per 1,000 Population	6.02	4.35
Per Capita Income (natural logaristhm)	10.30	0.25
Located in a Metropolitan Area	0.76	0.43
Percentage of Population		
Ages 0 to 19	28.15	2.76
Ages 65 and Over	13.35	3.53
With Four Years College	22.95	9.30
Uninsured	13.50	4.42
At or Below Poverty Level	12.19	4.89
Hispanic	10.68	13.78
Black	11.99	12.91
Provider-Level Characteristics		
For-Profit Ownership, Individual or Partnership	0.11	0.31
Ownership Type		
For Profit	0.68	0.47
Government	0.07	0.25
Nonprofit, Corporation	0.19	0.39
Nonprofit, Church	0.05	0.23
Nonprofit, Other	0.02	0.13
Large Nursing Home	0.48	0.50
Located within a Hospital	0.04	0.19
Resident and Family Councils Present	0.47	0.50
Baseline Nonfocus Quality Measures		
Improvement in Ambulation, Baseline	12.17	7.06
Improvement in Pain Interfering with Activity, Baseline	15.40	8.32
Improvement in Transferring, Baseline	4.25	5.30
Improvement in Urinary Incontinence, Baseline	8.59	5.12
Change in Nonfocus Quality Measures		
Improvement in Ambulation, Change	0.21	8.13
Improvement in Pain Interfering with Activity, Change	-0.15	9.33

Variable	Mean	Standard Deviation
Improvement in Transferring, Change	0.11	4.30
Improvement in Urinary Incontinence, Change	0.23	5.55
State-Level IPG Penetration		
IPG Penetration Rates for Pressure Ulcers/Restraints	15.02	8.96
IPG Penetration Rates for Depression/Pain	14.15	8.34

Source: Nursing Home Compare, second quarter of 2005 (baseline) and first quarter of 2008 (followup).

Note: The figures above are calculated for all providers that have baseline and follow-up values for at least one of the focus quality measures (and thus are able to be included in the multivariate analyses). Sample size is between 10,602 and 10,635 for the county-level measures, 10,705 for the provider-level characteristics other than quality measures, between 8,643 and 10,679 for the nonfocus measures, and 10,705 for IPG penetration.

IPG = Identified participant group.
MD = medical doctor.
RN = registered nurse.
SOW = statement of work.

TABLE D.10

DESCRIPTIVE STATISTICS, VARIABLES IN PROVIDER-LEVEL
HHA IMPACT ANALYSES

Variable	Mean	Standard Deviation
County Level Characteristics		
MDs per 1,000 Population	2.43	1.77
RNs per 1,000 Population	5.09	4.23
Per Capita Income (natural logarithm)	10.26	0.25
Located in a Metropolitan Area	0.71	0.45
Percentage of Population		
Ages 0 to 19	28.73	3.18
Ages 65 and Over	13.11	3.97
With Four Years College	21.88	8.73
Uninsured	15.14	5.07
At or Below Poverty Level	13.56	5.20
Hispanic	14.51	18.75
Black	12.01	13.05
Provider-Level Characteristics		
Ownership Type		
For Profit	0.61	0.49
Government	0.12	0.33
Nonprofit, Other	0.09	0.28
Nonprofit, Private	0.15	0.36
Nonprofit, Religious	0.06	0.24
Date of Certification, 1990s	0.32	0.47
Date of Certification, 2000s	0.25	0.43
Provides Medical Social Services	0.84	0.37
Baseline Quality Measures		
Average Baseline Value on the Nonselected Measures[a]	0.00	0.69
Average Change Value on the Nonselected Measures[a]	0.00	0.68

Variable	Mean	Standard Deviation
Indicator of Measure Chosen for Statewide Improvement		
Dyspnea	0.27	0.45
Management of Oral Medications	0.59	0.49
Pain Interfering with Activities	0.10	0.30
IPG Penetration, State Level		
IPG Penetration Rate for ACH	20.92	4.10

Source: Home Health Compare, baseline data collected September 2004-August 2005 and follow-up data collected March 2007-February 2008.

Note: The figures above are calculated for all providers that have baseline and follow-up values for at least one of the focus quality measures in which the particular measure is used as a control in the impacts analyses. Sample sizes range from 5,700 to 6,308. Providers are weighted equally in calculations.

[a]Measure has a mean of zero because it is the average of variables that have been standardized to have a mean of zero (and standard deviation of one).

ACH = acute care hospitalization.
HHA = home health agency.
IPG = identified participant group.

TABLE D.11

DESCRIPTIVE STATISTICS, 8TH SOW CONTROL VARIABLES
IN HOSPITAL IMPACT ANALYSES

Variable	Mean	Standard Deviation
County-Level Characteristics		
MDs per 1,000 Population	3.12	1.94
RNs per 1,000 Population	6.82	3.89
Per Capita Income (natural logarithm	10.33	0.23
Located in a Metropolitan Area	0.88	0.33
Percentage of Population		
Ages 0 to 19	28.19	2.87
Ages 65 and Over	12.76	3.51
With Four Years College	24.64	8.51
Uninsured	13.83	4.30
At or Below Poverty Level	12.35	4.45
Hispanic	11.85	14.91
Black	13.83	13.53
Provider-Level Characteristics		
Large Hospital	0.62	0.48
Acute Care Hospital	0.996	0.066
Ownership Type		
For Profit	0.14	0.35
Nonprofit, Church	0.21	0.40
Nonprofit, Other	0.24	0.43
Nonprofit, Private	0.30	0.46
Government	0.12	0.33
IPG Penetration Rate (ACM), State Level	**26.35**	**10.29**
Number		**2,353**

Source: Hospital Compare, baseline data collected July 2004-June 2005 and follow-up data collected
            October 2006-September 2007.

Note: Providers weighted by total numbers of patients. Sample consists of providers included in the
            ACM impacts analyses (Model 2, Table 5).

ACM = appropriate care measure.
IPG = identified participant group.
MD = medical doctor.
RN = registered nurse.
SOW = statement of work.

APPENDIX E

SUPPLEMENTAL TABLES FOR CHAPTER IV
(ANALYSES OF PROVIDER SURVEY)

TABLE E.1

ADDITIONAL PROVIDER KNOWLEDGE QUESTION

Question	N	Percent Answering Yes
Aware That QIOs Work with Many Different Health Care Providers and Organizations		
Nursing Homes		
IPG	2,267	90.8
Non-IPG received QIO help	1,934	88.4
Non-IPG received no QIO help	809	67.7
Home Health Agencies		
IPG	1,796	94.2
Non-IPG received QIO help	1,848	91.1
Non-IPG received no QIO help	419	63.5
Hospitals		
IPG	1,414	96.8
Non-IPG received QIO help	1,649	95.7
Non-IPG received no QIO help	103	78.6

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at p<0.001, chi-squared test.

TABLE E.2

ADDITIONAL QUESTIONS ON PROVIDERS' SATISFACTION WITH THEIR LOCAL QIOS

Question

How Satisfied With the Way in Which Information (from the QIO) Presented?	N	Very Satisfied	Somewhat Satisfied	Neither Satisfied Nor Dissatisfied	Somewhat or Very Dissatisfied
Nursing Homes					
IPG	2,226	69.1	24.7	3.9	2.4
Non-IPG received QIO help	1,930	46.6	42.8	8.5	2.2
Non-IPG received no QIO help	501	20.8	48.9	26.8	3.6
Home Health Agencies					
IPG	1,790	79.7	17.9	1.2	1.2
Non-IPG received QIO help	1,844	67.7	27.3	3.4	1.6
Non-IPG received no QIO help	238	25.6	46.6	21.4	6.3
Hospitals					
IPG	1,413	71.6	23.2	2.9	2.3
Non-IPG received QIO help	1,649	61.4	31.1	4.4	3.1
Non-IPG received no QIO help	64	21.9	39.1	28.1	10.9

How Satisfied with the Amount of Contact With the QIO?	N	Very Satisfied	Somewhat Satisfied	Neither Satisfied Nor Dissatisfied	Somewhat or Very Dissatisfied
Nursing Homes					
IPG	2,227	70.2	20.2	7.5	2.1
Non-IPG received QIO help	1,924	39.7	35.9	20.5	4.0
Non-IPG received no QIO help	513	15.6	30.6	46.2	7.6
Home Health Agencies					
IPG	1,787	78.5	16.4	3.7	1.5
Non-IPG received QIO help	1,838	60.3	26.4	10.5	2.8
Non-IPG received no QIO help	250	20.0	25.6	38.0	16.4
Hospitals					
IPG	1,411	75.8	17.2	5.2	1.8
Non-IPG received QIO help	1,649	63.2	25.2	8.7	3.0
Non-IPG received no QIO help	66	19.7	30.3	37.9	12.1

TABLE E.2 (*continued*)

Question

How Satisfied with Timeliness of QIO Responses?	N	Very Satisfied	Somewhat Satisfied	Neither Satisfied Nor Dissatisfied	Somewhat or Very Dissatisfied
Nursing Homes					
IPG	2,205	79.4	14.4	4.5	1.7
Non-IPG received QIO help	1,859	54.2	27.5	16.3	2.1
Non-IPG received no QIO help	459	19.6	27.7	48.8	3.9
Home Health Agencies					
IPG	1,779	84.4	12.3	2.3	1.0
Non-IPG received QIO help	1,807	70.3	20.4	7.5	1.7
Non-IPG received no QIO help	231	25.1	22.9	44.6	7.4
Hospitals					
IPG	1,407	77.1	18.8	1.9	2.1
Non-IPG received QIO help	1,640	72.4	21.1	3.4	3.2
Non-IPG received no QIO help	65	33.9	29.2	27.7	9.2

How Satisfied with Professionalism, Courtesy, Respectfulness of QIO Staff?	N	Very Satisfied	Somewhat Satisfied	Neither Satisfied Nor Dissatisfied	Somewhat or Very Dissatisfied
Nursing Homes					
IPG	2,213	87.9	8.4	2.5	1.2
Non-IPG received QIO help	1,893	74.7	17.0	7.2	1.1
Non-IPG received no QIO help	456	41.2	24.3	33.1	1.3
Home Health Agencies					
IPG	1,783	92.5	6.0	0.8	0.6
Non-IPG received QIO help	1,826	84.9	11.0	3.3	0.8
Non-IPG received no QIO help	217	47.5	19.8	30.0	2.8
Hospitals					
IPG	1,406	90.5	7.8	1.2	0.5
Non-IPG received QIO help	1,642	87.7	9.3	2.0	1.0
Non-IPG received no QIO help	62	48.4	27.4	24.2	0.0

TABLE E.2 (*continued*)

Question				
How Often Able To Get Through To the Desired Person At The QIO?	N	Always	Usually	Sometimes/Never
Nursing Homes				
IPG	2,077	57.8	40.2	2.0
Non-IPG received QIO help	1,694	36.4	50.5	13.1
Non-IPG received no QIO help	358	22.1	40.5	37.4
Home Health Agencies				
IPG	1,669	61.7	36.0	2.3
Non-IPG received QIO help	1,628	51.2	41.2	7.7
Non-IPG received no QIO help	182	25.8	34.6	39.6
Hospitals				
IPG	1,246	49.4	49.5	1.1
Non-IPG received QIO help	1,524	43.0	52.4	4.5
Non-IPG received no QIO help	52	36.5	53.9	9.6

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at $p<0.001$, chi-squared test. Percentages may not sum to 100 because of rounding.

TABLE E.3

ADDITIONAL QUESTIONS ON PROVIDERS' PERCEPTIONS OF QIOS' VALUE

Question	N	Strongly Agree	Somewhat Agree	Neither Agree nor Disagree	Somewhat or Strongly Disagree
Provider Used the Information Provided by the QIO					
Nursing Homes					
IPG	2,215	51.6	38.8	5.7	3.8
Non-IPG received QIO help	1,912	33.1	49.5	11.7	5.8
Non-IPG received no QIO help	507	14.8	41.6	30.6	13.0
Home Health Agencies					
IPG	1,783	73.2	24.0	1.9	1.0
Non-IPG received QIO help	1,833	56.6	35.6	5.2	2.6
Non-IPG received no QIO help	244	23.8	42.6	24.2	9.4
Hospitals					
IPG	1,406	53.7	37.0	5.6	3.8
Non-IPG received QIO help	1,642	45.4	41.7	8.2	4.7
Non-IPG received no QIO help	64	14.1	43.8	23.4	18.8
"Our Organization is Better Off Having Received Services from QIO"					
Nursing Homes					
IPG	2,213	67.8	22.7	5.8	3.7
Non-IPG received QIO help	1,910	50.0	34.2	11.1	4.7
Non-IPG received no QIO help	499	23.7	37.7	29.9	8.8
Home Health Agencies					
IPG	1,783	81.1	15.0	2.1	1.8
Non-IPG received QIO help	1,823	68.8	22.9	5.6	2.7
Non-IPG received no QIO help	242	29.3	36.4	26.9	7.4
Hospitals					
IPG	1,404	68.7	23.8	5.6	1.9
Non-IPG received QIO help	1,641	61.1	28.8	7.3	2.9
Non-IPG received no QIO help	63	22.2	36.5	28.6	12.7

Source: Westat de-identified survey of providers May-September 2007; dataset provided to MPR by CMS.

Note: All differences statistically significant at p<0.001, chi-squared test. Percentages may not sum to 100 because of rounding.