Rules for Medical Markets: The Impact of Medicare Contractors on Coverage Policies

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Objective. Examine Medicare's local contractors' claim payment rules, focusing on how technology affects the balancing of competing demands to respond to local medical markets (rule heterogeneity) with concerns about national consistency in payment rules (rule homogeneity).

Data Sources. Local medical review policies (LMRPs) posted in policy sets by contractor organizations on the Centers for Medicare and Medicaid Services (CMS) website and a survey of Contractor Medical Directors.

Study Design. We classified LMRPs based on type (NT = new technology; TE = technology extensions, and UM = utilization management), and examined the effect of technology type on LMRP focus, evidence use, policy revisions, implementation speed, and reference material citation characteristics of LMRPs using multivariate analysis.

Principal Findings. NT policies were more homogenous, as were policies among contractors related through multistate affiliation or through informal networks. UM policies were more heterogeneous. NT policies were more likely than UM policies to cite research journals as evidence while UM policies were more likely to cite medical reference materials.

Conclusions. Coverage policies associated with new technologies diffuse rapidly and are homogenous compared to utilization management coverage policies. This suggests that new technology policies are responsive to the development of new technologies at the national level. In contrast, utilization management policies are responsive to local heterogeneity in health care practice. Congress has mandated reforms to the contracting process to achieve consistency and reduce duplication. Our data elucidate the nature and sources of variation and will help policymakers strike a balance between homogeneity and local adaptation.

Key Words. CMS, medicare, coverage policy, rules, institutional theory

Organizational theorists have long called attention to the ubiquity of rules. Weber, for example, identified rules as a cornerstone of bureaucracies (Weber 1978). Rules are an efficient means of guiding behavior, either by providing actors a template for behavior in a given situation or knowledge of the

consequences of a behavior given a situation (March 1991; Kaplow 2000). Rules are a cornerstone of markets because they identify the outcomes associated with action—they provide the ability for producers to plan actions with the assurance that compensation will be received. Within health care, rules describe the conditions under which specific services will be reimbursed. While organizational theorists have extensively examined the dynamics of written rules within organizations (Allison 1971; Zhou 1993; Schulz 1998; March, Schulz, and Zhou 2000; Schulz 2003), within inter-organizational fields (Leblebici and Salancik 1982), and within legal systems (Kaplow 2000), there is little research on the analysis of rule development that guides market functioning. This paper extends this research by examining Medicare contractors' rules for claims payment. The findings elucidate institutional management issues for development of rules for Medicare.

This paper also extends research on the involvement of the government in markets. Government involvement occurs through administrative law processes at a national level and through the delegation of responsibility for rule making. The administrative law literature studies the involvement of the government in rules, including analysis of the behavior of regulators and their relationships to other branches of government (Congress, the Executive, and the Judiciary), levels of government (states, localities), and regulated industries (Davis 1972, pp. 123–156). Examples include antitrust, economic or social regulation (pollution, health and safety), and market-based incentives such as emission trading rules (Rabe 1997, pp. 384–401). In this arena, “rule” is generally a term of art, referring to formal processes defined by the Administrative Procedures Act (APA). Administrative agencies also have authority to issue less formal directives without the extensive APA-required procedures (Davis 1972, pp. 88–122).

Delegating responsibility for rule making is an alternative to centralized administrative processes. In Medicare's case, the Centers for Medicare and Medicaid Services (CMS) contracts with private sector organizations to administer coverage and claims payment. These organizations must comply with Medicare's procedural rules and, in turn, they have discretion to develop policies or payment rules (called local medicare review policies or LMRPs)

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that apply in the contractors' local jurisdictions. This paper examines LMRPs. The paper seeks to determine whether differences across policy types, particularly in technology type, are consistent with delegation to local contractors.

BACKGROUND AND THEORY

Before developing our theoretical argument and methods, we first describe the institutional environment. The 1965 Medicare statute set forth broad coverage categories such as hospital and physician services. Medicare must determine if specific services within the covered categories are "reasonable and necessary" (Foote 2003, footnote 1), and relies on private contractors—fiscal intermediaries (for Part A, Hospital Insurance) and carriers (for Part B, Supplementary Medical Insurance)—to process individual claims for payment. In the late 1980s, contractors also began to issue LMRPs prospectively to assist providers in filing claims (Centers for Medicare and Medicaid Services 2003). While the central CMS office can issue national prospective coverage policies that apply in all the local jurisdictions, the vast majority of decisions are made through the local process (Foote 2002).

All contractors must follow Medicare's rules that have increased in number and specificity over the years. The Medicare Program Integrity Manual, along with regularly updated program memoranda, define the LMRP development process, including services for which a new or revised LMRP is needed, when contractors may use discretion to develop LMRPs, evidence to support the LMRP, coding requirements, and the process for receiving public comment and posting policies. Carriers must establish a Carrier Advisory Committee composed primarily of physicians and consult with the committee to develop LMRPs (Foote 2003). Fiscal intermediaries have the option to create similar advisory committees.

Each LMRP specifies the conditions for claims payment based on the procedure and diagnosis codes. LMRPs make clear the linkage between condition, severity, procedure, and payment, reduce payment uncertainty (Daniels 1996, 1999; Daniels and Sabin 1998; Sabin and Daniels 1998), and increase efficiency.

In managing the LMRP process, CMS balances two competing policy goals—adaptation to local conditions and homogeneity in coverage decisions across geographic areas (Foote et al. 2004). Adaptation to local conditions is valuable because it allows policies to reflect the widespread geographic variation in medical practice (Wennberg and Gittelsohn 1973; Wennberg 2004).

But, adaptation to local conditions is problematic because it can lead to policy variation, which, in turn, creates the possibility of differential access to services. Some policy experts have weighed in on the side of consistency and recommended greater centralization (Medicare Payment Advisory Commission 2001; U.S. General Accounting Office 2003). The medical device community, however, has urged retention of the local adaptation model (AdvaMed 2001). There have been little data developed to support either side.

Organizing LMRPs: A Theoretical Perspective

Our research strategy is to “explain many effects on the basis of one or a few variables” (King, Keohane, and Verba 1994, p. 29), with the variable being technology type—new technologies (NT), technology extensions (TE), and utilization management (UM). By using organizational theory to develop and test multiple hypotheses, the robustness and validity of the argument is assessed using the consistency of the results. Our theoretical argument is based in the literatures on organizational rule-making processes (March 1991; pp. 104–107; Zhou 1993; March, Schulz, and Zhou 2000) and institutional theory (Scott and Meyer 1994).

Technology type (NT, TE, UM) is our key theoretical variable. This contrasts with organizational research that uses the count of number of organizations that have an administrative feature (e.g., prior adoptions of civil service in Tolbert and Zucker 1983). It is consistent with the literature on rule making within organizations that use differences in institutional environments and types of rules to examine institutional effects (Zhou 1993).

Rules develop in three broad ways (March 1991). First, organizations learn from experience, “modifying the rules for action incrementally on the basis of feedback from the environment” (March 1991, p. 106). An example is new LMRP policies to address new uses of existing technologies, such as using MRI to diagnose Alzheimer’s Disease, that do not fit within existing payment rules. Second, the distribution of rules changes because organizations select from an invariant set of rules over time. In the case of LMRPs, this process is reflected in a contractor mimicking another contractor’s LMRP. The third process is diffusion—“rules that spread through a group of organizations like fads or measles” (March 1991, p. 106).

Within health care, there are strong pressures for both local adaptation and heterogeneity associated with learning from experience and homogeneity associated with mimicry and diffusion. The pressure for local heterogeneity comes from the variation in the practice of medicine (Wennberg and

Gittelsohn 1973; Berg 1997; Wennberg 2004). Because contractors manage claims in a geographic area, and must confer with local practitioners, local variation suggests that there is significant heterogeneity across contractors. There are also strong homogenizing pressures. LMRP management is highly structured and similar across all contractors. All contractors do the same job (pay medical claims) in one field (medicine) for one purchaser (CMS). Medicine is arguably a fairly uniform national field because of the presence of national professional organizations (e.g., American Medical Association, American College of Cardiology), research organizations (the National Institutes of Health and its specialized centers, e.g., National Heart, Lung, and Blood Institute), regulators (e.g., Food and Drug Administration), and common educational standards. In fact, the movement for evidence-based medicine leads to recommendations for evidence-based coverage decisions (Garber 2001), which would presumably be fairly uniform since they are predicated on the same evidence base.

The push toward homogeneity and the pull toward heterogeneity is a function of technology type. Strong institutional pressures that often accompany new technologies, such as national scientifically rigorous research publications and extensive interest among payer, teaching, and research organizations, encourage homogeneity. In contrast, policies that focus on managing widely diffused procedures will vary as a function of local provider differences in their use or misuse, reflecting local adaptation rather than institutional pressures.

H1: There is greater homogeneity and faster development among LMRPs for new technologies than among LMRPs for utilization management.

Because of mimicry, we expect greater homogeneity among contractors with strong organizational ties (Tolbert and Zucker 1983; Burns and Wholey 1993; Westphal, Gulati, and Shortell 1997). In 1980, there were nearly 80 Fiscal Intermediaries and over 40 carriers. By 2002, the numbers were 24 and 20, respectively, as plans consolidated or left the business (Foote 2003, p. 140). Some organizations acquired additional contracts, creating multi-contract networks, while others remained single contract entities. We expect that common ownership of multiple contracts results in variation in the contractors' size and resources. Coordination among contractors, due to common ownership and inter-organizational LMRP coordination, increases LMRP homogeneity across contractors, mitigating purely local adaptation.

H2: Common ownership and inter-organizational coordination result in greater LMRP homogeneity.

DATA

CMS Website

The primary data come from LMRP policies posted on a CMS-sponsored website. The LMRP policies are supplemented with data from a survey of contractor medical directors. The LMRPs are posted in policy sets by contractor organizations for each of their jurisdictions on the CMS-sponsored website, www.cms.hhs.gov/med. The policies were downloaded on a snapshot date (May 31, 2001). At the time we downloaded the LMRPs, the website URL was www.lmrp.net (since we downloaded the policy sets, CMS reorganized the website; our description reflects their former website). The snapshot date is important because contracts, particularly carrier contracts, may be transferred to a new contracting organization. To account for missing data on our snapshot date, we revisited the LMRP website and downloaded the “missing” policy sets on April 2, 2002. We included only those policies with original effective dates on or before May 31, 2001. We excluded two carrier and one fiscal intermediary policy sets because they appeared on the website after the “snapshot” date and subsequent download date. Our database contains all the LMRPs that were publicly available on our “snapshot” and subsequent download dates.

We excluded policies that fell outside the time frame of the study, focused on processes, such as health care management rather than treatment, or had no recorded procedure codes. The analysis includes data from 36 fiscal intermediary and 48 carrier policy sets. The final data set consists of 5,189 carrier LMRPs and 1,685 fiscal intermediary LMRPs for a total of 6,874 policies.

From each LMRP, we coded: policy title; policy description; policy type (e.g., drug, surgery, medicine, etc.); start date of policy comment period; start date of policy notice period; original policy effective date; HCPCS or CPT procedure codes covered; types of evidence cited (e.g., journal articles, FDA approval, other contractors); revision effective dates and the reasons for those policy revisions; states covered by the policy; and dates and locations of Carrier Advisory Committee meetings. The Healthcare Common Procedure Coding System (HCPCS) is used in Medicare’s automated payment systems to

identify procedures and devices used in diagnosis and treatment. The HCPCS contains three sets of codes—Level I, II, and III. Level I codes include Current Procedural Terminology (CPT) codes used to identify medical services and procedures furnished by physicians and other health professionals. Level II codes include products, supplies, and services not included in CPT codes, and Level III codes are “local” codes developed by carriers, fiscal intermediaries, and Medicaid agencies for use only in their jurisdictions.

Contractor Medical Director Survey

As part of a larger survey of contractor medical directors, we obtained information regarding other contractors with whom they coordinated policies. The survey included all 67 contractor medical directors (Foote et al. 2004). The instrument was administered by mail and telephone follow-up. The overall response rate was 60 percent (40 respondents). Of the 28 fiscal intermediaries, 16 responded for a 57 percent response rate. Of the 39 carriers, 24 responded for a 62 percent response rate. We investigated differences between respondents and nonrespondents by comparing them in size (number of claims processed), geography, and organizational form (multistate or single-state). Our respondents reflected the proportion of intermediaries and carriers in the total population. Additionally, 80 percent of intermediaries and 73 percent of carrier respondents reported that their organizations had multiple contracts, which is also consistent with the population as a whole. An indicator for coordinating policies was set to one when both members of a dyad reported coordinating policies. This measure was used in the analysis of policy overlap between contractors. Because of survey response patterns, the policy coordination measure was available only for carriers.

LMRP Classification

We classified policies as NT, TE, or UM with the assistance of two physician consultants (MD 1, MD 2), who classified each policy title into one of three categories: NT, TE, or UM. We provided the following definitional guidelines: new technology policies provide guidance for, and limitations on, the use of new clinical interventions; an example includes deep brain stimulation, a neurosurgical procedure that uses subcortical electrical stimulation to control tremors. Technology extension policies expand coverage to new uses of procedures or technologies already covered for other applications. For instance, the use of urethral stenting is an extension of the use of stents to open occluded vessels in other parts of the body. Utilization management policies circum-

scribe the clinical indications for widely diffused technologies or procedures to avoid misuse or overuse. Examples include toenail debridement, the reduction of a dystrophic nail.

The LMRPs were classified based on the policies' original effective dates in order to capture the status of the technology, device, or procedure at the time the policies were implemented. Both physicians initially classified the carriers' LMRPs. We then classified the fiscal intermediary LMRPs based on the distribution of HCPCS procedure codes among the NT, TE, and UM categories for each physician. The majority of intermediary policies were successfully classified. There were 264 policies that could not be classified using this technique because the HCPCS procedure codes documented in them were evenly divided between two categories. We were able to classify 216 of these intermediary policies by matching their titles with carrier policy titles and assigning categories to these policies consistent with the carrier policies. The physicians then classified the remaining 48 intermediary policies.

The physician consultants agreed on classification for 82.0 percent of the intermediary policies and 84.3 percent of the carrier policies. While the overall agreement was high, the disagreements were not unexpected. The technology definitions are broad, the physician consultants viewed the policies from significantly different work roles, and the framing of the technology may have varied—over time a specific technology can pass from NT to TE to UM through expansion to new uses and finally to common practice. So, while most procedures are clearly agreed on, there are some policies in a gray area that reflects the transition of technologies along the diffusion curve. To account for the differences in classification, we estimated and report results based on the two physicians' (MD 1 and MD 2) classifications separately where appropriate. These estimates can be interpreted as the lower and upper range of technology effects.

Our arguments predict that NT policies will be more homogeneous than UM policies and that TE policies will lie between the two. Since physicians learn about new technologies through rational professional information sharing, NT policies will diffuse faster than UM policies. Since UM policies are often driven by local practice variations rather than by research reported at the national level, UM policies are less likely to cite academic and professional journals.

METHODS

The analyses were done at both policy and procedure levels because of the way the data are structured. Analyses of the relationship between technology

type and use of information, policy focus, policy age, and policy revisions were at the policy level. Analyses of the overlap in policies among contractors and the relationship of technology to diffusion rates were at the procedure level.

Policy-Level Analyses

Since technology type, policy age, policy focus (number of procedures per policy), information cited, and policy revisions were coded at the policy level, they were analyzed at the policy level. Policy focus, the number of procedures per policy, is an atypical measure of policy similarity. But, related research supports its use as a measure of similarity. A content analysis of coverage policies that compared six randomly selected policies, one of each technology type for diagnosis and treatment, showed that substantial homogeneity among NT and TE policies in procedures coded in contrast to UM policies, which had more heterogeneous procedures (Foote, Halpern, and Wholey 2005). This is consistent with our arguments about the institutional processes underlying coverage policy development. UM policies respond to local variation, which should result in greater heterogeneity while NT and TE policies respond to a national mimicry and diffusion process. While we would have preferred to be able to code more direct measures of policy similarity, the amount of effort required to content code so many policies was prohibitive because contractors bundle procedures into policies in different ways. While the policy focus measure may not be an ideal measure of similarity, it is a feasible measure that research shows is valid. And, since our study relies on consistency across multiple predictions, the results for policy focus will not provide the sole support for the overall argument.

Policy age and policy focus were studied using PROC MIXED in *SAS* with fixed effects included for technology type (NT, TE, UM) and for each contractor. Evidence use was studied using with fixed effects for technology type and contractor, and with a continuous measure of policy age. Age was included to control for accretion of evidence and changes due to time. Since the dependent variable was a binary variable indicating whether a particular type of evidence was used, PROC LOGISTIC in *SAS* was used for estimation. Policy revisions (number of times policy was revised, number of diagnosis changes, number of procedure changes) were studied with fixed effects for technology type and contractor and a continuous measure of policy age. Since the number of revisions was an ordered, positive integer that is heavily skewed toward zero, an ordered logistic was estimated using PROC LOGISTIC in *SAS*.

The contractor fixed effect controls for unmeasured differences, such as those due to local markets or contractor characteristics, across contractors that may be correlated with technology type (e.g., larger contractors or some medical directors may be more active in writing NT and TE LMRPs). Since technology type effects were measured as “within contractor” effects, the likelihood of spurious correlation between technology type and the dependent variable due to unmeasured contractor and market characteristics was eliminated. Each analysis examining the effect of technology type was done for both physician coders.

Procedure-Level Analyses

Analyzing technology diffusion and policy overlap is difficult at the policy level because contractors do not uniformly bundle procedures into policies. Bundling may result in policy level comparisons of procedure diffusion being apples-to-oranges comparisons and conducting the analysis at the procedure level results in a meaningful comparison.

The analysis of the effect of common contractor ownership and policy coordination on coverage pattern similarity was done at the dyadic level. For each pair of contractors, the number of procedures covered by both contractors was counted (shared procedures). The number of shared procedures was regressed on indicators of whether the two contractors were affiliated with the same contractor and whether they coordinated policies. PROC MIXED in SAS was used for estimation. Since shared procedures measures the number of common procedures for contractors i and j , there were multiple observations of both contractor i and j in the data set. This may result in correlated errors. This problem was addressed using fixed effects, an indicator for i and an indicator for j . As well as addressing correlated errors, the fixed effects also controls for other contractor characteristics that are not included the model, such as contractor organizational characteristics and local market conditions, and which may influence shared procedure coverage. Since shared procedures are symmetric (shared procedures for the pair i, j is the same as shared procedures for j, i) and since shared procedures are meaningless for a contractor paired with itself (i, i), the only dyads included in the analysis were the ones where $i > j$.

The analysis of technology diffusion rates was done at the procedure level. The number of times a procedure was mentioned in a NT, TE, or UM policy was counted because a procedure could appear in multiple types of policies. Some UM type procedures, e.g., were sometimes listed in NT polices

as ancillary approved procedures. For example, both MD1 and MD2 coded breath testing for *Helicobacter pylori* (*H. pylori*) infection as NT. *H. pylori* bacteria cause ulcers. In many breath test policies, there were HCPCS codes not only for the breath tests but also for bacterial cultures, a common laboratory procedure, and for office visits. Technology type for the procedure was measured as the proportion of times the procedure was mentioned in a NT or TE policy (UM is the excluded contrast). PROC REG in SAS was used to regress the time between earliest and latest procedure effective dates and the average wait time between the policies mentioning a procedure on technology type and the number of contractors covering the procedure.

The arguments about speed of diffusion by technology type were assessed by measuring the time between the earliest and latest effective dates and the average wait times for a procedure. They were calculated by constructing a data set for each unique procedure code and policy identifier and the original effective date. This data was sorted by effective date in ascending order within procedure. The number of times a procedure was mentioned by different contractors measured the extent of the diffusion of the procedure, the proportion of times a procedure was mentioned in a different policy type (NT, TE, UM) measured the procedure's technology, the difference between the earliest and latest dates a procedure code was mentioned measured the length of time between first and last policies, and the wait time between policies covering the procedure was used to calculate average wait time between policies for a procedure. Controlling for the extent of diffusion of a procedure, our arguments suggest that in contrast to UM procedures, NT procedures diffuse faster, which is reflected in a shorter period between first and last effective dates and lower average waiting times between policies.

RESULTS

We found variation in number of policies and policy focus (procedures per policy) for carriers and fiscal intermediaries. There is significant variation in the number of policies issued by contractors, from a minimum of 5 to a maximum of 143 for intermediaries, and a range from 4 to 291 for carriers. In terms of numbers of procedure codes subject to a coverage policy, the intermediary range was 20–891; for carriers 24–3,154 (Foote 2003). There is also variation in the pattern of evidence citation for carriers and intermediaries. Again consistent with local variation, patterns of citing evidence vary significantly across carriers and intermediaries in most cases. Only 26.93 percent of

carrier policies cite other carrier policies; 37.53 percent of fiscal intermediary policies cite carrier LMRPs. About 27 percent of carrier and intermediary policies cite journal articles; 16.68 percent of carriers and 15.22 percent of intermediaries cite CMS-sponsored contractor work groups. Our results show strong evidence of significant heterogeneity in coverage rules. This suggests that there are strong local adaptation pressures driving diversity.

As predicted by H2, this diversity is mitigated by common ownership and LMRP coordination. Analysis of coverage overlap, the number of common procedure codes covered by pairs of contracts, shows that common ownership by a national firm has a strong positive effect on procedure coverage overlap for carriers ($\beta = 311.83$, $T = 9.77$). There was no effect for fiscal intermediaries ($\beta = 0.81$, $T = 0.12$). When an indicator for policy coordination was added to the carrier analysis, the effect of common ownership remained significant ($\beta = 312.31$, $T = 9.81$) and the effect of policy coordination was significant ($\beta = 143.27$, $T = 2.60$). This suggests that common ownership and policy coordination increases policy homogeneity among carriers.

Technology Type and LMRP Homogeneity

We examine H1, about the effects of technology type, using a multipronged approach. A variety of LMRP characteristics are examined, including policy age, policy focus, evidence use, and policy revisions, to see how consistent the effects of technology type are with the arguments about differences between NT and UM policies. The general argument being examined is that NT policies are more homogeneous in policy focus and diffuse more quickly than UM policies.

Table 1 shows the results for policy focus and supports H1. All 4 NT estimates are negative and significant, meaning that NT policies are much more focused. The only significant TE effect is for carriers for MD 1 ($\beta = -4.47$). The carrier effect of MD 2 is also negative and marginally significant ($\beta = -2.41$, $T = -1.86$). For carriers, the TE effect is smaller than the NT effect, which means the TE effect lies between NT and UM. The estimates also show that NT and TE policies tend to be newer than UM policies.

Table 2 shows the relationship between technology type and evidence use. National institutional pressures on LMRP development is reflected in differences across technologies in the evidence citation, such as journal articles and medical reference materials. Research on new technologies will initially appear in journals and will take time to be codified into medical references. For fiscal intermediaries and carriers, the estimates for MD 1 and MD 2 each

Table 1: Effect of Technology Type on Policy Age and Policy Focus (Number of Procedures per Policy) (Contrast Is Utilization Management)

	<i>Fiscal Intermediaries</i>				<i>Carriers</i>			
	<i>MD 1</i>		<i>MD 2</i>		<i>MD 1</i>		<i>MD 2</i>	
	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>b</i>	<i>t</i>	<i>B</i>	<i>t</i>
Policy age								
NT	-0.28	-1.89	-0.27*	-2.32	-0.79*	-6.08	-0.66*	-6.65
TE	-0.56	-1.86	-0.40*	-3.22	-0.41*	-2.02	-0.35*	-2.89
Policy focus (procedures per policy)								
NT	-3.68*	-2.17	-4.10*	-3.12	-6.19*	-4.42	-6.19*	-5.80
TE	-4.70	-1.38	0.56	0.40	-4.47*	-2.07	-2.41	-1.86
Policy age	-0.69*	-2.50	-0.68*	-2.45	-0.08	-0.51	-0.10	-0.66

Procedures per policy was regressed on technology type, policy age, and fixed effects for contractor.

* $p < .05$.

NT, new technology; TE, technology extension.

show that NT policies are much more likely to cite journal articles rather than medical reference materials. Since the contrast is UM, the latter finding can be reinterpreted as meaning UM policies are more likely than NT policies to cite medical reference materials. Among carriers, UM policies are also more likely to cite medical textbooks. In sum, in contrast to UM policies, NT policies cite journals while in contrast to NT policies, UM policies are more likely to cite medical texts and references. In one sense, journals, texts, and references are all forms of conveying institutional knowledge. The key difference between journals and texts or references is that journals reflect emerging dynamic knowledge while texts or references reflect static codified knowledge. This suggests that NT policies reflect the dynamic development of medicine.

Table 3 examines the relationship of technology type to policy revisions. Three types of policy revisions are examined—number of revisions, number of changed diagnoses that are linked to procedures, and number of procedure code changes. As expected, older policies have been revised more frequently. Controlling for policy age, the general argument is that NT policies have been revised less. This occurs because the LMRP content is being driven by a common source, rather than random local variation. The results for number of policy revisions and number of diagnosis changes are consistent with this argument, with six of the eight estimates negative and significant. Both the nonsignificant estimates are negative. For number of procedure code changes

Table 2: Effect of Technology Type on Evidence Use (Contrast Is Utilization Management)

	<i>MD 1</i>				<i>MD 2</i>			
	<i>NT</i>		<i>TE</i>		<i>NT</i>		<i>TE</i>	
	β	χ^2	β	χ^2	β	χ^2	β	χ^2
Fiscal intermediaries								
Journal articles	0.52*	7.42	0.00	0.00	0.55*	23.59	0.20	2.77
Government publications	2.97	0.00	-7.96	0.00	-0.64*	4.65	0.58*	6.16
Manufacturer reports	4.04	0.00	-7.85	0.00	-0.07	0.09	0.32	2.08
FDA approval	4.30	0.00	-7.79	0.00	0.30	1.03	-0.08	0.05
Workgroup	0.46	1.41	-0.91	1.72	0.18	1.17	-0.60*	8.71
CMS documents	-0.54*	4.90	0.50	2.29	-0.07	0.22	0.11	0.68
Medical textbooks	0.08	0.09	-0.31	0.61	-0.14	0.74	-0.29	2.81
Medical reference materials	-0.24	1.04	-0.61	2.73	-0.49*	15.31	0.09	0.55
Other LMRP—any	-0.47*	4.86	0.04	0.01	-0.53*	17.30	0.23	3.07
Carriers								
Journal articles	0.34*	13.50	0.23	3.66	0.56*	79.28	0.07	0.99
Government publications	-0.08	0.09	-0.27	0.56	-0.16	1.18	0.31*	4.44
Manufacturer reports	0.42	3.69	-0.65	3.52	0.12	1.08	0.04	0.09
FDA approval	0.63*	5.10	-0.90	3.45	0.05	0.10	0.12	0.53
Workgroup	0.03	0.08	0.31	3.16	0.06	0.56	-0.31*	9.45
CMS documents	-0.21	3.61	0.15	1.16	-0.23*	10.70	0.38*	24.43
Medical textbooks	-0.35*	6.47	0.21	1.76	-0.40*	14.85	-0.01	0.01
Medical reference materials	-0.47*	17.60	-0.38*	6.62	-0.60*	77.65	0.24*	11.15
Other LMRP—any	-0.11	1.17	-0.19	2.06	-0.28*	17.45	0.05	0.50

Evidence use (use, do not use) was regressed on technology type, policy age, and fixed effects for contractor using a logistic regression. Policy age almost always had a negative effect, suggesting that older policies were less likely to cite evidence.

* $p < .05$.

NT, new technology; TE, technology extension; FDA, Food and Drug Administration; CMS, Centers for Medicare and Medicaid Services; LMRPs, local medical review policies.

for carriers, though, the effect of NT is positive for both MD 1 and MD 2. This effect may be a result of flux in assigning procedure codes during the early development phase of a technology. At the earliest points of technology development, contractors may use “local” procedure codes (e.g., Level III codes) for coverage purposes. As coverage widens across contractors, CMS will adopt a common procedure code.

The TE results for MD 2 for carriers suggest that TE policies are revised more frequently than UM and the revision often consists of diagnosis code changes. This is consistent with an interpretation of TE diffusion as extending a procedure to new indications (diagnoses). However, the TE findings for

Table 3: Effect of Technology Type on Policy Revisions (Contrast Is Utilization Management)

	<i>MD 1</i>		<i>MD 2</i>	
	β	χ^2	β	χ^2
Fiscal Intermediaries				
Number of policy revisions				
NT	-0.44*	4.51	-0.40*	9.69
TE	0.45	2.52	0.26*	4.53
Policy age	0.42*	136.09	0.42*	133.63
Number of diagnosis changes				
NT	-0.26	0.90	-0.48*	7.09
TE	0.13	0.13	0.07	0.18
Policy age	0.22*	25.39	0.21*	23.02
Number of procedures changes				
NT	-0.17	0.20	-0.32	2.23
TE	-0.02	0.00	0.50*	6.71
Policy age	0.17*	8.22	0.18*	10.05
Carriers				
Number of policy revisions				
NT	-0.13	2.64	-0.30*	29.07
TE	0.04	0.17	0.20*	10.64
Policy age	0.16*	208.96	0.15*	204.46
Number of diagnosis changes				
NT	-0.43*	9.00	-0.69*	47.43
TE	0.07	0.19	0.26*	7.01
Policy age	-0.02	2.22	-0.03	3.20
Number of procedure code changes				
NT	0.27*	4.16	0.17*	4.09
TE	-0.25	1.84	-0.05	0.23
Policy age	-0.03	2.50	-0.03	2.17

Number of changes was regressed on technology type, policy age, and fixed effects for contractor using an ordered logistic regression.

* $p < .05$.

NT, new technology; TE, technology extension.

carriers for MD 1 are not significant, so the finding should be interpreted with caution.

Table 4 shows the relationship between technology type and procedure diffusion rates. Controlling for the number of contractors covering a procedure, for both intermediaries and carriers, the analysis for both MD 1 and MD 2 shows the more frequently a procedure is mentioned in NT policies, the shorter the time from first to last effective date and the average time between effective dates for policies including the procedure. This means that NT policies diffuse faster than UM policies. For TE policies compared to UM policies,

Table 4: The Effect of Technology Type on Procedure Adoption Rates (β and T -Statistic)

	<i>Fiscal Intermediaries</i>		<i>Carriers</i>	
	<i>MD 1</i>	<i>MD 2</i>	<i>MD 1</i>	<i>MD 2</i>
Time from first to last effective date for procedures				
Proportion of times mentioned in NT policies	-4.78*	-3.67*	-12.31*	-7.67*
T -statistic	(-2.63)	(-2.67)	(-9.80)	(-8.52)
Proportion of times mentioned in TE policies	12.39	2.65	-8.57*	15.98*
T -statistic	(1.8)	(1.40)	(-4.10)	(17.69)
Number of contractors covering procedure	50.92*	48.98*	23.78*	29.16*
T -statistic	(8.22)	(7.76)	(12.89)	(16.76)
Intercept	1123.33*	1151.68*	2661.64*	2338.80*
F	25.40*	24.30*	92.44*	213.07*
Adjusted R^2	0.094	0.091	0.12	0.25
Average time between effective dates for procedures				
Proportion of times mentioned in NT policies	-0.62*	-.45*	-1.30*	-.77*
T -statistic	(-3.37)	(-3.24)	(-8.06)	(-6.62)
Proportion of times mentioned in TE policies	0.52	0.16	-0.63*	1.92*
T -statistic	(0.74)	(.85)	(-2.36)	(16.45)
Number of contractors covering procedure	-7.44*	-7.62*	-9.76*	-9.11*
T -statistic	(-11.79)	(-11.91)	(-41.30)	(-40.56)
Intercept	269.83*	272.62*	441.05*	402.58*
F	52.28*	52.94*	596.78	776.91*
Adjusted R^2	0.18	0.18	0.48	0.55

Ordinary least-squares regression used.

* $p < .05$.

NT, new technology; TE, technology extension.

the evidence is mixed. For carriers, the effect of TE on diffusion rates is significant but opposite for MD 1 and MD 2. For MD 1, TE policies diffuse more quickly than UM policies, but not as fast as NT policies. For MD 2, TE policies diffuse slower UM policies and much slower than NT policies. The difference between MD 1 and MD 2 may be due to the more restrictive use of the TE category by MD 1, resulting in placing TE close to NT. For MD 2, the wider use of the TE category may have resulted in the TE category being coded as similar to UM. While the results for the TE category are mixed, the results for the NT category are not. Consistent with the argument, NT policies diffuse faster. Tables 1, 2, 3, and 4 are consistent with the argument that in contrast to UM policies, a common institutional process occurring at the national level drives NT policies. This process is reflected in citation of journal articles, fewer policy revisions, fewer diagnosis changes, and faster diffusion.

DISCUSSION

Consistent with a local adaptation story, the results show significant heterogeneity in LMRPs across contractors for utilization management, with common ownership and policy coordination increasing homogeneity. Consistent with the institutional argument, the results show that a common institutional process based on professional and medical technology institutions, such as journal publication, drives LMRPs that include new technologies.

Given arguments from organizational theory about the influence of institutional environments, the results are interesting. The study setting can be described as a homogenous institutional environment. Contractors contract with the same organization (CMS) to do the same job and operate within the same professional environment (medicine) that is fairly well standardized in terms of training and information availability. Given the institutional homogeneity, it seems reasonable to expect fairly strong homogeneity in coverage rules. What the results seem to suggest is that while institutions may be relatively homogeneous, they are not identical, and the differences in size and resources affect homogeneity. Also, there is significant latitude for practice variation through local adaptation (Wennberg and Gittelsohn 1973; Berg 1997).

The results are also informative for organizational theory arguments about the diffusion of institutions such as administrative structures and rules. A common institutional story is that early adopters adopt for technological, local reasons and later adopters adopt for institutional, conformity reasons (Tolbert and Zucker 1983; Burns and Wholey 1993; Strang and Soule 1998). Our analyses show that prevalence of a practice is not necessarily the source of conformity. In this study, institutional pressures come from a professional and medical technology field that surrounds the rule-making process. In contrast, local adaptation comes from local differences. While common local issues may sometimes be addressed with coordinated template policies, this homogenizing process seems less prevalent than the diversity due to managing local area variations. A reason that our results differ from earlier research may be a difference in the focus of the object being studied. Earlier institutional studies focused on the diffusion of administrative structures (e.g., civil service, matrix management) rather than rules used to manage a market. It appears that the institutional and local processes influencing rules to manage markets are different than those influencing administrative structures.

This quantitative analysis of LMRPs is consistent with other analyses we have done. A detailed comparison of six LMRPs selected to contrast policies for procedures and for diagnostic tests by type of technology (NT, TE, UM)

showed that there was significantly more homogeneity among the selected new technology policies than among the selected utilization management policies (Foote, Halpern, and Wholey 2005). Also consistent with our results are findings from a 2002 survey of local contractors that showed that there are significant differences among contractors in resource allocation and LMRP development based on organization size (Foote et al. 2004).

A possible limitation is not adequately measuring homogeneity by technology type. While we would have liked to measure policy characteristics to the same level of detail in this paper as we did in qualitative analyses of a limited number of policies, doing so was not feasible. Capturing the data on all the policies was very resource intensive, as was capturing the data for the qualitative analyses. Capturing highly detailed data on all policies was beyond the project's scope. Because we could not measure policies in as great a level of detail in this paper, our research strategy was to examine homogeneity for a number of theoretically based effects. While there is always the risk of measurement problems, the consistency of the results within in this paper and to the more detailed qualitative analyses is evidence validating the measures. If there were significant differences in measurement between the two analyses, it would seem reasonable to expect that we would not have obtained such consistent results. Further research with more detailed measures would be useful both to further test the arguments and to develop a deeper understanding of the effects of technology type.

We have described elsewhere the political debate on local versus national coverage as a "tug of war" between interested stakeholders (Foote et al. 2004). Congress recently set a policy direction in the Medicare Prescription Drug, Improvement and Modernization Act of 2003. The Act requires CMS to make improvements in national and local coverage determinations, including a plan to "decide to what extent greater consistency can be achieved among local coverage decisions" and to "reduce duplication of effort" among local contractors (Medicare Prescription Drug, Improvement and Modernization Act of 2003, Sec. 796).

CMS faces many challenges to achieve these goals. There has been little understanding of the causes of inconsistent local policies. Our work has demonstrated that all LMRPs are not alike on many dimensions. All three sets of results suggest that a different organizational process drives new technology policies than utilization management policies. Understanding these differences is essential to designing policies to address them.

In February 2005, CMS submitted a report to Congress describing its first steps to implement the Medicare Modernization Act, including replacing

current contractors with 15 new Medicare Administrative Contractor (MAC) regions, combining the work of Part A fiscal intermediaries and Part B carriers (Centers for Medicare and Medicaid Services 2005). The factors used to determine the regions included cost and risk of transition, balance in size based on claims processed, among others. Although there was no focus on policy variation in the design, our findings suggest that this effort to equalize the size and resources of local contractors could also increase policy homogeneity as a result. However, it is uncertain how the Medicare Modernization Act consolidation might affect local adaptation as the new larger regions may not reflect local markets.

To date, the CMS has not addressed the issues of consistency or duplication. The new Medicare Administrative Contractors will continue to make local policy; there will also be national policy capacity. Our findings will be useful in CMS' effort to respond to Congress. Our classification of policies by categories will help CMS evaluate local versus national allocation. We have found that new technology policies showed significantly more homogeneity than utilization management policies, despite the decentralized local contractor decision making. One could argue that there is no need to centralize new technology policies if local decision makers produce homogeneous results. On the other hand, do we need the duplication of multiple assessments if the results are similar? Multiple assessments may make it easier for new technologies to take hold in regions that are early adopters. However, policy makers will need to weigh the value of the decentralized status quo against the potential reduction in duplication if CMS undertook national decisions for new technology in the future.

Utilization management policies appear to reflect adaptation to local conditions and are much more heterogeneous. As we have noted, there is significant variation in utilization of services in Medicare, with important implications for quality of care and costs of care (Wennberg 2004). To the extent that practice variation represents deviation from best practices, such as overuse or misuse of services, one could argue that homogeneous utilization management policies could improve quality and potentially reduce costs. On the other hand, processes may be best managed at the level where variation occurs. Making all utilization management decisions at the national level might present management burdens at CMS, not just in volume but also because much of this work would be idiosyncratic to a specific local area and might require continual adjustment at the national level. However, for those decisions in which there is a clear best practice, processes could be built to move those issues to the national level.

CMS must respond to the directives of the Medicare Modernization Act and should pay close attention to this study as it does so. The data helps explain the local contractors' output, and how those results vary across contracting organizations. Our research cannot replace the need for CMS to consider the pros and cons of various alternatives, while navigating contentious political and resource concerns. Our work, however, provides essential information to inform CMS' choices. Changing administrative regulations and processes will affect the variation and duplication to some degree. However, recognizing the interface between organizations and regulation reveals that changes in the organizations themselves may also impact LMRP variation.

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