

Impact of Policies and Performance Measurement on Development of Organizational Coordinating Strategies for Chronic Care Delivery

Leonard Pogach, MD, MBA; Martin P. Charns, MBA, DBA;
James S. Wrobel, DPM, MS; Jeffrey M. Robbins, DPM; Kristin M. Bonacker, BA;
Linda Haas, PhC, RN, CDE; and Gayle E. Reiber, MPH, PhD

Objective: To examine the impact of policy directives and performance feedback on the organization (specifically the coordination) of foot care programs for veterans, as mandated by public law within the Department of Veterans Affairs Health Care System (VA).

Study Design: Case study of 10 VA medical centers performing diabetes-related amputations.

Patients and Methods: Based on expert consensus, we identified 16 recommended foot care delivery coordination strategies. Structured interview protocols developed for primary care, foot care, and surgical providers, as well as administrators, were adapted from a prior study of surgical departments.

Results: Although performance measurement results for foot risk screening and referral were high at all study sites over 2 calendar years (average 85%, range 69% to 92%), the number of coordination strategies implemented by any site was relatively low, averaging only 5.4 or 34% (range 1-12 strategies). No facility had systematically collected data to evaluate whether preventive foot care was provided to patients with high-risk foot conditions, or whether these patients had unmet foot care needs.

Conclusions: Although foot care policies and data feedback resulted in extremely high rates of adherence to foot-related performance measurement, there remained opportunities for improvement in the development of coordinated, technology-supported, data-driven, patient-centered foot care programs.

(*Am J Manag Care.* 2004;10(part 2):171-180)

evidence-based medicine and to promote patient-centered care.

Other conceptual frameworks to implement care for chronic disease have been proposed, including the Chronic Disease Model.² This model, which incorporates evidence-based medicine and informatics, results in productive patient-provider interactions and improved patient outcomes. The Joint Commission on Accreditation of Healthcare Organizations relied on this model when it developed its Disease Management Certification Standards, which include program management, clinical information management, supporting self-management, delivering or facilitating clinical care, and performance measurement.³ However, the organizational factors that lead to the development and implementation of successful disease management programs remain poorly understood.⁴

Coordination of care has been proposed as a key organizational factor for improving the quality of chron-

The Institute of Medicine has stated that the healthcare system is comprised of multiple interacting systems of care (including emergency, ambulatory, inpatient, imaging, laboratory, and pharmacy), delivered by networks of individuals, teams, and payer systems that “function in such diverse and diffuse management, accountability, and information systems that the overall term health system is today a misnomer.”¹ Consequently, the Institute stated that a radical re-engineering of the American healthcare system is needed to deliver high-quality, patient-centered care. The Institute envisioned a central microsystem of care (ie, a unit that actually provides medical care), driven by systems-oriented approaches utilizing information technology to increase the rate of knowledge diffusion to clinicians, in order to standardize the provision of

From the Department of Veterans Affairs New Jersey Health Care System, Center for Healthcare Knowledge Management, East Orange, NJ (LP); the University of Medicine and Dentistry of New Jersey, New Jersey Medical School, Newark, NJ (LP); the VA Management Decision & Research Center and the Program on Health Policy and Management, Boston University School of Public Health, Boston, Mass (MPC); the VA Medical and Regional Office Center, Department of Veterans Affairs, White River Junction, Vt (JSW); the Department of Community and Family Medicine, Dartmouth Medical School, Hanover, NH (JSW); the Cleveland VA Medical Center, Department of Veterans Affairs, Cleveland, OH (JMR); Health Services and Research and Development (KMB, GER), and Primary and Specialty Medical Care Services (LH), VA Puget Sound Health Care System, Department of Veterans Affairs, Seattle, Wash; and the Departments of Health Services and Epidemiology, University of Washington, Seattle, Wash (GER).

This research was supported by grant DIS-99037 from the Department of Veterans Affairs, Health Services Research and Development. The views expressed in this article are those of the authors and do not necessarily represent the views of the agencies providing support.

Address correspondence to: Leonard Pogach, MD, MBA, VA New Jersey Health Care System, Health Services Research Center for Healthcare Knowledge Management, East Orange VAMC, Room 9-160 (111), 385 Tremont Avenue, East Orange, NJ 07018. E-mail: leonard.pogach@med.va.gov.

ic care delivery in smaller, more organized microsystems such as intensive care units and surgical care services.⁵⁻⁸ More recently, we have demonstrated that greater coordination of care by programming, as reported by professionals involved in Department of Veterans Affairs Health Care System (VA) foot care programs, is associated with fewer minor amputations.⁹ In this study we utilize organizational contingency theory as a conceptual model, and site visits as a methodology, for the evaluation of coordination strategies for foot care delivery, an important but often-overlooked aspect of diabetes chronic care disease management. Specifically, we examined foot care programs at 10 sites within the VA to understand the impact of policies and performance measurement feedback on the implementation of specific coordination strategies to support foot care delivery to individuals with high-risk foot conditions.

METHODS

VA Foot Care Policies

Within the VA, law and policy are explicit in their establishment of facility foot care programs with annual reports to Congress. These policies mandate, but do not fund, VA networks and facilities within these networks to establish multidisciplinary foot care teams and a designated facility-level coordinator.¹⁰ Although the policies do not mandate a specific organizational framework, they direct facility managers to identify veterans at risk for lower-limb complications; provide preventive care; track high-risk foot care across the continuum of outpatient, inpatient and rehabilitative care; and provide education, orthotics, and social support.

Furthermore, the VA directive is supported by nationally issued foot care guidelines for risk stratification¹¹ and quarterly and cumulative performance measurements on facility and network foot screening and referral of high-risk patients to foot specialists.

Study Sample

Because veterans with diabetes account for two thirds of all amputations¹² in the VA, we focused on this cohort at 10 VA medical centers performing lower-limb amputations. The 10 medical centers selected each performed more than 30 lower-limb amputations in fiscal year (FY) 1999. Study sites included those with high and low age-adjusted lower-limb amputation rates by geographic area (Healthcare Analysis and Information Group. *Lower Extremity Complications in VHA (FY 89-99) Part II: LFA Rates, Combined Conditions, and Outpatient Utilization*. VA Intranet document. Contact author to gain access). Approval was received from each study site's institutional review board.

Conceptual Framework

The theoretical basis of the study was organizational contingency theory, which states that an organization's structure, systems, and practice should support its unique mission in the context of its environment.¹³⁻¹⁵ Building on general organizational theory, Charns and Schaefer¹⁶ developed a conceptual framework that described health-care coordination in 2 major categories: programming and feedback. A study of VA surgical services based on this framework demonstrated that more intense programming and feedback approaches to coordination among surgeons, anesthesiologists, and nurses resulted in lower risk-adjusted postsurgical complications in the VA.^{7,8,17}

In our study, we assessed coordination by programming and feedback, and the global support resources supporting a study site's foot care program. *Coordination by programming* is best characterized as the use of preestablished plans, policies, procedures, information, and communication systems to standardize the work that needs to be performed through specification of tasks and skill sets necessary to perform them. Such approaches have been noted to be efficient in that they require minimal verbal communication among the individuals performing the task.^{8,18} An example of coordination by programming would be use of computerized reminders in the electronic medical record for mandated performance measures. Coordination by programming is efficient for routine work, but ineffective for situations of greater uncertainty.

Coordination by feedback involves adjustment of actions based on new information; within organizations, it involves either personal or group responses to facilitate the transfer of that information.¹⁸ Examples of feedback strategies at the level of clinical care include supervisory coordination and peer interactions such as committees, multidisciplinary rounds, and team meetings. In the surgery study, the organizations with the best clinical outcomes had high levels of both programming and feedback.

Coordination by programming and coordination by feedback occur within an organizational context of global support resources provided by the healthcare system (rather than the individual clinicians). Contingency theory posits that to implement coordinating mechanisms in the most effective manner (and therefore to achieve high levels of performance), organizational leaders have an imperative to manage resources such as staff, space, and information systems to support the required coordination.^{15,16}

Foot care for people with diabetes covers a broad continuum. Diabetic foot care includes screening examinations to detect high-risk conditions, surveillance of patients with foot risk factors to maintain healthy feet while preventing complications, and providing salvage

care for complications including ulcers, infections, and advanced peripheral vascular disease. **Table 1** describes the 3 levels of our foot care framework and conceptual constructs for coordination by programming and by feedback. For example, coordination by programming ensures that multidisciplinary providers have training and a minimum skill set before performing foot exams and wound care. An example of coordination by feedback is structured opportunities for multidisciplinary clinicians to review findings and discuss issues. We used this foot care framework to develop 7 programming strategies (**Table 2**), 9 feedback coordination strategies (**Table 3**), and 6 global resources to support them (**Table 4**), all of which were evaluated in our site interview protocols.

Site Visit Structured Interviews

Structured interview protocols were developed for primary care, foot care, and surgical providers and administrators, based on domains of coordination adapted from the VA National Surgical Quality Improvement Program⁷ and specific strategies for foot care programs adapted from the literature.^{19,20} The site visit interview protocols are available on the Diabetes Quality Enhancement Research Initiative Web site (http://www.va.gov/annarbor-hsr/queri/queri_projects.htm).²¹ The interview assessed components such as the structure of foot care provided by each service in inpatient and outpatient settings, confidence in care, working relationships, education and training, coordinating mechanisms, patient

Table 1. System Coordination Features of an Ideal Foot Care System*

Feature	Screening Component	Surveillance Component	Salvage Component
1. Foot Care Program Framework			
Major tasks	Identify asymptomatic persons at increased risk for ulcers and amputation	Provide preventive care (foot wear, callus/nail care, education) for people with high-risk foot conditions	Provide ulcer, revascularization and amputation care; rehabilitation services
Usual providers	Primary care provider, podiatrist, nursing staff	Podiatrist, nurse, rehabilitation specialist, educator (any discipline)	Podiatrist, vascular and general surgeons, orthopedist, rehabilitation specialist
2. Coordination by Programming			
Standardization of skills	Training on foot exams	Training on high-risk foot care	Training in wound care, surgical management, and rehabilitation
Standardization of tasks	Screening foot exam protocols Referral guidelines for high-risk foot care	Implement high-risk foot care protocols and protocols for therapeutic footwear	Ulcer care protocols Amputation protocols Rehabilitation protocols
Standardization to document processes and outcomes	Risk status of specific patient Date for next foot exam Provider reminders	Registry of high-risk patients Tracking system	Ulcer healing rates Amputation rates
3. Coordination by Feedback			
Multidisciplinary and peer communication	Multidisciplinary conferences Multidisciplinary rounds Conflict resolution		
Committee structure and data feedback	Screening index (EPRP) Visual exam Neuropathy exam Vascular exam Referral rate of high-risk patients	Surveillance index Risk identified and referred Provision of: Education Footwear Provider visits	Ulcer rates and amputation rates
Systems committees	Chartered Quality Improvement Patient survey (unmet needs, behaviors, knowledge, satisfaction) Provider survey (360-degree feedback [evaluation of staff by administrators, and of administrators by staff], resource issues)		

*EPRP indicates External Peer Review Program.

POLICY

Table 2. Foot Care Coordination by Programming

Category	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J	Total by Category
Written policies and/or procedures	X	X	X		X		X	X			6/10 (60%)
Guidelines or care maps		X									1/10 (10%)
Coordinated patient-level educational efforts		X				X					2/10 (20%)
Written information regarding risk level provided to patients			X								1/10 (10%)
Off-hour telephone triage		X	X	X	X	X	X			X	7/10 (70%)
Outsourcing of custom footwear	X		X		X		X	X			5/10 (50%)
Formal mechanism to evaluate the appropriateness of prescribed footwear		X									1/10 (10%)
Total by site	2/7 (29%)	5/7 (71%)	4/7 (57%)	1/7 (14%)	3/7 (43%)	2/7 (29%)	3/7 (43%)	2/7 (29%)	0/7 (0%)	1/7 (14%)	

issues, resources, and recommendations. The interview protocols were designed to evaluate whether each medical center had developed foot care-specific programming policies and procedures; whether each medical center had coordinated feedback approaches to standardize and coordinate the delivery of foot care across the continuum of screening, surveillance, and salvage; and whether interviewees were aware of their facility's foot care performance measurement results and amputation rates. Additionally, because the VA had recently implemented a nationwide computerized patient record system, we specifically addressed whether the organization's informatics framework provided information to assist staff at the time of patient contact, and whether high-risk foot registries had been created. Finally, we designed the interview protocols to evaluate whether the facility had addressed structural issues pertinent to the global administration of an integrated foot care program such as staffing, staff privileges, space, and information systems pertinent to the delivery of foot care.

Facility-Level Characteristics and External Peer Review Program Performance Rates

The prevalence of veterans with diabetes at each study site was estimated from the VA Patient Treatment File administrative data for FY 2000. Patients with diabetes were defined by having a diagnosis code (*International Classification of Diseases, Ninth Revision, Clinical Modification [ICD-9-CM]* 357.2x, 362.x, 648.0x, 250.xx, or 366.41) listed on at least 2 out-

patient visits or 1 inpatient stay, or a prescription for a hyperglycemic medication.²² Individuals were identified as having a high-risk foot based on *ICD-9-CM* codes for neuropathy, hammertoes, Charcot foot, peripheral arterial disease, peripheral vascular procedures, deep infections or ulcers, or prior amputation. Because a specific code for the identification of the insensate foot was not available to providers during the study period, individuals with foot risk are underestimated.

We obtained facility-level performance rates for an annual foot risk stratification examination for FY 2000 and FY 2001 from chart audits performed by an independent contractor (West Virginia Medical Institute) through the VA External Peer Review Program administered by the Department of Veterans Affairs Headquarters Office of Quality and Performance. Because the VA is not an insurance indemnity system requiring premiums, continuous enrollment criteria were established by including veterans with 12 months of continuous enrollment and more than 1 visit annually to a primary care or medical subspecialty clinic. We then constructed a combined score for each facility (the average of a visual, pulse, and sensory examination, and referral of high-risk veterans with any abnormality on screening to a foot care specialist).

Site Visit Process and Data Collection

Seven individuals with expertise in foot care policy, clinical care, and/or research served as site reviewers. Each site visit team was comprised of 3 experienced professionals, including 1 with VA headquarters pro-

Table 3. Foot Care Coordination by Feedback

Category	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J	Total by Category
Multidisciplinary and Peer Communication											
Multidisciplinary clinics with collaboration on high-risk foot care	X	X		X		X	X	X	X		7/10 (70%)
Multidisciplinary conferences to discuss clinical foot-related cases											0/10 (0%)
Annual multidisciplinary conferences to discuss system-level foot care		X		X		X			X		4/10 (40%)
No significant interdisciplinary conflicts	X	X					X				3/10 (30%)
Committee Structure and Performance Feedback*											
Minutes of foot care meetings to leadership		X	X	X					X		4/10 (40%)
Review of External Peer Review Program results with staff	X		X	X		X	X	X	X		7/10 (70%)
Review of ulcer and amputation rates		X	X	X							3/10 (30%)
Nonscreening quality improvement projects		X		X							2/10 (20%)
Known prevalence of diabetes, high-risk patients, and ulcers		X									1/10 (10%)
Total by site	3/9 (33%)	7/9 (78%)	3/9 (33%)	6/9 (67%)	0/9 (0%)	3/9 (33%)	3/9 (33%)	2/9 (22%)	4/9 (44%)	0/9 (0%)	

*Five study sites (A, B, D, E, J) were referral centers for patients requiring amputations from other facilities and, therefore, had an additional coordination-by-feedback strategy: "formal communication strategies with referring facilities on foot care." However, none of the sites had this strategy in place.

grammatic responsibility for an aspect of foot care, 1 with research expertise, and 1 with clinical foot care responsibility. Site visits occurred between October 2000 and April 2001. We interviewed providers involved in high-risk diabetic foot care, including general, vascular, and orthopedic surgeons; rehabilitation specialists; podiatrists; physical therapists; pedorthists; orthotists; diabetes care specialists; diabetes educators; dermatologists; and infectious disease physicians interested in diabetic foot care. We also interviewed administrators and a convenience sample of primary care providers at each study site. Interviews lasted 50 minutes, and site visits were conducted over 1-2 days.

Analysis

After receiving input from other team members, the lead reviewer for each site wrote a qualitative assessment of findings. This report detailed which of the 7 coordination-by-programming and 9 coordination-by-feedback activities a site had implemented (see Tables 2 and 3). Five study sites were referral centers for patients requiring amputations from other facilities; therefore, they had an additional coordination-by-feedback strategy. However, none of the sites had this strategy in place. We also identified whether or not global support resources were adequate for routine activities of a foot care program. Without information on the facility ampu-

Table 4. Global Support Resources for Foot Care Programs

Category	Site A	Site B	Site C	Site D	Site E	Site F	Site G	Site H	Site I	Site J	Total by Category
Registry of high-risk patients			X							X	2/10 (20%)
Clinical Reminders	X	X		X	X	X	X		X	X	8/10 (80%)
Tracking of no-shows	X										1/10 (10%)
Electronic consultations	X	X			X					X	4/10 (40%)
No unmet space needs			X							X	2/10 (20%)
Independent providers' privileges based on their scope of licensure, education, training, and competency			X	X		X	X	X			5/10 (50%)
Total by site	3/6 (50%)	2/6 (33%)	3/6 (50%)	2/6 (33%)	2/6 (33%)	2/6 (33%)	2/6 (33%)	1/6 (17%)	1/6 (17%)	4/6 (67%)	

tation rates, the research team then used a nominal group process to qualitatively rank the 10 sites based on perceived effectiveness of their foot care program. We used Spearman rank correlation to correlate nominal facility-level rankings with the number of coordinating strategies, cross-sectional FY 2000 and FY 2001 foot care performance measurement, and longitudinal change in performance measurement.

RESULTS

On average, sites had only implemented 5.4 (34%) of the 16 combined coordination-by-programming and coordination-by-feedback strategies (range 1-12 strategies) described in Tables 2 and 3, and 2.2 (37%) of the 6 global support strategies (range 1-4 strategies) noted in Table 4. An examination of coordination by programming (Table 2) indicated that 6 of the 10 sites had formal written policies; however, the extent of these policies varied widely and ranged from organizational administrative memorandums to formal policies for screening in the primary care clinics, consultation referrals, and manuals for house staff or nurses.

Although all sites indicated that they provided patient education, only 2 sites standardized efforts across care delivery units such as primary care, diabetes clinics, and foot care clinics. In general, sections at each site used different education materials. Only 1 site provided patients with information regarding their personal foot risk level after screening. Seven sites indicated that they had 24-hour patient telephone triage available, but none provided routine written informa-

tion to patients on whom to contact for foot care emergencies or what conditions would merit provider contact. At these 7 sites, the effectiveness of the triage system had not been evaluated.

Half of the study sites outsourced custom (molded to fit the patient's foot) footwear. At 1 site, a pedorthist attends the podiatry clinic to coordinate footwear dispensing. Only this 1 site had a formal mechanism (eg, a patient survey, follow-up fittings) to evaluate the quality of footwear dispensed from the VA from either the provider or the patient perspective.

Foot care coordination by feedback was assessed in terms of multidisciplinary and peer communication, committee structures, and performance feedback. Table 3 shows that 7 of 10 sites indicated that they had multidisciplinary clinics for high-risk patients. In several instances, this feedback resulted from clinics being held at the same time in contiguous areas. In other sites, a specific effort was made to have podiatrists attend diabetes clinics, or to have vascular surgeons integrated into high-risk foot clinics. None of the study sites had ongoing multidisciplinary clinical conferences to discuss foot care for high-risk patients, although multidisciplinary inpatient rounds often were held. Although 5 study centers were referral sites for other VA facilities without surgical services, we did not identify formal coordination-by-feedback strategies to provide systems-level feedback to the referral sites regarding pretransfer care.

Clinicians at 7 sites were aware of current performance measurement data at their facility. However, the intensity of review and sharing of the data varied. At 1 site, an interviewee noted that "posting of results" would

be a more accurate term than reviewing results. On the other hand, several sites actively monitored the process and results of screening. At 1 site, providers reviewed the records of a sample of patients with diabetes to evaluate unmet needs, and at 2 other sites, administrators used random chart reviews only to identify "outliers."

Ulcer and amputation results from the Office of Policy and Planning, which were posted on the VA Intranet, were reviewed by only 3 sites. These 3 were sites with formal high-risk foot care committees that reported to medical center leaders. Two additional sites tracked amputation rates in their defined service population, while 2 sites tracked the number of amputations over several years but did not express the data as rates. None of the 5 sites that received referrals for amputations were able to determine what percentage of all patients treated, and amputations performed, were patients from referring facilities.

Only 2 sites reported quality improvement efforts in the area of foot care beyond foot risk screening examinations. One site perceived that its efforts had led to a reduction in amputations, whereas the other noted that consensus had not been reached over implementation issues. None of the sites were able to evaluate the success of their program in terms of real-time outcomes that could be impacted quickly, such as continuity of foot care for high-risk patients, patient self-reports of unmet needs, or patient and provider satisfaction with footwear.

Global support mechanisms for foot care programs such as registries were available only at 2 sites (see Table 4). Despite the VA's sophisticated computerized patient record system, none of the sites had instituted a comprehensive, integrated electronic registry that would support all components of a foot care program such as tracking of individuals with high-risk feet or provision of preventive care, including education, footwear, or durable medical equipment. One site had a diabetes registry that provided clinicians with the status of veterans' foot examinations, and one site had a registry of veterans with high-risk feet or prior amputations. Departmental records were maintained at several other sites that represented a partial registry for patients screened in primary care, treated for ulcers, or treated with bypass surgery. These data were not available to the entire foot care team. None of the sites were able to provide the site team with data on the number of diabetes-related visits, continuity of foot care or missed appointments, ulcers, or amputations. No site had linked a patient's high-risk status for lower-extremity complications to the electronic medical record, although individual providers could incorporate that information into the problem list.

As shown in **Table 5**, we used nominal group rankings to order our study sites into low-, medium-, and

high-performing facilities. We created a summary score for each site of coordination by programming and feedback mechanisms, and global support resources. We also created a summary measure of each study site's foot care-related performance measurement data, as previously described. There were no statistically significant correlations between the reviewers' nominal group rankings or the number of coordination strategies and either the cross-sectional summary External Peer Review Program performance measurement score or the change in score from FY 2000 to FY 2001.

.....
DISCUSSION

Prevention of lower-extremity complications is of great importance in the VA veteran user population, because approximately 20% of veteran clinical users have diabetes, and more than 15% of persons with diabetes would be expected to develop lower-extremity complications over the course of their lifetime, with significant morbidity, mortality, and costs.²³⁻²⁵ The Veterans Health Administration has many similarities to a staff-model delivery system and has a nationwide, standardized, electronic medical record system that can be customized at the local level.²⁶ Consequently, foot care delivery in the VA provides a unique model in which to evaluate coordination strategies in the implementation of chronic disease programs because of the explicit linkage of policy with ongoing and active performance measurement and feedback, and the high prevalence of the condition.

A number of studies suggest that multidisciplinary foot care programs based in general diabetes, specialty, or research clinics have improved patient outcomes,^{19,20,27} and we recently reported that summary provider-reported coordination scales correlated with improved outcomes. Therefore, we anticipated that the commonality of the VA foot care programs (microsystems of care) would be in their coordinating activities, especially those that involve VA data and the electronic medical record.

Consequently, we were surprised to find that the best-performing facility had implemented only 14 of the 22 coordinating and global-resources (Tables 2-4) strategies that we had identified on the basis of expert consensus, and that 6 of the 10 sites had implemented fewer than one third of those strategies. Of particular concern were the observations that interfacility coordination of foot care between tertiary care and referral centers was not optimal at 5 sites, and that high-risk foot registries had not been established despite the strength of the VA informatics systems and the availability of facility-level reg-

POLICY

Table 5 Site Rankings, Coordination Strategies, Global Support Resources, and Performance Measures for 10 VA Foot Care Programs*

Nominal Group Process Ranking (1 = Best to 10 = Worst)	Coordination Strategies [†]	Global Support Resources	No. of Patients With Diabetes [‡]	% Patients With High-Risk Feet [§]	EPRP Data FY 2000 (National Average 85.5%)	EPRP Data FY 2001 (National Average 84.3%)	Site ID
					Site Difference From National Mean		
1	6/16 (38%)	2/6 (33%)	<5000	24.3	3.8	-1.0	G
2	4/16 (25%)	1/6 (17%)	<5000	16.4	3.3	7.0	I
3	12/16 (75%)	2/6 (33%)	>5000	17.4	12.8	6.2	B
4	7/16 (44%)	2/6 (33%)	>5000	12.4	3.0	-0.05	D
5	5/16 (31%)	2/6 (33%)	<5000	19.1	-7.0	-2.5	F
6	5/16 (31%)	3/6 (50%)	<5000	19.2	-11.5	-2.0	A
7	7/16 (44%)	3/6 (50%)	<5000	15.9	8.8	2.2	C
8	3/16 (19%)	2/6 (33%)	<5000	12.4	9.8	1.7	E
9	1/16 (6%)	4/6 (67%)	>5000	13.2	3.0	-15.0	J
10	4/16 (25%)	1/6 (17%)	<5000	17.5	8.0	8.2	H

*EPRP indicates External Peer Review Program; FY, fiscal year; VA, Veterans Affairs Health Care System.

[†]Feedback and programming coordination strategies.

[‡]Patients with diabetes mellitus are defined as all individuals with an *International Classification of Diseases, Ninth Revision* 250.xx code for at least 1 inpatient or 2 outpatient visits, or a prescription for diabetes-specific medication or monitoring supplies, and who did not have a date of death.

[§]Patients at "high risk" are defined as those with diabetes mellitus who have 1 or more of the following foot conditions: peripheral neuropathy, peripheral vascular disease (peripheral vascular disease in diabetes; generalized arteriosclerotic vessel disease; gangrene; absent pulses; lower-limb complication from bypass), ulcer or abnormal skin condition (cellulitis, paronychia of toe; cellulitis, abscess of foot, infected ulcer; chronic, nonhealing wound of the lower extremity; osteomyelitis), or deformity/abnormal biomechanics (Charcot foot; hammer or claw toe; amputation of lower extremity; stump complications), as evidenced by an inpatient or outpatient code in FY 2000.

istries from VA headquarters. Individual microsystems of care within facilities that provided services for individuals with high-risk feet (eg, vascular surgery) constructed hand-entered databases. Nonetheless, in today's environment of patient safety, informal coordination strategies cannot substitute for formal mechanisms. Although veteran education is a national priority for the Veterans Administration,²⁸ foot care education was not systematized within the facilities we studied. Furthermore, we found that self-reports of patient foot care needs were not systematically evaluated at any facility.

Documented adherence to foot risk screening and referral recommendations markedly improved after the introduction of performance measures. For example, in FY 2000 the mean national percentages of veterans with diabetes receiving an annual visual, sensory, and vascular (pulses) foot examination were 93%, 82%, and 78%, respectively, compared with 77%, 38%, and 51% during the baseline FY 1995-FY 1996 period.²⁹ Furthermore, 85% of patients with an abnormal screening result were referred to a foot care provider. During this time period, major, minor, and total amputations performed in the

Veterans Health Administration each decreased by about 16% despite a 34% increase in the number of veteran clinical users, although these data do not account for out-of-system procedures (Healthcare Analysis and Information Group. *Lower Extremity Complications in VHA (FY 89-99) Part II: LFA Rates, Combined Conditions, and Outpatient Utilization*. VA Intranet document. Contact author to gain access). These findings indicate the high functioning of the VA with respect to the provision of foot care in 2000 and 2001 and are without a contemporaneous benchmark in any other system of care, because the Health Plan Employer Data and Information Set (HEDIS®) did not incorporate foot care screening into its measurement set. Our findings are also consistent within the larger context of the systematization of quality in the VA through structure and policy²⁶ and application of health services research.³⁰

Nonetheless, our findings indicate that during the study period there remained opportunities to improve foot care coordination strategies despite explicit national policy and the potential availability of informatics support. These findings are consistent with recent literature suggesting that there are more fundamental issues for the existence of a “quality chasm” in healthcare other than the lack of organized systems of care and unavailability of reliable and timely data.³¹

Economic competition and reimbursement have been cited as barriers to achieving efficient medical care. However, the VA is not in a competitive marketplace and subsidizes its largely economically challenged population. Based on the Veterans Equitable Resource Allocation Law, network-level and facility-level funding is primarily based on the number and complexity of patients.²⁶ However, fixed funding must be allocated across multiple clinical programs in the VA, as well as a variety of mandated preventive and disease-specific performance measures.

One possible explanation for our findings is that facilities give priority to resource allocation for quality improvement in measured areas of care.³² This thesis is supported by the emphasis at all study sites on improving adherence to foot screening and referral, which are mandated performance measures, often through the use of clinical reminders in the electronic medical record; however, less emphasis is placed on quality improvement in unmeasured surveillance and salvage activities (postscreening care).

In addition, competing needs may prevent the facility from having informatics personnel devote time to developing program-specific products such as foot care registries for identifying and tracking patients at risk. It is possible that the improvement in performance measures for foot screening may have led managers to pri-

oritize allocation of resources to other programs. Alternatively, the line managers responsible for organizing and providing oversight for foot care programs may not understand the purpose of foot care performance measurement,³³ which in this case is to identify a high-risk cohort that can be tracked for foot care delivery.

Another possibility is that healthcare systems often are allocated insufficient resources for the development of care management programs, resulting in a lack of incentives to encourage physician participation.³⁴ Although the VA is largely a staff-model system, certain key individuals in foot care programs (eg, podiatrists, vascular surgeons) may not be full time, and thus have a decreased incentive for unreimbursed involvement in quality improvement activities. These factors may impede implementation of the Institute of Medicine’s recommendations for consistent development of effective teams and teamwork based on a sound human resources development strategy.

We recognize a number of limitations to our findings. Our coordination strategies were adapted from work performed in surgical intensive care units,⁷ and while the foot care-specific strategies we evaluated have face validity based on a small study from 1 outpatient setting,²⁰ there is no evidence of their effectiveness in reducing ulcers and amputations. Our list of strategies may have overlooked other key elements. Furthermore, although the VA directives on foot care recommended general strategies to achieve multidisciplinary programs, specific strategies were not provided to field facilities.

In addition, we evaluated a small, not randomly selected, sample of VA medical centers. It is possible that other medical centers have achieved the objectives of a coordinated foot care program, but were not included in the study. This limits the generalizability of our findings both to other VA facilities and to other systems of care. Although we attempted to interview front-line providers, their managers, and senior administrators at each site, we acknowledge the possibility of both reviewer and respondent bias. Finally, given the rapid evolution of the VA electronic medical record, and the recent introduction of care coordination as a major Veterans Health Administration initiative, our findings may not be representative of VA foot care programs in 2004. Nonetheless, our findings may have ongoing relevance to the private sector, where neither foot care measures nor an electronic medical record are routinely implemented in the ambulatory care setting.

CONCLUSION

In conclusion, our key study finding is that neither explicit policies nor mandated process measures to

identify patients at risk for lower extremity complications necessarily resulted in the development of systematized, real time, data-driven, patient-centered foot care for veterans with diabetes who were at high risk of sustaining lower limb complications.

These observations suggest the importance of additional research to better understand how to improve coordination of care of patients with chronic disease in the outpatient setting. In addition, we propose that organizations that accredit chronic disease programs go beyond policies, performance measures, and patient interviews, and attempt to evaluate coordination of care. Findings from our studies suggest that provider surveys⁹ and site visits may be synergistic in evaluating the coordination-of-care strategies within a defined healthcare system. Such knowledge could be used internally by healthcare systems to develop and manage action plans to improve coordination, and evaluate and track trends in key elements of disease-specific care, including patient-centered care, even if these results are not able to be used for public comparisons.

Acknowledgments

We would like to thank Gerald Hawley, RN, MSN, for his assistance in creating the facility-specific diabetes registries. We also thank the 10 site principal investigators whose efforts were invaluable to the conduct of this research, but whose names must be withheld to protect site anonymity.

REFERENCES

- Institute of Medicine Committee on Quality of Health Care in America.** *Crossing the Quality Chasm: A New Health System for the 21st Century.* Washington, DC: National Academy of Medicine Press; 2001.
- Wagner EH, Austin BT, Von Korff M.** Organizing care for patients with chronic illness. *Milbank Q.* 1996;74(4):511-544.
- Joint Commission on Accreditation of Healthcare Organizations.** Facts about disease-specific care certification. Available at: <http://www.jcaho.org/dsc/certification+information/facts+about+dsc.htm>. Accessed May 10, 2003.
- Shortell SM, Alexander JA, Budetti PP, et al.** Physician-system alignment: introductory overview. *Med Care.* 2001;39(7 suppl 1):11-8.
- Berwick DM.** A user's manual for the IOM's "Quality Chasm" report [comment]. *Health Aff.* 2002;21(3):80-90.
- Shortell SM, Zimmerman JE, Rousseau DM, et al.** The performance of intensive care units: does good management make a difference? *Med Care.* 1994;32(5):508-525.
- Daley J, Forbes MG, Young GJ, et al.** Validating risk-adjusted surgical outcomes: site visit assessment of process and structure. *J Am Coll Surg.* 1997;185:341-351.
- Young GJ, Charns MP, Daley J, Forbes MG, Henderson W, Khuri SF.** Best practices for managing surgical services: the role of coordination. *Health Care Manage Rev.* 1997;22(4):72-81.
- Wrobel JS, Charns MP, Diehr P, et al.** The relationship between provider coordination and diabetes-related foot outcomes. *Diabetes Care.* 2003;26(11):3042-3047.
- Department of Veterans Affairs.** *Preservation Amputation Care and Treatment.* Washington, DC: Veterans Health Administration; 2001. VHA Directive 2001-030.
- Office of Quality and Performance.** Clinical practice guidelines. Available at: <http://vaww.oqp.med.va.gov>. Accessed May 10, 2003.
- Mayfield J, Reiber G, Maynard C, Caps M, Sangeorzan B.** Trends in lower extremity amputation in the Veterans Affairs Hospitals, 1989-1998. *J Rehabil Res Dev.* 2000;37:23-30.
- Woodward J.** *Industrial Organization: Theory and Practice.* Oxford, UK: Oxford University Press; 1965.
- Lawrence P, Lorsch J.** New management job: the integrator. *Harvard Business Rev.* 1967;45:142-151.
- Gailbraith JR.** *Designing Complex Organizations.* Reading, Mass: Addison Wesley; 1973.
- Charns MP, Schaefer MJ.** *Health Care Organizations: A Model for Management.* Englewood Cliffs, NJ: Prentice-Hall; 1983.
- Young GJ, Charns MP, Desai K, et al.** Patterns of coordination and clinical outcomes: a study of surgical services. *Health Serv Res.* 1998;33(5):1211-1236.
- Van de Ven AH, Delbecq AL, Koenig R.** Determinants of coordination modes within organizations. *Am Sociol Rev.* 1967;41:322-338.
- Edmonds M, Blundell M, Morris M, Thomas M, Cotton L, Watkins P.** Improved survival of the diabetic foot: the role of a specialized foot clinic. *Q J Med.* 1986;60:763-771.
- Litzelman DK, Slemenda CW, Langefeld CD, et al.** Reduction of lower extremity clinical abnormalities in patients with non-insulin-dependent diabetes mellitus. A randomized, controlled trial. *Ann Intern Med.* 1993;119(1):36-41.
- Krein SL, Hayward RA, Pogach L, BootsMiller BJ.** Department of Veterans Affairs' Quality Enhancement Research Initiative for Diabetes Mellitus. *Med Care.* 2000;38(6 suppl 1):138-48.
- Miller DR, Safford MM, Pogach LM.** Who has diabetes? Best estimates of diabetes prevalence based on computerized patient data. *Diabetes Care.* In press.
- Palumbo PJ, Melton LJI.** Peripheral vascular disease and diabetes. In: National Diabetes Data Group, eds. *Diabetes In America.* 2nd ed. Bethesda, Md: National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health; 1995:401-408. NIH publication 495-1468.
- Peters EJ, Childs MR, Wunderlich RP, Harkless LB, Armstrong DG, Lavery LA.** Functional status of persons with diabetes-related lower-extremity amputations. *Diabetes Care.* 2001;24(10):1799-1804.
- Eckman MH, Greenfield S, Mackey WC, et al.** Foot infections in diabetic patients. Decision and cost-effectiveness analyses. *JAMA.* 1995;273(9):712-720.
- Kizer KW.** The "new VA": a national laboratory for health care quality management. *Am J Med Qual.* 1999;14(1):3-20.
- Larsson J, Apelqvist J.** Toward less amputations in diabetic patients: incidence, causes, cost, treatment and prevention. *Acta Orthop Scand.* 1995;66(2):181-192.
- Department of Veterans Affairs.** VHA six for 2006. Available at: <http://vaww.va.gov/6for2006>. Accessed May 10, 2003.
- Sawin CT, Walder DJ, Bross DS, Pogach LM.** Diabetes process and outcome measures in the Veterans Health Administration. *Diabetes Care.* In press.
- Demakis JG, McQueen L, Kizer KW, Feussner JR.** Quality Enhancement Research Initiative (QUERI): a collaboration between research and clinical practice. *Med Care.* 2000;38(6 suppl 1):17-25.
- Newhouse JP.** Why is there a quality chasm?[comment]. *Health Aff.* 2002;21(4):13-25.
- West TD.** Comparing change readiness, quality improvement, and cost management among Veterans Administration, for-profit, and nonprofit hospitals. *J Health Care Finance.* 1998;25(1):46-58.
- Ginsburg LS.** Factors that influence line managers' perceptions of hospital performance data. *Health Serv Res.* 2003;38(1 pt 1):261-286.
- Gillies RR, Zuckerman HS, Burns LR, et al.** Physician-system relationships: stumbling blocks and promising practices. *Med Care.* 2001;39(7 suppl 1):192-06.