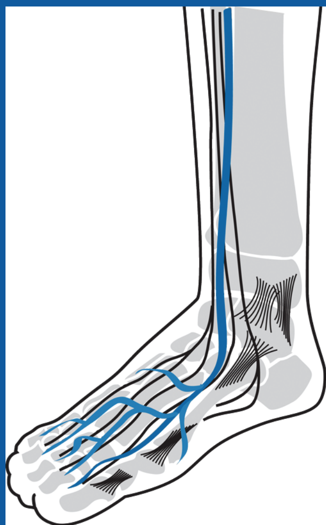
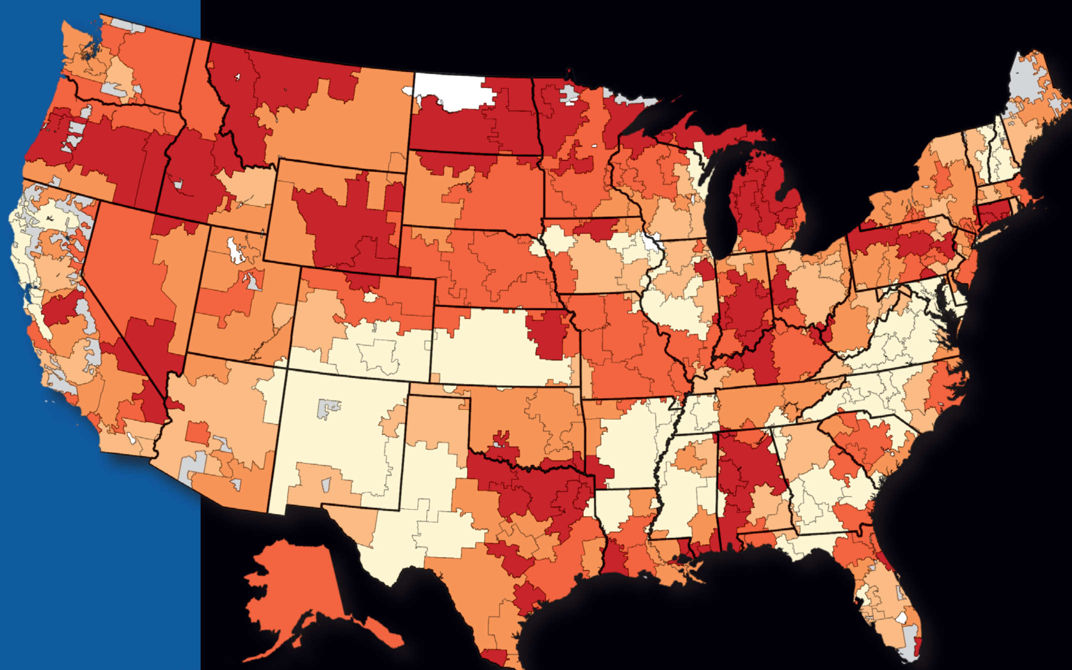


Variation in the Care of Surgical Conditions: Diabetes and Peripheral Arterial Disease

A Dartmouth Atlas of Health Care Series



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Variation in the Care of Surgical Conditions: Diabetes and Peripheral Arterial Disease

A Dartmouth Atlas of Health Care Series

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Foreword

The new Dartmouth Atlas series on variation in the care of surgical conditions, including this report on the treatment of diabetes and peripheral arterial disease, raises new questions regarding surgical management of both common and less frequently occurring medical conditions. This report carefully details the scope of the problem of diabetes and peripheral arterial disease and, as in previous Atlas analyses, emphasizes geographic practice variation in both preventive services and in surgical treatment rates. However, the report also takes a more patient-centered view. The goals of avoiding amputation and retaining the ability to walk are paramount. The best strategies to achieve these goals are the focus of quality improvement groups such as the Vascular Quality Initiative, described in this report. The outcomes data being recorded should go a long way toward producing the kind of widely applicable data upon which patient decision support tools should be based. Patients want to know procedure and facility-based risks and benefits. Just as the future of medicine is personalization of diagnosis and treatment, so too the future of decision support is to increasingly provide information tailored to the person and his or her health care environment. Ultimately, it is the active participation of fully informed patients that can address the question of "which rate is right," so provocatively posed by the Dartmouth Atlas analyses.

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Variation in the Care of Surgical Conditions

A Dartmouth Atlas of Health Care Series

Introduction

Twenty-first century surgery is among the great accomplishments of medicine. Surgeons have led some of the most important improvements in care quality, safety, and efficiency. Surgical methods are now highly effective for some of the most serious and previously intractable medical conditions, ranging from arthrosclerosis to obesity to chronic back pain. Today, surgical procedures work better and entail lower risk, less pain, and less time in the hospital.

As the scope and quality of surgical care continues to advance, there is still much that remains to be done to optimize care for patients. For many conditions, surgery is one of several care options, and in some instances, there are several types of surgical procedures available. Research into the effectiveness and adverse effects of a surgical procedure compared to alternatives is often incomplete. While quality has generally improved over time, outcomes can differ across hospitals and surgeons. Too often, treatment options, whether medical or surgical, are recommended without patients fully understanding the choices and participating in the decision; and these recommendations can vary markedly from one physician to the next. Finally, the costs of care continue to rise and often differ across health care systems, even the most reputable and prestigious. Why can the "best" surgical care at one academic medical center cost twice as much as another?

This Dartmouth Atlas of Health Care series reports on unwarranted regional variation in the care of several conditions for which surgery is one important treatment option. Unwarranted variation is the differences in care that are not explained by patient needs or preferences. Each report begins with an examination of the underlying condition, the available treatment options before surgery, and the role of shared decision-making. The care during surgery is then presented, including aspects of quality, risks, and costs. The next section is concerned with the care of patients after surgery, including hospital readmissions and ambulatory care.

The bottom line is that the greatest promise of surgery still lies before us. These reports show that quality is often excellent, but not in all places. Variation in surgical rates is high and represents both gaps in outcomes research and poor patient decision quality. Outcomes differ from place to place even when controlling for patient differences. The opportunities for better and more efficient care are substantial and will require renewed efforts in research and clinical quality improvement.

Variation in decision-making for surgical conditions

Experienced leaders and educators in surgery often emphasize to their trainees and students that performing an operation is easy: choosing the right patients for surgery is much more difficult. Over the last decade, important changes have occurred related to how surgeons and patients decide whether, when, where, and how to best perform surgery. In the past, surgeons commonly played a paternalistic role, and many surgeons made decisions for their patients, relying on their own training and experience.

When surgeons—and more importantly, patients—face a decision regarding surgery, making the "right" choice can be clear and straightforward in certain situations. For example, patients with hip fracture almost always need to undergo surgery. For nearly every patient, surgical repair offers better pain control, improved functional status, and lower mortality when compared to treatment with conservative measures. Further, most patients who experience hip fracture are over the age of 65 and have access to surgical care, as they receive their health care benefits through Medicare. Because of this important constellation of circumstances—the treatment works well, is readily available, and is actively sought by both physicians and patients—hip fracture care is fairly uniform and regional rates vary relatively little, as shown in previous work by the Dartmouth Atlas and others (Figure 1).[1,2]

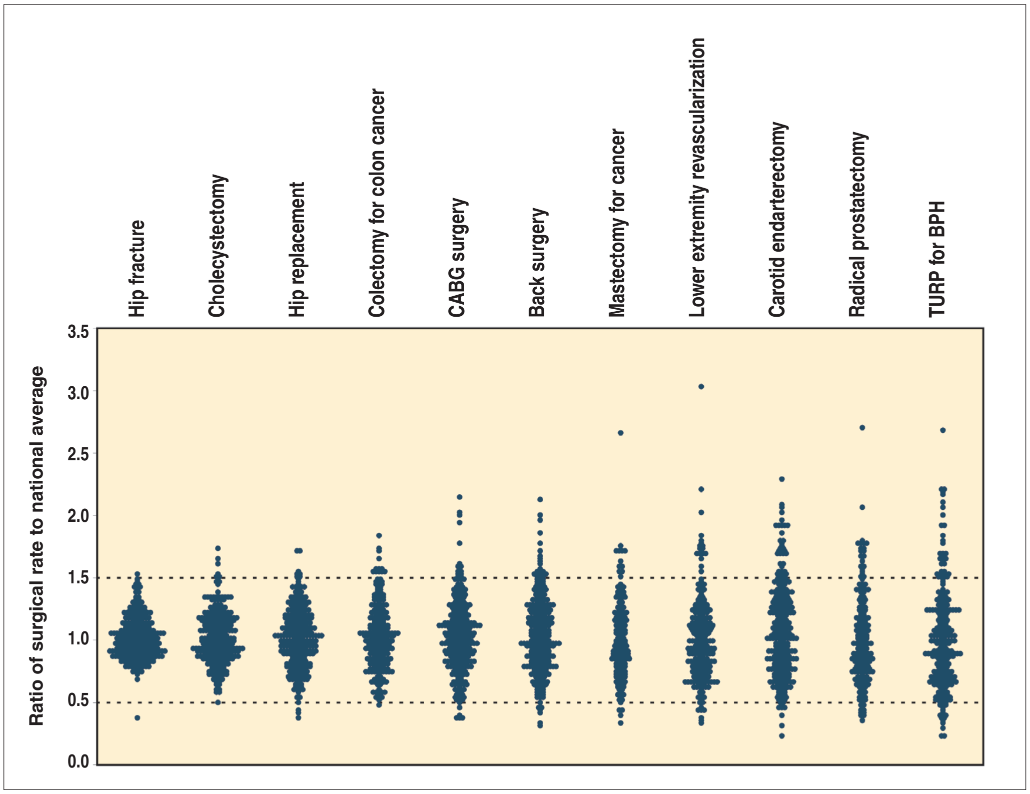
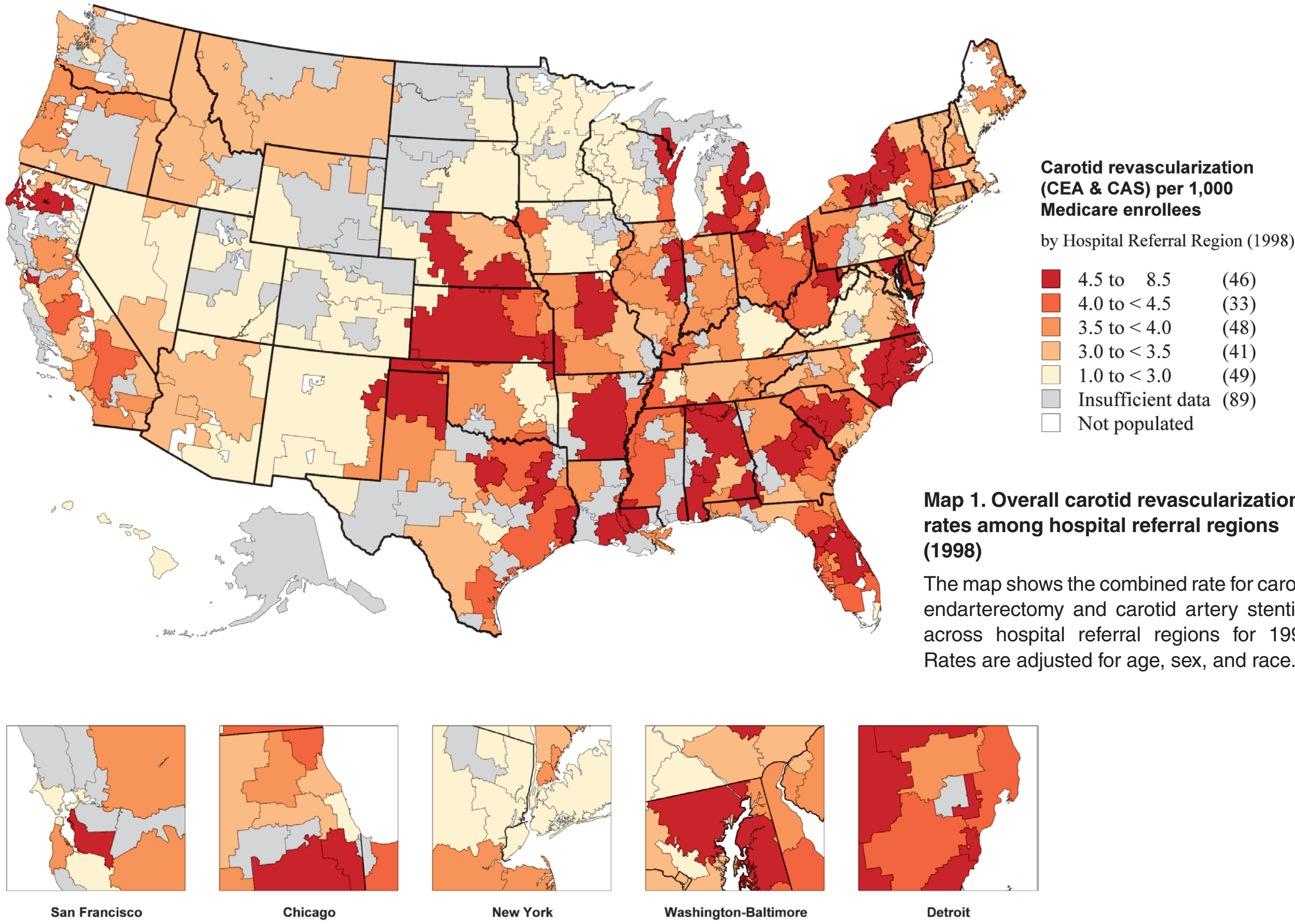


Figure 1. Variation profiles of 11 surgical procedures among hospital referral regions (2010)

Each point represents the ratio of observed to expected (national average) Medicare rates in the 306 U.S. hospital referral regions. Rates are adjusted for age, sex, and race. High and low outlier regions are distinguished by dotted lines.



Map 1. Overall carotid revascularization rates among hospital referral regions (1998)

The map shows the combined rate for carotid endarterectomy and carotid artery stenting across hospital referral regions for 1998. Rates are adjusted for age, sex, and race.

For many other illnesses, the choice of surgery is much less clear. For example, patients with asymptomatic carotid artery stenosis have a small but measurable risk of stroke as a result of narrowing within the carotid artery (the blood vessel in the neck that supplies the brain).[3] For certain patients with carotid disease, the risk of surgery to remove the plaque is fairly low, and removal of plaque can reduce the patient's risk of stroke over time. However, in patients with other illnesses, the chance of complications from surgery may be higher than the risk of stroke from the plaque itself.[4]

Because of this uncertainly about who should undergo carotid revascularization, treatment decisions vary considerably. Unlike hip fracture treatment, carotid surgery varies dramatically across the United States, as the Dartmouth Atlas has previously shown.[5] Carotid procedures are performed commonly in some regions, but rarely in others, resulting in marked regional differences in the use of revascularization. Many of these differences appear to be explained by differences in local medical opinion of the value of surgical care (Map 1).

New developments that have influenced surgical decision-making

How can surgeons and patients make the best decisions? In the past, many investigators reasoned that the surgeons who achieved the best results were likely to have the largest practices, and using this seemingly simple metric would ensure that patients received good surgical care. However, this assumption ignored the fact that it is difficult for surgeons to know who really achieves the "best" results. Many outcomes (such as death after carotid surgery) occur uncommonly, and a single surgeon has little ability to compare his or her results to those of other surgeons.

Given this challenge, over the last two decades, efforts to organize, measure, and improve results in surgical practice via quality improvement initiatives have developed, despite substantial obstacles. Patterns of surgical practice vary broadly across different regions of the United States, making it challenging to study and compare patients and outcomes. Further, the process of collecting, studying, and improving surgical outcomes represented a formidable challenge a decade ago, when most medical information lived in paper records, arranged in leaning stacks of bulging charts.

One important development in measuring care has been the development of clinical registries. These registries are used to study the clinical characteristics and outcomes of patients undergoing surgery and have supported many quality improvement initiatives, such as those shown in Table 1.

Table 1. Surgical registries and quality improvement organizations

Quality Improvement Initiative	Organization	Surgical Specialty	Focus	Funding
American College of Surgeons National Surgical Quality Improvement Initiative (ACS-NSQIP)	American College of Surgeons	Many	Measuring and reporting patient characteristics and outcomes	Hospitals
Veterans Affairs National Surgical Quality Improvement Program	Veterans Affairs	Many	Measuring and reporting patient characteristics and outcomes	Federal
Society of Thoracic Surgeons National Database (STS)	Society of Thoracic Surgeons	Thoracic surgery	Limiting risk with cardiac and thoracic procedures	Surgeons
Vascular Quality Initiative (VQI)	Society for Vascular Surgery	Vascular surgery	Improving care of patients with vascular disease	Surgeons and hospitals

Surgeons interested in measuring and improving their surgical results collaborated by systematically tracking patient outcomes. In many ways, these new efforts represented an important and novel strategy toward reducing variation by using clinically derived information to improve surgical decisions and care (Figure 2). As information for surgeons and patients increased (the green arrow), uncertainty for patients decreased (the red arrow). This simple but effective approach helped to limit variation in surgical treatments.

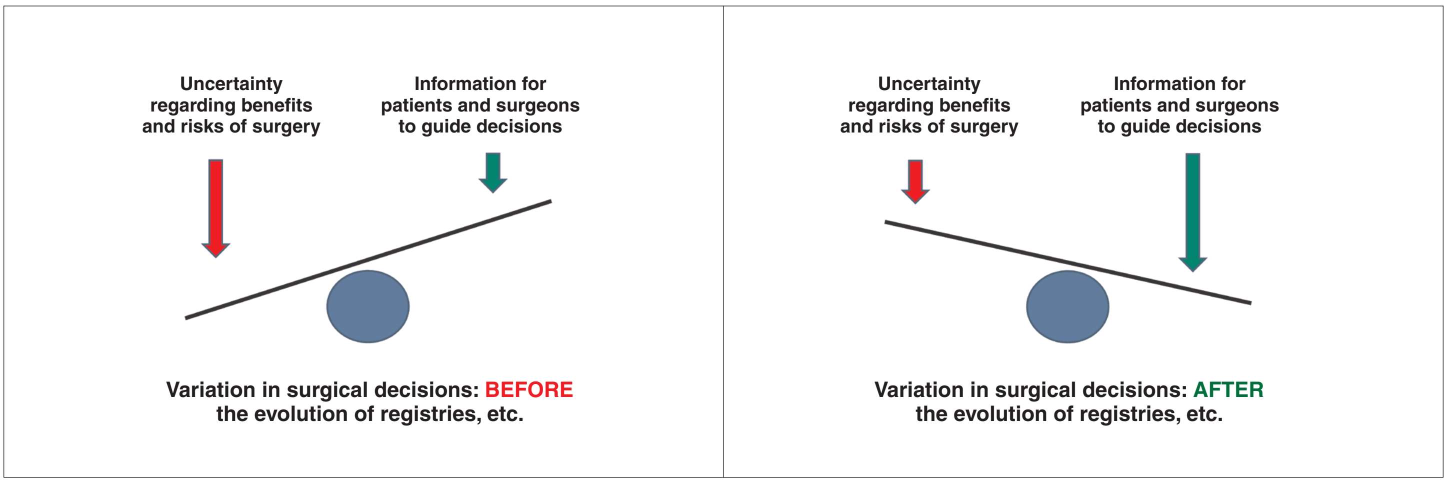


Figure 2. How information and uncertainty can affect variation in surgical care

Three other changes occurred during this time that helped create a spirit of engagement and excitement for quality improvement efforts and surgical outcomes research. While there were some differences, these general changes are outlined below:

> ***1. Less invasive methods became commonly available in surgery.*** In recent years, across nearly every surgical specialty, rapid advances in surgical technology have helped offer patients the ability to undergo major surgery without the need for a major recovery. Several examples illustrate this trend. Working inside body cavities no longer requires large abdominal or chest incisions, and surgeons instead use video cameras and small instruments in laparoscopic and endoscopic surgery. In vascular surgery, the blood vessels themselves are often the pathway to perform procedures (i.e., endovascular techniques). And finally, with the development of radiofrequency ablation, locally acting chemotherapeutics, and laser thermablation, the key objectives of a surgical procedure can be accomplished using a much less invasive approach. Patients rapidly learned about many of these approaches and sought out these less invasive procedures, and surgeons retrained to offer these new approaches.

2. Surgeons learned about data management and quality improvement. In places like Northern New England,[6,7] the Veterans Administration,[8] and others,[9] leaders in surgical outcomes assessment built the systems necessary to study and improve surgical care. These regional and national quality improvement efforts grew to become the infrastructure that allowed surgeons and patients to know when, how, where, and why surgical procedures were being performed. These initiatives set the stage for an emphasis on achieving the best outcomes.

3. Surgeons, patients, and payers put a new emphasis on measuring and reporting. Armed with gigabytes of data and advanced analytic systems, surgeons were now able to quickly analyze their outcomes. The ability to determine the structural and process measures associated with the best outcomes allowed surgeons new insights into what works and what does not. For example, surgeons used information from studies based on registries to demonstrate the benefits of processes of care, such as perioperative antibiotic administration, or of evolving procedures, such as bariatric surgery for patients with morbid obesity. Payers' and patients' expectations grew; they demanded the best operation, at the right time, with the highest quality.

Challenges to improving surgical decision-making and the goals of this series

Of course, several challenges accompanied these new developments. Who will pay for continued efforts to organize and measure surgical practice? How should results be shared and compared, especially among competitors? Would efforts to use the newest, latest, or most profitable device win out over the goal of improving quality and efficiency? Would surgeons, a group steeped in tradition and often slow to change, adopt these new approaches?

These questions have different answers in different settings. In some cases, such as in coronary bypass surgery, cardiac surgeons adopted outcomes assessment and quality improvement broadly, quickly, and enthusiastically. However, in other settings, such as surgery for prostate cancer or lower extremity vascular disease, efforts toward quality measurement and outcomes assessment have been taken up more slowly, and the impact of these initiatives remains less striking.

Why might some surgeons improve their decisions using these new strategies while other surgeons choose not to try these approaches? In this series of reports, we will use several examples to illustrate the challenges. We will describe, across a broad spectrum of conditions, advances in surgical decision-making, including shared decision-making, which have resulted in less variation in care, improved patient satisfaction, and better outcomes. We will also describe settings wherein these strategies have been less successful, and variations in surgery rates and surgical decision-making remain. In these latter cases, we will outline the potential to improve surgical practice by refining the methods we use to select patients for intervention.

This series will study these conditions and their challenges in much the same way that surgeons approach these problems: by considering the challenges in care that occur before surgery, during surgery, after surgery, and beyond surgery. Within each condition, we will follow the patient along these choices and decisions and learn where the greatest challenges, most important uncertainties, and best evidence lie in making decisions about surgery. Further, we will examine the implications of these uncertainties and identify settings where more effective choices surrounding surgical care could result in healthier populations and potentially even lower costs.

Table 2. Structure of each report

Before surgery	Determinants of condition and treatment decisions
	Incidence of condition
	Regional variation in condition/covariates related to the condition
	Treatment options - effectiveness, trade-offs, and knowledge gaps
	Issues related to decision quality and shared decision-making
	Examples of quality improvement efforts or attempts to limit variation in treatments for condition
During surgery	Technical quality and outcomes
	Variation in procedure rates
	Cross-sectional rates of competing treatments
	Technical quality and results (short-term outcomes related to treatments)
	Example where regional quality improvement efforts may hold potential benefits in improving care
After surgery	Post-procedure care and long-term outcomes
	Downstream effects of treatment on condition
	Readmission or re-interventions after treatments for condition
Beyond surgery	Implications for surgeons, patients, and society
	How variation in treatments for the condition reflects opportunities for quality and efficiency gains
	How, why, and where efforts to limit variation are needed and might help
	How to move ahead in limiting variation or improving care in surgical treatments for condition

Influencing the key decision-makers: Patients, primary care physicians, surgeons, and policymakers

In the past, when it came to making a decision about surgery, the surgeon's recommendation was considered the most important opinion. His or her perspective was often critical in determining the use of a particular surgical procedure, especially for "preference-sensitive" care: care for conditions where there is no single "right" rate for every population or patient.

Current models of care suggest that better outcomes occur when full information about treatment options is shared with patients, who are then assisted in sharing the decision with the physician. This information often needs to come not only from surgeons, but also from primary care physicians who help patients choose among the different options, each with their likely outcomes and trade-offs. (For more information about patient-centered medical decision-making, please visit the Dartmouth Center for Informed Choice at http://tdi.dartmouth.edu/research/engaging/informed-choice and the Informed Medical Decisions Foundation at www.informedmedicaldecisions.org). In addition to reaching patients, the best information needs to reach policymakers who make decisions about how we spend our health care dollars, such that our resources provide the most effective care for patients with surgical conditions.

Shared Decision-Making

Dale Collins Vidal, MD

Professor of Surgery, Geisel School of Medicine; Director, Center for Shared Decision Making, Dartmouth-Hitchcock

Much of the striking variation in the use of surgical procedures reported in this Dartmouth Atlas series can be attributed to differing physician opinions about the value of one surgery over another, or a single surgical option compared to other treatments such as medication, active surveillance, or physical therapy. Each option can have different potential benefits as well as short and long-term side effects. For a given condition, any of the options may be a reasonable alternative. The decision is often further complicated by incomplete evidence regarding both benefit and harm.

It is particularly important to note that many informed patients have different perspectives than their physicians about the benefits and trade-offs of treatment options. The final choice of treatment should be made by patients who have been informed about the choices, including the pros and cons of each approach and any uncertainty about the evidence that supports each option. In addition, the health care team needs to help patients clarify their own goals and partner with patients to make joint decisions.

This process of engaging patients in decisions about their care is known as shared decision-making. Shared decision-making is a collaborative process that allows patients and their providers to make health care treatment decisions together, taking into account the best scientific evidence available, as well as the patient's values and preferences. The right choice for one patient may not be the same as the next. In this series, Dartmouth Atlas investigators will consider many clinical situations where there is no single "right" choice and highlight areas where shared decision-making may have an important role for patients with surgical conditions.

In summary, this series of Atlas reports is intended to help patients, physicians, and policymakers recognize where improvements in science have helped to limit variation and improve surgical care; but more importantly, for each of the surgical conditions we study, we hope to identify specific clinical settings and situations where variation in the treatment of surgical condition remains, and outline the best opportunities for improvement in surgical care that lie ahead.

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Diabetes and peripheral arterial disease: Putting patients at high risk for amputation

Patients with diabetes (high blood sugar) and peripheral arterial disease (PAD, or blockages in the arteries of the legs and other locations) are at high risk for major limb amputation at rates several times the national average for patients without diabetes.[1,2] Nearly 100,000 major leg amputations are performed annually in Medicare patients, and more than half of them occur as a result of diabetes.[3-5] Co-occurrence of these two illnesses—diabetes and peripheral arterial disease—has a negative synergistic effect, leaving patients at a higher risk for amputation than either of the two diseases alone.

In the context of these two diseases, a seemingly simple event, such as a small ulcer or break in the integrity of the skin of the foot, can result in a life or limb-threatening infection. When infection manages to breach the barrier of the skin of the lower limb, it often finds its way into the soft tissue, and occasionally into the bony structures of the foot. Given the poor ability of patients with diabetes to heal, the poor blood supply caused by arterial insufficiency known to occur in PAD, and the inability of antibiotic therapy to be delivered effectively through narrowed blood vessels, a "perfect storm" for uncontrolled infection results.

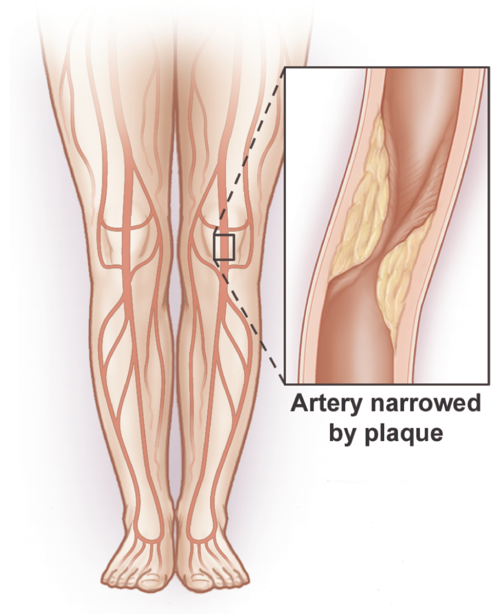


Figure 3. Arterial outline showing atherosclerosis

Source: The Society for Vascular Surgery, 2005.

Once infection has spread into the foot, it can be exceedingly difficult to eradicate.[6] The patient's blood sugar must be well controlled, which can be very difficult for many patients with diabetes. Measures to keep the patient's foot wounds clean and to keep the patient from bearing weight directly on the wounds are absolutely essential, but this is not easy when the wound is on the bottom of the foot. Patients with diabetes and PAD also need the best preventive medical treatments, such as statin therapy and smoking cessation counseling, to ensure the best outcomes. Therefore, for patients with diabetes and PAD, strategies for prevention and revascularization are of the utmost importance.[7-9]

Coordinating this complex care for diabetes and PAD can be challenging for patients and physicians. While plausible for patients with good financial and social resources, the task is daunting for the many patients with limited resources. This report examines how Medicare patients with diabetes and PAD are treated across the United States. It describes how, when, and why they may (or may not) be treated with preventive measures, as well as invasive treatments aimed at limiting amputation. By examining these treatment patterns, and outlining the ways in which physicians have attempted to study and improve the care of these complex patients, we hope to highlight opportunities to reduce amputations for patients at the highest risk for limb loss.

Before surgery

Regional variation in the risk of amputation

While the processes of care for patients with diabetes and PAD are complex, one outcome that matters is easily measurable: major leg amputation, or loss of the leg above or below the knee. In many regions of the United States, amputation rates are quite low, especially in parts of the country where diabetes is uncommon, and among patients who are unlikely to be poor or black (Figure 4).[10-12] However, in other regions—for example, rural areas of the southeastern United States—amputation rates, especially among black patients with diabetes, are high (Map 2). In these regions, the risks of major amputation are often three to four times the national average.

During the period from 2007 to 2011, the national average rate of leg amputation was 2.4 per 1,000 Medicare beneficiaries with diabetes and PAD. This rate varied more than fivefold across hospital referral regions, from 1.2 per 1,000 patients in Royal Oak, Michigan and Sarasota, Florida, to more than 6 per 1,000 patients in Tupelo, Mississippi (6.2) and Appleton, Wisconsin (6.1). Nationally, the amputation rate among black patients—5.6 per 1,000—was nearly three times higher than the rate among other beneficiaries (2.0). The amputation rate varied by a factor of more than seven among black patients, from about 2 per 1,000 in San Diego (2.1) and Las Vegas (2.2) to 14 or more per 1,000 in Lynchburg, Virginia (14.0), Meridian, Mississippi (14.2), and Tupelo (16.1). Among non-black patients (including white, Hispanic, Asian, and others), the amputation rate was less than 1 per 1,000 in Takoma Park, Maryland (0.9) and Royal Oak (0.9) and more than 4 per 1,000 in Lynchburg (4.1) and Tupelo (4.7).

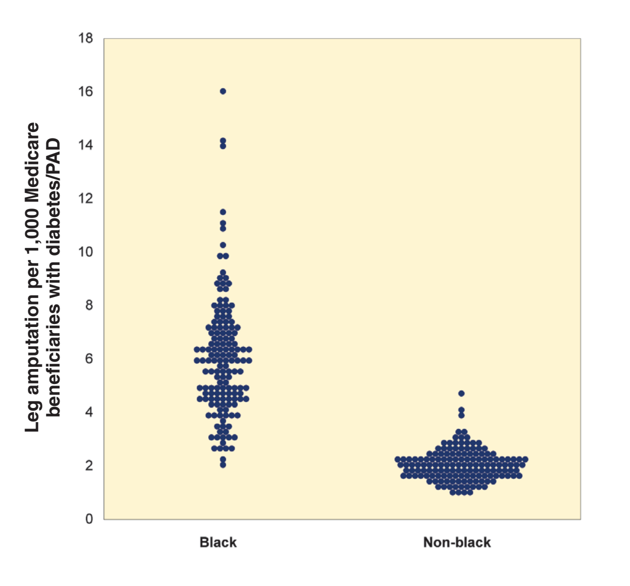
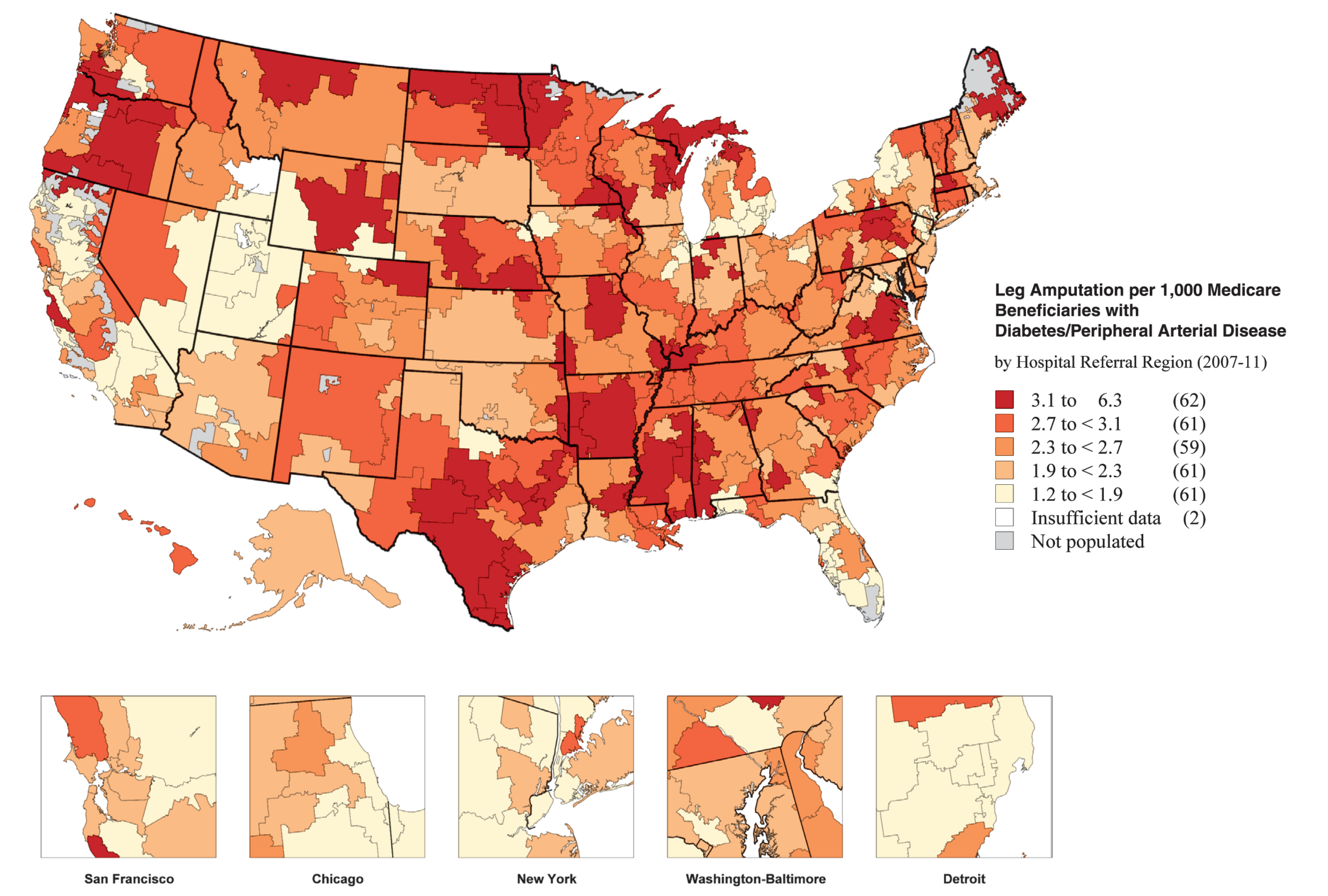


Figure 4. Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD by race among hospital referral regions (2007-11)

Each blue dot represents the rate of leg amputation among patients with diabetes and PAD in one of 306 hospital referral regions in the U.S. Rates are adjusted for age and sex.

While amputation rates among black patients were higher than others in each of the 306 hospital referral regions, the differences in some were small. For example, in San Antonio, Texas, amputation rates among black and non-black patients were nearly identical during 2007-11 (3.2 and 3.0 per 1,000, respectively). This was a result of the San Antonio region having relatively high amputation rates for non-black patients and below average rates for black patients. By contrast, in Monroe, Louisiana, amputation rates among black patients (7.9) were more than five times higher than among non-black patients (1.5). Tupelo had the highest amputation rates for both black and non-black patients, but the rate among black patients was more than three times higher (16.1 versus 4.7 per 1,000).

The results shown highlight one of the major persistent findings in the care of patients at risk for amputation. Across the United States, the risk of amputation averages between 2 and 3 per 1,000 patients with diabetes and peripheral arterial disease. However, this rate can be up to eight times higher in some places, especially among black patients. In fact, when comparing black and non-black patients, the lowest-risk black patients have higher risk of amputation than nearly all non-black patients. Further, the extent of variation—the distance from the bottom dots, indicative of the regions with the lowest amputation risk, to the top dots, indicative of the regions with the highest amputation risk—is much more dramatic among black patients when compared to other patients (Figure 4). These data leave little doubt where the focus on amputation prevention needs to be directed.



Map 2. Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD (2007-11)

Rates are adjusted for age, sex, and race.

Treatment options: Effectiveness, trade-offs, and knowledge gaps about preventive and invasive approaches

Several approaches are available to limit the risk of amputation for patients with severe diabetes and PAD. Wounds on the feet and poor circulation carry a sizeable potential risk of amputation for these patients and require interventions focused on improving blood flow to the legs to allow wounds the best possible chance to heal. At the same time, patients are in need of preventive treatments aimed at treating the complications of diabetes and PAD. First and foremost, preventive measures, such as those outlined in the Healthcare Effectiveness Data and Information Set (HEDIS), can help to prevent problems such as foot ulceration or cellulitis that may lead to amputation.[13-15] These preventive treatments are simple, inexpensive, and vital to the care of patients with diabetes, not just with respect to their legs, but in terms of their overall lives.[15,16] These measures focus on four key goals: tests to examine the quality of blood sugar control; foot care aimed at limiting the presence of ulcerations; testing and treatment of high cholesterol; and smoking cessation. All have been shown to limit the risk of limb loss. However, the use of these preventive measures by patients faced with limb amputation varies widely.

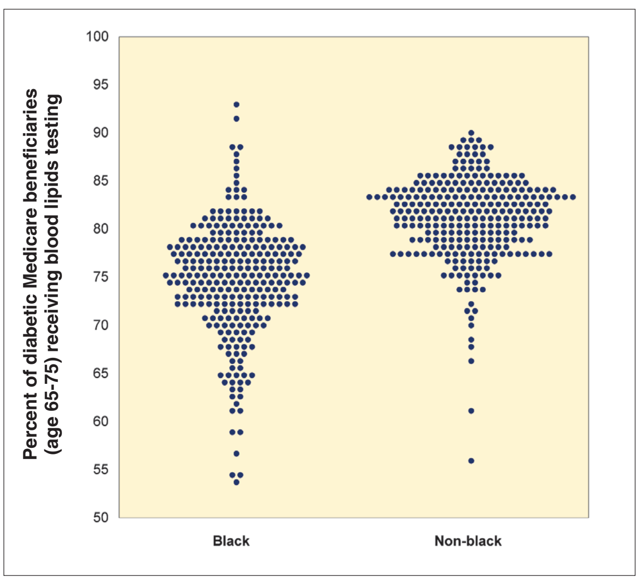
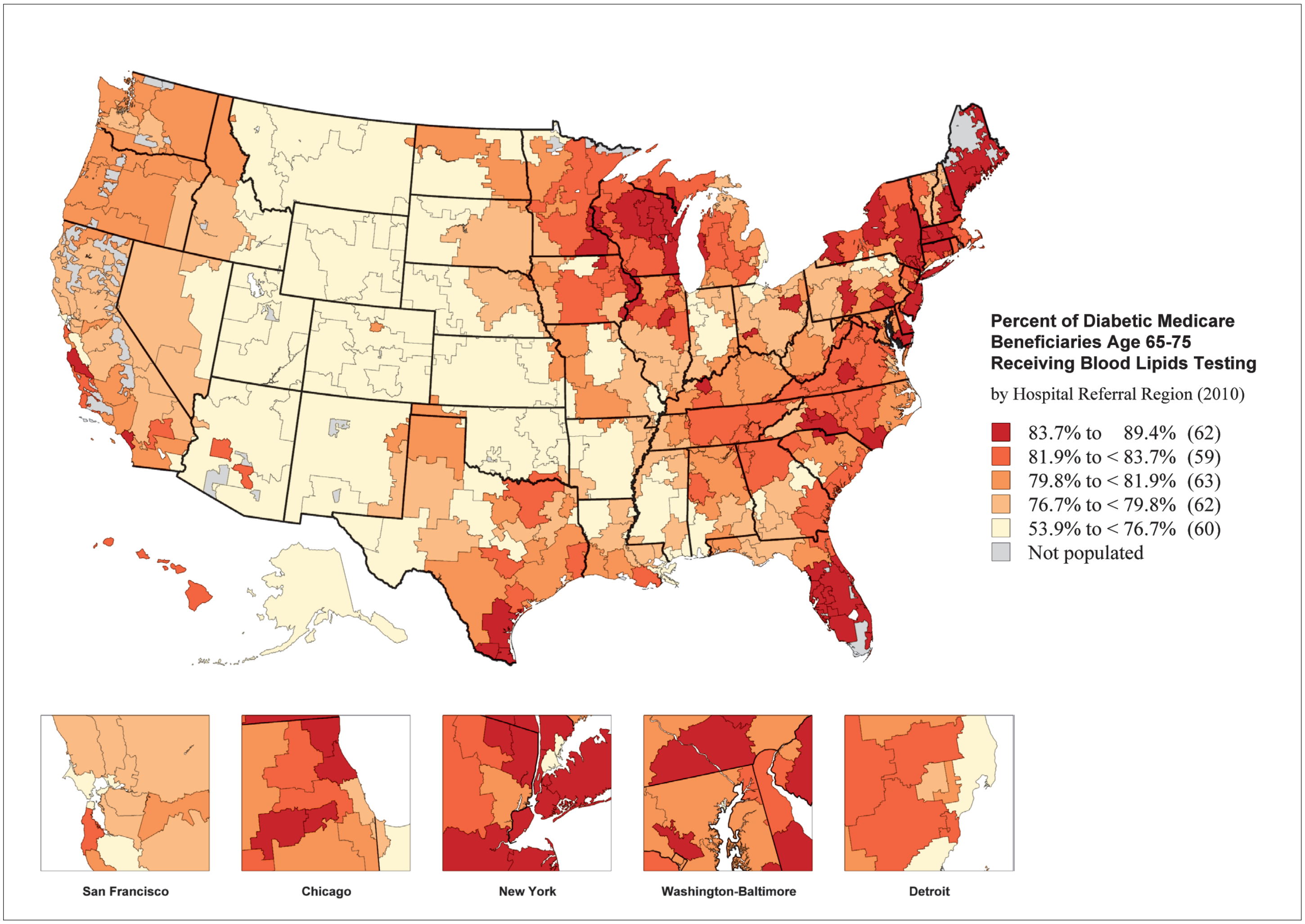


Figure 5. Percent of diabetic Medicare beneficiaries receiving cholesterol testing by race among hospital referral regions (2010)

Each blue dot represents the rate of blood lipids testing among patients age 65-75 with diabetes in one of 306 hospital referral regions in the U.S. Rates are unadjusted.

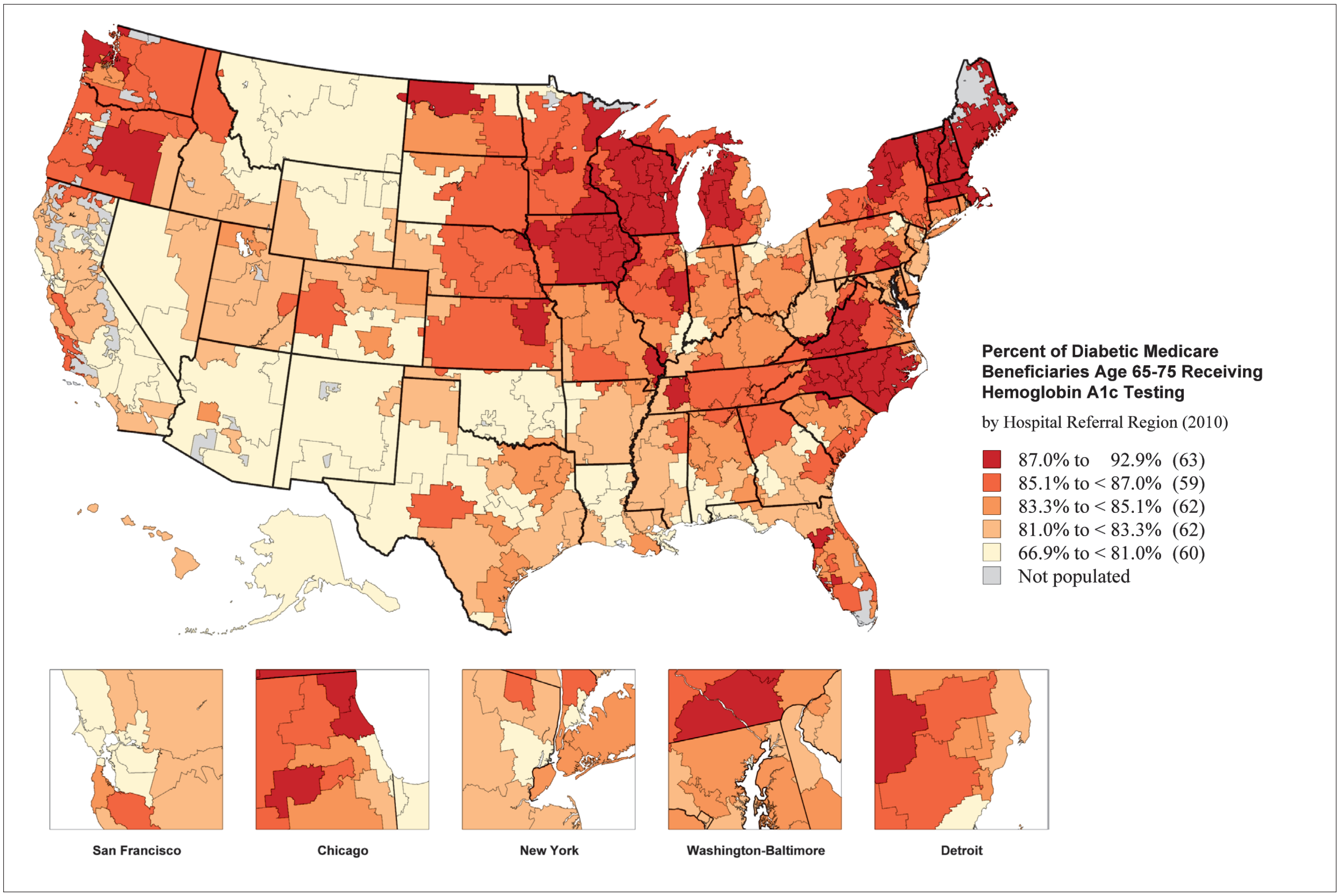
Given that preventive treatments are evidence-based, nearly universally available, and inexpensive, one might expect that their use would be high. However, as shown in Maps 3 and 4, there are marked differences in the use of these basic services in different regions of the United States. For example, while an average 80.7% of diabetic patients had at least one blood lipids test to check their cholesterol in 2010, testing levels were much lower in hospital referral regions in the central and mountain states—including Casper, Wyoming (53.9%) and Albuquerque, New Mexico (60.9%)—than in the Northeast and in Florida regions such as Ocala (89.4%) and Clearwater (88.7%) (Map 3). Rates of hemoglobin A1C testing, a measure of the quality of blood glucose control, averaged 83.8% during 2010. Testing rates were relatively low in southern and western regions, including Albuquerque (66.9%), Anchorage, Alaska (69.8%), and Lawton, Oklahoma (73.8%), compared to regions in the upper Midwest, including Dubuque, Iowa (92.8%), Rochester, Minnesota (92.7%), and Marshfield, Wisconsin (92.3%) (Map 4).



Map 3. Percent of diabetic Medicare beneficiaries receiving cholesterol testing (2010)

Rates are unadjusted.

Two major findings are evident in these maps and Figures 5 and 6. First, there are broad differences in the best and worst performing regions, in terms of the provision of preventive measures for patients with diabetes. Second, while there is variation by region, there are also differences by race; black patients are less likely to be treated with preventive measures, on average, across the country. While 81.5% of non-black diabetic patients received a blood lipids test in 2010, only 75.2% of black diabetic patients had this test. Similarly, 84.2% of non-black patients had hemoglobin A1c tests in 2010, while 80.9% of black patients had them.



Map 4. Percent of diabetic Medicare beneficiaries receiving hemoglobin A1c testing (2010)

Rates are unadjusted.

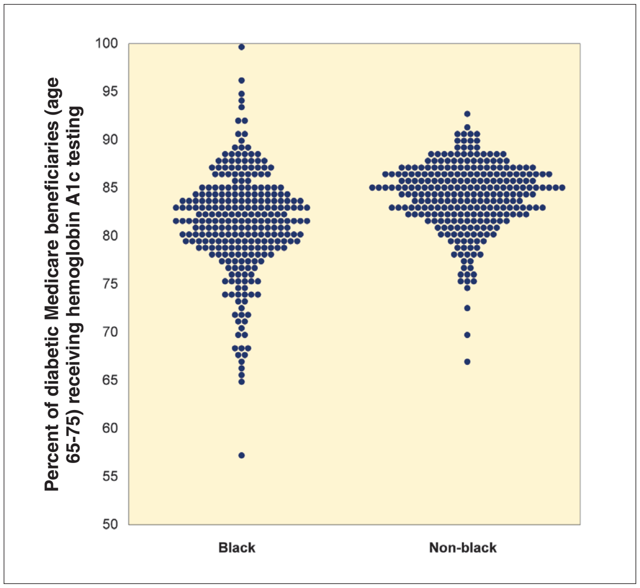


Figure 6. Percent of diabetic Medicare beneficiaries receiving hemoglobin A1c testing by race among hospital referral regions (2010)

Each blue dot represents the rate of hemoglobin A1c testing among patients age 65-75 with diabetes in one of 306 hospital referral regions in the U.S. Rates are unadjusted.

Preventive measures are not the only beneficial services available for patients with diabetes and PAD. After the preventive strategies have been optimized, patients with diabetes, PAD, and wounds or ulcerations generally improve most rapidly if blood flow to their feet is improved. The strategies that are available for increasing blood flow vary, but can be combined into two basic categories: endovascular treatments such as balloons or stents, or open surgical procedures such as bypass surgery (Figure 7).

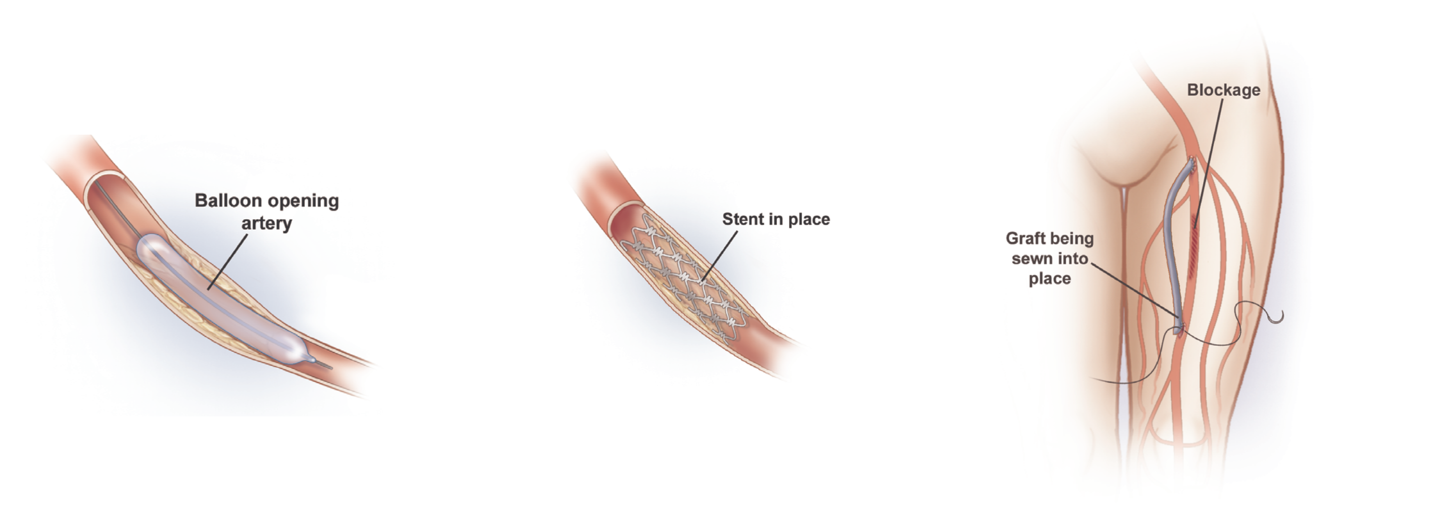


Figure 7. Types of revascularization

Source: The Society for Vascular Surgery, 2004-05.

Which of the treatment strategies is the most effective? Do the different treatments complement one another, or is there a synergy effect? These questions are still debated, and patients, providers, and payers remain uncertain as to which strategy—or combination of strategies—is the most effective at limiting the risk of amputation.[17,18] Each of these strategies brings trade-offs for patients, physicians, and society. While preventive measures are inexpensive and non-invasive, they may not arrest the most severe disease in an advanced state. Conversely, if invasive procedures are overused in low-risk patients, the risks may outweigh the potential benefits and result in increased costs that society must bear in the care of these chronically ill patients. Invasive vascular treatments are expensive. Balloons, stents, and catheter-based treatments, especially atherectomy devices, range in cost from a few hundred to several thousand dollars for each treatment, and some procedures can involve several treatments per artery. Similarly, surgical procedures, such as lower extremity bypass surgery, can involve a long hospital stay and complex recovery, resulting in costs that can extend above tens of thousands of dollars.

Decision quality and shared decision-making

Which of these treatment strategies is the best and how should physicians and caregivers advise patients and families who are faced with potential limb loss from diabetes and PAD? Significant gaps in knowledge exist in terms of which of these strategies will offer patients the best outcomes at the lowest risk.[11,19] The variation in the treatment of these conditions indicates that many physicians and patients choose vastly different treatment strategies, introducing potentially wasteful, and at times even potentially harmful, variation in treatment.

Patients with diabetes and peripheral arterial disease are faced with difficult decisions regarding their health care. "How should I care for my diabetes? Is my blood sugar well controlled? Do I need an invasive procedure to keep me from losing my leg?" When important questions such as these are faced by patients and their health care providers, decision aids can offer guidance and consistency, and often improve the quality of a patient's decision.

Treatment Options	Decision Support Tool Components			Patient Outcomes
	Patient Needs	Decision Support	Decision Quality	
Preventive care a. Blood sugar monitoring b. Diabetic foot care c. Smoking cessation d. Cholesterol monitoring Surgical and diagnostic interventions a. Diagnostic endovascular procedure b. Endovascular procedure c. Open bypass surgery	Clarification of individual values and preferences Knowledge of procedure risks, benefits, and other considerations	**Continuously updated, patient-specific data regarding risks and benefits** Guidance for the patient/surgeon interaction Other considerations	Assessment of patient knowledge and understanding Assessment of congruence with pre-specified values and preferences	Measurement of: Adherence to preventive care Patient satisfaction Quality of life

Figure 8. Conceptual model for decision support process

Many groups and societies have established web sites and resources aimed at helping patients make the best decisions about their care, especially care related to diabetes and peripheral arterial disease. For example, the American Diabetes Association has created patient information sites aimed at improving understanding about the care of foot wounds among patients with diabetes (www.americandiabetesassociation.org). Similarly, the Society for Vascular Surgery has web-based information available for patients who need treatments for vascular disease (www.vascularweb.org). But while educational tools improve patients' understanding of their disease and its treatments, work is still needed to help patients better understand what treatments will offer them the best results.

As outlined in this report, patients with diabetes and peripheral arterial disease are at risk for foot problems that may lead to amputation. While successfully navigating these health problems is difficult, resources are available at:

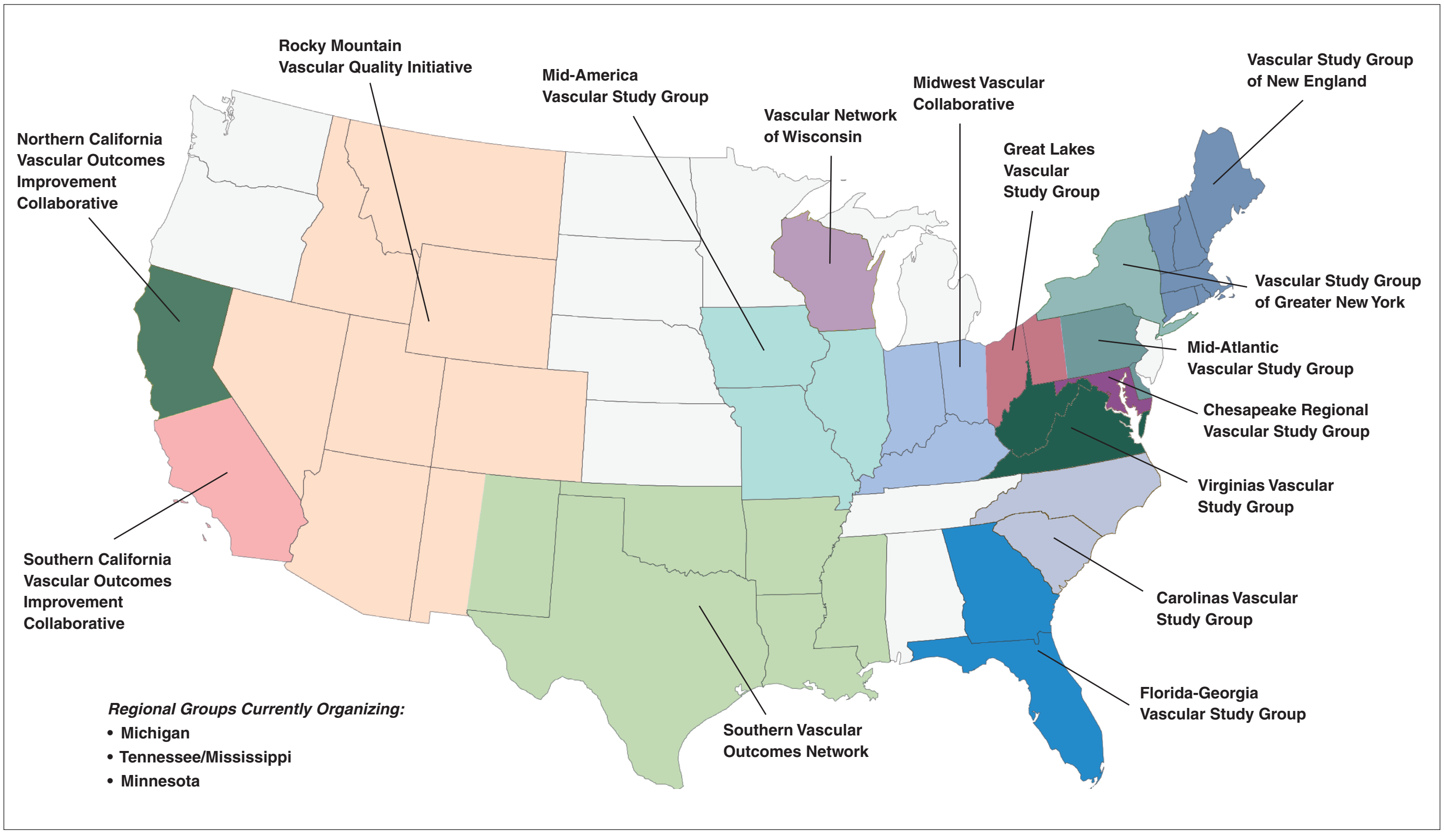
The Society for Vascular Surgery: www.vascularweb.org/vascularhealth/Pages/diabetic-vascular-disease.aspx

The American Diabetes Organization: www.diabetes.org/living-with-diabetes/complications/foot-complications/

The Diabetic Foot Blog, from the Southern Arizona Limb Salvage Alliance (SALSA): diabeticfootonline.blogspot.com/

The Society for Vascular Surgery's Vascular Quality Initiative (VQI)

Determining the outcomes of treatments is complex when the illnesses are as broad and complex as diabetes and PAD. Few resources exist to provide the most current information to patients. To address this gap, in 2002, vascular surgeons in New England began a regional vascular quality improvement initiative called the Vascular Study Group of New England, modeled after similar regional quality improvement initiatives started by the Northern New England Cardiovascular Study Group. This regional effort in New England has expanded to become the National Vascular Quality Initiative (www.vascularqualityinitiative.org), or VQI. The VQI records outcomes across the country for hundreds of thousands of patients with vascular disease. While many questions still remain, these efforts have made important contributions toward a better understanding of vascular care. Early efforts have seen the VQI achieve success in limiting length of stay after vascular operations and helping to standardize approaches to post-operative care after surgery.



Map 5. The Society for Vascular Surgery's fifteen regional quality groups participating in Vascular Quality Initiative (VQI)

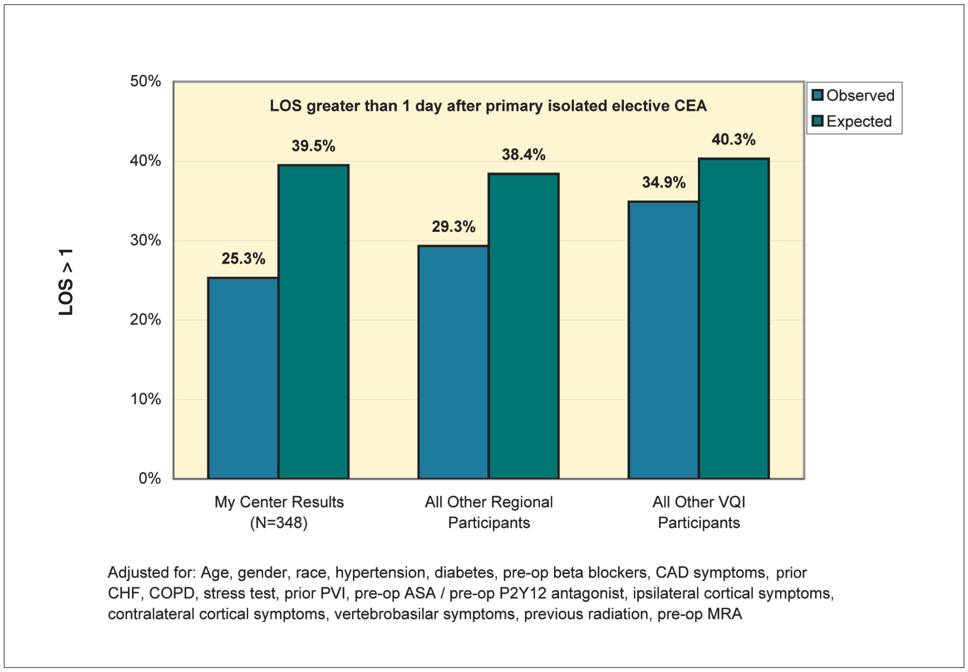


Figure 9. Example of a VQI benchmarking graph

The VQI benchmarking graph allows a center to compare its results to other participants across several criteria, including pre-operative risk factors, intra-procedural variables, post-procedural outcomes, and one-year follow-up data.

During surgery

Cross sectional rates of competing treatments

For patients with diabetes and PAD, preventive measures are underused, especially for black patients, and their use varies nationwide. Similarly, the use of revascularization treatments also varies dramatically for patients with diabetes and PAD. An examination of cohorts of patients at high risk for limb loss—patients with diabetes, PAD, and severe wounds on their feet requiring hospitalization—revealed that, in some regions of the United States, invasive vascular care was rarely provided, while in other regions, vascular interventions, including interventional procedures and surgical bypass operations, were common.[10,11] The use of these procedures also varied markedly by patient race. Further, while the rates of revascularization were higher among black patients in many regions, the extent of variation for both endovascular procedures and open bypass surgery was much more dramatic among black patients, indicative of a poorer understanding of what works best to limit amputation risk for these high-risk patients.

The average rate of therapeutic endovascular interventions for Medicare patients with diabetes and PAD in the United States during the period from 2007 to 2011 was 14.1 per 1,000 beneficiaries. The rate varied more than sixfold across hospital referral regions, from fewer than 6 procedures per 1,000 patients in Columbus, Georgia (4.8), Boulder, Colorado (5.4), and Honolulu (5.5) to more than 30 in Petoskey, Michigan (33.5) and Munster, Indiana (32.0) (Map 6). The national average rate among black patients (19.7) was nearly 50% higher than the rate among non-black patients (13.3). Rates among black patients also varied dramatically, from fewer than 5 procedures per 1,000 in Columbus, Georgia (4.8) to more than 40 in Lafayette, Louisiana (42.9), Amarillo, Texas (41.7), and Hattiesburg, Mississippi (41.7). Among non-black patients, the rate varied less—but still more than fivefold—from fewer than 6 per 1,000 in Columbus (5.6) and Rochester, New York (5.9) to more than 30 in Munster (33.0) (Figure 10).

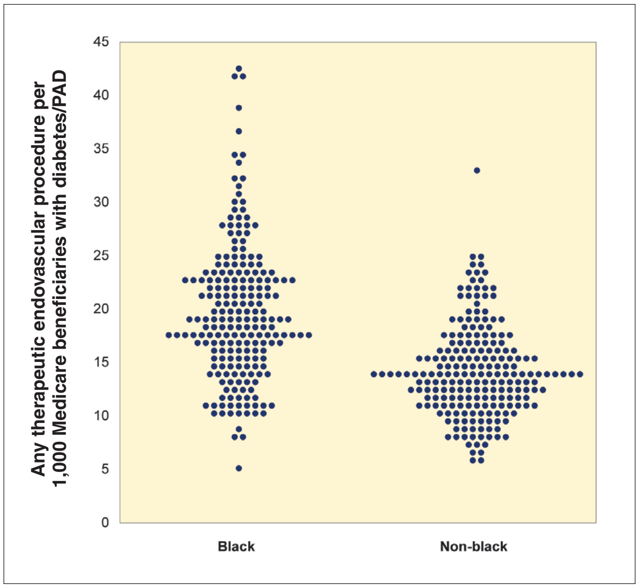
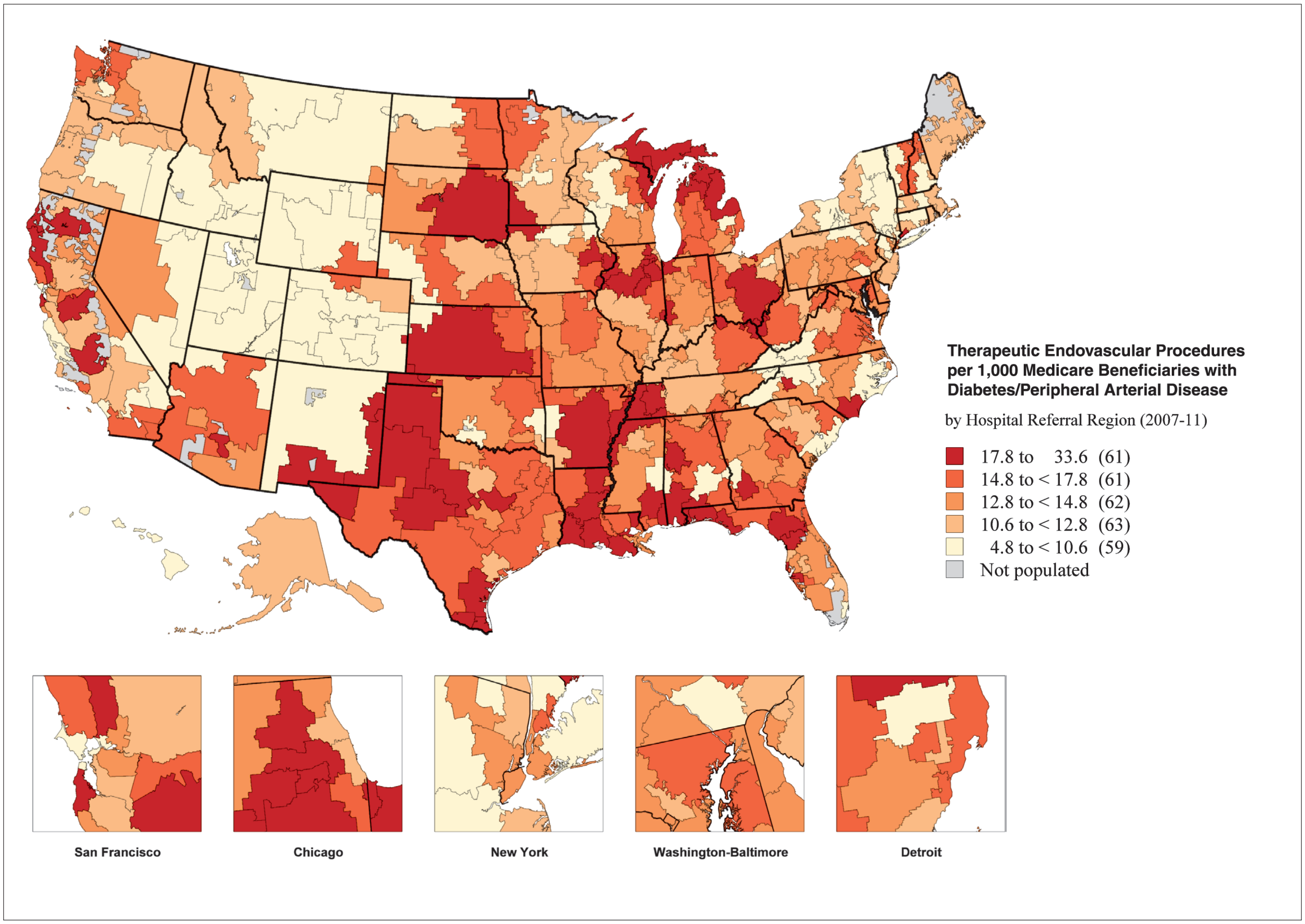


Figure 10. Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD by race among hospital referral regions (2007-11)

Each blue dot represents the rate of therapeutic endovascular procedures among patients with diabetes and PAD in one of 306 hospital referral regions in the U.S. Rates are adjusted for age and sex.



Map 6. Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD (2007-11)

Rates are adjusted for age, sex, and race.

During 2007-11, the average rate of open leg bypass surgery was 4.1 per 1,000 Medicare beneficiaries with diabetes and PAD. This rate varied from fewer than 2 to more than 9 procedures per 1,000 among hospital referral regions. Open leg procedures occurred relatively infrequently in the Ogden, Utah (1.4), Houma, Louisiana (1.5), and Provo, Utah (1.6) hospital referral regions. These procedures were much more common in the Medford, Oregon (9.4), Corpus Christi, Texas (8.6), and Wausau, Wisconsin (8.2) regions (Map 7). Rates of open leg bypass were about 30% higher among black patients than other patients (5.2 versus 4.0 procedures per 1,000). Among black patients, the rate varied from fewer than 3 procedures per 1,000 in several regions—including Winston-Salem, North Carolina (2.1), Tupelo, Mississippi (2.5), Jackson, Tennessee (2.6), and Lexington, Kentucky (2.7)—to more than 10 per 1,000 in Mobile, Alabama (13.5), Portland, Oregon (11.2), Corpus Christi (10.4), and Bridgeport, Connecticut (10.4). There was less variation among non-black patients, but the rate still varied more than fourfold, from 1.8 procedures per 1,000 in Meridian, Mississippi to 8.3 per 1,000 in Corpus Christi (Figure 11).

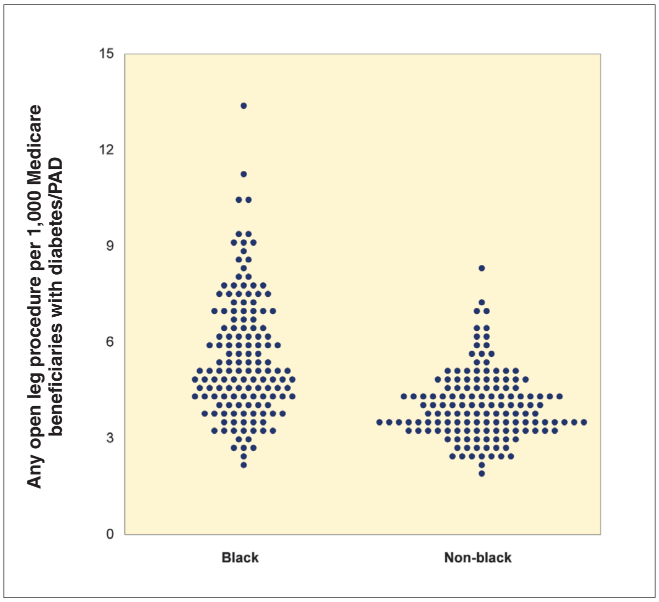
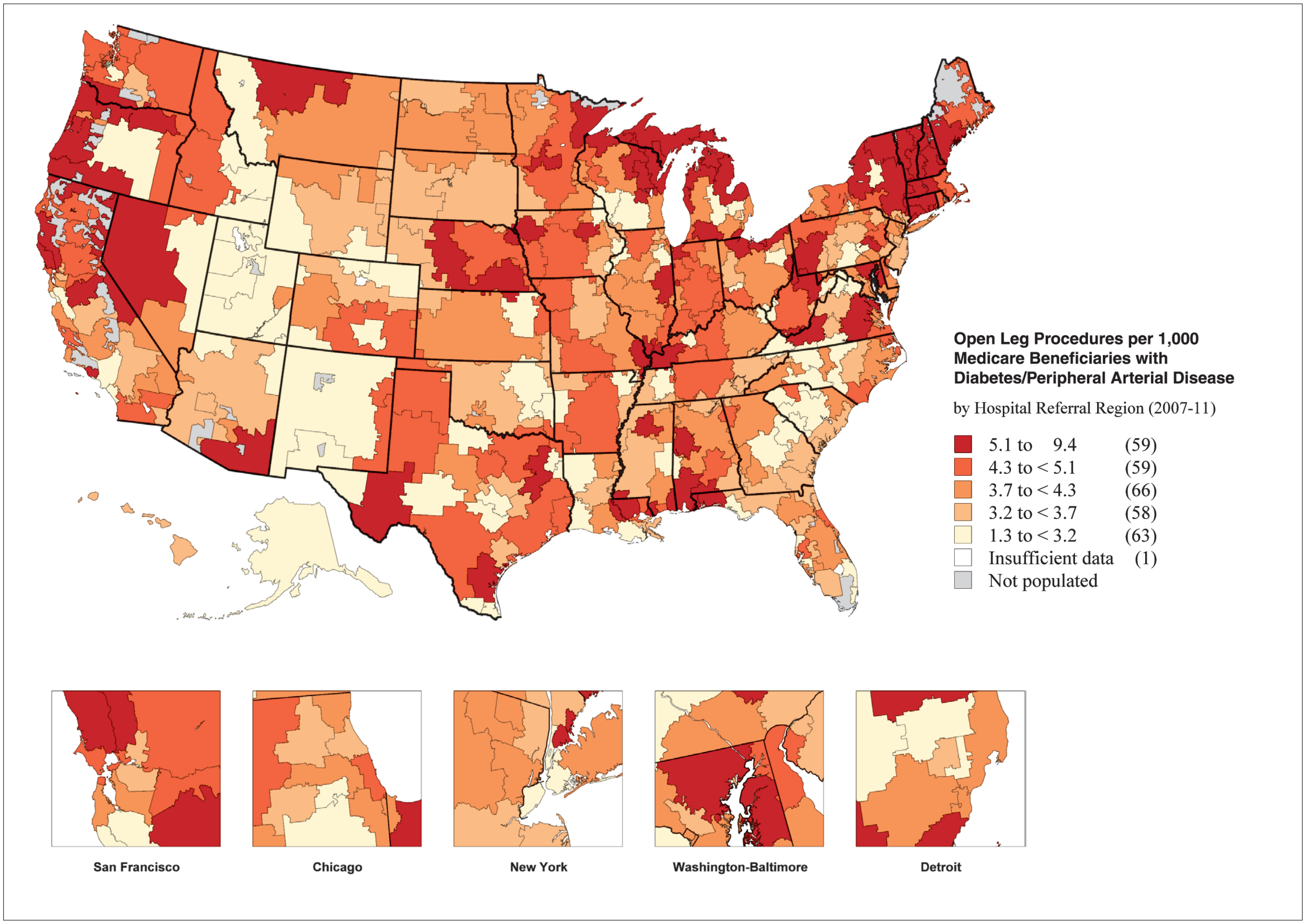


Figure 11. Open leg procedures per 1,000 Medicare beneficiaries with diabetes and PAD by race among hospital referral regions (2007-11)

Each blue dot represents the rate of open leg procedures among patients with diabetes and PAD in one of 306 hospital referral regions in the U.S. Rates are adjusted for age and sex.



Map 7. Open leg procedures per 1,000 Medicare beneficiaries with diabetes and PAD (2007-11)

Rates are adjusted for age, sex, and race.

Risk factors associated with poor outcomes after surgical revascularization

Within the Vascular Quality Initiative, vascular surgeons have worked to improve the information available to physicians and patients about outcomes, as well as the processes of care that occur during surgery. For example, for patients faced with lower extremity bypass surgery, the risks of amputation or death may seem hard to quantify. Recent research in the Vascular Quality Initiative has identified specific patient characteristics, such as lack of an available conduit to construct a new artery, that are important determinants of success. But the relationships are exceedingly complex, and many clinical factors interact with other factors such as race to determine outcomes. Research to identify the benefits and risks of revascularization is complicated but promising.

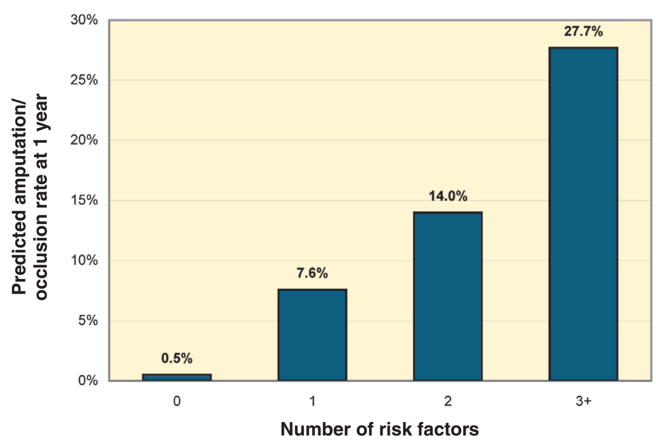


Figure 12. Risk factors associated with poor outcomes after surgical revascularization

After surgery

Readmission or re-intervention following treatment for peripheral arterial disease

Hospital readmission is a common complication among patients with complex illnesses, and patients undergoing vascular procedures have among the highest rates of hospital readmission within 30 days of discharge. The national rate of readmission following revascularization procedures was 17.9% during 2007-11. In some regions, such as Sioux City, Iowa, hospital readmission after revascularization was common, happening to nearly one out of three patients who underwent a revascularization procedure. In other regions, such as Redding, California, readmission was much less common; about one in ten patients who underwent a revascularization procedure were readmitted within 30 days.

Table 3. Thirty-day readmission rates after any revascularization procedure among patients with diabetes and PAD (2007-11)

HRR	State	Percent of patients with diabetes/PAD readmitted within 30 days following any procedure (2007-11)
10 highest HRRs		
Sioux City	IA	30.7%
Sioux Falls	SD	29.4%
Paducah	KY	28.8%
Roanoke	VA	27.6%
Neenah	WI	27.3%
Johnson City	TN	26.3%
Worcester	MA	25.9%
St. Cloud	MN	25.8%
Montgomery	AL	25.4%
Appleton	WI	24.9%
10 lowest HRRs		
Fort Collins	CO	12.6%
Owensboro	KY	12.3%
Winchester	VA	12.3%
Kettering	OH	12.1%
Tupelo	MS	12.1%
Ogden	UT	11.8%
St. Joseph	MI	11.5%
Ocala	FL	10.9%
Rapid City	SD	10.5%
Redding	CA	10.4%

Quality and results: outcomes that matter to patients

The most important outcomes after revascularization procedures to patients with peripheral arterial disease and diabetes are simple and clear. "Have I had to suffer amputation? Can I live independently? Can I walk?" These are the questions that are central to patients' health goals. Procedure rates and the amount of preventive care received by patients are important to measure, for physicians and policymakers alike. However, what matters most to patients is to keep their legs and to walk. The ability to walk—even if it is only for short distances, such as from the bed to the restroom or the bed to the kitchen table to eat—is vital for independent living. Therefore, a key outcome of surgery to improve blood supply to the limbs of diabetic patients is ambulatory status. A patient who retains the ability to walk when faced with foot wounds, diabetes, and peripheral arterial disease is a success story.[20,21]

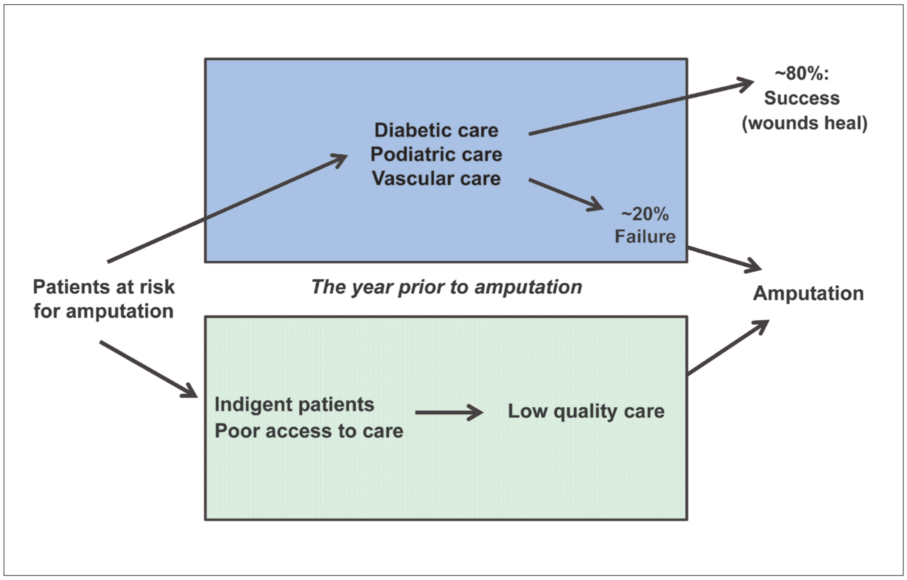


Figure 13. Conceptual model for amputation as a quality measure

Vascular care in the year prior to amputation can provide insight about the overall quality of vascular care.

The ability to walk, however, cannot be measured easily using Medicare billing data. For this reason, members of the Vascular Quality Initiative studied how common it was for patients faced with limb-threatening situations to be able to continue walking. The study found that, if they survived the challenges associated with their diabetes and PAD, most patients retained their ability to walk and live independently within the first year after lower extremity revascularization.[22] However, the analysis also found that patients who were unable to walk before surgery—such as those who were bedridden, often living in nursing homes—were almost always unable to walk after surgery. The importance of acting to provide revascularization while there is still a chance to keep the person walking was an important lesson for both surgeons and patients. In combination with preventive measures, the treatment of these patients with revascularization offers an excellent likelihood of a good outcome; the patient has the chance to retain the ability to walk and live independently, as long as he or she begins the process in reasonably good health.

Even if patients with diabetes and PAD are treated with revascularization, they remain at risk for amputation. Sometimes the increased blood flow after revascularization is not sustained. Despite revascularization, preventive care, and other treatments, factors like continued smoking and poor medical compliance might lead patients to lose their legs. Unfortunately, because these risks remain, the failure of "limb salvage"—the goal of preventing the patient from losing their limb—among patients with diabetes and PAD is common.[23]

Long-term effects of treatment on patients with diabetes and peripheral arterial disease

Patients face complex treatment choices that involve the likelihood that they will survive after revascularization with an intact limb, as well as whether or not they are likely to need repeated interventions if their revascularization treatment does not prove durable. Because many of these events may happen at a distant time in the future, it can often be difficult for patients to understand the chances of these events occurring. A better understanding of these risks will help patients and surgeons make the best treatment choices—both before surgery (e.g., whether to have a blood vessel operation at all) and after surgery (e.g., whether to undergo revisions, repairs, and surveillance of existing bypass operations).

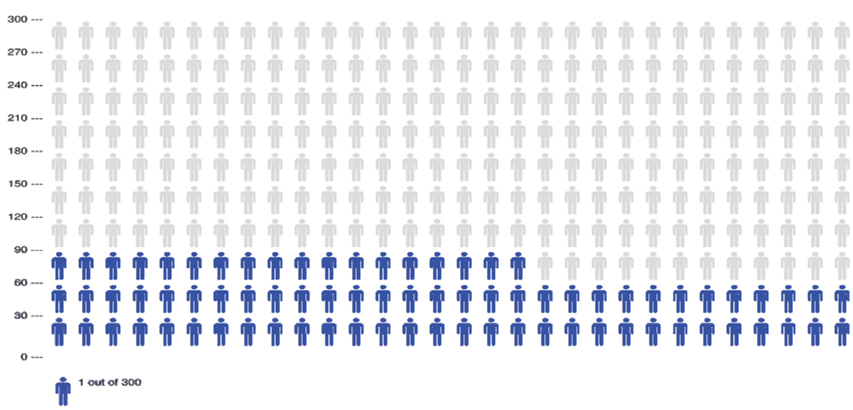


Figure 14A. Risk of amputation or death

78 out of 300 (26%).

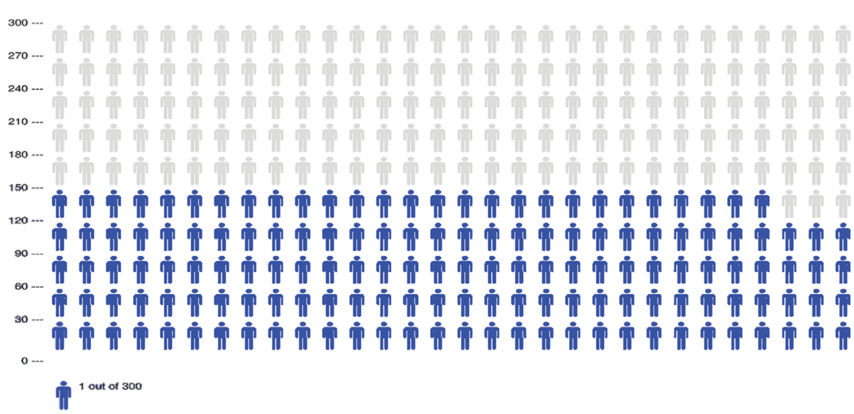


Figure 14B. Risk of re-intervention or death

147 out of 300 (49%).

Figure 14. Risks of complications two years following a vascular procedure

Figures 15A and 15B show the likelihood of amputation within the first two years after revascularization. These figures provide an illustration of the long-term effectiveness of revascularization procedures—both open surgical bypass, as well as endovascular interventions—in helping patients avoid amputation. Four out of five patients will still be alive and avoid amputation two years after their initial treatment for wounds that threaten them with limb loss. The results are worse for black patients when compared to non-black patients. Table 4 lists the hospital referral regions with the 10 highest and 10 lowest rates of amputation-free survival following revascularization for both black and non-black patients.

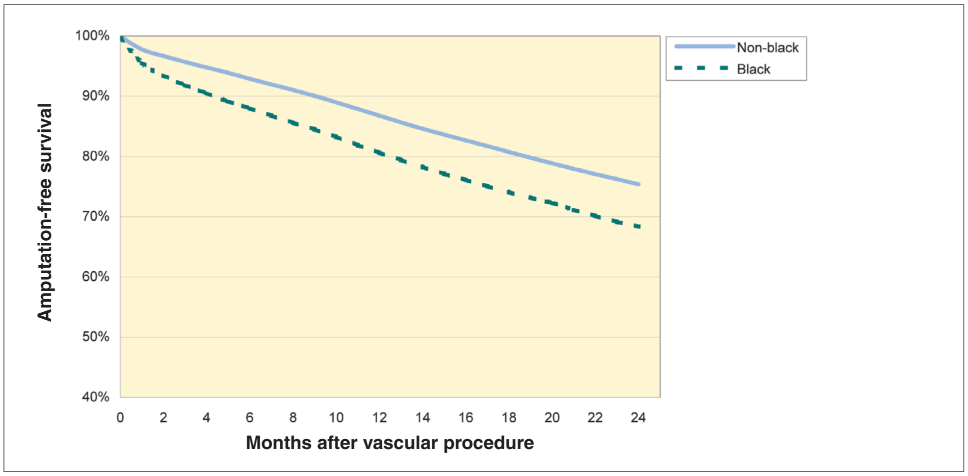


Figure 15A. Amputation-free survival after any vascular procedure among black and non-black patients with diabetes and PAD (2007-11)

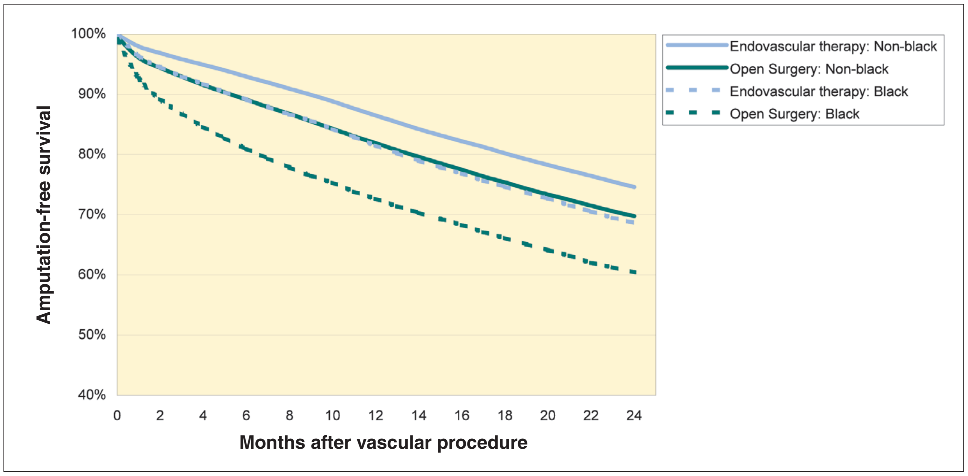


Figure 15B. Amputation-free survival after endovascular therapeutic or open surgery procedures among black and non-black patients with diabetes and PAD (2007-11)

Table 4. Amputation-free survival after any vascular procedure among black and non-black patients with diabetes and PAD (2007-11)

Black patients			Non-black patients		
10 highest HRRs			10 highest HRRs		
Gary	IN	76.2%	Yakima	WA	83.4%
Boston	MA	73.7%	Owensboro	KY	83.2%
Washington	DC	73.6%	Sarasota	FL	82.9%
Wilmington	NC	73.4%	Ocala	FL	82.8%
Detroit	MI	72.4%	St. Joseph	MI	82.6%
Beaumont	TX	71.9%	Davenport	IA	82.6%
Birmingham	AL	71.8%	Tupelo	MS	82.0%
Pensacola	FL	71.6%	Texarkana	AR	81.9%
Wilmington	DE	71.1%	Traverse City	MI	81.9%
Little Rock	AR	70.7%	Wichita Falls	TX	81.9%
10 lowest HRRs			10 lowest HRRs		
Philadelphia	PA	64.4%	Ridgewood	NJ	68.2%
Louisville	KY	63.6%	Lynchburg	VA	68.1%
Manhattan	NY	63.6%	Honolulu	HI	67.9%
St. Louis	MO	63.1%	Akron	OH	67.8%
Charleston	SC	62.2%	Roanoke	VA	67.7%
Arlington	VA	62.2%	Canton	OH	67.5%
Dallas	TX	61.0%	Olympia	WA	67.2%
Jackson	MS	60.6%	Bronx	NY	67.0%
Macon	GA	60.5%	Salinas	CA	66.7%
Savannah	GA	53.7%	Appleton	WI	64.9%

Once patients undergo revascularization, there is a risk that improved blood flow will not continue. Patients may need a second procedure to reestablish adequate blood flow to the legs, called a "re-intervention." Figures 16A and 16B demonstrate that this is a fairly common occurrence. The likelihood of this complication occurring is higher among black patients than others.

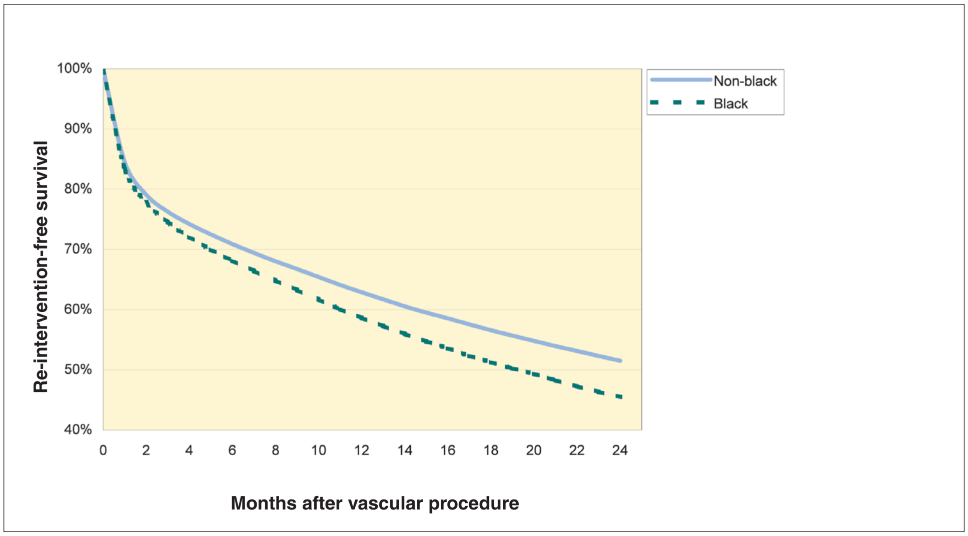


Figure 16A. Re-intervention-free survival after any vascular procedure among black and non-black patients with diabetes and PAD (2007-11)

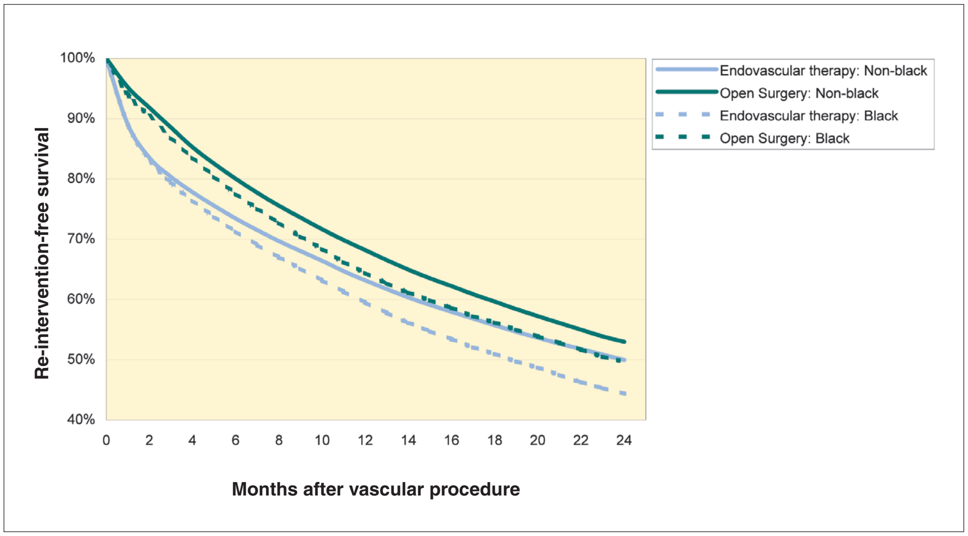


Figure 16B. Re-intervention-free survival after endovascular therapeutic or open surgery procedures among black and non-black patients with diabetes and PAD (2007-11)

Table 5. Re-intervention-free survival after any vascular procedure among black and non-black patients with diabetes and PAD (2007-11)

Black patients			Non-black patients		
10 highest HRRs			10 highest HRRs		
Florence	SC	55.0%	Owensboro	KY	68.5%
Orlando	FL	53.1%	Kingsport	TN	65.2%
Charlotte	NC	52.8%	Texarkana	AR	65.0%
Charleston	SC	52.5%	Santa Cruz	CA	65.0%
Columbia	SC	52.1%	Tupelo	MS	62.4%
Wilmington	NC	51.6%	Billings	MT	61.3%
Milwaukee	WI	51.2%	Abilene	TX	61.3%
Boston	MA	51.2%	Yakima	WA	61.2%
Birmingham	AL	51.0%	Wichita Falls	TX	60.5%
Greenville	NC	50.2%	Winston-Salem	NC	60.4%
10 lowest HRRs			10 lowest HRRs		
Cleveland	OH	40.3%	Corpus Christi	TX	43.6%
Lafayette	LA	40.0%	Sioux City	IA	43.0%
Takoma Park	MD	39.7%	Muskegon	MI	42.8%
Baton Rouge	LA	39.7%	Olympia	WA	42.1%
Dallas	TX	39.1%	El Paso	TX	41.0%
East Long Island	NY	38.3%	Bronx	NY	41.0%
Augusta	GA	38.1%	Appleton	WI	40.7%
Indianapolis	IN	36.0%	Terre Haute	IN	40.5%
Bronx	NY	36.0%	Munster	IN	40.1%
Manhattan	NY	34.8%	Medford	OR	37.9%

Beyond surgery

How variation in treatments for diabetes and PAD reflects opportunities for improvement

This report reveals significant variation in the approaches to the treatment of diabetes and PAD chosen by patients and physicians. These differences are striking, not only for preventive treatments, but also in the use of invasive treatments designed to limit the devastating effects of these diseases. Depending on a variety of influential factors—race, the part of the country in which they live, as well as the choices made by the physicians caring for them—patients may or may not receive important preventive care.

The findings of this report suggest that there are areas of "low-hanging fruit" that reflect opportunities for improvement, especially in poorer regions of the United States and among black patients, where increases in the use of preventive care and vascular treatments are likely to have an immediate impact. Further, while most of these procedures are effective when utilized for patients whom they are likely to help, more work is necessary to identify precisely which patients are most likely to benefit from invasive and non-invasive strategies. Finally, improving prevention, focusing on variation in procedure rates, and limiting the need for re-intervention are three areas where improving the care of patients with diabetes and vascular disease can make a real difference in the lives of these high-risk patients.

These efforts are needed most, and will have the greatest impact, in the regions of the United States where the amputation risk is the highest. There are many regions where amputation is common, such as the rural southeastern states. In these regions, especially among black patients, the risk of amputation is several times higher than in nearly all other regions of the country. This report suggests that, while a comprehensive approach is necessary, focusing on black patients in poor, rural regions of the United States is likely to be the best place to start. This approach will have the most impact—and likely the greatest challenge towards implementation—as high limb loss rates have been a part of life for many years in rural portions of the southern United States.

An integrated, multifaceted approach will be the most effective tool in improving care and limiting amputation risk for high-risk patients. Primary care physicians must engage patients with preventive measures and educate them about risk factor modification. Surgeons and interventionalists should aim to limit invasive treatment to patients who have received proper medical management in order to achieve the best possible outcomes. Finally, continued attention to the measurement and improvement of the quality of vascular care, especially to measuring patient-centered outcomes that demonstrate the long-term value of vascular care, will be a major focus for regional registries, physicians, and payers in the years to come.

Methods

In this report, we examined secular trends in the rates of amputation and other pertinent outcomes among patients with diabetes and peripheral arterial disease at the level of the hospital referral region (HRR). To accomplish this, we studied all patients with evidence of diagnostic codes for these conditions (for diabetes and peripheral arterial disease). All diagnostic codes indicative of diabetes and PAD and the procedure codes indicating vascular interventions are shown in Table A.

Table A. Codes used to identify patients with type II diabetes and PAD, and vascular surgery

Measure	Codes	Inclusion/exclusion criteria
Type II diabetes*	ICD-9 diagnosis codes 250, 357.2, 362.0, 366.41, 648.0 CPT visit codes: Outpatient: 92002-92014, 99201-99205, 99211-99215, 99217-99220, 99241-99245, 99341-99345, 99347-99350, 99384-99387, 99394-99397, 99401-99404, 99411, 99412, 99420, 99429, 99455, 99456 Non-acute inpatient: 99304-99310, 99315, 99316, 99318, 99324-99328, 99334-99337 Acute inpatient: 99221-99223, 99231-99233, 99238, 99239, 99251-99255, 99291 Emergency department: 99281-99285 Revenue center codes: Outpatient: 051x, 0520-0523,0526-0529, 057x-059x, 082x-085x, 088x, 0982, 0983 Non-acute inpatient: 0118, 0128, 0138, 0148, 0158, 019x, 0524, 0525, 055x, 066x Acute inpatient: 010x, 0110-0114, 0119, 0120-0124, 0129, 0130-0134, 0139, 0140-0144, 0149, 0150-0154, 0159, 016x, 020x,021x, 072x, 080x, 0987 Emergency department: 045x, 0981	Beneficiary must be enrolled in Medicare Parts A & B for at least 11 months during the year and at year end. Diabetic diagnosis must be noted in at least two outpatient or one inpatient physician encounter(s).
Peripheral arterial disease (PAD)	ICD-9 diagnosis codes 429.xx, 440-448xx, 451-454xx, 585, 709.8, 719.47, 727xx, 728xx, 730xx, 731xx, 733xx, 736xx, 821xx, 823xx & 824xx	
Vascular surgery		
Amputation	CPT codes 27590-27592, 27880-27882, 28805	
Endovascular procedure (therapeutic)	CPT codes 35452, 35454, 35472, 35473, 35481, 35482, 35491, 35492, 37205-37208	
Open bypass surgery	CPT codes 35351, 35355, 35361, 35363, 35521, 35537-35541, 35546, 35548, 35549, 35551, 35563, 35565, 35621, 35623, 35637, 35638, 35646, 35647, 35651, 35654, 35661, 35663, 35665	

*2011 Healthcare Effectiveness Data and Information Set (HEDIS) definition from the National Committee for Quality Assurance

After establishing our inclusion criteria, we examined the incidence of each event over time between 2001 and 2011. We assessed rates by each year individually. The numerator for calculating the crude rates consisted of the number of procedures in each year selected as described above; the denominator consisted of the number of beneficiaries eligible as of June 30 for each year (a mid-year denominator). These rates were adjusted for changes in age, sex, and race occurring over time using the population during the year 2001 as the standard population.

After defining the rates of vascular procedures over time, we assessed differences in outcomes. We used t-tests to compare rates between regions, and non-parametric tests of trend were used to test significance across years; p values <0.05 were considered significant. All analysis was performed using SAS (SAS Institute, Cary, NC), and STATA (College Station, TX). To learn more about Dartmouth Atlas methods, please visit www.dartmouthatlas.org.

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Birmingham	AL	141,039	26,044	114,995	2.7	5.9	2.3	16.2	22.7	15.3
Dothan	AL	30,100	5,886	24,214	3.1	8.6	2.2	15.9	24.4	14.6
Huntsville	AL	41,051	5,222	35,829	2.9	7.5	2.3	14.7	18.6	14.2
Mobile	AL	43,842	9,806	34,036	3.4	8.8	2.6	21.4	27.2	21.0
Montgomery	AL	25,361	8,657	16,704	2.6	7.0	1.7	8.6	13.3	7.5
Tuscaloosa	AL	16,920	5,267	11,653	3.9	9.8	2.9	22.1	23.7	24.1
Anchorage	AK	18,541	734	17,807	2.3			11.5		
Mesa	AZ	39,750	1,266	38,484	1.5			18.3	22.4	17.5
Phoenix	AZ	111,852	3,393	108,459	2.0	3.3	1.7	17.0	29.3	15.9
Sun City	AZ	24,450	575	23,875	1.9			14.3		
Tucson	AZ	40,429	1,258	39,171	2.7			13.1	14.5	12.5
Fort Smith	AR	21,493	505	20,988	4.9			9.9		
Jonesboro	AR	14,541	306	14,235	2.9			15.3		
Little Rock	AR	90,541	13,395	77,146	3.5	8.7	2.7	19.8	28.1	18.7
Springdale	AR	21,498	95	21,403	3.0			15.2		
Texarkana	AR	17,819	3,168	14,651	3.9	11.6	2.7	11.6	13.9	11.5
Orange County	CA	107,926	1,732	106,194	1.4			7.5	14.6	7.1
Bakersfield	CA	44,038	1,537	42,501	3.1			20.4	30.0	19.3
Chico	CA	21,337	304	21,033	1.6			13.9		
Contra Costa County	CA	25,035	1,937	23,098	1.9			14.2	19.4	13.5
Fresno	CA	51,920	2,829	49,091	2.5	6.3	2.0	12.1	15.2	11.6
Los Angeles	CA	381,344	37,056	344,288	1.7	4.5	1.3	10.8	21.0	9.6
Modesto	CA	39,114	1,489	37,625	2.0			20.2	20.3	19.5
Napa	CA	11,797	187	11,610	2.1			24.1		
Alameda County	CA	38,909	6,491	32,418	2.3	6.1	1.7	11.7	10.6	12.2
Palm Spa/Rancho Mirage	CA	16,976	400	16,576	2.5			10.6		
Redding	CA	20,728	163	20,565	1.3			20.9		
Sacramento	CA	81,816	4,875	76,941	1.8	4.7	1.5	11.0	16.1	10.4
Salinas	CA	22,073	1,206	20,867	3.8			10.2	15.5	9.6
San Bernardino	CA	68,378	6,989	61,389	1.9	3.0	1.7	11.1	12.1	10.9
San Diego	CA	113,518	5,648	107,870	2.0	2.1	1.8	16.3	23.1	15.4
San Francisco	CA	42,399	5,070	37,329	2.2	5.9	1.7	8.8	11.0	8.5
San Jose	CA	53,107	1,186	51,921	1.8			11.7	15.2	11.1
San Luis Obispo	CA	12,532	113	12,419	1.4			7.4		
San Mateo County	CA	19,700	895	18,805	2.1			18.9	22.1	18.1
Santa Barbara	CA	19,362	626	18,736	2.6			10.6		
Santa Cruz	CA	10,270	125	10,145	3.4			14.0		
Santa Rosa	CA	13,687	194	13,493	2.9			15.2		
Stockton	CA	20,751	1,862	18,889	1.5			17.0	22.5	16.3
Ventura	CA	35,102	880	34,222	1.9			16.5	18.7	15.7
Boulder	CO	5,764	56	5,708	2.7			5.4		
Colorado Springs	CO	28,373	1,541	26,832	2.5			8.2	11.6	7.7

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
4.3	6.3	3.9	80.2	74.9	81.5	83.8	81.5	84.4
3.4	3.6	3.4	79.7	76.6	80.5	84.4	84.4	84.5
3.3	3.6	3.3	79.9	72.8	81.2	85.1	80.2	86.0
7.7	13.5	6.3	76.1	71.0	77.7	80.3	79.5	80.6
4.7	6.3	4.3	78.0	73.8	80.3	82.8	81.6	83.5
5.8	6.8	5.9	82.9	80.9	83.9	84.3	84.8	84.0
2.8			66.0	58.7	66.3	69.8	64.6	70.0
3.9			82.4	79.7	82.5	83.1	83.5	83.1
3.5	4.6	3.4	73.9	78.8	73.8	76.3	78.7	76.2
3.3			82.9	82.2	83.0	84.4	86.1	84.4
5.1			75.5	61.4	76.1	78.7	68.7	79.1
3.2			67.5	61.2	67.6	75.4	82.8	75.2
3.1			76.7	64.3	77.0	83.9	79.8	84.0
4.5	6.9	4.1	75.6	68.7	76.8	82.5	81.4	82.7
3.4			75.7			80.8	81.3	80.8
4.9	5.9	4.7	78.1	72.9	79.2	81.9	81.6	81.9
2.5			84.9	76.1	85.0	82.8	78.7	82.9
4.0	7.5	3.8	80.2	76.9	80.3	79.0	73.9	79.2
5.0			78.3	71.4	78.4	77.9	78.6	77.9
3.5			77.8	66.3	79.0	79.6	67.6	80.9
3.5	4.6	3.4	78.9	76.1	79.0	81.3	76.6	81.6
2.9	5.4	2.7	80.3	72.1	81.2	79.0	71.8	79.8
5.2	7.7	5.0	79.5	74.9	79.6	82.6	83.8	82.5
5.5			77.8	86.8	77.6	81.9	86.8	81.8
3.9	8.1	3.2	77.8	66.8	80.3	78.0	70.0	79.7
4.0			82.4	68.2	82.8	79.6	71.6	79.8
4.6			78.1	76.5	78.1	82.7	88.2	82.7
4.4	6.7	4.2	79.6	73.0	80.0	81.0	76.3	81.3
4.2			83.8	72.9	84.3	82.3	74.9	82.7
3.3	3.6	3.3	78.3	74.6	78.7	76.9	73.8	77.2
4.5	6.8	4.3	81.0	72.7	81.5	82.3	75.5	82.7
4.4	7.6	3.9	75.7	64.2	77.5	79.9	74.1	80.8
3.0			75.6	64.6	75.9	85.3	85.0	85.3
4.7			82.1	88.5	82.0	85.4	84.6	85.4
4.3			82.1	75.7	82.4	83.7	82.9	83.8
3.8			83.4	80.6	83.5	86.7	84.3	86.7
2.4			80.7	84.4	80.6	82.9	87.5	82.8
5.3			77.4	65.0	77.6	80.0	75.0	80.1
4.6			81.9	78.4	82.2	82.0	79.7	82.2
5.2			79.8	71.1	80.1	82.4	77.4	82.6
			80.6	81.3	80.6	83.7	81.3	83.7
4.3			70.7	59.2	71.4	77.0	68.2	77.6

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Denver	CO	55,321	3,507	51,814	2.5	4.7	2.1	9.7	14.5	9.1
Fort Collins	CO	10,859	126	10,733	1.3			15.4		
Grand Junction	CO	7,540	12	7,528	2.9			8.4		
Greeley	CO	13,204	27	13,177	3.2			11.6		
Pueblo	CO	9,354	157	9,197	2.0			7.0		
Bridgeport	CT	33,657	4,616	29,041	2.3	6.8	1.6	18.5	31.5	16.6
Hartford	CT	90,626	6,631	83,995	2.7	6.1	2.3	8.6	11.3	8.2
New Haven	CT	92,616	6,846	85,770	2.8	6.9	2.3	11.8	18.5	11.0
Wilmington	DE	59,663	11,786	47,877	2.5	5.3	2.1	13.2	15.8	13.2
Washington	DC	150,419	53,229	97,190	2.2	4.6	2.1	14.0	21.2	12.4
Bradenton	FL	25,024	1,147	23,877	1.3			26.5	36.6	25.1
Clearwater	FL	34,540	1,000	33,540	2.3			18.6	23.2	17.7
Fort Lauderdale	FL	180,908	13,822	167,086	1.4	5.1	1.1	11.7	20.3	10.7
Fort Myers	FL	103,603	4,310	99,293	1.7	5.0	1.4	14.1	16.7	13.5
Gainesville	FL	40,436	6,263	34,173	2.3	7.4	1.5	18.7	22.3	18.5
Hudson	FL	40,030	935	39,095	1.8			12.8		
Jacksonville	FL	104,844	19,630	85,214	1.7	4.7	1.3	16.3	22.5	15.5
Lakeland	FL	24,661	2,152	22,509	1.3			12.6	14.1	12.3
Miami	FL	160,910	15,710	145,200	1.8	4.4	1.4	9.0	16.7	8.1
Ocala	FL	71,290	3,442	67,848	1.5	3.7	1.2	24.0	22.3	23.2
Orlando	FL	256,687	23,878	232,809	2.3	6.4	1.8	14.7	17.6	14.3
Ormond Beach	FL	33,451	2,930	30,521	1.7	3.6	1.5	14.6	17.7	14.1
Panama City	FL	16,549	1,846	14,703	2.7	6.0	2.3	20.0	19.1	20.0
Pensacola	FL	61,571	7,681	53,890	1.8	5.6	1.3	18.5	24.3	17.8
Sarasota	FL	45,670	1,674	43,996	1.2			16.3	25.2	15.4
St. Petersburg	FL	24,875	2,561	22,314	2.9	9.0	2.1	15.1	19.4	14.5
Tallahassee	FL	42,556	11,349	31,207	2.4	6.0	1.9	15.0	23.2	13.5
Tampa	FL	61,247	6,166	55,081	1.6	2.9	1.4	13.9	18.8	13.2
Albany	GA	12,395	4,446	7,949	3.3	7.2	3.0	19.1	34.2	14.1
Atlanta	GA	244,088	49,793	194,295	2.3	6.3	1.7	13.4	18.2	12.8
Augusta	GA	38,957	11,531	27,426	2.2	6.1	1.4	15.2	23.4	13.6
Columbus	GA	24,733	8,585	16,148	2.0	3.9	2.1	4.8	4.8	5.6
Macon	GA	50,418	14,386	36,032	2.6	6.6	2.0	13.8	22.5	11.8
Rome	GA	19,441	1,433	18,008	3.8	11.2	2.9	15.1	18.9	14.4
Savannah	GA	48,196	13,107	35,089	3.0	7.9	2.1	14.8	21.8	13.6
Honolulu	HI	53,722	354	53,368	2.8			5.5		
Boise	ID	24,945	88	24,857	2.5			8.6		
Idaho Falls	ID	9,314						8.1		
Aurora	IL	11,776	953	10,823	2.0			21.3	27.2	20.4
Blue Island	IL	62,029	15,946	46,083	1.5	2.6	1.5	15.4	17.9	15.8
Chicago	IL	128,243	57,095	71,148	1.7	3.4	2.0	11.9	14.1	13.4
Elgin	IL	36,097	677	35,420	2.4			18.9	32.4	17.8

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
3.3	4.6	3.2	76.5	68.1	77.1	81.8	75.4	82.3
3.2			75.4	63.0	75.5	82.3	81.5	82.4
4.3			71.2			85.4		
3.1			74.1			83.7		
2.6			74.2	75.7	74.1	83.4	86.5	83.3
7.0	10.4	6.5	81.8	73.8	83.7	81.4	78.2	82.2
5.9	7.7	5.6	84.0	77.7	84.7	86.9	84.8	87.1
5.2	5.9	5.1	82.3	71.7	83.5	84.6	80.7	85.0
5.1	5.7	5.1	82.1	76.9	83.7	82.4	80.4	83.0
4.1	6.3	3.2	81.8	77.5	84.4	82.9	79.6	84.7
2.2			84.4	72.6	85.2	83.8	73.8	84.4
3.6			88.7	80.9	89.1	87.1	79.8	87.3
3.1	4.8	2.9	87.2	80.6	88.2	85.2	81.9	85.7
3.4	3.4	3.4	87.8	80.3	88.3	86.4	81.5	86.6
3.8	4.7	3.6	80.6	74.6	81.7	83.0	82.7	83.1
3.1			88.3	87.4	88.3	85.3	81.4	85.4
3.5	3.8	3.5	83.5	79.5	84.4	82.7	80.9	83.2
3.6			87.0	80.9	87.6	85.1	80.4	85.6
2.8	3.2	2.7	88.2	80.0	89.5	84.3	79.8	85.0
3.6			89.4	83.9	89.6	87.7	86.6	87.7
4.0	4.3	4.0	86.5	82.1	87.0	84.6	82.6	84.8
4.6	6.2	4.4	88.2	84.7	88.6	85.1	84.0	85.3
3.2			77.0	74.1	77.4	77.0	76.9	77.0
6.1	9.3	5.7	80.7	76.0	81.3	79.8	78.8	80.0
4.2			86.7	77.1	87.1	87.4	83.3	87.6
5.0	8.9	4.5	84.0	80.7	84.6	83.2	83.4	83.1
3.5	5.0	3.2	79.6	75.1	81.2	82.5	80.2	83.4
4.5	4.2	4.5	84.6	76.1	85.7	83.5	80.6	83.9
4.0	5.1	3.8	78.0	72.7	81.3	77.1	73.8	79.2
3.9	4.8	3.8	82.7	78.3	83.9	85.7	84.6	86.1
2.9	4.3	2.5	76.4	72.0	78.4	80.6	78.7	81.4
4.2	4.0	4.8	76.4	72.7	78.6	80.6	78.9	81.6
3.0	3.5	3.1	76.8	72.3	78.6	81.4	80.8	81.6
4.3			82.3	78.0	82.7	86.0	84.6	86.2
3.3	3.1	3.5	82.8	78.4	84.4	85.3	83.6	85.9
3.7			83.2	64.4	83.3	83.3	65.5	83.4
4.6			77.3	78.3	77.3	83.1	78.3	83.1
2.5			72.5			79.3		
3.2			85.7	79.2	86.4	87.9	88.3	87.8
3.8	3.2	4.2	80.3	76.6	82.0	81.6	80.1	82.3
4.7	5.2	5.1	76.7	73.1	79.9	76.6	73.0	79.7
3.4			83.1	82.0	83.1	85.3	80.4	85.4

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Evanston	IL	61,876	1,766	60,110	1.6			11.1	10.3	10.7
Hinsdale	IL	23,466	1,105	22,361	1.8			22.7	20.3	22.1
Joliet	IL	42,804	3,457	39,347	1.7			19.5	18.4	19.3
Melrose Park	IL	73,355	6,001	67,354	2.1	3.9	1.8	22.1	19.5	22.0
Peoria	IL	41,802	1,874	39,928	2.6	7.5	2.1	25.7	34.4	24.4
Rockford	IL	44,561	2,055	42,506	2.0			14.5	17.2	13.9
Springfield	IL	60,369	2,384	57,985	2.9	8.3	2.3	11.9	16.9	11.3
Urbana	IL	24,289	1,531	22,758	2.0			16.2	11.1	16.2
Bloomington	IL	9,216	246	8,970	1.4			19.9		
Evansville	IN	47,338	1,328	46,010	2.9			11.9	17.3	11.2
Fort Wayne	IN	41,984	1,696	40,288	2.0			15.0	29.6	13.8
Gary	IN	41,785	9,411	32,374	1.8	4.0	1.5	22.2	30.2	21.2
Indianapolis	IN	166,889	14,337	152,552	2.0	5.0	1.6	13.1	18.3	12.5
Lafayette	IN	11,938	114	11,824	3.5			13.1		
Muncie	IN	13,495	584	12,911	3.7			14.1		
Munster	IN	27,666	3,843	23,823	1.5	3.5	1.3	32.0	28.3	33.0
South Bend	IN	40,195	2,262	37,933	3.2	6.0	2.7	14.0	22.6	13.1
Terre Haute	IN	15,076	474	14,602	1.9			23.4		
Cedar Rapids	IA	15,996	235	15,761	2.4			21.2		
Davenport	IA	33,706	1,367	32,339	2.6			25.9	25.3	25.0
Des Moines	IA	60,623	1,098	59,525	2.4			12.7	10.8	12.2
Dubuque	IA	6,315			3.6			13.7		
Iowa City	IA	17,304	152	17,152	3.0			17.7		
Mason City	IA	11,158	18	11,140	2.3			9.6		
Sioux City	IA	14,812	81	14,731	1.4			12.0		
Waterloo	IA	14,568	678	13,890	2.1			14.6	19.1	13.9
Topeka	KS	26,160	1,464	24,696	2.9			16.8	27.1	15.7
Wichita	KS	76,209	2,905	73,304	2.1			24.1	28.9	23.0
Covington	KY	18,732	321	18,411	2.8			18.7		
Lexington	KY	95,377	4,192	91,185	2.5	4.3	2.1	15.9	15.9	15.4
Louisville	KY	107,798	9,824	97,974	3.0	7.3	2.4	12.8	18.6	12.0
Owensboro	KY	13,872	452	13,420	2.4			13.8		
Paducah	KY	32,872	1,650	31,222	3.6			11.0	12.7	10.6
Alexandria	LA	21,256	5,072	16,184	3.7	9.2	2.9	20.0	28.1	18.9
Baton Rouge	LA	39,637	14,603	25,034	3.0	7.3	2.3	17.6	23.2	17.5
Houma	LA	17,660	2,803	14,857	3.0	6.2	2.7	23.1	26.5	23.0
Lafayette	LA	44,911	13,328	31,583	2.6	6.7	1.8	26.2	42.9	22.3
Lake Charles	LA	17,044	3,541	13,503	2.1	4.6	1.8	18.5	24.7	17.8
Metairie	LA	21,664	3,727	17,937	2.9	8.0	2.2	23.7	39.1	21.2
Monroe	LA	19,678	5,679	13,999	2.7	7.9	1.5	19.4	26.3	18.8
New Orleans	LA	21,539	10,499	11,040	3.0	6.8	2.6	14.6	21.5	12.9
Shreveport	LA	46,189	15,204	30,985	2.6	7.0	1.7	16.1	22.8	15.1

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
3.6	8.6	3.3	84.5	75.9	84.8	87.1	82.9	87.3
2.3			84.8	78.4	85.3	85.9	83.4	86.0
3.0			81.4	76.7	81.8	84.0	80.6	84.3
3.7	4.1	3.7	82.6	76.0	83.4	84.1	77.8	84.9
3.8			83.4	77.2	83.7	86.6	84.3	86.7
4.7			81.6	75.3	82.0	86.4	83.1	86.6
3.9			79.8	73.5	80.1	86.5	84.6	86.6
5.2	7.1	5.0	82.2	74.6	82.8	87.0	82.6	87.3
3.5			86.5	83.9	86.6	88.9	90.3	88.9
4.7			79.3	62.3	79.8	80.7	78.5	80.7
4.1			78.8	70.0	79.2	85.1	81.6	85.2
5.3	7.0	5.1	74.1	70.6	75.1	80.0	75.3	81.4
5.0	7.0	4.8	76.0	63.4	77.2	84.0	82.7	84.1
4.8			55.7	54.3	55.8	86.2	82.9	86.2
4.4			80.1	74.5	80.4	86.9	83.2	87.1
4.2	7.1	3.8	78.6	73.5	79.7	80.4	75.9	81.3
4.4			79.7	74.8	80.0	85.1	81.6	85.3
4.0			78.4	66.7	78.8	83.4	80.2	83.5
4.2			83.5	62.7	83.8	90.7	78.4	90.9
2.4			84.3	75.6	84.7	88.4	87.1	88.4
4.5			82.4	75.5	82.5	89.6	85.2	89.7
3.7			84.9			92.8		
3.3			77.2	65.0	77.3	88.3	95.0	88.3
4.6			73.3			87.1		
7.2			80.0	86.4	80.0	87.4	90.9	87.4
5.9			82.8	78.0	83.1	91.4	93.1	91.2
2.0			76.6	73.4	76.8	88.0	85.2	88.2
4.0	3.7	4.0	73.2	69.1	73.4	86.4	85.1	86.5
4.1			81.8	72.0	82.0	82.1	84.9	82.1
3.8	2.7	3.8	79.8	74.6	80.1	83.9	87.1	83.8
4.5	6.0	4.4	81.2	76.7	81.6	84.2	83.2	84.3
2.8			86.9	81.4	87.0	84.7	83.7	84.8
5.4	9.0	5.1	80.0	72.2	80.3	83.3	82.4	83.3
3.3	4.3	3.1	76.9	74.3	77.7	79.9	79.8	79.9
5.9	7.8	5.4	79.2	76.7	80.7	81.8	81.4	82.1
1.5			83.1	78.4	84.1	84.6	80.7	85.4
4.1	5.0	4.0	80.2	77.3	81.4	78.8	78.3	79.1
2.9	5.3	2.3	81.5	76.7	82.8	83.2	81.4	83.7
4.3	6.0	4.1	79.3	74.7	80.6	81.0	81.8	80.8
4.0	3.3	4.6	78.8	77.8	79.2	80.5	82.0	79.9
3.5	4.7	3.1	75.5	73.3	78.2	78.9	77.9	80.0
2.4	2.7	2.4	75.7	72.0	77.6	80.6	79.3	81.3

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Slidell	LA	9,610	1,127	8,483	3.6	9.8	2.8	17.4	23.8	16.6
Bangor	ME	26,822	71	26,751	4.0			10.7		
Portland	ME	63,045	223	62,822	2.2			11.2		
Baltimore	MD	173,846	47,304	126,542	2.2	4.8	2.0	15.3	21.3	14.6
Salisbury	MD	46,480	7,740	38,740	2.4	6.4	1.8	13.6	16.6	13.4
Takoma Park	MD	45,513	15,344	30,169	1.6	4.6	0.9	12.6	20.4	10.4
Boston	MA	258,931	14,465	244,466	2.1	4.0	1.8	12.0	14.8	11.5
Springfield	MA	44,936	2,830	42,106	3.5	6.6	3.0	11.0	10.9	10.8
Worcester	MA	27,782	634	27,148	2.8			8.5		
Ann Arbor	MI	74,955	8,264	66,691	1.7	2.6	1.5	14.3	17.4	13.9
Dearborn	MI	44,312	2,390	41,922	1.8			16.8	23.3	15.9
Detroit	MI	146,699	59,883	86,816	1.6	3.1	1.7	16.9	24.6	15.4
Flint	MI	43,292	8,201	35,091	1.8	3.1	1.7	9.1	10.8	9.1
Grand Rapids	MI	45,608	2,398	43,210	2.6	5.3	2.2	16.5	13.6	16.1
Kalamazoo	MI	38,601	2,789	35,812	1.7			15.1	24.1	14.0
Lansing	MI	37,354	1,753	35,601	1.8			16.6	16.5	16.1
Marquette	MI	12,678	25	12,653	3.7			20.4		
Muskegon	MI	14,943	1,192	13,751	2.5			13.2	14.3	12.9
Petoskey	MI	13,168	11	13,157	3.7			33.5		
Pontiac	MI	26,013	3,413	22,600	1.5			15.5	22.9	14.5
Royal Oak	MI	51,078	8,012	43,066	1.2	3.1	0.9	11.0	16.1	10.3
Saginaw	MI	57,165	3,495	53,670	3.0	3.9	2.7	18.5	14.9	18.2
St. Joseph	MI	10,764	1,989	8,775	1.9			18.5	20.3	18.8
Traverse City	MI	17,577	29	17,548	1.9			27.1		
Duluth	MN	16,233	62	16,171	2.9			10.7		
Minneapolis	MN	82,566	1,672	80,894	2.8			11.6	19.9	10.9
Rochester	MN	18,200	48	18,152	3.3			12.2		
St. Cloud	MN	6,658	18	6,640	3.1			9.3		
St. Paul	MN	24,862	748	24,114	2.8			10.8		
Gulfport	MS	11,563	2,166	9,397	4.2	10.3	3.3	15.6	16.8	15.9
Hattiesburg	MS	20,098	4,557	15,541	3.0	7.8	2.3	26.1	41.7	23.2
Jackson	MS	62,582	25,474	37,108	3.5	8.9	2.5	13.2	17.7	12.9
Meridian	MS	14,988	5,168	9,820	5.5	14.2	3.8	9.7	13.5	9.2
Oxford	MS	9,739	2,915	6,824	2.1			12.8	16.6	12.6
Tupelo	MS	24,996	5,259	19,737	6.2	16.1	4.7	13.5	11.0	14.9
Cape Girardeau	MO	21,198	1,444	19,754	3.6	9.0	2.9	14.3	17.8	13.7
Columbia	MO	47,372	1,633	45,739	3.1			17.5	18.4	16.8
Joplin	MO	27,389	222	27,167	3.3			17.7		
Kansas City	MO	115,769	10,989	104,780	2.3	6.3	1.8	14.4	19.6	13.7
Springfield	MO	45,084	253	44,831	2.7			13.8		
St. Louis	MO	203,732	26,272	177,460	2.6	6.7	2.1	14.5	17.3	14.1
Billings	MT	24,146	49	24,097	2.6			9.9		

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
5.2			76.6	71.9	77.2	82.1	79.7	82.5
4.9			83.7	83.3	83.7	87.7	83.3	87.7
6.2			84.0	78.8	84.0	88.1	92.3	88.1
6.0	6.9	6.0	81.1	76.2	83.3	83.7	81.1	84.8
4.2	4.7	4.2	83.9	77.5	85.1	84.8	83.3	85.1
3.4	5.9	2.4	83.7	80.2	86.0	84.1	81.5	85.7
4.8	4.4	4.8	83.4	77.5	83.8	89.1	88.0	89.2
5.2	7.6	4.9	85.1	82.1	85.4	88.1	87.4	88.2
6.2			84.5	75.2	84.8	87.3	83.4	87.4
4.3	4.9	4.2	81.9	75.1	82.8	86.5	82.5	87.1
4.0			82.6	72.4	83.3	83.6	76.6	84.0
3.8	5.0	3.4	75.0	64.0	82.3	83.2	78.0	86.6
2.9	2.9	3.0	83.0	80.1	83.6	85.7	84.6	85.9
3.8			82.8	72.9	83.4	88.1	83.5	88.4
7.3	9.1	7.0	81.8	72.4	82.5	86.3	80.7	86.7
2.5			83.6	78.8	83.9	88.3	86.4	88.4
7.8			82.4			87.0		
6.5			85.4	81.4	85.8	90.3	87.6	90.6
7.7			79.8			87.9		
3.6	4.6	3.5	76.7	70.3	77.7	84.7	82.2	85.1
2.9	3.6	2.8	81.9	74.3	83.6	83.9	82.8	84.1
5.4			81.7	74.8	82.1	85.1	75.7	85.7
4.3			80.8	76.0	81.9	86.1	83.4	86.7
6.9			83.3			88.9		
5.8			82.0	80.0	82.0	87.8		
4.6			82.7	72.1	83.0	86.9	84.0	87.0
3.7			86.7	88.2	86.6	92.7	94.1	92.7
6.7			81.8			88.6		
4.2			85.5	72.4	86.0	90.1	89.0	90.1
5.0			69.9	64.8	71.1	75.6	77.3	75.2
3.8	4.9	3.6	76.9	75.1	77.5	82.4	81.3	82.7
3.5	4.9	3.0	72.1	67.1	75.7	81.7	79.2	83.6
2.3	3.8	1.8	70.0	69.6	70.3	79.4	84.0	76.6
5.4	7.6	4.8	74.6	74.1	74.8	83.1	86.1	81.8
3.8	2.5	4.3	79.2	77.7	79.7	86.8	87.9	86.4
5.3			74.9	70.6	75.2	87.0	84.8	87.2
3.4			76.3	67.7	76.7	84.6	83.6	84.6
3.6			75.3	73.9	75.3	81.3	87.0	81.2
4.9	7.3	4.6	80.1	74.8	80.7	85.1	80.6	85.6
5.1			81.2	78.2	81.2	86.1	87.3	86.1
3.8	4.9	3.6	79.2	71.9	80.3	84.4	82.6	84.7
4.1			68.3			79.4		

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Great Falls	MT	7,459	40	7,419	3.3			10.3		
Missoula	MT	15,559	25	15,534	2.5			11.2		
Lincoln	NE	31,064	259	30,805	4.1			17.3		
Omaha	NE	63,427	2,520	60,907	2.8	4.8	2.4	12.7	16.7	12.1
Las Vegas	NV	77,317	8,512	68,805	1.3	2.2	1.2	9.9	13.7	9.4
Reno	NV	26,089	380	25,709	2.8			14.4		
Lebanon	NH	22,188	64	22,124	2.9			17.2		
Manchester	NH	46,624	303	46,321	2.1			10.0		
Camden	NJ	257,693	27,657	230,036	2.1	4.0	1.9	12.1	18.4	11.3
Hackensack	NJ	97,862	6,616	91,246	1.9	2.7	1.7	11.2	11.8	10.9
Morristown	NJ	63,664	5,435	58,229	1.6	4.2	1.3	9.8	10.0	9.6
New Brunswick	NJ	73,185	6,164	67,021	1.9	3.8	1.6	10.3	12.7	9.9
Newark	NJ	102,065	31,276	70,789	2.1	4.5	1.8	12.9	19.8	11.4
Paterson	NJ	28,000	3,515	24,485	1.5	4.4	1.1	13.7	28.9	11.5
Ridgewood	NJ	28,907	1,703	27,204	2.1			10.2	8.7	10.0
Albuquerque	NM	62,692	1,005	61,687	2.9			9.1	14.6	8.6
Albany	NY	112,185	5,131	107,054	2.1	4.9	1.8	8.6	10.7	8.2
Binghamton	NY	24,840	385	24,455	2.5			12.7		
Bronx	NY	52,117	17,243	34,874	2.7	4.9	3.0	15.6	22.3	14.6
Buffalo	NY	54,131	6,441	47,690	1.9	2.6	1.8	12.3	17.1	11.7
Elmira	NY	25,753	783	24,970	1.7			9.7		
East Long Island	NY	302,921	33,330	269,591	2.0	4.5	1.6	10.4	16.9	9.6
Manhattan	NY	266,610	48,551	218,059	1.9	5.4	1.3	14.1	22.9	12.6
Rochester	NY	39,043	3,642	35,401	2.6	8.2	1.9	6.1	7.9	5.9
Syracuse	NY	66,813	2,471	64,342	1.8			12.7	17.3	12.0
White Plains	NY	70,622	9,963	60,659	1.9	5.0	1.4	9.7	15.7	8.8
Asheville	NC	42,561	1,632	40,929	2.8			7.3	10.5	6.9
Charlotte	NC	134,069	24,994	109,075	2.6	6.1	2.1	14.3	18.3	13.9
Durham	NC	77,030	22,388	54,642	2.9	7.2	2.3	13.3	19.6	12.2
Greensboro	NC	27,065	5,630	21,435	3.8	10.9	2.5	8.6	11.2	8.4
Greenville	NC	64,352	21,619	42,733	2.5	4.9	2.5	9.7	10.2	10.9
Hickory	NC	19,985	1,239	18,746	3.3			18.5	19.6	17.9
Raleigh	NC	105,005	32,329	72,676	2.8	6.4	2.3	14.3	19.3	13.9
Wilmington	NC	36,688	8,827	27,861	2.2	5.5	1.6	17.9	21.6	18.0
Winston-Salem	NC	55,031	7,038	47,993	2.1	4.5	1.8	8.3	12.5	7.7
Bismarck	ND	13,872	22	13,850	2.7			11.6		
Fargo/Moorhead MN	ND	26,311	44	26,267	3.8			16.1		
Grand Forks	ND	7,595	44	7,551	4.5			15.2		
Minot	ND	8,143	23	8,120	4.0			10.1		
Akron	OH	36,706	4,330	32,376	2.3	5.8	1.8	6.6	8.0	6.4
Canton	OH	35,608	1,824	33,784	1.6			10.7	10.3	10.3
Cincinnati	OH	78,179	10,168	68,011	2.6	6.9	2.0	14.8	22.6	13.7

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
7.9			67.7			76.4		
3.0			73.7			80.5		
6.0			75.3	64.5	75.4	86.3	81.6	86.3
4.7	4.2	4.7	77.0	67.9	77.4	85.5	85.1	85.5
3.7	5.3	3.5	77.7	72.4	78.4	77.3	72.8	77.8
5.9			76.9	73.8	77.0	78.4	80.4	78.3
6.8			79.2	93.3	79.2	88.4	100.0	88.4
6.1			85.5	79.8	85.6	89.0	79.8	89.0
3.6	3.9	3.5	84.5	75.1	85.8	82.6	76.8	83.4
3.6	3.2	3.6	86.2	80.4	86.7	82.9	80.2	83.2
3.8	5.6	3.5	82.7	77.9	83.2	81.8	79.1	82.1
3.6	4.0	3.5	83.8	77.6	84.5	82.6	77.7	83.1
3.9	5.4	3.6	80.4	73.4	84.2	78.7	74.3	81.1
4.1	6.5	3.8	82.3	75.2	83.6	82.1	80.0	82.5
3.8	8.1	3.5	88.1	85.9	88.3	86.6	84.3	86.8
2.1			60.9	71.1	60.8	66.9	81.6	66.7
7.6	9.3	7.3	85.0	79.3	85.3	86.4	81.0	86.8
5.1			80.7	73.4	80.8	85.6	81.9	85.6
5.5	7.7	4.9	75.8	73.3	77.2	78.4	78.0	78.6
4.2	5.2	4.1	83.7	76.7	84.9	85.6	80.3	86.5
2.8			82.0	69.5	82.5	87.0	80.9	87.3
4.0	4.0	4.0	87.2	80.9	88.2	84.7	81.4	85.2
2.8	4.2	2.6	84.7	77.6	86.8	83.4	78.8	84.8
4.5	5.9	4.3	81.9	75.3	82.9	86.6	84.8	86.9
6.5	6.9	6.3	84.9	79.9	85.2	87.7	88.8	87.6
3.5	4.2	3.4	86.5	82.2	87.4	85.4	83.0	85.9
3.8			77.2	69.3	77.4	86.4	88.1	86.3
3.0	3.7	2.9	84.4	80.5	85.4	87.5	86.2	87.8
3.1	3.8	3.0	82.4	79.1	83.8	87.4	86.2	87.9
4.0	6.5	3.4	82.0	79.0	83.0	87.7	84.3	88.8
3.9	3.9	4.3	80.1	77.5	81.5	87.5	87.8	87.4
3.8			85.2	80.7	85.5	89.5	92.3	89.4
3.7	4.7	3.5	82.5	78.8	84.3	87.8	86.3	88.5
4.4	4.3	4.6	87.6	83.1	89.0	90.2	88.6	90.7
2.6	2.1	2.6	83.3	80.4	83.7	88.9	88.1	89.0
3.9			75.1			83.7		
4.2			80.2			86.8		
4.3			72.7			80.8		
3.5			80.2			87.2		
3.4	3.8	3.4	79.0	74.8	79.7	83.0	82.8	83.0
3.0			84.9	75.7	85.4	86.3	78.5	86.7
4.4	6.3	4.2	80.8	73.9	82.0	85.0	82.4	85.4

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Cleveland	OH	127,532	21,954	105,578	2.7	5.6	2.3	14.6	18.8	14.1
Columbus	OH	155,927	11,998	143,929	2.4	5.9	2.0	18.8	25.2	17.9
Dayton	OH	68,323	8,440	59,883	2.2	4.9	1.8	15.6	17.4	15.5
Elyria	OH	18,725	1,401	17,324	1.9			19.3	21.0	18.7
Kettering	OH	23,109	1,043	22,066	2.5			13.4	19.0	12.7
Toledo	OH	70,903	6,028	64,875	2.5	6.4	2.0	11.9	13.6	11.6
Youngstown	OH	47,596	4,516	43,080	2.1	5.6	1.7	11.2	18.9	10.2
Lawton	OK	15,805	1,413	14,392	2.0			10.5	17.1	9.7
Oklahoma City	OK	98,638	6,376	92,262	2.2	4.4	1.9	14.5	21.2	13.6
Tulsa	OK	67,448	4,032	63,416	2.4	3.5	2.1	16.2	17.6	15.7
Bend	OR	8,138	32	8,106	4.1			7.2		
Eugene	OR	26,735	112	26,623	2.6			10.7		
Medford	OR	22,877	105	22,772	3.6			10.8		
Portland	OR	57,742	1,135	56,607	3.2			10.9		
Salem	OR	6,366	24	6,342				10.7		
Allentown	PA	98,634	2,333	96,301	2.8	7.2	2.3	13.2	13.9	12.6
Altoona	PA	20,723	171	20,552	2.1			13.6		
Danville	PA	36,250	231	36,019	3.7			14.0		
Erie	PA	51,690	922	50,768	2.8			12.3	22.0	11.6
Harrisburg	PA	67,230	2,489	64,741	2.7	4.6	2.3	13.5	25.7	12.5
Johnstown	PA	11,109	177	10,932	3.4			11.3		
Lancaster	PA	44,800	1,506	43,294	1.8			8.5	14.5	8.0
Philadelphia	PA	206,281	39,805	166,476	2.2	5.5	1.7	11.6	17.2	10.8
Pittsburgh	PA	122,201	7,206	114,995	2.5	4.1	2.2	13.7	15.6	13.2
Reading	PA	39,896	752	39,144	4.2			16.4	31.9	15.3
Sayre	PA	14,944	111	14,833	3.3			9.7		
Scranton	PA	29,073	229	28,844	2.4			11.0		
Wilkes-Barre	PA	24,973	183	24,790	3.0			10.2		
York	PA	29,831	869	28,962	2.8			13.3	15.7	12.7
Providence	RI	52,356	1,716	50,640	2.2			11.8	16.5	11.2
Charleston	SC	69,956	17,728	52,228	2.5	7.4	1.6	8.5	12.8	7.8
Columbia	SC	75,718	24,821	50,897	2.9	7.5	2.1	11.7	16.2	11.1
Florence	SC	30,112	11,771	18,341	2.7	6.5	2.2	14.9	21.3	13.9
Greenville	SC	54,384	6,592	47,792	2.1	6.3	1.5	14.3	21.4	13.4
Spartanburg	SC	21,266	2,922	18,344	3.1	6.7	2.7	11.3	21.9	9.7
Rapid City	SD	9,756	25	9,731	2.2			14.1		
Sioux Falls	SD	42,337	83	42,254	2.0			17.9		
Chattanooga	TN	46,846	4,645	42,201	2.9	5.9	2.5	17.6	24.5	16.6
Jackson	TN	29,148	4,898	24,250	2.9	5.9	2.5	18.0	27.9	16.5
Johnson City	TN	14,767	282	14,485	2.0			7.5		
Kingsport	TN	30,765	453	30,312	2.4			9.6		
Knoxville	TN	85,029	3,486	81,543	2.5	4.2	2.2	13.3	17.8	12.6

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
5.2	7.4	4.8	78.2	70.4	80.0	82.9	79.5	83.6
4.2	5.5	4.1	79.6	74.9	79.9	84.6	82.7	84.8
3.4	4.6	3.2	77.7	70.2	78.7	82.2	77.7	82.7
5.5			81.6	80.3	81.7	82.9	80.3	83.1
3.2			84.6	78.1	84.9	86.1	83.6	86.2
5.3	5.2	5.2	75.8	66.0	76.8	74.8	67.8	75.4
4.1	7.8	3.7	81.0	71.9	82.0	83.7	79.5	84.2
4.1			70.5	68.9	70.7	73.8	69.5	74.3
3.4	4.7	3.2	75.3	74.5	75.4	79.5	82.2	79.3
3.2			72.0	72.9	72.0	78.0	81.0	77.9
2.9			81.0			87.7		
5.5			80.4	83.3	80.4	86.5	88.9	86.5
9.4			80.6	71.4	80.6	85.8	71.4	85.9
6.5	11.2	6.2	80.7	75.4	80.8	86.6	87.7	86.6
3.9			81.1			79.8		
5.0	5.8	4.8	81.8	78.4	82.0	83.6	79.7	83.7
3.3			83.7	75.0	83.8	87.8	81.3	87.9
3.3			77.3	54.4	77.5	83.5	70.2	83.6
4.9			79.4	74.8	79.5	84.1	82.3	84.1
2.9			80.8	72.8	81.1	86.9	79.7	87.2
3.6			78.2	75.0	78.3	81.8	71.4	81.9
4.0			84.9	76.6	85.3	87.7	80.2	88.1
3.6	4.5	3.4	81.4	73.0	83.9	83.5	78.7	84.9
5.5	5.1	5.4	77.6	65.8	78.5	81.1	74.3	81.6
6.6			84.6	70.3	85.0	87.2	75.1	87.6
3.8			75.9			86.0	68.2	86.2
3.7			73.7	78.6	73.7	76.2	83.9	76.1
5.1			68.3	53.3	68.5	72.6	66.7	72.6
4.1			87.6	82.0	87.9	90.2	85.7	90.4
4.6	9.0	4.3	83.1	74.2	83.5	85.0	83.1	85.1
3.3	3.9	3.3	82.7	78.1	84.3	85.8	85.2	86.0
2.8	3.1	2.9	80.2	77.1	81.8	83.4	82.3	84.0
4.0	5.0	3.9	80.0	78.2	81.2	84.5	84.5	84.5
2.7	4.6	2.5	82.0	77.0	82.7	84.5	80.1	85.1
4.5	5.9	4.3	80.5	77.1	81.1	84.6	84.2	84.7
3.3			66.3			76.4		
3.5			78.4	70.8	78.5	87.0	95.8	87.0
3.5	2.8	3.5	81.9	75.6	82.6	85.6	85.0	85.6
2.3	2.6	2.2	81.5	77.9	82.1	87.3	87.5	87.2
3.5			79.1	81.0	79.1	84.9	75.9	85.1
2.1			83.0	80.9	83.0	86.5	88.3	86.5
3.4			83.5	80.3	83.6	86.9	89.1	86.8

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Memphis	TN	100,612	35,294	65,318	2.8	6.8	2.2	18.2	24.3	17.8
Nashville	TN	145,892	14,095	131,797	3.0	7.6	2.4	12.4	17.6	11.7
Abilene	TX	21,181	888	20,293	3.9			22.2	30.7	21.1
Amarillo	TX	21,387	664	20,723	2.0			21.3	41.7	19.8
Austin	TX	62,995	6,086	56,909	2.5	4.7	2.2	15.2	16.3	14.9
Beaumont	TX	37,641	8,035	29,606	2.2	5.6	1.8	13.0	24.5	10.6
Bryan	TX	10,765	2,029	8,736	3.1	8.1	2.4	16.3	23.7	15.3
Corpus Christi	TX	37,882	1,163	36,719	3.5			22.4	13.0	21.8
Dallas	TX	194,759	30,793	163,966	3.0	6.9	2.4	16.3	22.5	15.5
El Paso	TX	62,684	1,604	61,080	1.9			22.6	27.8	21.5
Fort Worth	TX	87,283	9,481	77,802	2.9	6.3	2.5	12.6	17.5	12.0
Harlingen	TX	50,153	198	49,955	3.7			18.9		
Houston	TX	244,810	43,523	201,287	2.6	6.5	2.1	17.0	24.7	15.9
Longview	TX	12,968	2,340	10,628	3.0	7.9	2.3	16.2	27.5	14.3
Lubbock	TX	36,724	1,752	34,972	2.7			23.0	33.6	21.7
McAllen	TX	53,269	180	53,089	3.7			23.3		
Odessa	TX	15,254	800	14,454	3.0			15.8		
San Angelo	TX	11,333	399	10,934	3.3			18.2		
San Antonio	TX	149,072	7,745	141,327	3.3	3.2	3.0	17.3	20.4	16.6
Temple	TX	17,022	2,681	14,341	2.9	4.6	2.8	14.8	11.4	15.7
Tyler	TX	42,843	6,387	36,456	3.9	8.6	3.2	16.7	22.8	15.9
Victoria	TX	13,811	1,052	12,759	4.7			11.1		
Waco	TX	17,405	2,483	14,922	3.1	7.9	2.4	23.4	26.0	23.3
Wichita Falls	TX	16,456	1,063	15,393	1.6			13.0	17.7	12.4
Ogden	UT	14,864	188	14,676	1.6			10.2		
Provo	UT	12,660	11	12,649	1.5			6.4		
Salt Lake City	UT	56,700	289	56,411	1.9			8.2		
Burlington	VT	38,210	174	38,036	2.9			10.3		
Arlington	VA	69,277	8,599	60,678	1.7	5.5	1.1	13.8	23.1	12.5
Charlottesville	VA	36,431	4,155	32,276	2.0	5.1	1.6	11.3	18.8	10.3
Lynchburg	VA	17,801	3,493	14,308	5.4	14.0	4.1	15.3	20.0	14.8
Newport News	VA	35,060	10,456	24,604	2.7	7.4	1.7	14.8	20.9	13.9
Norfolk	VA	83,755	26,213	57,542	2.3	5.7	1.8	13.7	17.6	13.6
Richmond	VA	93,994	29,058	64,936	3.1	7.1	2.6	15.3	22.4	14.1
Roanoke	VA	53,077	4,113	48,964	2.5	4.5	2.1	7.8	10.3	7.5
Winchester	VA	27,622	1,235	26,387	1.9			17.0	12.0	16.7
Everett	WA	21,836	222	21,614	2.9			15.7		
Olympia	WA	15,677	147	15,530	3.4			11.4		
Seattle	WA	94,933	3,596	91,337	2.6	6.1	2.2	14.8	22.3	14.0
Spokane	WA	74,537	598	73,939	2.9			10.9		
Tacoma	WA	33,240	1,817	31,423	1.9			9.3	12.5	8.9
Yakima	WA	13,069	144	12,925	1.4			14.3		

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
3.7	5.0	3.3	78.2	72.9	81.0	83.1	82.2	83.6
4.8	7.3	4.5	82.1	76.1	82.7	85.6	83.8	85.7
3.8			74.1	67.6	74.4	79.5	78.7	79.6
4.9			80.0	79.2	80.0	82.3	79.9	82.4
2.7	3.7	2.6	82.5	74.5	83.4	84.3	78.5	84.9
4.4	6.1	4.1	81.9	79.1	82.7	82.4	83.0	82.2
3.3	5.7	2.8	80.7	77.2	81.4	80.8	78.1	81.4
8.6	10.4	8.3	84.6	78.7	84.8	84.8	83.6	84.9
4.4	5.3	4.2	82.2	77.3	83.1	83.8	80.7	84.4
2.4			75.5	69.9	75.7	76.0	66.3	76.3
4.4	4.9	4.3	80.3	74.7	81.0	82.8	79.6	83.2
2.6			85.4	91.4	85.3	82.6	82.9	82.6
4.6	6.6	4.3	80.0	75.5	81.0	81.4	79.0	81.9
3.1			81.7	78.8	82.4	85.0	86.0	84.8
4.6	6.3	4.4	76.9	71.4	77.1	80.4	77.0	80.5
3.1			87.5	71.4	87.6	80.0	77.1	80.1
6.7			74.7	67.8	75.1	79.0	77.4	79.1
3.1			77.2	70.9	77.5	86.2	88.4	86.1
4.6	4.3	4.6	80.9	73.5	81.3	81.2	77.2	81.4
3.1			76.5	68.9	77.8	80.3	79.6	80.5
5.8	7.5	5.6	78.8	76.7	79.2	83.5	84.0	83.5
3.2			82.9	78.6	83.3	85.0	85.2	85.0
3.5			78.4	76.6	78.7	80.2	78.1	80.6
1.9			76.1	74.4	76.3	78.2	78.6	78.2
1.4			76.3	70.2	76.4	85.0	87.2	85.0
1.6			72.1			82.1		
2.5			73.4	72.9	73.4	83.2	89.8	83.2
5.7			82.4	70.7	82.5	88.8	80.5	88.8
2.7	5.2	2.4	82.5	76.7	83.3	83.7	79.7	84.3
3.3	6.2	3.0	82.4	77.6	83.0	88.2	86.4	88.4
3.3	4.0	3.3	84.3	81.6	85.0	87.1	86.2	87.4
3.8	4.4	3.8	79.6	73.4	82.5	85.0	80.5	87.1
4.4	5.4	4.3	80.3	76.4	82.0	83.9	82.6	84.5
5.8	8.3	5.1	83.1	78.3	85.4	85.9	84.4	86.7
7.2	8.6	7.0	83.3	77.6	83.7	87.1	84.3	87.3
2.7			83.2	79.0	83.4	85.3	87.2	85.2
4.8			81.2	72.6	81.3	86.9	80.6	87.0
4.7			77.3	56.9	77.6	83.5	56.9	83.9
4.3	7.4	4.1	81.1	70.2	81.6	87.4	82.3	87.6
4.9			79.9	75.2	79.9	86.6	83.5	86.7
2.1			79.1	65.7	79.9	84.1	71.8	84.8
3.6			78.7	61.5	78.9	85.8	73.1	85.9

Appendix Table 1. Rates of preventive services among patients with diabetes (2010), leg amputation, and revascularization procedures among patients with diabetes and PAD (2007-11), overall and by race, among hospital referral regions

HRR Name	State	Number of Medicare beneficiaries with diabetes and PAD			Leg amputation per 1,000 Medicare beneficiaries with diabetes and PAD			Therapeutic endovascular interventions per 1,000 Medicare beneficiaries with diabetes and PAD		
		Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
Charleston	WV	65,383	2,017	63,366	2.5			15.4	19.3	14.7
Huntington	WV	28,753	495	28,258	3.1			23.7		
Morgantown	WV	25,078	417	24,661	3.1			10.8		
Appleton	WI	12,082	13	12,069	6.1			16.4		
Green Bay	WI	25,181	65	25,116	4.0			19.8		
La Crosse	WI	16,026	62	15,964	3.5			7.7		
Madison	WI	46,285	912	45,373	2.3			14.1	12.9	13.5
Marshfield	WI	22,141	25	22,116	2.6			8.8		
Milwaukee	WI	132,717	12,471	120,246	2.2	4.9	1.8	14.5	15.2	14.3
Neenah	WI	9,991	27	9,964	4.2			10.7		
Wausau	WI	12,500			2.6			13.4		
Casper	WY	8,534	24	8,510	4.1			10.5		
United States	US	15,937,763	1,861,061	14,076,702	2.4	5.6	2.0	14.1	19.7	13.3

Procedure rates are adjusted for age, sex, and race. Race-specific rates are adjusted for age and sex. Rates of preventive services are unadjusted. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Open leg bypass procedures per 1,000 Medicare beneficiaries with diabetes and PAD			Percent of diabetic Medicare beneficiaries (age 65-75) receiving blood lipids testing			Percent of diabetic Medicare beneficiaries (age 65-75) receiving hemoglobin A1c testing		
Overall	Black	Non-black	Overall	Black	Non-black	Overall	Black	Non-black
4.7			81.0	77.9	81.0	82.8	81.1	82.9
3.1			78.3	71.6	78.4	83.0	82.1	83.0
5.8			78.6	68.9	78.7	82.6	80.0	82.6
7.4			87.6			89.4		
6.3			84.3	70.0	84.4	89.5	75.0	89.6
3.2			83.4			90.8		
3.1			82.7	72.7	83.0	89.7	82.4	89.8
4.3			86.5			92.3		
4.0	4.7	3.9	83.9	78.8	84.5	88.4	87.0	88.6
5.7			87.2			92.1		
8.2			85.0			90.3		
3.6			53.9			73.6		
4.1	5.2	4.0	80.7	75.2	81.5	83.8	80.9	84.2

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)

HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Birmingham	AL	15.0	71.8	77.9	51.0	58.9
Dothan	AL	19.4		76.2		50.3
Huntsville	AL	14.0		78.6		56.9
Mobile	AL	19.8	69.3	77.6	46.4	53.9
Montgomery	AL	25.4				
Tuscaloosa	AL	18.2		74.0		47.3
Anchorage	AK	14.9		72.3		50.2
Mesa	AZ	15.8		76.3		52.2
Phoenix	AZ	18.2		78.2		53.0
Sun City	AZ	18.5		73.6		48.4
Tucson	AZ	20.8		69.2		46.9
Fort Smith	AR	16.6		74.2		58.2
Jonesboro	AR	16.9		79.0		53.5
Little Rock	AR	17.0	70.7	77.9	44.7	53.1
Springdale	AR	17.5		74.8		53.3
Texarkana	AR	18.4		81.9		65.0
Orange County	CA	18.3		73.0		51.6
Bakersfield	CA	18.1		71.8		44.3
Chico	CA	13.8		79.5		51.6
Contra Costa County	CA	15.5		69.9		46.2
Fresno	CA	18.1		74.1		52.0
Los Angeles	CA	19.1	69.4	74.3	42.0	48.8
Modesto	CA	14.3		79.6		49.0
Napa	CA	15.3		74.6		45.9
Alameda County	CA	16.7		73.4		48.6
Palm Springs/Rancho Mirage	CA	16.3		70.3		56.0
Redding	CA	10.4		79.3		54.1
Sacramento	CA	16.6		73.6		50.2
Salinas	CA	15.3		66.7		48.8
San Bernardino	CA	15.6		74.2		49.9
San Diego	CA	17.0		74.0		50.9
San Francisco	CA	18.7		75.4		51.2
San Jose	CA	14.1		74.8		49.1
San Luis Obispo	CA	17.3				
San Mateo County	CA	19.2		72.4		44.7
Santa Barbara	CA	15.5		74.3		55.1
Santa Cruz	CA	12.6		76.3		65.0
Santa Rosa	CA	15.0		76.4		54.6
Stockton	CA	15.9		80.1		46.2
Ventura	CA	16.2		77.5		48.7
Colorado Springs	CO	15.1		74.2		56.6
Denver	CO	18.0		70.3		51.7
Fort Collins	CO	12.6				
Greeley	CO	15.9				

Rates are adjusted for age, sex, and race. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)

HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Pueblo	CO	20.7				
Bridgeport	CT	16.0		70.1		46.2
Hartford	CT	20.1		70.8		47.6
New Haven	CT	19.9		68.2		46.7
Wilmington	DE	18.1	71.1	73.9	46.5	47.1
Washington	DC	16.7	73.6	73.4	41.8	51.1
Bradenton	FL	16.1		79.7		44.5
Clearwater	FL	14.1		79.5		52.1
Fort Lauderdale	FL	17.6	66.5	75.9	44.6	52.5
Fort Myers	FL	14.9		78.4		57.7
Gainesville	FL	15.2		80.9		51.5
Hudson	FL	17.8		75.5		56.0
Jacksonville	FL	15.7	70.1	75.3	46.5	52.3
Lakeland	FL	15.7		73.7		51.4
Miami	FL	19.1	67.4	70.5	42.7	48.2
Ocala	FL	10.9		82.8		56.3
Orlando	FL	15.6	67.3	77.2	53.1	54.4
Ormond Beach	FL	14.5		76.7		53.4
Panama City	FL	13.4		77.2		46.1
Pensacola	FL	18.0	71.6	80.1	42.4	45.7
Sarasota	FL	15.1		82.9		56.6
St. Petersburg	FL	16.0		78.8		57.9
Tallahassee	FL	16.3	67.9	78.0	46.0	54.7
Tampa	FL	19.2		79.6		59.2
Albany	GA	18.6				
Atlanta	GA	17.7	67.6	76.4	43.5	52.3
Augusta	GA	19.3	65.7	75.6	38.1	48.7
Columbus	GA	20.4		70.2		46.0
Macon	GA	15.0	60.5	75.8	41.2	55.4
Rome	GA	17.0		71.5		50.7
Savannah	GA	14.3	53.7	74.2	41.8	52.1
Honolulu	HI	24.2		67.9		48.0
Boise	ID	17.8		71.7		53.9
Idaho Falls	ID	13.9				
Aurora	IL	16.3		75.9		44.9
Blue Island	IL	23.6	67.6	77.2	48.2	48.7
Chicago	IL	23.6	67.9	76.5	47.4	50.4
Elgin	IL	24.3		74.6		46.8
Evanston	IL	23.0		72.4		51.4
Hinsdale	IL	16.0		76.8		48.8
Joliet	IL	20.9		76.5		49.1
Melrose Park	IL	19.1		75.2		47.0
Peoria	IL	14.0		76.2		49.0
Rockford	IL	18.0		81.8		57.8

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)						
HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Springfield	IL	16.8		78.9		54.6
Urbana	IL	17.3		76.7		48.6
Bloomington	IL	13.8		73.5		50.5
Evansville	IN	20.7		69.9		50.0
Fort Wayne	IN	16.4		72.1		48.8
Gary	IN	20.3	76.2	75.2	41.6	43.7
Indianapolis	IN	21.6	65.1	76.8	36.0	46.6
Lafayette	IN	20.0		76.3		51.8
Muncie	IN	24.0		74.3		52.7
Munster	IN	24.3		78.4		40.1
South Bend	IN	17.7		71.9		48.7
Terre Haute	IN	19.0		81.5		40.5
Cedar Rapids	IA	12.7		73.5		51.7
Davenport	IA	14.4		82.6		51.4
Des Moines	IA	18.4		75.8		54.5
Dubuque	IA	13.9				
Iowa City	IA	14.2		78.2		56.9
Mason City	IA	17.1				
Sioux City	IA	30.7		69.7		43.0
Waterloo	IA	16.2				
Topeka	KS	15.8		76.8		55.1
Wichita	KS	15.3		79.6		50.3
Covington	KY	19.7		72.0		55.5
Lexington	KY	16.0		77.6		56.6
Louisville	KY	20.4	63.6	74.4	43.4	53.4
Owensboro	KY	12.3		83.2		68.5
Paducah	KY	28.8		74.5		48.6
Alexandria	LA	15.8		75.1		49.4
Baton Rouge	LA	17.1	64.4	73.8	39.7	50.9
Houma	LA	12.9		77.4		56.5
Lafayette	LA	18.5	70.6	76.9	40.0	46.3
Lake Charles	LA	19.7		80.5		48.5
Metairie	LA	18.2		73.6		50.9
Monroe	LA	16.9		77.5		53.3
New Orleans	LA	13.9	70.5	70.1	49.0	48.5
Shreveport	LA	19.8	68.4	75.0	46.5	47.2
Slidell	LA	20.4				
Bangor	ME	16.7		71.3		52.2
Portland	ME	21.5		76.9		49.5
Baltimore	MD	23.6	66.3	73.6	42.0	47.2
Salisbury	MD	15.9		78.0		53.1
Takoma Park	MD	19.1	68.5	76.2	39.7	51.7
Boston	MA	20.7	73.7	74.5	51.2	50.1
Springfield	MA	20.4		70.1		51.2

Rates are adjusted for age, sex, and race. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)						
HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Worcester	MA	25.9		70.0		46.8
Ann Arbor	MI	14.3		77.9		50.6
Dearborn	MI	17.4		77.8		48.6
Detroit	MI	19.6	72.4	73.6	40.6	49.3
Flint	MI	16.0		72.9		52.1
Grand Rapids	MI	15.5		74.4		47.7
Kalamazoo	MI	17.6		75.4		49.9
Lansing	MI	15.5		76.8		52.3
Marquette	MI	14.4		75.6		52.2
Muskegon	MI	19.8		75.0		42.8
Petoskey	MI	13.8		77.0		46.6
Pontiac	MI	17.6		77.7		53.4
Royal Oak	MI	19.0		75.3		50.0
Saginaw	MI	15.7		77.1		49.1
St. Joseph	MI	11.5		82.6		57.8
Traverse City	MI	17.3		81.9		50.6
Duluth	MN	16.4		73.7		55.4
Minneapolis	MN	22.0		73.8		54.1
Rochester	MN	15.1		71.8		56.4
St. Cloud	MN	25.8				
St. Paul	MN	20.2		72.6		52.5
Gulfport	MS	20.6		75.6		56.6
Hattiesburg	MS	13.8		76.5		56.4
Jackson	MS	16.6	60.6	75.2	48.1	54.3
Meridian	MS	13.8				
Oxford	MS	21.3				
Tupelo	MS	12.1		82.0		62.4
Cape Girardeau	MO	17.6		75.6		57.5
Columbia	MO	20.1		77.3		53.7
Joplin	MO	20.7		72.4		51.4
Kansas City	MO	18.1	68.6	75.2	47.7	52.6
Springfield	MO	17.6		79.0		51.6
St. Louis	MO	18.7	63.1	75.2	45.7	53.4
Billings	MT	19.1		75.8		61.3
Great Falls	MT	22.6				
Missoula	MT	12.8		76.7		60.2
Lincoln	NE	19.9		71.5		48.0
Omaha	NE	19.4		75.2		56.5
Las Vegas	NV	15.3		79.2		56.4
Reno	NV	12.9		77.5		49.5
Lebanon	NH	18.0		72.5		53.2
Manchester	NH	17.9		77.9		54.2
Camden	NJ	18.4	69.3	73.4	47.5	50.7
Hackensack	NJ	17.9		70.8		47.9

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)						
HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Morristown	NJ	19.1		71.4		50.1
New Brunswick	NJ	18.6		73.2		54.1
Newark	NJ	19.2	67.2	69.2	44.9	49.2
Paterson	NJ	15.1		73.7		46.5
Ridgewood	NJ	20.1		68.2		46.3
Albuquerque	NM	17.0		70.9		53.1
Albany	NY	23.1		73.4		44.7
Binghamton	NY	15.7		72.6		51.2
Bronx	NY	22.4	64.9	67.0	36.0	41.0
Buffalo	NY	16.8		70.2		49.1
Elmira	NY	19.9		71.6		49.7
East Long Island	NY	18.7	67.1	72.6	38.3	46.5
Manhattan	NY	20.6	63.6	73.9	34.8	43.6
Rochester	NY	18.1		69.6		54.5
Syracuse	NY	16.9		76.4		47.7
White Plains	NY	19.3		69.5		46.1
Asheville	NC	21.1		75.0		59.1
Charlotte	NC	16.0	69.4	78.5	52.8	57.1
Durham	NC	16.1	64.7	74.4	46.4	53.9
Greensboro	NC	17.8		72.1		53.0
Greenville	NC	16.2	65.7	73.2	50.2	53.8
Hickory	NC	15.8		72.9		51.0
Raleigh	NC	16.2	67.8	77.0	44.1	53.6
Wilmington	NC	14.7	73.4	78.5	51.6	55.2
Winston-Salem	NC	21.3		76.0		60.4
Bismarck	ND	18.1		77.3		59.8
Fargo/Moorhead MN	ND	22.8		70.8		48.0
Grand Forks	ND	23.1				
Minot	ND	20.1				
Akron	OH	19.0		67.8		49.1
Canton	OH	21.7		67.5		49.1
Cincinnati	OH	18.6	67.4	73.3	41.4	47.0
Cleveland	OH	21.2	67.0	69.4	40.3	44.8
Columbus	OH	20.0	68.6	74.8	43.7	48.6
Dayton	OH	17.4		76.7		52.9
Elyria	OH	23.9		77.8		49.5
Kettering	OH	12.1		75.7		54.0
Toledo	OH	20.0		75.4		50.0
Youngstown	OH	19.0		70.9		51.1
Lawton	OK	15.8		74.4		51.0
Oklahoma City	OK	16.8		75.2		56.2
Tulsa	OK	17.7		72.2		51.9
Bend	OR	19.7				
Eugene	OR	19.7		75.0		52.7

Rates are adjusted for age, sex, and race. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)						
HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Medford	OR	23.1		74.8		37.9
Portland	OR	20.4		73.4		48.1
Salem	OR	18.6				
Allentown	PA	19.3		70.4		47.3
Altoona	PA	12.8		73.7		53.8
Danville	PA	21.5		70.2		49.4
Erie	PA	15.0		73.3		53.6
Harrisburg	PA	16.0		72.2		52.0
Johnstown	PA	17.4				
Lancaster	PA	16.1		76.1		53.3
Philadelphia	PA	20.1	64.4	73.4	43.1	50.3
Pittsburgh	PA	20.5		70.1		46.4
Reading	PA	18.9		73.1		47.0
Sayre	PA	19.9		80.9		58.7
Scranton	PA	18.8		77.4		53.0
Wilkes-Barre	PA	18.1		73.5		50.4
York	PA	12.8		74.9		54.4
Providence	RI	18.9		69.4		49.8
Charleston	SC	17.6	62.2	78.7	52.5	58.5
Columbia	SC	14.1	66.6	79.8	52.1	59.7
Florence	SC	14.5	68.9	70.5	55.0	50.1
Greenville	SC	14.8		79.8		59.8
Spartanburg	SC	16.7		71.8		55.3
Rapid City	SD	10.5				
Sioux Falls	SD	29.4		73.2		47.4
Chattanooga	TN	15.8		74.7		50.9
Jackson	TN	14.1		73.9		53.8
Johnson City	TN	26.3		79.4		58.0
Kingsport	TN	16.2		75.3		65.2
Knoxville	TN	17.0		73.5		52.8
Memphis	TN	15.1	70.1	78.1	42.8	53.8
Nashville	TN	19.8	67.9	75.9	48.9	51.7
Abilene	TX	12.8		77.8		61.3
Amarillo	TX	17.5		79.7		52.2
Austin	TX	14.5		77.6		59.1
Beaumont	TX	13.3	71.9	77.7	47.6	52.4
Bryan	TX	16.2				
Corpus Christi	TX	16.4		75.4		43.6
Dallas	TX	17.1	61.0	73.6	39.1	49.7
El Paso	TX	17.9		72.6		41.0
Fort Worth	TX	16.8	68.3	74.4	49.4	51.2
Harlingen	TX	13.6		73.1		49.5
Houston	TX	16.8	65.3	74.7	45.5	52.3
Longview	TX	15.3				

Appendix Table 2. Thirty-day readmission rates, amputation-free survival, and re-intervention-free survival following surgical discharge among hospital referral regions (2007-11)

HRR Name	State	Percent of Medicare beneficiaries with diabetes and PAD readmitted within 30 days following revascularization procedure	Amputation-free survival after any vascular procedure among patients with diabetes and PAD		Re-intervention-free survival after any vascular procedure among patients with diabetes and PAD	
			Black	Non-black	Black	Non-black
Lubbock	TX	17.8		77.5		53.9
McAllen	TX	14.6		79.8		52.5
Odessa	TX	17.8		73.2		52.6
San Angelo	TX	19.0		77.3		52.3
San Antonio	TX	20.5		70.5		46.2
Temple	TX	16.4		77.7		53.8
Tyler	TX	19.1		75.6		45.8
Victoria	TX	19.8		74.1		59.0
Waco	TX	14.3		78.8		58.0
Wichita Falls	TX	14.3		81.9		60.5
Ogden	UT	11.8				
Provo	UT	17.2				
Salt Lake City	UT	15.1		73.4		53.9
Burlington	VT	20.7		75.0		54.3
Arlington	VA	16.1	62.2	72.6	41.0	51.5
Charlottesville	VA	23.7		79.1		54.9
Lynchburg	VA	19.0		68.1		53.6
Newport News	VA	13.6	67.1	75.2	45.4	52.9
Norfolk	VA	15.3	65.9	75.6	49.5	52.8
Richmond	VA	17.6	65.7	74.8	40.5	55.2
Roanoke	VA	27.6		67.7		44.2
Winchester	VA	12.3		80.0		59.2
Everett	WA	19.3		71.6		46.6
Olympia	WA	21.1		67.2		42.1
Seattle	WA	17.1		76.1		46.9
Spokane	WA	20.4		72.8		47.7
Tacoma	WA	15.8		72.1		55.1
Yakima	WA	16.2		83.4		61.2
Charleston	WV	17.9		74.4		53.1
Huntington	WV	16.1		76.9		53.9
Morgantown	WV	22.0		75.9		51.8
Appleton	WI	24.9		64.9		40.7
Green Bay	WI	20.1		73.1		46.8
La Crosse	WI	20.3				
Madison	WI	17.0		74.1		54.3
Marshfield	WI	22.9		76.7		53.7
Milwaukee	WI	18.8	67.2	73.5	51.2	50.1
Neenah	WI	27.3				
Wausau	WI	20.0		77.7		52.2
Casper	WY	20.4				

Rates are adjusted for age, sex, and race. Blank cells indicate that the rate was suppressed due to a small number of events occurring in the region during the study period.

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The Dartmouth Atlas Project works to accurately describe how medical resources are distributed and used in the United States. The project offers comprehensive information and analysis about national, regional, and local markets, as well as individual hospitals and their affiliated physicians, in order to provide a basis for improving health and health systems. Through this analysis, the project has demonstrated glaring variations in how health care is delivered across the United States.

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The Dartmouth Atlas

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