Improving Patient Decision-Making in Health Care:

A 2011 Dartmouth Atlas Report Highlighting Minnesota

A Report of the Dartmouth Atlas Project

THE DARTMOUTH INSTITUTE
FOR HEALTH POLICY & CLINICAL PRACTICE

Where Knowledge Informs Change

Table of Contents

Improving Patient Decision-Making in Health Care:

A 2011 Dartmouth Atlas Report Highlighting Minnesota

February 24, 2011

Authors:
Shannon Brownlee, MS
John E. Wennberg, MD, MPH
Michael J. Barry, MD
Elliott S. Fisher, MD, MPH
David C. Goodman, MD, MS
Julie P.W. Bynum, MD, MPH

Editor:
Kristen K. Bronner, MA

What This Report Is and How It Can Be Used

For patients whose conditions can be treated with elective surgery, location matters. In this Dartmouth Atlas report, the first in a series looking at individual states and regions, we show the wide regional variation in the likelihood that patients with similar conditions receive elective procedures. This report highlights Minnesota and shows the variation across the state. For example, if you have heart disease and live in St. Cloud, Minnesota, you are half as likely to undergo cardiac bypass surgery than if you live in Detroit Lakes, and more than twice as likely to undergo back surgery than if you live in Rochester. If you have gallstones and live in Wadena, you are three times more likely to have your gall bladder removed than if you live in Minneapolis.

Variations of a similar magnitude were found across the state for other procedures as well. Among the largest 60 communities in Minnesota, we found fourfold variation in coronary angioplasty and stenting and more than threefold variation in carotid endarterectomy, a procedure performed to prevent stroke. The greatest variation was seen in transurethral resection of the prostate, or TURP, a procedure for treating benign prostate hyperplasia. Among the 60 largest communities, rates of TURP varied an astonishing sevenfold, ranging from a low of 1.6 per 1,000 male Medicare beneficiaries in Rochester to 11.6 per 1,000 in Bemidji.

In highlighting the variation from community to community for these and other elective procedures, we hope to help patients, families and clinicians—physicians, nurses and other health care providers—better understand both the importance of these variations and their major cause: the fact that patients' preferences are not always taken into account when medical decisions are made. This report is intended to encourage patients and their families to make sure they are fully informed about their choices and to share important health care decisions with their clinicians.

All too often, patients facing the possibility of elective surgery are not given an opportunity to understand their options fully. Many patients are not even aware that the decision about elective surgery is actually a choice and that it should generally be theirs to make. Instead, they routinely delegate such important, even life-altering decisions to their clinicians in the belief that "the doctor knows best." The result is that patients often do not get the treatment that they would prefer. Research suggests that for many conditions—especially those that can be treated with elective surgery—the treatment a patient receives depends more on the physician's recommendations than the patient's preferences.[1]

Clinicians are not mind readers. They often do not know or ask their patients about their values and preferences; or they may assume that the patient's values are similar to their own. As a result, they may recommend treatment that is different from what their patients would have chosen had they been fully informed.[2,3] Clinicians also vary widely in their opinions about the best course of treatment for any given condition.

These differences in clinicians' personal beliefs and opinions contribute to the variation in surgical rates in different geographic locations. For example, there is considerable disagreement among surgeons about the need for back surgery, its effectiveness, and even the best way to diagnose the cause of back pain. With no consensus about how to diagnose and treat back pain, the rate of back surgery varies widely from place to place.

This report, a collaborative project with the Foundation for Informed Medical Decision Making, looks at the variation in surgical rates in 306 hospital referral regions across the United States (a hospital referral region is a large health care market containing at least one referral hospital). In the Appendix, patients can find the rates for ten different surgical procedures and one test in 121 different hospital service areas in Minnesota (a hospital service area encompasses the geographic area served by a relatively small number of hospitals). Future editions will look at variation in the rates of these procedures in other states and regions. Data for the entire nation, encompassing more than 3,400 hospital service areas, can be found on the Dartmouth Atlas web site (www.dartmouthatlas.org).

This report is divided into three parts. The first section, "The Importance of Choice in Health Care," explains the concept of shared decision-making, a process that helps patients understand their choices fully and allows them to share treatment decisions with their clinicians. The second section, "Variation in Preference-Sensitive Care," briefly describes the treatment choices facing patients with eight different conditions, all of which can—but do not have to be—treated with surgery.

The last section, "Ensuring Patients Get the Care They Need and Want," discusses steps patients can take to make sure they get the care they want and need. It also discusses how physicians and other clinicians can support shared decision-making to ensure that patients make fully informed choices. When done right, shared decision-making results in a better decision: a personalized choice based on the best scientific evidence and the patient's own values.

The Importance of Choice in Health Care

Medicine involves decisions. Traditionally, patients have relied on their clinicians—physicians, nurses and other health care providers—to decide for them: to prescribe tests, surgeries and drugs; to refer them to specialists; and to admit them to hospitals and intensive care units. But some of the most important choices in medicine are not the clinician's alone to make. These decisions should be shared with patients.

The patient's preference for the kind of care he or she wants is especially important when facing a test, surgery or other treatment that is "elective." When a treatment is elective, it means there is more than one way to treat the patient's illness or condition, each possible treatment involves different trade-offs, and individual patients will view those trade-offs differently. Sometimes, doing nothing at first—"watchful waiting"—may be a completely reasonable option.

In order to ensure that each patient gets the treatment that is right for him or her, the choice should be a shared decision, involving both the patient and the clinician. In the process known as "shared decision-making," the patient is a fully informed partner in the choice, knowledgeable about the risk and benefit trade-offs of each treatment option. When done right, shared decision-making results in a better decision: a personalized choice based on both the best scientific evidence and the patient's own values.

For example, consider the importance of shared decision-making to women who have early-stage breast cancer. For most women with this condition, the options are mastectomy, which involves surgical removal of the entire breast, or lumpectomy, which is local excision of the tumor followed by radiation. Clinical trials have shown that the two treatments are the same in terms of a woman's chances of surviving her cancer, but they are obviously very different in terms of their effect on her body and possibly her sense of well-being.

For women who choose lumpectomy, there is a higher risk that the cancer will recur in the same breast. To reduce this risk, most patients who have a lumpectomy also undergo radiation treatment. Women who elect mastectomy do not need to worry as much about a local recurrence, but mastectomy is more disfiguring, and women who choose it will have to undergo more surgery if they wish to have the breast reconstructed. Women who have lumpectomy also may need more than one operation to be sure all of the tumor is removed, and they will usually need weeks of radiation treatment. Different women will prefer one option or the other, depending upon how much they value preserving their breast, their willingness to undergo radiation or more invasive surgery, and the level of uncertainty they are willing to live with in terms of their cancer recurring.

Elective tests, procedures, and surgeries like mastectomy and lumpectomy are used to treat conditions that are considered "preference-sensitive."[i] For such con-

[i] For preference-sensitive conditions, the rate at which a procedure occurs is sensitive to, or driven by, somebody's preference. In the absence of shared decision-making, it is often the doctor's preference that determines treatment, rather than the patient's.

ditions, medical ethics requires that the patient be given the opportunity to help make a fully informed choice: to look at the various options and select one with her clinician based on her personal values and a sound understanding of the available medical evidence. When patients do not have a chance to make a fully informed choice, clinicians are at risk of prescribing the wrong treatment to a patient—a treatment that the patient would not have wanted had she been fully informed and given the opportunity to share the decision.

The link to practice variation

Patients facing elective procedures—such as surgeries and tests—are not always given the chance to understand their choices and share the decision with their clinicians. A recent study found that most patients were poorly informed about the potential risks and benefits offered by a wide variety of treatments recommended by their clinicians, and clinicians did not ensure that their patients fully understood their options.[2] Other studies have shown that patients who *are* given the opportunity to fully understand their options often make different choices than patients who are not fully informed.[4]

Research suggests that for many preference-sensitive conditions—especially those that can be treated with elective surgery—the treatment a patient receives depends more on the physician's recommendation than the patient's preferences.[1] This is due in part to the fact that many patients are not even aware that the decision about elective surgery is in part theirs to make, and they routinely delegate the decision to undergo surgery to their surgeons in the belief that "the doctor knows best."

Many patients do not realize that their clinician does not always fully understand their values and preferences. When this happens, the clinician's treatment recommendations may be different from what their patients would have chosen had they been given the opportunity to be fully informed.[2] Many clinicians are not accustomed to involving their patients in treatment decisions in a meaningful way and thus cannot be sure which treatment their patients would prefer.[3,5] Clinicians also vary widely in their opinions about the best course of treatment; one surgeon may believe one procedure is best, while another favors a different approach. This is the case more often than patients might think. There are gaps in medical knowledge, and sometimes the scientific evidence is not yet sufficient to clarify which treatment is safest and most effective for a given condition in an individual patient.[6] Even when the risks and benefits of a treatment are well documented, physicians have their own beliefs about what matters most and often value the possible treatment options differently than would their patients.

These differences in clinicians' personal beliefs and opinions lead to differences in the kinds of treatment patients receive in different geographic locations. For example, there is considerable disagreement among surgeons about the need for back surgery, its effectiveness, and even the best way to diagnose the cause of back pain. This lack of agreement stems in part from a lack of studies, called clinical trials, which provide the scientific evidence that clinicians need in order to know how best

WHAT IS A RATE?

A rate measures how often something happens in a defined population. In medicine, a rate is usually expressed as the number of events (procedures, tests, etc.) that happen in a given group of people over a given period of time (the numerator), divided by the total number of members of the group (the denominator) during that period. For example, if there are 1,000 people in a group, and 15 of them undergo back surgery in one year, the rate of back surgery is 15 per 1,000 for that year. This can also be expressed as a rate of 1.5% (or 1.5 per 100). In this report, the rates are usually based on the number of procedures performed on Medicare beneficiaries divided by the total number of Medicare beneficiaries who live in a given geographic area. Most of the rates in this report are expressed as the number of procedures per 1,000 beneficiaries; they are averaged over a five-year period, 2003 to 2007.

These rates have been adjusted for age, sex and race. This means that demographic factors that might affect how common a condition is have been taken into account. For example, communities where Medicare beneficiaries are older, on average, tend to have more heart disease. That could affect the rate of cardiac bypass surgery, because we would expect that communities where heart disease is more common would have more bypass surgery. Adjusting for age (and for sex and race, which can also affect the amount of disease) makes it unlikely that the variation we see in rates of cardiac bypass surgery in different communities is due to differences in the age composition of the population and thus to different rates of heart disease itself. In essence, these adjustments make the results what they would be if there were no age, sex or race differences between areas.

Knowing the rate at which a particular procedure occurs among local communities is a way to compare the average chance of undergoing that procedure, depending on where one lives. For example, over the five-year period 2003-2007, the average rate of back surgery among Medicare beneficiaries living in and around Bend, Oregon was 8.6 per 1,000 beneficiaries, one of the highest rates in the nation. The rate in and around East Long Island, New York was 2.1, about a quarter of the rate in Bend. That means a resident of Bend was four times more likely to undergo back surgery than a resident of East Long Island. Another way to judge the chance of undergoing a procedure is to compare the rate in a given community against the U.S. average. The rate of back surgery in Bend was twice the U.S. average.

to treat their patients. With no consensus about how to diagnose and treat back pain, the rate of back surgery varies a great deal from place to place.[ii]

On the other hand, when clinicians agree on how to treat a condition, there is often relatively little geographic variation in the care patients receive. Take the example of hip fracture. Diagnosing a broken hip is not difficult, and all physicians agree that patients with a broken hip must be hospitalized and undergo a procedure to repair it. Moreover, patients who break their hips always seek medical care. Thus the rate of hospitalization for hip fracture is a reflection of the rate of hip fracture itself; and this does not vary much from place to place. What variation does exist can be considered justified, or warranted, because it can be explained on the basis of the rates at which hip fractures actually occur in populations.

[ii] The wide variation in rates of surgeries, tests and other procedures can be due to the opinions of a relatively small number of physicians in a community. This was seen in Vermont in the 1970s, where rates of tonsillectomy varied widely in towns that were only a few miles apart. In the town of Waterbury, for example, less than 20% of children had undergone a tonsillectomy by age 15. In nearby Morrisville, more than 60% of children had had their tonsils removed by that age. Two physicians in Morrisville were responsible for the high rate of tonsillectomy there. When the physicians in Morrisville learned that children in their town were far more likely to undergo the surgery than in the rest of the state, they decided to seek a second opinion before recommending the surgery. Two years later, the rate of tonsillectomy in Morrisville dropped to 10%.[22]

Where you live is what you get

The rates of use of most surgical procedures vary to a much greater extent than the rate of hospitalization for hip fracture. What this means is, if you are a patient with a surgical condition—a disease or condition that can be treated surgically—your chances of having surgery depend in large measure on where you live and which clinicians you happen to see. In health care, to a remarkable degree, geography is destiny.

Previous editions of the Dartmouth Atlas have documented striking variations in the rates of use of elective surgery among the 306 hospital referral regions (HRRs) in the United States.[iii] This edition of the Atlas, which is a collaborative project with the Foundation for Informed Medical Decision Making (see box), not only looks at the variation in care delivered in HRRs; it also contains information about the care delivered in much smaller areas, known as hospital service areas (HSAs), which generally encompass geographic areas served by a relatively small number of hospitals.[iv] The Foundation, through its medical editors, is responsible for the information regarding the treatment options for the conditions discussed in this report. The Dartmouth Atlas Project is responsible for the analysis of the data on practice patterns.

By focusing on both hospital referral regions and hospital service areas, this report offers individuals information about their chances of undergoing ten surgeries and one cancer screening test, depending upon where they live. The information on treatment options and local rates of use is intended to help clinicians, patients and families understand both the importance of patients' preferences in making medical decisions and the (sometimes wide) variation in rates of these procedures in their local communities. Through this understanding, we hope to encourage patients and their families to make sure that they are given the chance to be fully informed and to share important health care decisions with their clinicians.

The following section, "Variation in Preference-Sensitive Care," provides information about eight different preference-sensitive conditions. It describes the treatment options and highlights the trade-offs that patients face in choosing between them. It describes the variation in the rates at which ten surgical treatments and one test were delivered in the 306 HRRs around the country during the period from 2003 to 2007. For information about the rate of each procedure or test in each HSA in Minnesota, please see the Appendix Table. The data are also available on the Dartmouth Atlas web site (www.dartmouthatlas.org).

[iii] Hospital referral regions are large health care markets that include at least one large referral hospital, such as an academic medical center, as well as other community hospitals. For a more complete definition of a hospital referral region, go to www.dartmouthatlas.org.

[iv] Hospital service areas are defined by patterns of use of local hospitals. Most contain only one hospital; and most hospital referral regions contain a number of hospital services areas. For example, the Minneapolis hospital referral region comprises 61 hospital service areas in Minnesota and Wisconsin. See the Appendix on Methods for details on this and other points of methodology.

THE FOUNDATION FOR INFORMED MEDICAL DECISION MAKING

The Foundation for Informed Medical Decision Making (www.informedmedicaldecisions.org) is a non-profit organization dedicated to increasing patient involvement in health care decision-making. Health Dialog Services Corporation (Health Dialog) was created to disseminate the material and insights developed by the Foundation. The licensing agreement between the Foundation and Health Dialog, its production and distribution partner, provides royalties as well as contract funding to develop and maintain Shared Decision-Making® Programs and other decision support materials. Health Dialog is a private, wholly owned subsidiary of Bupa, a global health and care company headquartered in London, England.

Different readers will find the next section useful for different purposes. Patients with one of the conditions discussed may realize that they want to know more before they make a decision about how they want to be treated. This section may also raise questions patients might want to ask their clinicians in order to help them choose the treatment that is right for them.

The variation in rates of different treatments can also inform clinicians, who are often unaware that the care in their medical community may differ from that in other communities. It can also serve as a reminder to the medical profession of the importance of fully informing patients about their treatment choices as an ethical standard for clinical decision-making.

The final section, "Ensuring Patients Get the Care They Need and Want," discusses steps patients can take to make sure they get the care they want and need—and no more. It also discusses ways physicians and other clinicians can support shared decision-making, to ensure that patients make fully informed choices and to reduce unwarranted variation in medical practice.

A word of caution: the conditions discussed in this report by no means represent an exhaustive list of all the preference-sensitive treatments and tests that vary in their rates of use in different communities. There are many more decisions about elective procedures and treatments that patients and clinicians should share. Many decisions—such as prescribing drugs and undergoing screening tests—should be shared between well-informed patients and their clinicians. Patients should also be cautioned against considering the information about individual conditions and possible treatments presented in this report as sufficient for making decisions about preference-sensitive care. Patients should go to their clinicians for more information.

Variation in Preference-Sensitive Care

The information in this section summarizes the major treatment options available for most patients with one of eight preference-sensitive conditions:

- Early-stage breast cancer (treatment)
- Stable angina, or chest pain due to coronary artery disease
- Low back pain
- Arthritis of the knee or hip
- Carotid artery disease
- Gallstones
- Enlarged prostate (benign prostatic hyperplasia)
- Early-stage prostate cancer (screening and treatment)

Readers can find an overview of each condition, prepared under the guidance of the Foundation for Informed Medical Decision Making. Each overview summarizes the major treatment options and the trade-offs patients face. Readers can also find a map showing the variation in rates of use in the 306 HRRs for each condition, prepared by the Dartmouth Atlas team. Each map shows the variation across the U.S. and indicates the chances of receiving one treatment or another, depending upon location. To find out the rate for each procedure in your community, go to the Appendix Table, which shows the rates for the 121 hospital service areas in Minnesota. Rates for all HRRs and HSAs will be available at the Dartmouth Atlas web site (www.dartmouthatlas.org).

The surgical rates are for procedures performed during the calendar years 2003-2007 for patients enrolled in traditional (fee-for-service) Medicare. The data for PSA testing are for men age 68-74 enrolled in traditional Medicare in 2008. These are the most recent dates for which Atlas data are available. All data are based on Medicare claims, and rates are age, race and, when appropriate, sex adjusted (see the Appendix on Methods). Although studies in Michigan, California and Louisiana suggest that the variations in rates among communities are similar for patients under 65, data are not yet available in most parts of the country.

A word about the study population. Variation in the procedure rates presented in this report was measured across a national sample of fee-for-service Medicare beneficiaries (the denominator in rate calculations). While this population includes a mixture of illness types—different stages of breast cancer, for example—most of the variation in procedure rates occurs within the population diagnosed with the above listed illnesses. An exception is that prostate cancer screening (prostate-specific antigen testing) was measured in men without any evidence of prior prostate disease (see page 46).

Early-Stage Breast Cancer

Early-stage breast cancer is the second most common cancer among women (after lung cancer). Most early-stage breast cancers are curable, and women have a choice between two equally effective surgical treatments. The majority of women treated for early-stage breast cancer will die of some other cause.

How early-stage breast cancer is diagnosed and treated

Early-stage breast cancer is most often diagnosed with a biopsy (removal and examination of a small sample of breast tissue) following a screening mammogram, and patients must choose between mastectomy and lumpectomy. Mastectomy removes the entire breast. Lumpectomy, also known as breast-conserving surgery, removes only the tumor and a bit of surrounding tissue. Women who choose lumpectomy usually receive radiation therapy after surgery to reduce the risk that the tumor will recur in the same location. Most women who undergo mastectomy do not have radiation treatment. For almost all women with early-stage breast cancer, mastectomy and lumpectomy followed by radiation are equally effective in reducing their chances of dying of breast cancer.

Patient choices

Since both modes of treatment offer the same odds in terms of reducing a woman's risk of death from breast cancer, which treatment she chooses depends upon her feelings about her appearance after surgery, the time and energy required for each treatment option, and the risk of a local recurrence. Mastectomy usually involves one operation and reduces the worry that the cancer might recur in the same breast. Women who choose mastectomy must also decide if they want to undergo breast reconstruction.

Women who value their breasts highly, and who can accept a slightly higher chance of cancer coming back in the treated breast, may decide to choose lumpectomy, which can sometimes be done under local anesthesia in the surgeon's office. Lumpectomy may require more than one surgery to ensure that all of the cancer has been removed. Women who choose lumpectomy usually undergo radiation therapy. This may involve multiple trips to the hospital or clinic. Radiation reduces—but does not eliminate—the chance that cancer will return in the treated breast, and it is not safe for some breast cancer patients. Women who feel they would have greater peace of mind if the breast is removed, or who do not want to undergo radiation treatment, may decide that mastectomy is a better choice.

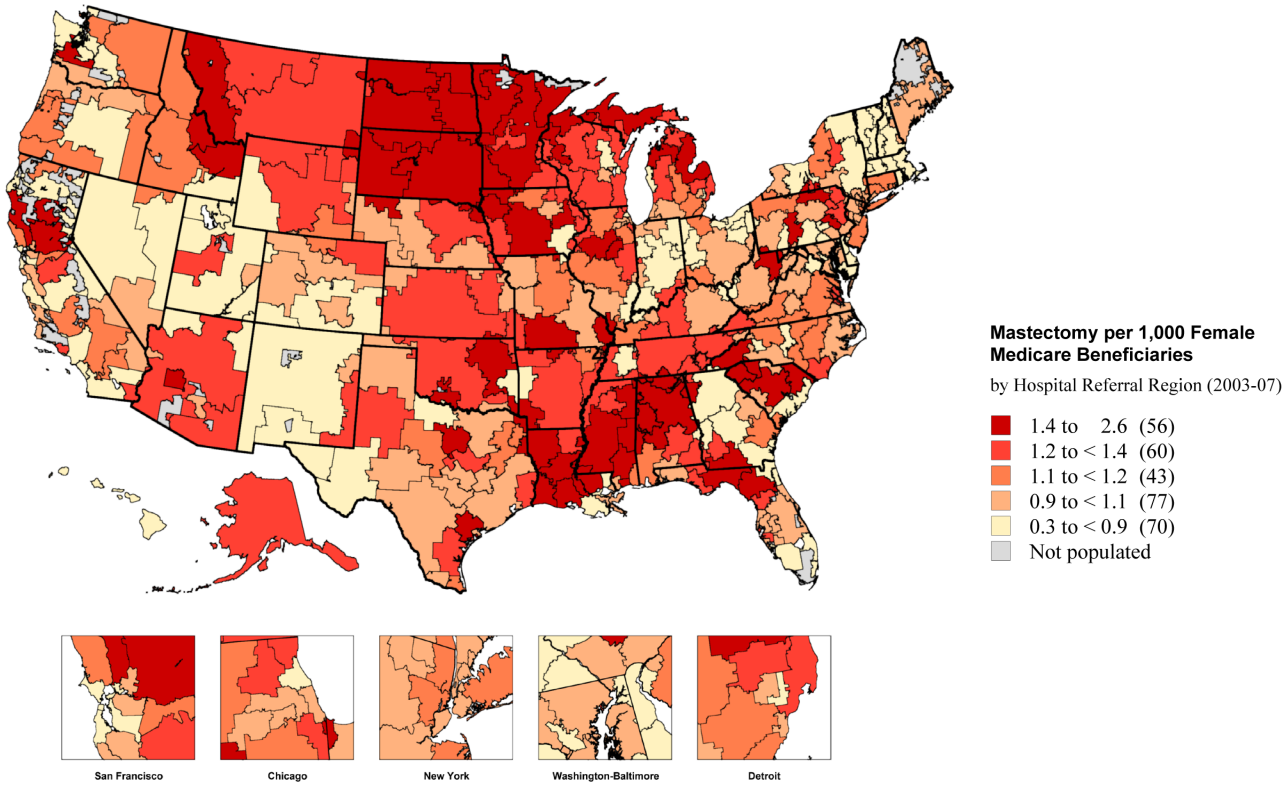
There was a high degree of variation in rates of mastectomy across the U.S. during the period 2003-07 (Map 1). This variation is a reflection of several factors that go into the choice between mastectomy and lumpectomy. Physicians have different views about which surgery they recommend, and their opinions do not always take into account what patients want. In recent years, some breast surgeons have moved away from performing mastectomies in the belief that lumpectomies are better for most women, regardless of whether patients prefer it. At least one study has found a

Early-Stage Breast Cancer

gap between what women with early breast cancer value and what their physicians and nurses think patients want.[7]

Patients also vary in their choices. Some studies have found that the choice of lumpectomy is strongly associated with more years of formal education. Another way of saying this is that more educated women may be less likely to choose mastectomy. But other studies have shown that women who participate in the decision about breast surgery are *more* likely to choose mastectomy than women whose surgeons make the decision.[8,9]

The person in the best position to decide which surgery to undergo is the patient. Women who are active participants in the decision about how to treat early-stage breast cancer are more satisfied with their treatment than women who are not active participants, regardless of which treatment they received.[8,9]



Map 1. Mastectomy per 1,000 female Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of mastectomy (surgical removal of the breast) per 1,000 female Medicare beneficiaries in each of the 306 HRRs. Rates are adjusted for age and race. The highest rate, 2.5 surgeries per 1,000 female Medicare beneficiaries, was seen in the Victoria, Texas HRR. The lowest rate, 0.3 surgeries per 1,000, was seen in the Muncie, Indiana HRR. In other words, women over 65 living in Victoria were more than seven times more likely to undergo mastectomy for early-stage breast cancer than women living in Muncie. The average rate of mastectomy was 1.1 per 1,000 in the entire U.S.

The greatest variation within a single region was seen in Raleigh, North Carolina, where the rate of mastectomy ranged from 0.4 per 1,000, in the Wilson HSA to 2.7 per 1,000 in the Goldsboro HSA.

Stable Angina

The coronary arteries supply blood to the heart muscle. Fatty deposits, called plaques, sometimes form inside the arteries; this is called coronary artery disease. If the plaques narrow the artery enough that it is unable to deliver enough oxygen to the heart muscle, patients can experience chest pain called angina.

There are two types of angina. A person is said to have "unstable angina" if he or she has pain that is unpredictable, unexpected or difficult to control. This type of angina is an emergency and can signal a heart attack. However, chest pain that occurs at predictable times, such as with exertion—walking up stairs, for example, or lifting something heavy—is called "stable angina." The severity and associated disability can vary, but stable angina is usually relieved by resting or taking nitroglycerin.

How stable angina is diagnosed and treated

Once an emergency (like a heart attack) has been ruled out, it is important to determine the cause of the chest pain. Several conditions that have nothing to do with the heart can cause chest pain, such as severe heartburn or chest muscle strain. Tests may be done to determine if the chest pain is due to coronary artery disease, often starting with an exercise stress test.

Once coronary artery disease is diagnosed, even when there is no angina, patients are offered medical therapy to reduce their chances of a heart attack and death. Medical therapy typically combines lifestyle changes, such as quitting smoking, losing weight and exercising, with drugs to control blood pressure, manage cholesterol and prevent blood clots from forming. Patients who have stable angina are often given additional drugs to reduce its frequency and discomfort. For some, medical therapy alone provides complete relief from stable angina.

Clinicians may also recommend more invasive procedures for patients with coronary artery disease. One procedure is balloon angioplasty with stents, which involves threading a small tube into the heart vessel (coronary artery) with the fatty blockage, or plaque. A tiny balloon is inflated inside the tube, compressing the plaque against the wall of the vessel, and then leaving behind another small tube—called a stent—to keep the vessel open. This and related procedures are often referred to as percutaneous coronary intervention, or PCI. When used in addition to medical therapy, PCI can provide greater relief from angina than can medical therapy alone. However, the procedure also has short-term risks; it can sometimes cause heart attacks, strokes or even death. Another procedure to treat large blockages, called coronary artery bypass surgery, or CABG, is even more effective at relieving stable angina, although it has more short-term risks and requires a hospital stay and recovery period.

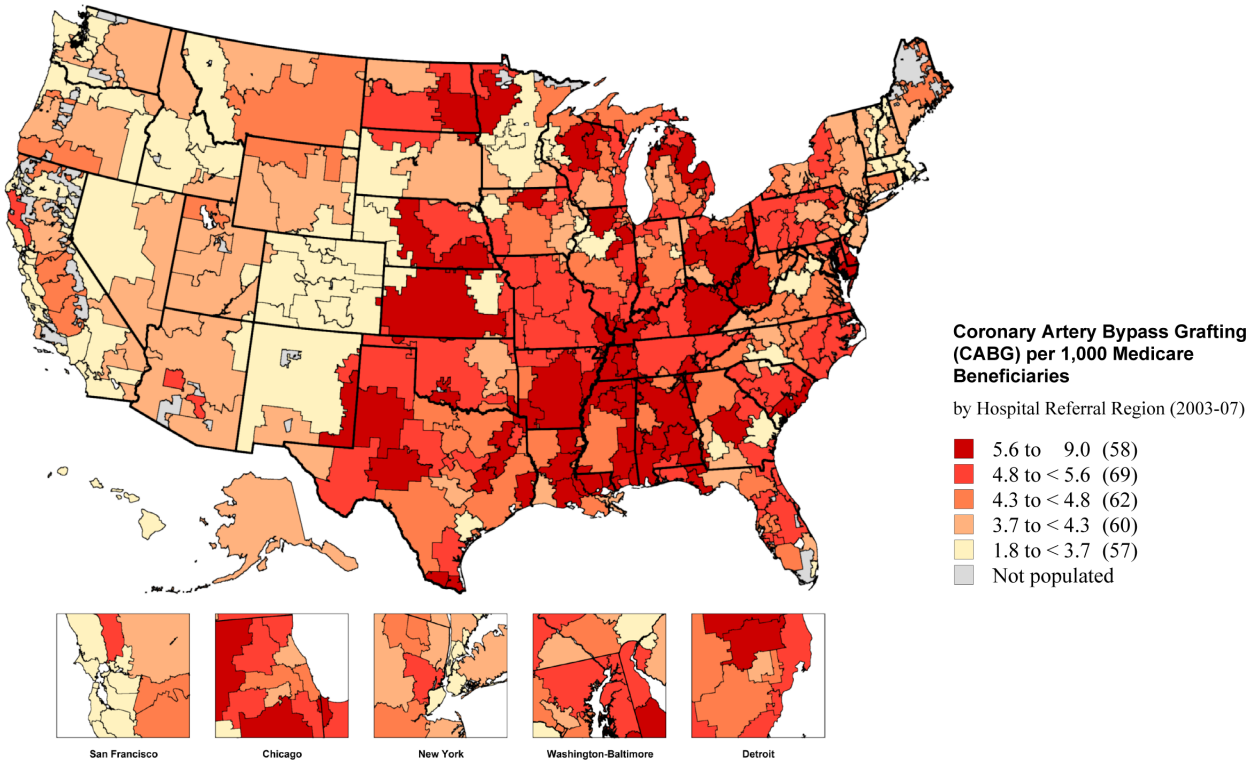
For most people, meaning those *without* severe disease, PCI and CABG do not prevent heart attacks or improve survival compared to medical therapy alone. These procedures treat large blockages—the ones that typically cause angina—while heart attacks are often caused by blockages from smaller plaques. However, for people *with* severe disease (those with large blockages in critical arteries, or

Stable Angina

large blockages in addition to either heart failure or diabetes), PCI and CABG *do* improve survival compared to medical therapy alone.

Patient choices

While all patients with stable angina will need to take medications, patients can choose whether to have PCI or CABG in addition to their prescriptions. For those who do not have severe disease—the majority—these procedures will not, on average, prolong survival, so for these people, the decision may be about how they feel about their angina. If medical therapy cannot adequately address their angina symptoms, they may look to a procedure. The patient will have to weigh the increased likelihood of angina relief against the potential risks and burdens of the procedures. People with severe disease also have the survival benefit of PCI and CABG to consider compared to medical therapy alone. The trade-offs may vary depending on the person; for instance, people with diabetes are more likely to experience harm during CABG. It is also important to realize that people may



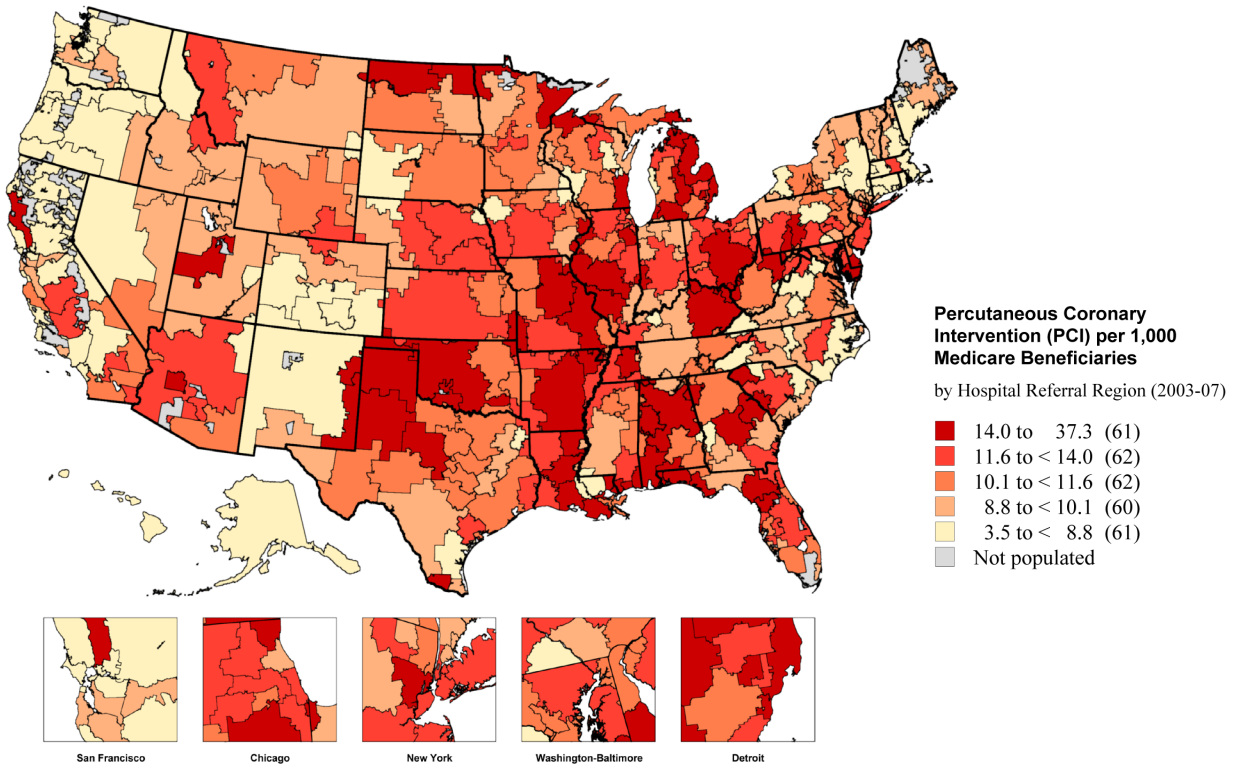
Map 2. Coronary artery bypass surgery (CABG) per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of CABG surgery per 1,000 Medicare beneficiaries in each HRR. Rates are adjusted for age, sex and race. The highest rate, 8.9 procedures per 1,000 beneficiaries, was seen in McAllen, Texas. The lowest rate, 1.9 procedures per 1,000, was seen in Pueblo, Colorado. In other words, patients in the McAllen HRR were more than four times more likely than patients in the Pueblo HRR to undergo CABG during 2003-07. The national average rate of CABG was 4.6 per 1,000. The greatest variation within a single HRR was seen in Denver, where the rate of CABG surgery ranged from less than 2 per 1,000 beneficiaries in the Steamboat Springs, Colorado HSA to more than 7 per 1,000 in the McCook, Nebraska HSA.[v]

[v]Hospital service areas can belong to hospital referral regions in different states if patients frequently cross state lines to receive care at the closest tertiary care hospital.

not know whether or not they have severe disease unless they choose to have additional tests, which have their own short-term risks.

Physicians do not always agree on the best course of treatment for patients with stable angina, which is reflected in the degree of variation in rates; rates of CABG varied nearly fivefold across HRRs (Map 2), and rates of PCI varied more than tenfold (Map 3). Some believe that, compared to medical therapy alone, heart procedures prolong survival, even in people without severe disease. Many patients also have a difficult time understanding why a procedure that opens blood vessels would not be the best option.[10] The decision on how to treat stable angina is best shared between the patient and the physician. The doctor can help the patient understand the pros and cons of each treatment choice for their particular situation: for instance, how their diabetes influences the trade-offs in benefit and risk. But only the patient knows how bothersome the symptoms are and how he or she feels about the pros and cons of each treatment option. For some people, a few angina attacks are tolerable, as long as the pain can be relieved with rest or nitroglycerin. For other people, the possibility of greater angina relief makes the short-term risks of PCI and CABG worth taking.



Map 3. Percutaneous coronary intervention (PCI) per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

The different colors represent the rates of PCI per 1,000 Medicare beneficiaries in each HRR. Rates are adjusted for age, sex and race. The highest rate, 37.3 procedures per 1,000 beneficiaries, was seen in the Elyria, Ohio HRR. The lowest rate, 3.6 procedures per 1,000, was seen in Honolulu. Medicare beneficiaries living in the Elyria HRR were more than ten times more likely to undergo PCI than beneficiaries living in Honolulu. The rate in Elyria was also more than three times the average rate across the entire U.S (11.3 per 1,000). The greatest variation within a single HRR was seen in Napa, California, where the rate of PCI ranged from a little more than 5 per 1,000 beneficiaries in the Fort Bragg HSA to nearly 42 in the Clearlake HSA.

Low Back Pain

Low back pain is a nearly universal complaint that afflicts most American adults at some point in their lives. Most episodes of back pain go away in time with no treatment, even when the pain is severe or when it persists for weeks or months. The majority of back pain is termed "non-specific," which means it cannot be traced to a specific cause. Back pain that has lasted up to four weeks is called "acute." Pain that lasts more than four weeks may be considered "sub-acute" or "chronic," depending upon the duration. While back pain is common, diagnosing its specific cause can be difficult. Less than 10% of people who visit their clinicians because of back pain have an identifiable cause. For the vast majority, the cause of their pain is unknown.

How low back pain is diagnosed and treated

After first ruling out a serious cause for acute back pain (for example, a spine infection or cancer), physicians and nurses will often recommend over-the-counter pain medication such as acetaminophen, ibuprofen or naproxen. Spinal manipulation may also help. Bed rest and inactivity will delay recovery. If the pain is severe and interferes with sleep or the ability to work, physicians sometimes recommend short courses of drugs that relax muscles, such as cyclobenzaprine, or pain medications that contain morphine-like drugs known as opioids, such as codeine.

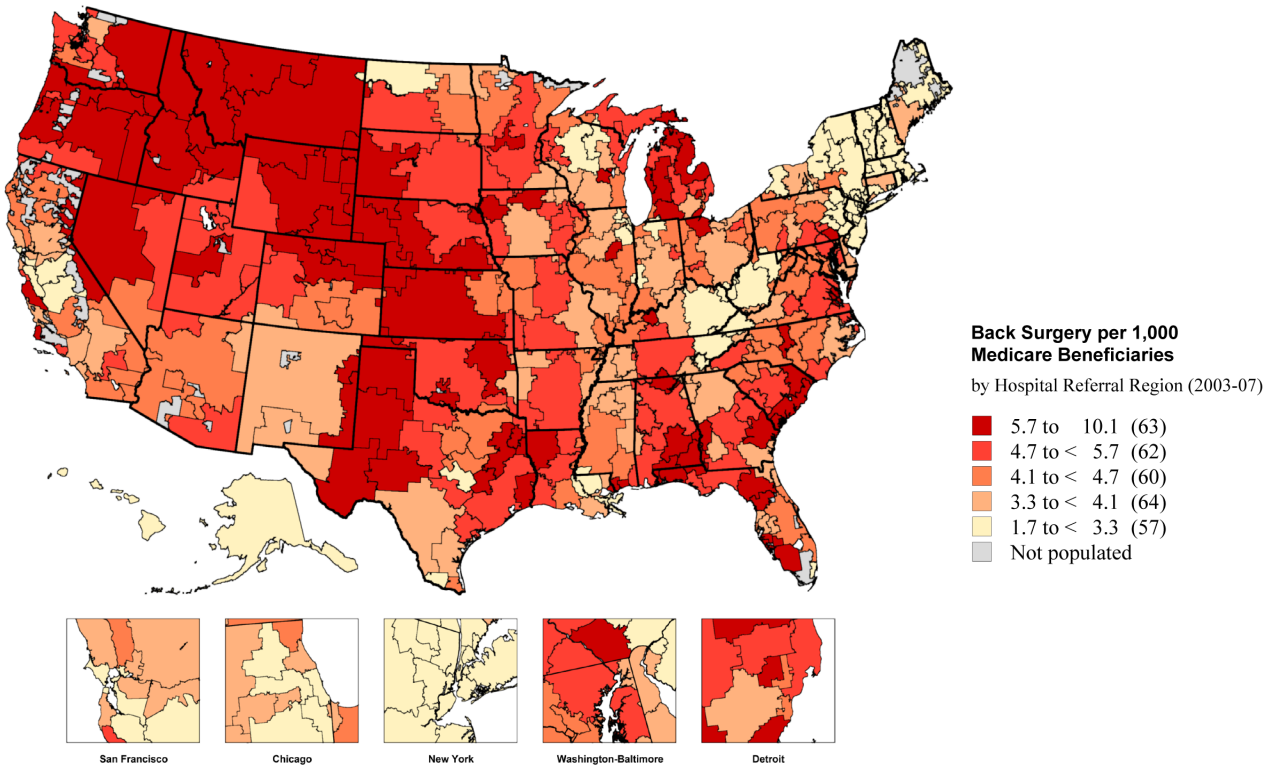
For non-specific back pain that lasts beyond the first month, there are a variety of other treatments, including physical therapy, exercise, massage, acupuncture, yoga, relaxation therapy and cognitive behavioral therapy. There is little evidence that surgery is better than non-surgical treatment for chronic or persistent non-specific low back pain in patients who do not also have leg pain.

Sometimes a herniated or "ruptured" disc in the spine can cause sciatica, pain that usually extends down the back of the legs and may occur along with back pain. Herniated discs are visible on advanced imaging tests—such as a magnetic resonance image (MRI) or a computed tomography (CT) scan—but not on plain X-rays. These discs sit between the vertebrae to cushion the impact of bone on bone. They are filled with a soft, jelly-like material, which can bulge or break out from the fibrous covering of the disc, irritating nerves and causing sciatica. Herniated discs are not believed to cause low back pain, only sciatica. Herniated discs are most commonly diagnosed in people aged 30-50 years and affect men and women about equally.

If the pain persists for more than a month, the patient's physician may order an imaging test such as an MRI or CT scan. Imaging tests are usually not helpful in diagnosing and treating back pain and may even be misleading. Some people with severe back pain have normal spine imaging tests. On the other hand, more than half of people *without* back pain have a bulging or herniated disc on imaging scans, so the results of an imaging test alone are not enough to determine a source of the pain or indicate a particular treatment.

Back pain and leg pain may be related to arthritis, which can cause bony growths on the vertebrae that press on nerves or irritate them. This condition is known as spinal stenosis ("stenosis" means "narrowing"). Pain from spinal stenosis can radiate down the legs and feel like numbness or tingling, and unpleasant muscle spasms are common. Spinal stenosis most often occurs among people in their 50s and older and appears to be more common in women than men.

The pain associated with herniated disc usually goes away on its own. Some people with mild to moderately symptomatic stenosis get better with no treatment, some get worse, and most stay about the same. Strengthening and aerobic activities may help reduce pain and improve the ability to do physical activities for some people with spinal stenosis. Medications may also help with short-term flare-ups, but the drugs can be habit forming and cause side effects. Steroid injections may relieve pain temporarily, although it is not known how often they can be taken safely.



Map 4. Back surgery per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of back surgery per 1,000 Medicare beneficiaries in each HRR. Rates are adjusted for age, sex and race. The highest rate, 10.0 surgeries per 1,000 Medicare beneficiaries, was seen in Casper, Wyoming. This rate was nearly six times higher than the lowest rate, 1.7 surgeries per 1,000, seen in the Honolulu HRR. The average rate of back surgery in the entire U.S. was 4.3 per 1,000.

The greatest variation within a single region was seen in Lexington, Kentucky, where the rate of back surgery ranged from 0.8 per 1,000 beneficiaries in the Jackson HSA to 5.4 per 1,000 in the Somerset HSA.

There are several surgical procedures used to treat herniated disc and spinal stenosis. Until recently, there has been limited scientific evidence to show when surgery might be effective. For herniated disc, surgery appears to be more helpful for leg pain than back pain. For those with leg pain, surgery may offer slightly faster relief than non-surgical treatment, but it is no more effective over time. Some patients get no relief at all or suffer more pain after surgery.[11-13]

Research now suggests that patients with spinal stenosis may find more pain relief from surgery than from non-surgical treatment.[14,15] However, surgery has more risks, and a significant number of people who undergo one type of surgery, spinal fusion, have additional back surgeries to treat ongoing pain.

Patient choices

Rates of back surgery varied nearly sixfold in different parts of the country during 2003-07 (Map 4). Because patients differ in both their perceptions of pain and the disability it can cause and their preferences for treatment, they should not have surgery based solely on a diagnosis of chronic low back pain, spinal stenosis or herniated disc. For some, the pain and lack of mobility are not severe enough to warrant major surgery, which involves real risks. Older patients may have other serious conditions, such as heart disease, that may also restrict their movements or increase the risks of surgery, so back surgery might not offer a substantial improvement in their quality of life. For some people with herniated disc or spinal stenosis, surgery may seem like the right choice despite the risks and uncertainty about the outcome.

Osteoarthritis of the Knee and Hip Joints

As people age, their knee and hip joints may become stiff and sore due to osteoarthritis, or degeneration of the joint cartilage. Painful osteoarthritis can limit mobility, and pain medications and other non-surgical approaches may have limited power to relieve symptoms. For patients suffering from severe osteoarthritis pain, surgeons may recommend total joint replacement. This is a major surgical procedure that removes the patient's joint and replaces it with a prosthetic (artificial) device.

How osteoarthritis is diagnosed and treated

Osteoarthritis of the hip or knee is usually diagnosed on the basis of the patient's symptoms, followed by an imaging test such as an X-ray or a magnetic resonance image (MRI), which can show damage to the cartilage and bone in the joint. But the severity of the damage that appears on an image is not a sufficient reason for recommending treatment. Some patients, even those with severe symptoms and X-ray or MRI evidence of damage to the joint, are not bothered enough by their condition to want to undergo surgery. A recent Canadian study found that only about 35% of patients with severe symptoms of arthritis and significant damage to their joint definitely or probably wanted surgery at that time. Most were unwilling to have it, or unsure.[16] Moreover, patients with severe degeneration on an X-ray or MRI may experience little pain, while the joints of some patients with severe pain may show little degeneration on images.

There are several ways to treat knee and hip pain, each of which has potential benefits and risks. Exercise can help reduce stiffness, strengthen supporting muscles, and boost energy level and mood. Clinicians may recommend that patients with knee osteoarthritis lose weight, which can relieve stress on the knees and poses very little risk (and may offer other health benefits). It is not known whether weight loss helps hip pain.

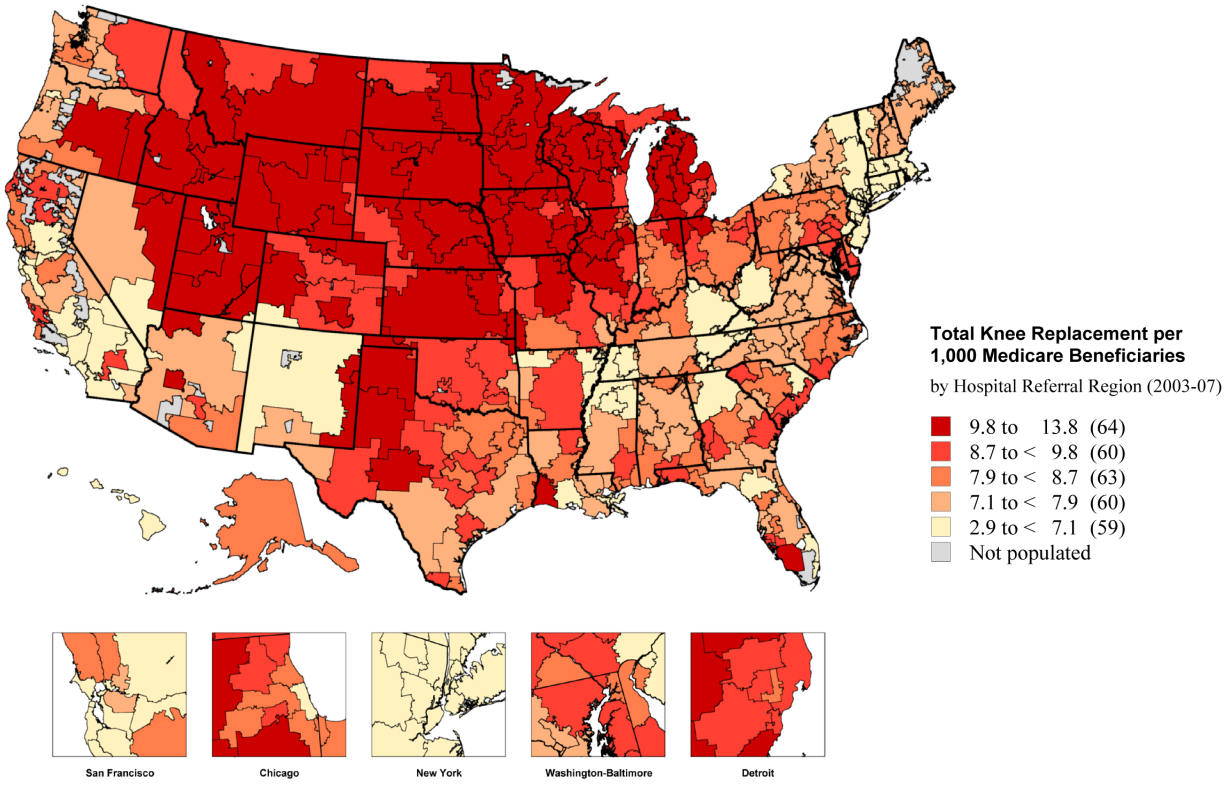
Pain medications such as aspirin, ibuprofen, naproxen and acetaminophen may relieve pain, but many pain medications can irritate the stomach when taken for long periods of time or in high doses. In rare cases, this irritation can cause life-threatening bleeding. Using a cane or walker can improve mobility but will not relieve pain.

For patients with severe osteoarthritis, total joint replacement usually relieves pain and improves mobility. Like any major surgery, joint replacement can pose serious risks, including death, a blood clot in the lung, and infection. The initial rehabilitation period for total joint replacement may last weeks, during which time mobility is severely limited. It may take another two to three months before the patient can resume most of his or her usual daily activities. For about 10% of patients, surgery does not relieve pain and may make it worse. A few patients may experience problems due to the prosthetic joint itself. Eventually the artificial joint may wear out, and the patient may face the same decision about surgery when he or she is older and may be less able to undergo surgery safely.

Osteoarthritis of the Knee and Hip Joints

Patient choices

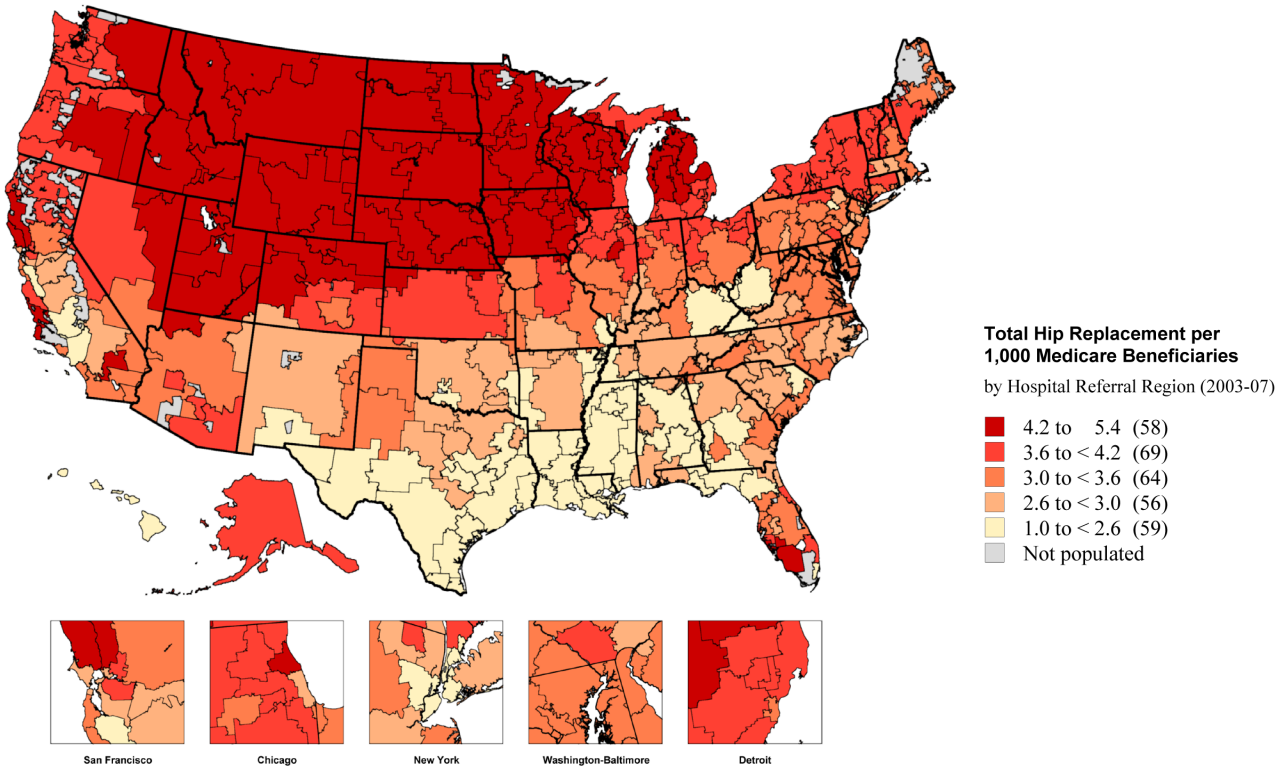
Rates of surgery to replace a hip or knee varied approximately fivefold across HRRs during 2003-07 (Maps 5 and 6), reflecting the lack of agreement about how best to treat patients with osteoarthritis. The decision about whether or not to undergo joint replacement surgery should be shared between the patient and his or her clinician. For some patients, the pain and activity limitations from osteoarthritis are not severe enough to warrant major surgery, and they would prefer to continue with non-surgical treatments or try losing weight. Some patients have other serious conditions, such as lung disease, that make surgery more dangerous. For others, the risks of surgery and the time needed for rehabilitation are worth taking.



Map 5. Total knee replacement per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

Each area on the map represents an HRR. The color indicates the rate of total knee replacement per 1,000 Medicare beneficiaries in that HRR. Rates are adjusted for age, sex and race. There was considerable variation in the rates at which Medicare beneficiaries underwent knee replacement during 2003-07. Medicare beneficiaries living in the Lincoln, Nebraska HRR were nearly five times more likely to undergo joint replacement surgery for osteoarthritis of the knee than beneficiaries living in Honolulu (13.8 per 1,000 beneficiaries versus 2.9 per 1,000). The national average rate of knee replacement was 8.0 per 1,000.

The greatest variation within a single HRR was seen in Charleston, West Virginia, where the rate of knee replacement surgery ranged from 2.7 per 1,000 beneficiaries in the Williamson HSA to 9.2 per 1,000 beneficiaries in the Hurricane HSA.



Map 6. Total hip replacement per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

Each area on the map represents an HRR. The color indicates the rate of total hip replacement per 1,000 Medicare beneficiaries in that HRR. Rates are adjusted for age, sex and race. There was considerable variation in the rate at which Medicare beneficiaries underwent hip replacement. The highest rate, 5.3 surgeries per 1,000 beneficiaries, was seen in the Sioux City, Iowa HRR; the lowest rate, 1.0 procedure per 1,000, was seen in Honolulu. In other words, beneficiaries living in and around Sioux City were more than five times more likely to undergo the surgery than beneficiaries living in Honolulu. The average rate of hip replacement in the U.S. was 3.3 per 1,000 Medicare beneficiaries.

Even within a single HRR, there was substantial variation in rates of hip replacement. For example, in the San Diego region, the rate of hip replacement surgery ranged from less than 1 procedure per 1,000 beneficiaries in and around the community of National City to nearly 7 per 1,000 beneficiaries in nearby Coronado.

Carotid Artery Disease

The carotid arteries supply blood to the brain. Fatty deposits called plaques sometimes form inside them. When they do, the condition is called carotid artery disease or carotid stenosis ("stenosis" means "narrowing"). Carotid artery disease often causes no symptoms. Many people learn they have the condition only after they have a test, such as an ultrasound, that shows how well blood is flowing in the arteries.

Having carotid artery disease means a patient is at increased risk of having a stroke or a transient ischemic attack (TIA). A stroke happens when blood flow to a part of the brain is blocked by a blood clot or a piece of plaque that has broken off and traveled up into the smaller blood vessels in the brain. If a part of the brain goes without blood for too long, the cells in that area die. The effects may last for days, weeks, months, or the rest of the patient's life. A TIA is a temporary stroke. A clot or plaque blocks the flow of blood for a short time and then dissolves, and the symptoms go away in a matter of minutes or hours.

Even though carotid artery disease can increase a person's risk of stroke, most people with the condition never have one. Out of 100 people with carotid artery disease who take medication to lower their risk and have not had a stroke or TIA in the past 12 months, a little more than 2 will have a stroke within the next year, and 98 will not.[17]

How carotid artery disease is diagnosed and treated

Carotid artery disease is diagnosed with various imaging tests including ultrasound, which gives a picture of the insides of the arteries in the neck and can show whether and by how much they are narrowed by plaque. Studies show that medications that lower blood pressure and help prevent blood clots can lower the risk of stroke. Quitting smoking and getting regular physical activity can also lower the risk of stroke, as can carotid artery surgery. The two main surgeries are carotid endarterectomy and stenting. During an endarterectomy, the surgeon makes an incision in the neck, opens the artery, removes the plaque, and closes the artery back up. Carotid stenting is a relatively new procedure. The surgeon inserts a stent (a tiny metal tube) to keep the artery open. Both procedures involve a stay in the hospital.

In asymptomatic patients—those who have not had a stroke or TIA within the past 12 months—carotid endarterectomy surgery can reduce the risk of stroke more than medications alone (to about 6% over five years versus about 12% over five years for medication alone). But surgery itself can cause a stroke, a heart attack or death. Even though surgery can lower the chance of stroke, there is no strong evidence that people who have it live longer than people who do not.[17]

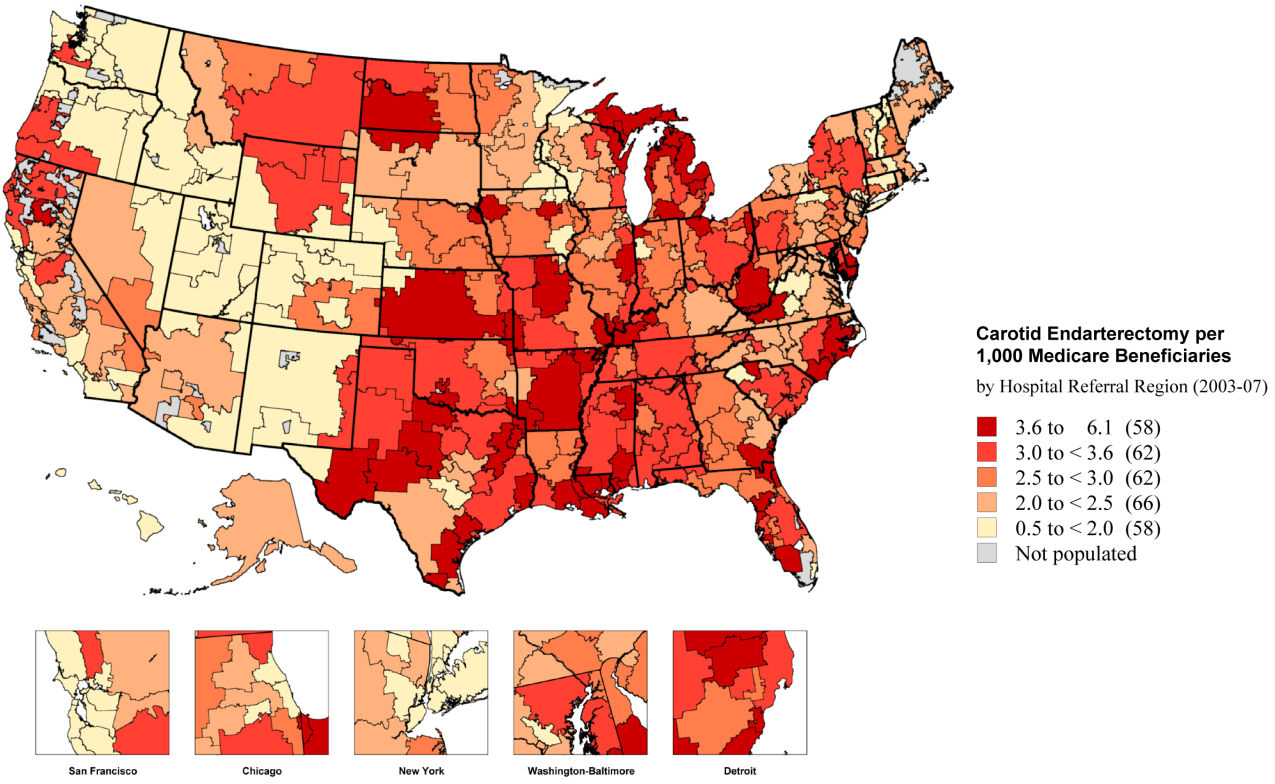
Patient choices

Once the diagnosis of carotid stenosis is made, the patient has the option to be treated medically—with drugs and lifestyle changes—or with medical treatment plus surgery. Medical treatment alone can help, and surgery reduces the risk further. But there is a trade-off, because surgery also increases the short-term risk of

stroke, heart attack and death. In addition, only 15% of all strokes are due to carotid artery disease. Other health conditions, such as heart, lung or kidney disease and diabetes, can also cause a stroke, and surgery does not reduce the risk of stroke from these causes.

Physicians differ in the value they place on the short-term risks of surgery versus the long-term risks of stroke. There is also disagreement among physicians about the value of carotid endarterectomy versus carotid stenting. The very high variation in rates of carotid endarterectomy in different parts of the country (Map 7) is likely due in part to the range of opinions about the value of surgery among clinicians.

The decision to proceed or not with carotid artery surgery should be shared between the patient and clinician. For some patients, the potential long-term benefits of carotid artery surgery will outweigh the possible short-term risks. For others, the immediate risks of surgery will outweigh the long-term benefits, and they would prefer to continue with medical treatment.



Map 7. Carotid endarterectomy per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of carotid endarterectomy per 1,000 Medicare beneficiaries in each HRR. Rates are adjusted for age, sex and race. The highest rate, 6.0 surgeries per 1,000 beneficiaries, was seen in the Beaumont, Texas HRR. The lowest rate, 0.5 surgeries per 1,000, was seen in Honolulu; Medicare beneficiaries living in the Honolulu HRR were twelve times more likely to undergo the procedure than beneficiaries living in Beaumont. The average rate of carotid endarterectomy surgery was 2.7 per 1,000 in the entire U.S. The greatest variation within a single HRR was seen in Albuquerque, where the rate of surgery ranged from a little more than 0.5 per 1,000 beneficiaries in the Gallup/Crownpoint area to nearly 4.5 per 1,000 beneficiaries in Roswell.

Gallstones

Gallstone disease is one of the most common and costly of all digestive disorders. Gallstones are hard, pebble-like deposits that can form in the gallbladder, a pear-shaped sac located in the upper abdomen that secretes bile into the small intestine to aid the digestion of fats. Gallstones can be as small as a grain of sand or as big as a golf ball. They form for unknown reasons, and they are most common among women, certain ethnic groups, people over 40, and those who are overweight, pregnant, have diabetes, take certain medications (for example, birth control pills) or lose a lot of weight quickly.

How gallstones are diagnosed and treated

In the past, gallstones were generally diagnosed when a patient suffered a gallbladder "attack," an episode of moderate to severe abdominal pain caused by one of two conditions: biliary colic or acute cholecystitis. Biliary colic, which occurs when the stone or stones irritate the lining of the gut, generally goes away on its own in a matter of minutes to hours. In acute cholecystitis, the stone blocks a bile duct, causing the gallbladder to become inflamed and sometimes infected. Complications of gallstones can include jaundice (yellowing of the skin and whites of the eyes), fever and acute pancreatitis (inflammation of the pancreas).

These days, most gallstones are detected as "silent gallstones," meaning they do not cause symptoms. The diagnosis is usually made when the patient is undergoing an imaging test for another condition. Gallstones are diagnosed using ultrasound, X-ray, computed tomography (CT) scan or another method of imaging. Many people have gallstones and never have symptoms.

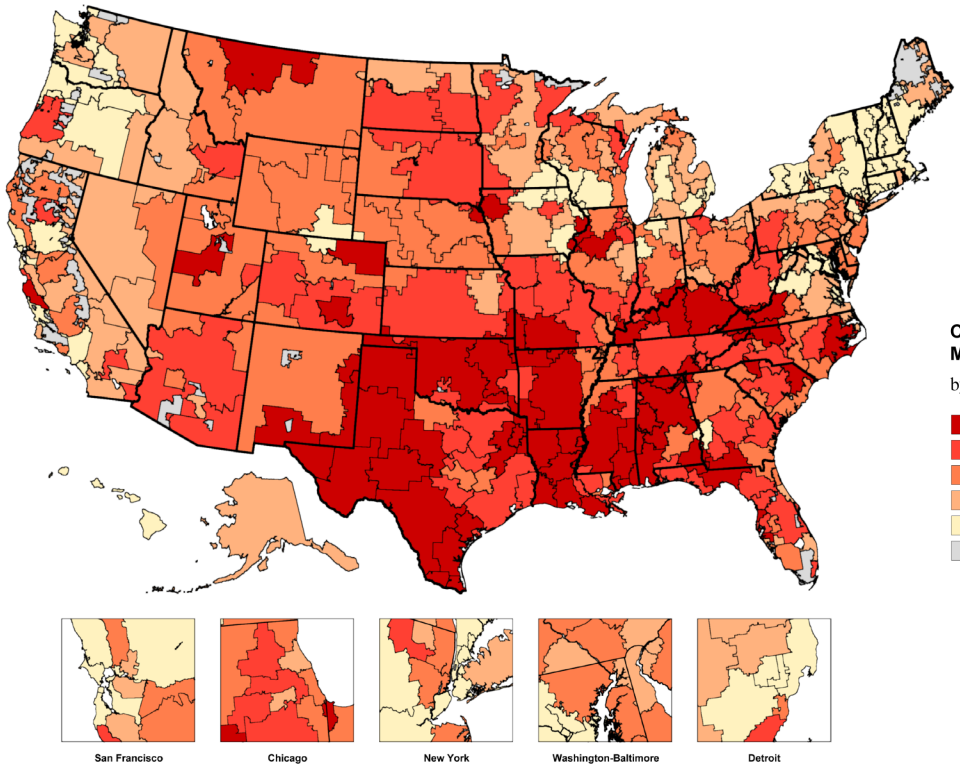
Patients with gallstones and no symptoms ("silent gallstones") do not require treatment; rather, they should be educated about the symptoms of gallstone disease and when to seek treatment if symptoms occur. Patients who suffer from gallstones that cause symptoms (biliary colic or acute cholecystitis) may want to consider the various treatment options: medications, minimally invasive procedures and surgery. Some kinds of gallstones, which are made of cholesterol, can be treated with drugs that dissolve cholesterol. Gallstones are sometimes broken up using shock wave lithotripsy, a powerful beam of sound. Alternatively, the gallbladder can be surgically removed (cholecystectomy) to prevent future attacks. In rare cases, a stone blocks the bile duct completely, and surgery must be performed immediately to prevent injury to the pancreas.

The gallbladder is commonly removed with minimally invasive (laparascopic) surgery. Compared with open surgery, laparascopic surgery often involves less post-operative pain, a faster recovery and less risk, unless the patient has coronary artery disease, chronic obstructive pulmonary disease or previous upper abdominal surgeries.

Patient choices

Many people who have been diagnosed with silent gallstones will never suffer any symptoms, and choosing no treatment at all is an option. People who have suffered an episode of biliary colic or acute cholecystitis may choose watchful waiting, which simply means waiting until another attack and then deciding if they wish to be treated; or they can consider being treated immediately.

The rate of gallbladder surgery varies widely in different parts of the U.S. (Map 8). Much of this variation appears to be due to differences of opinion among clinicians. Some surgeons recommend that any patient who has gallstones, or has suffered a single gallbladder attack, have their gallbladder removed as a precaution against a future attack requiring emergency surgery. Many believe that it is better to remove the gallbladder when the patient is younger and less likely to suffer complications. Other physicians think it is better to wait, because most patients will not suffer an attack in the future, especially those who have silent gallstones.



Map 8. Cholecystectomy per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of cholecystectomy per 1,000 Medicare beneficiaries in each HRR. Rates are adjusted for age, sex and race. The highest rate, 6.8 procedures per 1,000 Medicare beneficiaries, was seen in the McAllen, Texas HRR. The lowest rate, 2.4 procedures per 1,000, was seen in the Mason City, Iowa HRR. Medicare beneficiaries living in and around McAllen, Texas were nearly three times more likely to undergo gallbladder surgery than beneficiaries living in Mason City during 2003-07. The average rate of gallbladder surgery in the entire U.S. was 4.0 per 1,000. The greatest variation within a single HRR was seen in Minneapolis, where the rate of gallbladder surgery ranged from 1.9 per 1,000 beneficiaries in the Aitkin HSA to 10.3 per 1,000 in the Wadena HSA.

Gallstones

The person in the best position to choose among these options is the patient. Some with silent gallstones may decide that the risk of a first attack is low enough that they would prefer not to undergo surgery. Even patients who have experienced an episode of biliary colic or acute cholecystitis may want to try drugs, dietary changes or shock wave lithotripsy before they consider surgery; or they may be suffering from other conditions that are more worrisome than a possible gallbladder attack. Others may choose to undergo surgery to forestall any possibility of biliary colic or acute cholecystitis.

Enlarged Prostate (Benign Prostatic Hyperplasia)

The prostate is a gland that sits below a man's bladder and makes some of the fluid (semen) that carries sperm. The prostate surrounds the urethra, the tube that carries urine and semen down the penis and out of the body. As men age, the prostate often enlarges, pressing on the urethra and making it more difficult to urinate. This condition, called benign prostatic hyperplasia, or BPH, is not cancer. Symptoms of BPH are very common in older men.

How benign prostatic hyperplasia is diagnosed and treated

BPH can cause a variety of symptoms. Men may feel the urge to urinate but find it takes several seconds for the flow to begin. The flow may be slow, it may start and stop, and men may feel the need urinate more often during the day and at night, and with greater urgency. Many men have an enlarged prostate for years with no symptoms, while others may develop severe symptoms over time. Others may have similar urinary symptoms but no enlarged prostate.

Clinicians diagnose BPH by first asking a man about his symptoms. This is usually followed by digital rectal exam, which involves the clinician inserting a gloved finger into the rectum and feeling the prostate gland through the rectum wall. The clinician may perform other tests such as a urinalysis or measuring the flow of urine.

An enlarged prostate can lead to other complications such as deteriorating bladder muscles, bladder stones, bladder infection and blood in the urine. In some cases, a man may become unable to urinate at all, a complication known as acute urinary retention. To treat this condition, a catheter will be inserted into the bladder to allow urine to drain. Very rarely, an enlarged prostate may lead to kidney failure or serious infection.

For men with symptoms, there are a variety of treatment options available, including watchful waiting, drug treatments, minimally invasive therapies and surgery. All have benefits and risks. In general, the treatments that provide the most symptom relief also have the highest risks.

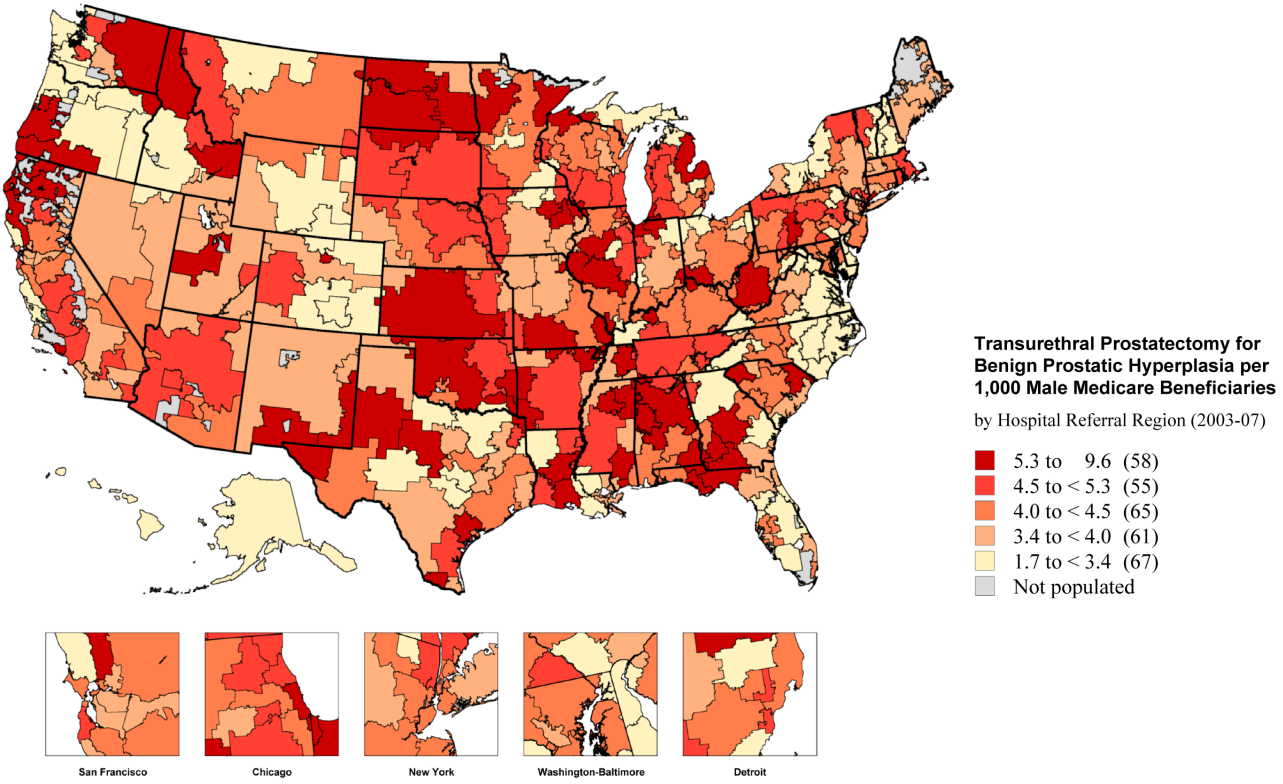
Watchful waiting means that both the clinician and patient monitor symptoms. If symptoms worsen, or if they become too bothersome, the man can decide on a different course of treatment. The risks of watchful waiting include acute urinary retention and the chance that treatment done sometime in the future may provide less symptom relief than it might have had it been done sooner. Drugs such as alpha blockers, reductase inhibitors, or a combination of the two can prevent symptoms of BPH from worsening and provide adequate symptom relief for some men. Side effects caused by these medications go away when they are stopped. Minimally invasive therapies, such as radio waves and laser treatment, destroy prostate tissue around the urethra. They provide more symptom relief than medication but less than surgery. There are also more risks associated with these therapies than with medication but less than the risks associated with surgery.

Of all the treatment options, surgery offers the best chance for improved symptoms, along with the highest risk of complications and side effects. The most common type of surgery is called a transurethral resection of the prostate, or TURP. The most common complication of TURP surgery is retrograde ejaculation or "dry orgasm." This happens when the bladder fails to close when a man ejaculates and semen goes back into the bladder instead of out the penis. This permanent side effect occurs in more than 50% of men who have TURP surgery.

Patient choices

Clinicians have different opinions about the best way to treat BPH. Some may recommend surgery in order to prevent acute urinary retention, which is rarely dangerous but is quite uncomfortable and requires immediate treatment. Other clinicians suggest non-surgical remedies unless the man's symptoms have become extremely severe. These differences of opinion likely contribute to the fivefold variation in rates of TURP, the most common surgery for BPH (Map 9).

However, because men with BPH differ in their perceptions of how bothersome their symptoms are and their preferences for treatment, clinicians cannot judge when or even if a patient should have surgery based on a diagnosis of BPH alone. Which treatment a man chooses, if any, should depend upon how bothersome his symptoms are to him, his level of concern about the possibility of his condition worsening, and his concern about the risks and side effects of surgery. For some men, BPH symptoms are not severe or sufficiently troubling to them to warrant surgery. These men would prefer to continue with less invasive treatments such as watchful waiting or drugs. For men who find their symptoms especially bothersome, the risks of surgery may seem worth taking, particularly if they have already tried other treatments that have failed.



Map 9. Transurethral resection of the prostate (TURP) for benign prostatic hyperplasia (BPH) per 1,000 male Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of TURP for BPH per 1,000 male Medicare beneficiaries in each HRR. Rates are adjusted for age and race. Rates of TURP varied widely across the U.S. during 2003-07. The highest rate, 9.5 procedures per 1,000 male Medicare beneficiaries, was seen in the Idaho Falls, Idaho HRR. This rate was more than five times higher than the lowest rate, 1.7 surgeries per 1,000, in the Terre Haute, Indiana HRR. The national average rate of TURP was 4.3 per 1,000.

The greatest variation within a single hospital referral region was seen in Salt Lake City, where the rate of surgery ranged from less than 1 per 1,000 male beneficiaries in the St. George, Utah HSA to more than 11 per 1,000 male beneficiaries in the Rock Springs, Wyoming HSA.

Early-Stage Prostate Cancer: Screening and Treatment

Prostate cancer is an age-related condition that occurs more commonly as men get older. Most prostate cancer is slow growing and often never causes problems or becomes life threatening. However, if prostate cancer does spread outside the prostate, it can cause bone pain and death. One complication in knowing how best to deal with prostate cancer is that there are no perfect tools for distinguishing which early-stage prostate cancers will become problematic from those that will not. Not all men wish to be screened for prostate cancer (screening means testing for the presence of cancer before it causes symptoms), and it is important for men to understand the trade-offs involved in the decision.

Screening for cancer with the prostate-specific antigen (PSA) test

The PSA test is a blood test that detects the prostate-specific antigen, a protein made by the prostate. A high level of PSA in the blood can indicate the presence of a cancer. However prostate cancer is not the only thing that can cause the level of PSA to be high. This means that sometimes the test leads to a false positive, a high reading when there is no cancer in the prostate. In other cases, the PSA test can miss a cancer. This is called a false negative.

A second important problem with relying on PSA level for cancer diagnosis is that the majority of early-stage prostate cancers are slow growing and unlikely to ever become life threatening. Diagnosing these cancers means that the test has uncovered the presence of something that does not require treatment. The problem is our current inability to distinguish between those early-stage prostate cancers that will grow slowly and those that will develop into aggressive disease.

How prostate cancer is diagnosed and treated

If the level of PSA is elevated, a biopsy is needed to determine whether cancer is present. A prostate biopsy can be painful, and there is a small risk of infection and bleeding. If cancerous cells are present in the biopsy, the clinician and the patient need to decide whether to engage in immediate active treatment and, if so, what type of treatment. There is often considerable uncertainty as to whether the cancer cells will ever grow enough to harm the patient.

There are three categories of treatment for early-stage prostate cancer: active surveillance, surgery and radiation. Active surveillance, also known as “expectant management,” involves regularly monitoring the cancer and deciding on treatment only if it shows signs of progressing. Surgery to treat prostate cancer, known as a prostatectomy, removes the entire prostate gland. Radiation therapy is intended to kill the prostate cancer cells. For men who choose radiation therapy to treat their prostate cancer, several types are available.

Each treatment choice has both benefits and drawbacks. The benefit of choosing active surveillance is avoiding the side effects of surgery and radiation. But men who choose active surveillance risk having their cancers grow to the point that they

begin to cause symptoms, including pain, or become life threatening. Surgery may reduce a man's chances of dying from prostate cancer. But for many men, especially those with other health issues, the prostate cancer will never cause harm, even if left untreated. In addition, if the cancer has spread beyond the prostate, removing it surgically may not offer a cure.

Like any major surgery, removing the prostate gland poses risks. The most serious of these include death, heart attack, stroke, pneumonia and a blood clot in the lungs. Far more common side effects are urine leakage (incontinence) and sexual problems (erectile dysfunction). About a third of men who undergo prostate surgery suffer incontinence and half suffer from erectile dysfunction. Radiation has many of the same common side effects as surgery and, in addition, can cause damage to the bowel and rectum. It is not known to what extent, if any, radiation treatment reduces the risk of dying of early-stage prostate cancer.

Patient choices

The first choice men face is whether or not to have a PSA test. Many clinicians begin recommending the test when a man reaches the age of 50. For men at increased risk of prostate cancer, including those with a family history of prostate cancer and African American men, some guidelines recommend prostate cancer screening at the age of 40. Recent studies have found that getting a PSA test might offer a small reduction in the risk of death from prostate cancer in men who start screening between the ages of 55 and 69.[18] For older men, however, especially those over age 75, catching prostate cancer early and treating it probably will not reduce the risk of dying from prostate cancer. The uncertainty about whether and whom to screen is reflected in the more than tenfold variation in rates of PSA testing among men age 68-74 (Map 10).

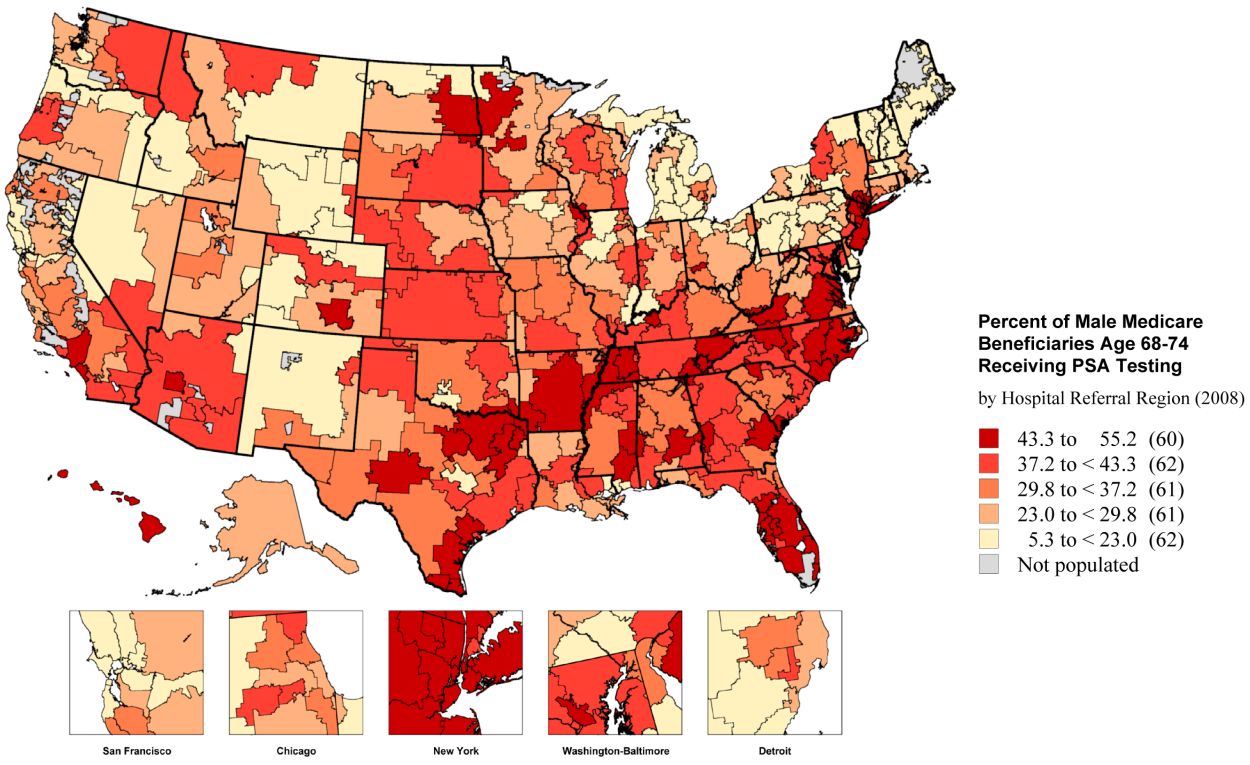
One thing for men to keep in mind is that prostate cancer treatments themselves can cause lasting problems or even death. This is an especially important consideration in light of the fact that many prostate cancers will not progress or cause symptoms within a man's lifetime. For men who would want to have treatment if cancer is found, the choice to have the PSA test will give them the opportunity to find and treat prostate cancer before it causes symptoms. Another way to think about this is the test may be right for men who worry more about the possible harms of cancer than about the possible harms of treatment. Other men choose not to have the test because they would rather not know about a cancer that may never cause problems. These men worry more about the possible harms of treatment than about the possible harms of the cancer.

Once early-stage prostate cancer has been diagnosed, a patient then must make a decision about how he wants to be treated. Active surveillance avoids the side effects of treatment, but men who choose this option run the risk that their cancer will progress and eventually cause symptoms or lead to death. This option also generally involves regular biopsies. Surgery may reduce the risk of dying of prostate cancer, but it has significant side effects. It is not clear that radiation reduces the risk of death for men diagnosed with early-stage prostate cancer, and it too has

Early-Stage Prostate Cancer

side effects. The differences in prostate cancer treatment across the country are reflected in the very high variation in rates of prostatectomy surgery during 2003-07 (Map 11).

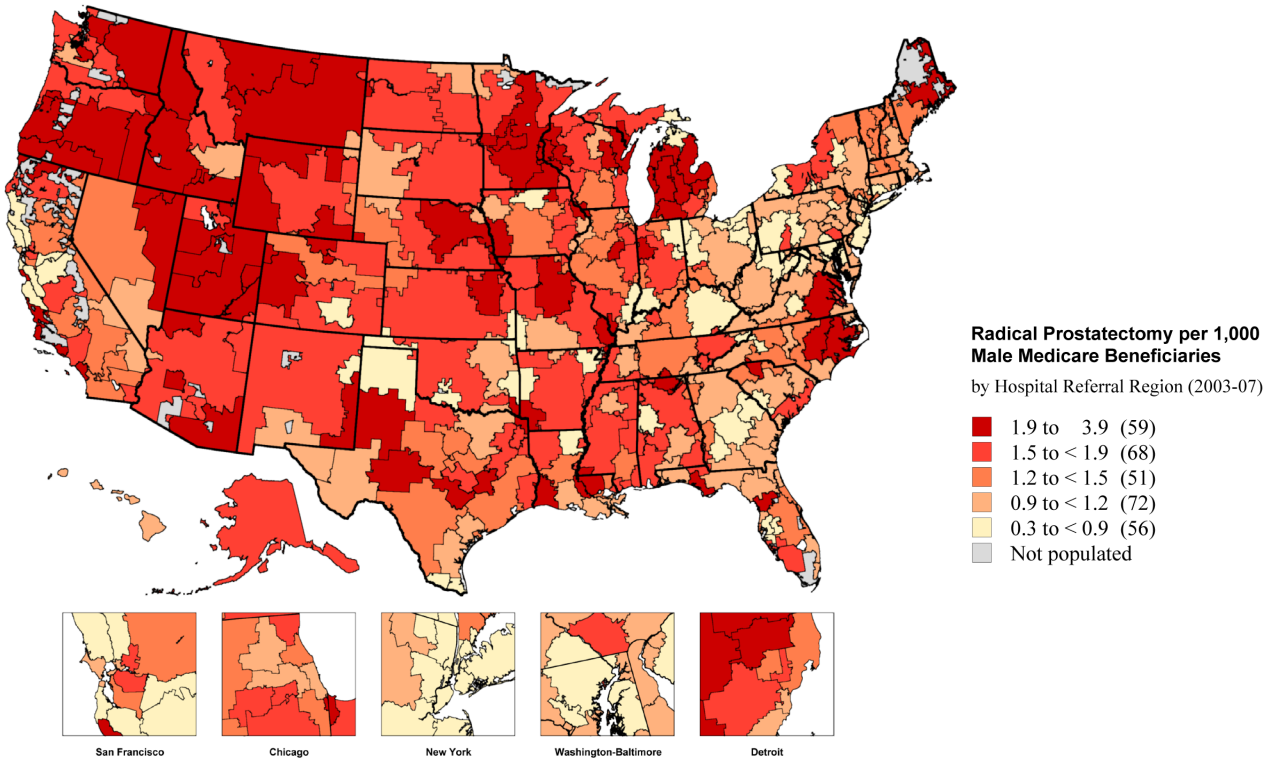
The decision about whether or not to undergo PSA screening should be shared between a clinician and a fully informed patient. Once an early-stage cancer is detected, the well-informed patient may choose to undergo immediate intervention to treat the prostate cancer, or he may wish to avoid immediate treatment and pursue active surveillance.



Map 10. Percent of male Medicare beneficiaries age 68-74 receiving prostate-specific antigen (PSA) testing among hospital referral regions (2008)

The colors on the map represent the percentages of male Medicare beneficiaries age 68-74 having PSA tests in each HRR. Rates are adjusted for race. More than 55% of men age 68-74 underwent PSA testing in the Wilmington, North Carolina HRR in 2008, more than ten times more than in Minot, North Dakota, where about 5% of men age 68-74 had a PSA test. In the U.S., on average, 35% of men age 68-74 underwent PSA testing in 2008.

There was high variation in the percentage of men receiving PSA testing among the HSAs that make up the Sacramento, California HRR. Less than 5% of men age 68-74 had PSA tests in the Grass Valley HSA, while almost 39% of men—nearly 8 times more—received PSA testing in Roseville.



Map 11. Radical prostatectomy per 1,000 male Medicare beneficiaries among hospital referral regions (2003-07)

The colors on the map represent the rates of surgical removal of the prostate (prostatectomy) per 1,000 male Medicare beneficiaries in each HRR. Rates are adjusted for age and race. Men over 65 enrolled in traditional Medicare living in San Luis Obispo, California—where there were 3.8 surgeries per 1,000 during 2003-07—were more than twelve times more likely to undergo radical prostatectomy for prostate cancer than men living in Albany, Georgia (0.3 per 1,000). The national average rate of prostatectomy was 1.4 procedures per 1,000 men.

The greatest variation within a single HRR was seen in Spokane, Washington, where the rate of prostate surgery ranged from 0.6 per 1,000 male beneficiaries in the Lewiston, Idaho HSA to 4.2 per 1,000 male beneficiaries in the Wenatchee, Washington HSA.

Ensuring Patients Get the Care They Need and Want

Undergoing surgery is an important event in the life of any patient. So is taking a test, such as the PSA test, which can lead to a diagnosis of a disease that may or may not matter to the patient's health. Even the decision to undergo medical treatment with drugs involves important choices. Most patients need help to understand the trade-offs involved in treatment decisions. Many patients will then want to discuss their options with their clinicians and come to a shared decision about the best course of action.

For patients: becoming informed

If you are a patient facing a treatment choice or diagnostic decision (for example, PSA screening for prostate cancer), your primary care physician is one of the best resources to go to for more information. Two major primary care physician groups, the American College of Physicians and the American Academy of Family Physicians, have endorsed the practice of shared decision-making; so has the American Medical Association (AMA). According to a recent AMA statement, "although patients always have the right to participate in decisions about their medical treatment, using formal shared decision-making processes can be especially useful in cases where more than one treatment option is available, and no treatment is considered 'best' according to clinical evidence."[19]

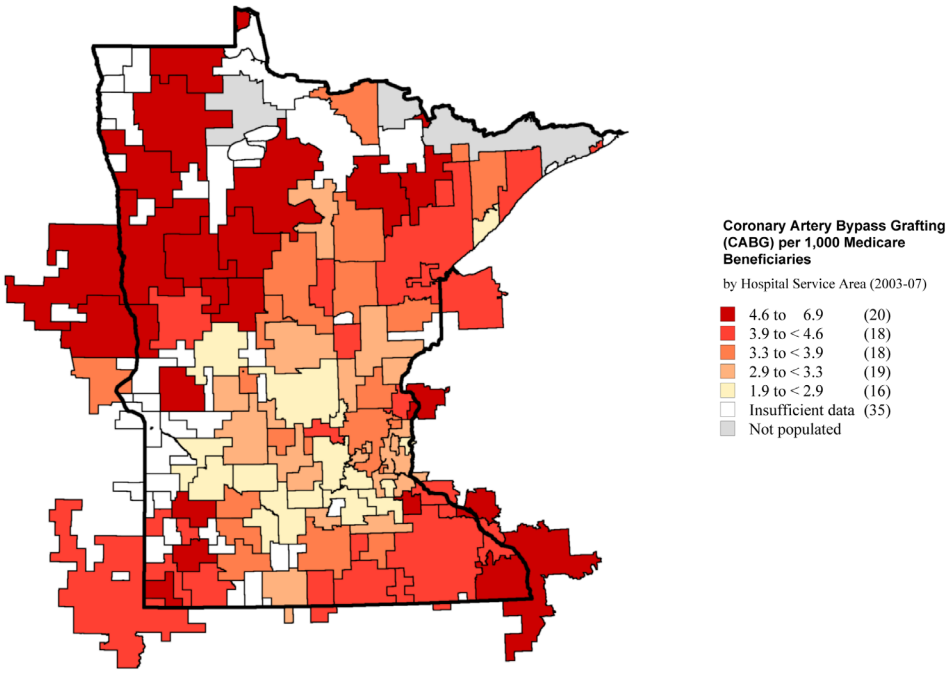
Perhaps the most important aspect of sharing medical decisions is becoming fully informed. According to the AMA, one of the best ways for patients to become informed is with a "patient decision aid." A patient decision aid can be a brochure, a video or DVD, or a web-based interactive program. These aids are intended to help patients understand their condition, what is known about the possible treatments for it, and the potential benefits and risks of various treatment decisions. Aids should also help patients consider their personal values and how they might weigh their various treatment options based on how they feel about different possible outcomes.

Some patient decision aids are available for free on the Internet. They may also be provided as a service by your health insurer. Your primary care physician may be able to help you find the aid that is best for you, or you can ask your insurer to make aids available. Your clinician may also have someone in his or her office—such as a nurse or case manager—who can help you with the information in the aid. Once you have seen or read the decision aid, your physician or another clinician should be able to discuss your options with you and share important decisions about how you want to be treated, including many treatments that may be delivered by another physician, such as a surgeon.

If you have a condition that can be treated with either an elective surgery or a less invasive option, or if you are considering a screening test such as a PSA test, you may also want to know how likely it is that people in your area are receiving one treatment or another. This report provides information about your chances of undergoing one of the ten surgeries and the test detailed in the previous section, depending upon where you live. If your clinician has recommended back or knee

surgery, for example, you can find out the rate of each procedure in your community and compare that to the rate in other communities near you and in the rest of the U.S. Rates for all HRRs and HSAs are available at the Dartmouth Atlas web site (www.dartmouthatlas.org).

For example, the map below shows the rates of cardiac bypass surgery in the 121 hospital service areas within Minnesota. A hospital service area includes at most a handful of hospitals and may not include a referral hospital where cardiac bypass surgery is performed; patients may need to travel to a larger tertiary care hospital in another HSA within the HRR to have this procedure. The rates of cardiac bypass surgery given for each HSA reflect people's chances of undergoing that procedure if they live in the HSA, regardless of where the surgery was actually performed. In Minnesota, the average rate of bypass surgery among Medicare patients living in the Breckenridge HSA was 6.9 per 1,000 Medicare beneficiaries in 2003-07. The rate of bypass surgery was much lower in Alexandria (2.6 per 1,000) and close to the national average in Winona (4.6 per 1,000). This map provides only one example; to find the rates in your community for the ten procedures and the test detailed in this report, please see the Appendix Table or the Dartmouth Atlas web site.



Map 12. Coronary artery bypass surgery (CABG) per 1,000 Medicare beneficiaries among hospital services areas in Minnesota (2003-07)

The colors on the map represent different rates of cardiac bypass surgery (CABG) per 1,000 Medicare beneficiaries in each of the 121 HSAs in the state of Minnesota. Rates are adjusted for age, sex and race. The highest rate, 6.9 surgeries per 1,000 Medicare beneficiaries, was seen in Breckenridge; the lowest rate, 2.0 surgeries per 1,000, was seen in Sleepy Eye. Some HSAs are not shown for one of two reasons: either there were not enough CABG procedures performed on beneficiaries living in the region during the study period to ensure patient confidentiality; or the population of beneficiaries was not large enough to produce a statistically significant rate for this measure. HSAs from other states are shown if their boundaries extend to encompass a significant number of beneficiaries living in Minnesota.

For clinicians: establishing an ethical standard of fully informing patients and engaging them in shared decision-making

The endorsement of shared decision-making and patient decision aids by major professional societies represents a significant shift in the concept of informed consent. Research has shown that the quality of medical decisions resulting from the usual process of informed consent is inadequate. Patients have unrealistic expectations of treatment benefits and harms, and clinicians are often poor judges of patients' values. As a consequence, people do not always get the best treatment for their condition,[4] and we see unwarranted variation in rates of treatment for preference-sensitive conditions such as those detailed in this report.[1]

Medical ethics dictates that patients have the right to understand the possible outcomes of their choices. The current ethical standard of informed consent does not ensure that patients are adequately informed.[20] Patient decision aids represent important tools for ensuring fully informed patients, and shared decision-making is essential to this process. According to the AMA statement, decision aids have three core elements: clinical information, "values clarification," and guidance to help patients make and communicate their treatment decisions. "The clinical information should reinforce what a patient has already learned from his or her physician, and give the patient the opportunity to consider the information in a different way, without being influenced by conscious or unconscious biases on the part of the physician."[19] Patient decision aids should also help patients examine their medical choices in light of their values. Many elective treatments and tests have important social and emotional effects, which patients may not be aware of, and clinicians may not take into account when recommending a treatment option.

While some patients may prefer not to participate in shared decision-making, research suggests that, compared with patients who receive usual care, patients who have access to patient decision aids, and whose physicians and nurses welcome and promote shared decision-making, have less conflict about their decisions, and make more informed, values-based decisions.[4] Clinical studies of patient decision aids and shared decision-making have shown an average 20% reduction in rates of several operations, depending upon the treatment.[4] However, this number reflects the average; some patients decide after shared-decision making to change their treatment choice from medication or watchful waiting to surgery.

Shared decision-making has important implications for reducing unwarranted variation in rates of treatment for preference-sensitive conditions. It may be tempting for policy makers and clinicians to think that a high rate of any given treatment means that patients must be getting all the procedures they need and want. Conversely, they might think low rates of surgery represent a shortage of care. But a high rate of surgery is no guarantee that the *right* patients are undergoing surgery—patients who are appropriate candidates according to clinical guidelines and who want the surgery. By the same token, a low rate of surgery does not necessarily mean that patients are avoiding surgery they neither need nor want.[16]

For this reason, setting quotas for treatments is not the best approach to reduce unwarranted variation. The only way to ensure the rate is "right" is to recognize the need for fully informed patients and for clinicians and patients to share treatment decisions. For many treatments, including many surgeries and some tests, the right rate in a community will probably be lower than the current rate. For other treatments, the right rate may be higher.[21]

Three crucial steps remain in the process of establishing shared decision-making as the ethical standard of care. First, the 2010 Patient Protection and Affordable Care Act provides for the development of patient decision aids and for validating and disseminating them. Second, physicians and nurses will need to be trained in the use of decision aids and the process of sharing decisions. Finally, the legal standard of informed consent should be expanded for medical decisions involving elective procedures and tests.

Traditional disclosure required for legal informed consent does not lead to well-informed patients and thus fully informed choices.[21] The ethical importance of patients making fully informed choices has been recognized by the AMA.[19] States can also promote informed patient choice and shared decision-making by acknowledging the benefits of shared decision-making and offering clinicians legal protection if a competent patient signs a document affirming he or she has been informed and made a shared decision. In 2007, the Washington state legislature passed such legislation, and several other states are considering it.[22] Shared decision-making can remedy the omissions of traditional disclosure, promote better patient understanding of treatment options, and strengthen the therapeutic alliance between clinician and patient.

Appendix on HRR Variation in Minnesota

The distribution graphs in this section provide a simple way to show the variation in rates across the 306 hospital referral regions. Each dot represents one HRR. The chart summarizes two features of the data. The first is a measure of dispersion: if the rate per thousand (or whatever measure is on the vertical axis) for the highest HRR is two or three times higher than the lowest HRR, it suggests substantial variation. Second, the distribution graph shows whether the variation is caused by just a few outliers—HRRs that, for various reasons, are very different from the rest of the country—or whether the variation is pervasive and widespread across the country. The 306 HRRs in the U.S. are represented by blue dots; the red dots indicate the five HRRs in Minnesota.

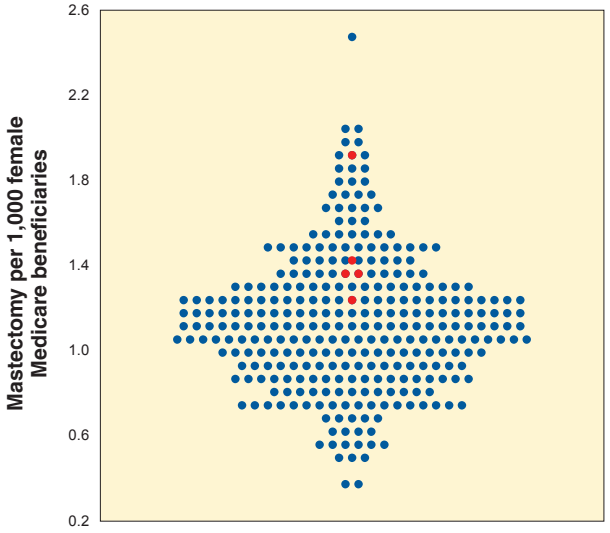


Figure 1. Mastectomy per 1,000 female Medicare beneficiaries among hospital referral regions (2003-07)

Duluth	1.9
Minneapolis	1.4
Rochester	1.4
St. Paul	1.4
St. Cloud	1.3

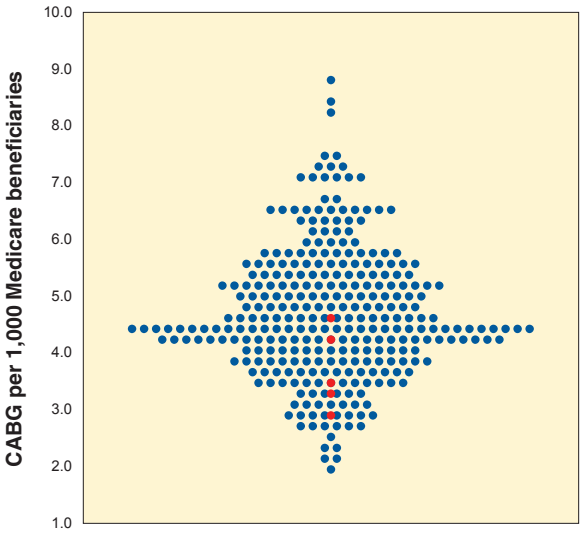


Figure 2. Coronary artery bypass surgery (CABG) per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

Duluth	4.5
Rochester	4.1
Minneapolis	3.6
St. Paul	3.3
St. Cloud	2.8

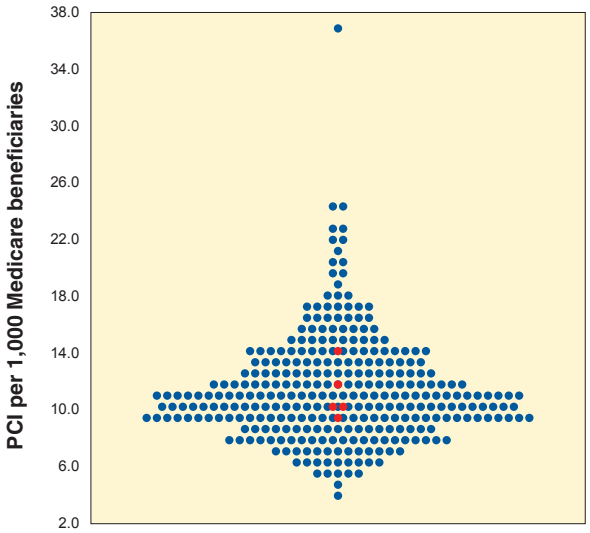


Figure 3. Percutaneous coronary intervention (PCI) per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

Duluth	14.0
St. Cloud	11.6
Minneapolis	10.5
St. Paul	9.9
Rochester	9.1

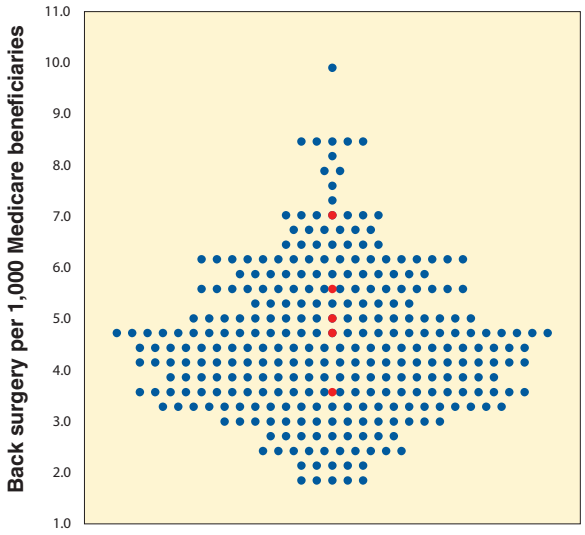


Figure 4. Back surgery per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

St. Cloud	7.0
St. Paul	5.5
Minneapolis	5.0
Duluth	4.6
Rochester	3.6

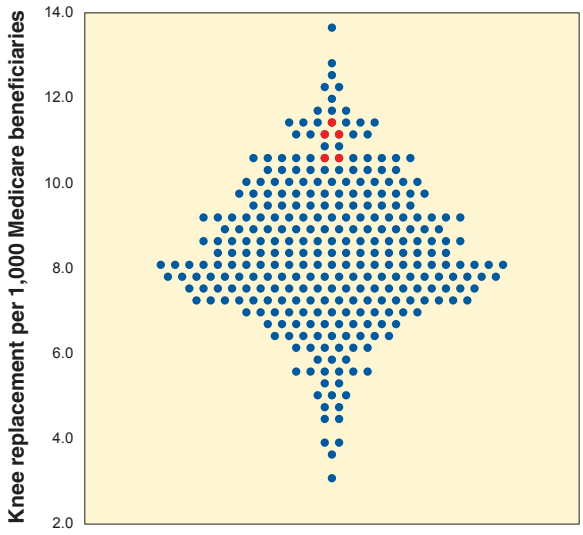


Figure 5. Total knee replacement per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

St. Cloud	11.4
Duluth	11.1
St. Paul	11.1
Rochester	10.7
Minneapolis	10.5

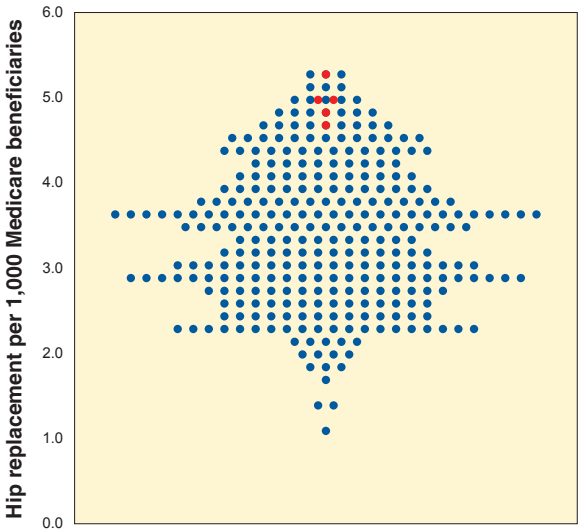


Figure 6. Total hip replacement per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

St. Cloud	5.3
Rochester	5.0
Minneapolis	4.9
Duluth	4.8
St. Paul	4.7

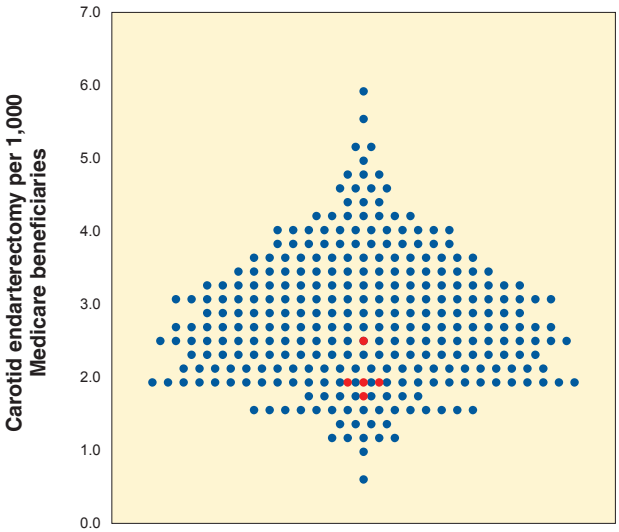


Figure 7. Carotid endarterectomy per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

St. Cloud	2.4
Minneapolis	2.0
St. Paul	1.9
Duluth	1.9
Rochester	1.7

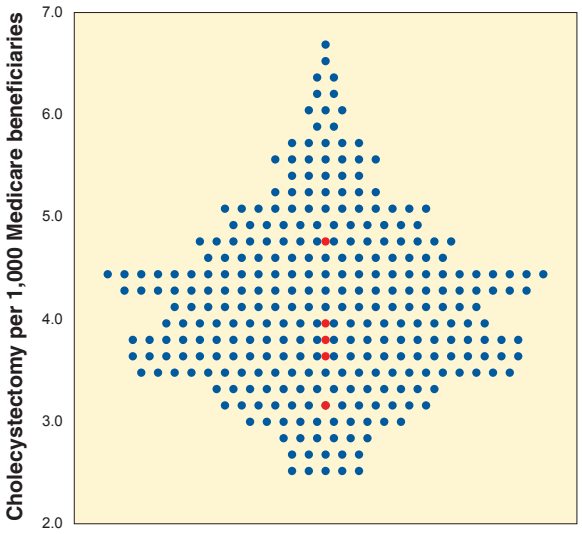


Figure 8. Cholecystectomy per 1,000 Medicare beneficiaries among hospital referral regions (2003-07)

Duluth	4.8
St. Cloud	4.0
St. Paul	3.9
Minneapolis	3.6
Rochester	3.1

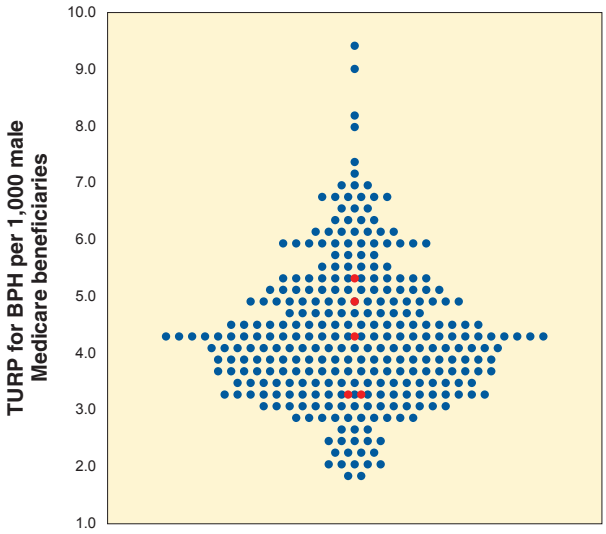


Figure 9. Transurethral resection of the prostate (TURP) for benign prostatic hyperplasia (BPH) per 1,000 male Medicare beneficiaries among hospital referral regions (2003-07)

Duluth	5.3
St. Paul	4.9
Minneapolis	4.2
St. Cloud	3.3
Rochester	3.2

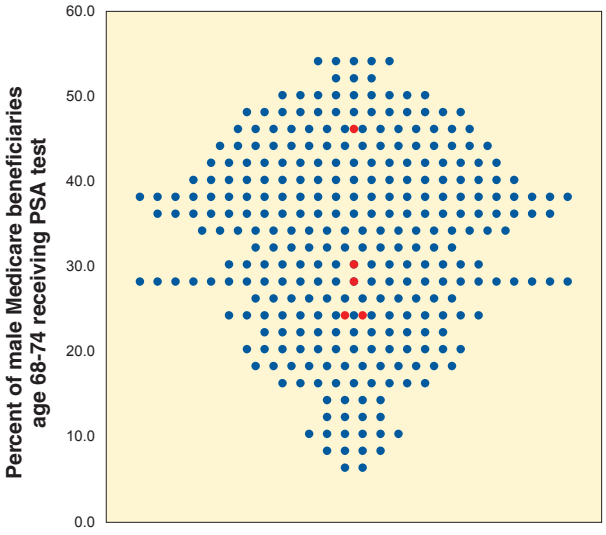


Figure 10. Percent of male Medicare beneficiaries age 68-74 receiving prostate-specific antigen (PSA) testing among hospital referral regions (2008)

St. Cloud	46.0
Rochester	30.0
Minneapolis	27.6
Duluth	25.3
St. Paul	24.8

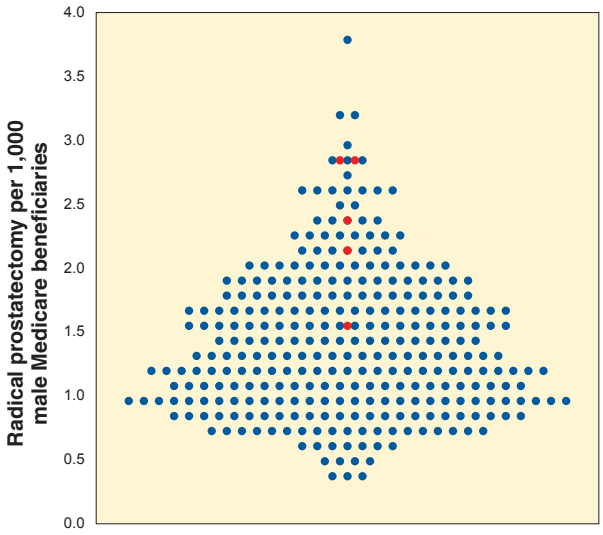


Figure 11. Radical prostatectomy per 1,000 male Medicare beneficiaries among hospital referral regions (2003-07)

St. Cloud	2.9
St. Paul	2.9
Minneapolis	2.4
Rochester	2.1
Duluth	1.6

Appendix Table: Rates of common surgical procedures (2003-07) and PSA testing (2008) among Medicare beneficiaries in Minnesota hospital service areas

HSA name	Medicare beneficiaries (2003-07)	Mastectomy per 1,000 female Medicare beneficiaries (2003-07)	CABG per 1,000 Medicare beneficiaries (2003-07)	PCI per 1,000 Medicare beneficiaries (2003-07)	Back surgery per 1,000 Medicare beneficiaries (2003-07)	Knee replacement per 1,000 Medicare beneficiaries (2003-07)	Hip replacement per 1,000 Medicare beneficiaries (2003-07)	Carotid endarterectomy per 1,000 Medicare beneficiaries (2003-07)	Cholecystectomy per 1,000 Medicare beneficiaries (2003-07)	TURP for BPH per 1,000 male Medicare beneficiaries (2003-07)	Percent of male Medicare beneficiaries age 68-74 receiving PSA test (2008)	Radical prostatectomy per 1,000 male Medicare beneficiaries (2003-07)
Ada	2,273		(7.7)	(8.8)	(12.6)	(7.9)	(7.6)					
Aitkin	13,811		3.7	11.6	5.8	10.5	5.5	2.1	1.9	4.1		(2.4)
Albert Lea	34,534	(1.5)	4.0	7.1	4.3	10.8	5.0	1.6	3.2	5.6	20.4	(3.1)
Alexandria	33,736	(0.9)	2.6	11.0	6.5	11.7	5.4	1.5	5.6	5.1	36.6	(2.4)
Appleton	2,924			10.7	(3.8)	(7.9)	(5.7)		(5.0)			
Arlington	6,809		2.2	9.2	2.5	12.7	(4.6)		3.0			
Aurora	6,253		4.5	15.6	4.6	11.2	(4.1)	(2.1)	(2.7)			
Austin	26,322	(0.8)	3.9	8.4	2.1	10.6	4.2	1.2	2.9	6.6		
Bagley	5,321		(4.3)	9.6	(2.5)	7.9	(5.6)	(3.3)	(3.2)	(6.7)		
Baudette	4,359		(4.4)	19.9	(4.5)	12.3	(6.4)	(4.1)	(3.4)	(6.8)		
Bemidji	28,361	(2.5)	5.2	9.6	3.7	9.6	5.3	2.1	5.2	11.6	55.3	(2.0)
Benson	5,545		(2.6)	12.6	(5.5)	12.0	(4.4)	(3.3)	(4.2)			
Bigfork	3,691		(4.1)	14.3	(4.8)	8.4	(8.2)			(7.0)		
Blue Earth	10,118		3.9	11.0	3.8	8.8	6.2	1.9	2.9			
Brainerd	51,668	0.9	3.4	12.0	6.8	11.4	5.1	1.6	3.8	6.2	36.7	3.1
Breckenridge	16,331	(1.5)	6.9	7.2	4.2	11.5	5.2	3.5	5.7	6.6	49.8	
Buffalo	15,442		4.0	13.5	6.0	10.2	6.0	2.5	3.2	2.8	24.4	(4.9)
Burnsville	51,025	1.4	3.0	9.2	4.5	11.1	5.1	2.2	3.2	3.7	41.6	2.2
Cambridge	16,913	(1.3)	3.7	11.0	4.5	9.1	4.2	2.9	3.2	2.8		(2.1)
Canby	4,058		(5.3)	12.7	(5.0)	9.4	(5.0)		(5.9)			
Cannon Falls	5,865		4.7	12.5	4.9	10.5	(4.8)	(2.6)	(3.7)	(5.0)		
Chisago City	14,219		4.4	10.3	7.2	11.1	4.7	2.2	3.3	2.5		(3.1)
Cloquet	13,298	(2.3)	4.0	14.4	3.9	10.7	4.6	1.6	6.5	(5.2)	34.0	(2.7)
Cook	3,989		(5.4)	14.3	(4.9)	10.8	(2.7)		(3.5)			
Crookston	12,072		5.6	22.0	3.6	9.2	5.4	2.1	3.2	(2.8)		
Crosby	10,769	(2.4)	4.5	10.1	5.3	10.5	5.5	1.8	2.9	(5.4)	47.0	(2.9)
Dawson	2,419			(8.5)	(4.7)	(8.7)			(5.1)			
Deer River	6,353		3.2	19.1	4.1	11.9	(3.2)	(2.5)		(6.2)		
Detroit Lakes	22,571	(1.4)	6.8	8.8	4.9	11.2	5.2	3.0	5.8	4.3	58.3	(2.1)
Duluth	120,878	1.7	4.4	14.4	4.9	11.1	4.8	1.9	5.1	5.5	24.1	1.6
Elbow Lake	2,767			7.4	(4.8)	(10.3)	(6.8)		(4.2)			
Ely	6,046		3.7	13.3	(5.3)	12.7	(6.1)		(4.4)	(4.0)		
Fairmont	20,170	(1.8)	3.3	8.6	6.3	9.9	6.5	1.6	2.6	1.6		(2.8)
Faribault	23,071	(1.4)	3.3	10.9	3.8	9.6	4.1	1.8	3.5	3.7	24.9	(2.5)
Farmington	5,679		2.9	8.3	(4.2)	10.5	(3.8)	(2.6)	(5.2)	(7.6)		

All rates are adjusted for age, race and sex (when appropriate). Surgical rates are expressed as rates per 1,000 Medicare beneficiaries and are averages for the five-year period from 2003 to 2007. Only surgical procedures performed during a hospital admission are included. Rates for mastectomy and prostate surgery are sex-specific. PSA testing rates are expressed as the percent of male beneficiaries age 68-74 who received a test during 2008. They are adjusted for race only. Data exclude Medicare beneficiaries who were members of risk-bearing health maintenance organizations.

For surgical procedures, hospital service areas with fewer than 26 expected cases are shown in parentheses in the table. All rates for HSAs with 10 or fewer cases during the study period are omitted.

Specific codes used to define the numerators for rates, and methods of age, sex and race adjustment, are included in the Appendix on Methods.

CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention; TURP for BPH = transurethral resection of the prostate for benign prostatic hyperplasia; PSA = prostate-specific antigen

Appendix Table (continued): Rates of common surgical procedures (2003-07) and PSA testing (2008) among Medicare beneficiaries in Minnesota hospital service areas

HSA name	Medicare beneficiaries (2003-07)	Mastectomy per 1,000 female Medicare beneficiaries (2003-07)	CABG per 1,000 Medicare beneficiaries (2003-07)	PCI per 1,000 Medicare beneficiaries (2003-07)	Back surgery per 1,000 Medicare beneficiaries (2003-07)	Knee replacement per 1,000 Medicare beneficiaries (2003-07)	Hip replacement per 1,000 Medicare beneficiaries (2003-07)	Carotid endarterectomy per 1,000 Medicare beneficiaries (2003-07)	Cholecystectomy per 1,000 Medicare beneficiaries (2003-07)	TURP for BPH per 1,000 male Medicare beneficiaries (2003-07)	Percent of male Medicare beneficiaries age 68-74 receiving PSA test (2008)	Radical prostatectomy per 1,000 male Medicare beneficiaries (2003-07)
Fergus Falls	27,162	(1.9)	4.5	7.4	3.6	11.1	5.1	2.5	5.9	4.4	46.7	(1.1)
Forest Lake	8,386		3.9	12.4	6.6	11.2	6.3	(1.7)	2.9			
Fosston	4,742		(3.8)	10.3	(6.0)	10.7	(3.7)		(5.1)	(5.0)		
Glencoe	9,646		2.9	11.8	3.9	12.6	4.6	(1.3)	5.6			(3.5)
Glenwood	7,198		3.1	9.5	4.5	11.6	(5.7)	(2.5)	7.1			
Graceville	1,961		(5.4)	(10.8)	(6.6)	(10.7)						
Grand Marais	3,616		(2.9)	17.5	(2.9)	16.7	(6.5)			(8.8)		
Grand Rapids	24,285	(1.8)	3.8	13.7	4.4	10.4	4.7	2.0	4.0	7.4		(2.2)
Granite Falls	8,201	(2.8)	2.6	6.8	6.3	12.0	5.3	(2.1)	4.6	(3.7)		
Hallock	2,439		(6.7)	(15.1)		(7.4)						
Hastings	17,545	(1.1)	3.2	10.1	6.5	11.7	4.9	1.6	3.8	9.0		(2.0)
Hendricks	2,272		(5.2)	(6.9)		(12.4)	(9.1)		(5.1)			
Hibbing	23,546	(1.4)	4.6	16.0	4.4	10.0	5.2	1.9	3.0	6.4		
Hutchinson	17,029	(1.5)	3.3	12.5	4.7	13.4	5.1	1.5	5.6	2.5	43.6	(2.2)
International Falls	10,457		3.7	11.2	4.1	11.7	4.9	2.8	3.1	(4.7)	52.0	
Ivanhoe	1,229			(9.1)		(17.0)						
Jackson	4,526		(3.3)	11.1	(3.8)	9.4	(7.8)		(2.5)			
Karlstad	1,724			(10.6)	(6.4)	(11.7)	(6.8)					
Lake City	6,076		4.3	7.0	3.6	10.3	(4.6)		(2.7)			
Lakefield	2,877		(5.3)	11.5		(10.3)	(5.4)		(5.0)			
Le Sueur	3,891		(3.1)	11.7	(3.9)	11.8	(7.5)		(2.8)	(7.2)		
Litchfield	10,888	(1.8)	3.3	12.3	4.8	12.7	4.2	1.6	5.7	(6.0)		
Little Falls	23,101	(1.7)	3.1	12.4	6.8	13.1	5.6	2.5	3.9	2.5	41.1	(3.2)
Long Prairie	5,227			11.3	(5.6)	10.7	(3.5)		(4.3)			
Luverne	7,107		4.7	12.5	4.7	15.8	(5.1)	(2.4)	5.2	(5.4)		
Madelia	2,805		(5.3)	13.3		(7.7)	(5.5)		(5.9)			
Madison	3,445		(3.2)	7.1	(6.3)	(13.4)	(5.2)		(3.6)			
Mankato	42,065	1.5	3.5	8.3	4.3	11.6	5.5	1.7	4.4	2.0	40.2	(1.6)
Maplewood	52,825	1.4	3.0	9.2	6.6	12.2	4.4	2.3	4.2	4.7	18.5	2.5
Marshall	11,260		5.0	8.5	4.0	12.4	4.3	2.2	5.1	(4.7)	48.5	
Melrose	4,028			10.3	(5.9)	11.0	(5.3)	(3.2)	(3.4)			
Minneapolis	469,355	1.3	3.4	10.6	5.1	9.8	4.8	2.2	3.2	4.2	27.8	2.6
Montevideo	9,371		2.5	10.3	2.7	8.0	3.9	(2.1)	6.8	(7.7)		
Monticello	9,612	(2.5)	2.7	10.4	6.3	11.8	4.6	(2.0)	3.9		37.8	(4.1)
Moose Lake	7,006		3.7	14.8	5.6	10.6	(6.1)	(2.1)	3.2	(6.2)		(3.9)

All rates are adjusted for age, race and sex (when appropriate). Surgical rates are expressed as rates per 1,000 Medicare beneficiaries and are averages for the five-year period from 2003 to 2007. Only surgical procedures performed during a hospital admission are included. Rates for mastectomy and prostate surgery are sex-specific. PSA testing rates are expressed as the percent of male beneficiaries age 68-74 who received a test during 2008. They are adjusted for race only. Data exclude Medicare beneficiaries who were members of risk-bearing health maintenance organizations.

For surgical procedures, hospital service areas with fewer than 26 expected cases are shown in parentheses in the table. All rates for HSAs with 10 or fewer cases during the study period are omitted.

Specific codes used to define the numerators for rates, and methods of age, sex and race adjustment, are included in the Appendix on Methods.

CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention; TURP for BPH = transurethral resection of the prostate for benign prostatic hyperplasia; PSA = prostate-specific antigen

Appendix Table: Rates of common surgical procedures (2003-07) and PSA testing (2008) among Medicare beneficiaries in Minnesota hospital service areas

HSA name	Medicare beneficiaries (2003-07)	Mastectomy per 1,000 female Medicare beneficiaries (2003-07)	CABG per 1,000 Medicare beneficiaries (2003-07)	PCI per 1,000 Medicare beneficiaries (2003-07)	Back surgery per 1,000 Medicare beneficiaries (2003-07)	Knee replacement per 1,000 Medicare beneficiaries (2003-07)	Hip replacement per 1,000 Medicare beneficiaries (2003-07)	Carotid endarterectomy per 1,000 Medicare beneficiaries (2003-07)	Cholecystectomy per 1,000 Medicare beneficiaries (2003-07)	TURP for BPH per 1,000 male Medicare beneficiaries (2003-07)	Percent of male Medicare beneficiaries age 68-74 receiving PSA test (2008)	Radical prostatectomy per 1,000 male Medicare beneficiaries (2003-07)
Mora	13,243	(2.7)	3.3	12.1	6.3	10.1	3.5	1.9	3.4	(5.0)		(2.5)
Morris	8,868		4.9	12.5	6.3	10.1	6.1	(2.4)	5.6	(5.6)		
New Prague	16,896	(1.6)	2.8	11.6	4.8	13.0	5.5	1.6	3.0	5.9		(2.5)
New Ulm	18,517	(1.6)	2.7	10.1	3.4	11.1	4.5	2.1	5.2	1.7		(1.8)
Northfield	13,397		2.6	13.8	4.2	9.6	4.9	1.2	4.8	(8.4)		(2.9)
Olivia	7,961		2.9	8.5	5.3	13.9	7.3		3.8	(6.5)		
Onamia	7,731		3.9	13.9	4.9	9.9	(5.3)	(3.1)	5.1	(3.2)		(3.0)
Ortonville	5,360		(3.9)	9.1	(7.5)	9.6	(5.4)	(2.4)	(4.0)			
Owatonna	17,103	(1.8)	3.5	9.1	3.3	14.9	5.3	2.0	2.9	4.1	30.7	(3.5)
Park Rapids	18,477	(2.5)	6.5	10.2	4.4	10.4	4.5	2.4	6.5	5.3	45.3	(2.3)
Paynesville	6,250		3.2	11.7	7.1	10.1	(8.1)	(2.1)	(2.7)			
Perham	7,990		4.8	10.3	3.3	10.1	5.7	(2.4)	5.3	(4.2)		
Pipestone	5,741	(4.4)	(3.0)	6.9	(5.6)	11.9	(3.5)		(6.2)			
Princeton	15,814		3.3	12.7	4.7	8.7	4.8	1.9	3.1	4.3		(3.3)
Red Wing	16,333	(2.1)	4.3	10.0	4.0	11.4	5.5	1.1	2.5	2.9		
Redlake	1,225		(9.6)	(34.8)		(11.2)						
Redwood Falls	9,583	(2.7)	3.7	6.9	4.4	9.5	4.6	(1.8)	2.9	(3.3)	54.3	
Robbinsdale	58,598	1.4	3.3	9.7	5.1	10.5	4.1	1.6	2.8	4.1	14.2	2.4
Rochester	118,269	1.3	3.9	9.8	2.9	9.9	5.1	1.5	3.1	1.6	45.7	2.2
Roseau	8,185		6.1	16.5	3.9	7.7	4.3	(2.4)	2.5	(6.6)		
Rush City	8,544		2.9	10.7	5.6	10.4	4.5	(3.0)	3.4	(2.8)		
Sandstone	2,517		(4.6)	16.0	(6.2)	(8.2)	(6.2)					
Sauk Centre	5,773		3.6	12.1	(8.9)	14.6	(4.8)		(3.0)	(4.5)		
Shakopee	26,631	(1.2)	2.9	9.5	4.0	10.4	4.5	2.1	3.5	5.2	26.8	(1.4)
Slayton	5,906		4.9	11.0	(6.3)	12.8	(4.1)	(2.4)	(2.8)			
Sleepy Eye	6,079		2.0	9.8	(4.6)	12.6	(5.5)		(4.6)			
Springfield	6,576		3.5	10.5	4.5	9.7	(6.4)	(1.9)	3.8			
St. Cloud	87,170	1.0	2.8	11.7	7.6	11.4	5.4	2.4	3.8	3.2	50.7	2.9
St. James	5,153		(2.7)	7.2		8.2	(5.8)		(3.0)			
St. Louis Park	81,904	0.8	3.0	7.8	5.0	9.6	5.3	1.8	2.8	4.4	17.7	2.0
St. Paul	240,349	1.3	3.1	10.0	5.1	10.5	4.6	1.9	3.9	5.0	29.0	3.1
St. Peter	7,962		3.2	8.6	3.1	12.3	6.6	(1.7)	3.8	(3.2)		
Staples	6,438		3.5	13.7	5.0	9.9	(3.3)	(2.6)	5.7			(3.9)
Starbuck	3,383		(3.1)	9.9	(4.0)	9.3	(6.3)	(4.1)	(4.3)			
Stillwater	19,569	(2.1)	2.9	10.5	6.0	14.3	5.9	1.5	4.2	4.2		(2.7)

All rates are adjusted for age, race and sex (when appropriate). Surgical rates are expressed as rates per 1,000 Medicare beneficiaries and are averages for the five-year period from 2003 to 2007. Only surgical procedures performed during a hospital admission are included. Rates for mastectomy and prostate surgery are sex-specific. PSA testing rates are expressed as the percent of male beneficiaries age 68-74 who received a test during 2008. They are adjusted for race only. Data exclude Medicare beneficiaries who were members of risk-bearing health maintenance organizations.

For surgical procedures, hospital service areas with fewer than 26 expected cases are shown in parentheses in the table. All rates for HSAs with 10 or fewer cases during the study period are omitted.

Specific codes used to define the numerators for rates, and methods of age, sex and race adjustment, are included in the Appendix on Methods.

CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention; TURP for BPH = transurethral resection of the prostate for benign prostatic hyperplasia; PSA = prostate-specific antigen

Appendix Table (continued): Rates of common surgical procedures (2003-07) and PSA testing (2008) among Medicare beneficiaries in Minnesota hospital service areas

HSA name	Medicare beneficiaries (2003-07)	Mastectomy per 1,000 female Medicare beneficiaries (2003-07)	CABG per 1,000 Medicare beneficiaries (2003-07)	PCI per 1,000 Medicare beneficiaries (2003-07)	Back surgery per 1,000 Medicare beneficiaries (2003-07)	Knee replacement per 1,000 Medicare beneficiaries (2003-07)	Hip replacement per 1,000 Medicare beneficiaries (2003-07)	Carotid endarterectomy per 1,000 Medicare beneficiaries (2003-07)	Cholecystectomy per 1,000 Medicare beneficiaries (2003-07)	TURP for BPH per 1,000 male Medicare beneficiaries (2003-07)	Percent of male Medicare beneficiaries age 68-74 receiving PSA test (2008)	Radical prostatectomy per 1,000 male Medicare beneficiaries (2003-07)
Thief River Falls	14,055		6.8	15.4	4.0	8.7	4.3	1.8	3.8	5.3	47.3	
Tracy	3,909		(6.7)	14.4	(4.6)	12.9	(5.6)		(4.9)			
Two Harbors	6,097		2.6	14.5	6.3	14.7	(4.3)		(3.5)			
Tyler	2,310			(5.2)	(5.6)	(14.3)			(5.5)			
Virginia	24,781	(2.3)	4.6	15.5	4.7	12.4	5.1	2.3	4.2	3.9	31.1	
Wabasha	6,628		6.0	6.8	6.1	10.9	(4.3)	(1.5)	3.3			
Waconia	35,403	(1.5)	2.8	9.9	5.6	11.9	5.3	1.7	4.5	3.4	19.9	(2.5)
Wadena	12,819	(2.6)	4.7	9.1	6.2	10.1	6.1	1.5	10.3	(3.3)		(2.3)
Warren	4,554		(5.2)	30.6	(3.3)	14.0	(6.7)		(2.7)			
Waseca	7,298		4.4	11.4	3.6	10.3	(4.9)		2.4			
Westbrook	2,294			(8.8)		(10.9)		(6.0)				
Wheaton	4,917		(4.9)	10.8	(4.1)	7.0	(6.0)		(2.7)	(6.6)		
Willmar	32,134	(1.7)	3.1	9.7	5.7	10.4	4.4	2.2	4.1	5.2	45.6	(1.8)
Windom	11,841		3.8	10.1	4.2	10.7	5.3	1.8	2.9			(3.5)
Winona	26,735	(2.2)	4.6	5.5	3.0	7.2	4.2	1.6	3.3	3.6	35.8	(1.2)
Worthington	15,645	(1.7)	3.9	10.5	4.4	10.8	4.8	1.8	3.8	2.8	52.2	(2.0)

All rates are adjusted for age, race and sex (when appropriate). Surgical rates are expressed as rates per 1,000 Medicare beneficiaries and are averages for the five-year period from 2003 to 2007. Only surgical procedures performed during a hospital admission are included. Rates for mastectomy and prostate surgery are sex-specific. PSA testing rates are expressed as the percent of male beneficiaries age 68-74 who received a test during 2008. They are adjusted for race only. Data exclude Medicare beneficiaries who were members of risk-bearing health maintenance organizations.

For surgical procedures, hospital service areas with fewer than 26 expected cases are shown in parentheses in the table. All rates for HSAs with 10 or fewer cases during the study period are omitted.

Specific codes used to define the numerators for rates, and methods of age, sex and race adjustment, are included in the Appendix on Methods.

CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention; TURP for BPH = transurethral resection of the prostate for benign prostatic hyperplasia; PSA = prostate-specific antigen

Appendix on Methods

The methods used in this report were developed over a number of years and have been described in detail in peer-reviewed publications and in previous editions of the Dartmouth Atlas. The data are drawn from the enrollment and claims data of the Medicare program and are restricted to the fee-for-service population over age 65; HMO patients are not included in our analysis. A brief overview of the approach and measures is provided here. For more information, please visit the Dartmouth Atlas web site (www.dartmouthatlas.org).

The Geography of Health Care in the United States

Defining hospital service areas

Hospital service areas (HSAs) represent local health care markets for community-based inpatient care. The definitions of HSAs used in the original edition of the Atlas have been retained in subsequent editions in order to provide continuity of the market areas. HSAs were originally defined in three steps using 1993 provider files and 1992-93 utilization data. First, all acute care hospitals in the 50 states and the District of Columbia were identified from the American Hospital Association Annual Survey of Hospitals and the Medicare Provider of Services files and assigned to a location within a town or city. The list of towns or cities with at least one acute care hospital (N=3,953) defined the maximum number of possible HSAs. Second, all 1992 and 1993 acute care hospitalizations of the Medicare population were analyzed according to ZIP code to determine the proportion of residents' hospital stays that occurred in each of the 3,953 candidate HSAs. ZIP codes were initially assigned to the HSA where the greatest proportion (plurality) of residents was hospitalized. Approximately 500 of the candidate HSAs did not qualify as independent HSAs because the plurality of patients living in those cities was hospitalized in other cities.

The third step required visual examination of the ZIP codes used to define each HSA. Maps of ZIP code boundaries were made using files obtained from Geographic Data Technologies (GDT) (now Tele Atlas) and each HSA's component ZIP codes were examined. In order to achieve contiguity of the component ZIP codes for each HSA, "island" ZIP codes were reassigned to the enclosing HSA, and/or HSAs were grouped into larger HSAs (see the Appendix on the Geography of Health Care in the United States at www.dartmouthatlas.org for an illustration). Certain ZIP codes used in the Medicare files were restricted in their use to specific institutions (e.g., a nursing home) or a post office. These "point ZIPs" were assigned to their enclosing ZIP code based on the ZIP code boundary map.

This process resulted in the identification of 3,436 HSAs. In most HSAs, the majority of Medicare hospitalizations occurred in a hospital or hospitals located within the HSA.

Defining hospital referral regions

Hospital referral regions (HRRs) represent health care markets for tertiary medical care. As defined in the 1996 Atlas, each HRR contained at least one HSA that had a hospital or hospitals that performed major cardiovascular procedures and neurosurgery in 1992-93. Three steps were taken to define HRRs.

First, the candidate hospitals and HRRs were identified. A total of 862 hospitals performed at least 10 major cardiovascular procedures (DRGs 103-107) on Medicare enrollees in both years. These hospitals were located within 458 HSAs, thereby defining the maximum number of possible HRRs. Further checks verified that all 458 HSAs included at least one hospital performing the specified major neurosurgical procedures (DRGs 1-3 and 484).

Second, we calculated in each of the 3,436 HSAs in the United States the proportion of major cardiovascular procedures performed in each of the 458 candidate HRRs in 1992-93. Each HSA was then assigned provisionally to the candidate HRR where most patients went for these services.

Third, HSAs were reassigned or further grouped to achieve (a) geographic contiguity, unless major travel routes (e.g., interstate highways) justified separation (this occurred in only two cases, the New Haven, Connecticut and Elmira, New York HRRs); (b) a minimum population size of 120,000; and (c) a high localization index. Because of the large number of hospitals providing cardiovascular services in California, several candidate California HRRs met the above criteria but were found to perform small numbers of cardiovascular procedures. These HRRs were further aggregated according to county boundaries to achieve stability of cardiovascular surgery rates within the areas. The process resulted in the definition of 306 hospital referral regions.

Surgical Procedure Rates

Surgical procedure rates represent counts of the number of inpatient procedures that occurred in a defined time period (the numerator) for a specific population (the denominator). The counts of discharges for specific procedures are based on the MedPAR files for the measurement years, 2003 to 2007. The denominators are the corresponding Medicare enrollee populations that were enrolled in Medicare Part A on June 30 of the measurement year. Patients enrolled in risk-bearing HMOs at any time during the year (HMO status = A, B or C) are excluded.

The procedure codes used in the MedPAR file are based on the International Classification of Disease, ICD-9-CM. Selection of procedure codes is based on review of the literature and/or consultation with clinical experts. Some rates are suppressed to meet CMS suppression rules for patient confidentiality. Rates with fewer than 26 expected events are suppressed because of low statistical precision. The specific procedures and the codes used to identify the event in the file are given in Table 1.

Table 1. Codes Used to Define Procedures

Surgical Procedure	Procedure Code(s)	&/or Diagnosis Code(s)
General Surgery		
Mastectomy for cancer (female)	85.41, 85.43, 85.45, 85.47	174-174.9, excluding 233.0
Cholecystectomy	51.21-51.24	---
Cardiothoracic Surgery		
Coronary artery bypass grafting surgery (CABG)	36.10-36.19	---
Percutaneous coronary intervention (PCI)	00.66, 36.01-36.02, 36.05, 36.06, 36.07, 36.09	---
Orthopedic Surgery		
Back surgery	03.0, 03.02, 03.09, 03.6, 80.50-80.54, 80.59, 81.00-81.09, 81.31-81.39, 81.61-81.64, 84.60-84.69;	Excluding Dx codes 140-239.9, 324.1, 630-676, 720.0-720.9, 730-730.99, 733.1, 733.10, 733.13, 733.8, 733.81-733.82, 733.95, 805-806.9, 839-839.59, E800-E849.9: Sx codes 03.2-03.29
	03.93, 03.94, 78.50, 78.59, 78.60, 78.69, 78.90, 78.99, 84.51, 84.52, 84.58, 84.59, 84.80-84.85	With exclusions above and only with Dx codes = 353.9, 355.0, 355.9, 721.0-721.4, 721.42, 721.7-721.9, 721.90, 721.91, 722.0, 722.10, 722.11, 722.2, 722.4, 722.5, 722.51, 722.52, 722.6, 722.70-722.73, 722.80, 722.81, 722.83, 722.90-722.93, 723.0, 723.1, 723.8, 724.00-724.02, 724.09, 724.2-724.6, 724.70, 724.71, 724.79, 724.8, 724.9, 737.0, 737.1, 737.10, 737.19, 737.20, 737.3, 737.30, 737.32, 737.34, 737.39, 737.43, 737.8, 737.9, 738.4, 756.11, 756.12, 846.0, 846.1-846.3, 846.8, 846.9, 847.0, 847.2, 847.9
Hip replacement	81.51	Excluding 820-821.39, 996.4x
Knee replacement	81.54	---
Vascular Surgery		
Carotid endarterectomy	38.12	---
Urology		
TURP for BPH (male)	60.2, 60.21, 60.29	Dx slots 1-5 = 600x-601.4, 601.8, 601.9, 602x-602.1, 788.2-788.29, 788.4x
Radical prostatectomy (male)	60.5x	---

Adjustment of Rates

Surgical procedure rates are adjusted using the indirect method for age, sex and race using the national Medicare population as the standard. Sex-specific population estimates are used for prostate and breast procedures. Although the majority of events occurred only once per person during the study period, we include multiple events to the same person to allow the rates to reflect total health care utilization.

Calculation of age, sex and race adjusted rates

Medicare procedure rates are adjusted using the indirect method for the following strata: sex, race (black, non-black) and age (65-69, 70-74, 75-79, 80-84, 85-99). The standard population is the U.S. Medicare population age 65 to 99 with Medicare Parts A and B entitlement and no HMO enrollment during the measurement period. The expected counts within HSAs are computed using the stratum-specific crude rates in the standard population, weighting by the stratum-specific population. Observed and expected counts at the HSA level are summed to the HRR level. Indirectly standardized rates for HRRs are then computed from observed and expected counts. A detailed explanation of indirect adjustment is available from the Dartmouth Atlas web site.

PSA Testing Rates

Prostate-specific antigen (PSA) screening was measured in men age 68 to 74 using the Medicare Carrier and Outpatient files with Common Procedural Terminology (CPT) codes G0103 or 84153.[23] To capture those who had a PSA test for a presumed screening indication, men who had any history of prostate disease (prostate cancer, prostate surgery, or diagnosis of elevated PSA in the prior three years) or who had symptoms in the three months before a PSA test that might have triggered a suspicion of cancer according to diagnostic codes billed on visits and hospitalizations were excluded from the PSA measure. This algorithm has been previously validated.[24] Rates were adjusted for race using the indirect method.

References

[1] Wennberg JE, Cooper MM. The Surgical Treatment of Common Diseases. In *The Dartmouth Atlas of Health Care 1998.* American Hospital Publishing, Chicago, 1998:108–111.

[2] Zikmund-Fisher B, Couper M, Singer E, Ubel P, Fowler F, Levin C, Ziniel S, Fagerlin A. Deficits and variations in patients' experience with making 9 common medical decisions: The DECISIONS Survey. *Medical Decision Making.* September/October 2010;30:85S-95S.

[3] Blank T, Graves K, Sepucha K, Lewellyn-Thomas H. Understanding treatment decision-making: Contexts, commonalities, complexities and challenges. *Annals of Behavioral Medicine.* 2003;32(2):211-217.

[4] O'Connor AM, Bennett CL, Stacey D, Barry M, Col NF, Eden KB, Entwistle VA, Fiset V, Holmes-Rovner M, Khangura S, Llewellyn-Thomas H, Rovner D. Decision aids for people facing health treatment or screening decisions. *Cochrane Database Syst Rev.* 2009 Jul;8(3):CD001431.

[5] Feldman-Stewart D et al. The information required by patients with early-stage prostate cancer in choosing their treatment. *British Journal of Urology International.* 2001;86(3):218-223.

[6] Institute of Medicine. Learning what works best: The nation's need for evidence on comparative effectiveness in health care. *National Academy Press* 2007.

[7] Lee CN, Dominik R, Levin CA, Barry MJ, Cosenza C, O'Connor AM, Mulley AG Jr, Sepucha KR. Development of instruments to measure the quality of breast cancer treatment decisions. *Health Expect.* 2010 Sep;13(3):258-272.

[8] Lantz PM, Janz NK, Fagerlin A, Schwartz K, Liu L, Lakhani I, Salem B, Katz SJ. Satisfaction with surgery outcomes and the decision process in a population-based sample of women with breast cancer. *Health Services Research.* 2005 Jun;40(3):745-767.

[9] Katz SJ, Lantz PM, Janz NK, Fagerlin A, Schwartz K, Liu L, Deapen D, Salem B, Lakhani I, Morrow M. Patient involvement in surgery treatment decisions for breast cancer. *Journal of Clinical Oncology.* 2005 Aug 20;23(24):5526-5533.

[10] Rothberg M, Sivalingam S, Ashraf J. Patients' and cardiologists' perceptions of the benefits of percutaneous coronary intervention for stable coronary disease. *Annals of Internal Medicine.* 2010;153:307-313.

[11] Weinstein JN, Tosteson TD, Lurie JD, Tosteson ANA, Hanscom B, Skinner JS, Abdu WA, Hilibrand AS, Boden SD, Deyo RA. Surgical vs nonoperative treatment for lumbar disk herniation: The Spine Patient Outcomes Research Trial (SPORT): A randomized trial. *JAMA.* 2006;296(20):2441–2450.

[12] Weinstein JN, Lurie JD, Tosteson TD, Skinner JS, Hanscom B, Tosteson ANA, Herkowitz H, Fischgrund J, Cammisa FP, Albert T Deyo RA. Surgical vs nonoperative treatment for lumbar disk herniation: The Spine Patient Outcomes Research Trial (SPORT) observational cohort. *JAMA.* 2006;296(20):2451–2459.

[13] Atlas SJ, Keller RB, Wu YA, Deyo RA, Singer DE. Long-term outcomes of surgical and nonsurgical management of sciatica secondary to a lumbar disc herniation: 10 year results from the Maine Lumbar Spine Study. *Spine.* 2005;30(8):927–935.

[14] Weinstein JN, Tosteson TD, Lurie JD, Tosteson AN, Blood E, Hanscom B, Herkowitz H, Cammisa F, Albert T, Boden SD, Hilibrand A, Goldberg H, Berven S, An H. Surgical versus nonsurgical therapy for lumbar spinal stenosis. *N Engl J Med.* 2008 Feb 21;358(8):794-810.

[15] Weinstein JN, Tosteson TD, Lurie JD, Tosteson A, Blood E, Herkowitz H, Cammisa F, Albert T, Boden SD, Hilibrand A, Goldberg H, Berven S, An H. Surgical versus nonoperative treatment for lumbar spinal stenosis: Four-year results of the Spine Patient Outcomes Research Trial. *Spine.* 2010 Jun 15;35(14):1329-1338.

[16] Hawker GA, Wright JG, Coyte PC, Williams JI, Harvey B, Glazier R, Wilkins A, Badley EM. Determining the need for hip and knee arthroplasty: The role of clinical severity and patients' preferences. *Medical Care.* March 2001;39:206–216.

[17] Halliday A, Mansfield A, Marro J, et al.; MRC Asymptomatic Carotid Surgery Trial (ACST) Collaborative Group. Prevention of disabling and fatal strokes by successful carotid endarterectomy in patients without recent neurological symptoms: Randomised controlled trial. *Lancet.* 2004;363(9420):1491–1502.

[18] Schröder FH, Hugosson J, Roobol MJ, Tammela TL, Ciatto S, Nelen V, Kwiatkowski M, Lujan M, Lilja H, Zappa M, Denis LJ, Recker F, Berenguer A, Määttänen L, Bangma CH,Aus G, Villers A, Rebillard X, van der Kwast T, Blijenberg BG, Moss SM, de Koning HJ, Auvinen A. Screening and prostate-cancer mortality in a randomized European study. *N Engl J Med.* 2009 Mar 26;360(13):1320-1328.

[19] McAneny BL. Report of the Council on Medical Service. *CMS Report* 7-A-10: http://www.ama-assn.org/ama1/pub/upload/mm/372/a10-cms-rpt-7.pdf.

[20] King JS, Moulton BW. 2006. Rethinking informed consent: The case for shared medical decision-making. *American Journal of Law & Medicine.* 2006;32(4):429–501.

[21] Murray E, Davis H, Tai SS, Coulter A, Gray A, Haines A. Randomized controlled trial of an interactive multimedia decision aid on benign prostatic hypertrophy in primary care. *British Medical Journal.* 2001;323:493-496.

[22] Wennberg JE. Tracking Medicine: A Researcher's Quest to Understand Health Care. *Oxford University Press*, New York, 2010.

[23] Bynum J, Song Y, Fisher E. Variation in prostate-specific antigen screening in men aged 80 and older in fee-for-service Medicare. *Journal of the American Geriatrics Society.* 2010;58:674-680.

[24] Walter LC, Bertenthal D, Lindquist K et al. PSA screening among elderly men with limited life expectancies. *JAMA.* 2006;296:2336–2342.

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.

The Dartmouth Atlas Project is funded by a broad coalition of funders, led by the Robert Wood Johnson Foundation.

Other major sources of funding include the **National Institute of Aging**, **California Healthcare Foundation**, **United Healthcare Foundation**, and the **WellPoint Foundation**.

The Dartmouth Atlas
The Dartmouth Institute
for Health Policy and Clinical Practice
Center for Health Policy Research

Contact: Eva Fowler
202-261-2868 voice
202-331-7207 fax

www.dartmouthatlas.org

02252011.dap1.1

The Dartmouth Atlas Working Group

Leadership

Elliott S. Fisher, MD, MPH, Dartmouth Atlas Co-Principal Investigator
David C. Goodman, MD, MS, Dartmouth Atlas Co-Principal Investigator
John E. Wennberg, MD, MPH, Founder of the Dartmouth Atlas
Kristen K. Bronner, MA, Managing Editor

Senior Authors and Faculty

John Erik-Bell, MD
John D. Birkmeyer, MD
Shannon Brownlee, MS
Chiang-Hua Chang, PhD
Amos R. Esty, MA
Philip P. Goodney, MD, MS
Jonathan S. Skinner, PhD
Thérèse A. Stukel, PhD
James N. Weinstein, DO, MS

Analytic and Administrative Staff

Christopher I. Young, MSc, Director of the Data and Analytic Core
Elisabeth L. Bryan, BS
Thomas A. Bubolz, PhD
Caitlin J. Clapp, BA
Jennifer Dong, MS
Edward Gawlinski, BS
Daniel J. Gottlieb, MS
Jia Lan, MS
Martha K. Lane, MA
Stephanie R. Raymond, BA
Sandra M. Sharp, SM
Yunjie Song, PhD
Dean T. Stanley, RHCE
Dongmei Wang, MS
Peter J. Westphaelen, BA
Weiping Zhou, MS

Design and Production

Jonathan Sa'adah and Elizabeth Adams

Foundation for Informed Medical Decision Making Clinical Evidence Team

Julie M. Beauregard, MLIS
Mary McNaughton-Collins, MD, MPH
Ruth D. Lipman, PhD
Colin Nelson
Chad Parmet
Diana L. Stilwell, MPH

THE DARTMOUTH INSTITUTE
FOR HEALTH POLICY & CLINICAL PRACTICE
Where Knowledge Informs Change