

Assuring Appropriate Patient Care Under Capitation Arrangements

Recommendations of
the American Society
of Internal Medicine

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2011 Pennsylvania Avenue, NW
Suite 800
Washington, DC 20006-1808
(202) 835-2746
Fax: (202) 835-0443

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Contents

Executive Summary	4
Introduction	6
How Prevalent Are Capitation Arrangements?	8
Implications of Capitation for Patient Care	10
Recommendations	
• For MCOs	14
• For Internists	21
Conclusion	23
Endnotes	24
Risk Adjustment Methodologies: A Selected Bibliography	25

Executive Summary

Within the next few years if current trends continue, most Americans are likely to receive their medical care under health plans that place physicians at financial risk for the clinical decisions that they make on the patient's behalf. Capitation arrangements—which pay physicians a set amount per patient per month for all services provided to enrolled patients—are the most popular way of compensating physicians among plans that require physicians to share in financial risk. Physician capitation creates a stronger incentive to reduce unnecessary or marginal services than other methods for compensation. But for the same reason, capitation also creates the greatest potential for some patients to get less than adequate care if the legitimate cost of providing needed medical services exceeds what the plan expects that care to cost. This could occur, for example, if an individual physician's pool of enrolled patients is sicker than the “average” patients enrolled in the plan.

The American Society of Internal Medicine (ASIM) has prepared this white paper to explore potential problems that patient care might experience if the current trend toward capitating physicians continues. It also will provide recommendations to reduce the risk that some patients—particularly the patients with complex illnesses typically seen by internists—will receive inadequate treatment. This paper explains the various methods of capitating physicians; discusses the prevalence of capitation and the implications for patient care; and provides specific recommendations for the managed care industry and internists to assure that appropriate patient care is provided under capitation arrangements.

ASIM's recommendations for health plans include:

- assuming a responsibility to assure that the financial risk-sharing methods they adopt do not lead to compromised patient care;
- providing stop-loss coverage to all physicians;
- establishing a minimum number of enrolled patients per physician to spread the risk under capitation arrangements that place physicians at risk for services outside their direct control;
- adjusting capitation rates by health status and prior utilization;
- creating “carve outs” from the capitation payments for high-cost patients and treatments;
- informing patients of arrangements that place physicians at financial risk when they first enroll;
- providing a fee-for-service, point-of-service option for patients enrolled in plans that capitate network physicians; and
- using current resource-based relative value units (RVUs) in determining reimbursement mechanisms.

The recommendations for internists include:

- evaluating the services included under primary care capitation and negotiating “carve outs” for high-cost services and clinical conditions;

- considering the option of negotiating a group capitation payment; and
- maintaining their ethical commitment to do everything possible to assure that patient care is not compromised when they accept financial risk.

This paper cites research literature in support of its findings and recommendations and includes a bibliography on

methodologies for adjusting capitation payments by severity of illness. It is one of four policy papers on “Reinventing Managed Care” published simultaneously by ASIM. The other papers, which are available upon request, address access to subspecialty care, use of board certification in health plan credentialing of physicians, and methods for assessing physician performance.

Assuring Appropriate Patient Care Under Capitation Arrangements

Introduction

Within the next few years, most Americans are likely to enroll in health plans that place their physicians at financial risk for patient care services. *Financial risk* means that physicians agree to have some or all of their compensation linked to how effective they are individually—or they and their colleagues are collectively—at keeping patient care costs under control. Under managed care health plans that require physicians to share in the financial risk of taking care of patients, physicians can expect to earn more if they order fewer tests, hospitalize their patients less frequently, provide fewer procedures, use less technology and see patients less often than their colleagues who order or provide more tests, hospital admissions, procedures and visits.

This change in the financial incentives under which patient care is provided—from a predominantly fee-for-service environment that rewarded physicians for doing “more” for patients to one that encourages them to do less—will dramatically affect patient care. On one hand, patients can benefit if physicians learn to practice in a way that reduces unnecessary, marginal or less-effective treatments. On the other hand, if some patients do not get needed or potentially beneficial treatments, their care may suffer. Patients who are older and sicker than the average patient may be undertreated, unless the financial risk-arrangement takes into account the likelihood that patients with more complex conditions will require more services.

Health plans ask physicians to share in financial risk in many different ways, such as:

- **Risk pools.** Some place only a portion of the physician’s compensation at financial risk in the form of a risk pool. Some managed care organizations (MCOs) withhold a percentage of the fees that would otherwise be due to the physician. (Because of the negative connotation associated with “withholds,” many MCOs now refer to these arrangements as “bonus” programs.) MCOs typically put these withheld funds into a risk pool—a pool of money that pays for defined expenses—that they use to pay excess expenses for services associated with that pool. Commonly, if there is a balance in the risk pool at the end of the year, it is returned in part or in total to those managing the risk.¹ After the expenses are paid for patient care, excess money is refunded to the participating physicians. However, there can be deductions and withholds that are not always paid back.²
- **Global fees.** Less commonly, some health plans pay for some specified physician services on a global fee basis. Global fees, sometimes referred to as package pricing or case-rate reimbursement, are flat fees that cover all medical services provided during a defined episode of care. While reimbursement will increase with the total volume of services, the financial risk for physicians is that the cost for many individual episodes of care will exceed the global fee.³
- **Capitation.** Compared to risk pools and global fees that place only a portion of the physician’s compensation at risk, capitation arrangements place physicians at the greatest degree of financial risk because they pay a set amount per patient for all services included in the capitated rate. Capita-

Capitation creates a stronger incentive to reduce unnecessary or marginal services than other methods for compensating physicians.

tion is a managed care payment system in which a fixed-dollar amount is prepaid to contracting physicians, typically on a monthly basis, based on the MCO's determination of the cost per patient per month. A physician who accepts a capitated payment arrangement commits to providing the agreed bundle of necessary services included in the capitated payment for an individually enrolled patient. If no services are necessary for a particular patient in a month, the physician still receives the capitated payment. However, if an enrolled patient requires an unusually high level of services in a month, there is no additional payment.⁴

There are four general arrangements typically used to capitate physicians:

- **Primary care capitation.** The physician is paid a set amount per patient per month only for those primary care services—such as office visits and tests commonly provided during the visit—that are provided by or are under the physician's direct control.
- **Risk-bearing (or full-risk) capitation.** The physician is placed at financial risk for services—such as hospitalizations and referrals to consultants—that go beyond the primary care services that are under his or her direct control.
- **Specialty capitation.** Specialists/consultants are placed at risk for their services. Similarly, "reverse" capitation is when specialists are capitated and the primary care physician is paid on a fee-for-service basis.
- **Group capitation.** The group practice, rather than an individual physician, is placed at financial risk for the

services provided by physicians within the group.

Capitation also is used to describe arrangements where an MCO agrees to cover all services included in its benefits package for a fixed amount per month for each enrollee. This puts the health plan at financial risk for providing all covered benefits for the agreed-upon capitated amount. Health maintenance organizations (HMOs) collect premium payments on a capitated basis. Capitated MCOs then typically shift the financial risk to physicians who are employed by or contract with the plan. Although capitation to health plans raises many of the same issues as physician capitation (such as the need to include adjustments for severity of illness), this paper discusses physician capitation except where otherwise noted.

Capitation creates a stronger incentive to reduce unnecessary or marginal services than other methods for compensating physicians. But capitation also creates the greatest potential that some patients will get less than adequate care, if the legitimate costs of providing needed services to the pool of patients covered exceeds the plan's determination of those expected costs. This could occur, for example, if an individual physician's pool of enrolled patients is sicker than the "average" patients enrolled in the plan.

This paper explores the implications for patient care in the movement toward capitating physicians for services provided to patients enrolled in MCOs. It also provides ASIM's recommendations for structuring capitation arrangements to reduce the risk that some patients (particularly the sickest patients commonly treated by internists) will receive inadequate treatment.

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How Prevalent Are Capitation Arrangements?

As recent as eight years ago, the vast majority of Americans received their health care from traditional “indemnity” fee-for-service plans. In 1988, indemnity insurance accounted for 72.6 percent of the health insurance market. By 1993, it had shrunk to 33.3 percent.⁵

It would be a mistake to conclude from this that most people are now insured by health plans that place their physicians at financial risk. Some of the competition that is edging out traditional indemnity insurance has come from “managed” fee-for-service or managed indemnity plans—plans that borrow some HMO methods such as requirements that elective procedures receive precertification but still pay on a fee-for-service basis. Another popular form of “managed care”—the preferred provider organization (PPO)—typically requires that contracting physicians agree to discounted fees and utilization controls, but does not place physicians at financial risk (through risk pools or capitation) for their clinical decisions. PPO enrollment increased from 12.2 million people in 1987 to 76.6 million in 1993.⁶

Still, a large—and growing—number of Americans are insured by HMOs. In 1993, HMO penetration nationwide reached 19.4 percent of the population, or almost 49 million people, the highest ever.⁷ Because HMOs agree to provide covered benefits at a set capitation payment, most require employed or contracting physicians to share in the financial risk. As HMO enrollment increases, the proportion of patient care that is provided under arrangements where the physician is at financial risk also will grow.

In 1993, capitation became the most popular form of physician reimbursement among HMOs, with 62 percent using this form of payment, although not exclusively:

- 60 percent reimbursed physicians for at least some services on a fee-for-service basis;
- 21 percent paid physicians salaries; and
- 18 percent offered a bonus program to physicians.⁸

Newer HMOs—those that have been in operation less than five years—were more likely to pay physicians on a capitation basis (71 percent compared to an average of 62 percent for all HMOs). Network HMOs, which account for nearly 13 percent of all health plans, were most likely (78 percent compared to 62 percent) to reimburse physicians on a capitated basis. Individual practice associations (IPAs) and group plans were slightly above average in reimbursing physicians on a capitated basis. Staff model HMOs were below average in using capitation, with 25 percent indicating they reimburse physicians on a capitated basis. (The vast majority of staff model HMOs compensate physicians on a salary basis.)⁹ Because enrollment in IPAs, network and group model HMOs has been increasing faster than staff model HMOs, the proportion of medical care that will be provided under physician capitation arrangements will continue to grow accordingly.

ASIM recently conducted its own survey of over 200 MCOs. Of the respondents, 70 percent (43 out of 61) indicated that they reimburse primary care physicians under a capitation arrangement. Fifty-one percent (31 out of 61) capitate

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specialists.¹⁰ In a survey of ASIM's membership, 28.4 percent of the 1,891 respondents indicated that they obtained income from capitation. As a percentage of income, however, capitation accounted for only 4.3 percent.¹¹

Even though capitation represents a relatively low proportion of income for ASIM's membership, internists rated concerns about capitation payments—and particularly, the lack of severity of illness adjustments to capitated payments—as the most important managed care issue they faced.¹² This suggests that internists' concerns about capitation are not predominantly based on the impact on their incomes. Rather, it may reflect concern about the effect capitation will have on their ethical obligations to provide their patients—and especially, their sickest patients—with the best care possible. It also may represent an understanding that capitation may become the dominant form of compensation in many parts of the country, if not nationwide.

The previously cited data indicate that an ever-increasing proportion of patient care will be provided under capitation arrangements with physicians. Virtually all experts expect HMO enrollment to continue increasing rapidly, especially in the network and IPA models that are likely to reimburse physicians under capitation. Other developments could accelerate the growth of capitation arrangements. The 104th Congress is considering proposals to increase the enrollment of Medicare beneficiaries in HMOs. Because Medicare is one of the last bastions of fee-for-service medicine, legislation that would encourage or force more Medicare beneficiaries into HMOs could rapidly increase the number of patients treated by physicians who are being paid by capitation. According to ASIM's membership

survey, 41.9 percent of internists' incomes are from Medicare reimbursements.¹³ Internists could soon find that the substantial portion of their income that is now derived from Medicare fee-for-service will be funneled through HMOs, many of which will probably capitate physicians for their Medicare patients.

In addition, many states are setting up programs that require Medicaid beneficiaries to obtain services through MCOs, and this trend is likely to accelerate. If Medicaid is converted to a state block grant program (Congress currently is discussing the idea), the states will bear a greater share of the financial risk associated with providing coverage to Medicaid patients. State governments are likely to transfer much of that risk to physicians and other "providers" by requiring Medicaid beneficiaries to enroll in managed care plans. Medicaid reform therefore is likely to increase the number of patients whose care is provided under physician capitation arrangements.

The effect of the rapid increase in physician capitation on patient care must be examined. ASIM believes that there has been inadequate discussion of the ethical and qualitative issues associated with placing physicians at direct financial risk for patient care. How will physicians respond to the potential conflict of interest that can result from capitation payments? Capitation pits the physicians' financial interest in doing as little as possible for the patient against the physicians' professional obligation to do everything possible to help the patient. Should patients be informed about this potential conflict of interest? Will patients with the most complex health problems be the most at risk of being "undertreated" in capitation systems that are based on a health plan's projections of "average" cost? What

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changes are needed in the way that health plans capitate physicians to assure that the patient's interest always comes first?

Implications of Capitation for Patient Care

The growth in capitation payment systems will have a dramatic impact on patient care. On the positive side, it creates the potential for reducing overutilization and improving the cost-effectiveness of patient care. But capitation can have a detrimental impact on patient care if it results in physicians spending inadequate time with patients or undertreating them. Whether the impact on patient care is positive or negative will depend in large part on how the capitation arrangement is designed and implemented. There are several ways that *poorly designed and implemented* capitation arrangements could have a detrimental impact on patient care:

First, unless MCOs adjust capitation payments to physicians to reflect severity of illness, they will not adequately predict the costs of treating patients who are sicker and legitimately need more medical care.

Capitation rates to physicians are based on the health plan's determination of the cost of providing medical care services for an enrolled patient. Typically, MCOs consider the age and sex of the population served by the health plan in determining the capitation rates, because an older population and sicker patients use services in greater numbers and intensity.

MCOs also may look at differences in the nature and level of utilization that can

result from unique characteristics represented by local demographics, economics and practice patterns. Socioeconomic factors—the wealth and educational level of the insured enrollees—and the types of industries in which enrollees work also may be considered. Although these adjustments may reflect some of the reasons that different enrollees will require more or less medical care, they do not adequately capture the different health status of enrolled patients.

The capitation rate does not need to accurately predict the precise amount of resources that will be expended for *each* enrolled patient. Rather, it should predict what is necessary for the combined monthly capitation payments for all enrolled patients, spread over the entire year, to adequately cover the costs of all needed services that are included within the physician's capitation payment. The problem is that without specific adjustments in the capitation rates for severity of illness, physicians who have a "sicker" than average pool of patients may find that the capitated rate does not cover the costs associated with providing all necessary care for their patients. One article explains the problem this way:

As the health care system moves toward managed care, capitation, community rating, and universal coverage, both health plans and providers will become more concerned about the financial implications of the illness burden of their patient panels. If payments are not adjusted to account for differences in illness burden, some providers or insurers may be put out of business trying to serve a sicker population while receiving community-rated compensation. Without morbidity-based performance profiling or compensation schemes, providers and insurers serving sicker pa-

Capitation rates to physicians are based on the health plan's determination of the cost of providing medical care services for a patient enrolled in the health plan.

tients could be forced to withdraw from the system, succumb to incentives to undertreat, or find ways to recruit and retain patients with fewer medical problems. The ideal mechanism for profiling or evaluating providers will take the distribution of illness burden into account explicitly. The ideal patient care reimbursement mechanism will fairly compensate providers who care for sicker patients and will also minimize incentives to under- or over-treat them.¹⁴

There are a number of reasons that an individual physician may have a patient population that has “above average” risk that is not accounted for by age, sex and the other basic demographic adjustments now made by health plans in calculating capitation rates. When accepting a capitation payment, the physician incurs two types of risk:

- **Random financial risk.** This is the chance occurrence that the physician will need to care for a patient with a catastrophic illness; and
- **Systematic financial risk.** This is the chance that high health-risk enrollees may select a physician for specific reasons. Some individuals may enroll because their physician joined a point-of-service or HMO network; others will choose a physician because of a friend’s recommendation or geographic location. Systematic risk can be a major problem for physicians. If a third-party payer offers all its physicians the same capitation per member, some physicians will suffer heavy financial losses simply because a handful of very high-risk members decide to enroll with them.¹⁵

One study examined the statistical “pro-

files” used by managed care plans to compare the utilization patterns of physicians. The study found that failure to adjust for case mix in physician practice profiles may lead to overestimates of variation and misidentification of outliers. Adjustment for patient characteristics decreased the observed variation in practice patterns, with a decrease of more than 50 percent in the coefficient of variation.¹⁶ Although this study was concerned with improving the accuracy of practice profiling, not setting capitation rates, the study’s conclusion is applicable to capitation: differences in case mix will result in wide variation in use of medical care resources, which should be taken into account by MCOs as they develop their profiles and establish their capitation rates.

Second, because capitation payments usually do not take into account the complex case mix typically seen by physicians who specialize in internal medicine, patients being treated by internists are at greater risk of having their care adversely affected.

Physicians who specialize in internal medicine are at greater risk of having a patient population that will require more resources than would be predicted based on age and sex alone. According to the National Ambulatory Medical Care Survey, internists on average have patients with more complex illnesses, who require a greater use of laboratory tests and other diagnostic procedures, than patients of family physicians and other primary care physicians.¹⁷ One author has noted that adverse selection—the enrollment of a disproportionate share of persons who are in poorer health, who pose higher financial risks than the average person, and who are more likely to make claims for

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services—is a particular problem for internists and internist-subspecialists. He reports that internists with both general internal medicine and subspecialty practices are vulnerable to adverse selection in several ways:

- Internists are primary care physicians with specialty training in internal medicine, which can lead to adverse selection.
- Existing patients, when seen in the subspecialty practice, join the MCO and select the physician for their primary care. In addition, MCOs provide members information about physicians—particularly primary care physicians—on their contracted panel. A physician who is listed as both a specialist and a subspecialist of internal medicine may be adversely selected by patients who, because of past medical problems, anticipate needing subspecialty care.
- Some MCOs restrict or prohibit primary care physicians from providing subspecialty care to their own patients—even if the physicians are qualified subspecialists—without going through a referral authorization process.
- Physicians who seek to attract capitated enrollees from their existing practice may suffer because they are seeking patients only from a medically needy population. For the law of averages to work, the patient pool must include a representative number of individuals who need little or no medical care.¹⁸

Many adult patients with more complex medical problems choose an internist because they know that internists, through

their training and experience, are best qualified to provide comprehensive medical care to adults. No other medical specialty has such extensive training in caring for adult patients. When adults become seriously ill, they generally seek care from an internist or internist-subspecialist rather than other primary care physicians. Family physicians also often refer more complex patients to internists. For all of these reasons, internists—and their patients—are likely to find that capitation payments do not accurately or completely reflect the type of patients seen in a typical internal medicine practice.

Internists who have a patient population requiring additional resources over those allowed by the capitation payment will face a difficult ethical dilemma. If these physicians decline to sign up with a health plan offering inadequate capitation payments, they may lose the ability to take care of their patients who have been enrolled (usually by an employer) in the plan. This may interrupt the continuity of care established by the physician and the patient over many years. If internists sign on with a plan, agreeing to accept the capitated payment, they may lose money because their patients legitimately need more services. They also may be faced with the ethical conflict of providing what a patient medically needs or watching their own financial interest by doing as little as possible for the patient. In a worst-case situation, their sickest patients could be undertreated.

Third, health plans may use inadequate capitation payments to discourage physicians with sicker patients from joining the plan.

By setting capitation rates at levels that are too low to cover the costs of services

If internists sign on with a plan, agreeing to accept the capitated payment, they may lose money because their patients legitimately need more services.

provided to sicker patients, unethical health plans can engage in a form of systematic discrimination against sicker patients. For example, physicians who are taking care of a large number of AIDS patients or internists who have large inner-city practices with greater health risks may find that they cannot accept the health plan's capitation rate. By keeping such physicians off their panels, health plans know that they also can keep many patients of those physicians from enrolling in the plan. Managed care "skimming" of healthier patients could leave sicker patients in the fee-for-service setting, thus driving up fee-for-service premium costs. At some point, the higher premiums could result in loss of insurance coverage for many seriously ill people.

Fourth, unless capitation payments reflect the differences in the work required to take care of patients based on the severity of their illnesses, they will underpay physicians who work harder because they take care of patients with more complex illnesses and overpay those who treat healthier patients.

A fundamental principle of a fair payment system is that those physicians who provide more work (time spent taking care of the patient, the mental effort and judgment required, the physical skill and technical effort needed, and physician stress experienced due to iatrogenic risk to the patient) should be paid more than those who do not. An internist who is taking

care of a complex patient population will work harder than a physician with a healthier pool of patients. If both physicians are paid the same capitation rate, the payment to the physician with the sicker patients will be inherently inequitable.

Although capitation can potentially affect patient care adversely, it should be among the options available to patients and physicians. Capitation offers positive potential for improving efficiency and reducing unnecessary tests and procedures. But this analysis does suggest that as capitation becomes increasingly prevalent, the managed care industry must look at ways to change how capitation payments are established to minimize any adverse impact on patients. The goal should be to structure capitation payments to deliver high-quality care at the lowest cost. Unfortunately, under current methods, there is too much of a risk of conflict arising between the physician's and the health plan's financial interest in reducing services and the legitimate need of some patients—particularly those with more complex illnesses—for more medical care. Like other aspects of managed care, physicians and health plans need to "reinvent" capitation to minimize any adverse impact on patient care.

ASIM believes that steps can be taken to protect patients and their physicians from being placed at undue financial risk for providing appropriate medical care.

An internist who is taking care of a complex patient population will work harder than a physician with a healthier pool of patients.

Recommendations

ASIM believes that both the managed care industry and physicians share responsibility to assure that appropriate patient care is provided under capitated arrangements. For the industry, the task is to reinvent how capitation rates are determined to reduce incentives for undertreatment—particularly of patients with the most complex illnesses—and to show a willingness to discuss concerns that physicians may have about capitation. Internists and other physicians have a responsibility to evaluate carefully how capitation arrangements may affect patient care, to seek changes in the proposed capitation arrangement when necessary and to act always as the patient's advocate for obtaining needed services.

ASIM's recommendations should be considered as a package of proposals on how capitation payments should be structured. Implementing a single recommendation, or only some of the recommendations, may not be sufficient to protect patients from adverse outcomes, if the other recommended changes also are not implemented. Acceptance or nonacceptance of each recommendation also will affect the other recommendations. For example, the size of the minimum risk pool for primary care and risk-bearing capitation would vary if other recommendations—such as stop-loss coverage, severity adjustments and carve outs of high-cost services and diagnoses—are accepted. Capitation arrangements that do not include these recommendations would require a much larger pool of patients to spread the risk.

ASIM believes that stop-loss coverage should be provided for all risk-bearing contracts, including primary care services.

Recommendations for MCOs

1. All health plans must assume responsibility to assure that financial risk-sharing methods do not lead to compromised patient care, which capitation and other risk-sharing methods may do. The plans need to be open to proposals from physicians to restructure their capitation arrangements to reduce any potential adverse impact on patients. It is not sufficient for health plans to argue that the responsibility for assuring that appropriate care is given falls solely on the physician, when it is the health plan that determines the financial arrangement under which medical care is provided.

2. All health plans should offer stop-loss coverage to all physicians. Physicians should be required to obtain stop-loss coverage if their capitation contains risk provisions beyond the services that the physician provides (for example, sharing risk for hospital care).

Stop-loss coverage helps protect physicians who have more complex case mixes. Stop-loss coverage is a form of reinsurance that provides protection for annual medical expenses above a certain limit, for example, over \$2,500. When costs of a patient's care exceed that amount in a single year, the physician will be reimbursed for additional services at an agreed-upon rate.¹⁹ Some health plans provide stop-loss coverage at the health plan's expense; others require that physicians purchase such coverage. ASIM believes that stop-loss coverage should be provided for all risk-bearing contracts, including primary care services. A *risk-bearing contract* includes in the phy-

sician's capitation payment such services as hospitalizations that are not necessarily under the physician's direct control, in addition to the usual capitated primary care services.

Although many health plans now offer stop-loss coverage, the decision on whether a health plan will offer such coverage, and whether the physician will obtain it, is purely voluntary and varies from plan to plan. ASIM believes that a uniform requirement or agreement among MCOs to offer coverage to physicians for both primary care and other risk-bearing contracts would reduce the adverse impact on physicians with a more complex mix of patients. By itself, stop-loss coverage is not sufficient to address the problem of adverse selection, however. Required stop-loss insurance should be viewed as something that would help, but not solve, the problem of inequitably low capitation payments to physicians with more complex patients.

3. Risk-bearing capitation payments should be based on a minimum enrolled patient population of 250 or more patients per physician. If an internist has fewer than a group average of 250 patients per plan, the internist should be compensated under a fee-for-service or a primary-care capitation payment mechanism.

ASIM believes that risk-bearing capitation payments should spread the risk over a sufficiently large number of enrollees to protect physicians from the consequences of adverse selection, should they end up taking care of patients with unusually expensive illnesses. Because risk-bearing capitation places the physician at financial risk for services beyond his or her direct control, it needs a larger pool of patients to spread the financial risk. A

smaller number of enrollees may be required for primary care capitation, assuming that there are no other selection biases.

The number of enrollees required to spread risk greatly depends on other variables, such as the specific scope of services included, the characteristics of the insured population, and the availability of stop-loss coverage. So, the literature does not support one preferred minimum number of enrollees to be included in capitation payments. One author believes that a minimum of 500 subscribers (or, assuming an average, covered family size of 2.5 persons, about 1,250 members) is required to reduce extreme medical cost fluctuations caused by a small, predictable number of random catastrophic expenses. He argues that providers enrolling fewer than 500 subscribers can best handle this risk by negotiating stop-loss provisions.²⁰ Several authors suggest that most experts would agree that a single physician is assuming an inordinately high risk if the basic primary care capitation is based on a pool of fewer than 200 to 300 assigned members.²¹

After reviewing the research literature, ASIM suggests that a *minimum* of 250 patients in the pool for a risk-bearing arrangement would allow the "law of averages" to work. As one author notes: "The most significant and obvious risk in a capitated arrangement is based on chance, the risk of higher-than-anticipated utilization of services, either in terms of frequency or intensity. To manage that risk, invoke the law of large numbers, to the extent possible."²² For primary care capitation, the minimum number of enrollees will depend on variables such as if stop-loss coverage is provided and if carve-outs are allowed for high-cost patients and diagnoses. By in-

By itself, stop-loss coverage is not sufficient to address the problem of adverse selection, however.

corporating adequate severity adjusters into capitation payments, a smaller pool of patients may be required to reduce or eliminate systematic or random risk.

4. Managed care plans that use a “gatekeeper” model should require either that patients select a primary care physician within 30 days of enrollment, or the plan will select a primary care physician for the patient. If, for some reason, a primary care physician is not selected within this time frame, health plans that use a capitation payment mechanism must pay the primary care physician who first sees the patient a capitation payment for that patient retroactive to the enrollment date.

When a gatekeeper-model HMO enrolls a patient who fails to select a primary care physician, the physician who sees the patient first is required to provide care without any prior compensation (i.e., the physician’s capitated payments are not paid retroactively). The health plan profits at the primary care physician’s expense because it receives the premium for the patient but does not compensate the physician for the services provided to that patient. ASIM believes that primary care physicians should be compensated for any patient for whom services are rendered from the time the patient is enrolled in the plan.

5. Health plans should modify the methods they use to determine capitation payments to include several factors, in addition to age and gender, that can predict use of medical care resources. Specifically, ASIM recommends that health plans incorporate measures of health status and prior-year utilization.

The research literature strongly supports the conclusion that current methods for establishing capitation rates do not adequately predict differences in resource use due to variations in the complexity of patients’ illnesses seen by physicians. Of the approaches being developed for adjusting for case mix, ASIM believes that incorporating measures of health status and prior utilization offer the best potential for assuring adequate payments to physicians with a more complex case mix of patients while maintaining incentives to control costs. ASIM has reviewed the literature on severity risk-adjustment systems. Although several of these methodologies show promise, ASIM does not endorse any one.

One author notes: “Many studies show that broad-based utilization variables—such as the number of prior-year hospitalizations, ambulatory care visits, and specialty visits—will significantly increase the precision of age/sex capitation rating.” He argues, however, that other actuarial characteristics besides predictive ability also must be considered. “Prior year utilization, although highly predictive, may be unsatisfactory because it could cause unnecessary utilization, especially if the associated capitation increase exceeds the cost of providing the service. Research shows that health measures of an individual’s health status are predictive of future medical expenditures. Unlike prior-year utilization, however, health status measures do not provide any direct incentives for physicians to promote unnecessary use.” The author concludes that:

- Research shows that incorporating measures of age/sex, health status and prior-year utilization can significantly improve predictions of member medical expenditures.

...Primary care physicians should be compensated for any patient for whom services are rendered from the time the patient is enrolled in the plan.

- Physicians will have a more difficult time manipulating the reimbursement level of the capitation payment if prior utilization is considered along with health status. Instead of being able to influence their members' responses on a few health status questionnaires to place them in higher reimbursement levels, physicians will have to manipulate a number of verifiable prior-year utilization variables to raise their capitation rate.
- Incorporating health status scores with prior utilization may reduce incentives for physician groups to provide unnecessary services. Physicians have less ability to move members to more lucrative payment categories simply by providing more unnecessary care, because the adjustment system is based on member health status and utilization.²³

ASIM does not agree that physicians are likely to manipulate health status data or prior utilization to obtain higher capitation rates. Increasing utilization rates to raise future capitation payments would actually hurt capitated physicians financially during the year that utilization is being increased. Manipulating health status measures to obtain higher capitated payments would be unethical.

But ASIM agrees that the combination of prior utilization and health status would predict resource utilization more than age and sex adjustments alone. These two factors would strike an appropriate balance between the physician's acceptance of risk and assuring that sicker patients are not penalized by that acceptance. **Because the potential for systematic risk adversely affecting patient care is great, severity adjustments are needed regardless of the pool size of**

enrollees included under the capitation arrangement. ASIM agrees with the author's view that:

The goal of capitation is to place gatekeepers at financial risk for the services they deliver. However, third-party payers should provide gatekeepers with some financial protection against random and systematic risks transfer. The primary care physicians' other alternative is to reduce this risk on their own by actively marketing services to healthier patients and creating barriers to care for their sicker patients.²⁴

Several methodologies have been developed for adjusting capitation rates by health status and prior utilization. A partial bibliography of studies on adjusting capitation rates by severity is appended to this paper. ASIM does not endorse any particular methodology, but believes that the managed care industry—in cooperation with health services researchers, actuaries and physicians—should evaluate the different methodologies, determine which ones are most capable of accurately predicting future medical expenditures based on prior utilization and health status, refine the methodologies as needed, and incorporate them into determination of their physician capitation rates.

ASIM believes that several of the methodologies have been sufficiently developed to be incorporated into determinations of capitation payment rates without undue delay. Because the growing use of capitation can result in practices that are discriminatory and harmful to patients with complex illnesses, the managed care industry must make a commitment to incorporate severity adjustments expeditiously into their capitation rate determinations.

Manipulating health status measures to obtain higher capitated payments would be unethical.

The risk adjustment methodologies being developed today include the ambulatory care groups (ACGs), diagnostic care groups (DCGs), and payment amount for capitated systems (PACS). They all have the same goal of assessing risk pools fairly. The principal difference is that each methodology solicits information from different sources. ACGs establish patient risk-pools based on physicians' records, and DCGs and PACS establish patient pools from inpatient records.

Developed by Jonathan Weiner, DrPH, and others at Johns Hopkins University, ACGs are a population-based adjustment that considers differences in patient illness burdens. Patients are classified into various pools with age, sex and diagnosis as criteria. One of the major criticisms ACGs receive is their susceptibility to physician fraud by physician "upcoding" of diagnosis. Dr. Weiner claims that physicians attempting to alter utilization patterns can be easily identified, and compensation arrangements may be altered appropriately. Combining ACGs with other measures of current health status could reduce concerns about physician "gaming" of the severity adjustments. Other elements of risk cited in the research literature include age; acute clinical stability; principal diagnosis; severity of principal diagnosis—extent and severity of comorbidities; physical function status; psychological, cognitive, and psychosocial functioning; nonclinical attributes such as socioeconomic status; health status and quality of life; and patient attitudes and preferences.

DCGs were developed by Arlene Ash and Randy Ellis at Boston University. PACS were developed by Gerard Anderson, MD, and others at Johns Hopkins University. Unlike ACGs, DCGs and PACS both are

prior history models and solicit information from inpatient hospitalizations.

Other methodologies that have been developed include RAND 36 (which consists of a 36-question patient survey) and the Robinson-Luft model (a series of conditional probability regression equations to assign relative risk values).

Of the health plans that responded to ASIM's survey, 70 percent indicated that it would be appropriate to employ capitation rating methodologies that consider severity of patient illness. Eighty-five percent indicated that they would consider using such methodologies if they became available. Those who would not consider using such methodologies cited "administrative difficulty and cost of determining the severity of illness for each patient" (24 percent); "difficulty and expense of determining different capitation rates for each physician" (12 percent); "physicians may use the severity of illness adjustments to their economic advantage" (5 percent); and "other reasons" for being unwilling to consider severity adjustments (59 percent). Although the administrative concerns are valid, they should not stand in the way of making changes that will improve the quality of care provided to sicker patients. ASIM is encouraged that the vast majority of surveyed plans would consider using severity adjustments. Two plans responded that they are already using the ACG methodology.²⁵

ASIM supports the concept of severity adjusting for prior utilization and health status in a patient population but does not endorse trying to severity-adjust each individual capitation payment on an on-going basis.

Combining ACGs with other measures of current health status could reduce concerns about physician "gaming" of the severity adjustments.

6. Managed care contracts should include provisions to protect physicians from adverse selection when certain high-cost patients with pre-existing conditions sign up with the primary care physician (e.g., patients with active AIDS, organ transplants or end-stage renal disease). Specified high-cost patients with pre-existing conditions should be excluded from the individual capitation rate and handled on a fee-for-service or capitation carve-out basis.

Such provisions would protect internists and other physicians who experience adverse selection because an unusual number of patients with complex, costly illnesses sign up with them as primary care physicians. By permitting services that are provided to those patients to be billed separately from the capitation payment, the financial incentive to avoid treating the highest cost patients would be reduced. It also would reduce the chance that care to such patients would be compromised because of concerns about their impact on the physician's overall experience under capitation.

7. Patients should be informed, at the time of enrollment, of any financial arrangements—including capitation—that place physicians at risk for the services that they provide to patients.

Because capitation payments can potentially misalign the physician's financial incentive to do less for the patient and an individual patient's legitimate need and desire for more medical services, patients should be informed by the health plan, before they join it, of this possible conflict of interest. This is especially important until adequate severity of adjustment indices can be applied to capitation

rates. Without prior knowledge of the incentives created by capitation, some patients—particularly those with complex illnesses—may join certain health plans that they would not have otherwise joined had they had prior knowledge. Others may still choose to join, but they would at least be aware of the potential conflict that may exist.

8. Health plans that capitate physicians should provide a fee-for-service, point-of-service option.

One way to reduce capitation's potential conflict of interest is to permit patients to go outside the health plan's capitated "physician" network to a noncapitated physician. By offering enrollees the ability to obtain services on a "point-of-service" basis from non-network physicians, health plans would be able to assure patients that if they are concerned about the care they are receiving from physicians in the capitated network, they have the right to obtain care from a non-network physician who would bill on a fee-for-service basis for covered services. A point-of-service requirement also would allow patients with complex illnesses to continue to see a non-network physician on a fee-for-service basis, even if their employer switched coverage to a health plan with a capitated physician network.

Individuals who elected to obtain services on a point-of-service basis would be required to pay cost-sharing when they receive services from non-network physicians, and services rendered by the non-network physicians would be subjected to the plan's utilization review. Especially in a capitated system, patients must have the "escape valve" of obtaining services from physicians who are not at financial risk for the medical care they provide. ASIM has developed a proposal for "com-

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petitive pricing” that would enable patients who use non-network physicians to compare the physician’s fees with those allowed by the health plan, through use of a resource-based relative value scale (RBRVS) with disclosure of the health plan’s and the individual physician’s dollar multiplier (conversion factor) for the RBRVS. A description of this proposal is available from ASIM upon request.

9. Health plans should use the most current work relative value units as found in the Medicare fee schedule methodology in determining their reimbursement mechanisms.

Health plans usually determine capitation payments by reviewing previous budgets and dividing the budget by utilization for the pool of patients whose services are being covered under the capitation payment. The plans generally categorize utilization by looking at the percentage of the budget spent on broad types of services—e.g., office visits, laboratory tests, inpatient visits and diagnostic services for varied age/sex categories—rather than on the explicit utilization of specific services, as is the case under fee-for-service arrangements. The RBRVS usually is not a factor in de-

termining capitation payments because previous budgets, in general, were based on historic usual, customary and reasonable (UCR) fee-for-service payments. Since the RBRVS is a measure of physician work, it may be possible for health plans to incorporate the RBRVS into capitation payments rather than carrying over the historical UCR-based budgets. Capitation payments for visit-intensive primary care services could be increased to be consistent with the incentives intended by the RBRVS.

In addition, MCOs increasingly use the RBRVS to structure their fee-for-service payments. It is important that the plans use the most current work RVUs to determine their fee-for-service payments. MCOs should not incorporate other policies adopted by Medicare in applying the RBRVS to Medicare payments, which have distorted the intent of the RBRVS. Those policies include separate conversion factors for surgical procedures that are higher than those for primary care and other nonsurgical services, volume performance standards, and “budget neutrality” adjustments in RVUs. ASIM has published guidelines on use of the RBRVS by non-Medicare payers; these guidelines are available upon request.

Recommendations for Internists

1. Internists should evaluate the services included under primary care capitation, taking into account how services such as EKGs, pulmonary function tests, flexible sigmoidoscopy, minor dermatological procedures, joint injections, holter monitors, and tread-mill tests affect primary care capitation. The capitation should be adequate to cover the procedures expected to be provided under the capitation arrangement, or they should be carved out and paid on a fee-for-service basis outside of the capitation rate. Internists also should carefully review contracts with MCOs and seek to exclude from the capitation payment those high-cost patients with pre existing conditions who subsequently sign up with the primary care physician.

As noted previously, carve-outs are a feature of a number of capitation arrangements. Certain services that would otherwise be considered part of the primary care capitation may be provided through other arrangements. When this occurs, the services will be carved out, both financially and definitionally, from the primary care arrangements. Carve-outs also can minimize the physicians' financial risk for certain high-cost or high-risk medical services during the early period of a contract. The services previously described are among those that could be considered for a carve-out. In addition, certain patients have pre-existing conditions that will require extensive and costly medical treatment. If those patients sign up with a primary care physician after the physician's capitated rate has been determined, the capitated pay-

ments may be inadequate to cover the physician's costs in providing an adequate and appropriate level of care to all enrollees. By carving out such patients and reimbursing physicians on a fee-for-service basis for services provided to those patients, this risk can be reduced.

2. As an alternative to individual capitation, internists in group practices and health plans may wish to consider the option of negotiating a group capitation payment.

Unlike individual capitation payments, group capitation spreads the risk among all of the physicians and all of the enrollees treated by the group practice, rather than placing too much risk on the individual physician. Under group capitation, the group is paid a set amount per patient signed up to be treated by the group. The group then decides how it wishes to distribute payments to physicians within the group. It also decides which financial incentives and utilization controls it wishes to place on individual physicians to assure that the group fares well under group capitation rates. For some internists, group capitation would be preferable to individual capitation. Internists who are considering group capitation need to be aware, however, that there are certain trade-offs that go along with the benefit of spreading risk throughout the group practice. For primary care groups that involve primary care physicians besides internists, and for other multi-specialty group practices, the trade-offs involve the necessity of deciding on the internal incentive structure, rewards, and utilization controls needed to make group capitation work.

3. Most importantly, internists have a responsibility to do everything they can to assure that patient care

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is not compromised when they accept financial risk for clinical decisions. Physicians must carefully review proposed capitation contracts and not accept any arrangement that they believe would create a conflict of interest that would compromise patient care. When they accept a capitated rate, physicians must align themselves with the patient's interest by striving to provide the best care possible at the lowest cost, rather than by reducing costs at the expense of providing the best possible care. ASIM also encourages physicians to enter into a dialogue with MCOs to discuss proposals to "reinvent" capitation to minimize any potential for harm to patients. Most importantly, physicians have an ethical and legal obligation to provide patients with the best care possible, regardless of financial and other limits that may be imposed by managed care. As one author has written:

To the extent that managed care attempts to limit the services actually provided, the physician may well have an obligation to inform the patient as to what will and will not be financed by the insurance or prepaid health plan

and to provide the patient with the physician's best judgment as to what is medically necessary, regardless of financial considerations. For many years, Medicare and other third-party payers maintained that they did not tell physicians how to practice medicine, they simply told physicians and their patients what they would and would not pay for. In a mature managed care environment, however, the attempt by the financing organization to influence clinical decision-making cannot be ignored. If a physician believes care is necessary, there may be an obligation to indicate to the patient alternative sources for the care and to be the patient's advocate with the managed care organization in attempting to procure authorization for coverage for a needed service. Capitated payment methodologies may be seen to encourage physicians to assume responsibility for so many patients that individuals cannot be adequately served in a timely manner...The physician should be able to close his or her practice to additional managed care patients to protect against this.²⁶

Conclusion

It is clear that health plans that pay physicians on a capitated basis are an option that will continue to be popular among many purchasers, individual patients and physicians. Traditional fee-for-service also should be an option for physicians and patients, but it is likely that market forces will drive more and more physicians and patients into arrangements that require physicians to accept financial risk.

Acceptance of financial risk through capitated arrangements can potentially improve patient care if physicians are encouraged to provide the best possible care at the lowest cost. But accepting financial risk also can be harmful to patient care if physicians are exposed to excessive financial pressure to reduce potentially beneficial services, to spend less time with patients, and to exclude the sickest patients from their practices. The physician's ethical obligations may minimize the potential adverse impact on patients. But the medical profession's ethical obligations do not relieve the managed care industry of its responsibility to change the way it capitates physicians to reduce potential harm to patients.

Patients with complex and costly medical conditions are the most vulnerable to receiving inadequate and discriminatory

treatment under capitated systems. It is wrong to place those patients—and their physicians—at excessive risk because capitated rates do not take into account the legitimate need for the services requiring more physician time and work that are involved with taking care of the sickest patients. As the specialty that provides medical care to adults with the most complex medical problems, internists in particular must advocate changes in capitated arrangements that will protect their sickest patients.

The recommendations in this paper—especially adjusting capitation payments by severity, carving out certain high-cost conditions and treatments, disclosing financial risk arrangements to patients, and offering the option of obtaining services on a fee-for-service, point-of-service basis—will help protect the most vulnerable patients from having their care compromised by capitation. Implementing these recommendations is intended to assure that the physician's and the patient's best interests continue to be aligned, especially for the sickest patients. The shared interest of physicians and patients must continue to seek to provide the best care in the most efficient way possible. MCOs must structure their capitation arrangements to support, not detract, from that shared interest.

**The recommendations
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Endnotes

1. Wieland JB. *The Internist's Guide to Negotiating Managed Care Contracts & Capitation Rates*. Washington, DC, American Society of Internal Medicine (ASIM), 1995, p. 186.
2. *Ibid.*, p. 38.
3. *Ibid.*, p. 30.
4. *Ibid.*, p. 31.
5. Weiss B. "Managed Care: There's No Stopping It Now." *Medical Economics*, March 11, 1995, p. 26.
6. *Ibid.*, p. 26.
7. Marion Merrell Dow. *Managed Care Digest: HMO Edition*, 1994, p. 4.
8. *Ibid.*, p. 12.
9. *Ibid.*, p. 12.
10. ASIM. "Survey of Physician Practice Situation." March 1995, p. 8.
11. *Ibid.*, p. 8.
12. *Ibid.*, p. 8.
13. *Ibid.*, p. 8.
14. Smith N, Weiner J. "Applying Population-Based Case Mix Adjustments in Managed Care: The Johns Hopkins Ambulatory Care Group System." *Managed Care Quarterly*, Spring 1994, p. 4.
15. Cave D. "Capitation Adjustments for Physician Risk." *Medical Interface*, January 1994, p. 135.
16. Salem-Schatz S *et al.* "The Case for Case-Mix Adjustment in Practice Profiling: When Good Apples Look Bad." *Journal of the American Medical Association*, Sept. 21, 1994, p. 873.
17. Department of Health and Human Services. "Ambulatory Medical Care Survey." 1974, 1975, 1979. Public Health Service, Washington, DC.
18. Wieland, p. 35.
19. *Ibid.*, p. 187.
20. Cave, p. 135.
21. Wieland, p. 62. Also: Vogel DE. *Family Physicians and Managed Care: A View to the 90s*. American Academy of Family Physicians, Washington, DC, 1993.
22. Wieland, p. 62.
23. Cave, p. 23.
24. *Ibid.*, p. 137.
25. ASIM. "Survey of Managed Care Organizations." Washington, DC, February 1995.
26. Wieland, pp. 108-109.

Risk Adjustment Methodologies: A Selected Bibliography

- American Academy of Actuaries. "Health Risk Assessment and Health Risk Adjustment Crucial Elements in Effective Health Care Reform." Monograph Series on Health Care Reform, Monograph One, May 1993, pp. 1-36.
- Anderson G, *et al.* "Setting Payment Rates for Capitated Systems: A Comparison of Various Alternatives." *Inquiry*, 27:225-233 (Fall 1990).
- Carter G. "Development of a Risk Adjustment System Under Health Reform." Submitted by RAND to the Health Care Financing Administration, OAG/Division of Contracts and Grants, April 28, 1994.
- Cave D. "Capitation Adjustments for Physician Risk." *Medical Interface*, January 1994, pp. 134-137.
- Fowles J, *et al.* "A Comparison of Alternative Approaches to Risk Measurement." Submitted by the Park Nicollet Medical Foundation and Johns Hopkins University School of Public Hygiene and Public Health to the Physician Payment Review Commission, Washington, DC, Sept. 23, 1994. (Draft copy.)
- Goldfield N. "The Importance of Case Mix in Outcomes Management." *The Journal of Outcomes Management*, December 1994, pp. 10-15.
- Group Health Association of America. "Research on 'Risk Adjusters' Needed for Competition Based on Quality and Cost," Feb. 8, 1993.
- Hartz A *et al.* "Comparing Hospitals That Perform Coronary Artery Bypass Surgery: The Effect of Outcome Measures and Data Sources." *American Journal of Public Health*, October 1994, pp. 1609-1614.
- Iezzoni L, Ed. "Risk Adjustment for Measuring Health Care Outcomes." Health Administration Press, Ann Arbor, Mich., January 1994, pp. 83-93.
- Lubitz J. "Health Status Adjustments for Medicare Capitation." *Inquiry*, 24:362-375 (Winter 1987).
- Manton K, Stallard E. "Analysis of Underwriting Factors for AAPCC." *Health Care Financing Review*, Fall 1992, pp. 117-132.
- Mozes B *et al.* "Case Mix Adjustment Using Objective Measures of Severity: The Case for Laboratory Data." *Health Services Research*, February 1994, pp. 689-712.
- National Health Policy Forum Issue Brief Workshop. "The Role of Risk Adjustment in National Health Reform." The George Washington University, Washington, DC, Feb. 23, 1994, pp. 3-10.
- Newhouse J *et al.* "Adjusting Capitation Rates Using Objective Health Measures and Prior Utilization." *Health Care Financing Review*, Spring 1989, pp. 41-54.
- Perkins N. "Case-Mix Adjustment, Claims Data Quality, and Physician Profiling." *Medical Interface*, August 1994, pp. 93-97.

- Robert Wood Johnson Foundation. "Risk Selection in a Reformed Health Care Marketplace." Conducted by the Alpha Center, Washington Vista Hotel, Washington, DC, Oct. 6, 1994.
- Robinson J, *et al.* "A Method of Risk Adjusting Employer Contributions to Competing Health Insurance Plans." *Inquiry*, 28:107-116 (Summer 1991).
- Salem-Schatz S *et al.* "The Case for Case-Mix Adjustment in Practice Profiling: When Good Apples Look Bad." *Journal of the American Medical Association*, Sept. 21, 1994, pp. 871-874.
- Schauffler H *et al.* "Using Chronic Disease Risk Factors to Adjust Medicare Capitation Payments." *Health Care Financing Review*, Fall 1992, pp. 79-90.
- Smith N, Weiner J. "Applying Population Case-Mix Adjustment in Managed Care: The Johns Hopkins Ambulatory Care Group System." *Managed Care Quarterly*, Spring 1994, pp. 21-34.
- Weiner J, *et al.* "Development and Application of a Population-Oriented Measure of Ambulatory Care Case-Mix." *Medical Care*, May 1991, pp. 452-472.