CHAPTER 6

The role of **health insurance**

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This chapter examines the role that health insurance, especially the government programs Medicare and Medicaid, might play in controlling antibiotic resistance. The central problem with antibiotic use by one patient is that it may have a negative externality—the spread of a resistant infection to other patients. If, however, those patients are part of the same health insurance pool, the health insurance company will "internalize" those effects and therefore have an incentive to promote the socially optimal level of antibiotic use.

The two federal government health insurance programs are in a unique position to manage the externalities from antibiotic use. Medicare is the nation's largest unified insurer. Moreover, because Medicare and Medicaid together are such large purchasers of medical care, they have the bargaining power to effect significant changes in the conduct of doctors and hospitals. At the very least, because they have high visibility, they can take a leadership role in highlighting the importance of ensuring the socially optimal use of antibiotics.

It is important, however, to note the difficulties with employing Medicare and Medicaid as instruments to limit the growth of resistance. One is that government agencies likely do not respond as well as private firms to incentives to control costs, in this case from resistance. Another is that Medicare, which is better able to coordinate a response to resistance than Medicaid, does not cover long-term care facilities, which are a significant source of antibiotic use and resistance.

This chapter is organized into seven sections. The first explains why health insurance companies might find it in their interest to control the externalities from antibiotic use. The second presents some limitations on the scope of health insurance companies and thus on their ability to control antibiotic-related externalities. The third section explains

why, among health plans, Medicare and Medicaid might be uniquely positioned to control resistance externalities from antibiotic use. The next section reviews existing quality control programs that could serve as models for programs to control antibiotic resistance, and the following section explores ideas for new programs specifically targeting the problem. The penultimate section reviews the limitations of Medicare and Medicaid. The conclusion explores alternative mechanisms to internalize the externalities from antibiotic use.

Background

The public policy concern with antibiotics is driven by the externalities from their use, one positive and one negative. To simplify, the positive externality is that patient A's use of an antibiotic against a contagious bacterial infection prevents the spread of that infection to patient B. The negative externality is that patient A's use (or misuse) of an antibiotic may make the bacteria in her body resistant to the antibiotic, and these resistant bacteria may spread to patient B. Because the bacteria are now resistant to the antibiotic that A used, B cannot use that antibiotic to control his infection.

A standard solution to an externality is to get the source of the externality to "internalize" the external benefits or costs she imposes on others. If the source bears all the external effects of her decision, she will behave in a manner that is consistent with social welfare—that is, the good of the community and not just herself. To demonstrate how this might work, consider the classic example of the rancher who is neighbors with a farmer (Coase 1960). The externality is that the rancher's cattle occasionally wander onto the farmer's land and trample his crops. There are many ways to get the ranching business to internalize its externality on the farm. For example, the farmer could buy the rancher's business or sue the rancher in tort for damage to his crops. If the value of the lost crops is greater than the value of additional grazing opportunities for cattle, then the grazing will voluntarily cease.[1]

The problem with applying this solution to the antibiotic problem is that it is not immediately obvious how to get one patient to internalize the externalities of her antibiotic use on the other patient. Moreover, allowing one patient to sue another is complicated by two problems.[2] First, litigation

1 Another solution is to regulate the behavior or environment of the source to control her externalities. In the rancher and farmer example, the alternative to internalization is mandatory government regulation that, for instance, requires ranchers to fence their property or limits cattle populations. In the antibiotic context, the government could tax antibiotic use or require better sanitation.

2 People can and do sue hospitals for hospital-acquired infections. In one view, this strategy holds hospitals vicariously liable for externalities that emanate from patients. In another view, hospitals (or their agents, nurses, and nonindependent contractor doctors) are liable for infections because they are delegated the task of treatment by patients. In either case, the purpose of liability is to encourage hospitals to control infections and to manage antibiotic use. Some obvious limitations of the strategy are that

is traditionally used to manage only negative externalities—damages as opposed to windfalls. Second, whereas it is easy to determine whether the rancher's cattle harmed his neighbor's crops, it is hard to determine which other patient's antibiotic use is responsible for a victim's resistant bacterial infection.

Nevertheless, there may be an indirect way to ensure that antibiotic externalities are internalized. Most patients do not directly pay for their medical care. Rather, their health insurance plan pays for the cost of treatment. In most cases, patients pay an annual premium (in monthly installments) and the health insurance company pays for each treatment as required. If a patient acquires a bacterial infection, whether resistant or otherwise, the health insurance company bears the marginal cost of treatment of that infection. Moreover, if patients A and B purchase health insurance plans from the same company and thus are in the same insurance pool, then that company internalizes the health expense behavior of both patients. If A uses an antibiotic, the company pays for it. If this prevents a nonresistant bacterial infection in B, the company avoids paying for treatment of that infection. If it causes a resistant infection in B, then the company pays for the cost of his treatment. Therefore, the company has an incentive to subsidize consumption of an antibiotic when it has a positive externality because it lowers the costs of treating other patients. Likewise, it has an incentive to limit consumption of an antibiotic when it has a negative externality because that would increase the cost of treating other patients.[3] In short, health insurance may be a vehicle for internalizing the externalities from antibiotic use.

Limitations to using health insurance

That said, there are several limitations on the use of health insurance to manage the external effects of antibiotic use. First, some costs of bacterial infections—days off work, pain and suffering—may not be insured.[4] The magnitude of this omission may be quite large. For evidence we can look to medical malpractice cases. Compensatory damages from malpractice are divided into two categories, economic and noneconomic. Economic damages include cost of medical care and loss of wages; noneconomic damages include pain and suffering. A 2004 RAND study of medical malpractice jury verdicts in California found that the average award for noneconomic damages was 72 percent of the average award for economic damages (Pace, Golinelli et al. 2004). This suggests that the nonmedical costs of bacterial infections may be less than 42 percent of the total costs of these infections.[5] Although medical malpractice injuries may not be representative of all injuries and jury verdicts may be somewhat imprecise,[6] the statistics suggest that health insurance companies may not fully internalize the costs of third-party bacterial infections.

The incomplete scope of coverage does not necessarily sink health insurance as a vehicle for regulating externalities. If the noncovered costs of the positive versus negative externalities are roughly proportional to the covered costs

it does not address the problem of community-acquired infections or of patients admitted with resistant infections acquired at other hospitals (not the fault of the hospital being sued). Indeed, it is possible that liability exposure may encourage hospitals to avoid patients with a history of resistance. Nevertheless, the possibility of internalizing infection externalities through litigation should be explored. It is, however, outside the scope of this chapter.

3 Of course, insurance companies cannot stop patients from consuming antibiotics that are purchased over the counter.

4 Indeed, the to-the-bone cynic might argue that one cost–mortality–actually encourages the health insurance company to always undertreat in the hopes of reducing costs. This perverse incentive is limited by the Consolidated Omnibus Budget Reconciliation Act of 1985, which allows an employee's surviving spouse to purchase continuation coverage, 29 U.S.C.A. §1163, at virtually the same premium, §§1162(3), 1164, for 18 months, §1162(2).

5 It is possible that the noneconomic damages include not just the nonmedical costs of malpractice, but also, for example, the "outrage" the jury feels towards the defendant's behavior or other "justice"-related concerns. Nevertheless, a nontrivial portion of noneconomic damages also includes nonmedical costs.

6 But see Vidmar (1995).

of these externalities, then heath insurers may still have the proper incentives to balance these externalities. Although the findings of studies that examine the effects of resistant and nonresistant infections vary widely, a recent study by Cosgrove, Qi et al. (2005) is fairly representative. That study found that methicillin-resistant *Staphylococcus aureus* (MRSA) increased the length of hospital stay and hospital charges by similar numbers, 29 and 36 percent, respectively, relative to methicillin-susceptible *S. aureus* (MSSA).[7] Thus there may be a rough balance in relative impact of resistant infections on covered outcomes (hospital charges) and noncovered outcomes (length of stay and thus wages), which are proportional to length of stay. Therefore, the incomplete coverage may not significantly skew the incentives of health insurers to achieve the social optimum.

A second problem with using health insurance to control antibiotic externalities is that no health insurance plan covers all third parties that might be affected by a covered individual's antibiotic use. Therefore, no insurance plan will account for the external effect of a beneficiary's antibiotic use on all third parties. The largest private insurer, UnitedHealth Group, covers about 65 million persons nationwide (WSJ.com 2006). This is, to be sure, a very high number. But no other company comes close to UnitedHealth's market share. Moreover, unlike the externalities from antibiotic use, UnitedHealth's market share is not geographically concentrated. If it were, it could face significant antitrust liability.

A third problem with internalization through health insurance is that most insurance contracts have limited duration. Therefore, insurers do not have the incentive to account for the externalities suffered by (as opposed to those caused by) an individual that occur after her contract terminates. In general, insurance contracts have a duration of one year. Because most health insurance is provided as an employee benefit, however, the actual length of coverage is the length of employment at a given employer. Moreover, under the Consolidated Omnibus Budget Reconciliation Act (COBRA) of 1985, an employee generally has the right to purchase 18 months of continuation coverage from the same insurance company, 29 U.S.C.A. §1162. Finally, many employees have retiree coverage. According to the U.S. Census Bureau (2006), of the 34.7 million persons over the age of 65 in 2003, 12.2 million had private health insurance related to their employment. Regardless of the length of an individual's health insurance contract, however, and even with COBRA, coverage ends 18 months after retirement unless the individual has retiree coverage through his employer. And it is unheard of for an individual—other than one associated with the military—to have cradle-to-grave insurance coverage from the same company. Therefore, even a covered person's life includes significant periods that are not incorporated into an insurance company's calculus of the net benefit of antibiotic use.

Like the problem of incomplete scope of coverage, neither the nonuniversal nature of coverage nor its incomplete duration renders health insurance useless as a vehicle to internalize the external effects of antibiotic use. At most, the limitations make it a somewhat worse second-best remedy.[8] The loss from incomplete duration and nonuniversal coverage is limited so

7 At least for MRSA, the results on mortality are scattered. Along with McHugh and Riley (2004), Cosgrove, Qi et al. (2005) found no effect of resistance on mortality. However, Engemann, Carmeli et al. (2003) found a threefold increase in mortality relative to MSSA for surgical-site MRSA. Finally, Pittet, Tarara et al. (1994) and Pittet and Wenzel (1995) report that patients with a nosocomial bloodstream infection are 35 percent more likely to die.

8 That said, there is an asymmetric risk that current health insurance may contribute to the overuse of antibiotics. The first-order effect of insurance is to reduce the marginal cost of antibiotic use and thus encourage more consumption than may be optimal, given the negative resistance externalities of antibiotic use (see Chapter 2). If the net external effect of antibiotic use is negative, antibiotics should be subject to a Pigovian tax rather than a subsidy, it may be hard for an insurance company to levy such a tax because a patient could simply purchase the antibiotic on her own without telling the insurance company. It would be difficult for insurance companies to enforce contractual limitations on such sales.

> Because of their size, Medicare and Medicaid have greater incentives than private insurance plans to internalize the costs of antibiotic use.

long as either the external benefits or the external costs of antibiotic use are not relatively concentrated in covered life years. For example, if covered life years tend to capture only the positive externalities from antibiotic use—that is, covered lives are mainly at risk from nonresistant infections—then health insurance policies will be biased in favor of excessive use of antibiotics.

The unique potential of Medicare and Medicaid

Given that the incentive of health insurance plans to correctly control externalities from antibiotic use is proportional to coverage, the limitations of current private health insurance plans highlight a potential benefit from a universal health insurance plan, whether run by the government or by a private entity. Since our focus is the problem of drug resistance, the pros and cons of universal health insurance are outside the scope of this discussion. Instead, this chapter focuses on the next best thing: Medicare and Medicaid.

Medicare is primarily a federally run, mandatory old-age and disability insurance program. Medicaid is primarily a state-run welfare program that pays for health care for the poor. Each program has a different structure, and each structure has its own complexities (Box 6.1 and Box 6.2). Although Medicare and Medicaid do not have a significantly broader scope of coverage than private plans, they do have two advantages for the purpose of creating proper incentives to internalize the external effects of antibiotic use.

First, the duration of coverage under the programs is relatively long. Medicare covers individuals from the time they reach the age of 65 to the day they die, 42 U.S.C.A. §426(a). In addition, Medicare covers the disabled for as long as they are disabled, §426(b), and Medicaid covers certain classes of poor people so long as they are poor. Since many disabilities are permanent and the ailments that afflict Medicaid recipients typically reduce their incomes, coverage for disabled persons and for the poor is typically long-lived. Second, the two programs cover a large number of lives. According to the U.S. Census Bureau (2006), Medicare covered 39.5 million persons, and Medicaid, 35.5 million persons in 2003. Because Medicare and Medicaid beneficiaries tend to be medically more vulnerable, although these programs cover only 26 percent of the U.S. population of 288.3 million in 2003, they paid for 47 percent of the cost of all hospital care and 64 percent of the cost of all nursing home care that year (U.S. Census 2006).[9]

Because of their size, Medicare and Medicaid have greater incentives than private insurance plans to internalize the costs of antibiotic use. In addition, however, their immense buying power gives them a great deal of influence over the behavior of providers even with respect to persons *not* covered by these programs. Medicare and Medicaid can directly require, for example, broad infection control programs as a condition of participation. Such programs would benefit not only Medicare and Medicaid enrollees but also other patients. Institutional providers, such as hospitals, would face the prospect of losing half or more of their revenues unless they complied, even though compliance would increase costs for

9 Medicare did the heavy lifting of hospital care costs (30 percent of all costs) and Medicaid did the heavy lifting of nursing home costs (46 percent). The two programs' share of physicians' costs (27 percent) was roughly in line with their population shares.

BOX 6.1

MEDICARE

Medicare covers two classes of individuals. One class comprises all individuals above the age of 65. Medicare will cover only expenses not otherwise covered by employment-related health insurance for these individuals. The other class includes all disabled persons who have been eligible for Social Security benefits for at least two years. It also includes all individuals with end-stage renal (kidney) disease after a three-month waiting period.

Medicare has four parts. Part A covers inpatient hospital care, care at rehabilitation hospitals, and care at skilled-nursing facilities. It does not, in general, cover care at nursing homes. The distinction between hospitals, skilled-nursing facilities, and nursing homes is that the first are acute care facilities, the second are intermediate care facilities that "pit stop" between hospitals and nursing homes, and nursing homes are long-term care facilities. Home health services are covered partly by Part A and partly by Part B. The latter primarily covers outpatient care at hospitals, physician care, and certain other specialized services, such as home dialysis. Part C, also called the Medicare Advantage (previously the Medicare+Choice) program, is a series of managed-care, prepaid health plans that not only cover all the benefits in Parts A and B but also may offer additional supplemental benefits, including prescription drug coverage. Part D is the new Medicare drug benefit enacted in 2003. It covers some of the cost of prescription drugs outside the hospital setting. (Drugs prescribed pursuant to inpatient hospital services are covered by Part A.) There is also a class of insurance called MediGap that covers services not otherwise covered by Parts A and B.[1]

Part A coverage is primarily financed by the Medicare payroll taxes that individuals pay throughout their lives. It is automatic for those individuals eligible for Medicare.[2] Part B coverage is not automatic: it is available only to those individuals who enroll and pay a Part B premium that only partly covers the cost of the program. (Medicaid typically picks up the premium for low-income enrollees.) The remainder is financed out of general revenues. Part C is an alternative to Part A and Part B. It is offered by private health insurance companies and available to individuals who opt for it and pay a premium to these companies. The essential tradeoff is that individuals typically pay a lower premium than under Part B and/or get broader coverage than Part A and B, but in return they must accept the treatment constraints of managed care. Finally, Part D is financed by and available to any individual who pays a somewhat complicated scheme of premiums, deductibles, and coinsurance.[3] These fees are discounted for low-income individuals.

1 MediGap is a supplemental insurance for which individuals must pay separately. The government's basic role in this market is to standardize the 10 basic insurance plans that private companies may offer. The purpose of government regulation is to simplify the choices available to seniors.

2 One caveat is that if an individual has paid less than 40 quarters of Medicare taxes, then she may be charged a premium for Part A benefits.

3 Monthly premiums are roughly $35, and the deductible is $250. There is a 25 percent coinsurance for the next $2,000 of drug expenses, a 100 percent coinsurance for the next $2,850 of drug expenses (popularly known as the "doughnut hole"), and a 5 percent coinsurance for drug expenses in excess of $5,100 (Kaplan 2005).

Medicare coverage and premiums for all parts but C are ultimately set by the Centers for Medicare and Medicaid Services (CMS), a part of the Department of Health and Human Services. Claims are processed and providers are paid, however, by private contractors, such as Blue Cross and Blue Shield associations. Because CMS handles only high-level (or appealed) coverage issues, many applied coverage decisions are made by these private contractors. Because each contractor covers a particular geographic area, Medicare coverage may not be perfectly uniform across the country.

Institutional health care providers, such as hospitals, certain nursing facilities, and home health agencies, must enter into provider agreements to participate in Medicare. These agreements impose certain conditions. For our purposes the most relevant are that providers be "certified" and that they contract with a private peer-review organization to conduct quality and utilization review. For most facilities, the certification requirement is satisfied by seeking accreditation from the Joint Commission on the Accreditation of Health care Organizations (JCAHO), a private accreditation organization that is governed by members of, for example, the American Medical Association and the American Hospital Association. (The JCAHO accreditation process focuses not on health outcomes so much as whether a facility has the resources to provide quality care.) Doctors and pharmacies are not required to sign contracts with Medicare to participate in the program.

all patients. Few providers could stand up to that pressure.

Medicare and Medicaid can also indirectly affect provider behavior. If Medicare and Medicaid were to require, for example, the use of heterogeneous or shorter duration antibiotic therapies for their enrollees, providers would have two reasons to employ the same therapies for patients not covered by the government. First, it is easier for providers to use the same techniques for all patients rather than modify treatment based on the identity of the patient's insurance company.[10] Second, Medicare and Medicaid can change the standard of care by which doctors are judged in medical malpractice cases. Most state courts hold doctors to standards defined, in part, by custom (Peters 2002). But by changing the behavior of a quarter or more of doctors who treat Medicare and Medicaid patients, these programs can change the custom of care.

Current quality control programs in Medicare

This section describes the various quality control measures implemented by Medicare that might serve as antecedents for antibiotic control measures.

Three basic sources of authority govern Medicare's quality control programs. The first is the Medicare statute that, in addition to setting some basic conditions that hospitals must meet to participate in Medicare, authorizes the U.S. Department of Health and Human Services (HHS) to "impose additional requirements if they are found necessary in the interest of the health and safety of the individuals who are furnished services in hospitals," 42 U.S.C. §1995x(e); 42 C.F.R. 421.1(1)(a)(i) (2005).[11] Recently, Medicare used this

10 This is consistent with research by Heidenreich, McClellan et al. (2002), who found that HMO treatment guidelines influence care of nonenrollees who suffer myocardial infarction.

11 Medicare does not have a direct relationship with doctors, as it does with hospitals. The only relationship is indirect: a doctor who accepts

BOX 6.2

MEDICAID

In general, Medicaid covers two categories of people: the categorically needy and the medically needy. The categorically needy are mainly poor pregnant women, poor families with children, and the elderly and disabled who are poor. The medically needy are individuals not eligible for welfare benefits based on income but who are nonetheless impoverished because of medical expenses. The main group of poor persons omitted from Medicaid coverage consists of nonelderly, nondisabled persons without children. Because Medicaid is administered by states, specific eligibility criteria vary. Although federal rules mandate that certain groups be covered, states have the option to cover others. Moreover, under the so-called Section 1115 waiver, eligibility is determined solely by negotiations between a state and the Department of Health and Human Services.

Medicaid covers everything in Medicare Parts A and B and more. For example, it also covers family planning and long-term care at nursing homes. At a state's option, it may also cover prescription drugs. For the elderly, it covers Medicare Part A and Part B premiums, as well as long-term nursing home care that is not included in Medicare. Importantly, roughly 50 percent of nursing home residents are on Medicaid (Furrow et al. 2004).

Unlike Medicare, Medicaid is not an insurance plan. Rather, it is an entitlement, which means it is funded entirely from general government revenue. It does not charge beneficiaries any premium, deductible, or coinsurance. The costs of Medicaid are split between the states and the federal government, which contributes 50 to 83 percent of funds, depending on the per capita income of a state (Furrow et al. 2000). Medicaid is administered by each of the 50 states. Subject to certain federal guidelines, states determine eligibility, benefits, and provider reimbursement, and thus the program varies across the country.

mandate to implement the so-called Quality Assessment and Performance Improvement (QAPI) program, 42 C.F.R. §482.21. This program requires hospitals to track quality indicators, such as health outcomes and medical errors; use the data to identify opportunities for improving the quality of patient care and the causes of medical error; adopt programs designed to act on the data; and hold executives and medical staff accountable for implementation of these programs.

Second, the Medicare statute has a Medical Utilization and Quality Control Program, 42 U.S.C. §1320c-1–c-19. Related to this, the statute requires HHS to contract with peer-review organizations (now called quality improvement organizations, QIOs[12]) to monitor hospitals and other

assignment of a beneficiary's claim so as to secure payment directly from Medicare must agree not to bill the patient for any unpaid portion of her bill. This narrow relationship limits the extent to which Medicare can change the behavior of individual physicians.

12 A list of QIOs can be found at http://www.medqic.org/dcs/ContentServer?pagename=Medqic/MQGeneralPage/GeneralPageTemplate&name=QIO%20Listings.

institutional providers to ensure that their services meet coverage criteria and promote effective, efficient, economical, and quality health care, §1395y(g). Medicare has contracted with 53 such organizations to review the health care provided to enrollees in all states and territories. If a QIO finds that a service does not meet the utilization or quality standards, it can retrospectively deny Medicare payment for that service to the provider, §1320c-3(a)(2). If a provider is found to have engaged in flagrant or repeated violations of quality standards, a QIO may institute proceedings to fine the provider or deny it the right to participate in Medicare, §1320c-5(b).

Third, the Centers for Medicare and Medicaid Services (CMS), a part of the Department of Health and Human Services, has the authority to initiate demonstration programs and studies to improve Medicare payment methodologies and operation, §1395ll. In addition, HHS has authority to offer "incentives to improve safety of care provided to beneficiaries" on a demonstration basis, §1395cc-3.[13] One project initiated under CMS authority is the Premier Hospital Quality Incentive Demonstration. This project provides financial rewards to certain nonprofit hospitals that demonstrate high-quality performance in areas such as treatment for heart attacks, pneumonia, and hip and knee replacements (CMS 2006a). Participating hospitals in the top (second) decile of performance receive a 2 percent (1 percent) bonus on their Medicare payments for measured conditions. Another project is the National Health Information Infrastructure (NHII), a voluntary program; it establishes standards for the sharing and analysis of data on patients and their treatments and outcomes to facilitate more effective clinical decisionmaking and control of diseases that threaten public health (HHS 2006). A third project—similar to QAPI but targeting physicians rather than hospitals and not involving any penalties or rewards—is the Physician Voluntary Reporting Program. This program invites physicians to report certain designated quality-related data from their own practices. For example, physicians are asked to report their timing for administration of antibiotics to patients hospitalized for pneumonia and the frequency with which they give antibiotic prophylaxis to surgical patients (CMS 2005).

HHS has authority to offer "incentives to improve safety of care provided to beneficiaries" on a demonstration basis.

Medicare will likely have to rely on one or more of these three powers—its authority to set conditions for participation, contract with peer-review organizations or QIOs, and initiate demonstration projects—to implement a program to control antibiotic use. The difference among them lies in the carrots and sticks they employ to achieve their aims. The penalty for failing to meet the conditions of participation is loss of all sales to the government—a rather blunt instrument. The penalty for noncompliance with QIO standards is retrospective denials of payment—a more narrow and targeted instrument. Finally, the demonstration authority employs bonus payments and subsidies rather than penalties to ensure cooperation. It is more powerful in the context of hospitals whose resources are already stretched to the limit. Because Medicare can allow only limited demonstrations, however, full implementation will typically require additional legislation to provide authority to mandate participation by all providers.

To set up a demonstration antibiotic control program or expand a demonstration to all of Medicare (via legislation), one needs

13 This power is called the §646 demonstration authority. Because approval of a §646 demonstration involves a lengthy and complex process, it is preferable to act under CMS's more general demonstration authority (Sage forthcoming).

a method for paying providers for their cooperation. There are currently three models for paying Medicare institutional providers; each is illustrated in Medicare compensation of hospitals.[14] Medicare primarily pays hospitals on a prospective-pay system that offers a fixed fee per ailment, regardless of the actual cost of treatment. Specifically, ailments, such as heart attacks or ulcers, are categorized into diagnosis-related groups (DRGs), and each DRG is associated with a fixed level of compensation. Medicare also compensates hospitals for reasonable capital costs and regional variations in labor costs by adjusting their total DRG payments upon filing proof of these costs.[15] Finally, Medicare subsidizes hospital training of medical residents using a mix of fixed fees and reasonable costs. Specifically, subsidies are based on the number of residents a hospital trains, a hospital's cost of training a resident, the fraction of a hospital's patients who are Medicare enrollees, and the total amount of DRG compensation the hospital received (Bajaj 1999).

What Medicare and Medicaid can do

Medicare and, to a lesser extent, Medicaid can do three things to promote more efficient management of antibiotic use. First, these programs can track bacterial infections, resistance, and antibiotic use among members. Because these programs cover more than 75 million patients, most of whom are poor or elderly and at high risk for resistant infections, they are well positioned to serve as an advance warning system. Second, with their immense purchasing power, they can promote best practices for containing resistance, such as better infection control and extending the life of existing antibiotics. Third, because Medicare is somewhat centrally managed, it can coordinate and serve as a laboratory in which to experiment with different methods for optimizing antibiotic use.

:: TRACKING ANTIBIOTICS-RELATED OUTCOMES

Medicare already has the best national database for tracking ailments and medical expenditures, the so-called MEDPAR File and Physician/Supplier Procedure Summary Master File, which contains Part A and Part B claims. Because Medicare tracks ailments but not treatment, however, it does not currently permit tracking of antibiotic usage. Medicare Part D will not fully address this gap because it covers only drug prescriptions in the community setting. It therefore misses in-hospital drug use. Moreover, because Medicare tracks only ailments defined by diagnosis-related groups for hospitals and common procedure terminology (CPTs) for physicians, and these codes neither identify nosocomial infections nor distinguish susceptible from resistant bacterial

14 Institutions are compensated for longer-term care on a reasonable (or "necessary") cost basis, not the prospective pay system. Some physician services are reimbursed according to reasonable charges by the provider or customary charges by physicians. Other services are reimbursed on the basis of a fee schedule devised by CMS. Just as hospital procedures must be categorized into diagnosis-related groups (DRGs), physician services must be categorized into common procedure terminology (CPT) codes to be reimbursed. Medicare covers 80 percent of charges or fees; the enrollee is responsible for the remaining 20 percent.

15 Medicare monitors capital and labor costs by requiring hospitals to file detailed income statements and balance sheets through the Health care Cost Report Information System. These accounts are periodically audited by Medicare to ensure their accuracy.

infections, the program does not currently facilitate tracking of resistant infections.

A natural solution is to create DRG and CPT codes that correspond to nosocomial and resistant bacterial infections, as well as to the use of antibiotics. The Physician Voluntary Reporting Program demonstration is designed to test this approach. It requires participating doctors to report not just CPT codes when filing claims, but also a "G-code," which will track, for example, whether a patient was eligible for and received an antibiotic prophylaxis prior to surgery (CMS 2006b). However, one must be careful when making the Medicare fee structure sensitive to antibiotic-related codes lest one generate moral hazard. For example, if nosocomial (hospital-acquired) infections are separately compensated, hospitals may be less vigilant against these infections because they can generate additional payments from Medicare. Conversely, if nosocomial (hospital-acquired) infections are penalized, then hospitals may be discouraged from diagnosing or reporting them.

Several alternative strategies are less likely to be complicated by moral hazard in treatment. For example, Medicare could add nosocomial and resistant infections, as well as antibiotic prescriptions, to QAPI. The problem is that the penalty for failing to comply, disallowing participation in Medicare, is rather blunt. Another approach would be to require contracting QIOs to retrospectively deny payments for existing DRGs if they detect, during utilization review, that a provider has, for example, employed second-line or reserved antibiotics without performing a blood culture or without reporting antibiotic use directly to a registry, such as the National Nosocomial Infection Surveillance system run by the Centers for Disease Control and Prevention. This solution is both feasible and reasonable. Its only limitation is the frequency with which QIOs conduct utilization review. If the frequency is low, the incentive will be weak because the penalty for failing utilization review is effectively capped at the fee for those patient admissions that are reviewed by the QIO. A third option is to extend the National Health Information Infrastructure to cover antibiotics-related outcomes. The main advantage of NHII is that it would ensure that reports across hospitals are uniform and comparable. The disadvantage of NHII is that it is voluntary. As such, it is not much of an improvement over the National Nosocomial Infection Surveillance program, which is also voluntary and has a very low response rate on antibiotics-related questions.[16] For NHII to make a difference, it must either be coupled with greater financial incentives or be made mandatory.

:: PROMOTING BEST PRACTICES

A second task for Medicare is to promote best practices for antibiotic use. One category of best practice includes activities that resemble fixed costs, such as formulary controls to centrally manage antibiotic use. These controls can limit use or help cycle antibiotics over patients within a hospital to reduce the probability that a resistant infection cannot be treated by any antibiotic (Laxminarayan 2001).[17] The category also includes infection control activities, such as active surveillance of all incoming patients, regulations to encourage hand washing by hospital staff, and the convenient placement of sinks.

The second category includes patient-specific activities that are akin to incremental or marginal costs, such as blood cultures for sore throats, coughs, and the like to ensure

16 Phone conversation with Daniel Pollack, Health care Outcomes Branch Chief, Division of Health care Quality Promotion, National Center for Infectious Diseases, CDC, January 27, 2006.

17 Such controls are especially valuable for ear infections, sinusitis, and bronchitis–situations where blood cultures cannot usually be obtained. Lieberman and Wootan. (1998) suggest that use guidelines be developed by HHS directly rather than by hospitals. Although this would economize on the costs of developing guidelines and ensure uniformity across hospitals, such regulations may be harder for Medicare to police. Medicare could employ QIOs to punish violations, but utilization review is costly and therefore infrequent.

that antibiotics are used only when necessary, and shorter duration therapies (if they are effective) to reduce the probability that bacteria will evolve resistance to antibiotics. It also includes vaccinating patients at risk for pneumococcal infections to reduce the demand for antibiotics to control them. Finally, the category includes judicious use of certain catheters (indwelling bladder catheters and central venous catheters) that are major risk factors for resistant infections (Stosor, Peterson et al. 1998; McHugh and Riley 2004).

The purpose of dividing practices into fixed and incremental cost categories is to match practices with incentives and methods of financing that are best suited to promote them. Practices in the fixed cost category are best encouraged by employing Medicare's "conditions of participation" power (a stick) or reimbursing hospitals for capital costs (a carrot). The former would deny a provider the privilege of participating in Medicare if, for example, it failed to develop formulary controls. The latter could finance the installment of sinks and the use of rapid diagnostic tests for active surveillance.

Practices in the incremental cost category are best encouraged either by utilization review (a stick) to ensure compliance with HHS practice guidelines requiring, for example, more blood cultures, or by creating independently billable DRGs (a carrot) that explicitly require and reward use of shorter duration or combination therapies if they are effective. It is particularly important for Medicaid to encourage practices in this category by raising compensation for blood cultures and more effective methods of using antibiotics. Whereas Medicare can encourage hospitals to incur fixed costs that also benefit Medicare patients, it cannot do the same for incremental costs with respect to low-income, nonelderly patients. The problem is that Medicaid reimbursement rates are very low and therefore have little power to encourage better practices. The remedy is to move to reimbursement rates that reflect market prices but that may not be financially (or politically) feasible.

The rationale for this matching is that it would be difficult to encourage fixed costs with utilization review or DRGs alone. It is hard to tell from utilization review of a small number of medical cases whether a hospital has failed to adopt formulary controls or has simply failed to enforce those controls in the sampled cases. Moreover, because the costs of these programs depend not so much on the number of Medicare patients or how sick these patients are as on simply the size of the facility, it would be hard to find a formula for DRG-based fees that would neither under- nor overcompensate. Conversely, it would not make sense to employ the conditions of participation power to encourage more blood cultures. For one thing, Medicare does not have an extensive monitoring system to ensure ongoing compliance with conditions of participation. For another problem, it would not be credible for Medicare to deny a hospital all participation in Medicare for failing to comply with rules for one specific type of ailment.

An alternative to creating incentives for specific best practices is to reward certain outcomes and let providers choose how to

achieve them. For example, Medicare could require reporting of bacterial infections, their susceptibility to antibiotics, and whether they are community-acquired or nosocomial. If an institution falls below acceptable levels or fails to demonstrate improvement from baseline in these statistics, Medicare could make adjustments in total DRG compensation, much as Medicare does to account for capital and labor costs. The advantage of this approach is that it encourages hospitals to choose the best combination of methods to control susceptible and resistant infections. If hospitals have better information than CMS about local conditions and if local conditions play an important role in controlling infections, then this strategy may be more effective than a process-based incentive system.

A disadvantage, however, is that hospitals and physicians might game the outcome-based scheme by trying to avoid patients with bacterial infections (Dranove, Kessler et al. 2003) or by refusing to monitor and report thoroughly the rate of nosocomial infections. Moreover, because infectious diseases are not confined to institutions, hospitals and nursing homes may have externalities on one another (Smith, Levin et al. 2005). An incentive scheme that pays or punishes for performance only at the target provider will not be able to account for these externalities. Even if the scheme did account for outcomes at other providers—for example, by examining claims from all the Medicare providers that treated a Medicare enrollee who was diagnosed with a resistant infection—it may be difficult to assign blame and thus payoffs among providers. Medicare does not currently have a record of each patient's antibiotic usage. Even if it did, other problems would arise. If providers do not also have a patient's complete history of antibiotics usage, it would be difficult to determine whether antibiotic use is net beneficial; a Medicare incentive could not change that. Finally, if a patient does not have a history of antibiotic usage, she may have caught the infection from another patient. If this happened in the community, Medicare could not assign responsibility to any particular provider. One solution is for Medicare to simply give bonuses or impose penalties for all providers in a geographic vicinity based on prevalence of infection in that area. Unless the bonuses or penalties were very high, however, such a scheme would give inadequate incentives to control antibiotic use because the cost of poor practices would then be borne by others.

BEING A LABORATORY FOR INNOVATION

A third role for Medicare is experimentation with different methods of infection and resistance control. Because Medicare is centrally managed, it could ask similarly situated hospitals to try different control strategies, pool the information on their results, and determine which methods are superior. For example, Medicare could request that providers in different areas try different formulary management strategies to determine which strategy is most likely to reduce the risk that resistance develops. It could compare areas that employ strategies that require rotation of antibiotics with areas that do not to determine whether heterogeneous use of antibiotics delays emergence of resistance.[18] Such experimentation can be authorized using HHS's existing demonstration power. The main challenge for such experiments is that prior demonstrations have been voluntary, and voluntary participation introduces selection bias into inferences from experiments. The difficulty is not that participating providers cannot be randomized to different "treatments," but that the providers that volunteer for a demonstration may not be representative of nonparticipants. As such, the results of experiments may have limited external validity. One solution is to ensure that the payment for participation is sufficiently large that all providers want to participate—a costly proposition. The alternative is to make the demonstration mandatory. It is unclear, however, whether HHS has the

18 This sort of experimentation need not be confined to questions concerning antibiotic resistance. And its use to promote resistance control can certainly be a model for experimentation relevant to other quality control issues.

> Neither Medicare nor Medicaid has thus far made a serious attempt to control the externalities of antibiotic use.

power to require participation in a demonstration, let alone a demonstration that involves experimentation with, for example, different therapies.

Limitations to using Medicare and Medicaid

Although Medicare and Medicaid, because of their size and scope, hold promise as vehicles for improving the control of bacterial infections, the programs have limitations. Foremost is that, even though the programs are large enough to internalize a great deal of the externalities of antibiotic use, it is unclear whether they will respond by regulating antibiotic use in a manner that minimizes costs. These are government programs, not private firms. Their managers are not rewarded for the performance or cost-effectiveness of these programs, and if the programs fail to hold down costs, they will not go out of business. Shortfalls, which are expected even for Medicare, are covered by general revenues.[19] The most direct evidence of this point is that neither Medicare nor Medicaid has thus far made a serious attempt to control the externalities of antibiotic use.

A second concern is that Medicare has certain large gaps in its coverage. The most obvious is that it does not include non-disabled individuals under the age of 65. Therefore it could not gather data on resistance rates or innovate on alternative therapies for this population. Another gap is its exclusion of long-term care at nursing homes. These facilities are a significant risk factor for antibiotic resistance because residents are often taking antibiotics and they also cycle through hospitals, where they often receive antibiotics. Thus, nursing homes may be pools for the emergence of resistance (Nicolle, Strausbaugh et al. 1996) and may subsequently spread resistance to hospitals. Medicaid does cover the cost of nursing homes for its enrollees. But unlike Medicare, Medicaid is neither centrally managed nor well funded. As such it has relatively less bargaining power to impose quality controls.

A third problem is that both Medicare and Medicaid are complex programs. This should be evident from the text boxes that describe the two programs (Box 6.1 and Box 6.2) as well as from the above discussion of Medicare's existing quality control programs. It is difficult enough to devise an optimal antibiotic control program, given medical uncertainty. Adding a high degree of institutional and regulatory complexity makes the problem much more challenging. The implication is not that there is no solution; there remains a second best to be achieved. Rather, the implication is that the gap between first and second best may be quite large.

Alternative mechanisms

Medicare and, to a more limited extent, Medicaid offer unique instruments to address the problem of resistance, and it is prudent to explore their potential. They have limitations,

19 Duggan and Morton (2004) provide an interesting example of how poorly Medicaid controls costs and the negative impact this has on non-Medicaid consumers. Medicaid determines the price it pays for a drug by the average price for that drug in the private sector. In markets where Medicaid has a large market share of purchases, drug companies have an incentive to increase private sector prices to raise revenue from government purchases. Consistent with this prediction, Duggan and Morton find that a 10 percent increase in Medicaid market share is associated with a 10 percent increase in the private market price of a drug, holding all else constant.

but the extent to which these are disabling is uncertain. It may be best to attempt a series of regional but mandatory demonstration programs within Medicare to determine whether Medicare can make a difference. An important component of these efforts is to determine not just the efficacy of Medicare initiatives, but also whether failures are attributable to limitations in coverage or the nonresponsiveness of government agencies to cost incentives.

If the failures are so attributable, any game plan against resistance should consider whether private health insurance or the employers purchasing them could be employed to control resistance. For example, small employers might be allowed to pool their employees and jointly purchase insurance to increase the population coverage and thus the incentives of private insurance. Moreover, the federal or state governments might encourage employers to purchase long-term care insurance along with regular short-term care health insurance for employees to give employers an incentive to choose plans that consider the externalities in both long-term care and short-term care facilities.

References

Bajaj, A. (1999). "How Medicare Calculates GME Payments, Part I." *JAMA* 281(20): 1958a.

CMS. (2005). "Fact Sheet: Physician Voluntary Reporting Program." http://www.cms.hhs.gov/apps/media/press/release.asp?Counter=1701 (accessed May 31, 2006). Centers for Medicare and Medicaid Services.

———. (2006a). "Rewarding Superior Quality Care: The Premier Hospital Quality Incentive Demonstration." http://www.cms.hhs.gov/HospitalQualityInits/downloads/HospitalPremierFS200602.pdf (accessed May 31, 2006).

———. (2006b). "Physician Voluntary Reporting Program (PVRP): 16 Measure Core Starter Set G-code Specifications and Instruction." http://www.cms.hhs.gov/PVRP/Downloads PVRPCoreStarterSet SpecificationsAndInstruction.pdf (accessed May 31, 2006).

Coase, R. H. (1960). "The Problem of Social Cost." *Journal of Law and Economics* 3: 1–44.

Cosgrove, S. E., Y. Qi, et al. (2005). "The Impact of Methicillin Resistance in *Staphylococcus aureus* Bacteremia on Patient Outcomes: Mortality, Length of Stay, and Hospital Charges." *Infection Control and Hospital Epidemiology* 26: 166–74.

Dranove, D., D. Kessler, et al. (2003). "Is More Information Better? The Effects of 'Report Cards' on Health Care Providers." *Journal of Political Economy* 111(3): 555–88.

Duggan, M., and F. S. Morton. (2004). "The Distortionary Effects of Government Procurement: Evidence from Medicaid Prescription Drug Purchasing." Working Paper 10930. Cambridge, MA: NBER (National Bureau of Economic Research.

Engemann, J. J., Y. Carmeli, et al. (2003). "Adverse Clinical and Economic Outcomes Attributable to Methicillin Resistance among Patients with *Staphylococcus aureus* Surgical Site Infection." *Clinical Infectious Diseases* 36: 592–98.

Furrow, B. R., et al. (2000). *Health Law.* 2nd ed. St. Paul, Minn.: Thomson-West.

———. (2004). *Health Law: Cases, Materials and Problems.* 5th ed. St. Paul, Minn.: Thomson-West.

Heidenreich, P. A., M. B. McClellan, et al. (2002). "The Relation between Managed Care Market Share and the Treatment of Elderly Fee-For-Service Patients with Myocardial Infarction." *The American Journal of Medicine* 112(3): 176-182.

HHS. (2006). "FAQ Sheet for NHII." http://aspe.hhs.gov/sp/NHII/FAQ.html (accessed May 31, 2006). U.S. Department of Health and Human Services.

Kaplan, R. L. (2005). "The Medicare Drug Benefit: A Prescription for Confusion." *NAELA Journal* 1(2): 167–86.

Laxminarayan, R. (2001). "Bacterial Resistance and the Optimal Use of Antibiotics." Discussion Paper 01–23. Washington, DC: Resources for the Future.

Lieberman, P. B., and M. G. Wootan. (1998). "Protecting the Crown Jewels of Medicine: A Strategic Plan to Preserve the Effectiveness of Antibiotics." http://www.cspinet.org/reports/abiotic.htm (accessed May 31, 2006).

McHugh, C. G., and W. Riley. (2004). "Risk Factors and Costs Associated with Methicillin-Resistant *Staphylococcus aureus* Bloodstream Infections." *Infection Control and Hospital Epidemiology* 25(2): 425–30.

Nicolle, L. E., L. J. Strausbaugh, et al. (1996). "Infections and Antibiotic Resistance in Nursing Homes." *Clinical Microbiology Reviews* 9(1): 1–17.

Pace, N. M., D. Golinelli, et al. (2004). "Capping Non-Economic Awards in Medical Malpractice Trials: California Jury Verdicts under MICRA." Rand Institute for Civil Justice. http://www.rand.org/publications/MG/MG234/MG234.pdf (accessed May 31, 2006).

Peters, P. G., Jr. (2002). "The Role of the Jury in Modern Malpractice Law." *Iowa Law Review* 87: 909–969.

Pittet, D., D. Tarara, et al. (1994). "Nosocomial Bloodstream Infection in Critically Ill Patients: Excess Length of Stay, Extra Costs, and Attributable Mortality." *JAMA* 271(20): 1598–601.

Pittet, D., and R. P. Wenzel. (1995). "Nosocomial Bloodstream Infections: Secular Trends in Rates, Mortality, and Contribution to Total Hospital Deaths." *Archives of Internal Medicine* 155(11): 1177–84.

Sage, W. M. (forthcoming). "The Role of Medicare in Medical Malpractice Reform." *Journal of Health Care Law & Policy* 9(2).

Smith, D. L., S. A. Levin, et al. (2005). "Strategic Interactions in Multi-Institutional Epidemics of Antibiotic Resistance." *Proceedings of the National Academy of Sciences, Early Edition*. www.pnas.org/cgi/doi/10.1073/pnas.0409523102 (accessed May 31, 2006).

Stosor, V., L. R. Peterson, et al. (1998). "*Enterococcus faecium* Bacteremia: Does Vancomycin Resistance Make a Difference?" *Archives of Internal Medicine* 158(5): 522-527.

U.S. Census Bureau. (2006). "Statistical Abstract of the United States." Washington, DC: U.S. Census Bureau.

Vidmar, N. (1995). *Medical Malpractice and the American Jury: Confronting the Myths About Jury Incompetence, Deep Pockets, and Outrageous Damage Awards*. Ann Arbor, MI: University of Michigan Press.

WSJ.com. (2006). "Key Facts. UnitedHealth Group Inc. (UNH)." http://online.wsj.com/quotes/key_facts.html?mod=2_0470&symbol=unh&news-symbol=UNH (accessed November 11, 2006). Wall Street Journal Online.