Medicare has options for alleviating the shifting of resources away from hospitals serving more disadvantaged patients. First, the payment criteria in HVBP could be altered to give more weight to quality improvement than to quality achievement. Second, instead of having all acute care hospitals compete against each other, Medicare could create homogeneous competition pools, defined by region, DSH index, hospital size, or other criteria. Hospitals could then compete only against other hospitals in the same competition pool. In that case, HVBP would be budget-neutral within each competition pool, guaranteeing that certain types of hospitals would not be systematically disadvantaged by the program. These two strategies can be criticized because they excuse poorer performance for hospitals with more disadvantaged patients, in effect reinforcing existing disparities in care. This critique must be weighed against the potential harm to vulnerable patients if certain classes of hospitals face resource reductions under the current system. Third, Medicare could increase the technical assistance provided to hospitals with more disadvantaged patients, perhaps by directing Quality Improvement Organizations to focus attention on hospitals with a high DSH index value.

Programs that tie financial incentives to quality and efficiency have the potential to push our health care system to reward value rather than volume. However, a redistribution of resources away from hospitals serving high numbers of disadvantaged patients could increase disparities in care. Going forward, these programs must be carefully monitored and, if necessary, modified to avoid such unintended consequences.

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Preserving Antibiotics, Rationally

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Antimicrobial resistance is a critical threat to public health. The value of antibiotics for human health is immeasurable, but were one to try to measure, a plausible estimate of the increase in life expectancy attributable to antibiotics might be 2 to 10 years.[1] If we multiply this increase by 300 million Americans and a dollar value of, say, $100,000 per life-year, we arrive at an estimate for the worth of the current stock of antibiotics of $60 trillion to $300 trillion in the United States alone. Unfortunately, this stock is being gradually depleted owing to genetic mutations in bacteria and the selective pressure caused by the flood of antibiotics released into the environment. A total of 51 tons of antibiotics are consumed daily in the United States alone, so the selective pressure in favor of resistant pathogens is strong.

The main use of this invaluable resource is rather disappointing: approximately 80% of antibiotics in the United States are consumed in agriculture and aquaculture (see pie chart). Antibiotics are fed to pigs to speed up growth and increase the efficiency of their digestion (see photo), added to food pellets and dropped to salmon in cages in the seas, sprayed on fruit trees, and even embedded in marine paint to inhibit the formation of barnacles. Such promiscuous use of antibiotics is not surprising: non–pharmaceutical-grade antibiotics are typically priced at approximately $25 per kilogram, and there is little regulation or oversight of their use.

There is a great deal of concern that this profligate distribution of antibiotics around the world is contributing to the development and spread of resistant organisms. Agricultural industry groups, in line with their short-term financial interests, argue that there is no conclusive proof that the antibiotics used in agriculture harm human health. Unfortunately, evidence is mount-

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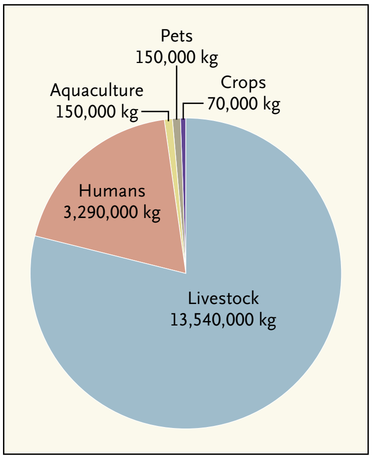

Estimated Annual Antibiotic Use in the United States.

Data are shown as approximate numbers of kilograms of antibiotics used per year.

A Commercial Pig-Farming Operation.

Antibiotics are fed to pigs to speed up growth and increase the efficiency of their digestion.

Image by Lou Gold (Creative Commons license BY-NC-SA 2.0)

ing that resistant pathogens are emerging and being selected for at least partly because of nonhuman uses of antibiotics.[2] Bacteria are not particular about whether they colonize a milk cow or a human, and they easily exchange genes conferring resistance. Much of the nonhuman use occurs at subtherapeutic levels that are nonetheless high enough to impart an advantage to surviving bacteria, but so far there is a lack of evidence regarding the extent to which various uses contribute to resistance.

Recognizing the problem, the Food and Drug Administration banned the use of fluoroquinolones in poultry in 2005. In 2012, it issued nonbinding guidance to farmers recommending that they avoid using antibiotics as animal-growth promoters, and in 2013, it encouraged pharmaceutical suppliers to voluntarily remove "production" uses from labeling within 3 years. In Europe, the use of antibiotics for growth promotion in animals has been banned, a move that has led to reductions in the volume of antibiotics used. In the Netherlands, the total volume of antibiotics sold initially remained unchanged, as farms reduced their use for growth promotion and increased their use for therapeutic purposes.[3]

Is a ban the right approach? There are many challenges. First, a ban would necessitate the monitoring of actual use, so that farmers who comply with the ban are not disadvantaged relative to those who continue to use antibiotics. Requiring veterinary oversight would be problematic for geographically remote farms and fish farms and would necessitate a substantial increase in the number of veterinarians. Moreover, defining exactly what is banned is like drawing a line on a slippery slope: it may not be clear whether an antibiotic is being used for growth promotion, for prophylaxis to reduce the risk of infection in the face of stressful conditions, or both.

Second, the range of uses of antibiotics is wide, and their value varies substantially. In some applications, an antibiotic may confer benefits worth slightly more than the cost of buying it; in others, a course of antibiotics may save an animal — or a whole herd of animals — from death. If infection is predictable, prophylaxis may even reduce the total use of antibiotics by eliminating the need for therapeutic use. Barring all uses of a given type of antibiotic is inefficient; the goal should be to deter only the low-value applications.

Since it would impose costs on farmers, a ban would increase food prices. A ban on the use of antibiotics as animal-growth promoters would raise production costs in the United States by an estimated $1.2 billion to $2.5 billion annually.[4] Although this cost increase pales in comparison with the therapeutic value of antibiotics in humans, it would be felt disproportionately by poor Americans and by farming operations that use animal-confinement systems and rely on antibiotics.

An economically rational solution is to impose a user fee on the nonhuman use of antibiotics. Every use of antibiotics increases selective pressure, thus undermining the value for other users. In effect, each antibiotic can have only a limited amount of use, so

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it is appropriate to charge a fee, just as logging companies pay "stumpage" fees and oil companies pay royalties. (A perfect fee would be calibrated to the extent of antibiotic resistance caused by each use; a practical fee, which is what we propose, would be based on the volume of antibiotics used.)

A user fee would have four important advantages over a ban. First, it would be relatively easy to administer, since it could be imposed at the manufacturing or importing stage.

Second, a user fee would deter low-value uses of antibiotics. Farms with good substitutes for antibiotics — for example, vaccinations or improved animal-management practices — would be discouraged from using antibiotics by higher prices, whereas farms with a high incidence of infections would probably continue to use antibiotics. The idea is to allow the farmer or veterinarian to decide whether the antibiotic confers enough benefits to make it worth the higher price, rather than relying on the intrusive, indiscriminate hand of government.

Third, user fees would generate revenues that could help to pay for rewards to companies that successfully develop new antibiotics,[5] or to subsidize antibiotic-research investments, or to support antimicrobial stewardship and education programs. In effect, a user fee could help to restock and maintain the antibiotic cupboard, which is looking increasingly bare.

The benefits to human health would be substantial. By reducing the volume of antibiotics, a user fee would mitigate the pressure of selection and diminish the prevalence of resistant pathogens. In addition, it could support the introduction of new drugs. According to our calculations above, a 1% reduction in the usefulness of existing antibiotics could impose costs of $600 billion to $3 trillion in lost human health. It is vital to protect this essential resource.

A user-fee policy would similarly help agricultural production. Farms, no less than hospitals, suffer because of antibiotic resistance. Individual farms would benefit from a reduction in use of antibiotics by other farms and from the introduction of new drugs able to treat resistant infections.

The fourth key benefit of the user-fee approach, as compared with a ban, is international replicability. Resistant bacteria do not respect national borders. Although the United States would benefit from imposing user fees on its own, an even better approach would be an international treaty to recognize the fragility of our common antibiotic resources and to impose user fees to be collected by national governments. A treaty would level the playing field for agricultural producers while mitigating the disastrous overuse of antibiotics. Such a treaty would also have a chance of attaining international compliance, since governments would be motivated to collect the revenues. By contrast, a ban, which disadvantages local producers while providing no revenues to government, would be much less attractive to enforce.

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Elder Self-Neglect — How Can a Physician Help?

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Mr. L. is a 96-year-old widower with critical aortic stenosis and mild cognitive impairment who had become increasingly short of breath and exhausted over the course of several weeks and needed 3 hours to get dressed on the day of admission. A concerned neighbor brought him to the hospital. He is not a candidate for aortic-valve replacement owing to poor functional status and coexisting conditions, and after several days of gentle diuresis, he can barely walk across

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