Florida TaxWatch
Economic Commentary
A Monthly Publication

February 2017

Antibiotic Resistant Bacteria Can Invade Taxpayers' Wallets Too

From 1940 to today, the average life expectancy in the U.S. has increased from 63 years to 79 years. While the use of antibiotics is not exclusively responsible for this increase, they have certainly played a large part.[1]

In the anthology of serendipitous scientific innovations, the discovery of antibiotics stands out. In the fall of 1928, Dr. Alexander Fleming returned from vacation to find some of his Petri dishes contaminated with mold. Fortunately, Dr. Fleming didn't just toss his moldy glassware. Instead, he examined the mess under a microscope and discovered that the mold, which turned out to be penicillin, had deterred the growth of Staphylococcus aureus (or "Staph"), a common bacteria responsible for skin infections, food poisoning, blood poisoning, and pneumonia.[2] As with most pharmaceuticals, it took a while to translate discovery into availability but, by 1944, the New York Times reported that "penicillin in reach of all is pictured."[3]

In 1945 Fleming (along with several others) was awarded a Nobel Prize for the discovery of penicillin. During his Nobel acceptance speech, Fleming warned that the overuse of penicillin might lead to bacterial resistance. Fleming was not a seer - the pathway of antibiotic resistance is simple and predictable. Unfortunately, we are experiencing the truth of Fleming's forecast.

The Problem

Bacterial resistance is a prime example of evolution, and with the short life-cycle of germs, adaptation happens in the span of years rather than eons. In short, over-prescribing and misuse of antibiotics have allowed for survival of the fittest. Unaware of this potential, many patients demand antibiotics from their physicians, and a recent study found that over 30 percent of antibiotic prescriptions in the U.S. are unnecessary.[4,5] If a patient is prescribed an antibiotic for a non-bacterial (viral) infection, the medication has no impact on the illness but does destroy some of the body's bacteria.

1 Life Expectancy at Birth by Race and Sex, 1930–2010. http://www.infoplease.com/ipa/A0005148.html

2 Markel, Howard (2013). The real story behind penicillin. rhttp://www.pbs.org/newshour/rundown/the-real-story-behind-the-worlds-fiwrst-antibiotic/

3 Laurence, William (1944, Apr 06). Penicillin in reach of all is pictured. New York Times (1923-Current File)

4 Fleming-Dutra, K. E., Hersh, A. L., Shapiro, D. J., Bartoces, M., Enns, E. A., File, T. M., ... & Lynfield, R. (2016). Prevalence of inappropriate antibiotic prescriptions among US ambulatory care visits, 2010-2011. Jama, 315(17), 1864-1873.

5 Castillo, Michelle (2012). Less than half of Americans recognize antibiotic overuse as a problem. http://www.cbsnews.com/news/less-than-half-of-americans-recognize-antibiotic-overuse-as-a-problem/

Likewise, if a patient does not complete the prescribed course of antibiotics, only the weakest bacterial populations are killed. Both situations allow antibiotic resistant bacteria (ARB) more room to grow, thrive, and spread. Eventually, the ARB subtype become the most common strain, which puts entire communities at risk.

Types of resistance vary; some strains develop resistance to a single antibiotic or class of antibiotics while others are resistant to all available antibiotics. The majority of ARB infections develop in those that are hospitalized for other reasons or reside in long-term care but infections can be acquired anywhere.

Economic impact

More than 2 million U.S. residents each year are infected with an ARB and as many as 23,000 people will die as a result of their ARB infection.[6,7] When considering the economic burden of ARB infections, several metrics must be considered, including individual healthcare costs, total healthcare system costs, and societal costs. Regarding individual costs, one study found that an ARB infection developed during hospitalization added $18,588 to $29,069 in costs and resulted in 6.4 to 12.7 additional days of hospitalization.[8] The cost to treat ARB infections that manifest during hospitalization may add an additional $20 billion annually to the U.S. healthcare bill. When considering the societal costs, ARB infections result in an annual loss of $35 billion attributable to lost productivity due to illness and death.[9]

ARB infections can also happen outside of healthcare settings. One of the most prevalent community acquired ARB infections is Methicillin-Resistant Staphylococcus Aureus (CA-MRSA). CA-MRSA is common in athletes, children that attend daycare, prisoners, and military personnel. In 2014, the Center for Disease Control (CDC) estimated there were 16,522 CA-MRSA infections in the U.S.[10] Each CA-MRSA infection costs third-party payers between $2,277 and $3,200, totaling between $37.6 and $52.8 million annually.[11]

As evolution increases the number and virulence of ARB, the economic impacts will rise, placing a greater burden on our already beleaguered healthcare system.

What is being done

Getting a handle on ARB infections centers on several strategies. As with any communicable disease,

6 CDC (2013). Antibiotic resistance threats in the United States, 2013. https://www.cdc.gov/drugresistance/threat-report-2013/

7 Ventola, C. L. (2015). The Antibiotic Resistance Crisis: Part 1: Causes and Threats. Pharmacy and Therapeutics, 40(4), 277–283.

8 Roberts, R. R., Hota, B., Ahmad, I., Scott, R. D., Foster, S. D., Abbasi, F., ... & Naples, J. (2009). Hospital and societal costs of antimicrobial-resistant infections in a Chicago teaching hospital: implications for antibiotic stewardship. Clinical infectious diseases, 49(8), 1175-1184.

9 Ibid.

10 CDC (2016). Active Bacterial Core Surveillance (ABCs) Report Emerging Infections Program Network. Methicillin-Resistant Staphylococcus aureus, 2014. https://www.cdc.gov/abcs/reports-findings/survreports/mrsa14.pdf

11 Lee, B. Y., Singh, A., David, M. Z., Bartsch, S. M., Slayton, R. B., Huang, S. S., … Daum, R. S. (2013). The Economic Burden of Community-Associated Methicillin-Resistant Staphylococcus aureus (CA-MRSA). Clinical Microbiology and Infection : The Official Publication of the European Society of Clinical Microbiology and Infectious Diseases, 19(6), 528–536. http://doi.org/10.1111/j.1469-0691.2012.03914.x

prevention is key - becoming even more critical in the defense against ARB. Prevention efforts include handwashing, immunization, safe-food preparation, and stringent infection control practice in healthcare settings. In addition, providers need to be careful stewards of this lifesaving resource while educating patients on risks. In an effort to provide education, CDC and the World Health Organization (WHO) have launched educational campaigns for hospitals, physicians, and patients, and coalitions have formed around the issue.[12,13]

Surveillance and development of new testing protocols to track ARB and to identify new threats are also key components of control. The CDC tracks ARB infections in healthcare settings, community acquired infections, and reported food-borne illnesses. Likewise, the National Antimicrobial Resistance Monitoring System is a collaborative effort between state and local health departments and several federal agencies (including CDC) to track the types and sources of ARB infections.[14] As risk factors and pathways are identified, interventions that break the chain of infection can be implemented.[15]

Antibiotic resistance is evolution and while it can be slowed, no amount of stewardship will stop the arms race. Unfortunately, many pharmaceutical companies have discontinued antibiotic research because projected profits from new antibiotics are inherently small as these therapies are likely to be used as a last resort for a limited number of people. The number of antibiotics brought to market has precipitously decreased from 29 approvals during the 1980s to just 9 during the 2000s.[16] Fortunately, government funding for clinical development of antibiotics has emerged in both in the United States and in the European Union.[17] However, policy makers still need to puzzle out how profits will be shared for these public-private partnerships.

Conclusion

Antibiotics have changed the face of healthcare – reducing mortality and improving the quality of life for millions of people worldwide. However, the overuse of these powerful tools of intervention has led to antibiotic resistance that now threatens the future of our health and costs taxpayers, businesses, and the healthcare system millions each year in treatment expenses and lost productivity. Policymakers, patients, healthcare providers, and healthcare facility administrators must work together to improve antibiotic use and implement strategies to decrease the development of resistance. Furthermore, research supporting the development of new antibiotics must be encouraged via the development of well-designed public-private partnerships.

12 CDC (2014). Mission Critical. https://www.cdc.gov/features/antibioticresistance/

13 Antibiotic Resistance Coalition (2017). http://abrdeclaration.org/about-us/

14 NARMS (2016). https://www.fda.gov/AnimalVeterinary/SafetyHealth/AntimicrobialResistance/NationalAntimicrobialResistanceMonitoringSystem/

15 CDC (2014). Mission Critical. https://www.cdc.gov/features/antibioticresistance/

16 Pew Charitable Trusts (2016). A scientific roadmap for antibiotic discovery. http://www.pewtrusts.org/~/media/assets/2016/05/ascientificroadmapforantibioticdiscovery.pdf

17 Eichberg, M. J. (2015). Public funding of clinical-stage antibiotic development in the United States and European Union. Health Security, 13(3), 156–165.

Economic Commentary written by **Allison Wiman, R.N. M.P.H.**, Research Analyst

Robert Weissert, Executive VP & Counsel to the President & CEO
Chris Barry, Director of Publications

David Mann Chairman of the Board of Trustees, Florida TaxWatch
Senator George LeMieux, Advisory Board Chairman, TaxWatch Center for Competitive Florida

Dominic M. Calabro, President and CEO, Publisher & Editor

Florida TaxWatch Research Institute, Inc.
www.floridataxwatch.org