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From Test to Treatment ► The Value of Diagnostics in Combatting ANTIBIOTIC RESISTANCE

Antibiotic resistance (AR) occurs when the bacteria causing an infection no longer responds to the antibiotics we take to kill them. Strains of bacteria that are resistant to most antibiotics commonly used today are often referred to as "*superbugs*." **#TestToTreatment**

Antibiotic resistance is a global health crisis with a substantial impact on patients, health care systems and economies worldwide. Each year in the United States, at least 2 million people become infected with bacteria that are resistant to antibiotics, and at least 23,000 people die each year as a direct result of these infections.[1]

A major cause of resistance is the overuse and misuse of antibiotics. For example, a recent Centers for Disease Control and Prevention (CDC) study found that at least 30% of antibiotics prescribed in an outpatient setting are unnecessary.[2] That is, antibiotics are often prescribed for conditions, such as viral infections like influenza, that will not respond to antibiotics.

Addressing the Challenge of Antibiotic Resistance:

Robust antibiotic stewardship progress that includes the widespread and appropriate use of diagnostic tests by clinicians in the clinic, physician's office, hospital and other care settings can help stem the tide of superbugs. New antibiotics must also be developed and used in conjunction with diagnostics as a central part of strong antimicrobial stewardship programs in all health care settings.

The Role of Diagnostics:

Diagnostic tests are an essential tool for clinicians to determine when a patient's illness is caused by a bacterium and when it is not. Use of diagnostic tests to determine the type of bacteria informs which antibiotic should be used, and, often, the appropriate duration of antibiotic treatment. Diagnostic susceptibility testing is also critical, as these tests can detect possible drug *resistance* in common pathogens and assure *susceptibility* to drugs.

Early diagnosis and targeted treatment result in **better outcomes** for patients.

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The value of diagnostic tests in combatting antibiotic resistance:

Sepsis:

Sepsis accounted for nearly **$24 billion** in annual hospital costs in 2013 and was the most expensive condition treated.[3] Procalcitonin (PCT), diagnostics testing, on the first day of ICU admission for adult patients with sepsis is associated with reduced length of stay, less antibiotic exposure and reduced hospital and pharmacy costs.[4]

MRSA:

(Methicillin-resistant Staphylococcus aureus)
A clinical study found that use of a diagnostic test for the early detection of MRSA enabled doctors to prescribe **optimum antibiotics 1.7 days sooner**, reducing the length of hospital stay by 6.2 days and lowering hospital costs by approximately $21,000.[5]

Tuberculosis (TB):

The CDC has highlighted that use of certain new TB tests reduces the detection time of TB and drug resistance to less than 2 hours compared to standard cultures that can take 2 to 6 weeks.[6] The new tests also **reduced time** to treatment for smear-negative TB **from 56 days to 5 days**.[7]

C-Diff:

(Clostridium Difficile Infection)
After introducing more rapid diagnostic testing, one hospital achieved a **44% reduction** in hospital-onset C-Diff rates.[8]

Group A Strep:

In one randomized controlled study, use of rapid antigen diagnostic testing for strep throat cut antibiotic prescribing rates by more than half — from **58% to 27%**.[9]

Respiratory Tract Infections:

In adult patients with respiratory tract infections, procalcitonin guidance significantly reduced antibiotic duration **by 2.35 days**, antibiotic prescription rate by 22% and total antibiotic exposure without affecting morbidity or mortality.[10]

Endnotes

1 CDC, 2013. *Antibiotic Resistance Threats in the United States.* [Online] Available at: https://www.cdc.gov/drugresistance/threat-report-2013/index.html [Accessed 4 Sept 2018].

2 CDC, n.d. *Measuring Outpatient Antibiotic Prescribing.* [Online] Available at: https://www.cdc.gov/antibiotic-use/community/programs-measurement/measuring-antibiotic-prescribing.html#f1 [Accessed 4 Sept 2018].

3 HCUP, 2016. *National Inpatient Hospital Costs: The Most Expensive Conditions by Payer*, 2013. [Online] Available at: https://www.hcup-us.ahrq.gov/reports/statbriefs/sb204-Most-Expensive-Hospital-Conditions.jsp?utm_source=AHRQ&utm_medium=AHRQSTAT&utm_content=Content&utm_term=HCUP&utm_campaign=AHRQ_SB_204_2016 [Accessed 4 Sept 2018].

4 Physician, C., 2017. *Early procalcitonin testing reduced ICU costs for sepsis patients.* [Online] Available at: https://www.mdedge.com/chestphysician/article/129221/critical-care/early-procalcitonin-testing-reduced-icu-costs-sepsis [Accessed 4 Sept 2018].

5 Goff, D et al. An Antimicrobial Stewardship Program's Impact with Rapid Polymerase Chain Reaction Methicillin-Resistant Staphylococcus aureus/S. aureus Blood Culture Test in Patients with S. aureus Bacteremia. *Clin.Infect. Dis.* November 2010. Available at: https://www.ncbi.nlm.nih.gov/pubmed/20879856 [Accessed 4 Sept 2018].

6 CDC, 2014. A New Tool to Diagnose Tuberculosis: The Xpert MTB/RIF Assay. [Online] Available at: https://npin.cdc.gov/publication/new-tool-diagnose-tuberculosis-xpert-mtbrif-assay [Accessed 4 Sept 2018].

7 Boehme CC, Nicol MP, Nabeta P, et al. Feasibility, diagnostic accuracy, and effectiveness of decentralised use of the Xpert MTB/RIF test for diagnosis of tuberculosis and multidrug resistance: a multicentre implementation study. *Lancet* 2011;377:1495–505. Available at: https://www.ncbi.nlm.nih.gov/pubmed/21507477 [Accessed 25 October 2018].

8 Healthcare, B., n.d. *Antibiotic stewardship next steps: What to do when the low-hanging fruit is gone.* [Online] Available at: https://www.beckershospitalreview.com/quality/antibiotic-stewardship-next-steps-what-to-do-when-the-low-hanging-fruit-is-gone.html [Accessed 4 Sept 2018].

9 Worral, G, et al. "Diagnosing Streptococcal Sore Throat in Adults: Randomized Controlled Trial of in-Office Aids." *Canadian Family Physician*, June 2007. Available at: https://www.ncbi.nlm.nih.gov/pubmed/17872717 [Accessed 4 Sept 2018].

10 Soni NJ, et al Procalcitonin-guided antibiotic therapy: a systematic review and meta-analysis. *J Hosp Med.* 2013 Sep;8(9):530-40. doi: 10.1002/jhm.2067. Epub 2013 Aug 17. Available at: https://www.ncbi.nlm.nih.gov/pubmed/23955852 [Accessed 25 October 2018].