

The Power of Narratives: A New Understanding of Antibiotic Resistance

SLAVICA KODISH
Southeast Missouri State University, USA

Antibiotic resistance continues unabated despite many efforts to increase awareness and promote responsible use of antibiotics. The limited results of various campaigns and community education initiatives to alleviate antibiotic resistance are concerning. The world faces a future with diminishing power of antibiotics and a possible postantibiotic era with serious consequences for health and humanity. Typically, antibiotic resistance is viewed as a public health problem, and communication principles and theories serve a practical role in creating and disseminating messages. In the exploratory endeavor described in this article, the starting premise is that communication may be a part of the problem. This article provides a new understanding of antibiotic resistance and creates a basis for organizing future efforts to promote prudent use of antibiotics in a more effective manner.

Keywords: antibiotic resistance, communication theory, lists and stories, narratives, narrative reasoning

Proliferation of harmful bacteria that cannot be destroyed by antibiotics is a growing problem in the United States and around the world. According to the Centers for Disease Control and Prevention (CDC, 2017), each year at least 2 million Americans become infected with bacterial strains that do not respond to antibiotics and at least 23,000 die. Worldwide, the situation is even more concerning. In 2014 alone, 210,000 people died of antibiotic-resistant tuberculosis, which is only one of many diseases that are becoming incurable (Jasovský, Littmann, Zorzet, & Cars, 2016). Such a development may sound surprising and prompt us to ask, how is this possible? Aren't antibiotics miracle medications that can cure any disease?

Antibiotics are, indeed, miracle medications in many ways. They are so valuable that it would not be an exaggeration to say that the health of the human race—and, perhaps, even the future of civilization—depends to a large extent on the effectiveness of antibiotics.

Over the past several decades, antibiotics have been indiscriminately used and misused (Davies & Davies, 2010; Edgar, Boyd, & Palamé, 2009; Gross, 2013). Examples of unwise use of antibiotics abound: Broad-spectrum antibiotics are commonly prescribed in ambulatory care (Shapiro, Hicks, Pavia, & Hersh, 2014); patients typically expect and even request antibiotics from their health care providers

Slavica Kodish: skodish@semo.edu

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(Fletcher-Lartey, Yee, Gaarslev, & Khan, 2016; Hertz, 2014); patients often take antibiotics at will, rather than follow physicians' instructions (Vanden Eng et al., 2003); in many countries, antibiotics can be obtained over the counter and without a prescription (Morgan, Okeke, Laxminarayan, Perencevich, & Weisenberg, 2011).

Furthermore, in emerging economies, agricultural use of antibiotics is skyrocketing (Harford, 2017). Coupled with an adaptive feature of bacteria to evolve as the environment around them changes, unwise and indiscriminate use of antibiotics has resulted in the emergence of "superbugs"—bacteria that are resistant to antibiotics. The existence of superbugs and their increasing numbers are causing a serious public health problem. Humanity is potentially facing a future without medications that can cure deadly diseases. Taking steps to alleviate antibiotic resistance is, therefore, crucial.

Prudent use of antibiotics is central for alleviating antibiotic resistance (Aminov, 2010; Davies & Davies, 2010; Edgar et al., 2009; Howard et al., 2015; Hudson, 2013; Jessop, 2010). Thus, many public health campaigns and various educational efforts aimed at promoting responsible use of antibiotics have been undertaken over the past two decades.

Changing attitudes and behaviors in general is no easy task. Changing attitudes and behaviors about antibiotics and their use has proven to be particularly difficult. Despite the number and extent of public health campaigns, for the majority of the world population, antibiotics are still seen as harmless medications that can be taken for almost any ailment. Evaluations of campaigns and information about attitudes, knowledge levels, and practices regarding antibiotics indicate that public health campaigns have been mildly effective at best and that new explorations and new solutions to the problem of antibiotic resistance are needed. In this study, antibiotic resistance is explored in a transdisciplinary manner using an eclectic methodological approach. Transdisciplinary science is growing, and its synergistic benefits are many (Kreps & Malbach, 2008). In the spirit of the transdisciplinary approach, sources from medicine, history, social marketing, relational marketing, sociology, and the media are reviewed within a general communication framework to obtain a thorough understanding of the problem. The field of communication helps explain human behaviors, actions, motives, beliefs, and practices and, as such, is likely to provide insights and perhaps even answers to the question of how to best alleviate antibiotic resistance. Another reason for selecting a communication framework is that communication is central for the delivery of health messages and the promotion of public health (see Kreps, Viswanath, & Harris, 2002). Attempting to understand a matter of public health from a communication perspective, therefore, makes good practical sense.

This article describes the exploratory path undertaken with the aim of providing a new understanding of antibiotic resistance and contributing to its alleviation. Major aspects of the problem of antibiotic resistance are addressed, including efforts to promote prudent use of antibiotics and their effectiveness. The next section provides a theoretical explanation of narratives and their role in human lives. Then I describe the beginnings of the antibiotics era and provide an analysis of events that contributed to widespread use of antibiotics. Finally, suggestions are provided for future efforts aimed at the need to change the antibiotic master narrative and promote responsible use of antibiotics through the application of narrative theory.

Antibiotic Resistance

Various authors address the gravity of antibiotic resistance (see Dancer, 2007; Davies & Davies, 2010; Edgar et al., 2009; Essack, Desta, Abotsi, & Agoba, 2017; Hudson, 2013; Jessop, 2010; Klein, Smith, & Laxminarayan, 2007; Levy & Marshall, 2004; Malhotra-Kumar, Lammeni, Coenen, Van Herk, & Goossens, 2007; O'Donnell et al., 2013; Paterson & Harris, 2015). The data are concerning; for example, from 1999 through 2005, the number of *Staphylococcus aureus* infections resistant to methicillin increased 119% (Klein et al., 2007). In some countries, up to 50% of cases of blood poisoning caused by another bacterium, *Klebsiella pneumoniae*, are resistant to carbapenems—the most powerful class of antibiotics (Laurance, 2011). Antibiotic-resistant typhoid is becoming more common in Africa and Asia (Roberts, 2015). A study by Paterson and Harris (2015) reports that bacteria are becoming resistant to colistin, an antibiotic that is used as the last line of defense when fighting bacterial infections. The director of the CDC used the word *nightmare* when referring to the proliferation of *Enterobacteriaceae*—the family of bacteria that includes *Klebsiella*. He said that “[the] strongest antibiotics don’t work and patients are left with potentially untreatable infections” (as cited in Hudson, 2013, para. 3). England’s chief medical officer referred to antibiotic resistance as a “ticking time bomb” (as cited in Walsh, 2014). In Australia, the Office of the Chief Scientist issued a warning that bacteria are developing resistance “at an alarming pace,” and unless action is taken to address the threat, “humankind will be on the brink of a ‘post-antibiotics era,’ where untreatable and fatal infections become increasingly common” (Prasad & Smith, 2013, p. 1). The first global report from the World Health Organization (WHO, 2014), which included data from 114 countries, reveals that antibiotic resistance is a “serious, worldwide threat to public health” (para. 1).

Efforts to Promote Responsible Use of Antibiotics

Over the past two decades, various campaigns aimed at raising awareness of antibiotic overuse and antibiotic resistance, reducing antibiotics prescriptions, and changing patients’ behaviors have been undertaken in the United States and worldwide. In the United States, the most comprehensive and extensive campaign was organized by the CDC. The campaign was launched in 1995 as the “National Campaign for Appropriate Antibiotic Use in the Community” and was renamed in 2003 as “Get Smart: Know When Antibiotics Work.” Target audiences include various stakeholders: patients, health care providers, pharmacists, hospital administrators, farmers, global interest groups, and policy makers. Target audiences are reached by fact sheets, posters, podcasts, graphics, videos, social media messages, and printed messages on patients’ discharge lists. The campaign also provides partnership opportunities to other interested groups. The campaign’s U.S. Antibiotic Awareness Week, an annual event held in mid-November, is an additional opportunity to spread the word about wise use of antibiotics. In addition to the Get Smart campaign, other campaigns have been undertaken in the United States, such as the Arkansas Foundation for Medical Care’s “Save the Antibiotic” campaign and the “Keep Antibiotics Working” campaign to end antibiotic overuse. In 2015, the Forum on Antibiotic Stewardship brought together more than 150 organizations working to resolve antibiotic resistance.

At the global level, the most comprehensive campaign aimed at promoting prudent use of antibiotics is the “Antibiotics: Handle With Care” campaign organized by the WHO. The campaign was

launched in November 1995 during the first World Antibiotic Awareness Week and has been in effect ever since. The campaign addresses major stakeholders and, similar to the CDC's Get Smart campaign, uses a variety of materials and different communication channels to reach target audiences. Materials include videos, online quizzes, infographics, posters, fact sheets, tool kits, radio announcements, and gifs; communication channels include the Internet, social media, and traditional media.

The United Nations is also involved in tackling antibiotic resistance within its larger efforts to curb antimicrobial resistance. After six years of work and the support of all 193 member nations, the United Nations General Assembly (UNGA) in 2016 passed the Political Declaration of the High-Level Meeting of the UNGA on Antimicrobial Resistance (United Nations, General Assembly, 2016).

In addition to global efforts, campaigns and various initiatives have been undertaken by individual countries or by groups of countries. The Keep Antibiotics Working Coalition's "Extending the Cure" campaign in France was aimed at reducing the number of antibiotics prescriptions and the use of antibiotics. The focus of the Antibiotic Awareness Partnership in Canada was also a reduction in antibiotic prescriptions and overall use of antibiotics. The United Kingdom established a "5 Year Antimicrobial Resistance Strategy 2013 to 2018" and a specific program, the Antibiotic Guardian (2017), "to help save these vital medicines [antibiotics] from becoming obsolete" (para. 3). The Alliance for the Prudent Use of Antibiotics, an international organization that involves 80 countries, uses education and communication to promote and improve knowledge of antibiotics. Several African countries are involved in the Global Antibiotic Resistance Partnership. The International Network for Action on Antibiotic Resistance is another organization whose purpose is to alleviate antibiotic resistance. The European Parliament organized a seminar in 2011 entitled, "The Beginning of a New Era in Antibiotic Development: Shaping of a New Business Model for Life-Saving Innovation." Yet another initiative is the European Antibiotics Awareness Week, an annual event held in mid-November to coincide with the WHO's Antibiotic Awareness Week. Various stewardship programs to educate physicians, nurses, and pharmacists about prudent prescribing and use of antibiotics have also been undertaken in many countries.

The number of campaigns and various other efforts and initiatives aimed at raising antibiotic awareness and promoting responsible use of antibiotics is impressive and praiseworthy. The question that needs to be asked is, to what extent have they been effective? The next section provides data about effectiveness of campaigns to promote responsible use of antibiotics. Additional data are also provided to help describe the current situation regarding antibiotic resistance.

Effectiveness of Campaigns

Huttner, Goosens, Verheij, and Harbarth (2010) conducted a comprehensive study that describes characteristics and outcomes of 22 national or regional-level campaigns in high-income countries between 1990 and 2007. They determined that the campaigns "seemed to reduce antibiotic use . . . and that public campaigns can probably contribute to more careful use of antibiotics in outpatients, at least in high-prescribing countries" (p. 17). The mildly optimistic conclusions from the study are somewhat comforting. It seems that antibiotic awareness in developed countries has been increased and that public campaigns

are to be credited for a somewhat more responsible use of antibiotics. Antibiotic resistance, however, is a global issue and needs to be viewed from a global perspective.

Emergence of antibiotic-resistant bacteria anywhere on the planet poses a risk to people from all countries and regions. Ramanan Laxminarayan, the director of the Center for Disease Dynamics, Economics, and Policy, explains the global nature of antibiotic resistance: "If I were to take a statin, that doesn't diminish the effectiveness of the statin for any of you. Not so with antibiotics. You could get an infection that was drug-resistant even if you'd never taken antibiotics in the past" (as cited in Beck, 2015, para. 4).

The lack of evidence regarding the impact of campaigns at the global level is troubling. The most recent study on the effectiveness of campaigns worldwide was conducted at the end of 2016 by a team of experts at the WHO Collaborating Center on Patient Safety at the University of Geneva Hospitals. The authors of the study provide information about the effectiveness of campaigns, and they address various difficulties linked with campaign evaluations:

The most effective messages and interventions remain unclear. The lack of thorough evaluation, the absence of prospectively determined control groups and the multifaceted nature of most campaigns makes any formal conclusions difficult. It seems, however, that some campaigns were associated with a reduction in overall antibiotic use. (Saam, Huttner, & Harbarth, 2017, p. 2)

Conclusions from the study are far from optimistic. Some positive developments seem to have taken place, but, similar to Huttner et al.'s (2010) analysis of campaign effectiveness in high-income countries, the study does not suggest a meaningful behavioral change. Data describing practices and knowledge levels of the world population provide an additional insight into the beliefs and practices of the general population.

A WHO report published in 2015 contains an analysis of effective practices and structures required for dealing with the general problem of antimicrobial resistance in all six WHO regions. The report notes that public awareness of antimicrobial resistance was "generally low" throughout the world and that the sale of antimicrobials without prescription was widespread (WHO, 2015b). A 2015 survey that included 12 countries and a representative sample of 10,000 people found that the predominant number of beliefs and practices regarding antibiotics is incorrect and misguided and that most of the world population lacks basic knowledge about antibiotics (WHO, 2015a).

An evaluation of hospital stewardship programs aimed at prescribers rather than the public found that, of 660 hospitals, 58% had a stewardship program in place, and 89% educated their medical, nursing, and pharmacy staff on antibiotic resistance. Only 20% of hospitals, however, had an electronic prescribing system in place. The evaluation report also indicates difficulties with measuring the effectiveness of the programs and the actual effectiveness of stewardship programs (Howard et al., 2015).

A conclusion can be made that, for a large percentage of the world population, antibiotics are still miracle drugs that can be used for prevention or treatment of any ailment and in a manner that the patient deems appropriate. Campaigns and efforts to raise awareness of antibiotic resistance and develop responsible practices have had limited results. Campaigns seem to have contributed to awareness about the dangers of antibiotic resistance and instigated more responsible practices in some parts of the world, but knowledge levels about antibiotics among the general global population remain low, and behaviors continue to be concerning. A lot of serious work remains to be done. Edgar et al. (2009) write, "This [antibiotic resistance] is not a problem that will go away without a concerted effort to change the beliefs, attitudes and behaviour of key populations" (p. 231). Their perceptive statement accurately describes the current need for a concerted effort to change beliefs, attitudes, and behaviors. The question remains as to how beliefs, attitudes, and behaviors can be changed.

To embark on such a venture requires, first, a thorough understanding of how the beliefs, attitudes, and behaviors regarding antibiotics were formed. The study of behaviors and their underlying web of beliefs and attitudes is traditionally the domain of psychology. This article takes the communication path instead, and applies theories and concepts from the field of communication. Communication theory—and, specifically, narrative theory—provides valuable insights into how beliefs and attitudes are shaped, how humans make sense of the world around them, and how they take action.

The Role of Narratives in Human Lives

Narratives are intrinsically linked with human existence and human life. They are crucial in making sense of the world (see, e.g., Cooren, 2000; Greimas, 1970/1987; Postman, 1999; Weick, 1995), and they impact human beliefs and attitudes and inspire action (see Campbell, 1949, 1972; Fisher, 1984, 1989; Koschmann, 2005; MacIntyre, 1984). Narratives also help humans on their path of individuation and identity development, are instrumental for building relationships with others, and convey messages of ethical and acceptable behaviors (Campbell, 1972; Postman, 1999).

According to Campbell (1972), human life and human actions are linked with the myths dominant in a particular culture. Postman (1999) views narratives as a central sense-making and action-inspiring tool, and he analyzes the serious consequences of morally deficient narratives that have shaped behaviors of large groups of people. MacIntyre (1984) writes that humans are storytelling creatures in their "actions and practice, as well as in [their] fictions" (p. 201). For him, each one of us is a *Homo narrans*—a storytelling human being who is shaped by the many narratives he or she has been surrounded by and exposed to during his or her life. Greimas (1970/1987) explores the "deep structure" of narratives and the relationship of narratives to meaning making in an attempt to find narrative universals and explain humans' meaning making and human actions. Cooren (2000), in answering the question of how sense is produced, departs from Greimas's view that a narrative is organized according to a limited number of universal forms and suggests that the narrative structure can serve as a basis for making sense in other contexts. Koschmann (2005) writes, "People see their lives as a story and make sense of the world around them through the context of a narrative" (p. 2). Weick (1995) writes that stories "are templates . . . [that] explain . . . [and] energize" (p. 61). Narratives play an important role in all aspects of human life, including health.

Sharf (2009) expands the *Homo narrans* metaphor to include the relational and participatory aspect of narratives: If humans are natural storytellers, they are also "natural story-hearers" (p. 133). Jodlowski, Sharf, Nguyen, Haidet, and Woodard (2007) shed light on the narrative aspect of sense making among members of a specific support group and point to the narrative nature of human health experiences. Vanderford, Jenks, and Sharf (1997) view the patient as "the central agent who seeks out, receives, and uses information from a number of sources and whose experiences shape the way the individual makes decisions" (p. 16). According to Vanderford et al. (1997), the assumptions that undergird the view of a patient as an agent contain a narrative component that brings to the fore a patient's experiences, identity, and the context surrounding the experiences. For Anderson and Geist-Martin (2003), narratives "reflect people's lives and the changes in identity they experience when they become ill" (p. 136).

Antibiotic resistance is typically perceived as a public health problem, and communication is used as a means to promote and achieve desirable behaviors. The starting premise of this study is that communication may be a part of the problem. To explore the communication aspect of antibiotic resistance, we need to take a journey back through history to the very beginnings of the antibiotics era.

Beginnings of the Antibiotics Era

Modern-day antibiotics are the result of a series of discoveries and breakthroughs that span several centuries, starting with Antonie van Leeuwenhoek's work in the 17th century. A giant breakthrough was Alexander Fleming's discovery that a mold specie can destroy bacteria.

Fleming was aware of the significance of his discovery. He wrote about his finding in a scientific paper titled, "On the Antibacterial Action of Cultures of a *Penicillium* with Special Reference to Their Use in the Isolation of *B. influenza*." The article was published in the *British Journal of Experimental Pathology* in 1929, but it did not attract much attention. About nine years later, the article caught the attention of Howard Florey, a professor of pathology at Oxford University. Florey was able to secure grants and assemble a team of researchers with the aim of taking the "next giant steps" (Markel, 2013, para. 6), which included a series of procedures to purify and develop a medication fit for human use. The start of World War II in 1939 suddenly added a new layer of importance to research on antibiotics. During wars, infections claimed many victims, and a medication that could treat infections gained special relevance.

Unsurprisingly, research on antibiotics attracted the attention of British and American media. *The New York Times*, for example, addressed the discovery for the first time in a 1941 article with a catchy headline, "Germicide Yielded by Mold," and an even catchier subhead, "New Non-Toxic Drug Said to Be the Most Powerful Germ Killer Ever Discovered" (Bakalar, 2009).

Historical accounts indicate that Fleming and Florey, although both scientists, presented details about their work in a different manner. Fleming "happily talked to the press" (Gaynes, 2017, para. 10). He described his accidental discovery and his continuous research efforts in the hope of helping humankind (Macfarlane, 1984). He also used lively and descriptive language interspersed with metaphors and examples that were easy to understand.

Florey gave several interviews and wrote a number of academic articles in which he described his team's work and its significance. Florey's style was scientific, logical, and factual. The following excerpts from Fleming's and Florey's respective banquet speeches given on the eve of the Nobel Prize award ceremony illustrate the differences in their communication styles. Fleming's (1945) banquet speech was an interesting and thoughtful story:

I isolated the contaminating mould. It made an antibacterial substance which I christened penicillin. I studied it as far as I could as a bacteriologist. I had a clue that here was something good but I could not possibly know how good it was and I had not the team, especially the chemical team, necessary to concentrate and stabilise the penicillin.

It was ten years later that Florey and Chain made up a complete team at Oxford which succeeded in this and showed the marvellous chemotherapeutic properties of penicillin.

Florey (1945) centered his banquet speech on a specific topic. He passionately spoke about the magnificent possibilities of the scientific method:

Thus on a personal plane science can act as a force to bring people together but no-one can I think be optimistic at the present time about civilisation as we know it. During the last few years the demonstration of what the application of scientific methods can achieve has been so striking and of such a magnitude that even those brought up in the classical tradition, who form most of the statesmen and politicians of the world, are at last aware of the tremendous tasks that lie ahead in the utilisation of these forces.

On the following day, Fleming, Florey, and Florey's assistant Ernst Chain were awarded the Nobel Prize in Physiology or Medicine "for the discovery of penicillin and its curative effect in various infectious diseases" (Nobel Foundation, 2017, para. 1). Florey was knighted together with Fleming in 1944 (Rosenberg, 2017). Florey was also decorated by a number of countries for "his influence on the outcome of World War II" (Torok, 1998, para. 21).

Despite Florey's contribution to developing antibiotics and despite the official recognition that he received, few people heard about Florey and his work. The general public continues to associate the discovery of antibiotics with Sir Alexander Fleming. The question of how this happened and why one version of the events gained credibility is addressed in the next section.

The Power of Narratives

Browning's (1992) distinction between *lists* and *stories* provides a helpful theoretical frame for understanding why the general public preferred Fleming's story about antibiotics and ignored Florey's account of the events. According to Browning, lists and stories possess two different kinds of rationality and reflect two different worldviews. Lists reflect technical rationality, whereas stories reflect narrative rationality. The difference between the two is stark: "The list is rooted in science and presented in a

formula for action leading to controllable outcomes. The list represents standards, accountability, certainty, and reportability. Conversely, the story is romantic, humorous, conflicted, tragic and most of all, dramatic" (Browning, 1992, p. 281).

Florey presented facts in a logical and rational manner. His explanations and clarifications of what his team accomplished were rooted in the language of science and scientific rationality. In short, his explanations were a *list*. The language of lists, as a rule, is dry and abstract. The language of stories, on the other hand, is energizing, vivid, and alive. Stories, unlike cold, scientific lists, contain lived experiences and emotions (Browning, 1992); they have a different structure and, consequently, a special meaning for the general public. Stories also possess archetypes that resonate with the general public and have a strong inspirational and actuating appeal. The general public, unsurprisingly, preferred the *story* about Fleming's discovery over Florey's factual *list*. The story about a sincere and honest scientist who devoted his life to developing a medication that could treat diseases and infections that resulted in numerous deaths was meaningful and inspiring. Fleming's story also contained powerful archetypes that further reinforced its appeal.

The Hero's Quest Archetype

Campbell (1949) describes the hero's quest archetype, which can be found in all cultures and in all ages. Hercules and Gilgamesh, for example, were on a quest of great adventure and accomplishment, overcoming obstacles and achieving feats that led to glory and admiration. The hero's quest archetype involves an invariably male character who perseveres against innumerable odds and continues on his path until he reaches victory. One such hero was Fleming, who was victorious over "evil" germs (Jorgensen-Earp & Jorgensen, 2002). Unsurprisingly, the archetype resonated with millions of people throughout Britain and with hundreds of millions of people all over the world. Like the heroes of old, Fleming was bravely pressing on in his fight against bacteria that caused untreatable and deadly infections. Fleming's story also possessed another powerful archetype—an ingrained human belief in miracles.

The Miracle Archetype

Levy's (2002) story about an April Fools' Day joke and a surprising response from the public exemplifies the human belief in miracles, including medical miracles. Levy writes that editors of the French medical journal *La Revue Prescrire* had an ad published on April Fools' Day in 1984. The ad featured an imaginary pill the editors jokingly called "Panaceum." By taking the pill, the patient would keep his or her mental illness under control for a year. The editors had thought that the readers would recognize the ad as an April Fools' Day joke because no rational person would believe that something so serious as mental illness could be managed for a year by a single pill. They were surprised to learn that what they thought would be understood as a joke was understood as a truthful and relevant piece of information. One of the editors had to make an official statement on public television admitting that the magic pill did not exist and that the ad was meant as a joke. The audience was greatly disappointed. The miracle archetype persists in human consciousness and has a special allure and impact. Levy (2002) writes, "The idea that there is such an entity as a 'miracle drug' that will cure all ailments remains with us, even among prescribers" (p. 207).

The story about Fleming's discovery possessed the hero's quest archetype and the miracle archetype. It also possessed a tangible actionable component: Antibiotics are potent medications that cure bacterial diseases. This unique combination of two powerful archetypes and the actual effectiveness of antibiotics to successfully treat bacterial infections made the narrative very appealing.

The narrative about miraculous powers of antibiotics spread throughout the world quickly and effortlessly, crossing cultural, national, and religious boundaries. The speed and breadth of the narrative were impressive, especially because in the 1940s, when antibiotics were first introduced, media were relegated primarily to radio and newspapers, the Internet did not exist, and direct-to-consumer advertising of medications was yet to become a reality. Typically, disseminating a narrative and ensuring its acceptance requires a prolonged and concerted effort. In the case of the narrative about antibiotics, however, no such effort was needed. The narrative about antibiotics as omnipotent medications spread effortlessly and became accepted at face value throughout the world.

The Actuating Power of Master Narratives

The dispersion and acceptance of the narrative about the discovery of antibiotics and their miraculous powers had an unintended consequence: It became the basis for an antibiotics master narrative. Master narratives are compelling and persuasive and can literally move millions of people to think and act in a certain way. They are what Lyotard (1984) refers to as the *grand recits*—dominant or universal narratives—which are authoritative and totalizing and have a special actuating power. Their actuating power stems from their symbolic and archetypal meanings and their value-laden, suggestive, inspiring, and motivating language. The narrative about antibiotics as omnipotent medications possessed all the markings of a master narrative: It was value-laden; it possessed symbolic and archetypal meaning; it was inspiring and motivating.

As a result of its master narrative, antibiotics became a staple medication favored both by physicians and patients. Injectable antibiotics were soon replaced by ingestible ones, and taking antibiotics became akin to taking an aspirin. Physicians prescribed antibiotics even for minor health problems. Millions of people took antibiotics at the first sign of a cold or the flu, despite the fact that colds and the flu are viral and, thus, cannot be cured by antibiotics. Patients continue to place high hopes in antibiotics and often request, or even demand, antibiotics from their health care providers for various ailments, including those that are not treated by antibiotics (see, e.g., Vanden Eng et al., 2003). In some countries, antibiotics can be obtained over the counter and without a prescription (Harford, 2017; Morgan et al., 2011). In the United States, anyone can purchase antibiotics without a prescription on the Internet. As noted earlier, such practices have contributed to the diminishing power of antibiotics and to the emergence of bacteria that are resistant to antibiotics. Antibiotics are omnipotent medications in many ways, but they also have limitations that belie the master narrative and should, therefore, be used with caution.

Deflected Fact

Soon after antibiotics were officially administered some 70 years ago, the first instances of bacterial mutations and resistance were noted (Davies & Davies, 2010). A number of scientists warned

about future problems, but with the exception of a handful of scientists, no one paid heed. Alexander Fleming himself, in an interview following his Nobel Lecture in December 1945, mentioned that bacteria could become resistant to antibiotics. Even the word *antibiotic* escaped the normal linguistic scrutiny: Few people bothered to take a closer look at the two words of Latin origin that form the word *antibiotic*: *anti* means *against*, and *bio* means *life*, which suggests that antibiotics should be used sparingly and with caution. Bacteria are the oldest living organisms on Earth, and they play a necessary role in the chain of life. Destroying bacteria indiscriminately is, indeed, directed against life. The public, however, was not ready for such a caveat to the antibiotic master narrative. The narrative that effortlessly encircled the planet and became ingrained in the global medical and patient culture was too empowering and too optimistic to resist. In a world filled with uncertainty, illness, and change, there was at least something that was a constant—antibiotics.

Practical Suggestions

Promoting responsible use of antibiotics and changing attitudes and behaviors has proven to be extremely difficult. In this article, an argument is made that the antibiotics master narrative, despite its deflection of a critically important medical fact, is entrenched in the beliefs and practices of hundreds of millions of people throughout the world. As a master narrative, it is resilient, ingrained in human consciousness and human behaviors, and very difficult to change. It is not surprising that various efforts and campaigns to override the antibiotics master narrative have had limited success. As ancient philosophers noted and what marketing and social marketing campaign designers encounter on a regular basis, people may not necessarily accept what is more beneficial for them and prefer to hold on to their old practices, values, attitudes, and beliefs. To change current attitudes and practices that continue to erode the effectiveness of antibiotics, the antibiotics master narrative must be countered by a new narrative with a mesmerizing symbolic and archetypal appeal—a narrative that will supersede the existing narrative and its deficiencies.

Nelson (1995, 1996, 2001) developed the concept of the *counterstory* to describe the narrative that challenges the dominant master narrative and provides a new and empowering narrative that is morally sound, factual, and convincing. Similarly, Sharf (2009) calls for “re-storying” health narratives and creating new narratives with new meanings. The dominant master narrative about antibiotics as miracle medications needs to be re-storied, and new meanings added.

Narrative theory suggests that humans prefer narrative reasoning to logical reasoning and that a story rather than a logical argument is much more likely to be inspiring and actuating (see Browning, 1992; Fisher, 1984, 1989). Existing campaigns aimed at alleviating antibiotic resistance include narrative components or interesting narratives. None of the campaigns, however, have provided a compelling, powerful, and enduring narrative capable of countering and re-storying the existing master narrative. A randomly selected video from the CDC’s Get Smart campaign serves as an illustration of the need to focus on narrative reasoning.

Sample Video

The 3.35-minute video entitled *Get Smart About Antibiotics: For Patients and Parents* is a combination of a tragic story about a young man's passing away due to antibiotic resistance and factual information about antibiotics. The father of the young man tells the audience that his 27-year-old son became infected with antibiotic-resistant bacteria during a hospital stay. Different photos of the young man are shown depicting him as an active and healthy person and then as a patient in a hospital. In the subsequent scene, a physician provides helpful information about antibiotics. At the end of the video, we see the father again. He reminds us that antibiotics are a "medical miracle" when used properly and that they can save thousands of lives, but when used improperly, they are "a threat to us all" (CDC, 2015).

The video is touching, informative, and interesting. Its purpose is both to inform and to promote a desirable behavior. Its message, therefore, should be compelling, inspiring, and actuating. Fisher's (1984, 1989) narrative paradigm serves as a basis for obtaining clues about the potential actuating power of the message.

Narrative Analysis of the Video

According to Fisher (1984, 1989), the presence of *narrative probability*, *narrative fidelity*, and *good reasons* in a story are correlated with its potential impact. Narrative probability refers to the cohesiveness of a story, whereas narrative fidelity is the comparison that people make between the story and what they know to be true. Good reasons, which are influenced by a number of factors, including history and culture, are the values and ethics expressed in a story.

The video contains elements of all three components to a certain degree. Good reasons, as expressed by the underlying message of values and caring, are clear and compelling. The remaining two components, narrative probability and narrative fidelity, are less clear. Some details that would likely make the story more cohesive are missing. How did a healthy and strong young man get infected by antibiotic-resistant bacteria? Where did he get infected? Two striking images from the video—a photo of the young man as a healthy and strong parachutist and his photo in a hospital bed—overpower the physician's message. Learning what actually happened to the young man, how he got infected, and what the staff did to save his life would have helped support the cohesiveness of the message.

The physician's clear and informative message contains helpful information that rings true to an extent. In the past, ear infections and cases of sore throat were treated successfully by antibiotics, and now we are learning that only some ear infections and some cases of sore throat should be treated by antibiotics. It is not clear why we are to believe new information when experience may suggest something different. Another confusing piece of information refers to vaccines. The physician recommends getting vaccinated as a means of preventing some health problems. Combining a tragic story with factual information about antibiotics and the preventative nature of vaccines is somewhat confusing. Probably the most perplexing is the physician's statement that about half of all antibiotic prescriptions are unnecessary or incorrect. At the same time, the physician instructs the viewers to ask health care providers meaningful questions to help the health care provider make an informed decision. If half of prescriptions were

erroneous in the past, and since prescriptions are authorized by health care professionals, it is not clear how patients' participation might help prevent such errors. In short, the video contains a touching personal narrative and meaningful and helpful information. From the point of view of narrative reasoning, however, the video does not provide a compelling and actuating message.

This brief analysis is a tiny glimpse into the world of messages disseminated by campaigns. The intent is not to judge a campaign based on a single message but, rather, to show that impacting audiences is difficult and that a narrative foundation is crucial, particularly when combating a harmful master narrative.

We need to create a new master narrative with real heroes—scientists, health care providers, patients, family members—real individuals with heroic life stories linked with antibiotics and/or antibiotic resistance. The new narrative must also possess powerful symbols and archetypes, such as genuine caring, hope, a sense of purpose, and recognizable values. The task is very difficult, but attainable. Understanding the role of networks in decision making and information dissemination and diffusion provides a helpful theoretical frame for the task.

Networks

Campaigns tend to target individuals or unrelated groups of individuals rather than networks. Research, however, suggests that targeting networks rather than individuals may be more effective. Fayoyin (2016), for example, notes low effectiveness of digital media campaigns in promoting health messages and suggests that the problem is the underlying linearity of the approach: "Social and behaviour change is a complex process and merely reaching specific individuals with information will not result in behaviour change" (para. 37).

Vanderford et al. (1997) note the impact of families and social networks on decision making in matters of health. Jodlowski et al. (2007) write that support networks for a variety of health issues have shown positive results. An interesting new development centered on the concept of networks are online health communities that include patients and health care providers. Research suggests positive results when health care providers communicate with members of a support network (see Willis, 2016).

Networks play a central role in information dissemination (see, e.g., Granovetter, 1983; Shockley-Zalabak, 2002). Disseminating and sharing information among network members tends to be effective and is often effortless. Seemingly, it is simple and linear. In reality, however, it is complex and, to some extent, paradoxical. The concept of *strong* and *weak* ties can help in understanding the process of message dissemination and diffusion.

Strong ties refer to frequent interaction and communication among network members and indicate closeness and a closely knit network. Weak ties, on the other hand, indicate sporadic interaction and a relational distance among network members (Granovetter, 1983). Both strong and weak ties are necessary for a network to function, but, paradoxically, according to Granovetter, it is the weak ties that enable the dissemination of information. Fine and Kleinman (1979) also focus on weak ties. They find that

weak ties enable message diffusion and that weak ties are more effective for diffusing messages than a strong information source, such as the mass media. If we fast-forward Fine and Kleinman's conclusions to the 21st century and replace mass media with the CDC or the WHO—both very strong sources of information about antibiotics—it may not be surprising that the information they are distributing is resulting in limited attitudinal and behavioral changes.

The manner in which the story about antibiotics as miracle medications spread throughout the world in an effortless manner is reminiscent of the manner in which information spreads through networks. The same principles can be applied when disseminating the new master narrative about antibiotics, especially since technological means to support such an effort are available.

Social and digital media are increasingly being used for disseminating health messages, including messages about prudent use of antibiotics. According to the CDC (2011), "using social media tools has become an effective way to expand reach, foster engagement and increase access to credible, science-based health messages" (p. 1). The use of digital media for disseminating health messages, sometimes referred to as e-health communication, has also been on the increase, especially in developing countries (see Fayoyin, 2016). Advancements in social and digital media provide the means for disseminating the new master narrative about antibiotics in a network pattern. Theory-based conclusions and specific suggestions for practitioners are provided next.

Theory-Based Conclusions

- Narrative theory indicates that human behaviors, practices, attitudes, and beliefs are impacted by master narratives.
- The story about antibiotics as omnipotent drugs is a master narrative that contains powerful archetypes and symbols.
- The master narrative about antibiotics as miracle drugs deflects a crucial medical fact.
- The distinction between the concepts of lists and stories indicates that narrative appeal wins over a competing text with a factual or scientific appeal.
- The concept of strong and weak ties in networks reveals network dynamics and points to weak ties as essential for information dissemination.

Specific Suggestions

- The current dominant narrative about antibiotics as omnipotent drugs must be replaced with a new master narrative about antibiotics.
- The new master narrative must have a stronger archetypal and symbolic appeal than the existing narrative.
- The concept of social networks provides a theoretical basis for organizing the dissemination of the new master narrative.
- The prevalence and popularity of social and digital media indicate that they are a practical means to efficiently and effectively disseminate the new master narrative.
- A network rather than a linear approach to using social media is necessary.

- Future campaigns aimed at increasing awareness of antibiotic resistance and promoting prudent behaviors will have limited success unless the root of the problem—a motivating and actuating appeal of the current master narrative—is understood and taken into consideration.

Concluding Thoughts

This article addresses the issue of antibiotic resistance using a transdisciplinary exploration to understand the roots of antibiotic resistance and contribute to its alleviation. Throughout the exploration, communication theory—and, specifically, narrative theory—serve as a theoretical basis for understanding the communication-related dimension of antibiotic resistance. An argument is made that the dominant view of antibiotics as omnipotent and harmless medications has a strong communication component that starts with the story about the discovery of antibiotics.

The story about Sir Alexander Fleming's discovery serves as a basis for an unintended master narrative that has been impacting people's beliefs and practices for more than 70 years. The story possessed the hero's quest archetype, which resonated with millions of people throughout the world. Furthermore, the inherent human characteristic to believe in miracles reinforced the impact of the story. The fact that antibiotics are powerful medications used for treating serious bacterial infections added a tangible dimension to the story and intensified its appeal. The story about antibiotics as omnipotent medications spread throughout the world and over time became ingrained in the consciousness and practices of humans. The outcome was a master narrative—a powerful, compelling, and actuating narrative that is extremely difficult to change.

As humans, we are prone to narrative reasoning and are impacted by narratives and their symbolic and archetypal power (see Campbell, 1972; Fisher, 1984, 1989; MacIntyre, 1984; Postman, 1999; Weick, 1995). Our experiences and identities as patients have a narrative component (Jodlowski et al., 2007; Sharf, 2009; Vanderford et al., 1997). In view of the motivating and actuating power of narratives, this article proposes the creation of a new master narrative about antibiotics—a master narrative that includes real heroes, powerful symbols, recognizable archetypes, and inspiring values—and counter the power of the existing master narrative about antibiotics as omnipotent medications. This article is a call for the production and empirical testing of the efficiency and effectiveness of a new master narrative and its dissemination through social and digital media networks around the world to promote the more circumspect use of antibiotics and thus to help curb antibiotic resistance.

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