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Review Article

Florence Nightingale and Antimicrobial Stewardship

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Abstract

Following the uniquely coincident Year of the Nurse and the year of the pandemic, striking similarities between the principles and innovations that Florence Nightingale introduced to nursing and the inclusion of nurses in the pursuit of antimicrobial stewardship have become evident. Issues of universal healthcare, the treatment of infections, workforce collaboration, and quality of care are as critical in the 21st century as they were in Nightingale's lifetime. The importance of nursing involvement in each of these areas is compared and discussed with their relevance to past, present, and future healthcare.

Keywords: Antimicrobial resistance, antimicrobial stewardship, Florence Nightingale, nurses

Introduction

At first glance, there would seem to be little convergence between Florence Nightingale's career in the 19th century and antimicrobial stewardship in the late 20th and early 21st centuries. However, a closer examination reveals striking parallels, particularly regarding nursing practice. Florence Nightingale, widely regarded as the founder of modern nursing practice, did not merely expand the prevailing understanding of the nursing care of her times, she revolutionized and restructured the principles and perception of nursing in ways that persist to present time, 200 years after her birth. Today's nurse, while immersed in the founding principles as Florence Nightingale audaciously promulgated, practices in a science-based world of multi-drug resistance, delivering care in interprofessional teams, and recognized by the public as the most trusted professional of the healthcare team.

While many clinicians and researchers sounded alarms, antimicrobial stewardship was not a generally recognized concept at a societal level in the first half-century of antibiotic use. Only after six decades into the clinical use of antibiotics did the World Health Organization, the Centers for Disease Control and Prevention (CDC), and the European Union for Disease Prevention and Control publish formal documents recognizing the seriousness of the problem of antimicrobial resistance and suggest approaches to the limitation and control of antimicrobial resistance (Bartlett, 2011).

Both Nightingale and stewardship came to public prominence in response to crises—the horrific conditions of wounded soldiers in the Crimean War (1854–1856) (Gill & Gill, 2005) and the crisis of increasing antibiotic resistance in the 21st century (Bartlett, 2011). The intervention in both instances was stewardship, defined as the careful, responsible management of something entrusted to one's care. In the case of Nightingale, this was the health and well-being of wounded soldiers. In the case of antimicrobial stewardship, it is the optimal use and preservation of a valuable but diminishing social resource—antimicrobial medications.

One of the less appreciated of Nightingale's skills was her proficiency with statistics. She was among the first to analyze social phenomena and present in graphic form data demonstrating that excess military deaths from poor sanitation and disease were ten-fold that of mortality from battlefield casualties (Cohen, 1984). Her improved standards of hygiene are credited with a recorded decrease in mortality from 33 to 2% (Gill & Gill, 2005). In 1859, Nightingale was the first woman to be elected into the Royal Statistical Society for her development of the visual representation of statistical data, now referred to as polar area charts (Loveday, 2020). In the case of early antimicrobial stewardship programs (ASPs), basic nursing activities that overlap integral components of antimicrobial stewardship also went unrecognized (Olans et al., 2016). Only when Ha integrated nursing into a pre-existing ASP and documented improved outcomes was nursing's value statistically

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quantified (Ha et al., 2019). That study supported the accuracy of Nightingale's observation that "the most important practical lesson that can be given to nurses is to teach them what to observe – how to observe – what symptoms indicate improvement – what the reverse – which are of importance – which are of none…." (Nightingale, 1860). In both instances, however, there came a gradual awareness that good nursing is good patient stewardship and good antibiotic stewardship (American Nurses Association/Centers for Disease Control, 2017).

In the 19th century, women who worked as nurses were regarded as unskilled domestics (Cohen, 1984), without education or training. Nightingale was a sensation in the London press, celebrated as "The Lady with the Lamp." This image of illumination to permit observation coincided with her recognition of the important role of the professional nurse in patient monitoring and in the multifaceted care of sick patients. On her return to England from Scutari, she set up the first professional training school for nurses in England at Saint Thomas Hospital, raising the social status of nurses. Frontline nurses were similarly overlooked in the structure of the early ASPs. The original ASP model included administration, infectious disease physicians, pharmacists and microbiologists, epidemiologists/infection control preventionists, along with information technology and environmental services (Fishman, 2006). Only recently have the contributions of nurses to antimicrobial stewardship been more thoroughly examined (Olans et al., 2020).

As a prolific writer, Nightingale wrote *Notes on Nursing* in 1859. It became part of the curriculum at the Nightingale School, and editions remain in print even today. Her leadership and teaching, her extensive writings, and her passionate advocacy for nursing and egalitarian quality healthcare have earned her the title of the founder of modern nursing. Publications on antimicrobial stewardship have proliferated in a similar fashion over the past 15 years, but only a few have been written by nurses or about nursing (Olans et al., 2020). Some training manuals on stewardship interventions have been developed for nurses but nursing leadership in antimicrobial stewardship has come more from their work at the bedside (Heath et al., 2016; Olans et al., 2020). The most notable nursing antimicrobial stewardship accomplishment to date has been the practical operationalizing of bedside interventions leading to the reduction of central line-associated bloodstream infections (Furuya et al., 2011), a triumph that would make Nightingale proud. The U.S. Institute of Medicine recognized that "[nurses do] … spend the greatest amount of time in delivering patient care as a profession. Nurses, therefore, have valuable insights and unique abilities to contribute as partners with other health care professionals in improving the quality and safety of care" (Institute of Medicine Report, 2010).

Nightingale made this imperative for quality and safety of care clear in her *Notes on Hospitals* (1863): "…the very first requirement in a hospital [is] that it should do the sick no harm" (Nightingale, 1863). Antimicrobial stewardship, at its core, is also all about patient safety and population health (Tamma et al., 2014). Recently, in the United Kingdom, a set of core antimicrobial stewardship competencies were developed for all undergraduate nursing education (Courtenay et al., 2019).

Nightingale was a social reformer as well. After she returned to England, she introduced trained nurses into the workhouse system in Britain, enabling care for the poor by trained healthcare professionals. Through her advisory role to the British government on military healthcare, she contributed to introducing sanitation reforms in India with subsequent health and life expectancy benefits (Hays, 1989). Likewise, antimicrobial stewardship has no social or national boundaries. For antimicrobial stewardship to succeed in controlling the spread of antimicrobial resistance, traditional international and national social attitudes and practices will have to change in a similar fashion (Charani et al., 2014). Both physicians and the general public, infatuated by the early successes of "miracle drugs," developed the bad habit of presuming that "more [antibiotic] is always better." They ignored the warnings of Fleming and others about the potential perils of antibiotic overuse (New York Times Archives, 1945) with resulting drug resistance and further consequences arising from agricultural use and the potential for worldwide travel for having implications far beyond the hospital ward. Now we know better (Wald-Dickler & Spellberg, 2019).

Nightingale was a uniquely multi-talented, intelligent, multidisciplinary innovator. By the force of her personality, she not only created and changed processes but persistently and successfully advocated for their adoption despite opposing social and professional hierarchies and traditions. It would be presumptuous to try to predict what Nightingale would say about nurses and antimicrobial stewardship today, given that the first patients successfully treated with penicillin were treated two decades after she died. But, like other visionaries and transformational leaders, a retrospective examination of her innovations long after her death can still provide meaningful guidance and inspiration over a century later.

It could thus be instructive to imagine what Nightingale would do were she still alive today in the era of antimicrobial stewardship. Unquestionably, she would be a champion of the highest standards of nursing, encouraging nurses to work to the fullest extent of their education and training. Nightingale, the epidemiologist, would recognize the patterns of progression of antimicrobial resistance. And Nightingale, the author, would prod us all to heed the warnings of Alexander Fleming, Maxwell Finland, and other early infectious diseases scientist physicians about the consequences of antibiotic overuse (Sepkowitz, 2012). And, Nightingale, the infection preventionist, would demand adherence to basic principles of infection control, including the limitation of antimicrobial resistance. Nightingale, the advocate and statistician, would promote the graphic statistical representation of the numbers of SARS-CoV2 coronavirus cases and deaths to insure an appropriate response to the COVID-19 pandemic from politicians and the public.

Nightingale, the environmental theorist and proponent of healthier surroundings for patients, would recognize the effects of climate change on health and on antimicrobial resistance and would lobby governments to take urgent actions to save the planet. Understanding the role that agricultural use of antibiotics has in emerging resistance, Nightingale, the environmentalist, would strongly support worldwide One Health education in the promotion of stewardship (Centers for Disease Control and

Prevention, 2020). And she would espouse the value of nurses, as the largest segment of the world's healthcare workforce, in teaching the public about stewardship (Olans et al., 2020). Nightingale, the effective administrator, would ensure that various healthcare disciplines work collaboratively to address the problems of antibiotic resistance and would smoothly integrate nursing into a stewardship paradigm. Nightingale, the social reformer, would realize that to preserve the utility of antibiotics, successful antimicrobial stewardship would require cultural attitude change to succeed. At the same time, Nightingale the humanitarian would advocate for measures to address the social and economic disparities that disproportionally harm the health and welfare of the most disadvantaged in our societies.

Conclusion and Recommendation

The year 2020, the Year of the Nurse and the 200th anniversary of Florence Nightingale, was a unique year for all nurses as they rallied through the COVID-19 pandemic, employing many of the foundational principles of Florence Nightingale. Yet, if we imagine the Year of the Nurse 2020, the world might again look back, this time over 300 years, and marvel at the still relevant wisdom and multiple contributions of Florence Nightingale. The Lady with the Lamp would still illuminate the understanding that good nursing is good stewardship, and antimicrobial stewardship with the important component of good nursing is simply good health care and good common sense. The enduring legacy of Florence Nightingale lives on as a nurse of compassion—the Lady with the Lamp; a nurse as the collaborator—the administrator, a nurse as the communicator—the advocate for best practice, and the nurse as a critical thinker—the statistician and educator.

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