

Infectious Diseases Physicians: Improving and Protecting the Public's Health: Why Equitable Compensation Is Critical

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Infectious diseases (ID) physicians play a crucial role in public health in a variety of settings. Unfortunately, much of this work is undercompensated despite the proven efficacy of public health interventions such as hospital acquired infection prevention, antimicrobial stewardship, disease surveillance, and outbreak response. The lack of compensation makes it difficult to attract the best and the brightest to the field of ID, threatening the future of the ID workforce. Here, we examine compensation data for ID physicians compared to their value in population and public health settings and suggest policy recommendations to address the pay disparities that exist between cognitive and procedural specialties that prevent more medical students and residents from entering the field. All ID physicians should take an active role in promoting the value of the subspecialty to policymakers and influencers as well as trainees.

Keywords. public health; ID physician workforce; compensation; value of ID physicians.

In recent decades, emerging and reemerging infectious diseases (ID) have caused outbreaks with national and international implications and have underscored the critical need for ID expertise. ID physicians do more than protect the health of their patients. Due to the unique communicable nature of ID, ID physicians provide a population-level service by helping to secure the health of the community. However, as ID threats to public health continue to emerge, the number of young physicians applying for ID subspecialty training continues to wane.

ID physicians lead public health responses in their health-care facilities and communities and at federal and global levels. In the last 2 decades, ID specialists have played vital roles in responding to emerging diseases and epidemics including West Nile virus (1999), severe acute respiratory syndrome (SARS; 2003), H1N1 pandemic influenza (2009), Middle East respiratory syndrome (MERS; 2012 and ongoing), Ebola virus (2014–2016 and ongoing), and Zika virus (2016 and ongoing). While these outbreaks garner a great deal of media visibility, ID physicians also routinely detect, prevent, or mitigate community

outbreaks of vaccine-preventable diseases, foodborne illness, and healthcare-associated infections.

The work performed by ID doctors in the United States is substantially undercompensated. ID physician salaries average around \$100 000 a year less than other subspecialties [1, 2]. Young physicians, who generally complete training with substantial educational debt, can be driven from considering the field [1]. Developing a robust ID workforce of the future requires a strategy to attract quality physicians and keep them engaged on the frontline of patient care, research, and public health. Despite their documented value, ID physicians' services are undervalued by payers compared to primary care and procedure-based specialties. A graduating trainee finishing an internal medicine residency can work immediately as a hospitalist at a higher mean salary than an ID physician who will take 2 to 4 additional years of fellowship training. Such variances in compensation for direct patient care and insufficient pay for value in other roles such as infection control creates a significant disincentive to pursuing a career in ID.

The 2017 Medscape Physician Compensation Report reveals that the median salary of a specialty physician to be approximately \$316 000 per year [1]. The Infectious Diseases Society of America's (IDSA) 2017 compensation survey showed that the average ID physician earns about \$215 000 a year. Full-time public health physicians averaged \$30 000 per year less [2].

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The average medical student leaves school with approximately \$200 000 in debt [1]. This financial disincentive is a significant contributor to the 21.6% decline in the number of applicants to ID fellowship training programs over the 5-year period ending in 2016 [3]. Only 42.3% of these programs filled through the match, down 20% over the same period [3]. While the 2017–2018 match saw an improvement in the number of positions filled, the match rate was still significantly below that of other specialties, many of which customarily fill at or near 100% [4].

It is essential that ID physicians promote the value this subspecialty brings to public health in order to affect the policy changes necessary to secure the future of the field. Here, we provide concrete examples of ID physicians' unique contributions to public health, which can be used to educate policymakers and influencers at the federal, state, and local levels and to advocate for needed investments to sustain the field.

THE UNIQUE EXPERTISE OF THE ID PHYSICIAN

Training/Education Pathway

ID specialty preparation consists of training first in general adult internal medicine or pediatrics followed by 2 to 4 years of training in ID. The ID subspecialty fellowship includes integrated training to provide patient care and ensure population health. The clinical training includes diagnosis, management, and treatment of patients with ID; expertise in techniques for preventing healthcare-associated infections and antimicrobial resistance; prevention strategies; and research approaches to address ID-related questions.

The Diverse Practice Settings of ID Specialists

In 2015, 8515 ID physicians were practicing in the United States [5], often combining clinical care with work as educators, epidemiologists, public health leaders, antimicrobial stewardship or infection prevention and control directors, researchers, administrators, and policymakers.

Multiple studies have demonstrated the cost-effectiveness and patient benefit of ID physician care for hospitalized patients with ID [6–9]. Further, the work of ID physicians provides broader public protection against infectious threats through community and healthcare facility–based infection control and prevention activities, surveillance, outbreak response, and other public health activities.

ID PHYSICIANS AS LEADERS OF POPULATION HEALTH

Preventing and Treating Infectious Diseases in the Community

The ID workforce plays a critical role in managing infections such as human immunodeficiency virus (HIV), tuberculosis, and viral hepatitis, which can cause community outbreaks if not promptly diagnosed and treated. The public health workforce, including ID physicians, has been shrinking over the last decade [10, 11]. These workforce losses pose a significant barrier to carrying out routine public health activities and

responding to public health threats. ID physicians employed by federal agencies and state health departments have the community as their patient. Along with ID physicians in other practice settings, they provide leadership and subject matter expertise to enable a wide variety of community-based interventions. For example, ID management and prevention. Public health strategies to contain the spread of HIV rely on ensuring that people living with HIV–AIDS have access to ID-driven clinical care. By achieving sustained virologic suppression, people stay healthy and reduce the risk of community transmission [12].

The 2015 HIV and hepatitis C virus (HCV) outbreaks linked to injection drug use in rural Scott County, Indiana, serve as a stark reminder of the risk for rapid disease transmission in communities that lack robust outbreak prevention resources and activities [13]. In 2017 there was an outbreak of hepatitis A virus in the homeless population of San Diego, California, that required significant work from the public health community to resolve [14]. In March 2017, a National Academies of Medicine panel declared the elimination of hepatitis B and HCV in the United States by 2030 to be a feasible goal. A sufficient workforce with the expertise to treat patients with HCV will be critical to reaching this goal [15]. As an example of outbreak detection and response to emerging infections, the Indiana State Health Department recognized the first identified case of MERS in the United States in a traveler to that state. ID specialists at the department helped develop and implement protocols to ensure appropriate care, prevent the spread of infection, and avert an outbreak. ID physicians working inside or outside of public health often provide guidance to help allocate community vaccine resources and other preventive services. For example, during measles outbreaks in California in 2015 and Minnesota in 2017, ID physicians within the state and local health departments helped lead vaccination campaigns to halt the spread of the disease [16, 17]. Even in the absence of a major outbreak, patients in hospitals and healthy individuals in communities are potentially exposed to increasingly drug-resistant and difficult-to-treat pathogens, necessitating ID physician leadership to protect the population by limiting the spread of infectious threats [18]. ID public health physicians act as a trusted resource, working through the media, to help educate the public about communicable diseases and prevention strategies. Current topics of concern include multidrug-resistant bacteria, Zika virus outbreaks, the 2017 hepatitis A outbreak in San Diego, and *Mycobacterium chimer*a infections in patients treated with heart–lung bypass machines.

Infection Prevention and Control in Healthcare Settings

Infection prevention and control activities in healthcare settings involve a range of interventions. Methods include providing oversight of programs that conduct surveillance and identify risks, providing education regarding the use of appropriate isolation procedures and personal protective equipment,

developing policies to respond to novel infections, and ensuring that the healthcare environment and medical devices are properly cleaned and maintained. Studies have shown that development and implementation of these activities by ID physicians have resulted in improved outcomes and reductions in hospital-acquired infections in a variety of healthcare settings [19]. Prevention of healthcare-associated infections leads to savings of approximately \$1000 to more than \$40 000 per patient depending on the specific infection in a variety of healthcare settings [20].

Examples of ID physician leadership in infection control and prevention and healthcare epidemiology are described here. During the West Africa Ebola crisis in 2014 and 2015, ID physicians served as leaders of special biocontainment units at the National Institutes of Health, University of Nebraska, Emory University, and Bellevue Hospital. These units and their staff developed novel, sophisticated infection prevention strategies to care for patients with potentially deadly infections. They reassured medical providers, political leaders, and our nation's public by providing safe, state-of-the-art care. In Seattle, Washington, an ID physician reported an outbreak of deadly, multidrug-resistant carbapenem-resistant Enterobacteriaceae infections were attributed to contaminated, faulty duodenoscopes. This investigation helped lead to changes in guidance on endoscope reprocessing and safety [21, 22]. An ID physician at Vanderbilt University identified contaminated steroids as the source of a fungal meningitis outbreak that ultimately caused more than 700 infections and 46 deaths across 20 states before the cause was established [23, 24].

Antimicrobial Stewardship

Antimicrobial resistance is one of the most urgent public health threats of our time. Infections caused by antimicrobial-resistant organisms kill more than 23 000 people and result in \$20 billion in unnecessary healthcare costs each year in the United States [18]. Newer antimicrobials will be precious resources, and ID physician-driven expertise will be vital to ensure that they are being used appropriately. A recent *Clinical Infectious Diseases* article highlighted the unique skill set and training ID physicians have to lead antimicrobial stewardship programs (ASPs) in order to ensure that correct antimicrobials are used judiciously [25]. The Centers for Disease Control and Prevention (CDC) have acknowledged the impact and importance of ASPs in their release of the Core Elements of Hospital Antibiotic Stewardship Programs in 2014 [26], and the Joint Commission released their antimicrobial stewardship standard for healthcare settings in 2017. In 2014, legislation was passed in California that mandated that every acute care hospital in the state establish a physician-supervised ASP [27]. Adoption of a federal government requirement that other states follow suit would help to ensure that all patients can benefit from the positive impact of ASPs. ASPs will become increasingly vital in preventing a

post-antibiotic era where common infections become untreatable due to resistant organisms. ID physicians need to take an active role in ensuring their facilities have adequate ASPs that meet the standards laid out by the CDC and Joint Commission. Well-run ASPs not only help preserve the efficacy of antimicrobials but also improve patient outcomes. In fact, studies have indicated that ASPs generated several hundred thousand dollars a year in cost savings while also reducing rates of *Clostridium difficile* infections [28, 29]. It is vital that the government continue to support the implementation of ID-led ASPs in all healthcare settings to slow the development of resistance and to keep our current antimicrobials useful for as long as possible.

Emergency Preparedness and Response

In response to the 2001 anthrax bioterrorism attacks and the looming threat of pandemic influenza, hospitals began extensive preparations for natural and human-made bioemergencies. These activities substantially increased with the appearance of the SARS, MERS–coronavirus, and Ebola virus epidemics. ID physicians provided scientific and clinical expertise that shaped prevention, control, detection, and treatment efforts. Natural disasters also carry an increased risk of outbreaks of unusual, serious infections, as seen in connection with the hurricanes and flooding in Texas, Florida, Puerto Rico, and the US Virgin Islands, which led to more than 70 reported cases of leptospirosis and other waterborne and vectorborne diseases [30]. ID physicians also played a leading role in infection prevention at large-scale shelters for people who had been displaced by storms and flooding. Hospital and healthcare system emergency preparedness requires an intimate knowledge of hospital infection control procedures and capacities, regional collaboration with other facilities, planning with public health authorities, and development of communication strategies within the hospital community, with public health departments, and with the general public.

ID PHYSICIANS AS LEADERS IN GLOBAL HEALTH

A review of recent international ID outbreaks emphasizes the global dimensions of public health protection—the SARS epidemic originated in Hong Kong, the Ebola virus outbreak started in West Africa, and the Zika virus epidemic spread from Brazil throughout South America and the Caribbean. A bacterial plasmid that conferred resistance to colistin, often the last antimicrobial line of defense against gram-negative organisms, emerged from bacteria that were colonizing domestic animal populations in China and is now seen in patients on 6 continents. Older epidemics, of course, continue; tuberculosis and HIV–AIDS remain scourges in many countries. Emerging and reemerging infections with global consequences have reemphasized efforts to address global health security.

The global SARS epidemic illustrated how increased international travel and trade introduce new risks for the rapid

worldwide spread of new infectious pathogens. The World Health Organization International Health Regulations (IHR), issued in 2005, were officially adopted by 196 countries [31]. ID physicians remain crucial to ongoing IHR implementation efforts, including disease outbreak recognition, in-country training, and collaborative partnership in epidemic disease control, diagnostics, and preparedness.

With prescient timing, the CDC's Global Health Security Agenda (GHSA) was launched just months before the Ebola crisis surfaced in West Africa. The GHSA aims to "accelerate progress toward a world safe and secure from infectious disease threats; to promote global health security as an international priority and to spur progress toward full implementation of WHO IHR 2005" [32]. The goals fall into 3 major themes: prevention, detection, and response. ID physicians provide critical support to all 3 arms. ID training and expertise establish the necessary foundations for the *prevention* goal to address issues such as antimicrobial resistance, biosafety and biosecurity, and immunization needs. The *detection* goal promotes innovation in the area of accurate, real-time, cost-effective ID diagnostics. Greater use of diagnostic tests in countries currently lacking such resources is critical for containing emerging and reemerging infections, preventing outbreaks, and halting the development of antimicrobial resistance. The *response* goal would establish emergency operations centers that link public health with other rapid-response agencies, all of which draw on ID physician expertise.

WORKING TOWARD APPROPRIATE COMPENSATION FOR ID PHYSICIANS

Multiple studies have demonstrated that consulting an ID physician improves treatment outcomes and lowers patient care costs. This benefit has been documented for ID consultation in general [33], in specific patient populations such as intensive care unit patients [34], and for specific illnesses such as staphylococcal bloodstream infections and other multidrug-resistant organism infections [9, 35].

ID physicians also improve outcomes and reduce costs through antimicrobial stewardship and infection prevention [8, 36]. In addition, many complex procedures and treatments (such as bone marrow and solid organ transplantation) could not be safely conducted without input from ID specialists.

The IDSA has implemented several initiatives in an effort to reinvigorate the pipeline of ID applicants. These include mentorship programs; scholarships for medical students, residents, and fellows interested in ID; research and clinical career meetings; and medical school ID interest groups. However, other potential options should be considered in order to properly compensate ID physicians for the public health benefit of their work.

RECOMMENDATIONS

Recommendations for federal, state, local, and institutional policymakers include the following:

Establish loan repayment opportunities for ID physicians who work in public service (eg, local, state, or federal public health departments). Significant medical school debt can drive new physicians away from the ID specialty and public health. Targeted loan repayment opportunities would allow more physicians to pursue these critical career paths. In July 2018, in a move supported by IDSA, the US House of Representative's Energy and Commerce Committee passed legislation that would authorize the CDC to provide loan repayment for those who serve in the Epidemic Intelligence Services (EIS). More than 85% of EIS officers continue serving in public health roles, and this proposal would significantly help make this career path more financially feasible for physicians. Such loan forgiveness opportunities could also be broadened to support ID physicians who work in public health at the federal, state, or local level and face similar challenges around compensation and medical student debt.

Establish financial compensation for ID physicians who work in public service (eg, local, state, and federal public health agencies) or who do ID work that provides broader public health benefits (infection control and antimicrobial stewardship). Physicians who perform infection control and antimicrobial stewardship work should be compensated for these activities. As part of hospital accreditation, the Centers for Medicare and Medicaid Services (CMS) mandates that every participating facility have an active infection control program [37]. States could attach an accreditation process to such mandates that would formally document ID clinicians who oversee hospital infection control and antimicrobial stewardship committees, with loan forgiveness or other financial incentives attached to this accreditation.

Ensure that ID physician compensation reflects public health value added. As a cognitive specialty, many of the clinical services ID physicians provide are billed under Evaluation and Management codes, which have not been reevaluated in more than 20 years. The CMS should update these codes to reflect the increasingly complex care provided in inpatient and outpatient settings. Public and private payers, healthcare systems, and hospitals should also provide appropriate compensation and protected time for nonclinical services that are crucial to public health, including infection prevention and control, antimicrobial stewardship, and bioemergency preparedness and response.

Fully fund local, state, federal, and global public health agencies and build a competent workforce. Without proper workforce funding, including funding of ID physician positions, health departments will not be able to hire and retain the expert workforce necessary to detect, prevent, and respond to public health threats.

Appropriate compensation for ID service in all of these forms will have significant positive effects on individual patient care, nosocomial infections, and community public health, ensuring that the future ID workforce has enough of an incentive to pursue this vital field.

Note

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