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Review

Thoughts on and Proposal for the Education, Training, and Recruitment of Infectious Disease Specialists

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The global pandemic of COVID-19 has underscored the significance of establishing and sustaining a practical and efficient infection control system for the benefit and welfare of society. Infectious disease (ID) specialists are expected to take on leadership roles in enhancing organizational infrastructures for infection prevention and control (IPC) at the hospital, community, and national levels. However, due to an absolute shortage and an uneven distribution, many core hospitals currently lack the ID specialists. Given the escalating global risk of emerging and re-emerging infectious diseases as well as antimicrobial resistance pathogens, the education and training of ID specialists constitutes an imperative concern. As demonstrated by historical changes in the healthcare reimbursement system, the establishment and enhancement of IPC measures is pivotal to ensuring medical safety. The existing structure of academic society-driven certification and training initiatives for ID specialists, contingent upon the discretionary decisions of individual physicians, possesses both quantitative and qualitative shortcomings. In this article, I first address the present situations and challenges related to ID specialists and then introduce my idea of securing ID specialists based on the new concepts and platforms; (i) ID Specialists as National Credentials, (ii) Establishment of the Department of Infectious Diseases in Medical and Graduate Schools, (iii) Endowed ID Educative Courses Funded by Local Government and Pharmaceutical Companies, and (iv) Recruitment of Young Physicians Engaged in Healthcare Services in Remote Areas. As clarified by the COVID-19 pandemic, ID specialists play a crucial role in safeguarding public health. Hopefully, this article will advance the discussion and organizational reform for the education and training of ID specialists.

Key words: antimicrobial resistance, emerging infectious diseases, infection prevention and control, medical education, silent pandemic

The global pandemic of novel coronavirus disease 2019 (COVID-19) has brought about significant upheavals in various aspects of global societies [1-3]. To prevent the menace of COVID-19, the largest-ever lockdowns have been implemented worldwide, leading to economic risks such as stock market crashes [4, 5]. In today's highly globalized society, the risk of a new pandemic is looming, and there is an imminent necessity for structural transformation across society, not limited to the healthcare sector.

"Infectious Disease (ID) Specialists" are physicians with specialized knowledge and experience in the diagnosis and treatment of a wide range of infectious diseases who are supposed to play a central role in infection prevention and control (IPC) as well. Their contributions during the response to COVID-19 are

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unquestionable across the nations. However, there is an apparent shortage of ID specialists in Japan both quantitatively and qualitatively to combat the next pandemic in the future. In this article, firstly, the author would like to introduce the past and present topics of notable infectious diseases, such as emerging and re-emerging infectious diseases as well as antimicrobial resistance AMR. Then, I address the current situation and challenges related to ID specialists while expressing my opinion on the establishment of new platforms for the education and training of ID specialists.

Emerging and Re-emerging Infectious Diseases Due to Globalization

Emerging infectious diseases (EIDs) refer to infections that are newly recognized and have become significant public health concerns, either at the local or international level [6]. To date, there have been more than 10 notable EIDs confirmed since the initial identification of the Crimea-Congo hemorrhagic fever in 1956, indicating their occurrence at approximately five-year intervals [7, 8]. The primary factor contributing to the emergence of EIDs is the increased frequency of contact with microorganisms derived from wildlife due to natural developments such as deforestation [9]. EIDs potentially arise when such previously unrecognized pathogens exhibit high infectivity and pathogenicity in humans. While EIDs often originate in frontier areas of developing countries, the rapidly advancing globalization has reduced geographical barriers, leading to an increased number of EIDs being diagnosed in Western countries [10]. As of the time of writing this article (October, 2023), nearly four years having passed since the emergence of SARS-CoV-2; therefore, an out-of-the-blue report of the next EIDs is not too far [11].

Re-emerging infectious diseases (RIDs) refer to infections that had previously subsided but, due to certain factors (such as mutant strains or resistant strains), have once again become prevalent locally or globally [6]. The most recent and ongoing example of RIDs would be the Monkeypox. In July 2022, the World Health Organization (WHO) Director-General declared the worldwide monkeypox outbreak a Public Health Emergency of International Concern [12]. There have been approximately 90,000 cases reported worldwide by October 2023, with 208 cases in Japan <https://ourworldindata.org/monkeypox (accessed October 19, 2023)>. The transmission of Monkeypox is primarily linked to close interpersonal contact within the community of men who have sex with men, and the declare was announced to end in May 2023.

Antimicrobial Resistance - Historical Overview and Post-COVID-19 Situation

In 2014, the WHO characterized AMR as a "severe global threat to public health," representing an escalating public health concern that demands immediate global attention [13, 14]. Reducing AMR necessitates a multifaceted approach, including multidisciplinary strategies such as active surveillance, appropriate uses of antibiotics, and the broad implementation of IPC measures at healthcare settings [15, 16]. The AMR Global Action Plan was endorsed by the WHO in May 2015. Subsequently, the Japanese government lauched the National Action Plan on AMR in April 2016, advocating various administrative and healthcare measures to tackle this crisis. Moreover, during the G7 Ise-Shima Summit held in May of the same year, AMR countermeasures took a prominent position on the agenda, with the leaders' declaration underscoring the collective commitment of each country to confront AMR challenges as a global imperative, alongside other concerns to be shared with, such as the global economy, immigration, and counter-terrorism measures. At the G20 Health Ministers' Meeting held in Okayama in 2019, 10 out of the 48 joint statements were related to AMR, highlighting its substantial potential impact on international society. In April 2023, the National Action Plan on AMR was amended to delineate the objectives for the upcoming five-year period (2023-2027). During the G7 Hiroshima Summit held in May 2023, there was a renewed emphasis on advancing health innovations to address the AMR crisis (Table 1).

The global COVID-19 pandemic has accelerated the emergence and spread of AMR pathogens in healthcare settings. A systematic review indicates that the isolation rates of AMR organisms, such as carbapenem-resistant *Acinetobacter baumanii*, carbapenem-resistant *Enterobacterales*, vancomycin-resistant *Enterococcus* species, and methicillin-resistant *Staphylococcus aureus*, have notably increased during the COVID-19 pandemic, particularly in Western countries [17]. The significant surge in these AMR pathogens was hypothesized to result from disruptions in contact precautions, active surveillance, proper isolation of infected or colonized patients, and excessive antibiotic usage in

Table 1 Major events for antimicrobial resistance in Japan

Year (month)	Topics or events [Data sources]
2015 (May)	Global Action Plan on Antimicrobial Resistance (World Health Organization) [http://www.wpro.who.int/entity/drug_resistance/resources/global_action_plan_eng.pdf. accessed October 19, 2022]
2016 (April)	National Action Plan on Antimicrobial Resistance (Japanese government) [National Action Plan on Antimicrobial Resistance (AMR) 2016-2020 and relevant activities in Japan. Glob Health Med 2019; 1 : 71-77.]
2016 (May)	G7 Ise-Shima Summit (held in Japan) [https://www.mofa.go.jp/ecm/ec/page24e_000148.html. accessed October 19, 2023]
2019 (October)	G20 Okayama Health Ministers' Meeting (held in Japan) [https://www.mhlw.go.jp/seisakunitsuite/bunya/hokabunya/kokusai/g20/health/index.html. accessed October 19, 2023]
2023 (April)	National Action Plan on Antimicrobial Resistance 2023-2027 (Japanese government) [https://www.cas.go.jp/jp/seisaku/infection/activities/pdf/ap_honbun.pdf. accessed October 19, 2023]
2023 (May)	G7 Hiroshima Summit (held in Japan) [https://www.g7hiroshima.go.jp/en/. accessed October 19, 2023]

COVID-19 patients. Incidences of healthcare-associated infections have elevated during the pandemic as well [18], certainly leading to an increase in antibiotic consumption. In this context, promoting antimicrobial stewardship programs and related activities are currently of considerable importance, ideally under the leadership of ID specialists.

Current Situation and Challenges Regarding "ID Specialists" in Japan - Absolute Shortage and Uneven Distribution

Definition of "ID Specialists". Presently, there is a general consensus that a physician acknowledged as the Board Certified Physicians of the Japanese Association for Infectious Diseases are regarded as ID specialists in Japan. At the risk of being misunderstood, however, qualification systems generally certified by Japanese academic societies tend to exercise arbitrary discretion in determining the necessary duration and certification criteria without undergoing external assessment, potentially resulting in a lack of assurance regarding the requisite training content and achievements for the attainment of substantial expertise [19, 20]. This concern has been raised by experts, leading to an increasing demand for the establishment of a more comprehensive and stringent certification system [21]. To respond to the next pandemic rapidly and efficiently, Japanese government plans to establish a new organization, "National Institute for Health Risk Management" (temporary name at present) after 2025. The author acknowledges the merits of centralizing the infection control system; however, concerns arise regarding the scarcity of ID specialists in leadership roles on the healthcare frontlines.

Insufficiency of ID Specialists. Here is my contemplation for the securement and deployment of ID specialists in our country. The Japanese Association for Infectious Diseases has a membership of over 10,000; however, as of October, 2023, the number of board-certified ID specialists stands at 1,764 <https://www.kansensho.or.jp/modules/senmoni/index.php?content_id=29 (accessed December 5, 2023)>. According to the open data, I have documented a substantial disparity in the number of ID specialists per population across various domestic prefectures [22]. At that point, the national average of ID specialists was 1.34 per 100,000 population. Remarkably, Nagasaki Prefecture, with its illustrious history along with Nagasaki University, stood out with 5.05 ID specialists per 100,000 population, followed by Fukuoka Prefecture (2.53) and Tokyo (2.44), both of which had roughly double the national average. Conversely, there are prefectures like Iwate and Yamanashi, where the numbers of ID specialists are only one-tenth of the national average. Despite Okayama Prefecture having 1.42 ID specialists per 100,000 population, ranking 11th nationwide, they are absent at several major general hospitals, making it difficult to assert that we have an ample sup-

ply of ID specialists in our medical settings.

Unfortunately, this situation persists. Utilizing the latest data, I herein present the current inadequacy of ID specialists in Fig. 1. The national average of ID specialists only marginally increased to 1.40 per 100,000 population. In nearly one-third of prefectures, the number of ID specialists was less than 1.00 per 100,000 population. The rank among prefectures showed no significant change, with Okayama Prefecture securing the 12th position (1.69 per 100,000 population).

Uneven distribution of ID specialists in Japan. Solely relying on quantitative estimations at the prefectural level is inadequate for comprehending the imbalanced distribution of ID specialists. As indicated in a previous study [22], it is important to note that (i) ID specialists tend to be unevenly deployed in university hospitals, (ii) not all specialists are actively engaged in IPC measures at the hospitals they are affiliated with, and (iii) not all of them necessarily possess comprehensive knowledge and experience for IPC, despite their specialist status. Thus, qualitative assessment is also necessary to understand the proper deployment of specialists.

As of July 2023, out of 32 ID specialists in Okayama Prefecture, 12 (37.5%) were employed at university hospitals, either Okayama University Hospital or Kawasaki Medical School Hospital. Infectious diseases are ubiquitously prevalent across a range of healthcare settings, and thus, the IPC practices should ideally encompass all healthcare facilities, including all of clinics, regional chronic care hospitals, and major general hospitals. Therefore, it is preferable that ID specialists are allocated to hospitals of various sizes in a "decentralized" manner, rather than being "centralized" in highly specialized medical institutions such as university hospitals.

A far more critical fact to highlight in Japan is the absence of ID specialists in Designated Medical Institutions legislated by the Infectious Disease Control Law. As of November 2022, among 56 Class I Designated Medical Institutions, eight facilities (14.3%) had no ID specialists [23]. Similarly, among 351 Class II Designated Medical Institutions, 234 facilities (66.7%) did not employ ID specialists at all. Designated Medical Institutions, which are legally ordered by prefectural governors, are supposed to accommodate and treat

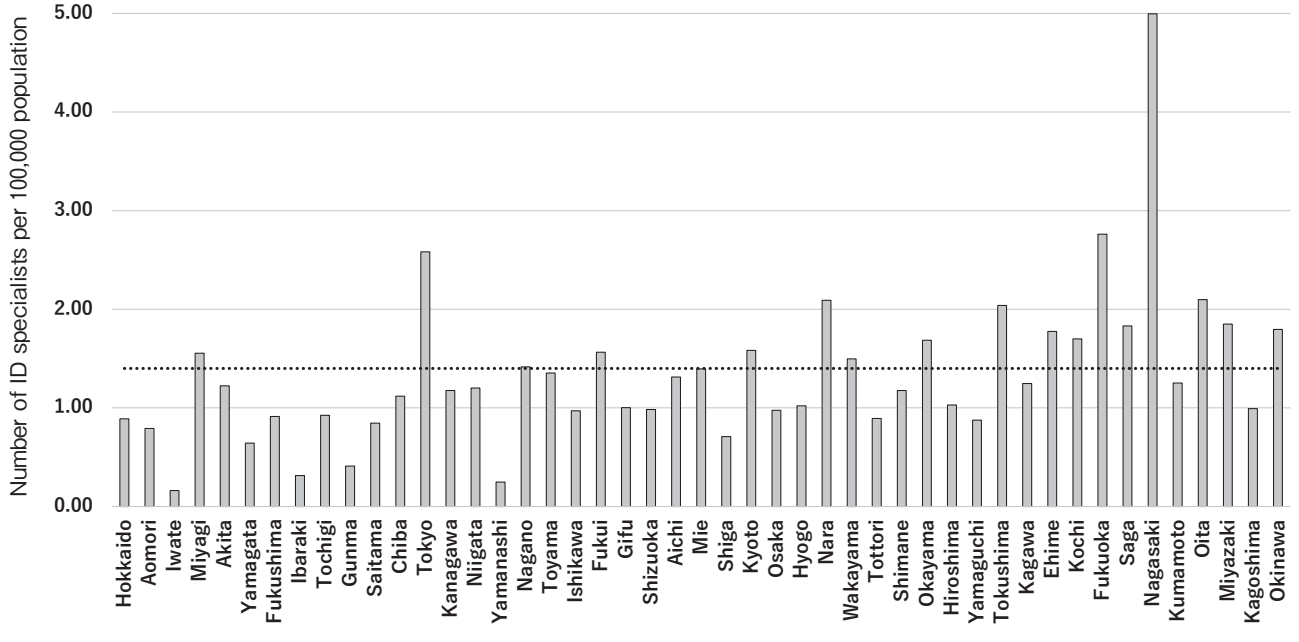

Fig. 1 The number of board-certified Infectious Diseases (ID) specialists per 100,000 population in Japan, by prefectures.
Publicly available population data (as of 2020) was extracted from the Statistics Bureau, Ministry of Internal Affairs and Communications <https://www.stat.go.jp/data/nihon/02.html (accessed December 5, 2023)>. The number of board-certified ID specialists by prefectures was obtained from the homepage of the Japanese Association for Infectious Diseases <https://www.kansensho.or.jp/modules/senmoni/index.php?content_id=29 (accessed December 5, 2023)>. The dotted line indicates the national average (1.40 per 100,000 population).

patients with designated infectious diseases. The author is skeptical that, in the absence of ID specialists, the Designated Medical Institutions can adequately deliver patient care in appropriate IPC measures. This implies a misalignment between administrative directives and healthcare capacities, underscoring a healthcare issue related to the distribution of ID specialists.

Other specialized certifications. Besides the Japanese Association for Infectious Diseases, other infectious disease-related academic societies have provided qualification systems, including the Japanese Society of Chemotherapy, the Japanese Society for Clinical Microbiology, and the Japanese Society for Infection Prevention and Control. However, these certification processes do not necessarily demand practical achievements or experiences. Hence, doubts persist regarding the ability of these certification holders to proficiently manage patients with various infectious diseases, including the emerging or remerging infectious diseases. Additionally, aside from society-certified specialists, there is an entity known as the ICD (Infection Control Doctor), which is granted by Japanese College of Infection Control Doctors. This was established in 1999 with the aim of providing high-quality IPC practices in hospitals. However, medical doctors or those with a PhD degree can be qualified with minimal efforts, if they attend a few training sessions. Thus, the author consider that the ICD certification does not guarantee practical competence in IPC activities as well.

Limitations of Certification Systems by Academic Societies

Typically, when we mention specialists in the field of medicine, we are often referring to those acknowledged as "society-certified specialists". A society is defined as "a collective term for organizations established by scholars and researchers to facilitate communication, knowledge exchange, and the presentation of research findings" (The World Encyclopedia, 2nd edition). These organizations were originally private groups founded by the society members themselves. Consequently, their foundational principles, goals, and activities are generally determined by the organization itself, and there is no inherent public obligation. Nevertheless, it is conceivable that the term "society" carries a perception of having a public dimension, even for members within the society and external observers. In the articles of the Japanese Association for Infectious Diseases, Chapter 2 (Purpose and Business) states: "To conduct academic research and investigations in the field of infectious diseases and related areas, develop the field of infectious diseases, contribute to society by disseminating and promoting information and knowledge related to infectious diseases, and enhance public health by fostering specialized human resources who engage in the prevention, response, and treatment of infectious diseases" <https://www.kansensho.or.jp/modules/about/index.php?content_id=3 (accessed October 19, 2023)>. Interpretations of this passage may depend, but I decipher it as signifying that the "The Japanese Association for Infectious Diseases is an assembly of experts that assumes a public role in the diverse domains of infectious diseases."

It is not a pressing issue whether it is desirable for such a private academic society to define and certify medical specialists who take public responsibilities. Further, the author certainly does not object to the Japanese Association for Infectious Diseases certifying ID specialists who are expected to have certain public roles in the realm of infectious disease control and public health. The matter is that there are no requirements to be achieved for the numbers of membership and certified specialists in such academic societies. In the lack of mandatory prerequisites or penalties, an increase of certified physicians is just a non-binding target for the societies. Consequently, given the current system that academic societies function as the foundation for the education and securement of ID specialists, I highlight that their numbers and deployment remain to be imbalanced in healthcare institutions, potentially resulting in an inability to meet societal expectation and demand.

New Platforms and Considerations for the Education and Training of ID Specialists

Through the discussions so far, it is evident that, from both a qualitative and quantitative standpoint, the comprehensive education and qualification of ID specialists who are supposed to have a public responsibility in safeguarding society against a series of devastating infectious diseases is vital. Placing them strategically at hospitals is of utmost importance for public health providers as well to tackle this tough nut to crack. Herein, I would like to propose notable platforms and perspectives to be on the table for the education, training, and

recruitment of ID specialists (Fig. 2).

The concept of ID specialists as national credentials. First, I dare to propose an establishment of national certification system for ID specialists and central management of such qualified personnel. As above, ensuring the availability of experts with a broad range of knowledge and experience in IPC is in the national interest. To this end, it would be useful to set up a qualification system under the framework of public health measures by local government that mandates well-sophisticated ID trainings.

As mentioned above, the current system for securing ID specialists largely depends on the society's scheme and the choices made by individual physicians. Under these circumstances, it is hard to effectively mitigate risks related to the rising numbers of emerging/re-emerging infectious diseases and AMR bacteria. By implementing a nationalized certification program that includes comprehensive practical training, it becomes possible to guarantee the competency of ID specialists. Additionally, by managing the qualification process for new certifications and renewals at the local government level (prefectural and municipal levels), it becomes possible to uphold a consistent standard of IPC levels throughout the regions. While this may appear to be a bold proposition, it can yield a fundamental solution to the challenging problem to be addressed.

Have any medical specialist qualifications been nationalized for physicians in Japan? To the best of my knowledge, the sole instance is the anesthesiologist qualification, which was delineated in the Medical Care Law in 1960 mandating approval from the Minister of Health, Labour and Welfare. However, looking back the history, it appears that anesthesia services were negatively perceived as not being equal to other medical services, and there reportedly was strong opposition to their specialty. In contrast to the anesthesiologist qualification established under adverse circumstances, I hope the national accreditation of ID specialists will be favorably instituted, considering their contribution in maintaining public health. While the necessity, feasibility, potential challenges, and other facets of this proposal are open to further deliberation, I believe it is worthwhile to contemplate it within the legal framework for enhancing domestic infectious disease control.

The raison d'etre of Department of Infectious Disease in medical and graduate schools. Enrichment of ID education at medical schools and university hospitals is indispensable to secure ID specialists in the future. I have conducted a questionnaire survey in 2021 to assess medical students' perspectives towards ID specialists [24]. Interestingly, 3.7% of them expressed an increased interest in pursuing a career as an ID specialist during the pandemic, while three times as many students (11.0%) indicated a preference for not choosing ID specialists as their career path. This highlights the significance of further educational initiatives in medical schools to increase the numbers of medical students to aim for ID specialists.

Historically, the Japanese medical science originated in German medicine, focusing on basic medicine such as microbiology and pharmacology, rather than clinical infectiology. Thus, Japanese medical schools have unfortunately offered limited educational opportunities for clinical ID and IPC skills in both pre- and post-graduate teaching curricula. However, given the current need for reassessment, it is expected to instill more educative initiatives concerning the knowledge

Fig. 2 Summary of proposals to facilitate the education, training, and recruitment of Infectious Disease (ID) specialists.

and techniques that all clinical practitioners should acquire, including the very basic principles of clinical infectious diseases practices, appropriate prescriptions of antimicrobials, and hand hygiene and standard precaution as the fundamental IPC measures. Higher education at the graduate and doctoral levels should include opportunities for role modeling and research as well.

To provide such a diverse and multilayered educational experience, we need at least several ID specialists at medical schools as well as university hospitals. However, it is not in reality. I have recently gone through the current registration of ID specialists at domestic medical schools [23]. According to data provided by the Japanese Association for Infectious Diseases, it is surprisingly apparent that among 82 medical schools in Japan, 2 lack ID specialists, 6 have only one, and 10 have only two. Although the median number of ID specialists registered at each medical school was 5, their affiliations, work allocations, and actual roles assigned are unclear. It is conceivable that some of them do not make contributions to ID and IPC education at all.

In light of such a situation, the necessity of establishing the Department of Infectious Diseases is underscored from multiple viewpoints. Well-organized department would enable the hiring of ID specialists, delineate responsibilities in education and research for infectious diseases, and enhance the accessibility of medical students and junior physicians to ID specialists. Ideally, this momentum would rise in each medical school, leading to self-efforts to create new staffing post. Alternatively, restructuring of university departments should be another approach. However, national universities are encountering annual cuts in operational grants, and the new establishment of the Department of Infectious Diseases presents a formidable challenge. Again, without ID specialists, medical schools cannot deliver undergraduate education sufficiently, despite the substantial demand for ID education. Drastic measures such as appropriation of the national budget should be discussed.

Recent trends in establishing endowed courses for ID education in medical schools funded by local government and pharmaceutical companies. Since the COVID-19 pandemic, there has been a surge in administrative investments aimed at facilitating ID educations (including the training of ID specialists), resulting in the establishment of endowed courses primarily at regional universities. It started with the inception of the "Course for Clinical Infectious Diseases" at Tottori University (supported by Tottori Prefecture) in November 2020. Subsequently, the second instance arose in April 2021 with the establishment of the "Course for Infectious Diseases" at Fukui University (supported by Fukui Prefecture). In August 2021, Gifu University initiated its "Endowed Course for Infectious Diseases" (supported by Gifu Prefecture), marking the third instance. Following that, in May 2022, Kumamoto University launched the "Endowed Course for Practical Education of Infectious Diseases Prevention" (supported by Kumamoto Prefecture), becoming the fourth. Notably, Kumamoto City served as the sponsor for the "Endowed Course for the Prevention of Emerging Infectious Diseases" established at Kumamoto University in November 2020 as well. Most recently, in July 2023, Kagoshima University established the "Endowed Department of Practical Education and Field Research for Infection Control and Prevention" in a financial support by Kagoshima Prefecture (All the course name in English was given by the author). In each of these cases, local authorities, including prefectures and cities, have established endowed courses at local universities with the primary objective of fostering ID specialists. The shared impetus for these initiatives would be the relatively low number of ID specialists per capita [22]. The author assumes that this movement arises from the recognition that, especially in the aftermath of the COVID-19 pandemic, there is an urgent need to nurture ID specialists to maintain the region's healthcare and public health. This collaborative structure within the realm of governance and legislation should be upheld, and thus the allocation of public funds is a valuable undertaking.

Moreover, it is welcome to consider corporate donations from pharmaceutical firms and other entities to catalyze the development of educational courses for ID specialists, alongside the governmental backing. In the narrowest sense, the core mission of pharmaceutical companies would be "drug discovery and manufacturing". However, considering the current dearth of development of new antimicrobial drugs [25], an enhancement of the antimicrobial stewardship, or the appropriate uses of existing drugs, has acquired relative significance. Akin to the slogan on the "3R (Reduce, Reuse, Recycle) Promotion Campaign" in environmental concerns, the fight against AMR should be facilitated from

the 3R viewpoint: "Reduce" the prescriptions of antimicrobial agents through appropriate use, "Reuse" existing antibiotics through wise and innovative approaches, and "Recycle" the antimicrobials by distributing them to the world equally. Especially, "Reduce" strategy, namely the Antimicrobial Stewardship strongly endorsed by the WHO, serves as a cornerstone in the battle against the AMR <https://www.who.int/publications/i/item/9789240025530 (accessed October 24, 2023)>. I believe that endowment for educative courses in medical or graduate schools to facilitate the training of ID specialists will lead to a kind of corporate contribution to society.

Recruitment of young physicians graduating from Jichi Medical University and the regional quotas enrollment. Jichi Medical University, established in 1972, is a public-private university funded with the aim of improving healthcare services in remote areas by dispatching physicians to regional healthcare facilities in each domestic prefecture [26]. Against the backdrop of the growing issue of physician shortage in distant regions, each medical schools have established the Regional Quotas Enrollment system in the last decade, independently having addressed the problem of physician maldistribution [27]. Young physicians graduated from the medical school are required to serve a mandatory nine-year term in remote fields. Nevertheless, due to ongoing efforts, concerns about physician shortages in isolated areas have been alleviated in prefectures. Management of infectious diseases is a major concern in remote areas with an aging population, and these young physicians are expected to play a key role in disease prevention and treatment. For these reasons, I reckon that they are suitable candidates for ID specialists and hope an institutional reform so that they can undergo the education and training of ID specialists even during the mandatory service periods.

Conclusion

A century ago, infectious diseases were the primary cause of human mortality. With the progress of medicine, including the development of antibiotics, mortality rates for various infectious diseases have remarkably decreased. Over the past few decades, the focus has shifted to non-communicable diseases such as cardiovascular diseases, cancer, diabetes, and chronic respiratory diseases, leading to substantial advancements in its diagnosis and treatment approaches. Since 2020, we have unexpectedly faced a global pandemic of COVID-19, underscoring the immeasurable impact emerging infectious diseases can have on society beyond the framework of healthcare.

In the future, ID specialists should play a leadership role in strengthening IPC levels at the multilayer levels of hospitals, communities, and nations. While the roles expected of ID specialists may vary depending on the medical context and position they are placed, when viewed from a broader perspective, they can be summarized as "safe guarders of public health from the threat of infectious diseases". In this article, I delved into the present situations, challenges, and possible solutions concerning ID specialists in Japan. To comprehensively bolster national response to infectious diseases, it is insufficient to solely rely on the voluntary choices of individual physicians within the existing framework of academic society's certification for ID specialists. The institutionalization of ID specialists as a national accreditation that can be overseen at the local administrative levels could signify a valuable approach in this era of globalization. In Japan, with a national health insurance system that provides coverage for all its citizens, healthcare disparities should be fully rectifiable. Infection prevention and control is no exemption.

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