


Infectious diseases consultations from general internal medicine physicians in Japan

A descriptive single-center study

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Abstract

In Japan, general internal medicine (GIM) physicians must be aware of frequently encountered infections because of the shortage of infectious disease (ID) specialists. However, there are currently no epidemiological data on this subject. This study aimed to describe the frequency and pattern of ID consultations requested by GIM physicians in Japan. This is a 3-year retrospective review of the ID consultations requested by GIM physicians in Japan at a community-based acute tertiary care teaching hospital in Tokyo from April 2018 to March 2021. Demographic data, such as reasons for consultation, causative organism, and final diagnoses, were collected. During the study period, ID consultations were requested by GIM physicians 128 times. The incidence rates of bacteremia and 30-day mortality were 65.6% (n = 84) and 3.1% (n = 4), respectively. The most common diagnostic classifications after ID consultation were bone/joint (24.2%, n = 31), respiratory (17.7%, n = 22), and cardiovascular infections (12.5%, n = 16). The most common final diagnoses were bacteremia (11.7%, n = 15), infective endocarditis (9.4%, n = 12), and vertebral osteomyelitis (7.8%, n = 10). This is the first study to describe the ID consultation cases requested by GIM physicians in Japan in a community-based acute tertiary care teaching hospital. Despite the shortage of ID specialists, GIM physicians covered a wide range of IDs, including bone/joint infections and infectious endocarditis, which require long-term care. ID and GIM physicians, including hospitalists, should cooperate to promote the quality of care and clinical management. Future multi-center studies with large numbers of clinical cases are needed to determine the ID clinical knowledge required by GIM physicians in Japan.

Abbreviations: GIM = general internal medicine, HIV = human immunodeficiency virus, ID = infectious diseases, IDS = infectious disease specialist.

Keywords: clinical knowledge, general internal medicine, infectious diseases consultations, Japan

1. Introduction

General internal medicine (GIM) physicians have a broad range of practice in Japan. Their roles can range from being a generalist and a hospitalist to an emergency room physician.^[1] Despite their vague role, hospital-based GIM physicians provide comprehensive clinical care and admission management in the inpatient units.^[2,3]

GIM physicians commonly encounter infections, specifically in the acute care setting. However, there are only a few infectious disease specialists (IDSs) in Japan.^[4-7] This means that the majority of hospitals and tertiary care centers do not have IDSs, especially those in rural areas. According to a report in 2019, there are only 1491 board-certified IDSs in Japan, which can be translated to 1.2 specialists per 100,000 population, compared to that of 2.8 in the United States.^[7] Thus, GIM

physicians are expected to clinically manage a significant load of ID cases.

Despite this added responsibility, there are no epidemiological data regarding IDs to learn from. The study aimed to describe the frequency and pattern of ID consultations among GIM physicians in Japan.

2. Materials and methods

2.1. Study design

This single-center retrospective study was conducted at the Itabashi Chuo Medical Center, a 569-bed community-based acute tertiary care hospital and teaching center with a 12-bed intensive care unit in Tokyo, Japan. This hospital has an active Department of GIM, and its average number of inpatients is

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The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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approximately 80 per day. This department manages cases with a variety of medical problems, including IDs. It is important to note that gastrointestinal infections are mainly taken care of by the Department of Gastroenterology, but all rest are the responsibility of GIM. This hospital has no trained full-time IDS, but consultation services are available for both outpatients and inpatients on a weekly basis by a part-time clinician. Consultations via email are also available, if necessary. This study was approved by the Itabashi Chuo Medical Center Research Ethics Committee (no. 20210201-2). The need for informed consent was waived because of the retrospective design as ID consultations are a part of standard patient care.

2.2. Inclusion and exclusion criteria

All ID consultations from GIM between April 2018 and March 2021 were eligible for analysis. Only the first consultation during the study period was included. However, if the patient developed another infection after the initial one, it was recognized as a separate episode. Patients who received multiple consultations for the same infection were only included once. The demographic data collected included age, sex, reasons for the referral at the first consultation, consultation location (intensive care unit, general ward, outpatient/emergency room), underlying diseases, the presence of bacteremia, causative organism (if known), 30-day mortality, classification of ID, and final diagnosis. The initial reasons for consultation were categorized as diagnosis and management (fever or elevated inflammatory markers such as white blood cell count and C-reactive protein of unknown etiology, suspicion of infection, positive blood culture, and empiric therapy), and treatment of established infections (management of already diagnosed infections including intra-abdominal, respiratory, urinary tract, etc.). The latter included definitive therapy (choice of antimicrobials or switching from intravenous to oral form), duration, intractable cases (unfavorable clinical course, difficult-to-treat, etc.), and adverse reactions to antimicrobial agents. We analyzed the ID consultation database from April 2018 to March 2021.

2.3. Statistical analysis

Categorical data were analyzed using either the chi-squared or Fisher's exact tests and non-categorical ones with the Student's *t* test or the Mann-Whitney *U* test. Differences were considered statistically significant at $P > .05$. All statistical analyses were performed using the JMP Pro software program (version 16.0; SAS Institute, Cary, NC).

3. Results

A total of 152 cases underwent ID consultations during the study period. Based on the exclusion criteria, we excluded 28 cases of multiple consultations with same episode. Finally, a total of 128 cases were included in this study, and their clinical characteristics are shown in Table 1. The median age was 78 years (64–86 years), and 2.3% ($n = 3$) were human immunodeficiency virus (HIV) positive. The reasons for ID consultation included treatment of established infections (89.8%, $n = 115$) and diagnosis and management (10.2%, $n = 13$). In the subcategory of established infections, intractable cases, definitive therapy, and treatment duration were at 38.3% ($n = 49$), 32.0% ($n = 41$), and 16.4% ($n = 21$), respectively. The incidence rates of bacteremia and 30-day mortality were 65.6% ($n = 84$) and 3.1% ($n = 4$), respectively.

The most common diagnoses were bone/joint (24.2%, $n = 31$), respiratory (17.7%, $n = 22$), and cardiovascular infections (12.5%, $n = 16$) (Table 2). As for the final clinical diagnosis

after consultation, the most common were bacteremia (11.7%, $n = 15$), infective endocarditis (9.4%, $n = 12$), and vertebral osteomyelitis (7.8%, $n = 10$) (Table 3).

A total of 122 culture-proven infections were documented in the study and 144 pathogens were isolated. The prevalent pathogens were gram-positive microbes (34%), including methicillin-resistant *Staphylococcus aureus* (27.0%), other *Staphylococcus* (8.2%) and *Streptococcus* species (10.6%), *Enterococcus* species (8.2%), as well as gram-negative bacteria microbes (31.9%), including *Pseudomonas aeruginosa* (4.9%), and atypical mycobacteria (16%) (Table 4).

The number of consultations related to tuberculosis, HIV, and syphilis was 8, 3, and 10, respectively.

4. Discussion and conclusions

To the best of our knowledge, this is the first study that describes ID consultations from GIM physicians in Japan in an acute care hospital. As previously mentioned, the number of IDS in Japan is low, so GIM physicians play a relatively large role in our country in terms of clinical care. However, there are no clear epidemiological studies on this topic. This study provides indications for future competencies in the field of IDs that GIM physicians, including residents and fellows, require.

We found that orthopedic-related infections, infective endocarditis, respiratory infections, and bacteremia were common. In comparison, the number of consultations for common diseases, such as urinary tract infections, was low. This is particularly surprising since GIM physicians in Japan are generally responsible for primary care. This suggests that they are comfortable treating internal medicine cases but require consultations for infections that are relatively rare and

Table 1
Clinical characteristics of patients who underwent infectious disease consultations ($n = 128$).

Variables	Frequency (%)
Age (yr) (range 20–99)	78 (64–86)
Gender	
Male	69 (53.9)
Female	59 (46.1)
Consultation location	
General ward	113 (88.3)
Intensive care unit	7 (5.5)
Outpatient/emergency room	8 (6.2)
Underlying diseases	
Cardiovascular diseases	41 (32.0)
Chronic lung diseases	6 (4.7)
Chronic kidney diseases	30 (23.4)
Hemodialysis	8 (6.3)
Diabetes	32 (25.0)
Solid tumor	12 (9.4)
Hematologic malignancies	2 (1.6)
Chronic skin diseases	9 (7.0)
Liver cirrhosis	3 (2.3)
HIV/AIDS	3 (2.3)
Immunosuppressive therapy	13 (10.2)
Reasons for consultation	
Diagnosis and management	13 (10.2)
Treatment of established infections	115 (89.8)
Definitive therapy	41 (32.0)
Treatment duration	21 (16.4)
Intractable cases	49 (38.3)
Adverse reactions	4 (3.1)
Bacteremia	84 (65.6)
30-day all-cause mortality	4 (3.1)

AIDS = acquired immune deficiency syndrome, HIV = human immunodeficiency virus.

Table 2**Diagnosis after clinical infectious disease consultation (n = 128).**

Diagnosis	Frequency (%)
Bone/joint infections	31 (24.2)
Respiratory infections	22 (17.7)
Cardiovascular infections	16 (12.5)
Bacteremia	15 (11.7)
Genitourinary infections	10 (7.8)
Catheter-related bloodstream infection	8 (6.3)
Hepatobiliary tract infections	5 (3.9)
CNS infections	4 (3.1)
Noninfectious diseases	3 (2.3)
Skin and soft tissue infections	3 (2.3)
Psoas abscesses	3 (2.3)
Syphilis related consultations	2 (1.6)
Intraabdominal infections	2 (1.6)
Other (febrile neutropenia, scabies, IM, and VZV)	4 (3.1)

CNS = central nervous system, IM = infectious mononucleosis, VZV = aricella zoster virus.

Table 3**Final clinical diagnosis after infectious disease consultation (n = 128).**

Variables	Frequency (%)
Bacteremia	15 (11.7)
Infective endocarditis	12 (9.4)
Vertebral osteomyelitis	10 (7.8)
Osteomyelitis	9 (7.0)
Community-acquired/hospital-acquired pneumonia	8 (5.4)
Catheter-related bloodstream infection	8 (6.3)
Urinary tract infections	7 (5.4)
Suppurative arthritis	7 (5.4)
Lung abscess/empyema	5 (3.9)
Tuberculosis	5 (3.9)
Prosthetic joint infection	5 (3.9)
Liver abscess/liver cyst infection	4 (3.2)
Noninfectious diseases	3 (2.3)
Psoas abscess	3 (2.3)
COVID-19	3 (2.3)
Graft-related infection	3 (2.3)
Meningitis	3 (2.3)
<i>Clostridioides difficile</i> infection	2 (1.6)
Cellulitis	2 (1.6)
Bacterial prostatitis	2 (1.6)
Syphilis	2 (1.6)
Other (febrile neutropenia, necrotizing fasciitis, brain abscess, cholecystitis, PCP, CIED infection, scabies, renal cyst infection, IM, and VZV)	10 (7.8)

COVID-19 = coronavirus disease 2019, CIED = cardiac implantable electronic devices, IM = infectious mononucleosis, PCP = pneumocystis pneumonia, VZV = varicella zoster virus.

require long-term treatment or surgical drainage. This trend is similar to that of previous research in Japan.^[5] Bone/joint infections such as vertebral and other types of osteomyelitis are among the relatively commonly encountered infections in community hospitals and emergency departments. Thus, GIM physicians should be comfortable managing these cases, especially in terms of treatment duration and transition to oral medication.^[8] Although their incidence is relatively uncommon, GIM physicians required HIV and syphilis-related consultations in our study. The most important aspect of treating HIV is its diagnosis.^[9,10] In addition, syphilis-related consultations can be divided into 2 main parts, clinical management of primary and secondary syphilis, and interpretation of laboratory tests, such as preoperative measurements (rapid plasma reagin and *Treponema pallidum* antibody hemagglutination test). Syphilis-related consultations, especially for laboratory

values, are frequent, and GIM physicians need to be familiar with their interpretation.^[11,12]

Regarding the main reasons for ID consultations, intractable cases were the most common, similar to that of other departments. There is a need to improve the clinical knowledge and decision-making of GIM physicians through continued medical education, case-based discussions, and lecture series in daily practice. Each institution should recognize opportunities for improvement based on their needs and perform continuous training for GIM physicians. In the case of this hospital, it may be important to address the management of bone/joint infections and cardiovascular infections.

In addition, improving the quality of medical care is another area in which GIM physicians and those serving as hospitalists are involved in, as well as playing an active role in infection control. In a previous study, the establishment of a department of GIM was associated with a reduction in the length of hospital stay in patients with pneumonia.^[2] Another report showed that it was associated with an increased number of blood cultures ordered in other departments.^[13] Due to the shortage of IDSs, ID and GIM physicians should cooperate to promote the quality of care and clinical management in hospitals in Japan.^[14]

There are some limitations that must be mentioned. Firstly, this retrospective study was conducted at a single-center community-based acute tertiary care teaching hospital, thus the results may not apply to other settings with different consultation styles, such as university hospitals. Secondly, the sample size was relatively small due to the single-center design and the short duration of the study. Thirdly, we were unable to show the proportion of ID consultations for all IDs in each department. Finally, our results did not include informal consultations, which play a role in our workload. Curbside consultations are an important issue, especially in situations where the number of IDSs is low.^[15]

In this study, we described the frequency and pattern of ID consultations from GIM physicians in Japan. The most commonly diagnosed diseases were bone/joint infections such as vertebral osteomyelitis, infective endocarditis, respiratory infections, and bacteremia. The wide range of IDs is due to the different functions of each center, yet an acute care teaching hospital with no IDS is thought to be a common setting in Japan. Future

Table 4**Most common infecting pathogens in the study patients.**

Variables	Frequency (%)
Infections with a microbiological diagnosis, proven by culture	122 (100)
<i>Staphylococcus aureus</i>	33 (27.0)
<i>Escherichia coli</i>	14 (11.5)
<i>Streptococcus</i> spp.	13 (10.6)
Coagulase-negative <i>Staphylococci</i>	10 (8.2)
<i>Enterococcus</i> spp.	10 (8.2)
<i>Pseudomonas aeruginosa</i>	6 (4.9)
<i>Klebsiella pneumoniae</i>	5 (4.1)
<i>Mycobacterium tuberculosis</i>	5 (4.1)
Carbapenem-resistant <i>Enterobacteriaceae</i>	3 (2.5)
<i>Corynebacterium</i> spp.	2 (1.6)
<i>Candida</i> spp.	2 (1.6)
<i>Enterobacter</i> spp.	2 (1.6)
<i>Nocardia</i> spp.	2 (1.6)
<i>Bacteroides</i> spp.	2 (1.6)
Other (<i>Achromobacter xylosoxidans</i> , <i>Aeromonas caviae</i> , <i>Aspergillus fumigatus</i> , <i>Citrobacter freundii</i> , <i>Clostridioides difficile</i> , <i>Haemophilus influenzae</i> , <i>Legionella pneumophila</i> , <i>Listeria monocytogenes</i> , <i>Morganella morganii</i> , <i>Mycobacterium intracellulare</i> , <i>Proteus mirabilis</i> , <i>Streptococcus gallolyticus</i> , <i>Streptococcus pneumoniae</i>)	13 (10.6)

multi-centered research studies are needed to better understand the IDs faced by GIM physicians in Japan.

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