

Bloodstream infections in the elderly Japanese population: Current reality and countermeasures

Keiji Nakamura^{1,2,*}, Kayoko Hayakawa^{1,3}, Shinya Tsuzuki^{1,3,4}, Norio Ohmagari^{1,3,5}

¹Department of Infectious Diseases, Disease Control and Prevention Center, National Center for Global Health and Medicine, Tokyo, Japan;

²Department of General Internal Medicine, Kyushu University Hospital, Fukuoka, Japan;

³AMR Clinical Reference Center, National Center for Global Health and Medicine, Tokyo, Japan;

⁴Faculty of Medicine and Health Sciences, University of Antwerp, Antwerp, Belgium;

⁵Emerging and Reemerging Infectious Diseases, Graduate School of Medicine, Tohoku University, Miyagi, Japan.

Abstract: We reviewed bloodstream infections in the elderly in Japan, referring to data recently reported from the National Center for Global Health and Medicine in Tokyo. We divided the locations of bloodstream infections into Hospital-onset (HO), healthcare-associated (HCA), and CA (community-acquired), as the elderly reside in different places. The study focused on the fact that the general condition and underlying diseases of the elderly differ by age group. And thus, we divided them into three groups: Pre-old (65–74 years), Old (75–89 years), and Super-old (≥ 90 years), and compared their characteristics of bloodstream infections. HO bacteremia was most common in the pre-old group. On the other hand, HCA bloodstream infections tended to increase as the population aged, and it was most prevalent in super-old group. According to the study results, early intervention through infectious diseases (ID) consultation may improve the prognosis of bloodstream infections even in the elderly. Since the rate of ID consultation is lower in the super-old group than in other groups, this group may be a significant target. In conclusion, a study of a cohort of elderly patients with bloodstream infections in Japan indicates that bloodstream infections in patients over 65 years is not uniform.

Keywords: elderly Japanese population, older people, bacteremia

Introduction

Japan is one of the "super-aging" countries, and the average life expectancy in 2022 is 87.09 years for women and 81.47 years for men, one of the highest in the world (1). The number of elderly people in the world is expected to increase in the future as the population ages. Among the infections of various organs, bloodstream infection is an extremely important infectious disease because of its high mortality rate, which is often associated with sepsis (2).

Although bloodstream infections are a threat to elderly patients, it is difficult to single out the elderly population as a whole. Among the elderly, it is clear that the mortality rate of bloodstream infections also increases with increasing age (3-6). Our knowledge of bloodstream infections in older adults in Japan is limited. We have recently reported on bloodstream infections in the elderly from the National Center for Global Health and Medicine (NCGM) in Tokyo. In this letter, we refer to these data and provide an overview of bloodstream infections in the elderly in Japan (7).

Descriptive characteristics of the elderly patients with bloodstream infections in the NCGM

We conducted a study to determine the clinical epidemiology and characteristics of bloodstream infections in the elderly patients (1,415 patients with 1,211 episodes excluding contamination) aged 65 years or older who had been diagnosed with bloodstream infections at our center (7). In this study, the older adults were classified into Pre-old (65–74 years: $n = 397$, 32.8%), Old (75–89 years: $n = 658$, 54.3%) and Super-old (≥ 90 years: $n = 156$, 12.9%) for analysis according to the definitions of the Japan Geriatrics Society and the Japan Geriatrics Society.

Descriptive characteristics differed significantly among the three groups. Hospital-onset (HO) bacteremia was most common in the Pre-old group. On the other hand, as the population aged, there was a trend toward an increase in healthcare-associated (HCA) bloodstream infections in the Super-old group, which was associated with an increase in nursing home residency (Figure 1A). Among underlying diseases, solid malignancies decreased from 36% in the Pre-old group to 11.5% in the

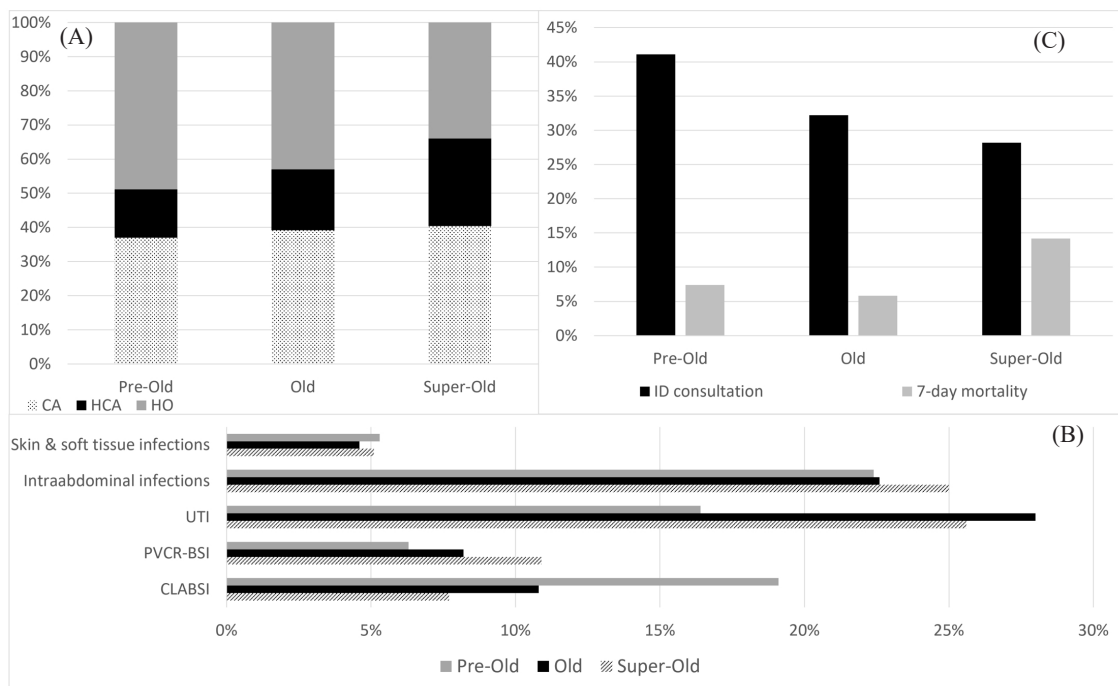


Figure 1. (A) Percentage of bloodstream infections among facilities by age at which the patient developed a bloodstream infection; (B) Causes of bloodstream infections by age; (C) ID consultation rates and 7-day mortality rates by age group for bloodstream infections. Abbreviation: CA, community-acquired; HCA, healthcare-associated; HO, hospital-onset; UTI, urinary tract infection; PVCRA-BSI, peripheral venous catheter-related bloodstream infection; CLABSI, Central-line associated blood stream infection; ID, infectious disease.

Super-old group, while congestive heart failure increased from 8.8% in the Pre-old group to 18.6% in the Super-old group.

The focus of bloodstream infections also differed significantly among the three groups (Figure 1B). Central-line associated bloodstream infections (CLABSIs) were most common in the Pre-old group, while peripheral venous catheter-related bloodstream infections (PVCRA-BSIs) were most common in the Super-old group, showing different trends even for the vascular device infection.

The 7-day fatality rate was highest in the Super-old group. Infectious disease (ID) consultations were most common in the Pre-old group (Figure 1C).

Independent predictors of mortality

Multivariate analysis was performed to determine which factors were independent predictors of mortality in the elderly population with bloodstream infections in the NCGM (7). The results showed that the Super-old group and hospital-onset each contributed to an increased risk of death (adjusted odds ratio [95% confidence interval]: 2.09 [1.13–3.88], 1.97 [1.20–3.33], respectively), whereas ID consultation was associated with a decreased risk of death (0.59 [0.35–0.99]).

The appropriate tailored management of bloodstream infections in elderly patients.

A review of more than 1,000 episodes of bloodstream infections in the older adults revealed some interesting points. Among the older adults, the underlying disease and the place of occurrence of bloodstream infections differed among different age groups, and there were also differences in the focus of infection of bloodstream infections: Super-old patients were more likely to live in nursing homes and to have urinary tract infections than Pre-old patients who were more likely to develop CLABSIs while hospitalized for treatment of malignancies.

The trend toward a higher risk of death from bloodstream infections due to hospital-onset or older adults was similar to other studies (5,8,9). Previous studies have suggested that infectious disease (ID) consultation for bloodstream infections improves the prognosis of bloodstream infections (5), however the effect of ID consultation in elderly patients with bloodstream infections has not been clarified. Our study suggests that early intervention with ID consultation may improve the outcome of bloodstream infections even in older adults by recommending changes of antimicrobial regimens, etc. Since the ID consultation rate was lower in the Super-old group than in the other groups, this group may be a particularly important target.

On the other hand, there are many opportunities to confirm the wishes of the patient and family regarding end-of-life care when the patient is admitted to the hospital following a bloodstream infection. The natural

course of advanced dementia, advanced malignancy, or other terminal illnesses themselves cannot be improved by antimicrobial agents. Therefore, when considering the treatment of patients at the end of life, it is important to set treatment goals and consider the place of antimicrobial therapy in this context (10). It is desirable to have more active discussions on the relationship between infectious diseases and end-of-life care in Japan in the future.

In conclusion, a study of a cohort of older adults with bloodstream infections in Japan showed that bloodstream infections in patients ≥ 65 years are not uniform. Tailored preventive and therapeutic approaches including ID consultation are needed to optimally manage BSI in the elderly patients.

Acknowledgements

The authors thank the clinical staff of the Disease Control and Prevention Center and Clinical Laboratory of NCGM for their help in completing this study

Funding: None.

Conflict of Interest: The authors have no conflicts of interest to disclose.

References

1. Ministry of Health, Labour and Welfare. Life expectancies at birth in some countries. <https://www.mhlw.go.jp/english/database/db-hw/lifetb22/> (accessed September 30, 2023).
2. Kontula KSK, Skogberg K, Ollgren J, Järvinen A, Lyytikäinen O. Population-based study of bloodstream infection incidence and mortality rates, Finland, 2004–2018. *Emerg Infect Dis.* 2021; 27:2560-2569.
3. Lee CC, Wang JL, Lee CH, Hung YP, Hong MY, Chang CM, Ko WC. Age-related trends in adults with community-onset bacteremia. *Antimicrob Agents Chemother.* 2017; 61:e01050-17.
4. Lee CC, Chen SY, Chang IJ, Chen SC, Wu SC. Comparison of clinical manifestations and outcome of community-acquired bloodstream infections among the oldest old, elderly, and adult patients. *Medicine (Baltim).* 2007; 86:138-144.
5. Hernandez C, Feh'er C, Soriano A, Marco F, Almela M, Cobos-Trigueros N, De La Calle C, Morata L, Mensa J, Martínez JA. Clinical characteristics and outcome of elderly patients with community-onset bacteremia. *J Infect.* 2015; 70:135-143.
6. Reunes S, Rombaut V, Vogelaers D, Brusselaers N, Lizy C, Cankurtaran M, Labeau S, Petrovic M, Blot S. Risk factors and mortality for nosocomial bloodstream infections in elderly patients. *Eur J Intern Med.* 2011; 22:e39-e44.
7. Nakamura K, Hayakawa K, Tsuzuki S, Ide S, Nomoto H, Nakamoto T, Yamada G, Yamamoto K, Ohmagari N. Clinical outcomes and epidemiological characteristics of bacteremia in the older Japanese population. *J Infect Chemother.* 2023; 29:971-977.
8. Crane SJ, Uslan DZ, Baddour LM. Bloodstream infections in a geriatric cohort: A population-based study. *Am J Med.* 2007; 120:1078-1083.
9. Laupland KB, Pasquill K, Steele L, Parfitt EC. Burden of bloodstream infection in older persons: A population-based study. *BMC Geriatr.* 2021; 21:31.
10. Baghban A, Juthani-Mehta M. Antimicrobial use at the end of life. *Infect Dis Clin North Am.* 2017; 31:639-647.

Received October 31, 2023; Revised December 12, 2023; Accepted December 22, 2023.

Released online in J-STAGE as advance publication January 2, 2024.

**Address correspondence to:*

Keiji Nakamura, Department of Infectious Diseases, Disease Control and Prevention Center, National Center for Global Health and Medicine, 1-21-1 Toyama, Shinjuku-ku, Tokyo 162-8655, Japan.

E-mail: nakamura.keiji.918@m.kyushu-u.ac.jp