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Original Study

Use of Point-of-Care Ultrasound in Home vs Non-home Medical Care Physicians in Japan



Toru Yamada MD, PhD^{a,*}, Takuma Kimura MD, PhD^b, Takahiro Shinohara MD^a,
Shuji Ouchi MD^a, Suguru Mabuchi MD, PhD^a, Takeshi Ishida MD^c,
Masayoshi Hashimoto MD, PhD^a

^a Department of General Medicine, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, Bunkyo-ku, Tokyo, Japan

^b Department of R&D Innovation for Home Care Medicine, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, Bunkyo-ku, Tokyo, Japan

^c Department of Community Medicine (Ibaraki), Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, Bunkyo-ku, Tokyo, Japan

A B S T R A C T

Keywords:

Point-of-care ultrasound
home medical care
physician
Japan

Objectives: To compare the use of point-of-care ultrasound between physicians providing home medical care and other physicians in Japan.

Design: A cross-sectional comparative study.

Setting and Participants: The participants were members of 3 societies related to home medical care in Japan.

Method: A web-based survey was conducted between April and June 2024 to assess use of point-of-care ultrasound, physicians' training history and needs in this technique, ultrasound machine availability and types, and barriers and facilitators for wider adoption.

Results: Overall, 692 physicians (461 providing home medical care) participated. There were more point-of-care ultrasound users among those providing home medical care (75.9% vs 67.1%; $P = .014$). There was no significant difference in training history (34.3% vs 36.4%; $P = .587$), but training needs were significantly greater among home medical care providers (80.9% vs 66.7%; $P < .001$). This group also had better access to ultrasound machines (53.6% vs 35.5%; $P < .001$), with higher personal ownership rates and handheld device usage (29.1% vs 4.8%, $P < .001$; 59.7% vs 13.2%, $P < .001$). The main barrier was insufficient training opportunities, especially for home care providers (61.6% vs 51.5%; $P = .011$), followed by inadequate training environments (46.4% vs 32.9%; $P = .001$), challenges in image acquisition (59.0% vs 37.2%; $P < .001$), and interpretation skills (51.4% vs 32.9%; $P < .001$). Facilitators included improved access to ultrasound machines and increased training opportunities and available mentors, with home care providers significantly emphasizing training opportunities (71.2% vs 62.3%; $P = .019$).

Conclusions and Implications: Home medical care providers were more likely to use point-of-care ultrasound and have better access to machines; however, they faced barriers related to skills and training opportunities. As handheld devices become prevalent, systematic training in this technique is becoming essential.

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This research did not receive any funding from agencies in the public, commercial, or not-for-profit sectors.

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

* Address correspondence to Toru Yamada, MD, PhD, Department of General Medicine, Graduate School of Medical and Dental Sciences, Institute of Science Tokyo, 1-5-45 Yushima, Bunkyo-ku, Tokyo 113-8510, Japan.

E-mail address: toru.y.fmed@tmd.ac.jp (T. Yamada).

<https://doi.org/10.1016/j.jamda.2025.105536>

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Point-of-care ultrasound (POCUS) is a technique of ultrasound examination designed with a specific purpose in mind. It has a limited scope of items to be evaluated, reducing the difficulty of mastering the technique. It also has clear diagnostic criteria to ensure quality assurance.¹ It is also common for a single practitioner to evaluate multiple organs, such as the heart, lungs, abdomen, and lower limb vessels. POCUS is becoming increasingly widespread not only in emergency and critical care settings but also in general wards and

primary care.²⁻⁶ POCUS has been shown to improve access to imaging examinations for patients who have difficulty being transported for diagnostic imaging.^{7,8}

Patients receiving home medical care are predominantly older, and often have mobility difficulties due to physical, economic, or social factors.^{8,9} When they develop symptoms such as fever or abdominal pain at home, their limited ability to visit medical institutions as outpatients often restricts the resources available for diagnostic tests and treatment. Studies have therefore reported that home medical care patients tend to experience worse outcomes than other patients, with higher rates of emergency department visits and hospitalizations.^{8,10,11} Under these circumstances, especially when advanced imaging techniques such as computed tomography are unavailable and medical resources are limited, POCUS can be a valuable diagnostic tool, especially because it enables whole-body evaluation.^{7,12}

Several studies have reported barriers and facilitators to the implementation of POCUS across different settings, such as primary care, hospital medicine, and critical care. A common major barrier identified in all these settings is the lack of opportunities for POCUS training.¹³⁻¹⁶ Limited access to ultrasound equipment is also a significant barrier, but not one of the top issues in critical care settings.⁶ This is probably because ultrasound equipment is often permanently installed in settings such as intensive care units. In recent years, portable ultrasound devices have become available, which are more advanced, compact, and affordable than traditional models. Cost remains a separate issue, but these advancements are creating an environment in which ultrasound examinations can increasingly be performed in nonhospital settings, such as patients' homes and long-term care facilities.

There are few reports on the usage, barriers, and facilitators of POCUS in home medical care settings. A survey among physicians working in sub-acute, long-term, and home-based care settings within the US Department of Veterans Affairs health system found that 60% of clinicians had no experience with POCUS, although 76% considered it useful. More than 50% identified a lack of training and insufficient equipment as major barriers to using this technology.⁸

The number of people receiving home medical care in Japan has been increasing year by year, and by 2022, exceeded 800,000 visits per month.¹⁷ Approximately 90% of patients receiving home medical care in Japan are 75 years old or older. As the population continues to age, it seems likely that home medical care will become an increasingly significant area of health care. Japan's aging rate, at 29.3%, is the highest in the world.¹⁸

In total, 20% of clinics and 30% of hospitals provide home medical care. Unlike some other countries, where nurse practitioners or other non-physician health care providers often play a central role in home medical care, one distinctive feature of Japan's system is that physicians are the primary providers.^{17,19} As it is still uncommon for non-physician professionals to perform POCUS, Japan, where physicians primarily provide home medical care, may find it easier for POCUS to gain traction as a more essential skill. Clarifying the implementation status, barriers, and facilitators of POCUS in Japan could therefore provide valuable insights for other countries that also have an aging population. Home medical care physicians typically conduct regular home visits for medical examinations and prescriptions. They also frequently make unscheduled visits in response to a patient's worsening condition. In Japan, there is no strictly defined primary care provider system, allowing patients to freely choose and visit the clinic of their preference. The same applies to home medical care, as patients are not subject to institutional restrictions based on their residential area or other regional factors when consulting physicians or clinics. Typical scenarios in which home medical care is initiated include when outpatient visits become difficult due to decline in activities of daily living or when a patient is discharged from the hospital for close management of malignant disease or severe heart failure. Patients can

select a nearby clinic from which they wish to receive home medical care, and if the clinic is able to accommodate their request, it provides the necessary home medical care services. In this context, POCUS may emerge as an essential skill. Clarifying the implementation status, barriers, and facilitators of POCUS in Japan could therefore provide valuable insights for other countries that also have an aging population.

In this study, we conducted a web-based survey targeting 3 major academic societies in the field of primary care whose physician members may provide home medical care. The survey aimed to examine the implementation status of POCUS and barriers and facilitators to its adoption.

Methods

Participants and Setting

In Japan, no restrictions based on medical specialties or specialist certification systems are placed on physicians wishing to provide home medical care. Any physician can provide this care as long as other requirements, such as those related to medical facilities, are met. Japan has a universal health insurance system, and home medical care is covered by medical insurance if the necessary criteria are fulfilled.¹⁷ In this study, we targeted 3 major academic societies in the field of primary care: the Japan Primary Care Association, the Japanese Association for Home Care Medicine, and the Japanese Society of Hospital General Medicine. A web-based survey was conducted among members listed on the mailing lists of these societies between April and June 2024. These societies include non-physician professionals, but we only included responses from physicians who consented to participate in the study. Responses from other health care professionals, duplicate submissions, and incomplete surveys were excluded.

Survey Questionnaire

An anonymous, voluntary web-based survey was distributed via email. It first asked for background information such as age, gender, years since obtaining a medical license, type of medical facility, and department affiliation. Participants were then asked about their usual field of practice (home medical care or other fields), their use of POCUS in their routine clinical practice, the POCUS applications they believe should be mastered, their POCUS training experience and training needs, and details of the setup and their regular use of any ultrasound devices. In this study, ultrasound machines the size of tablets or smartphones were defined as handheld devices. The survey also investigated barriers to and facilitators of POCUS implementation. A list of the survey questions is provided in [Supplementary Table 1](#). These questions were developed based on previous studies on POCUS.^{3,4,6} In Japan, there is no standardized format for POCUS training courses yet, and individual POCUS training courses are conducted independently by various academic societies and educational institutions. Therefore, in this study, we did not specify the format of POCUS training but instead included a question asking whether participants had received any form of POCUS training. For analysis, participants were divided into 2 groups, those who provided home medical care and other physicians, and the 2 groups were compared.

Statistical Analysis

Comparisons of participant characteristics, POCUS use, ultrasound machine availability, and barriers and facilitators between the 2 groups used the Wilcoxon rank-sum test for continuous variables and the χ^2 test for categorical variables. Statistical significance was defined

as a P value of $<.05$. All analysis used STATA software (version 17.0; StataCorp LLC).

Ethics Approval and Consent to Participate

This study adhered to the guidelines of the 2013 Declaration of Helsinki and was approved by the institutional review board of Institute of Science Tokyo (Approval Number: C2023-057). All participants received a written explanation on the web and provided their consent. No consent for publication was required.

Results

Participants

A total of 785 responses were received across the 3 academic societies. After excluding respondents who did not consent to participate, non-physicians, duplicate submissions, and data entry errors, 692 participants were included in the analysis (461 who provided home medical care and 231 who did not) (Table 1). No significant differences were observed between the 2 groups in terms of age, gender, or years since graduation. Of the home medical care providers, 72.2% worked in clinics and 64.9% were affiliated with family medicine. In contrast, 92% of those who did not provide home medical care worked in hospitals, with 60.2% affiliated to hospital medicine (the largest category). Overall, 85.3% of home medical care providers and 98.3% of other physicians provided outpatient care. The proportion of other physicians engaged in outpatient care, inpatient care, and critical care was statistically significantly higher in all categories (all $P < .001$).

The Use of POCUS in Daily Clinical Practice and Training Status

A significantly higher proportion of home medical care providers than other physicians used POCUS in their daily practice (75.9% vs 67.1%; $P = .014$). By organ system, the performance rate was higher for abdominal POCUS among home medical care providers (74.0% vs 64.5%; $P = .01$), whereas procedural POCUS was more frequently performed by other physicians (42.7% vs 53.7%; $P = .006$) (Figure 1).

Overall, 35.0% of participants had received training of some kind in using POCUS, and there was no significant difference between the groups (34.3% vs 36.4%; $P = .587$) (Figure 2A). However, the demand for future POCUS training was significantly higher among home medical care providers both overall (80.9% vs 66.7%; $P < .001$) and across all individual categories except for procedural POCUS, in which the proportions wanting training was very similar (Figure 2B).

Availability of Ultrasound Machines

A significantly higher proportion of home medical care providers than other physicians reported having sufficient access to ultrasound devices (53.6% vs 35.5%; $P < .001$). Home medical care providers were also more likely to have exclusive access to ultrasound devices (29.1% vs 4.8%; $P < .001$). Overall, 59.7% of home medical care providers used handheld devices, compared with only 13.2% of other physicians ($P < .001$). Both groups expressed a strong preference for handheld devices for POCUS, but home medical care providers showed a significantly greater preference (87.0% vs 72.3%; $P < .001$) (Figure 3).

Barriers to and Facilitators of POCUS Use

The top barrier in both groups was the lack of training opportunities; however, this was significantly more prevalent among home medical care providers. This group was also more likely to perceive challenges in the training environment (46.4% vs 32.9%; $P = .001$) and report greater difficulties with image acquisition skills (59.0% vs 37.2%; $P < .001$) and image interpretation skills (51.4% vs 32.9%; $P < .001$). They were also less confident performing POCUS independently (31.7% vs 24.2%; $P = .043$). Other physicians were significantly more likely to cite a lack of ultrasound machines as a barrier (34.3% vs 43.3%; $P = .021$) (Figure 4A).

The top 3 facilitators were good access to ultrasound machines, increased training opportunities, and the presence of accessible mentors. Notably, home medical care providers were significantly more likely to emphasize the importance of increased training opportunities (71.2% vs 62.3%; $P = .019$). They also placed greater importance on the ability to bill for POCUS services (50.1% vs 40.7%; $P = .019$) (Figure 4B).

Table 1
Participant Characteristics

	Total, n = 692	Home Medical Care Providers, n = 461	Other Physicians, n = 231	P Value
Male, n (%)	547 (79.1)	368 (79.8)	179 (77.5)	.637
Age, y, mean (SD)	48.7 (11.0)	49.3 (10.9)	47.6 (11.3)	.099
Time since graduating, y	23.0 (11.4)	23.4 (11.2)	22.2 (11.6)	.207
Institution, n (%)				
Clinic	339 (49.0)	333 (72.2)	16 (6.9)	<.001
Community hospital	264 (38.2)	118 (25.6)	146 (63.2)	<.001
University hospital	86 (12.4)	19 (4.1)	67 (29.0)	<.001
Other	3 (0.4)	1 (0.2)	2 (0.9)	
Department, n (%) [*]				
Family medicine	318 (46.0)	299 (64.9)	19 (8.2)	<.001
Hospital medicine	225 (32.5)	86 (18.7)	139 (60.2)	<.001
Internal medicine subspecialties	76 (11.0)	38 (8.2)	38 (16.5)	.001
Emergency or critical care medicine	17 (2.5)	3 (0.7)	14 (6.1)	.001
Surgical specialties	42 (6.1)	26 (5.6)	16 (6.9)	.504
Others	14 (2.0)	9 (2.0)	5 (2.2)	
Clinical field, n (%) [†]				
Outpatient care	620 (89.6)	393 (85.3)	227 (98.3)	<.001
Inpatient care	285 (41.2)	119 (25.8)	166 (71.9)	<.001
Critical care	96 (13.9)	31 (6.7)	65 (28.1)	<.001
Home medical care	461 (66.6)	461 (100.0)	0 (0.0)	—

^{*}Department: primary department in which the physician works.

[†]Multiple answers allowed.

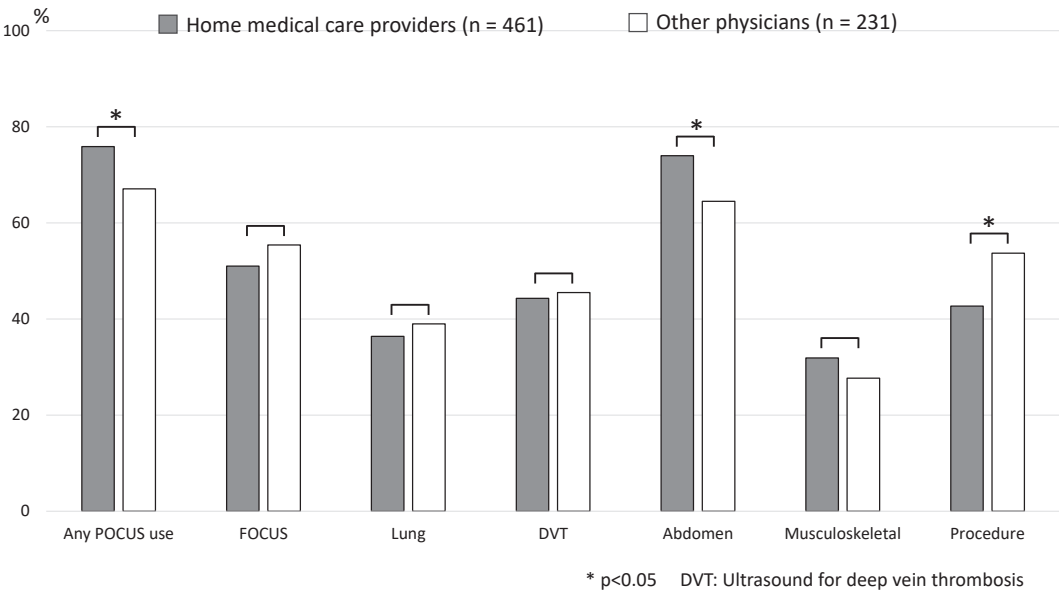


Fig. 1. POCUS use in daily clinical practice. FOCUS, focused cardiac ultrasound. *P < .05.

Discussion

This study compared the POCUS-related practices and circumstances of 692 physicians working in the field of primary care,

including 461 who provided home medical care and 231 who did not. Physicians providing home medical care were more likely to use POCUS in their clinical practice. There was no significant difference in training experience between the 2 groups, but home medical care

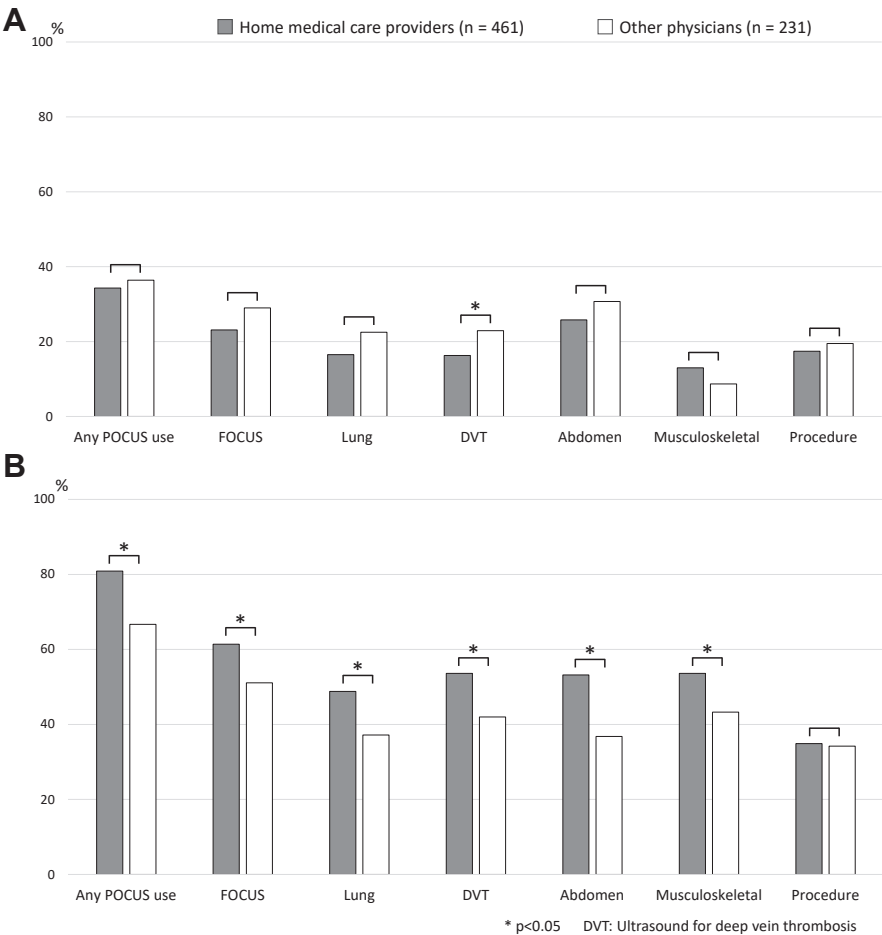


Fig. 2. Training in types of POCUS. (A) Types in which physicians had received training. (B) Types in which physicians wanted training. FOCUS, focused cardiac ultrasound. *P < .05.

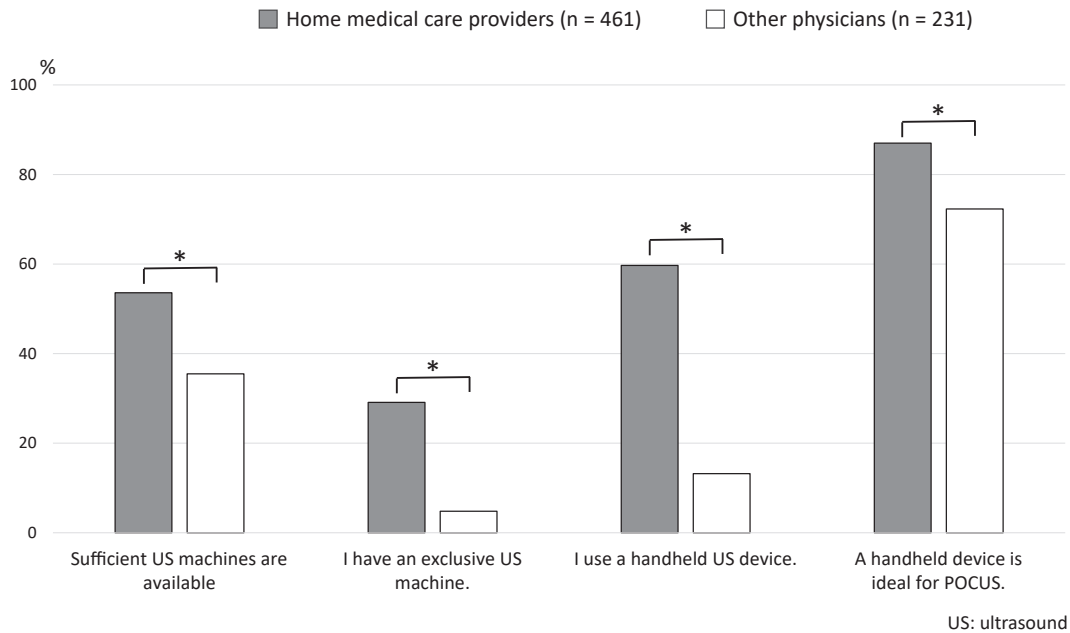


Fig. 3. Access to and use of ultrasound machines. * $P < .05$.

providers had higher training needs across all categories except for procedural POCUS. They also had better access to ultrasound machines and expressed a stronger preference for handheld devices. However, they reported feeling significantly less confident in their POCUS skills, particularly in image acquisition and interpretation. Other physicians reported facing significantly greater barriers to accessing ultrasound machines. The top facilitators identified were improved access to ultrasound machines, increased training opportunities, and the availability of mentors. Home medical care providers expressed a greater desire for increased training opportunities than other physicians.

The total number of members registered on the mailing lists at the time this survey was conducted was 13,000. The breakdown for each society was as follows: 7257 members in the Japan Primary Care Association, 3463 members in the Japanese Association for Home Care Medicine, and 2280 members in the Japanese Society of Hospital General Medicine. These societies include non-physician professions, such as nurses, among their members, and many individuals are members of not just one but multiple of these 3 academic societies. For this survey, it was clearly stated that if participants received the survey from more than 1 society, they should respond only once. Duplicate responses were excluded. However, information on the number of physicians excluding other professions in each society and the number of individuals belonging to multiple societies was not available, making the exact response rate for physicians unclear. That said, the response rate for physicians can be assumed to be higher than 5.3%, which is calculated by dividing the 692 valid responses from physicians by the total membership of 13,000, which includes non-physician members. Overall, 76% of home medical care providers in this study used POCUS, a significantly higher proportion than among other physicians. In home medical care, where medical resources are limited, access to imaging technologies such as computed tomography is poorer than in hospitals. Barriers such as transportation challenges and financial burdens further reduce outpatient visit rates among home medical care patients. They may therefore need to visit emergency departments and be admitted to hospital more often than other patients, resulting in higher overall health care costs.^{10,11} In recent years, more affordable and advanced handheld ultrasound devices have become available, creating a more favorable

environment for the adoption of POCUS in home medical care. The use of POCUS in this situation offers various benefits, including improved diagnostic accuracy, reduced health care costs, and enhanced access to imaging examinations, making it a very popular tool.^{7,8} We found that a large proportion of home medical care physicians in Japan used POCUS, more than has previously been reported among physicians involved in home medical or geriatric medicine in the United States.^{8,15} One possible factor contributing to the high POCUS use among home medical care providers in Japan may be that home medical care is generally provided by physicians there, unlike other countries where nurse practitioners or other health care professionals are more likely to be involved.¹⁹

The ultrasound market in Japan is substantial, around USD 474.2 million in 2024 and projected to grow to USD 637.5 million by 2028.²⁰ Japan is one of the largest markets in the world, but limited access to ultrasound devices remains a major barrier to the widespread adoption of POCUS.¹³ We found that home medical care providers had better access to ultrasound machines than other physicians, with a significantly higher proportion having devices exclusively available for their use (29.1% vs 4.8%; $P < .001$) and more use of handheld devices (59.7% vs 13.2%; $P < .001$). Lack of ultrasound machines was the sixth most common barrier to POCUS use for home medical care providers, but the third most common for other physicians. These findings suggest that limited access to ultrasound machines remains a major barrier to the widespread adoption of POCUS across Japan,¹³ but there are significant regional differences in the distribution of these devices. Handheld devices appear to be gaining some traction in home medical care. Although 72% of home medical care physicians work in clinics, these clinics often lack imaging equipment such as computed tomography scanners. As a result, ultrasound devices may be more commonly installed as an alternative imaging tool. Furthermore, the rise in home medical care may have prompted a shift from traditional stationary ultrasound machines to handheld devices. However, further investigation is required to validate this hypothesis.

Both home medical care providers and other physicians had low POCUS training rates, around the 30% mark, with no significant difference between the groups. However, home medical care providers were significantly more likely to express a greater desire for POCUS

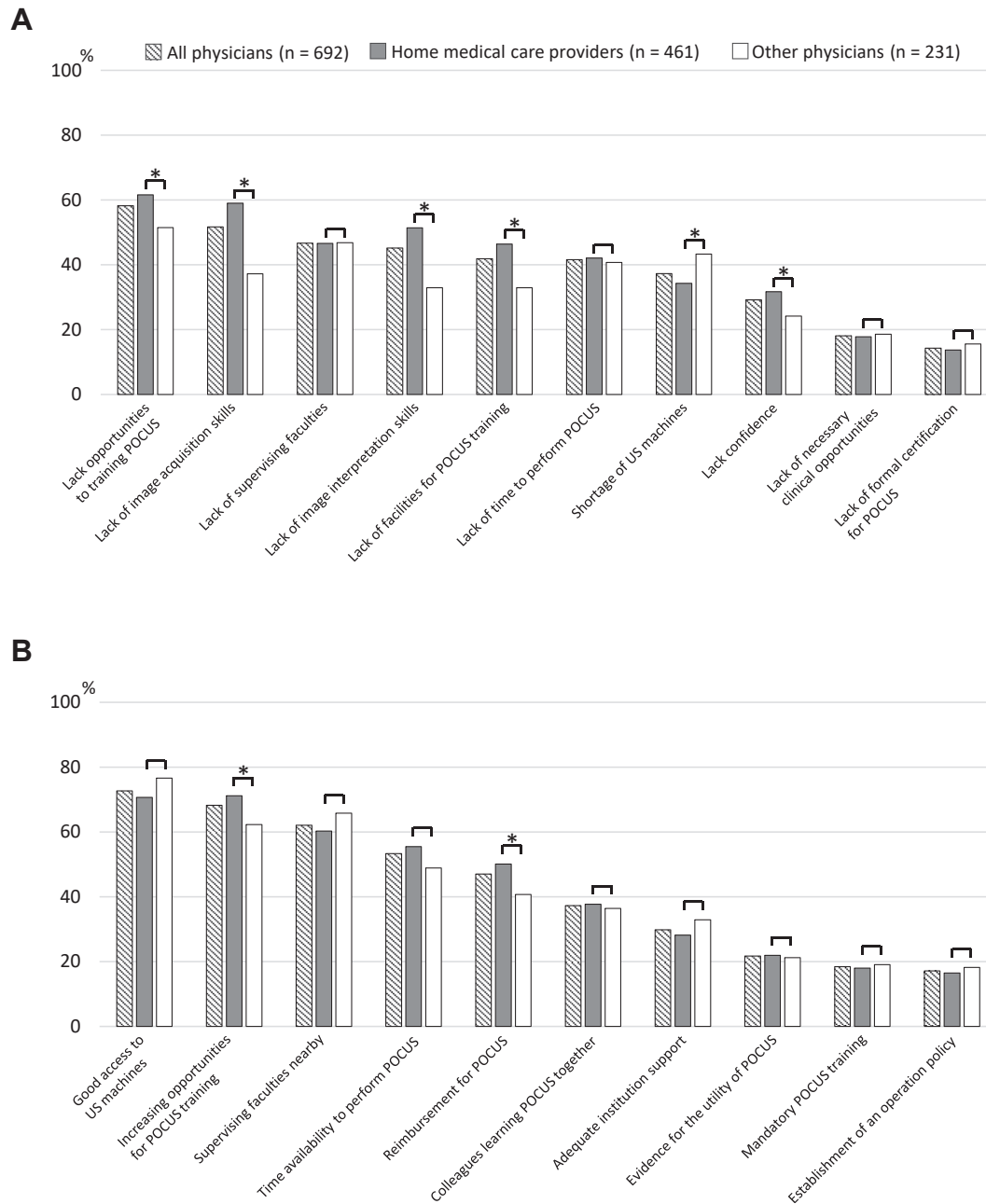


Fig. 4. The top 10 (A) barriers to and (B) facilitators of the use of POCUS. * $P < .05$. US, ultrasound.

training across all categories except for procedures. The demand for POCUS is growing across various fields, but our survey highlighted the particularly high demand for POCUS among home medical care providers.^{4,6,8,13,15,16,21} This is probably because of the barriers in home medical care to accessing other imaging technologies such as computed tomography and therefore use of POCUS as an alternative. This high demand for POCUS among home medical care physicians is consistent with previous studies.⁸

Home medical care physicians were significantly more likely than other physicians to perceive that they lacked skills in using POCUS (such as image acquisition and interpretation skills) and to report a lack of confidence as a barrier. They also reported significantly greater challenges with insufficient training opportunities and environments. The lack of training opportunities was the top barrier for both groups, highlighting a common challenge for the widespread adoption of

POCUS both in Japan and elsewhere.^{2,5,6,14-16} Standardized POCUS courses for physicians are available in Japan and can be attended by all physicians.^{13,22} Our results suggest that home medical care providers may encounter situations requiring POCUS more frequently in their daily practice and have better access to ultrasound machines, making their lack of POCUS skills more apparent and increasing their awareness of the need for training. Many home medical care physicians in Japan work as self-employed practitioners or in self-owned small groups. Because of factors such as a lack of backup staff, clinic physicians may have fewer opportunities to participate in POCUS training compared with hospital-based physicians. However, further investigation is needed to better understand this context. To increase opportunities for POCUS training, nationwide initiatives may be necessary. These could include the development of standardized national POCUS guidelines, the establishment of POCUS certification

programs, and the organization of collaborative POCUS training courses by various academic societies. In addition, the development of online educational content for image interpretation and acquisition techniques would also be beneficial, enabling learning even for those unable to attend in-person training courses.

There were no significant differences between the 2 groups in terms of gender, age, or years since obtaining a medical license. Overall, 65% of home medical care providers were family medicine physicians (compared with 8.2% among other physicians), and the proportions of physicians in hospital medicine, internal medicine subspecialties, emergency medicine, and critical care medicine were all significantly higher among other physicians. Other reports have pointed out that the prevalence of POCUS training is low in family medicine; however, we found no significant differences in POCUS training history between the 2 groups.^{23,24}

In the future, with the global increase in the aging population and rising health care costs becoming pressing challenges, home medical care could become a critical field in health care. Access to imaging modalities is one of the key factors in home medical care, and in this regard, POCUS has the potential to serve as a core tool. Japan is one of the largest implementers of home medical care worldwide, and the results of this study could serve as a benchmark for those engaging in home medical care moving forward. However, globally, home medical care is often led by non-physician professionals such as nurses, unlike in Japan, where physicians typically take the lead. Given that POCUS has shown potential for adoption by non-physician professionals, future efforts should not only focus on establishing POCUS training environments but also evaluate its utility when used by non-physician professionals.²⁵

This study had several limitations. The reported POCUS use rates among respondents were approximately 70% in both groups, which were higher than those in other reports.^{8,15} This was a voluntary and anonymous survey, and it is therefore possible that respondents were more likely to be those with a high interest in POCUS or who use it frequently in their practice. The response rate was relatively low. Therefore, the overall frequency of POCUS use, training rates, and opportunities, as well as the prevalence of ultrasound machines, may be somewhat lower than suggested by our results, and caution is required when applying these findings to the general population.

Conclusions and Implications

Home medical care providers had a higher demand for POCUS than other physicians, and better access to ultrasound machines. However, skill deficiencies and limited training opportunities are significant barriers to the use of this technology. With the growing prevalence of handheld devices, systematic POCUS training is becoming increasingly important.

Disclosure

T.K. has a competing interest related to C.U.C. Inc., Japan. All other authors declare no competing interests.

Acknowledgments

The authors are grateful to Nilam J. Soni and Taro Minami for their efforts in providing POCUS education to the authors. We also thank Melissa Leffler, MBA, from Edanz (<https://jp.edanz.com/ac>) for editing a draft of this manuscript.

The sponsor had no role in the design, methods, subject recruitment, data collections, analysis, and preparation of the paper.

Supplementary Data

Supplementary data related to this article can be found online at <https://doi.org/10.1016/j.jamda.2025.105536>.

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