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Integrating medical Mobility as a Service (MaaS) with the doctor-to-patient with nurse (D to P with N) telemedicine model and pharmacist-supported medication services: Towards mobility-integrated care for Japan's super-aged population

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Abstract: Japan has a super-aged society, where the population age 65 years or older accounted for 29.4% of the total population as of January 2026, and population aging, depopulation, and persistent physician shortages have increasingly constrained access to healthcare. These challenges are particularly evident in rural and remote areas, where mobility itself constitutes a major barrier to care. Although home medical care and telemedicine have been promoted as policy responses, each has inherent limitations when implemented independently. Against this backdrop, the practical integration of Mobility as a Service (MaaS) with the doctor-to-patient with nurse (D to P with N) telemedicine model has emerged as a policy-related approach to delivering multidisciplinary care under conditions of limited medical and transportation resources. In several municipalities in Japan, including early implementation sites such as the City of Ina, medical MaaS–based mobile healthcare initiatives have been implemented to reduce travel burdens while improving accessibility for patients with mobility challenges. From an implementation perspective, these initiatives demonstrate a growing convergence between medical MaaS and the D to P with N telemedicine model. Physicians provide remote consultations while nurses offer on-site clinical support, with telemedicine further linked to pharmacists' online medication counseling and medication delivery services. In practice, this integrated approach, which includes routine consultations, renewing prescriptions, and basic clinical monitoring, is primarily used for the stable management of chronic diseases and is mainly targeted at older patients receiving home-based care. By covering the care continuum from consultation to medication support, this approach aims to reduce patients' travel burden while ensuring the continuity of multidisciplinary care. Despite its potential, key challenges remain, including operational costs, data governance, and emergency response requirements. Overall, integrating medical MaaS with the D to P with N telemedicine model and pharmacist-supported medication delivery represents a significant step towards mobility-integrated care and may serve as a complementary component of community-based integrated care systems.

***Keywords*:** physician shortage, aging society, telemedicine, medical MaaS, health policy, Japan

1. Introduction

As of January 2026, individuals age 65 years or older accounted for 29.4% of Japan's total population, marking increased aging of the population (*1*). The extent and impact of this demographic shift vary substantially across regions (*2*). In remote islands and mountainous areas, depopulation has progressed rapidly: approximately 63.2% of the national land area and 51.5% of municipalities are classified as depopulated; these regions are home to only 9.3% of the national population, nearly 40% of whom are age 65 years or older (*2*). In such settings, declining public transportation services—driven by lower ridership and Labour shortages—have made private automobiles the primary means of accessing medical care (*3,4*). Recent traffic safety policies encouraging older adults to voluntarily surrender their driver's licenses have further intensified mobility constraints among older residents in depopulated areas (*5*).

At the same time, Japan faces chronic physician shortages, resulting in significant regional disparities in the distribution of medical care providers (*6*). According to OECD Health at a Glance 2025, Japan has 2.6

physicians per 1,000 population, well below the OECD average of 3.9 physicians (*7,8*). Despite policy efforts including government scholarships and programs of the Ministry of Health, Labour, and Welfare to increase physicians in certain regions, regional disparities in physicians remain acute (*6,8*). These challenges pose significant obstacles to the effective implementation of Japan's comprehensive community-based integrated care system, which seeks to enable older adults to continue living in familiar surroundings through the coordinated provision of medical, nursing, preventive, housing, and social services (*9*). Although community-based integrated care centers have been established nationwide (*9,10*), rural and depopulated regions continue to face structural barriers to healthcare access, and particularly where mobility limitations and medical resource constraints intersect (*4*).

In recent years, home healthcare and telemedicine guidelines have been revised to address these challenges. Moreover, in 2019, the Ministry of Economy, Trade and Industry (METI) and the Ministry of Land, Infrastructure, Transport, and Tourism (MLIT) jointly launched the Smart Mobility Challenge (*11*). Based on the Mobility as a Service (MaaS) concept, this initiative aims to solve mobility issues and revitalize local economies by integrating and utilizing multiple transportation services. As part of this effort, medical MaaS—designed to deliver healthcare to patients unable to be seen at hospitals—began pilot testing in select municipalities in 2020 and entered full operation in 2021 (*12*). As of October 2024, MONET Technologies' vehicles have been deployed in 25 municipalities, including those currently in the preparatory phase (*13*). Following MONET Technologies, TOYOTA AUTO BODY launched its service and had delivered vehicles to four municipalities by March 2024 (*14*). Growing attention has been directed toward the practical integration of medical MaaS with the doctor-to-patient with nurse (D to P with N) telemedicine model as a complementary approach to community-based integrated care.

Rather than proposing a new technology, this Policy Forum article focuses on how existing healthcare and mobility service components—specifically medical MaaS, the D to P with N telemedicine model, and pharmacist-supported medication services—are being operationally aligned in practice. Drawing on emerging medical MaaS initiatives in Japan, it examines the relevant policies, implementation challenges, and their potential role in overcoming barriers to healthcare access in super-aged societies.

2. Home healthcare and telemedicine, MaaS, and medical MaaS

2.1. Home healthcare and telemedicine

To address both patient transportation difficulties and physician shortages, the Ministry of Health, Labour, and Welfare (MHLW) has advanced legal frameworks and developed infrastructure for home healthcare such as home visits by physicians and telemedicine (*15-19*). Telemedicine in particular was promoted during the COVID-19 pandemic as an infection control measure (*17*). Home visits have long been a part of Japanese medical practice (*18*), but amendment of the Medical Service Act in 1992 officially recognized the home as a legitimate site of medical care (*18,19*). Telemedicine guidelines formulated in 2018 clarified the requirements for conducting online consultations and demonstrated telemedicine's potential as a complementary tool for home healthcare (*16*). However, home visits remain particularly vulnerable to physician shortages, primarily due to the significant travel time and burden on physicians. In contrast, telemedicine faces challenges due to dependence on patients' access to information and communication devices and their skill at operating those devices, as well as limitations in clinical information that physicians can obtain remotely (*16,20*).

2.2. MaaS

The "Smart Mobility Challenge", a project jointly launched by the METI and the MLIT in 2019, is founded on the concept of MaaS, an integrated mobility solution that encompasses route planning and payment systems. The initiative draws inspiration from Finland's successful implementation of MaaS in 2016 (*21*). However, Japan's Smart Mobility Challenge specifically aims to maintain and enhance local mobility services while simultaneously addressing transportation challenges and revitalizing regional economies (*11*). Examples include data-driven improvements to regional transport services based on ride histories and shared mobility services that coordinate vehicle dispatch based on appointments made by residents (*11*).

2.3. Medical MaaS

Medical MaaS was introduced in 2021 as a solution to address both the physician shortage in rural areas and the mobility challenges faced by patients, particularly those living in rural communities (*12*). The patients served are those with chronic illnesses who are unable to regularly be seen at hospitals and who are in stable condition, with implementation reports indicating that most are older patients (*12,22*).

For vehicle equipment and medical devices, all systems are designed to support remote consultations and basic clinical assessments. Depending on operational needs, vehicles can be equipped with examination beds, accessories for the disabled, digital communication devices, and various portable diagnostic equipment (*22-26*) (Table 1).

The system uses a D to P with N telemedicine model,

Table 1. Differences in vehicle equipment and installed medical devices by brand

Items	MONET Technologies	TOYOTA AUTO BODY
Standard equipment	Desk	Desk
	Examination bed	Examination bed
	Wheelchair lift	High-definition monitor
	Handrail	Handrail
	Step	Step
Optional equipment	Telemedicine system	Telemedicine system
	Personal computer	Personal computer
	Webcam	Zoom-capable camera
	Speakers	Speakers
	Microphone	Microphone
	Sink	Printer
		Wheelchair lift
Optional medical device	Portable ultrasound device	Portable ultrasound device
	Electronic stethoscope	Electronic stethoscope
	Upper arm blood pressure monitor	Upper arm blood pressure monitor
	Non-contact thermometer	Non-contact thermometer
	Pulse oximeter	Pulse oximeter
	Automated external defibrillator (AED)	Automated external defibrillator (AED)
	Portable blood glucose analyzer	Dermatoscope
	Centrifuge-based blood analyzer	Ultrasound bone density analyzer
	Portable ECG monitor	Portable ECG monitor
	ECG recording/analysis system	
	Spot-check monitor	
	Electronic auscultation device	
	Portable X-ray machine	

Note: This table presents examples of in-vehicle equipment used in medical MaaS services implemented across various regions in Japan. "Standard" and "optional" classifications reflect manufacturer-specific configurations. *Data source: Ref. (22-26)*

where nurses ride in the vehicle to see patients and to assist with examinations while physicians engage in telemedicine (*12*). Inside the vehicle, physicians engage in telemedicine while nurses perform delegated medical procedures such as intravenous infusions and injections under physician supervision. Additionally, when new symptoms that require additional testing develop, nurses can perform blood or urine tests (*27*). Notably, interpreting test results and making final treatment decisions must comply with relevant notification guidelines and requirements, with face-to-face consultations required as needed (*27*).

Since the initial deployment began, as of October 2024 MONET Technologies' vehicles had been deployed in 25 municipalities, including those currently in preparation (*13*), while TOYOTA AUTO BODY had delivered vehicles to four municipalities by March 2024 (*14*). Moreover, new body manufacturers have continued to enter the market (*28*), Some universities with medical schools are exploring operational models tailored to regional characteristics by implementing healthcare MaaS systems (*25,29,30*). Within this context, group-based online clinics are also being utilized as a mobile health screening unit or temporary medical facility in disaster-affected areas or other locations where hospital functions are limited (*23-25*).

Market research projected Japan's medical MaaS domestic market to be worth 1.76 billion yen as of 2025, with expected growth reaching 172 billion yen by 2035 (*31*).

In the next section, we will examine the benefits and challenges of this system within the regional care system in the City of Ina, the first municipality to adopt it.

3. An integrated approach to coordinating physician–nurse–pharmacist care based on medical MaaS

The City of Ina is a municipality where 32% of the population was age 65 or older in 2020, when the medical MaaS pilot program began (*32*). As of 2020, it had 151 physicians, corresponding to 228 per 100,000 population, which is below Japan's average (*33*). In addition, most hospitals are located in the city center, but many older people lived in mountainous outlying areas, making transportation costs for both patient visits and home healthcare increasingly problematic each year (*12,20,22*) (Figure 1).

The medical MaaS pilot program began when the City of Ina proposed the initiative to MONET Technologies, which had been operating a medical MaaS service (*12*). The pilot project began in 2020, with full-scale operations commencing in fiscal year 2021 (*12*). As of March 2026, 14 medical facilities in the City of Ina were using this service (*12*). Medical facilities apply

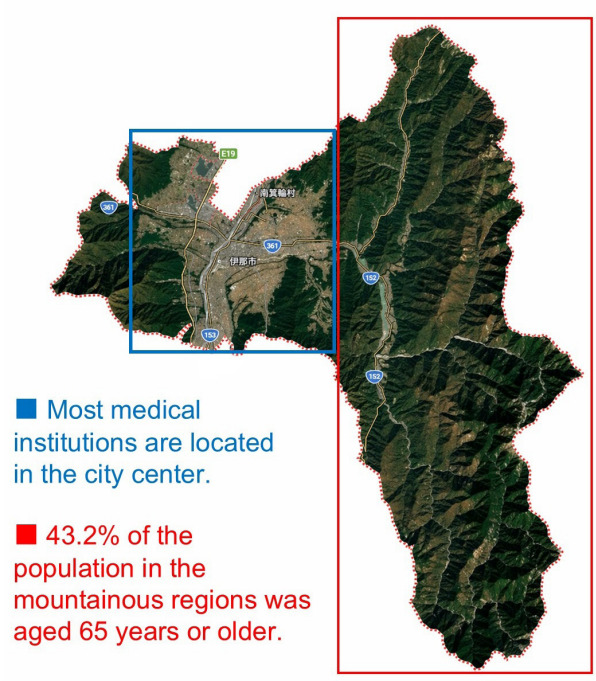

Figure 1. Satellite view of the City of Ina, Nagano Prefecture. The map shows the contrast between the central urban area and the surrounding mountainous regions. As of October 2024, 43.2% of the population in the mountainous regions was age 65 years or older, while most medical facilities are located in the city center. *Data source: Ref. (18) Map data ©2026 Google.*

to use the city-owned Medical MaaS vehicle, which is then dispatched to patients who have difficulty reaching healthcare facilities (*12*). By delivering medical care to patients' homes, this system supports the community-based integrated care system, which aims to enable older people to continue living in familiar surroundings (*12*).

The core practice of this model lies in the operational framework of the D to P with N telemedicine model, in which nurses perform examinations and provide medical assistance inside a vehicle on the patient's premises, while physicians deliver care through remote consultations. In rural healthcare settings and in recognition of the effectiveness of telemedicine with nurse support on site, the 2024 revision of medical fees introduced a new reimbursement item: a Nurse-assisted Telemedicine Add-on (50 points, equivalent to 500 yen) for telemedicine using D to P with N systems at remote clinics and core rural medical facilities (*34*). Further revisions in 2026 created a new evaluation category—a Nurse Support Fee for Visiting Telemedicine (265 points, equivalent to 2,650 yen)—along with newly defined rules for calculating fees for nurses performing tests, injections, and procedures (*35*). These expanded reimbursement measures provide institutional support for telemedicine incorporating on-site nursing assistance and could further support the expansion of multidisciplinary collaboration in future medical MaaS applications.

Moreover, the model includes multiple healthcare personnel to alleviate the burden on both healthcare personnel and patients. One key initiative involves the involvement of pharmacists. Following the 2019 amendment to the Pharmaceuticals and Medical Devices Act (implemented September 2020), online medication counseling became possible under certain conditions (*36,37*). And with the launch of electronic prescription management services in January 2023, pharmacies can now electronically verify prescription information under specified conditions, dispense medications, and combine this with online medication counseling to deliver drugs, including home delivery (*38*). Consequently, patients can receive telemedicine with nursing support, have prescribed medications delivered directly to their homes, and access online medication consultations with pharmacists—without being seen at hospitals, using digital devices installed in medical MaaS vehicles stationed on or near their premises. The City of Ina is also considering implementing a system for real-time delivery of prescription medications to medical MaaS vehicles by drones (*20*).

A distinctive feature of "the City of Ina's medical MaaS model" is its integration of telemedicine with pharmacists' online medication counseling and medication delivery services, thereby enabling the entire process of care, from consultation to medication support, to be designed with a minimal travel burden for patients (Figure 2).

Moreover, the City of Ina aims to establish an interprofessional collaboration platform for sharing information (*20*). By carefully managing patient data while respecting privacy—collecting information from physicians, pharmacists, and care workers—the City hopes to achieve both improved healthcare efficiency and service continuity for aging residents. The City of Ina has also promoted the use of this system for younger patients as well (*39*). As of 2025, the vehicles also began carrying fetal monitoring equipment for use in prenatal checkups (*40*).

4. A comparison of medical MaaS to home healthcare systems worldwide

While mobile healthcare services exist worldwide, Japan's medical MaaS differs in both its objectives and patients it serves (Table 2).

4.1. Japan's medical MaaS in comparison to mobile medical services worldwide

Although mobile clinics operated by international organizations such as the World Health Organization (WHO), universities, and Federally Qualified Health Centers (FQHCs) share the primary goal of providing primary care services, they differ from Japan's medical MaaS in their institutional focus and the populations served. Many mobile medical services around the world

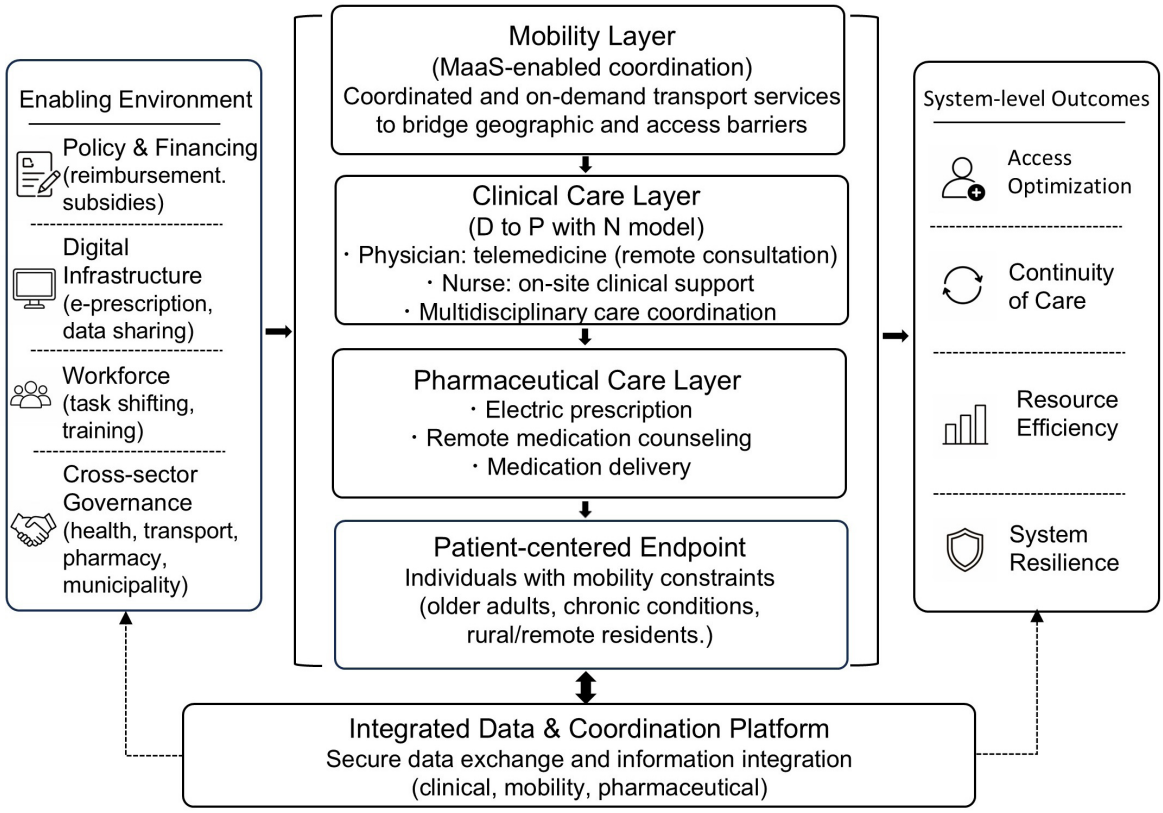

Figure 2. Conceptual approach to mobility-integrated care. Through this approach, patients can receive telemedicine services with in-person nursing support at home, obtain online medication guidance from pharmacists *via* computers installed in medical MaaS vehicles, and have prescribed medications delivered directly to their homes. *Abbreviations*: MaaS, Mobility as a Service (MaaS); D to P with N, Doctor-to-Patient with Nurse.

are designed primarily to improve healthcare equity by reaching populations with restricted access due to economic, geographic, or systemic barriers. In contrast, Japan's medical MaaS is more closely integrated with home medical care and community-based healthcare systems and is mainly intended to serve patients who have difficulty continuously accessing facility-based care (*41,42*).

A second important difference is the deployment context. Worldwide, mobile clinics are frequently utilized for outreach or response-based services in disaster-affected areas, humanitarian or conflict settings, and underserved communities. In contrast, Japan's medical MaaS is implemented predominantly as a routine, locally embedded healthcare delivery model, rather than as a temporary or emergency-focused intervention (*41,42*).

4.2. Japan's medical MaaS in comparison to home visiting medical care worldwide

In some developed countries, "Hospital at Home" models that rely heavily on visiting nurses have been implemented as alternatives to inpatient hospitalization. While both these models and Japan's medical MaaS involve the provision of medical care in the home setting with substantial involvement by nurses, their underlying objectives and populations served differ fundamentally.

"Hospital at Home" programs primarily focus on patients with acute conditions who would otherwise require hospital admission, aiming to substitute for inpatient care in order to reduce bed occupancy and healthcare costs. In contrast, Japan's medical MaaS is designed mainly for older adults in stable condition or with a chronic illness, so mobility-integrated services and telemedicine are routine components of ongoing community-based care rather than substitutes for acute hospitalization (*43*).

Accordingly, Japan's medical MaaS functions as a complementary implementation model that reinforces community-based integrated care systems rather than replacing hospital-based services. Its primary role lies in sustaining access to routine care for patients—particularly older adults with chronic illnesses—in familiar surroundings, particularly where mobility and medical resource constraints coexist.

5. Challenges and Perspectives

While medical MaaS is noteworthy for reducing the travel burdens for patients with mobility challenges and facilitating access to medical care for patients, and particularly older adults, several challenges remain.

First, like other telemedicine-based services, medical MaaS requires emergency ambulance services when

Table 2. Comparative analysis of medical transportation services

Items	Japan's Medical MaaS	International Mobile Clinics (Representative trends)	Hospital at Home (Representative model)
Purpose	Provision of home medical care for stable patients unable to be seen at a hospital. Chronic disease management and end-of-life care as part of community-based integrated care.	Provision of primary medical care and health education for low-income individuals, uninsured persons, and residents of disaster-affected or conflict zones who face difficulties accessing healthcare.	Alternative to acute-care hospitalization, providing hospital-level care at home to reduce bed occupancy and healthcare costs.
Targeted patients	Patients in stable condition or with a chronic illness, care recipients, pregnant women who cannot be seen at clinics.	Low-income populations, uninsured individuals, immigrants, homeless people, and disaster/conflict-affected communities.	Patients requiring hospitalization for acute conditions (such as pneumonia, heart failure, or infections) who are capable of managing their condition at home.
Type of medical care provided	Primarily focuses on stable management, prescription, and testing for chronic diseases.	Focus on primary care, emphasizing prevention, health education, maternal and child health, and chronic disease management.	Equivalent to secondary to tertiary medical care, with inpatient-level treatments including intravenous infusions, laboratory testing, and oxygen therapy at home.
Healthcare personnel involved	Physicians (telemedicine), nurses, pharmacists, laboratory technicians, *etc.*	Physicians (on-site medical treatment), nurses, pharmacists, laboratory technicians, *etc.*	Physicians (in-person or telemedicine), visiting nurses, laboratory technicians, *etc.*
Operating organization	Hospitals and clinics collaborate with local governments. university hospitals.	Diverse settings including hospitals, university hospitals, FQHCs, nonprofit organizations, and international NGOs.	Hospitals (public/private)
Source of funds	Public health insurance + subsidies provided by local or the national government.	Donations, federal grants, public insurance, private insurance, state grants, *etc.*	Payments through public insurance schemes (*e.g.,* Medicare/NHS), alternative payment models for inpatient care
Institutional position	A form of home medical care and telemedicine support.	Flexibly implemented as part of the public health and community medicine program.	Can be substituted for inpatient care and reimbursed by insurance (*e.g.,* U.S. Medicare Waiver).
Strengths	Suitable for continuous follow-up of older patients, family support, and community-based integrated care.	Improving equitable access to healthcare.	Reducing healthcare costs, preventing readmissions, and improving patient satisfaction.
Limitations	Inability to handle emergency situations, limitations when providing specialized medical care, and vehicle purchase/operation costs.	Funding, limitations in specialized care. Shortages in both rural and certain regions in the U.S.	Patient selection and safety management, attracting human resources, family burdens, and the fact that complete replacement with hospitals is impossible.
Representative cases	Representative case: Medical MaaS in the City of Ina, Nagano Prefecture and deployed across depopulated regions in Japan.	The Family Van (Harvard Univ), WHO Mobile Clinic.	Johns Hopkins Hospital at Home, NHS Virtual Ward.

Data Source: Ref. (12, 20, 22-27,30,31, 39-43)

patients experience a sudden deterioration in condition (*12*). The system operates under the assumption of a fully functional emergency medical system.

Second, vehicle-related operational challenges persist. These include the substantial costs of acquiring and maintaining vehicles, as well as the lack of nationally unified guidelines for vehicle specifications, which currently vary depending on local needs and operational models. At present, government subsidies and models in which municipalities own the vehicles and lease them to hospitals are commonly used to support implementation (*12,24,44*).

Third, medical MaaS is often implemented in mountainous or geographically remote areas, so service availability may be affected by adverse weather conditions such as heavy snowfall, posing region-specific operational constraints.

Fourth, the secure and appropriate management of personal health information across multiple institutions and sectors—including healthcare, transportation, and local government—remains a critical challenge, requiring robust governance frameworks and compliance with privacy protection regulations.

That said, the institutional and technical environment supporting the development of medical MaaS is gradually maturing. Revisions to medical fees in 2024 and 2026, which expanded the evaluation framework for the D to P with N telemedicine model, may serve as institutional foundations for sustaining telemedicine services that incorporate on-site clinical support by nurses and other healthcare personnel. Additionally, the introduction of electronic prescription management systems and the increased adoption of online medication counseling are creating an environment in which the entire care process—from prescription issuance to medication guidance and drug delivery—can be designed as an integrated service pathway.

Together, these developments suggest that medical MaaS may evolve beyond the role of a mobile clinic, functioning instead as a multidisciplinary collaboration platform capable of facilitating the continuous care required for chronic disease management. And by establishing secure mechanisms for sharing patient information in accordance with privacy protection standards, medical MaaS could provide a practical foundation for information-sharing systems within community-based integrated care frameworks, enabling collaboration among physicians, nurses, pharmacists, care workers, and local governments.

Moreover, case-based experiences in the City of Ina demonstrate that medical MaaS has already begun to be used beyond chronic disease management, including prenatal health checkups, indicating that its potential applications may extend to maternal and child health services, health screenings, and disaster response, depending on regional healthcare resources and transportation conditions.

6. Conclusions

This article examined medical MaaS as an emerging policy-related approach to addressing challenges to healthcare access in Japan's super-aged population, particularly in rural and depopulated areas where mobility limitations and medical resource constraints intersect. Rather than proposing a novel technology, this study highlighted how existing service components—including the D to P with N telemedicine model, on-site support provided by nurses, pharmacist-led online medication counseling, electronic prescriptions, and medication delivery—are being operationally integrated in practice.

While medical MaaS faces ongoing challenges related to operational costs, emergency preparedness, and information governance, this analysis suggests that it has substantial potential as a complementary implementation model within community-based integrated care systems. By facilitating continuous access to routine care for patients—and particularly older adults in stable condition or with a chronic illness—medical MaaS can overcome mobility-related barriers without replacing existing hospital-based or emergency services.

As institutional and technical environments continue to mature, including anticipated expansions in reimbursement frameworks and the wider adoption of electronic prescription systems, medical MaaS may evolve into a sustainable, multidisciplinary collaboration platform. In this context, medical MaaS represents not a standalone solution, but a pragmatic policy tool capable of enhancing coordination across healthcare, transportation, and caregiving systems in resource-constrained communities.

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