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FROM CARE COORDINATION TO KNOWLEDGE ECOSYSTEMS: ORGANIZATIONAL STRATEGIES FOR SUSTAINABLE HEALTHCARE

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Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

A Lucio, figlio di Federico e Otta
nonché figlio primogenito della mia
generazione di amici preziosi

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Introduction

1. The changing landscape of healthcare systems

Healthcare systems across the globe are undergoing profound transformations driven by demographic, technological, and societal shifts. Among these, population aging and the increasing burden of chronic diseases stand out as the most pervasive challenges. The World Health Organization (WHO, 2021) emphasizes that sustainability in healthcare now depends not only on economic resources but also on the ability of systems to innovate organizationally, coordinate efficiently, and manage knowledge effectively. In this sense, healthcare systems have become living organizations—complex adaptive structures that must continuously evolve to balance quality, equity, and sustainability.

The COVID-19 pandemic further exposed the vulnerabilities of traditional healthcare models, revealing structural fragmentation, workforce burnout, and inefficiencies in resource allocation (OECD, 2022). It also accelerated the digital transformation of care delivery, expanding telemedicine, artificial intelligence, and data-driven decision-making. Yet, these technological advances cannot replace the organizational dimension of care—the capacity to orchestrate people, knowledge, and processes in a coherent and sustainable way.

Within this multifaceted context, the present doctoral thesis aims to explore the organizational foundations of sustainable healthcare systems. It seeks to understand how coordination mechanisms, knowledge management, and relational capital contribute to building resilience and patient-centeredness in a time of demographic and institutional change. The overarching argument is that the sustainability of healthcare depends not only on financial efficiency, but also on the intelligent organization of processes and relationships—among professionals, institutions, and communities.

2. The rationale and structure of the thesis

This doctoral work is composed of three scientific papers, each addressing a distinct yet interrelated layer of the healthcare ecosystem, ranging from micro-level professional coordination to macro-level systemic transformation. Together, the three studies provide a coherent multi-level framework for understanding

how process organization, knowledge integration, and relational mechanisms can contribute to the sustainability of healthcare systems under increasing demographic pressure.

The first paper "*Case Managers in Adult and Pediatric Oncology: A Systematic Review"* focuses on the micro- and meso-organizational dimensions of healthcare delivery. It systematically reviews the international literature on the role of nurse case managers within Disease Units, with particular attention to oncology settings. The findings highlight the function of case managers as key boundary spanners, responsible for bridging communication gaps among professionals, facilitating patient navigation, and ensuring continuity of care across fragmented clinical pathways. Their role reflects a broader shift toward integrated and patient-centered models of care, in which relational and emotional competences complement technical and clinical expertise (Dal Mas *et al.*, 2020). At the same time, the review identifies persistent organizational barriers, including ambiguous role definitions, institutional inertia, and limited recognition of the strategic and managerial value of advanced nursing roles. Overall, the paper argues that empowering case managers represents a critical organizational lever for improving care quality and enhancing healthcare system sustainability.

The second paper *"Population Aging and Its Impact on the Japanese Healthcare System: A Literature Review"* extends the analysis to the macro level by examining the systemic consequences of population aging in Japan, the most aged society worldwide. Japan constitutes a unique empirical setting for observing how demographic change affects healthcare demand, workforce dynamics, service organization, and policy design. The review identifies several structural vulnerabilities, such as hospital overcrowding, shortages of healthcare professionals, and regional disparities in access to care. At the same time, it highlights adaptive strategies with potential relevance beyond the Japanese context. Among these, the Community-Based Integrated Care System emerges as a paradigmatic example of social and organizational innovation, integrating healthcare, social services, and long-term care through decentralized governance and strong community involvement (Iijima *et al.*, 2021). The Japanese case illustrates that healthcare sustainability cannot be achieved through cost containment alone, but rather through systemic reconfiguration and the mobilization of networks of actors, including families, professionals, institutions, and local communities.

Building on the insights of the first two studies, the third paper *"Relational Capital as a Driver of Knowledge Management in Healthcare Systems: Evidence from the KMU–KMU Hospital Case in Japan"* shifts the focus to the meso-organizational level, investigating how complex healthcare organizations translate micro-level professional practices and macro-level demographic and policy pressures into concrete organizational processes. Methodologically, the study adopts a qualitative approach based on Interventionist Research

(IVR) and a longitudinal single case study of Kansai Medical University and its affiliated university hospital. Through a six-month field immersion, combining document analysis, participant observation, small-scale interventionist interactions, and in-depth semi-structured interviews with key stakeholders, the research captures dynamic processes of coordination, learning, and knowledge integration as they unfold in real time. This interventionist design allows access to reflexive learning moments that are not observable through retrospective methods and supports the conceptualization of relational mechanisms—such as the emergent "*relational hub*"—as central drivers of organizational coordination.

Substantively, the paper examines how Knowledge Management (KM) and Relational Capital (RC) jointly sustain collaboration, innovation, and organizational learning in an aging society. KM provides the cognitive infrastructure for the creation, sharing, and application of knowledge while RC supplies the social infrastructure based on trust, communication, and shared purpose that enables collective intelligence. The case demonstrates how universities and teaching hospitals can function as knowledge ecosystems, bridging research, education, and clinical practice. Moreover, it shows how the integration of relational and digital infrastructures—such as telemedicine, artificial intelligence, and predictive analytics—can enhance organizational resilience while ensuring that technological innovation remains human-centered and ethically grounded.

Taken together, the three papers adopt complementary methodological approaches—systematic review, literature review, and qualitative interventionist case study—that align with their respective analytical levels and collectively support a coherent multi-level understanding of healthcare sustainability.

3. Theoretical framework: toward sustainable healthcare organization

The three papers converge on a shared theoretical perspective that connects organizational theory, process management, and sustainability science. Contemporary healthcare systems can be interpreted as knowledge-intensive organizations (Nonaka *et al.*, 1996), where outcomes depend less on material resources and more on the ability to coordinate distributed expertise. In this view, knowledge management becomes the backbone of sustainability—transforming individual competence into organizational learning and innovation (Bratianu *et al.,* 2024).

Equally crucial is the concept of relational capital, defined as the value generated through high-quality interactions among professionals, institutions, and communities (Bagnoli *et al.,* 2020). RC acts as an invisible infrastructure that supports collaboration, trust, and knowledge flow. In healthcare, where

uncertainty and interdependence are intrinsic, relational capital is not a luxury—it is a necessity. Effective coordination among doctors, nurses, case managers, and patients relies on the capacity to build and maintain relationships that sustain information exchange and mutual accountability. Finally, sustainability in healthcare extends beyond organizational performance. It involves maintaining the delicate equilibrium between economic viability, social equity, and environmental responsibility—the so-called "triple bottom line" (Elkington, 1997). In this sense, healthcare sustainability is not only a question of efficiency, but of organizational ethics: ensuring that the pursuit of innovation and productivity does not compromise human dignity, accessibility, or ecological balance. As the Japanese experience shows, integrating traditional values such as Ji-jo (self-help), Go-jo (mutual aid), and Kyo-jo (social solidarity) with modern technologies and management models can inspire new paradigms of sustainable healthcare organization.

4. Contribution and originality

The originality of this doctoral thesis lies in its multi-scalar and interdisciplinary approach. By combining systematic literature reviews with empirical evidence, it bridges three analytical levels:

1. **Micro-level**: the organizational role of case managers as agents of coordination and patient-centered innovation;
2. **Meso-level**: the institutional responses of a national healthcare system under demographic pressure, focusing on integration and equity;
3. **Macro-level**: the epistemic and relational infrastructure of knowledge-driven healthcare systems.

The integration of these three levels enables a holistic and process-oriented understanding of how healthcare organizations evolve toward sustainability. Rather than treating sustainability as a static outcome or a purely economic objective, the thesis introduces and operationalizes the concept of organizational sustainability as a dynamic capability. This capability is defined as the capacity of healthcare institutions to continuously learn, adapt, and innovate in response to environmental complexity, while preserving care quality, ethical standards, and social responsibility (Varsei *et al.,* 2014; Ketprapakorn & Kantabutra, 2022; Khizar *et al.,* 2022; Rahman *et al.*, 2022). By doing so, the thesis contributes to both healthcare management and sustainability research, offering an integrative framework that connects micro-level professional practices, meso-level organizational structures, and macro-level knowledge and relational systems. From a methodological standpoint, the thesis combines systematic literature review techniques with qualitative, case-based inquiry, enabling both breadth and depth of analysis. The use of

NVivo-assisted coding ensures rigor in the synthesis of evidence, while the in-depth interviews at Kansai Medical University and Kansai Medical University Hospital enrich the study with grounded insights from practitioners and policymakers.

5. Conclusion and research trajectory

Ultimately, this thesis argues that the sustainability of healthcare systems depends on the organization of knowledge and relationships as much as on financial or technological resources. The transition from hierarchical, hospital-centered systems to integrated, networked, and learning-oriented organizations marks a paradigm shift in healthcare governance.

Taken as a whole, the three studies illustrate how empowering professional roles, such as nurse case managers intermediate, can enhance coordination and contribute to more humanized care. They further show that demographic transitions, when approached as opportunities for systemic redesign rather than as crises, can drive the development of innovative models—exemplified by Japan's community-based integrated care system. Finally, the studies highlight that knowledge management and relational capital serve as strategic resources for institutional resilience, supporting continuous adaptation and sustainable innovation.

In an era when healthcare expenditure represents both a societal burden and a moral imperative, sustainability becomes not only an economic necessity but also a civilizational challenge. The ability of societies to care for their aging populations will increasingly measure the maturity of their institutions and the intelligence of their organizations.

As such, this doctoral work positions healthcare not merely as a technical system but as a learning ecosystem—a space where knowledge, ethics, and care converge. Its central message is both analytical and aspirational: only through organized knowledge and shared responsibility can healthcare remain sustainable, humane, and future-oriented.

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Paper 1 - Case managers in adult and pediatric oncology: a systematic review

This study is co-authored with Francesca Dal Mas (Department of Management, Ca' Foscari University, Venice, Italy), Veronica Pegoraro (Center for Governance and Social Innovation, Ca' Foscari Foundation, Venice, Italy; Department of Economics, Ca' Foscari University, Venice, Italy), Maristella Zantedeschi (Center for Governance and Social Innovation, Ca' Foscari Foundation, Venice, Italy; Department of Economics, Ca' Foscari University, Venice, Italy), Stefano Campostrini (Center for Governance and Social Innovation, Ca' Foscari Foundation, Venice, Italy; Department of Economics, Ca' Foscari University, Venice, Italy), Lorenzo Cobianchi (Department of Clinical, Surgical, Diagnostic, and Pediatric Sciences, University of Pavia, Pavia, Italy; General Surgery 1, IRCCS Foundation San Matteo, Pavia, Italy; ITIR – Institute for Transformative Innovation Research, University of Pavia, Pavia, Italy), and Gianpaolo Balzano (Pancreatic Surgery, Pancreas Translational & Clinical Research Center, IRCCS San Raffaele, Milano, Italy). *The article has been accepted and is awaiting publication in the international journal Chirurgia.*

Abstract

Introduction: The Disease Units organizational model has gained prominence in the field of oncology, as it prioritizes patient-centered care and relies on the collaborative efforts of various medical professionals. In Disease Units, a nurse case manager facilitates smooth coordination among healthcare professionals and guides patients through their treatment journeys.

Evidence acquisition: This article aims to comprehensively explore the contextual framework, defining characteristics, associated benefits, and prevalent challenges related to integrating nurse case managers in Disease Units. Drawing from an extensive international literature review, this study synthesizes insights from 20 scholarly papers selected in July 2023 to clarify the multifaceted role of nurse case managers within this healthcare model.

Evidence synthesis: The analysis highlights that the effectiveness of a nurse case manager depends on a diverse skill set, encompassing both technical and non-technical abilities. This role is strategic in providing comprehensive patient support, which affects the quality of life, treatment adherence, and managing the psychological and social aspects of care, contributing to establishing a patient-centered healthcare system.

Conclusions: Regulatory adjustments and reforms are essential to facilitate the seamless integration of

nurse case managers, aligning healthcare delivery with the evolving needs and expectations of patients and healthcare professionals.

Keywords: Case manager; Oncology; Disease units; Organizational models; Literature review; Patient-centric healthcare; Cancer; Pain

1. Introduction

The intricate nature of diagnosing and treating neoplastic diseases has prompted the development of new approaches to cancer patient care over the past three decades. Both academics and practitioners have increasingly focused on creating efficient organizational responses (Balzano *et al.*, 2021).

In oncology care, various challenges arise, including the involvement of multiple clinical specialists, fragmentation in diagnosis and treatment, uncertainty in professional roles, and resource allocation problems (Marchetti *et al.*, 2023; Marchetti *et al.*, 2016). Disease Units, employing multidisciplinary teams, have been established to address these issues for specific cancers. These units implement structured patient management, data sharing, and adherence to international protocols. This unified approach replaces the older fragmented model and in Breast Units has shown an 18 percent increase in survival rates (Sung *et al.*, 2021; Wilson *et al.,* 2013; Kalager *et al.*, 2009).

The Disease Unit model highlights the importance of multidisciplinary collaboration and introduces new roles, like the nurse case manager (Cobianchi *et al.*, 2024; Balzano *et al.,* 2024; Cobianchi *et al.,* 2023). The primary role of a nurse case manager is to oversee and coordinate the overall care of patients, ensuring that they receive comprehensive and continuous care throughout their cancer journey. Case managers focus on the entire care process, including clinical, psycho-social, and logistical aspects (Balzano *et al.,* 2021). They may proactively manage treatment plans, facilitate communication among the healthcare team, and address barriers to care. Nurse case managers often have clinical expertise and can provide clinical assessments and interventions.

The literature also acknowledges the role of nurse navigators (or patient navigators), whose responsibilities may overlap with case managers. However, Patient navigator primarily focus on guiding patients and their families through the healthcare system (Kelly *et al.*, 2019) They help patients navigate the complexities of diagnosis, treatment, and follow-up care. Nurse navigators provide education, emotional support, and assistance with accessing resources and services (Brown *et al.*, 2012). While they do not typically offer clinical care, they play a crucial role in ensuring patients understand their treatment

options and can access them efficiently. It is important to note that the functions of nurse case-managers and nurse navigators can vary from one healthcare institution to another, and there may be some overlap or hybrid roles in certain settings. Furthermore, the terminology and responsibilities can be influenced by local practices and healthcare policies. Hence, healthcare organizations should provide clear definitions and guidelines for these roles.

Additionally, some countries employ Advanced Nurse Practitioners (ANPs), a subset of nurses with advanced clinical skills and knowledge. ANPs are recognized for improving patient care, reducing medical personnel workload, enhancing cost-effectiveness, and achieving high patient satisfaction, often comparable to physicians (Htay & Whitehead, 2021).

In light of these dynamics, nurses play a central role in Disease Units. The aim of this article is to review the literature focusing on the nurse case manager's pivotal role in ensuring effective and continuous care for oncological patients.

2. Evidence acquisition

This study employed a systematic literature review methodology, utilizing the Scopus, Web of Science, and PubMed databases to gather pertinent research materials (Massaro *et al.*, 2016). An analytical research protocol was preliminarily defined to provide guidance on the conduct of the literature review. The protocol aimed to address the following Research Questions (RQs):

RQ #1: 1.What are the characteristics of the nurse case manager within the international literature?

RQ #2: What are the issues and critical aspects most frequently addressed in the literature?

RQ #3: What are the future research implications surrounding the topic of case managers, and what considerations should policymakers undertake in this regard?

The search process targeted articles written in English, employing the following keywords in the search string: "case manager, oncology, nurse." This search was conducted on July 22nd, 2023. A total of 51 articles without duplicates were retrieved. Following a review of relevant titles and abstracts, articles that solely delved into medical aspects without an organizational perspective were deemed irrelevant and excluded. This process led to the selection of 24 articles. Of these, one piece could not be found, and three were deemed peripheral to the objectives of this investigation, upon comprehensive examination. The remaining 20 articles were subjected to the final analysis.

Figure 1 shows the result of the search according to the PRISMA protocol (Page *et al.*, 2021).

The qualitative analysis software NVivo 12 facilitated the selected articles' systematic coding process. The

coding process encompassed the identification of nodes and corresponding sub-nodes, according to the most recent literature and the complex roles and responsibilities of case managers in the care of oncological patients (Dal Mas *et al.*, 2023; Dal Mas *et al.*, 2020). The coded material was categorized into three primary nodes:

- **Historical-temporal context**: this node encompassed geographical location and the year of publication, type of tumor, the type of hospital care, stakeholders mentioned, and requisite instruments;
- **Professional figure of the case manager**: this node scrutinized the attributes and competencies required of case managers, their specific roles and responsibilities, the educational pathways necessary for their preparation, and the strategic advantages and benefits they contribute to the diagnostic and therapeutic pathway of patients;
- **Barriers and limitations**: the third group of nodes focused on elucidating specific barriers and limitations described in the literature, particularly those that directly impact the function and efficacy of nurse case managers in the management of oncological diseases.

This methodological framework facilitated a comprehensive analysis of the selected literature, enabling a nuanced exploration of the role and significance of nurse case managers in the context of oncological care.

3. Evidence synthesis

The selected articles reveal a global interest in the role of nurse case managers in oncological care. Out of 20 analyzed research pieces, 17 concentrated on different geographical areas, spanning European nations like the Netherlands, Denmark, Germany, Switzerland, and Italy, as well as non-European countries such as China, Iran, North America, Canada, and Israel. This international dispersion underscores the widespread recognition of the case manager's significance on a global scale. In contrast, three articles provided a more generalized perspective on the role of case managers without tying it to any specific geographic region.

The temporal dimension of these articles ranged from 1999 to 2023. While the years from 1999 to 2020 witnessed an average of 1.5 papers per year, 2022 saw an acceleration with four articles published, and 2023 contributed two more articles (as of the analysis in July 2023), indicating a remarkable increase in scientific output on the subject.

Regarding the specific tumor site addressed, 13 papers did not refer to a particular cancer. These

articles focused on the case manager's role as a reference point for oncological patients, their families, healthcare personnel, and the multidisciplinary team (Admi *et al.*, 2013). They emphasized the case manager's responsibility in managing the diagnostic-therapeutic process, coordinating its execution, and addressing any issues. The remaining seven articles delved into various oncological settings, including colon-rectal cancer, genitourinary cancer, gynecological cancer, spinal cord cancer, with particular attention given to breast cancer in three articles.

In terms of hospital care, seven articles examined case managers in public healthcare settings, while none explored their role in private hospitals. The remaining 14 articles did not specify the type of hospital care under consideration.

Various stakeholders were involved (Magnani *et al.*, 2019). Patients, nursing and medical staff (oncologists, surgeons, psychiatrists), and patients' families were considered in all articles. Data managers, scientific societies, administrative staff, policymakers, researchers, patient advocates, and healthcare executives were also engaged (Vahedi Nikbakht-Van de Sande *et al.*, 2014, Olsen *et al.*, 2013; Steenbergen *et al.*, 2022). The authors emphasize the need for organizational and operational tools to tailor case manager responses to patients' unique and current needs. Proposed strategies included enhanced communication, electronic notifications, and weekly information meetings, along with improved written documentation to provide patients with comprehensive knowledge about their diagnostic-therapeutic pathway status (Grob *et al.*, 2017).

4. Results

4.1 Role and quality of the nurse case manager

Given the pivotal role of case managers in oncological care, the literature delineated their specific tasks and competencies into two domains: technical skills and non-technical or soft skills, as reported in Table 1.

Table 1. *Functions, technical skills, training, and soft skills of the case manager.*

Category	Elements
Functions and technical skills	1. Consulting function 2. Strategic-managerial function

	3. Educational function 4. Controlling function
Related training	1. Specific training in oncology 2. Specific training in patient mental health
Non-technical / Soft skills	1. Kindness 2. Sense of humour 3. Responsiveness to specific patient need 4. Understanding of the patient's personal situation 5. Communication and empathy 6. Problem-solving 7. Collaborative approach with other professionals 8. Ability to deal with the sensitive issue of death

4.1.a Functions, technical skills and training

In this section, the case manager's specific functions are categorized into four key domains: advisory/consulting, strategic-managerial, educational, and supervisory roles.

The advisory/consulting function pertains to interactions with physicians, nurses, caregivers, patients, and families throughout the diagnostic-therapeutic pathway (Grob *et al.*, 2017). The case manager assumes a central and supportive role for all stakeholders involved in the process (Crane-Okada, 2013).

The strategic-managerial function involves resolving issues and uncertainties that may arise among patients, family members, and the multidisciplinary team. Proficiency in organizational skills, directing the diagnostic-clinical process towards patient-centricity, and effective multidisciplinary teamwork structuring are essential attributes. Case managers are recognized as primary clinical leaders within the multidisciplinary team.

The educational function aims to enhance patient and family self-sufficiency, particularly by providing them with in-depth knowledge about the specific pathology. Case managers develop tailored

educational plans for each patient and their family, focusing on the disease itself and the collaborative care pathway.

Lastly, the supervisory function enables practical management of the multidisciplinary approach in patient care and ensures optimal coordination for the efficient utilization of available human and economic resources (Zhang *et al.*, 2022).

In addition to conventional training, it is imperative for these professionals to possess a robust background in oncology and patient mental health. Emphasis is placed on comprehensive training in psychological well-being and the potential use of antidepressants, highlighting the importance of these competencies (Walker *et al.*, 2009).

4.1.b. Non-technical/soft skills

Case managers were expected to exhibit personal characteristics to best accommodate the patients' and families' needs such as kindness and trustworthiness, to encourage the patient to engage with medical and nursing staff, expanding the spaces devoted to diagnostic and emotional communication (Gilbert *et al.*, 2011). Also, a sense of humor, responsiveness, excellent communication, empathic skills, and a collaborative approach with professionals are expected. Importantly, they needed to gauge the appropriateness of discussing sensitive topics related to death with patients.

4.2 Advantages of using the case manager in oncology care

All analyzed articles positively evaluated the introduction and structuring of the case manager role in oncological care, identifying benefits in three distinct areas, summarized in Table 2.

Table 2. *Strategic advantages and benefits of introducing case managers.*

Strategic advantages and benefits	Description
Psychological and social sphere of the patient	
Quality of life	Substantial improvement in quality of life and decrease in anxiety-depressive disorders with short- and medium-term benefits

Patient empowerment	Increased patient self-management and self-sufficiency through multiple forms of communication and information exchange
Access to care	Reduced disparities concerning access to cancer therapies
Preventive education for potential depressive disorders	Patient awareness concerning the emergence of possible anxiety-depressive issues during cancer disease
Additional support to caregivers	Case managers as a guide and additional accompanying figure in the diagnostic and therapeutic pathway for the patient for family caregivers
Improved management of the patient's overall clinical status	
Decrease in the rate of hospital admissions and inappropriate hospitalizations.	The decrease in the rate of hospitalization can be attributed to the constant and updated assessments put in place by the multidisciplinary team, which determines, in a timely manner, readmissions and/or possible outpatient visits
Improved patient adherence to the stated treatment	Effective communication between case manager and patient increases the relationship of trust and confrontation, leading, as a result, to better therapeutic compliance and achievement of the stated goals

Improved impact on patient health outcomes	The continued presence of the case manager in the patient's health care pathway produces a robust optimization of patient health outcomes, resulting in increased satisfaction with care as represented by the patient and family
Evolution toward a patient- and family centered approach	
Case manager as a reference point in the multidisciplinary team	The case manager represents the cornerstone within the multidisciplinary team, and this structured approach makes the patient an active and participatory user in their care process
Enhancement of the ongoing relationship with patient	The permanent exchange of information with the patient ensures personalized healthcare delivery according to the specific needs of each patient
Care coordination and continuity of care	The support offered by the case manager ensures a limitation to the fragmentation of patient care through personalized planning of the health care offered
Efficiency and effectiveness of treatment	Reduced length of stay and costs and decreased hospital readmission ensure efficient and effective healthcare during all phases of the disease event
Human trust relationship between patient and case manager	The evolution toward a patient-focused approach allows the building of a trusting relationship that facilitates communication, discussion, and exchange of information

4.2.a Psychological and social aspects of the patient

Case managers significantly improved the quality of life for cancer patients, reducing anxiety and depressive disorders, as reported by 13 articles (Callahan, 1999). Preventive education offered by case managers addressed potential depressive disorders during the care journey. Clear information about drug treatments, pain management, and disease impact on daily life was essential. Case managers also played a crucial role in offering support beyond family caregivers, alleviating psychological and daily burdens (Alfieri *et al.*, 2023).

4.2.b Management of the patient's overall clinical status

Twelve articles highlight how case managers were linked to a decrease in hospital admissions, enhanced patient adherence to treatment plans, and improved health outcomes.

4.2.c Evolution toward a patient-and family-centered approach

The presence of case managers stimulated a shift toward a patient- and family-centered approach in care, as underlined by 12 articles. They served as central reference points within the multidisciplinary team, ensuring effective care coordination, allowing the patient to have guidance through the healthcare system, and establishing trusting relationships between patients and healthcare providers (Johnson *et al.*, 2016).

4.3 Barriers and limitations in the introduction of a case manager

Table 3 summarizes the potential barriers to the introduction of this figure in oncology pathways, dividing the hindrances into three categories: barriers involving the cancer patient, in the proper case manager role, and institutional ones.

Table 3. *Barriers and limitations in the introduction of a case manager.*

Barrier Category	Key Issues
Barriers Involving the Cancer Patient	1. Lack of communication between patient and clinical party 2. Difficult in creating empathic communication between patient and nurse

	3. Reduced communication skills of nurses 4. Absence of a patient and family-centered culture 5. Discontinuity of care 6. Lack of ex-ante panned support 7. Lack of a structured multidisciplinary approach 8. Socioeconomic inequalities 9. Issues pertaining to the management of patients' anxiety-depressive problems 10. Barriers of a cultural nature
Barriers Related to the Case Manager Role	1. Underestimation and marginality of the nursing staff 2. Frequent inattention to psychosocial information 3. Confusion with respect to the role and responsibilities to be assigned to the case manager 4. Shortage of time due to work duties 5. Lack *ab origine* of good strategic organization
Institutional Barriers	1. Shortage of human resources in the nursing case manager field 2. Scarcity of economic resources invested in this specific area 3. Burden caused by bureaucratic machine

4.3.a Barriers involving the cancer patient

The first category centers on critical issues concerning the patients themselves. Specifically, 12 articles highlight two primary challenges: a lack of effective communication between patients and the clinical team and the difficulty in establishing empathic communication between patients and nurses (De Luca *et al.*, 2021). The fragmented nature of healthcare systems negatively impacts patient communication and knowledge translation dynamics (Cobianchi *et al.*, 2021). Patients express frustration with the

frequent rotation of oncologists responsible for their care, leading to a discontinuity that discourages them from discussing issues or asking questions. This can significantly affect the success of the patient's diagnostic and therapeutic journey (Farzi *et al.*, 2022: Cascella *et al.*, 2022). Additionally, empathic communication between cancer patients and nurses, while crucial, faces hurdles due to the case managers' heavy workload and limited time availability. Intense illness further disrupts communication, as severely debilitated patients may be unable to participate in discussions regarding their treatment and emotional journey. Notably, not all nurses possess adequate communication skills, hindering the patient's ability to recognize the nurse as a suitable figure for support. Effective communication with the case manager must encompass considerations of the patient's complex values and emotional state, often clouded by emotional and psychological barriers (Steenbergen *et al.*, 2022).
The second set of issues is closely related to communication problems and includes the absence of a patient- and family-centered culture, care discontinuity, and insufficient pre-planned support. Addressing these issues may require the implementation of targeted in-hospital regulations to prioritize a patient- and family-centered perspective (Steenbergen *et al.*, 2022).
Additional challenges pertain to the absence of a structured multidisciplinary approach, necessitating strategic reorganization within hospital facilities and greater formalization of therapeutic-diagnostic processes (Horlait *et al.*, 2022). Socioeconomic disparities in access to diagnostic services and cancer treatment further complicate matters for patients.
Anxiety and depression management in cancer patients pose complex problems. The emotional complexity experienced by patients, especially upon realizing the severity of their condition, demands a thorough analysis of the psycho-social component to mitigate their distress in daily life. Failure to address anxiety and depression can result in non-adherence to medical treatment and therapy failure.
Survivors of cancer diagnoses often lament the absence of specialized emotional and social support in the post-treatment phase, underscoring the crucial role of nursing in maintaining the quality and continuity of care for cancer survivors.
Cultural barriers may finally manifest, with patients struggling to fully comprehend the role of case managers, particularly during the transition from hospital care to reintegration into the social community (Walker & Sharpe, 2009).

4.3.b Barriers to the role assumed by case managers

These issues include an underestimation of nursing staff and inadequate consideration of psychosocial

information shared by nurses in clinical-therapeutic decision-making processes (De Luca & Sena, 2021; Horlait *et al.*, 2022). Medical expertise often takes precedence, marginalizing the nursing role. Furthermore, confusion may be generated among cancer patients and caregivers regarding the role and responsibilities of nurses, complicating the situation.

4.3.c Institutional barriers

These obstacles include shortages of human and financial resources for nursing case managers, in some studies leading to the premature termination of patient therapeutic/diagnostic pathways. Bureaucratic complexities within the healthcare system are also identified as hindrances, causing delays in the management of oncological conditions and frustrating patients and their families (Cobianchi *et al.*, 2023; Van der Plas *et al.,* 2017)

Data availability

The data associated with the paper are not publicly available but are available from the corresponding author on reasonable request.

Limitations

The protocol has not been registered on any repository.

5. Discussion

The nurse case manager has emerged as a pivotal figure in the restructuring of healthcare systems, particularly within the context of Disease Units (Balzano *et al.*, 2023). This review of international literature aimed to comprehensively assess the current state, characteristics, potential, and challenges associated with this role.

Regarding the first research question pertaining to the tasks and impacts of nurse case managers, there is a growing interest in the international literature. This interest is justified by the numerous positive effects observed by both healthcare staff and cancer patients (Admi *et al.*, 2013; Steenbergen *et al.*, 2022; De Luca & Sena, 2021). These effects encompass improvements in quality of life, reduced readmission rates, and increased adherence to predetermined treatment plans. Additionally, there is a heightened focus on managing anxiety and depressive symptoms in cancer patients, reflecting the evolving concept of patient quality of life in medical sciences (Zhang *et al.*, 2022). Patient well-being

is now recognized not only from a physical standpoint pertaining to health and disease progression but also from psychological and social perspectives, encompassing emotional well-being and social support. In light of the patient's overall well-being, the multifaceted role of the case manager emerges. Beyond their traditional skill set, case managers must facilitate effective communication and knowledge translation with patients, demonstrating acceptance and empathetic understanding of each patient's holistic situation (Dal Mas *et al.* 2020). For cancer survivors, who often grapple with intense feelings of loss, tools should be developed to provide greater support during the transition from the hospital to reintegration into society (Walker & Shape, 2009).

Concerning the second research question, a fragmented framework surrounds the role of nursing case managers. This complexity is exacerbated by the undervaluation and confusion surrounding the nursing staff's role and the multitude of stakeholders involved in a patient's diagnostic and clinical progression (De Luca & Sena, 2021).

Recognizing the importance of soft skills and the strategic-managerial role of the case manager is essential to move away from marginalizing the nursing profession and to establish a multidisciplinary approach that places the patient at the center (Olsen & Bradbury-Jones, 2013). Additionally, the emergence of non-traditional stakeholders in the diagnostic process, such as administrative assistants and friends of the patient, highlights the broad scope within which case managers operate. This includes interactions with professionals in areas like physiotherapy, physiatry, fitness, and administrative aspects (Gilbert *et al.*, 2011; Cobianchi *et al.*, 2022). Thus, nursing case manager education should encompass various professional figures, including those related to administrative, motor science, nutrition, and social aspects, as well as the patient's social network.

Regarding the third research question concerning implications for future research, limitations in the patient's diagnostic and clinical processes have influenced the modes of analysis in the literature. Often, studies focus on specific experiences within a single district, narrow geographic area, or specific issue, resulting in an analysis limited to individual patient experiences in a particular hospital facility. Methodological limitations are also evident, with studies frequently involving a limited number of respondents within questionnaires, often due to language barriers and tight timeframes. It is hoped that future research will embrace more inclusive interview approaches and extend the time period for comprehensive surveys.

Given the strategic importance of the case manager in integrated cancer patient care, further research is imperative to address various limitations. Efforts should involve active participation and input from

key stakeholders directly engaged in the care and support of cancer patients. The inclusion of family members of oncological patients can provide practical insights for future developments of the nursing case manager role. As this figure assumes an increasingly central role in the strategic management of oncologic diseases, future research should pay greater attention to the correlation between the increased involvement of the patient's family in information flow and the substantial reduction of stress experienced by both the patient and case manager.

Furthermore, while a shift toward a patient- and family-centered perspective has emerged, achieving socio-cultural and clinical change remains complex. There is a noted underrepresentation of the patient's perspective in the analysis of the case manager's role concerning continuity of care, which primarily impacts oncology patients.

Incorporating the patient's viewpoint can offer a holistic approach to the discussion of this profession and encourage communication between the patient and case manager, as well as among the case manager and the multidisciplinary team.

To facilitate this transformation towards a more patient- and family-centered model, it is essential to involve institutional and political decision-makers in implementing structural changes in the nursing case manager profession. This includes increased governmental support for oncology initiatives, investment in case manager education with a practical-operational focus, and curriculum enhancements in universities, fostering interdisciplinary courses and collaborative culture among different professions. The strength of the multidisciplinary team lies in its ability to dynamically adapt to the unique needs of each individual cancer patient.

6. Conclusions

In conclusion, while this study has illuminated key aspects related to the introduction and planned development of the nurse case manager in the oncology patient's diagnostic and therapeutic journey, it is essential to recognize that comprehensive data and information on the advancement of this profession are still evolving. This is due to the recent introduction of the role in oncology and the fragmented nature of international literature. Additionally, distinctions between the roles of case managers, nurse or patient navigators, and Advanced Nurse Practitioners (ANPs) remain unclear (Crane-Okada, 2013; Htay & Whitehead, 2021). Future research should aim to provide a unified perspective on this professional figure, with specific considerations for different oncological contexts. This research can inform interventions to enhance the role of the case manager within Disease Units

and meet the evolving needs of patients and families. Nonetheless, the study's limitations, such as a limited number of analyzed articles and the influence of cultural and national regulations, should be acknowledged. Given the dynamic nature of this field, ongoing research is expected to delve deeper into aspects related to the case manager's role, benefits within Disease Units, and new training and educational opportunities. Here are some examples:

Diversity and Inclusivity. It is important to recognize that patients come from diverse backgrounds , and their needs may vary based on factors such as culture, language, and socioeconomic status (Torain *et al.*, 2016). Nurse case managers may need to adapt their approach to provide culturally competent care. Additionally, discussing how healthcare organizations can promote diversity within the nursing profession and among case managers would be valuable.

Technology and Data Integration. In modern healthcare, technology and data play an increasingly significant role (Dal Mas *et al.*, 2023). Nurse case managers often rely on electronic health records (EHRs) and healthcare information systems for managing patient data and coordinating care. Discussing the challenges and opportunities related to technology integration, data privacy, and the role of nurse case managers in leveraging digital tools for patient care would be relevant.

Legal and Ethical Considerations. Nurse case managers may encounter legal and ethical problems. A discussion of the legal and ethical framework within which nurse case managers operate, including issues such as informed consent, patient autonomy, and end-of-life care, could add depth to the analysis (Torain *et al.*, 2016; Gramma *et al.*, 2023).

Cost-Efficiency and Resource Allocation. Given the growing emphasis on cost-effectiveness in healthcare, it would be pertinent to discuss how nurse case managers contribute to efficient resource allocation and cost savings.

Patient Advocacy and Policy Implications. Nurse case managers often serve as advocates for their patients, ensuring they receive appropriate care and support. Exploring the broader policy implications of their advocacy work, such as influencing healthcare policies or participating in healthcare quality improvement initiatives, could be a fascinating avenue for discussion.

Including these aspects would provide a more comprehensive understanding of the role of nurse case managers in oncology care and the challenges and opportunities they face in contemporary healthcare settings.

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Authors' contribution: FD conceived the idea of the study; LS, FD, and VP wrote the research protocol; LS and FD handled data collection; LS analyzed the data; LS, FD, VP, AV and GB wrote the first draft of the article; MZ, SC, FR, PF, HB, LM, FS, LL, MC, MC, CF, RB,IM, AV and LC revised the article. All the authors approve the latest version of the manuscript.

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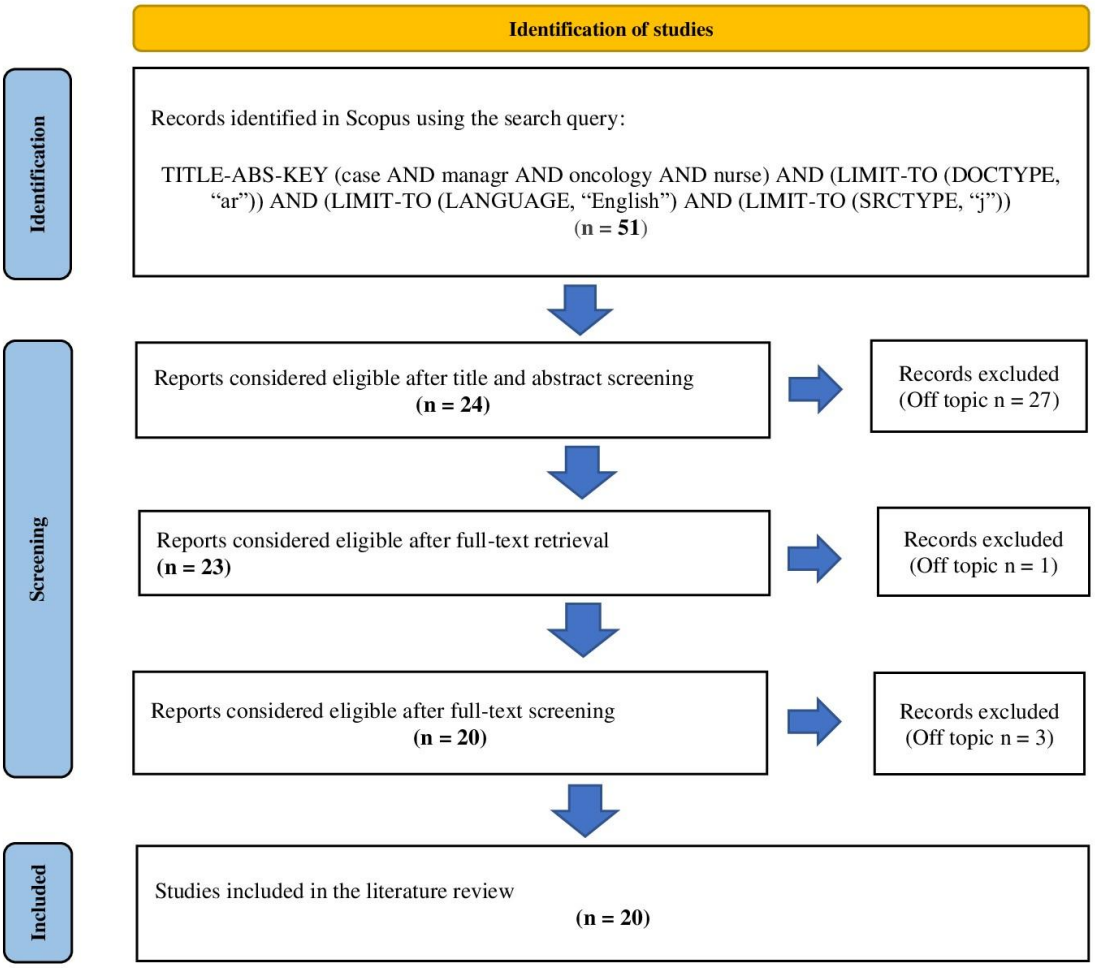
Figure 1. *Flow diagram related to the steps of the review according to the PRISMA protocol. Date of search: January 22nd 2023.*



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Paper 2 - Population aging and its impact on the Japanese Healthcare System: a literature review

This study is co-authored with Francesca Dal Mas (Venice School of Management, Ca' Foscari University, Venice, Italy; Collegium Medicum, SAN University, Lodz, Poland; francesca.dalmas@unive.it), Stefano Campostrini (Department of Economics, Ca' Foscari University, Venice, Italy; stefano.campostrini@unive.it), and Giuseppe Pezzotti (Biomedical Engineering Center, Kansai Medical University, Osaka, Japan; pezzotti@hirakata.kmu.ac.jp). *The paper has been submitted to an international journal focusing on health systems research and is currently under review.*

Abstract

Japan, emblematic of the global aging trend, offers a unique lens through which to observe the intersection of demographic transformation and healthcare sustainability. This structured literature review explores the international academic discourse on the implications of Japan's super-aged society, shedding light on systemic vulnerabilities and adaptive strategies. Beyond the familiar rise in chronic conditions and healthcare costs, the review uncovers deeper tensions: intergenerational disconnection, regional disparities, workforce burnout, and the fragility of long-term care models. At the same time, the Japanese system reveals remarkable resilience, particularly through community-based integration, policy innovation, and the gradual shift from hospital-centric care to personalized, decentralized models. Emerging technologies—telemedicine, AI, predictive analytics—are not presented as panaceas, but as tools requiring social acceptance, geriatric competence, and digital inclusivity. Crucially, the study emphasizes that aging must be framed not solely as a medical issue, but as a multidimensional challenge intertwined with environmental sustainability, territorial equity, and cultural expectations. Japan's experience, suspended between tradition and innovation, anticipates the choices many nations will soon face. Understanding its trajectory means engaging with aging not only as an emergency, but as a space of redesign for future healthcare systems.

Keywords

Japan – Aging – Healthcare System – Super-aged society

1. Introduction

Population aging is a global phenomenon, but it is most pronounced in Japan, one of the countries with the highest life expectancy: 87.2 years for women and 81.7 for men (World Health Organization, 2024), earning it the classification of a "*super-aged society*" (Molassiotis *et al.,* 2022; Iijima *et al.,* 2021). Between 2025 and 2050, Japan is expected to experience both an increase in its over-65 population and a steep decline in the 25–64 age group (Organization for Economic Cooperation and Development, 2024). Acknowledging the pyramid-shaped demographic structure, the Japanese government issued the programmatic document "*The Guideline of Measures for Ageing Society*" in February 2018. This guideline redefines the concept of elderly age, moving away from the rigid threshold of 65 years as proposed by the Japan Gerontological Society, and advocates for a sustainable "*age-free society"* (Iijima *et al.,* 2021). This concept promotes a social system that equally supports both older and younger generations, moving away from the traditional "*education, work, and old age*" model to encourage older individuals to contribute to society according to their capabilities and energy levels.

Japan's healthcare system, established in 1961, mandates universal health insurance, with premiums based solely on individual solvency rather than risk factors (Sato & Jakobsson, 2024). The central government annually reviews medical service tariffs (Sudo *et al.,* 2018), while healthcare providers include private non-profit hospitals, private outpatient clinics, and public health centers. Over 3,000 insurance companies operate under three main categories: National Health Insurance, Employee Health Insurance, and the Medical Care System for the Elderly (Sudo *et al.*, 2018). Healthcare spending is funded through insurance premiums, public investment, and out-of-pocket payments (Sudo *et al.,* 2018).

In 1973, Japan introduced free healthcare for those over 70, but rising costs led to the 1982 Elderly Health System, requiring a 10% co-payment (Iijima *et al.,* 2021). In 2008, the Medical Care System for the Elderly (MCS75) mandated pension-based premiums, with funding from insurance premiums (10%), government subsidies (50%), and employee health insurance (40%) (Sudo *et al.,* 2018). This model increasingly burdens Japan's shrinking working population, raising concerns about long-term sustainability (Shirakura *et al.,* 2024).

Historically, in Japan, elderly care was a family duty, primarily assigned to women. In response to this socio-cultural vision, feminist movements have emerged, and, finally, Japan introduced the Long-Term Care (LTC) Insurance system in 2000, shifting the responsibility of old family members to society (Sasaki *et al.*, 2024). Funded equally by taxes and premiums from citizens aged 40+, LTC covers home services,

day-care centers, and residential care facilities (Igarashi *et al.,* 2020). The national government sets macro policies, while local municipalities manage implementation (Ni *et al.*, 2022, Tomita *et al.,* 2020).

The Community-Based Integrated Care System was developed in Hiroshima Prefecture in 1974. This model integrates medical care, long-term care, and social services into a cohesive system (Hatano *et al.,* 2017). Officially adopted in 2012, it promotes home-based care, community support, and service coordination (Sudo *et al.,* 2018). The Community-based Integrated Care System integrates four essential elements: self-help (Ji-jo), mutual aid (Go-jo), social solidarity care (Kyo-jo), and government care (Ko-jo). These aspects are managed by the Community General Support Center, which is composed of multidisciplinary teams, including nurses, social workers, and care managers. The system ensures tailored care, optimizing resource allocation and enhancing elderly well-being (Iijima *et al.,* 2021).

A core feature of the Community-Based Integrated Care System is its decentralized approach, ensuring that services are adapted to local needs. The model seeks to create an age-friendly environment where the elderly can receive seamless, continuous care within their communities rather than relying on hospital-centered care. Each municipality plays a crucial role in implementing this system, coordinating with non-profit organizations and private care providers to enhance accessibility and efficiency (Hatano *et al.,* 2017).

Following the abovementioned aspects, Japan seems to be a valuable context worth studying. While Western countries keep cutting healthcare expenditures and struggle with a workforce shortage, their population ages, and healthcare needs progress because of chronic diseases (Dal Mas *et al.,* 2020). This research aims to deepen the Japanese system and strategies to care for the older population through a structured literature review (SRL). The analysis of this paper is currently worth developing for two main reasons. Firstly, there is a lack of multilevel analyses that address the key factors needed to ensure sustainable healthcare amid rapid population aging in Japan. Western literature has yet to thoroughly examine the Japanese context, where tradition and technological innovation uniquely converge. As such, Japan offers a valuable case study and potential model for other countries facing similar demographic challenges.

Secondly, Japanese authorities identified the year 2025 as the historical moment when demographic changes will begin to occur that will reshape the scale of the issue concerning the aging of the Japanese population (Statistics Bureau of Japan, 2024). The goal is, therefore, to understand, at this point in time, the current conditions of the Japanese healthcare system and its actual problems, and identify areas that still need improvement in order to better manage the increasingly growing phenomenon of population aging.

2. Methodology

The study was conducted through an SLR (Rocco *et al.,* 2023; Massaro *et al.,* 2016; Shah & Robinson, 2006) using the Scopus database, the largest dataset of peer-reviewed abstracts and citations in the fields of science, technology, medicine, social sciences, arts, and humanities (Kraiwanit *et al.,* 2023).

For the purpose of this study, researchers identified an analytical research protocol. The research questions guiding the investigation to outline the most relevant aspects concerning the aging population in Japan and the impacts on the healthcare system were defined as follows:

Research Question #1: What are the issues highlighted in the international literature concerning the impact of Japan's aging population on its healthcare system?

Research Question #2: What are the current and future tools suitable for limiting and/or preventing the negative consequences of Japan's aging population on healthcare?

Research Question #3: What future research directions, public policies, and practical interventions could help mitigate the impact of population aging on the Japanese healthcare system?

The articles were selected using the following keywords in the search string: ageing, japan, healthcare. The literature search was limited to peer-reviewed articles published in English within the fields of medicine and social sciences. This resulted in 233 articles, from which those deemed irrelevant were excluded after reading the respective titles and abstracts. Non-eligible articles addressed incongruent or too generic aspects of the study area. Following this initial analysis, 65 articles were selected, of which only 52 were coded, as the remaining articles, after a thorough and careful reading, focused on non-relevant or too general aspects for this investigation. Figure 2 below shows the result of the search according to the PRISMA protocol (Prisma Statement, 2021).

Using the qualitative analysis software NVivo 14, the selected articles were read and coded. The identification of nodes and their sub-nodes was carried out by considering the literature (Rocco *et al.,* 2023, Shah & Robinson, 2006), the structure of the Japanese healthcare system, the phenomenon of Japan's aging population, and national reforms and their impact on Japanese society.

The first category of nodes concerns the geographical and temporal framework of each paper and the stakeholders involved in analyzing the phenomenon of population aging and its impact on the Japanese healthcare system. The second category of nodes relates to current problems identified by the international literature in the relationship between Japan's aging population and its impact on the healthcare system. The third category focuses on tools identified by international literature as effective in

improving healthcare and/or preventing issues closely associated with population aging, as well as on the potential benefits of implementing such measures.

3. Results

3.1 Reference framework (area of Japan, publication year, and involved stakeholders)

To better understand results, it should be noted that, administratively, Japan is divided into 47 Prefectures and 1,741 municipalities comprising cities, towns, and villages. The selected articles analyzed almost the entire territory of Japan, involving both metropolitan and rural areas. More specifically, 4 articles focused on Tokyo Prefecture, 3 on Shimane Prefecture, 3 on Kanagawa Prefecture, 2 on Hiroshima Prefecture and 2 on Gifu Prefecture. Finally, only one paper for each of these areas: Nagasaki, Okayama, Gunma, Shiba, and Ibaraki Prefectures.

The remaining articles did not focus on specific Prefectures but instead used general or substantial data on Japan or did not specify the area, due to methodological reasons. It can be inferred that the phenomenon of population aging is affecting the entire Japanese state and, therefore, scholars have investigated this issue with the goal of ensuring the efficiency and quality of healthcare in all Prefectures, always considering the period of Japan's economic stagnation. Nonetheless, existing literature highlights significant disparities in the dynamics of population aging between rural and metropolitan areas, as will be further examined in the following sections of this paper.

Regarding the publication period of the selected articles in this literature review, there has been a sharp increase in publications starting from 2020, with an average of 8.2 articles between 2020 and 2025, and a peak in 2024 with 13 papers. In contrast, between 2015 and 2019, the average was only 2.2 articles on the subject. The reasons for the increase in publications can primarily be found in the approach of 2025, the year the Japanese government - during the establishment of the Long-Term Care System - identified as the peak year for the increase in the elderly population, with one in four Japanese citizens expected to be 75 years or older (Health and Welfare Bureau for the Elderly Ministry of Health, 2016). Additionally, a further reason is the recent awareness of the importance of increasing life expectancy, not so much, but increasing healthy life expectancy to reduce the impact on Japan's healthcare spending (Iijima *et al.*, 2021).

The stakeholders involved in the selected research are diverse, and in addition to traditional actors such as patients, medical doctors, nursing staff, families of the elderly, and social workers, Japan has an innovative role played by care managers (Hatano *et al.,* 2017), the National Hospital Organization, which

encompasses public hospitals, private hospitals (Nakagawa et al., 2022), non-profit organizations (Hatano *et al.*, 2017), local communities (Ohta *et al.*, 2024), the central Government (Anezaki *et al.*, 2022), individual Prefectures, and, finally, the Ministry of Health, Labour and Welfare (Shirakura *et al.*, 2024).

It can be inferred that the phenomenon of Japan's aging population involves numerous actors, each with its own differentiated role, and that it is, therefore, necessary for Japan to develop multilevel solutions tailored to the functions and roles of all the stakeholders outlined.

3.2 Issues of the aging population on the Japanese healthcare system

The current demographic change in Japan and the increase in the elderly population face numerous challenges that can be categorized into four main areas: socio-cultural issues, economic and regulatory issues, healthcare and healthcare facility-related issues, and environmental issues (Table 4).

Table 4. *Challenges posed by Japan's aging population on the healthcare system, categorized into socio-cultural, economic and regulatory, healthcare and facility-related, and environmental issues.*

Category	Problems	References
Socio-cultural issues	- **Social isolation**: Decline in younger population, erosion of intergenerational interactions, and solitary lifestyles	(Ohta *et al.,* 2024) (Huang *et al.,* 2024)
	- **Reluctance to seek help**: Elderly hesitant to request assistance for health matters	(Ohta *et al.,* 2024)
	- **Single-person households**: Leads to lack of social control, underestimation of health symptoms, and delayed diagnoses	(Seo & Takikawa, 2022)
	- **Loneliness in rural areas**: Migration of younger population to cities, weakening of rural healthcare networks	(Ohta *et al.,* 2024)
	- **Cultural expectations on caregiving**: Continued belief that eldest sons and women should care for the elderly	(Peng et al., 2023)

Economic and organizational issues	- **Economic recession**: Shrinking workforce and decreased consumption affect economic growth	(Iijima *et al.,* 2021)
	- **Population onus**: Increased burden of aging population on economic growth and healthcare system	(Iijima *et al.,* 2021)
	- **Healthcare costs**: Rising healthcare costs due to aging and technological advancements	(Miyata *et al*., 2024)
	- **Poverty and healthcare**: Difficulty providing adequate assistance to families in poverty	(Sasaki *et al.,* 2024)
	- **Migration to cities**: Weakens local communities and healthcare services in rural areas	(Iijima *et al.,* 2021)
	- **Fragmentation of services**: Elderly struggle to understand and access fragmented LTC services	(Sasaki *et al.,* 2024)
Healthcare and facility-related issues	- **Increased demand for care**: Higher frequency of hospitalizations and emergency visits, particularly for elderly	(Nishikawa *et al*., 2024) (Huang *et al.,* 2024)
	- **Growth in chronic conditions**: Sharp rise in diseases, cancers, cardiovascular diseases and dementia	(Matsumoto *et al.,* 2022)
	- **Healthcare workforce issues**: Excessive workload for doctors and shortage of healthcare professionals, especially in rural areas	(Sato & Jakobsson, 2024)
	- **Polypharmacy**: Overuse of medications leading to adverse reactions like falls, kidney failure, and death	(Ando *et al.,* 2024) (Kawabuchi & Kajitani, 2024)
	- **Healthcare disparities**: Gaps in healthcare access and quality between urban and rural areas	(Sun *et al.,* 2024)
	- **Fragmented patient care**: Lack of coordination in care for elderly patients with multiple conditions	(Ando *et al.,* 2024)

Environmental issues	- **Impact of pollution**: Elderly population highly vulnerable to respiratory and cardiovascular diseases due to pollution	(Chen *et al.,* 2024)
	- **Global warming**: Aging population contributes to carbon emissions through consumption patterns	(Huang *et al.,* 2024)
	- **Elderly and climate crisis**: Increased elderly mortality due to pollution and rising healthcare costs	(Chen *et al.,* 2024)

3.2.a Socio-cultural issues

According to the international literature, a key socio-cultural issue in Japan is social isolation, particularly among older adults (Ohta *et al.,* 2024). This is primarily due to a decline in younger generations taking care of the elderly, reduced intergenerational interactions (Ohta *et al.,* 2024) and the normalization of solitary lifestyles (Huang *et al.,* 2024). As a result, many elderly individuals are reluctant to seek help, even when it concerns their health (Ohta *et al.,* 2024). In urban areas, the prevalence of single-person households reduces social oversight of the elderly (Seo & Takikawa, 2022), contributing to the underestimation of health symptoms and delayed disease diagnosis. Rural areas face similar challenges, as the migration of the younger workforce to cities leaves elderly individuals isolated (Ohta *et al.,* 2024). Post-pandemic, communication between rural communities and healthcare professionals has decreased (Ohta *et al*., 2024), and concerns over privacy limit elderly individuals' willingness to seek help *(Ohta et al.,* 2024).

Another issue, as highlighted in the literature, is the burden aging places on younger generations. Despite the slogan "*from care by the family to care by society*", young people still require additional state support to balance family caregiving responsibilities with their personal lives (Peng *et al.,* 2023). Some cultural expectations persist, such as the belief that the eldest son should care for elderly family members, while women are expected to leave work to take on caregiving roles (Peng *et al.,* 2023).

3.2.b Economic and organizational issues

The aging population in Japan poses significant economic and organizational challenges for the healthcare system. Economic stagnation, fueled by weak consumption and inflation, has eroded wages and pensions, leading to a "*population onus*" where a small workforce supports a growing elderly population. This trend reduces Japan's domestic market and investment attractiveness (Iijima *et al.*, 2021), placing a heavy financial burden on the working population to sustain the healthcare system (Nakagawa *et al.,* 2022)

The aging demographic also drives up healthcare costs, particularly due to the rapid advancement of medical technologies (Nakagawa *et al.,* 2022), threatening the sustainability of the system (Miyata *et al.,* 2024, Fukui *et al.*, 2017). Additionally, families in poverty often struggle to access public support, with many rejecting the help guaranteed by law (Sasaki *et al.,* 2024).

There is ongoing migration to metropolitan areas, weakening rural communities (Iijima *et al.,* 2021). Furthermore, a disconnect between policy and implementation, especially regarding long-term care regulations, and fragmented protection programs make access difficult for elderly users (Sasaki *et al.,* 2024). Some Prefectures also lack familiarity with the complex healthcare system, hindering effective support (Sasaki *et al.,* 2024).

3.2.c Healthcare and healthcare facility-related issues

The aging population in Japan has led to a higher demand for socio-healthcare assistance, increasing pressure on the healthcare system. Elderly individuals frequently use emergency services, hospitalizations, and home care, but outpatient visits are less common (Huang *et al.,* 2024). This demographic shift has also contributed to a rise in chronic diseases such as liver diseases, gastrointestinal and lung cancers, cardiovascular issues, dementia (Noguchi *et al.*, 2015; Kamegaya & Yamaguchi, 2016, Matsumoto *et al.,* 2022). Additionally, conditions like senile anorexia exacerbate malnutrition and increase the risk of falls, fractures, and general weakness (Iijima *et al.,* 2021).

Regionally, there is significant variability in healthcare resources, with some areas experiencing an oversupply of hospital beds while others face shortages (Kim *et al.,* 2022, Seo & Takikawa, 2022, Shirakura *et al.,* 2024). Delayed diagnoses often lead to emergency hospitalizations, driving up healthcare costs (Goto & Miura, 2022). Healthcare professionals are also impacted by the aging population, facing excessive workloads as patient needs rise (Sato & Jakobsson, 2024). Despite a 40-hour workweek limit, doctors in Japan average 80 hours per week (Sato & Jakobsson, 2024). There is also a shortage of healthcare staff, particularly in rural areas, where unequal distribution of specialists exacerbates disparities in care access (Tsumura *et al.,* 2020).

The fragmentation of care for elderly patients with multimorbidity increases healthcare costs, with polydoctoring and polypharmacy contributing to inefficiencies and adverse effects (Iijima *et al.,* 2021; Ishida *et al.*, 2022; Hamada *et al.,* 2023; Ando *et al.,* 2024). Japan's dependence on medications increases the risk of dangerous drug interactions and inappropriate prescriptions (Kawabuchi & Kajitani, 2024)
Despite universal healthcare, disparities between urban and rural areas persist, with rural areas facing higher mortality rates and lower life expectancy (Iijima *et al.,* 2021, Sun *et al.,* 2024). Urban areas have more access to home care services and home visits, while rural residents rely more on long-term care facilities. The healthcare system's focus on hospital visits rather than long-term relationships with specialized doctors reflects a "*cure-seeking*" philosophy rather than a preventive approach (Iijima *et al.,* 2021).

3.2.d Environmental issues

The final macro category addresses the link between Japan's aging population and the climate crisis. Recent studies highlight the growing concerns related to increased life expectancy and pollution. In Japan, pollutant concentrations are higher in densely populated regions, especially in the western and central areas. Globally, air pollution has worsened, and Japan's aging population exacerbates global warming (Chen *et al.,* 2024). The rise of single-person households, particularly among the elderly, contributes significantly to carbon emissions, a phenomenon termed the "*solo economy*" (Huang *et al.,* 2024).
The elderly are especially vulnerable to high levels of PM 2.5, leading to respiratory and cardiovascular disorders. Elevated pollution increases mortality rates in the elderly, further raising healthcare costs (Chen *et al.,* 2024). Consequently, the health of the elderly depends on environmental quality, while their consumption patterns contribute to CO2 emissions, highlighting the need for effective management to mitigate the impact on climate change (Huang *et al.,* 2024).

3.3. Measures to improve healthcare and prevent problems directly related to the increase in the elderly population

In light of the heterogeneous issues raised in the previous paragraph, the literature has identified specific measures aimed at ensuring the right to health for elderly people in Japan, balancing this with the need to control costs and manage healthcare effectively. For clarity, the tools identified in the literature have been divided into five categories: adoption of new approaches, specific healthcare measures related to

healthcare, preventive measures, public policies and regulatory aspects, and the use of technologies (Table 5).

Table 5. *Measures to improve healthcare and prevent challenges associated with Japan's aging population, categorized into adoption of new approaches, healthcare-specific measures, preventive strategies, public policies and regulations, and technological interventions.*

Category	Key Measures	References
Adoption of new approaches	**- Focus on healthy life expectancy**, not just life expectancy, to reduce healthcare burden	(Iijima *et al.,* 2021)
	- **Shift from "cure-seeking" to "cure and support-seeking" care**, incorporating a multidisciplinary approach	(Iijima *et al.*, 2021)
	- **Promote patient-centered care**, with active patient involvement	(Yoshino *et al.*, 2023)
	- **Incorporate international experiences** and train healthcare professionals in geriatrics	(Saiki *et al.*, 2017) (Sato & Jakobsson, 2024)
Specific healthcare measures	- **Focus on home healthcare**, especially in rural areas, and increase outpatient services	(Seo & Takikawa, 2022)
	- **Develop a network of specialized nurses** to alleviate doctors' workload	(Sato & Jakobsson, 2024)
	- **Foster collaboration among healthcare professionals** (doctors, nurses, dietitians) to improve patient care	(Iijima *et al.,* 2021) (Sato & Jakobsson, 2024)
	- **Increase the role of family medicine** in rural areas and promote non-specialized home visits	(Ohta *et al.,* 2024)
	- **Integrate Kampo medicine**, addressing both physical and psychological health	(Yoshino *et al.,* 2023)

Preventive measures	- **Encourage physical activity** in the community to reduce health issues and costs	(Seo & Takikawa, 2022)
	- **Promote awareness of nutrition**, especially in addressing senile anorexia	(Iijima *et al.,* 2021) (Morishita *et al.,* 2024)
	- **Foster social participation** to reduce disabilities and healthcare costs	(Fukunishi & Kobayashi, 2023)
	- Support research on the climate crisis' impact on elderly health and improve regional planning for ambulance	(Takagi *et al.,* 2024)
Public policies and regulatory	- **Promote regionally differentiated home care policies** and support research for effective elderly health strategies	(Noguchi *et al.,* 2015) (Saiki *et al.,* 2017)
	- Improve collaboration within the healthcare system to address issues in depopulated areas	(Ohta *et al.,* 2024)
	- **Encourage policies that reduce co-payments** for financially struggling elderly individuals	(Kato *et al.,* 2022)
Implementation of technologies	- **Strengthen telemedicine services, AI, and robotics**, especially in long-term care	(Sun et al., 2024)
	- **Use predictive models** to identify high-risk healthcare areas and plan future demand for long-term care services	(Fukunishi & Kobayashi, 2023)
	- **Invest in quantitative forecasts to improve long-term care planning and prevent issues** such as medication demand	(Sato & Jakobsson, 2024)

3.3.a Adoption of new approaches

Renewing approaches to elderly care in Japan is essential for the international literature. Public policies should focus on promoting healthy life expectancy, rather than just extending lifespan, to ease the burden on families and the healthcare system (Iijima *et al.,* 2021). Healthy life expectancy refers to an elderly person's ability to perform daily activities independently (Iijima *et al.,* 2021). Additionally, the concept of

care should shift from "*cure-seeking medical care*" to a "*cure and support-seeking*" approach, incorporating a multidisciplinary model that includes prevention and addresses both medical and socio-cultural needs (Iijima *et al.,* 2021).

Patient-centered care is key, with patients actively participating in treatment alongside healthcare professionals (Yoshino *et al.,* 2023). Incorporating international experiences could also benefit Japan's healthcare system (Saiki *et al.,* 2017, Sato & Jakobsson, 2024). Training the next generation of healthcare professionals in geriatrics is crucial, as the traditional division of medical specialties in Japan does not align with the comorbidities commonly seen in elderly patients. This requires enhanced training for general physicians and nurses in comprehensive patient management, especially in end-of-life care (Igarashi *et al.,* 2020; Nishikawa *et al.,* 2024).

3.3.b Specific measures related to healthcare

Numerous studies underscore the importance of reducing pressure on hospital services for elderly care by strengthening alternative care models, particularly home healthcare tailored to regional characteristics (Seo & Takikawa, 2022). Special attention is needed in rural areas, where home healthcare remains underused (Seo & Takikawa, 2022), as well as in expanding outpatient services (Sun *et al.,* 2024)

To mitigate excessive workloads, the development of a network of specialized nurses has been proposed. These professionals could work autonomously or alongside physicians, taking on tasks currently limited to doctors, thus easing strain on the system and reducing costs (Sato & Jakobsson, 2024). Enhancing collaboration among healthcare providers—such as physicians, dietitians, physiotherapists, and pharmacists—is also crucial. Several authors support creating interdisciplinary platforms to foster knowledge exchange and synergy (Iijima *et al.,* 2021).

Family medicine plays a vital role in rural settings, where elderly patients predominate. Its holistic approach supports a better understanding of patients' conditions and fosters trustful, ongoing relationships, which improve outcomes (Ohta *et al.,* 2024) .Non-specialized care, such as home visits by volunteers appointed by public authorities, also contributes significantly to elderly well-being, helping reduce isolation and depressive (Noguchi *et al.,* 2015). Finally, recent studies have highlighted the value of Kampo medicine, a traditional Japanese practice integrating natural and modern approaches. Kampo treatments address both physical and psychological health, reinforcing the human connection in patient care (Yoshino *et al.,* 2023).

3.3.c Preventive measures: exercise, nutrition, and social participation

International literature identifies three key factors that contribute to ensuring a healthy life expectancy for the elderly: exercise, nutrition, and social participation (Iijima *et al.,* 2021). Studies indicate that elderly individuals working in the primary sector experience fewer health issues and lower healthcare costs (Seo & Takikawa, 2022).

Furthermore, community-level outdoor activities are essential for reducing hospital admissions and dementia (Kamegaya & Yamaguchi, 2016). The literature emphasizes that preventive actions, in addition to regular check-ups, are necessary to maintain elderly health (Morishita *et al.,* 2024). Nutritional awareness is highlighted due to high rates of senile anorexia, with a healthy diet being crucial for aging well (Kamegaya & Yamaguchi, 2016; Morishita *et al.,* 2024). Social participation, particularly through group activities and dialogue, is also seen as beneficial in reducing disabilities and healthcare costs (Fukunishi & Kobayashi, 2023).

Moreover, international studies stress the importance of preventive measures related to the climate crisis for elderly populations, including research on regional ambulance and hospital planning (Yuan *et al.,* 2024). The "*Proper Medication Guidelines for Older Adults*" by Japan's Ministry of Health also address the adverse effects of polypharmacy, though there is a call for more region-specific data (Ishida *et al*., 2022).

3.3.d Public policies and regulatory aspects

According to the international literature, new public policies are essential to support home care in a regionally differentiated manner. Multidisciplinary research plays a crucial role in defining effective strategies to promote elderly health (Noguchi *et al*., 2015, Saiki *et al.,* 2017). Collaboration within the healthcare system is key to improving local community engagement (Ohta *et al.,* 2024). The Government must consider the resource shortages and low utilization rates of home care support clinics/hospitals (HCSC) in depopulated areas, exacerbated by misinformation (Iijima *et al.,* 2021, Sun *et al.,* 2024). Literature suggests that promoting home care policies is necessary, as the LTC Insurance System may become financially unsustainable without such initiatives (Sugimoto *et al.,* 2017, Ni *et al.,* 2022). Additionally, policies should include surveillance networks to address rising temperatures, which is supported by scientific evidence (Yuan *et al.,* 2024). Studies also highlight the positive effects of reducing co-payment costs for elderly individuals with financial difficulties, urging lawmakers to reconsider the current model to prevent outpatient service abuse while ensuring proper elderly healthcare (Kato *et al.,* 2022).

3.3.e Implementation of technologies

The digital transformation of healthcare systems has significant potential, but sometimes the technological unpreparedness of countries limits its development and effectiveness. Increasing literature focuses on the need to strengthen telemedicine services in Japan (Sun *et al.,* 2024), as well as AI and robotics, particularly in long-term care (Ito *et al.,* 2017M Iijima *et al.,* 2021,). In the area of telemedicine, despite the existence of various studies and analyses, the majority are published in Japanese, thereby limiting their accessibility to the international research community (Ito *et al.,* 2017).
The aware use of predictive models by both the central and local governments to identify high-risk areas for healthcare demand and implement tools for the elderly population would have a significant impact (Fukunishi & Kobayashi, 2023)

Investment in quantitative forecasts regarding future demand for long-term care services, using data related to medical and long-term care insurance claims, is also essential (Sato & Jakobsson, 2024). This would allow for preventive research on primary issues such as medication demand and hospitalization rates (Sato & Jakobsson, 2024).

4. Discussion

The introduction highlights that this paper aims to examine, in light of the current state of the Japanese healthcare system and the challenges and countermeasures identified in the existing literature, which areas can still be further strengthened to mitigate the health-related impacts of population aging.

4.1. Urban and rural areas: a multilevel challenge

It clearly emerges that population aging in Japan, while a nationwide phenomenon, requires differentiated analysis based on territorial specificities due to increasing polarization between urban and rural areas. Rural regions, now predominantly inhabited by elderly individuals following the outmigration of younger populations to cities, show a heightened demand for healthcare services. This is linked to the lack of public services, the erosion of informal caregiving networks, and the social isolation of older adults (Ohta *et al.,* 2024). However, this rising demand clashes with the shortage of healthcare personnel, the low attractiveness of rural areas for medical professionals, and the limited availability of home-based care, leading to inequalities in access to healthcare compared to urban-dwelling elderly populations. These disparities result in lower life expectancy and reduced access to home care services in rural communities.

In urban areas, while older adults also experience social isolation, the underlying causes are largely cultural—stemming from the weakening of social networks and intergenerational separation. Nonetheless, access to healthcare, especially home-based medical services, tends to be more readily available in urban contexts. The Community-based Integrated Care System, from its inception, has emphasized the importance of social cohesion by promoting locally grounded interventions to address aging through a multilevel system that integrates medical care, long-term care, and preventive and recreational activities—often organized by volunteers.

Despite the proactive nature of Japan's national aging policy, challenges remain, particularly regarding the limited local recognition of the role of Community General Support Centers and the persistent asymmetry in service provision between urban and rural areas. The literature remains largely unanimous in recognizing the need to develop strategies within the current system that more effectively address territorial disparities in aging and healthcare access.

4.2. Geriatric care and workforce challenges in an aging society

It clearly emerges that demographic aging in Japan poses a systemic challenge to healthcare services, significantly increasing the workload and straining the sustainability of care provision. The growing proportion of elderly individuals has led to a substantial rise in healthcare demand, with direct consequences on the volume and quality of work expected from medical personnel (Sato & Jakobsson, 2024).

Beyond quantitative pressures, there is a pressing qualitative need for a holistic, multidimensional approach to elderly care. This population is marked by high rates of comorbidities, clinical frailty, and complex psychosocial needs—factors inadequately addressed by the current system, which remains heavily compartmentalized by medical specialty. It clearly emerges that the rigid separation of disciplines within Japan's healthcare system is not well-suited to managing the complex nature of aging, reinforcing the need to strengthen geriatric training across the entire healthcare workforce, including general practitioners and nurses (Iijima *et al.*, 2021). Geriatric competencies are essential for fostering an integrated approach to care that includes clinical, functional, cognitive, and social aspects of aging. This is particularly critical in advanced stages of life, where care delivery requires specific skills in palliative medicine, empathetic communication, and comprehensive patient assessments (Igarashi *et al.,* 2020, Nishikawa *et al.*, 2024).

In this context, family medicine emerges as a pivotal field due to its ability to ensure continuity of care and its deep knowledge of the patient's overall life situation—particularly relevant in rural areas with limited specialist access (Ohta *et al.,* 2024). At the same time, non-specialized support, such as home visits by volunteers appointed by local authorities, plays a complementary role in reducing isolation and supporting the psychological well-being of older adults. In conclusion, it is therefore essential to promote a care model based on geriatric and holistic competencies, integrating clinical, social, and relational dimensions to ensure effective, dignified, and sustainable care for Japan's aging population. Moreover, dedicated professional figures like case managers, nurse navigators, or advanced nurse practitioners (Schiavone *et al.,* 2023) may further support families, bridging the gaps between the multidisciplinary care team and the patient/families (Brown *et al.*, 2012; Htay & Whitehead, 2021).

4.3. Technological innovation: a patient-centered model

With reference to the second research question, the literature highlights with particular emphasis the need to advance technological innovation in the healthcare sector. A key rationale for this is the recognition that, from a public health perspective, promoting healthy aging in Japan increasingly depends on the ability to anticipate and respond to health risks early on—something that digital innovation can greatly support. In this regard, tools such as predictive models, remote monitoring systems, and digital health platforms are seen as crucial in shifting the paradigm from reactive treatment to proactive, preventive care, especially for elderly patients who often face multiple chronic conditions (Iijima *et al.,* 2021, Sato & Jakobsson, 2024, Sun *et al.,* 2024). In particular, the integration of these technologies supports early diagnosis, enables timely interventions, and allows for personalized care planning based on real-time data. This not only improves patient outcomes but also alleviates pressure on healthcare providers and facilitates more efficient use of resources. However, the success of these innovations depends on the development of user-friendly systems adapted to the needs of older adults, as well as investments in digital literacy and infrastructure.

Despite the acknowledged potential of emerging technologies—such as predictive and generative artificial intelligence, robotics, telemedicine, and remote monitoring—there are still challenges in establishing a clear, hierarchical, and planned framework for current and future interventions. Nonetheless, the literature reflects a growing awareness of the Japanese government's commitment to a multidisciplinary, patient-centered approach to elderly care, in which technological measures are increasingly integrated into healthcare delivery.

Given the projected rise in LTC system costs over the coming decades, it appears necessary to structure a progressive and coordinated alignment between predictive technologies and the evolving use of long-term care services. Still, this topic aligns with the ongoing global debate on the potential of virtual hospitals and telemedicine applications, which offer promising solutions for ensuring continuity of care in aging societies (Pegoraro *et al.,* 2023). In this context, Japan may serve as a key testing ground for the integration of advanced digital solutions into large-scale eldercare systems.

To ultimately prevent Japanese technological advancements and scientific contributions from remaining confined within national borders due to language barriers, it is essential to establish direct connections between Western and Japanese research communities.

4.4. A challenge between the climate crisis and comorbidities

The intersection of Japan's aging population, climate change, and fragmented healthcare presents a complex challenge. The increase in single-person elderly households, referred to as the "*solo economy*" (Huang *et al.,* 2024), contributes to higher carbon emissions while also making the elderly more vulnerable to environmental stressors like air pollution (Chen *et al.,* 2024). Climate change worsens chronic conditions such as cardiovascular, respiratory, and neurodegenerative diseases, with extreme weather events and pollution exacerbating symptoms. The presence of comorbidities complicates disease management, increasing the risk of negative interactions between health conditions and environmental factors.

In light of the literature, it emerges that care strategies must evolve to address these issues in a more integrated and coordinated manner, considering the interaction between health, environment, and healthcare. In terms of environmental sustainability, there is significant room for improvement and optimization of current policies and practices. Despite the progress made, the transition toward a truly sustainable healthcare system requires further reflection and development in public policies to more effectively address the relationship between aging, health, and the environment. Addressing these challenges requires integrated strategies that combine environmental sustainability and healthcare optimization. However, in terms of measuring and evaluating sustainability policies, there is still a lack of effective and shared tools. In this context, it is essential to emphasize that sustainable cost savings, which, if adequately planned from the design phase, should primarily drive practices, can and should be the main driver for adopting sustainable solutions. The potential for cost containment, for example, through energy efficiency or reducing hospitalizations via targeted environmental interventions, can provide a

concrete incentive for public and private stakeholders. However, shared evaluation tools that fully capitalize on this potential are still lacking. Greater attention to the economic impact of sustainable measures would strengthen their implementation and accelerate the transition to a more resilient healthcare system that is also attentive to environmental balances.

5. Conclusions

The literature review has allowed the exploration of various aspects of the global phenomenon of population aging in Japan, a country known for its high life expectancy. In particular, the lessons learned from Japan's integration of traditional principles - such as self-help and mutual assistance - into elderly care policies provide significant insights for other countries that will face growing elderly populations in the future (Nomura & Miyata, 2020; Nagai *et al.,* 2022). These principles, deeply rooted in Japanese culture, have been crucial in shaping a healthcare system that, despite numerous challenges, has shown remarkable resilience (Hatano *et al.,* 2017).

The Japanese healthcare system has implemented various measures in response to the growing elderly population, including healthcare payments for those over 75 and the Long-Term Care Insurance System. While notable progress has been made, persistent issues—such as rising healthcare costs, a shortage of qualified professionals, and the social isolation of the elderly—continue to pressure the system.

Japan's advanced infrastructure makes it well-suited to scale and integrate such innovations across the healthcare system. The continued development of digital health—particularly in telemedicine, robotics, and predictive analytics—is already improving quality. Yet these technologies could yield even greater benefits if strategically expanded and aligned with broader care policies. Japan's strong planning capacity and ability to anticipate demographic shifts position it to lead in AgeTech—technologies that support elderly health, independence, and well-being.

Ensuring the accessibility of these technologies is of paramount importance. In this regard, the concept of an "*age-free society*" is gaining relevance, promoting the idea that older adults should not be seen merely as a societal burden but as a valuable resource. Intergenerational cooperation and the strengthening of community support networks are essential to combat isolation and alleviate the pressure on family caregivers. In this sense, the technological competencies of younger generations should be leveraged to assist and empower older adults. Another crucial issue is sustainability, both social and environmental. Aging, combined with more single-person elderly households, impacts the environment through higher

carbon emissions and energy consumption. Here, the One Health approach offers a promising solution. By recognizing the link between human, and environmental health, it promotes integrated policies that enhance both elderly care and ecological balance—ensuring not only quality of life for older adults but also the sustainability of the system itself. It is therefore essential to adopt a One Health approach that embraces human, social, and environmental interconnection, engaging all stakeholders in creating inclusive, sustainable care models, supported by targeted technological innovation.

5.1. New research avenues

Future research on population aging should increasingly focus on territorial-level analyses, emphasizing empirical studies that assess the performance of specific hospitals, healthcare districts, or care facilities in managing the growing demand for elderly care. Priority should be given to identifying effective models at the local level that can respond sustainably and adaptably to the aging population's needs, rather than relying on generic analyses of macro-areas or overarching themes. In this regard, fostering continuous dialogue among academia, institutions, healthcare providers, and between Western and Japanese stakeholders is essential to ensure that research does not remain theoretical or disconnected from real-world needs, but instead contributes concretely to developing practical and widely accepted solutions (Kaneko *et al.*, 2022; Shiratori *et al.,* 2023).

At the same time, scientific investigation into the environmental impact of elderly care models must be intensified, particularly concerning energy consumption, emissions associated with new lifestyles, and housing systems for people over 65. A multidisciplinary approach is required—one that integrates medicine, health economics, law and engineering—in order to develop predictive and operational models aimed at the ecological sustainability of social and health services.

Lastly, research should delve deeper into the role of emerging technologies—such as telemedicine, assistive robotics, home monitoring systems, and artificial intelligence for predictive analytics—in the management of population aging. It is essential to assess these innovations in terms of their effectiveness, accessibility, social acceptability, and economic sustainability, with particular attention to their adaptability across diverse regional and infrastructural contexts. Only a serious and collaborative investment in technological research can ensure that these innovations become central tools in effectively and addressing the challenges posed by an aging society.

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Ethics, Consent to Participate, and Consent to Publish declarations

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Clinical trial number

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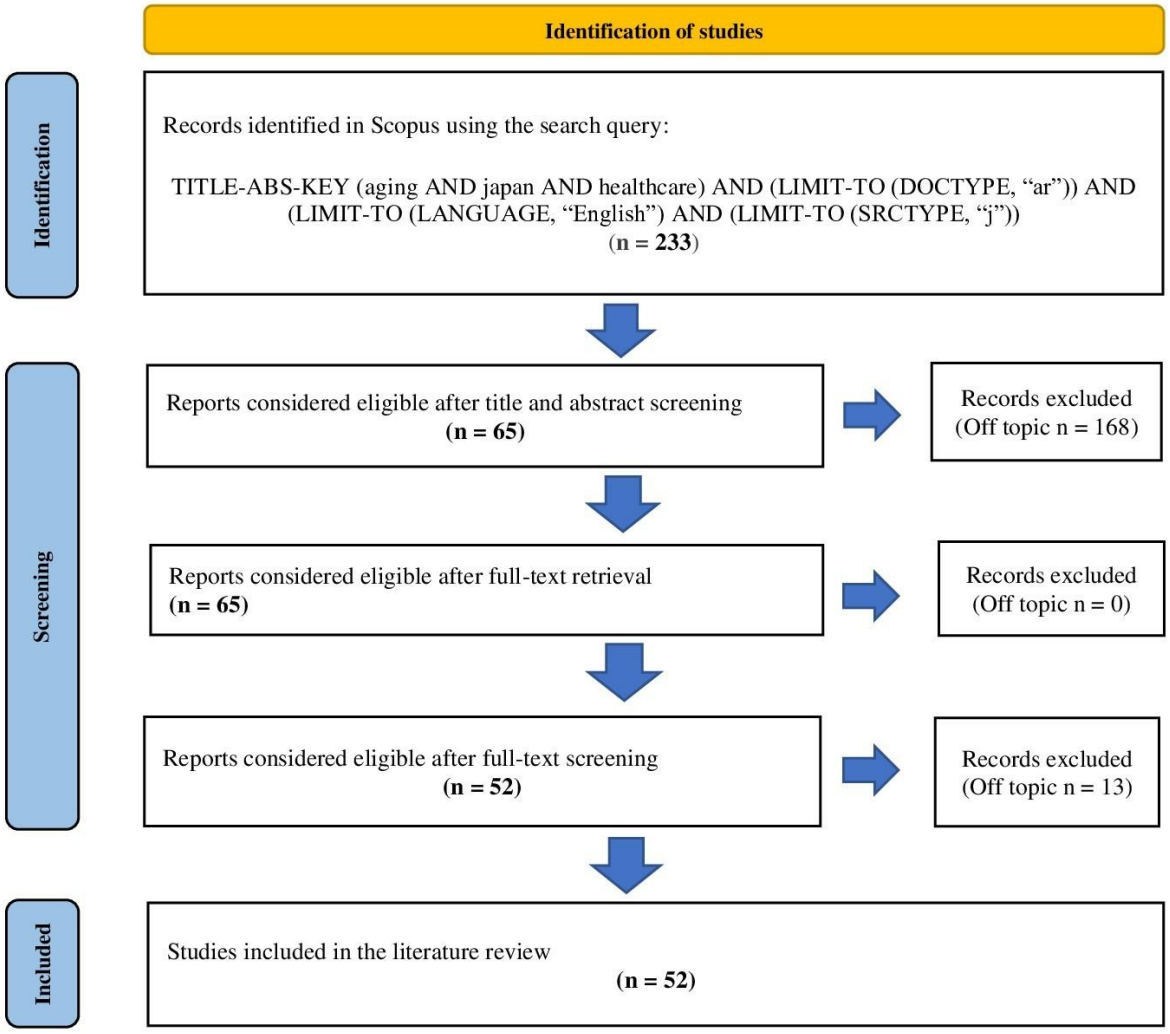
Conflict of interest

All the authors declare that they have no conflicts of interest associated with the conduct of this work.

Figure 2. *Flow diagram related to the steps of the review according to the PRISMA protocol. Date of search: January 29th, 2025.*



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Paper 3 - Relational Capital as a driver of knowledge management in healthcare systems: evidence from the KMU–KMU Hospital Case in Japan

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Abstract

Purpose: This study explores how knowledge management (KM) and relational capital (RC) can serve as strategic levers to address the challenges of an aging population within healthcare systems. Focusing on Kansai Medical University (KMU) and its affiliated hospital in Japan, the research examines how integrating traditional Japanese care principles, organizational knowledge systems, and digital transformation fosters sustainable, patient-centered elderly care.

Design/methodology/approach: An Interventionist Research (IVR) approach was employed through a longitudinal single-case study at KMU. Data was collected over six months via participant observation, institutional documentation, and semi-structured interviews with key stakeholders. The analysis combined theoretical insights from KM and RC with empirical evidence to identify how knowledge flows, interprofessional collaboration, and digital tools shape healthcare delivery for the elderly.

Findings: The results highlight that KMU's ability to integrate relational and technological infrastructures enables efficient knowledge sharing across departments, enhancing care coordination and organizational learning. Traditional Japanese principles of self-help (Ji-jo), mutual aid (Go-jo), social solidarity (Kyo-jo), and government care (Ko-jo) remain embedded in the institutional culture and are operationalized through RC and digital systems.

Originality/value: This study offers one of the first empirical examinations of how KM and RC jointly enable healthcare organizations to manage demographic aging. By positioning the university as an

orchestrator of knowledge flows among multiple stakeholders, the research contributes to the theoretical understanding of KM and RC in healthcare and provides practical insights for policymakers and hospital administrators seeking to design knowledge-driven, relationally grounded models of elderly care.

Keywords: Relational Capital; Japan; Healthcare; Aging population; Interventionist Research

Paper type: Research Paper

1. Introduction

The demographic transition towards an aging population is a significant challenge for the world in the 21st century (Jane Osareme *et al.*, 2024). It significantly influences the structure, sustainability, and equity of healthcare systems. Japan, specifically, is at the forefront of this demographic transformation. Over one-third of its population exceeds 65 years of age, rendering it a living laboratory for examining the impacts of aging on organizations, healthcare, and society(Ohta *et al.*, 2024). As the demand for long-term and integrated care increases, healthcare systems are becoming increasingly complex, fragmented, and often poor in resources, both human and financial. These dynamics require both technology solutions and effective strategies for information collection, dissemination, and collaboration among many stakeholders. In this evolving context, Knowledge Management (KM) emerges as a crucial competency for healthcare businesses seeking to transform fragmented information into valuable knowledge and foster innovation across professional and organizational boundaries (Karamitri *et al.*, 2017). Nonetheless, despite a growing awareness of its significance, the healthcare sector continues to face numerous challenges regarding effective KM, including fragmented communication and an absence of structured methods for information translation. In this context, Relational Capital (RC), the intangible value derived from trust-based relationships, cooperative networks, and institutional partnerships, is crucial (Cachón-Rodríguez *et al.*, 2022; Zamboni *et al.*, 2024). RC facilitates the dissemination of knowledge, promotes collaboration among healthcare professionals, and strengthens the connections between hospitals, universities, and local communities.

This enhances the system's resilience and prioritizes patient requirements. In Japan, where traditional values such as Ji-jo (self-help), Go-jo (mutual aid), Kyo-jo (social solidarity), and Ko-jo (government care) significantly influence healthcare delivery, the interaction between KM and RC is crucial (Sudo *et al.*, 2018). The integration of these concepts with contemporary technology, such as telemedicine, artificial intelligence, and data analytics, fosters innovative hybrid healthcare models that prioritize both knowledge and relationships(Ito *et al.*, 2017). Nevertheless, integrating these methodologies raises significant concerns regarding individuals' adoption of technology, their proficiency in using it, and the

preservation of human-centered care principles. Universities, as repositories of knowledge, are ideally positioned to spearhead these transformations (Massaro *et al.*, 2022). They facilitate knowledge exchange and relationship development by serving as venues for academia, healthcare organizations, and society to converge (Secundo *et al.*, 2018).

Starting from these premises, this study builds on existing foundations by investigating the relationship between KM and RC in the healthcare sector, focusing on the case study of Kansai Medical University (KMU) and its affiliated hospital in Japan, employing an Interventionist Research (IVR) methodological approach. KMU exemplifies how a university-hospital system may integrate traditional Japanese care ideals, advanced technology, and KM systems to address the challenges associated with an aging population.

This research will not only address these issues but will also investigate the effectiveness of KM tools, considering the fragmented nature of healthcare knowledge highlighted in the literature and their degree of adaptability to the specificities of the healthcare sector (Pereira & Fernandes, 2025). Such an analysis will contribute to understanding how KM can enhance coordination, knowledge sharing, and innovation in contexts where demographic pressures exacerbate systemic fragmentation, with the potential to also contribute to the achievement of social challenges (Brescia *et al.*, 2025). Conceptually, this study is grounded in KM and RC as its primary analytical lenses. These perspectives are employed to examine how knowledge is created, shared, and mobilized through trust-based relationships in a complex healthcare ecosystem. The role of the university is interpreted not as an additional theoretical construct, but as an orchestrating mechanism through which KM and RC are enacted in practice. The interventionist research approach provides the methodological logic enabling access to these processes in situ, while digital technologies, demographic aging, sustainability concerns, and culturally rooted care principles constitute the contextual conditions shaping the empirical setting rather than parallel theoretical frameworks. This hierarchical positioning allows analytical focus to be maintained while preserving the empirical richness of the case.

2. Literature review

2.1. Demographic aging, chronicity, and systemic fragmentation in Japanese healthcare

The management of an elderly population has several effects on the Japanese healthcare system and stands as an interdisciplinary and cross-sectional subject, encompassing medical, social, economic, and technological fields. The current literature highlights several study traditions and methodological approaches, underscoring the challenges of managing aging in a society marked by rapid demographic change. A considerable number of studies emphasize the increasing prevalence of chronic illnesses linked

to an aging population, alongside the urgent problem of healthcare fragmentation (Sasaki *et al.*, 2024). Within this context, the absence of effective communication, knowledge translation, and collaboration among medical professionals and other stakeholders represents a major barrier (Ando *et al.,* 2024), consistent with the broader international debate on healthcare integration (Dal Mas, Biancuzzi, *et al.,* 2020; Dal Mas, Garcia-Perez, Sousa, Lopes da Costa, *et al.,* 2020; Graham, Logan, Harrison, *et al.,* 2006). These challenges point to structural weaknesses that limit the capacity of healthcare systems to respond effectively to population aging.

2.2. Knowledge-intensive healthcare and the role of knowledge management

In response to these systemic pressures, several studies stress the need to adopt patient-centred approaches and to establish support mechanisms for healthcare professionals across multiple disciplines, not limited to physicians alone (Yoshino et al., 2023). Healthcare systems are fundamentally knowledge-dependent, and the integration of evidence-based medicine into routine clinical practice is essential (El Morr & Subercaze, 2010). Optimal care for elderly patients requires collaboration among diverse stakeholders who must continuously exchange competencies and expertise (Cobianchi et al., 2022). In the Japanese context, this perspective aligns with the knowledge-creation framework proposed by Nonaka and Takeuchi, which holds that knowledge generation extends beyond the management of objective data and relies on the elicitation and diffusion of tacit, experience-based insights within organizations (Nonaka *et al.,* 1996). Accordingly, knowledge management, defined as the creation, storage, sharing, and application of knowledge to improve decision-making and foster innovation, has emerged as a core organizational capability in contemporary healthcare organizations (Abubakar et al., 2019). Knowledge operates at both individual and organizational levels: individual knowledge reflects the competencies of single actors, while organizational knowledge results from the collective accumulation and structuring of these insights (Merali, 2000; Tsoukas & Vladimirou, 2001).

2.3. Relational capital, coordination, and patient-centered integration

Despite the centrality of knowledge, coordinating medical professionals and institutional actors remains a critical challenge. This difficulty highlights the importance of RC, understood as the intangible value generated through the establishment, maintenance, and enhancement of high-quality relationships with external partners (Bagnoli *et al.,* 2020). In healthcare settings, RC is essential for improving system efficiency and enabling patient-centred care models, as it facilitates trust, collaboration, and effective knowledge exchange across organizational boundaries (Paoloni & Modaffari, 2022). Thus, relational

dynamics emerge as a necessary complement to KM in addressing healthcare fragmentation and enhancing integrated care for the elderly population.

2.4. Technological innovation, digitalization, and knowledge dynamics

Although relatively few contributions explicitly address technological innovation as a response to demographic aging, Japan's advanced infrastructure and long-term planning capabilities position the country as a global leader in Age Tech (Iijima *et al.,* 2021; Kawabuchi & Kajitani, 2024). This leadership is supported by strong governmental investment in clinical research, which drives advances in disease management and therapy (Muili *et al.,* 2024). Digital health solutions, including telemedicine, robotics, and predictive analytics, offer significant potential to improve efficiency and quality of care, particularly when integrated into comprehensive and accessible care strategies. Technologies supporting aging in place emphasize communication accessibility, emergency support, and physical and emotional well-being, while simultaneously generating large volumes of data (Ollevier *et al.,* 2020). However, the effective use of these technologies depends on robust knowledge dynamics (Biancone *et al.,* 2021; Secundo *et al.,* 2019) and the development of appropriate competencies (Caputo *et al.,* 2023). The healthcare sector is increasingly characterized by fragmented data, complicating the identification of meaningful patterns for patient care and public health (Obenshain, 2004). Integrating ICT, data analytics, KM, and information systems enables the transformation of heterogeneous datasets into actionable insights that support timely and reliable decision-making (Loftus *et al.,* 2020; Spanò *et al.*, 2021; Wickramasinghe *et al.,* 2009). More broadly, digitalization has reshaped organizational processes and enabled new business models in healthcare (Al-Emran & Griffy-Brown, 2023; Bagnoli *et al.,* 2019). These technologies also facilitate virtual networks that overcome geographical barriers, giving rise to virtual relationships (VR) and virtual relational capital (VRC), which support trust-building and awareness between healthcare organizations and patients (Zamboni *et al.,* 2024).

2.5. Active aging, sustainability, and research gaps

Beyond healthcare delivery, the literature increasingly frames aging as a societal resource. The concept of an "*age-free society*" emphasizes older individuals as active contributors rather than passive recipients of care (Iijima *et al.,* 2021). In Japan, although more than 70% of individuals over 65 wish to continue working, only about 20% are employed, highlighting the lack of structured opportunities to valorise their skills. Empowering older adults as "*supporters of society*" can enhance public welfare while promoting health, self-efficacy, and well-being (Iijima *et al.,* 2021). Accordingly, several studies emphasize the need for systems that capture, preserve, and reintegrate the expertise of senior workers into society,

particularly in knowledge-based economies. At the same time, the debate on aging in Japan is closely linked to sustainability concerns. The rise of single-person elderly households and increasing healthcare demand generate environmental externalities, including higher energy consumption and carbon emissions (Huang *et al.,* 2024). The One Health approach, which recognizes the interdependence of individual, societal, and environmental health, offers a promising framework for addressing these challenges (Jindai *et al*., 2018). In line with this perspective, Japanese policies emphasize disease prevention, healthy lifestyles, and the integration of complementary and alternative medicine, contributing to cost reduction, environmental sustainability, and healthcare accessibility (Sakamoto *et al.,* 2018; Kondo *et al.,* 2018).

In conclusion, despite the breadth of existing literature, notable gaps remain. Persistent deficiencies in communication, knowledge sharing, and intersectoral coordination continue to hinder effective elderly care (Ando *et al.,* 2024). Moreover, although technological innovations are widely recognized, few studies investigate their concrete integration into daily clinical practice through KM approaches (Iijima *et al.,* 2021; Kawabuchi & Kajitani, 2024). Overall, there is a lack of contributions that explicitly address the combined role of KM and RC in managing the challenges of an aging society. To address this gap, the present study adopts an IVR perspective to highlight the strategic role of KM and RC in supporting the transformation required by demographic aging, using the Japanese context as a reference with broader international relevance (Nomura *et al.,* 2021; Ohta *et al.,* 2024; Sato *et al*., 2024).

Given this purpose, this study examines the subsequent research question:

RQ: What are the most effective RC and KM strategies that could be adopted to address the challenges of an aging population, starting from the case of Japan?

3. Methodology

3.1. Research approach

This study adopts a qualitative research methodology, employing IVR. IVR is a qualitative methodology that typically involves a longitudinal case study with two main goals: advancing scholarly understanding in the field and solving practical organizational issues. In IVR, researchers work closely with organizational members such as managers and employees to create solutions and execute changes. This approach allows researchers to learn by actively intervening and observing ongoing organizational activities and changing processes in real-time. The researcher often plays a dual role, as an "insider," to gain deep insights from the participants' perspective, and as an "outsider," to connect these findings to

broader scientific knowledge (Costantini, 2025; Lukka and Wouters, 2022). During the six-month immersion, the researcher acted mainly as an insider, participating in lectures, meetings, and day-to-day operations to observe processes and understand the internal culture, while maintaining an outsider perspective through reflection and comparison with scientific literature. Small-scale interventions consisted of observing and commenting with participants on selected procedures and analyzing management processes, providing richer insights and data grounded in real-time practices. Importantly, the interventionist approach enabled access to moments of reflexive learning (e.g., during feedback discussions and procedural adjustments) that would not be observable through retrospective interviews alone. These moments informed the conceptualization of the "relational hub" as an emergent coordination mechanism rather than a formal structure.

3.2. Research context and the choice of the single case

The case study focuses on the entire Kansai Medical University (KMU) complex, encompassing both the university campus and its associated hospital, a leading medical-university facility located in Japan in Hirakata City, Osaka Prefecture. Founded in 1928, Kansai Medical University (KMU) has a long history of fostering excellent doctors with a rich sense of humanity based on its founding spirit of Jijinshinkyo, namely "*Benevolence, Compassion, and Empathy*". Building on this founding principle, KMU formulates the "*KMU Medium-term Vision*", setting goals for each of eight strategic categories: education, research, globalization, healthcare business, health/preventive medical care/nursing care/rehabilitation business, facilities, business management, finance, human resources, and social contribution. KMU continues to carefully yet boldly endeavor to achieve and accomplish this vision.

The KMU complex was selected for this study because it represents an advanced and progressive example in Japan. Located in Hirakata City, in Osaka Prefecture, the KMU Hospital enjoys a strategic position between the metropolitan areas of Osaka and Kyoto. It is in one of the most densely populated regions of Japan, which is also characterized by a high proportion of elderly residents. Excellent railway connections via the Keihan Line make it easily accessible and confer a central role within the healthcare catchment area of the Kitakawachi district.

Concurrently, KMU has developed an extensive international network of collaborations, encompassing Southeast Asian countries such as Vietnam, Indonesia, China, Mongolia, and Laos, as well as institutions in America and Europe, consolidating a strong global projection in research and education. KMU has recently partnered with the Ca' Foscari University of Venice, Italy, and its extended ecosystem to create a joint European hub for scientific collaboration in the field of medicine.

3.3. Data collection and analysis

A research protocol was established to precisely structure the methods for data collection and analysis, according to the IVR methodology. More specifically, one researcher (LS) spent six months at KMU, within the collaboration framework between KMU and Ca' Foscari. Prior to the extended stay, a preliminary review and data collection was conducted through the analysis of extensive documentation, both historical and organizational, provided by the KMU President, Tatsuo Kinashi, and also public sources, like the website, news published online, and participation of the authors in joint meetings and summer schools organized by KMU. Subsequently, three in-depth semi-structured interviews with key stakeholders were conducted, guided by the outcomes of a literature review concerning the management of the elderly according to the Japanese healthcare system (reported in Table 6). The interviews were conducted in person, recorded, transcribed, and the main findings were subsequently coded. These interviews were informed by the small-scale interventions and observations, allowing the researcher to probe emerging insights and validate findings with participants, thereby reinforcing the iterative nature of data collection typical of IVR studies.

Table 6. *Semi-structured interview questions submitted to executives and organizational representatives at KMU Hospital and its affiliated university, including both literature-derived and study-specific items designed to explore organizational features and refine the investigation.*

Questions directly based on the literature review's results	**Themes related to Knowledge Management**	**References**
What are the organizational strengths of the KMU–KMU Hospital model, and which elements embed it within Japan's traditional approaches to elderly care?	Guiding questions to understand Knowledge Management in the healthcare sector in Japan.	(Iijima *et al.*, 2021)
The literature highlights the presence of traditional Japanese care principles in elderly healthcare—such as self-help (Ji-jo), mutual aid (Go-jo), social solidarity care (Kyo-jo), and government care (Ko-jo). What role do these	Guiding questions to understand Knowledge Management in the healthcare sector in Japan	(Hatano *et al.*, 2017)

principles currently play at KMU, and how do you think they will evolve?		
How do inter-professional relations among healthcare practitioners (doctors, nurses, dietitians, etc.) enhance organizational responses to demographic aging and improve healthcare delivery?	Relational Capital and knowledge management among professionals	(Bagnoli *et al.*, 2020; Paoloni & Modaffari, 2022; Sato *et al.*, 2024)
Socio-cultural developments are leading to a growing number of single-person households, primarily composed of older adults, with limited intergenerational interaction. How do you think this will affect healthcare provision in the long term?	Relational Capital among patient's family	(Seo & Takikawa, 2022)
What do you believe the current role of the Community General Support Center is, and how can community awareness of its function be improved?	Relational Capital played by local communities	(Iijima *et al.*, 2021)
What are the relationships between institutions, KMU, and the local community (including former students, researchers, other institutions, other hospitals)?	Relational Capital played by other stakeholders	(Iijima *et al.*, 2021)
Digital transformation—including artificial intelligence, telemedicine, and other tools—holds great potential in this area. What measures has KMU adopted, and are there any future projects in this regard?	Digital Tools for Knowledge Management	(Ito *et al.*, 2017; Ollevier *et al.*, 2020)
The literature suggests that, due to the multiple comorbidities common among the elderly, all healthcare workers should be equipped with	Tools for an effective knowledge translation using competencies	(Nishikawa *et al.*, 2024)

geriatric competencies. What are your thoughts on this?		

4. Findings

The in-depth analysis of Kansai Medical University (KMU) and KMU Hospital in Hirakata reveals how the challenges posed by Japan's aging society are mediated not only through clinical expertise but also through complex flows of knowledge, relational, and institutional linkages. Empirical observations indicate a growing burden of hospitalizations and emergency visits among elderly patients, with chronic and age-related conditions—particularly cancer, cardiovascular disease, stroke, and neurodegenerative disorders—being increasingly prevalent. The management of these conditions depends on the ability of diverse professionals to exchange information, coordinate decisions, and sustain collective knowledge systems. Observed practices such as structured knowledge-sharing sessions, digital repositories, and interdepartmental meetings enable lessons learned in one unit to inform practices in others. The hospital manages nearly 300 stroke cases annually, underscoring that timely diagnosis and coordinated care pathways depend as much on knowledge flows across units as on clinical infrastructure. Compared to a decade ago, the diffusion of shared knowledge on neurodegenerative disorders and mental illnesses, such as dementia and depression, is perceived as critical to adapting institutional strategies to emerging priorities.

Interpretative insights confirm that Japanese principles of elderly care—self-help (Ji-jo), mutual aid (Go-jo), social solidarity (Kyo-jo), and government care (Ko-jo)—remain embedded in KMU's philosophy, yet they are increasingly operationalized through RC and organizational knowledge systems. While it is acknowledged that intergenerational support is weakening due to urbanization and demographic shifts, KMU compensates by constructing knowledge networks that link hospital-based care with visiting nursing, rehabilitation, and community-based services. These relational structures also serve as channels for tacit knowledge transfer, enabling clinicians and staff to share experiential insights that are not captured in formal protocols. They function as conduits for knowledge transfer, enabling a cycle of acute-to-community care that embodies traditional solidarity while adapting it to contemporary institutional needs.

As Tatsuo Kinashi, President of KMU, explained: "*Our mission is not limited to providing healthcare; it also includes education—training students, residents, and young doctors. Equally important is building strong connections with local communities, smaller hospitals, and clinics. Patients must be part of this system as well: they are treated in the acute phase at the central hospital and then returned to their original facilities. The transfer of patients, including the careful handover of information when returning them, reflects not only a clinical process but also a deeply rooted aspect of Japanese*

culture. This practice embodies principles of mutual aid (Go-jo) and social solidarity care (Kyo-jo), emphasizing collaboration, trust, and shared responsibility within the community healthcare system". This observation illustrates that the clinical transition process is simultaneously a knowledge translation process, in which RC among institutions ensures that information, practices, and values circulate effectively. Maintaining these flows of knowledge across hierarchical and professional boundaries is crucial for adapting to emergent patient needs and complex clinical scenarios.

KMU has developed formal mechanisms such as inter-professional rounds, centralized knowledge repositories, and regular training workshops, which collectively enhance the institution's absorptive capacity and ensure rapid dissemination of best practices. KMU's ability to coordinate knowledge flows across actors and organizational boundaries is central to its resilience. The hospital thus depends not only on clinical expertise but also on the continuous refinement of organizational routines, technological systems, and interpersonal relations that anchor decision-making in reliable, shared knowledge.

Home-based care represents a strategic arena where RC and KM intersect. Home care strengthens community ties, decentralizes healthcare provision, and allows knowledge to circulate directly between patients, families, and healthcare providers. The deployment of digital technologies—such as telemedicine, wearable devices, and remote monitoring—is perceived as a means of amplifying VRC, extending trust-based networks into the digital domain. Digital platforms not only enable clinical monitoring but also act as knowledge-sharing infrastructures, where feedback from patients and caregivers informs care practices and supports adaptive learning at the organizational level. These tools are not only technical supports but also social infrastructures, creating new paradigms of interaction, especially in rural areas where traditional relational ties remain stronger. While these technologies enhance the ability of healthcare teams to track patient conditions in real time, they also require relational capital to be effective: continuous monitoring generates large volumes of data that must be shared, interpreted, and applied collaboratively to inform clinical decision-making. Continuous monitoring also poses risks to patient autonomy and individuality, potentially reducing complex human experiences to standardized data. Relational capital mitigates these risks by embedding ethical judgment, contextual understanding, and shared responsibility into the interpretation and application of patient data. In this way, technology does not operate in isolation but is integrated into networks of trust, expertise, and knowledge exchange that collectively support high-quality, patient-centered care.

Collaboration among healthcare professionals emerged as a key mechanism for transforming relational capital into actionable knowledge. Medical doctors, nurses, pharmacists, nutritionists, physiotherapists, and occupational therapists operate within an institutional culture that values team-based approaches. Formal training, interdisciplinary programs, and informal professional clubs all reinforce networks of

trust, enhancing the circulation of knowledge and improving coordination. At the same time, the system faces structural constraints, such as physician shortages and regulatory reforms limiting working hours for young doctors. These measures, while necessary for staff well-being, risk disrupting knowledge flows and weakening relational capital. KMU has addressed this by recruiting heavily from its own graduates (70–80 physicians annually), ensuring that newly trained doctors integrate smoothly into hospital routines. This strategy strengthens knowledge continuity and embeds fresh competencies into established relational networks, sustaining both organizational learning and long-term capacity.

Field observations highlighted challenges of elderly isolation, particularly among those living alone. In these cases, RC becomes fragmented, and knowledge transfer between patients, families, and providers is weakened. Technological innovations, including smart sensors and digital biomarkers, were seen as potential substitutes to re-establish relational channels and restore missing knowledge flows, though they require careful governance of privacy and ethics.

KMU is leveraging digital transformation to reconfigure knowledge circulation. Initiatives include telemedicine platforms, AI-assisted diagnostics, and mobile hospital buses equipped with diagnostic technologies and nursing staff, which extend relational networks into peripheral regions. Dedicated transport systems further embed elderly patients into these relational infrastructures, though respondents noted the risk of overuse by patients without acute needs. This highlights a paradox: while RC strengthens access, it can also strain hospital capacity and challenge the sustainability of universal coverage.

Institutional integration with the community was consistently described as a cornerstone of KMU's strategy. Events, community engagement, and the "Health Corridor®" network along the Keihan Railway Line exemplify how relational capital is spatially embedded, coordinating facilities across the Kansai region. This model enables the hospital to simultaneously disseminate specialized expertise and absorb locally generated knowledge, creating a reciprocal flow that strengthens both institutional and community capacities.

The researcher engaged in IVR, along with the enquired executives, acknowledged systemic challenges (like rising hospital demand, insurance strain, and workforce shortages), but framed KMU as a hub of innovation, leveraging relational capital to transform these constraints into opportunities. The Central Research Centre and Clinical Simulation Centre institutionalize organizational learning, while initiatives such as the Career Centre for Female Doctors extend relational capital into domains of gender equity and professional sustainability. International collaborations, such as the KMU–Ca' Foscari Hub in Venice, were described not as departures from tradition but as expansions of Japan's cultural values of benevolence and solidarity into global knowledge networks. Environmental sustainability was also

presented as part of KMU's broader knowledge strategy, embedding healthcare within wider societal and environmental knowledge systems.

Overall, the findings indicate from field observations that KMU manages demographic aging through robust KM and RC. Observed practices show sustained networks of trust and continuous flows of clinical and organizational knowledge. Interpretatively, aligning these practices with traditional Japanese principles allows KMU to transform demographic challenges into opportunities for innovation and resilience. These mechanisms, as evidenced by interviews and observations, facilitate the dissemination of best practices across departments and community partners, strengthen adaptive capacity to emerging healthcare trends, and integrate human, technological, and social knowledge resources, positioning KMU as a potential model for knowledge-driven elderly care nationally and internationally.

5. Discussion

This study set out to examine how KM and RC operate as strategic levers in addressing the challenges of population aging within a healthcare ecosystem. The findings show that these two dimensions, namely, KM and RC, form the core mechanisms through which coordination, learning, and innovation occur. Other elements highlighted in the case, such as digital technologies, sustainability initiatives, and culturally embedded care principles, do not operate independently; rather, they shape and are shaped by the underlying knowledge and relational dynamics. By foregrounding KM and RC while situating other dimensions as contextual enablers, the study provides a coherent explanation of how complex elderly care systems function in practice.

Moreover, this study highlights the pivotal role of KM and RC in addressing the complex challenges posed by population aging in Japan. KMU and its affiliated hospital exemplify how a university-centred approach can orchestrate a multi-stakeholder learning loop, integrating clinical expertise, technological tools, and educational initiatives to enhance patient care and organizational resilience (Massaro *et al.*, 2022; Nonaka *et al.*, 1996; Paoloni and Modaffari, 2022). Empirical evidence demonstrates that universities can act not only as centers of knowledge production but also as coordinators and facilitators of knowledge flows, aligning institutional practices with societal needs (Chau *et al.*, 2017; Massaro *et al.*, 2022; Secundo *et al.*, 2018). The university's expertise contributes to promoting sustainability, dialogue, and the solution to different challenges that could be replicated and shared globally (Massaro *et al.*, 2022). According to Thomas *et al.*, 2021, universities have the potential to execute many orchestration methods aligned with the literature, including promoting knowledge mobility, regulating innovation appropriability, and enhancing network stability. In this regard, KMU's role extends beyond traditional academic functions,

positioning the university as a central orchestrator capable of connecting healthcare professionals, patients, families, and local communities through both formal and informal knowledge-sharing mechanisms.

At the same time, it is important to acknowledge that the close collaboration between the researcher and KMU may have introduced potential interpretive biases, particularly in the framing of KMU as an exemplary case. While prolonged immersion and privileged access enhanced data richness and contextual understanding, they may also have influenced the emphasis placed on successful practices and innovation-oriented narratives. To mitigate this risk, empirical findings were triangulated through multiple sources, including interviews, observations, and documentary materials.

A key insight emerging from the KMU case is its intention to implement technical training programs, particularly in geriatrics, which illustrates how universities can, in the future, ensure that healthcare professionals acquire specialized competencies and the knowledge necessary to manage complex age-related conditions (Nishikawa *et al.*, 2024; Yoshino *et al.*, 2023). According to Dal Mas, Biancuzzi, *et al.*, 2020, p. 1842, the knowledge translation process "has the critical aim to make knowledge available considering the needs, concerns, level of skills, practices and sociopolitical or organisational context of each of the target audiences, as well as to the purpose of the transfer." The continuous multi-professional development strengthens RC and KM by creating shared understanding among diverse stakeholders, facilitating trust-based interactions, and enhancing the institution's overall absorptive capacity. By rapidly translating evidence into practice, KMU demonstrates the potential of university-led orchestration to accelerate innovation adoption while preserving traditional care principles such as self-help, mutual aid, and social solidarity putting together research, teaching and third mission (Iijima *et al.*, 2021).

In the actual context, digital technologies, particularly telemedicine and remote monitoring, represent another crucial dimension of knowledge integration (Caputo *et al.*, 2023; Ollevier *et al.*, 2020). The study confirms that digital technologies can significantly expand relational capital by connecting patients with healthcare providers across spatial and temporal boundaries. Notwithstanding these favourable results, the data also highlight considerable hurdles associated with technological uptake (Bidoli *et al.*, 2023). The successful use of technology relies not only on access to tools but also on individuals' preparedness to incorporate them into their professional practices. This underscores the necessity for organised, focused training initiatives and ongoing support systems that start during education and persist into postgraduate and professional development phases (Ito *et al.*, 2017). Universities, as hubs of both technical expertise and pedagogical capacity, are uniquely positioned to bridge this gap, ensuring that digital innovations are embedded within existing relational networks and understood by all relevant actors. In this sense, technology is not a standalone solution but a facilitator of knowledge exchange, whose effectiveness

depends on the university's ability to coordinate learning processes and foster shared understanding (Song, 2024).

From a theoretical perspective, the study contributes to the literature by positioning the university as an orchestrator capable of uniting innovation, tradition, and education within the healthcare sector (Sato *et al.*, 2024). KMU exemplifies how RC can be leveraged to transform knowledge into actionable insights, supporting both routine clinical care and strategic decision-making. According to Secundo *et al.*, 2018, universities should manage their intellectual capital (IC) contributing to drive economic and social progress with the so called "third mission", which complement the traditional missions of teaching and research. This study builds upon previous research on KM in healthcare by illustrating the synergistic potential of integrating institutional and academic knowledge with stakeholders, utilising digital tools to tackle the complex challenges posed by an ageing population (Ienca *et al.*, 2021; Secundo *et al.*, 2018).

From a practical standpoint, the findings suggest a limited set of transferable recommendations for healthcare systems facing similar demographic pressures. First, integrating interdisciplinary geriatric training across healthcare professions can enhance preparedness and adaptability. Second, strengthening relational capital beyond hospital boundaries—by systematically involving communities and local care providers—supports continuity of care and improves patient outcomes (Bratianu *et al.*, 2024; Dal Mas, Biancuzzi, et al., 2020; Dal Mas, Garcia-Perez, Sousa, da Costa, et al., 2020). Third, universities can act as neutral coordinators within innovation ecosystems, providing structured learning environments and facilitating knowledge translation among heterogeneous actors (Dal Mas et al., 2024).

According to Granstrand and Holgersson, 2020 an ecosystem of innovation can be defined as "the evolving set of actors, activities, and artifacts, and the institutions and relations, including complementary and substitute relations, that are important for the innovative performance of an actor or a population of actors". In light of the challenges posed by an aging population and the proliferation of available technologies, the future perspective is contingent upon the synergistic interactions among stakeholders, universities, and institutions to promote innovation for sustainable growth, as elucidated in the Triple Helix Model (Leydesdorff and Etzkowitz, 1998). Validating this issue, the research emphasizes that aging-related challenges cannot be addressed solely through structural or technological interventions. While specialized centres and digital platforms are theoretically valuable, their effectiveness is contingent upon mechanisms for knowledge dissemination, inter-organizational coordination, and continuous training. By assuming a leadership role, universities can help overcome these limitations, providing strategic guidance, aligning stakeholders' objectives and ensuring that innovations remain contextually relevant and socially embedded (Brescia *et al.*, 2025; Graham, Logan, M.B., *et al.*, 2006). Policy frameworks that recognize and support university orchestration can therefore enhance the resilience and efficiency of the healthcare

system in the context of an aging population through the combination of KM and RC. By integrating technical expertise, traditional care values, and innovative digital tools, KMU demonstrates that effective elderly care requires a holistic approach in which knowledge is continuously generated, shared, and applied. This study underscores the potential for replicating such models in other advanced and emerging economies, offering a blueprint for harmonizing innovation, education, and relational networks in the pursuit of sustainable, patient-centered healthcare systems.

Building on these theoretical insights, our field observations reveal that KMU functions as a true "relational hub", a central node where clinical, organizational, and community knowledge flows intersect. This hub does more than coordinate formal information between departments: it integrates tacit knowledge derived from shared experiences, professional trust, and informal exchanges among healthcare staff, students, patients, and caregivers. Observations indicate that the relational hub facilitates the rapid circulation of best practices, enabling lessons learned in one department or community setting to be adapted and applied elsewhere. For instance, innovative protocols for managing patients with neurodegenerative disorders, initially developed in a specialized unit, are disseminated through interprofessional meetings, training sessions, and digital platforms, amplifying their impact across the institution.

Moreover, the hub's centrality allows for the effective integration of technology and human relationships. Digital tools, such as telemedicine and remote monitoring systems, are most effective when embedded within pre-existing networks of trust among professionals, patients, and families. In this way, the relational hub functions as a knowledge catalyst, transforming data, skills, and experiences into shared clinical decisions and operational strategies.

Finally, the hub supports interdisciplinary education and training, fostering shared understanding among doctors, nurses, physiotherapists, and other professionals. This strengthens both knowledge continuity and organizational resilience, highlighting the relational hub as a distinctive contribution of our study, extending beyond the conventional treatment of KM and RC as separate or isolated constructs. Importantly, the relational hub should not be interpreted as a separate construct, but as an empirically grounded configuration through which knowledge management and relational capital become observable and actionable.

6. Conclusions

In conclusion, the aging population represents one of the most complex challenges for healthcare systems, with clinical, organizational, and social implications. In Japan, the growing demographic pressure and the fragmentation of healthcare services require innovative tools to coordinate different

stakeholders and ensure continuity of care. The in-depth analysis of the KMU–KMU Hospital case has shown how KM and RC can serve as strategic levers to address these challenges by integrating training, technological innovation, and interprofessional collaboration.

6.1. Research implications

The study highlights the central role of universities as orchestrators capable of coordinating stakeholders, defining appropriate tools, and promoting advanced training programs, particularly in geriatrics. By implementing targeted technical training, universities can ensure that healthcare professionals acquire specialized skills and tacit knowledge necessary to manage complex age-related conditions. Future research could explore the mechanisms by which KM and RC facilitate knowledge flows among multiple actors, including hospital staff, patients, caregivers, and local communities. Comparative studies in different healthcare systems could provide further insights into the replicability of KM strategies and the effectiveness of university-led coordination in diverse contexts. Building on these insights, the KMU–KMU Hospital case demonstrates that KM and RC act as strategic levers to address population aging through interdisciplinary training and professional collaboration. Trust, deeply rooted in Japanese culture, underpins effective knowledge flows and collaborative decision-making. The relational hub and orchestration of knowledge flows emerge as transferable conceptual models, offering guidance for designing resilient healthcare systems elsewhere while requiring critical adaptation to local realities. The Japanese case, often underexplored, shows that even within a highly bureaucratic system, flexible and integrated practices across departments and community actors can succeed, providing both theoretical and practical insights for adaptive, patient-centered care globally. Additionally, examining the integration of digital tools such as telemedicine, wearable devices, and AI platforms into clinical and organizational practices could shed light on how technological adoption interacts with relational structures to enhance patient-centered care.

6.2 Policy implications

The findings underline the importance of fostering policies that support knowledge sharing, inter-institutional coordination, and workforce upskilling. Universities can take a leadership role in shaping such policies by designing training programs, promoting interprofessional collaboration, and facilitating the dissemination of best practices across hospitals and community healthcare services. Policymakers should encourage the development of integrated care models, supporting investments in digital infrastructure, such as telemedicine platforms and data management systems, which enable the effective circulation of knowledge. Moreover, funding and incentives for the creation of continuous training

programs and collaborative networks could enhance the sustainability and efficiency of healthcare services, particularly in contexts with rapidly aging populations.

6.3 Limitations of the study

The study presents some methodological limitations. The choice of a single case may limit the generalizability of the findings, and the cultural and organizational peculiarities of the Japanese context may reduce the applicability of the results in other countries. Despite these limitations, the study provides valuable insights and encourages future comparative research in other university hospitals and international healthcare settings to further explore the impact of KM and RC in managing population aging.

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Concluding considerations

1. Healthcare as an adaptive system

The three studies presented in this doctoral thesis converge on a single argument: the sustainability of healthcare systems depends less on financial and technological resources and more on their organizational capacity to learn and adapt. Contemporary healthcare should be understood as an adaptive system in which people, knowledge, and technology interact continuously. Within this system, knowledge management and relational capital form the underlying structure that supports innovation, coordination, and the quality of care.

The first paper, focused on nurse case managers in oncology, shows how organizational design directly influences patient outcomes and professional collaboration. The case manager acts as a connector across disciplines and roles, ensuring that patients experience continuity rather than fragmentation. Through coordination, communication, and empathy, this role transforms complex care pathways into coherent processes. It represents the ongoing shift from hierarchical structures to collaborative forms of governance, where the effectiveness of care depends on cooperation and shared responsibility.

The second study, which examines the impact of population aging on the Japanese healthcare system, broadens this reflection to the systemic level. Japan's experience demonstrates how demographic change can drive organizational and policy innovation. The Community-Based Integrated Care System illustrates that sustainability can be achieved when healthcare, social assistance, and long-term care are integrated within local communities. In this model, care extends beyond hospital walls and becomes a shared process involving patients, professionals, and institutions. The Japanese case suggests that a sustainable system is built not only on advanced technologies but also on strong social networks and balanced governance.

The third paper, focused on relational capital and knowledge management, links these insights through an organizational and epistemic perspective. The case of Kansai Medical University and its affiliated hospital shows how collaboration, trust, and systematic knowledge sharing can transform healthcare institutions into learning environments. When digital infrastructures, such as artificial intelligence and telemedicine, are combined with relational ones based on communication and cooperation, organizations develop the capacity to adapt, innovate, and maintain stability even under pressure. Knowledge

management provides the cognitive foundation for this process, while relational capital sustains the social and organizational cohesion that makes it possible.

2. Sustainability as organizational intelligence

Taken together, the three studies offer a consistent model of sustainability as a dynamic organizational capability. Sustainable healthcare systems are those able to learn continuously, to coordinate effectively across professional boundaries, and to cultivate trust and accountability among all actors involved. Sustainability, therefore, is not a static condition but an evolving capacity to adapt to uncertainty while maintaining coherence and purpose. In this sense, healthcare organizations operate as living systems that renew themselves through reflection, collaboration, and the integration of new knowledge.

This perspective also implies a rethinking of public policy. Future healthcare reforms should promote coordination, participation, and co-production rather than rely on hierarchical control. Investments in interdisciplinary training, shared leadership, and digital transformation that includes all professional groups are essential to ensure both efficiency and equity. The Japanese experience provides valuable lessons, showing that innovation can coexist with continuity, and that modern healthcare governance can evolve by combining tradition, community values, and technology.

In conclusion, this thesis portrays healthcare as an organizational field in constant transformation, where sustainability depends on the intelligent use of knowledge and relationships. The ability to connect professionals, integrate processes, and translate data into shared understanding will determine the future capacity of healthcare systems to respond to social and demographic challenges. Across micro, meso, and macro levels, the findings converge on one central idea: what sustains healthcare in the long term is organizational intelligence—the collective ability to learn, adapt, and improve the way care is delivered.

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