Mini-Review

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Implementation and current status of frailty assessment in Japanese hospitals: Processes, epidemiology, and future directions

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SUMMARY: Frailty has become a pressing health concern in Japan as it has entered a super-aged society. Early identification of frailty is essential to preventing disability, hospitalization, and dependency on long-term care, and yet the implementation of standardized screening across clinical settings remains inconsistent. This review synthesizes current evidence on frailty assessment practices in Japan, highlights key challenges in routine implementation, and examines the potential of emerging digital tools. The feasibility of recent digital innovations — including artificial intelligence analysis of home electricity data, wearable-based mobility monitoring, and EMR-integrated frailty indices — has been demonstrated in pilot settings, though evidence of their large-scale clinical effectiveness remains limited. International comparisons have revealed that countries and regions such as the United Kingdom, Canada, Australia, and Singapore are increasingly implementing electronic frailty indices with policy-level support, offering valuable insights for Japan. Overall, although Japan has made significant progress in recognizing the importance of frailty assessment, substantial gaps remain in standardization, system integration, and clinical implementation. Strengthening national policy frameworks, enhancing workforce training, and accelerating a digital transformation may enable the development of a more comprehensive and scalable frailty-screening system to support healthy aging.

Keywords: frailty, frailty screening, hybrid model, community-based comprehensive care system, digital

1. Introduction

Population aging has become one of the most profound demographic shifts of the 21st century, reshaping health-care systems, social structures, and economic sustainability worldwide. According to Ageing and Health from the World Health Organization, the global population age ≥ 60 is projected to rise from 1 billion in 2020 to 1.4 billion by 2050 (*1*). By 2050, the world's population of people age 60 and older will double (2.1 billion). However, no country exemplifies the front line of this transition more starkly than Japan. Driven by unprecedented longevity and historically low fertility, Japan had the world's first "super-aged" population in 2007 (*2*) and now has the highest proportion of adults age ≥ 65 globally, exceeding approximately 29.3% in 2025 (*3*). Japan's demographic shift has been rapid and compressed into a few decades, creating a unique natural laboratory for examining the health consequences of population aging, including frailty, dependence on care, and healthcare system stress. As other countries accelerate toward similar demographic trajectories, Japan's experience provides critical insights into the clinical, organizational, and societal challenges posed by extreme population aging.

The influence of frailty on the health of the elderly has been prominent research focus in recent years. Fried *et al*. (*4*) provided the first standardized definition of the concept of frailty, with decreased internal stability and increased vulnerability due to the diminution of the functional reserves of multiple physiological systems. According to a meta-analysis, the global prevalence of frailty among community-dwelling older adults ranges from 12% to 24%, based on data from 1,755,497 participants across 62 countries and regions (*5*). In epidemiological studies conducted in Japan (*6*), the prevalence of frailty among individuals age 65 and older is 8.7%, while approximately 40.8% are classified as pre-frail. This indicates that nearly half of the older population in Japan faces health risks associated with frailty. As a dynamic and reversible geriatric syndrome, frailty lies between self-reliance and the need for care.

Reasonable preventive interventions can enable the elderly to resume living independently (*7*). A point worth noting is that a number of evidence-based studies have found that frailty could be a predictive factor for adverse outcomes, including prognosis, hospitalization or rehospitalization, postoperative complications, and mortality rates (*8*), which means that screening for frailty is very important in a clinical setting.

Despite the growing recognition of frailty screening in Japan and the rapid emergence of digital health technologies, current approaches remain fragmented and insufficient to meet the complex demands of a super-aged population. Bedside frailty screening tools, while clinically interpretable and well aligned with nursing workflows, are typically cross-sectional and episodic, limiting their ability to capture dynamic functional decline beyond the hospital setting. Conversely, passive digital monitoring approaches offer longitudinal and scalable data streams but often lack clinical context, multidimensional interpretation, and clear linkage to care pathways. In Japan, where frailty assessment is closely tied to nursing practice, discharge planning, and eligibility for long-term care insurance services, neither conventional tools nor digital-only solutions are sufficient in isolation. This gap highlights the need for a hybrid frailty screening model that integrates bedside clinical assessment with passive digital monitoring, enabling continuous risk detection while preserving clinical interpretability and care relevance across hospital, community, and home settings. However, how such a hybrid model should be conceptualized, operationalized, and positioned within Japan's health-care system remains insufficiently discussed.

2. Frailty screening tools and the status of frailty assessment in Japan

2.1. Frailty screening tools in Japan

With the growing burden of disease-related frailty risk (*9*), Japan has, in line with recommendations from the Japanese Geriatrics Society (*10*) and the Ministry of Health, Labour and Welfare (MHLW) (*11*), increasingly recognized the importance of incorporating frailty assessment into routine care. However, the extent of implementation varies substantially across institutions, and efforts to systematically integrate frailty evaluation into standard clinical practice remain incomplete. The most direct and effective tool for evaluating debilitating conditions is a frailty screening tool; despite the wide availability of validated frailty instruments, each tool is designed with a distinct theoretical framework, operational characteristics, and clinical purposes. As a result, no single assessment tool has emerged as a universally accepted gold standard (*12*), and selection typically depends on the clinical setting and the specific outcome of interest. Frailty assessment in Japan has evolved in parallel with the country's rapid demographic aging, and hospitals, community health programs, and long-term care systems increasingly rely on standardized tools to detect early functional decline. Several frailty instruments — some adapted from international standards and others developed domestically — are widely used across clinical and public health settings. Among these, the Japanese Cardiovascular Health Study criteria (J-CHS) (*13,14*), the Kihon Checklist (KCL) (*15,16*), the FRAIL scale (*17,18*), and the Tilburg Frailty Indicator (TFI) (*19,20*) constitute the core group of instruments used in Japanese hospitals and community assessments. Standardized Screening Tools in the Japanese Context: From KCL to Questionnaire for Medical Checkup of Old-Old (QMCOO). Japan has pioneered a policy-driven, tiered approach to frailty screening, uniquely characterized by the integration of self-reported multidimensional instruments into national health programs. Central to this framework is the KCL (*15*), a 25-item validated questionnaire encompassing physical, nutritional, oral, and cognitive domains, as well as social isolation. Unlike purely clinical scales, the KCL serves as a robust "upstream" screening tool with high sensitivity for predicting long-term care insurance (LTCI) certification and all-cause mortality. Its implementation transcends hospital boundaries, functioning as a bridge between community-based primary prevention and clinical risk stratification. Moreover, the introduction of the QMCOO by the MHLW in 2020 represents a strategic shift towards identifying "pre-frailty" in individuals age 75 and older. These instruments, particularly when adapted into digital formats or integrated with electronic health records (EHR), offer a distinctive "Japanese model" of frailty surveillance. This model prioritizes functional reserve and social participation over a mere accumulation of deficits, providing a comprehensive evidentiary base for perioperative optimization and post-discharge rehabilitation planning in a super-aged population.

Despite the widespread availability of validated frailty screening instruments in Japan, a persistent tool–setting mismatch remains a critical challenge in routine clinical practice. Several commonly used tools demonstrate inherent limitations when utilized outside their original target contexts (Table 1). The KCL, while comprehensive and well-suited to community-based screening and long-term care risk stratification, is often impractical in acute-care settings due to its length and reliance on self-reported functional and psychosocial domains, which may be unreliable during acute illness. Conversely, the J-CHS has been widely accepted in epidemiological research and phenotype-based frailty classification, but it provides limited guidance for individualized nursing care planning or multidisciplinary intervention design. In addition, ultra-brief instruments such as the FRAIL scale, despite their feasibility in busy clinical environments, suffer from low information

Table 1. Comparison of scales commonly used in Japan

Tool	Domains covered	Items (*n*)	Frailty classification	Time burden	Rationale for selection	Frequency of use in Japan	Context suitability	Critical appraisal	*Ref.*
J-CHS (Japanese Cardiovascular Health Study Criteria)	Physical frailty phenotype (grip strength, walking speed, exhaustion, physical activity, weight loss)	5	≥ 3 frail; 1–2 pre-frail	Moderate (5–10 min)	Adapted from the original CHS phenotype; standardized definition of physical frailty; widely used in Japanese population-based studies and national surveys	High	Epidemiological studies; community-dwelling older adults; research-oriented frailty phenotyping	Focuses primarily on physical frailty components; limited applicability for nursing care planning, multidisciplinary intervention design, or discharge coordination; insufficient coverage of psychosocial and care-related domains	*13,14*
KCL (Kihon Checklist)	Multidimensional (physical, social, cognitive, mood, nutrition, oral health)	25 5 15	≥ 8 frail; 4–7 pre-frail	Long (10–15 min)	Developed by the Ministry of Health, Labour and Welfare; widely implemented nationwide; covers multidimensional domains including physical, psychological, and social functions; closely linked to assessment of eligibility for long-term care insurance (LTCI)	Very high	Community-based screening; LTCI risk stratification; discharge planning support	Limited feasibility in acute-care settings due to questionnaire length and reliance on self-reported information; responses may be unreliable during acute illness, hospitalization, or cognitive impairment; less suitable for rapid bedside screening	*15,16*
FRAIL Scale	Fatigue, Resistance, Ambulation, Illnesses, Loss of weight		≥ 3 frail; 1–2 pre-frail	Very short (≤ 2 min)	Ultra-brief (5 items); minimal training required; highly feasible in time-constrained settings	Moderate	Rapid screening in busy clinical settings; outpatient clinics; preliminary triage	Low information density; limited sensitivity to multidimensional functional decline; insufficient granularity for rehabilitation planning, care coordination, or individualized intervention strategies	*17,18*
The Tilburg Frailty Indicator (TFI)	Multidimensional (physical, psychological, social)		≥ 5 frail	Moderate (5–10 min)	Explicit multidimensional framework	Low in Japan	Community and outpatient settings; multidimensional frailty assessment	Less commonly integrated into routine hospital workflows; relatively limited uptake in acute-care settings; longer administration time compared to ultra-brief tools	*19,20*

density and may insufficiently capture multidimensional functional deficits relevant to care coordination and discharge planning. These mismatches mean that the challenge with frailty assessment in Japan lies not in the lack of tools, but in the absence of context-appropriate selection frameworks linking screening objectives, clinical settings, and downstream care pathways.

Beyond general screening frameworks, frailty assessment has increasingly been incorporated into disease- and specialty-specific clinical guidance in Japan, and particularly in cardiovascular care. The 2025 Japanese Circulation Society (JCS)/Japanese Heart Failure Society (JHFS) Guideline (*21*) on Diagnosis and Treatment of Heart Failure explicitly incorporates frailty into its recommended evaluation and management pathways, including the revision of methods of assessing frailty in guideline tables to guide risk stratification and treatment planning for older patients with heart failure. Specifically, the revised guideline adds a structured approach to assessing physical and cognitive frailty domains in patients with heart failure, indicating that frailty status should inform peri-interventional decisions and prognostic considerations prior to invasive procedures. This guideline-level endorsement effectively elevates frailty assessment from an optional consideration to a core element of cardiovascular practice in Japan. Together, these developments suggest a gradual shift toward embedding frailty assessment within specialty-specific perioperative and clinical pathways, reinforcing its relevance beyond general population screening, and supporting its routine adoption in surgical and hospital settings.

2.2. Status of frailty assessment in Japan

As physical frailty becomes increasingly prevalent among older adults in Japan, there is growing recognition that frailty status is a critical determinant of hospital outcomes. Although nationwide initiatives have been launched to promote frailty prevention and management, substantial variation remains in how these programs are implemented across the country. Only a limited number of hospitals — particularly those with established geriatric services — have incorporated routine frailty screening into their nursing admission procedures (*22-24*). Frailty assessment is typically included within the first 24–48 hours of admission, integrated into the nursing intake workflow. Screening is usually performed by ward nurses using brief standardized instruments. If the screening indicates a frail status, patients are subsequently referred for a secondary comprehensive geriatric assessment in collaboration with relevant departments — such as geriatrics, rehabilitation, and nutrition. This integrated approach enables the development of a more comprehensive treatment plan tailored to the patient's condition and facilitates timely interdisciplinary communication among healthcare professionals. The assessment results are used to guide early mobilization therapy, nutrition interventions, polypharmacy review, and discharge planning, including linkage to LTCI services and community support programs (*25*), as shown in Figure 1.

Within the Japanese healthcare system, routine screening and management extend beyond physical frailty to include the identification of social vulnerabilities, such as living alone or having limited social support. When such vulnerabilities are recognized during preoperative assessment, perioperative care pathways can initiate early coordination with Community General Support Centers. Established under the Community-based Integrated Care System, these municipally operated centers serve as coordination hubs linking medical facilities with long-term care services, social welfare programs, and community resources. Early engagement allows discharge planning to begin before surgery, enabling advance arrangements for at-home nursing, care management, or transitional facility placement. This approach reflects Japan's administrative–medical integration, whereby hospital-based care is systematically linked to community support mechanisms to facilitate continuity of care perioperatively.

Moreover, coordination between hospitals and community-based care providers still varies, reducing continuity for frail patients after discharge. To address these gaps, Japan is promoting digital solutions such as the use of AI to analyze household electricity consumption patterns, enabling non-invasive detection of frailty risk among older adults living alone (*26*). This approach is particularly noteworthy, as it represents a model that integrates digital technologies with a community-based comprehensive care system. Early pilot programs report improved adherence to screening protocols and enhanced multidisciplinary communication, signaling a national shift towards more systematic frailty management in hospital settings.

3. Digital frailty detection in Japan

Recent advances in digital health technologies have stimulated growing interest in digital frailty detection in Japan, particularly in response to workforce constraints and the need for longitudinal monitoring in a super-aged population. Pilot studies using household electricity–based AI analysis, wearable sensors, and EMR-derived frailty flags have demonstrated technical feasibility and conceptual validity in identifying frailty-related risk signals in both community and hospital settings. These approaches offer important advantages, including passive data collection, a reduced burden of assessment, and potential scalability. However, current evidence remains largely confined to small-scale feasibility studies, retrospective analyses, or regionally limited pilot programs. Robust data demonstrating large-scale clinical effectiveness — such as improvements in patient

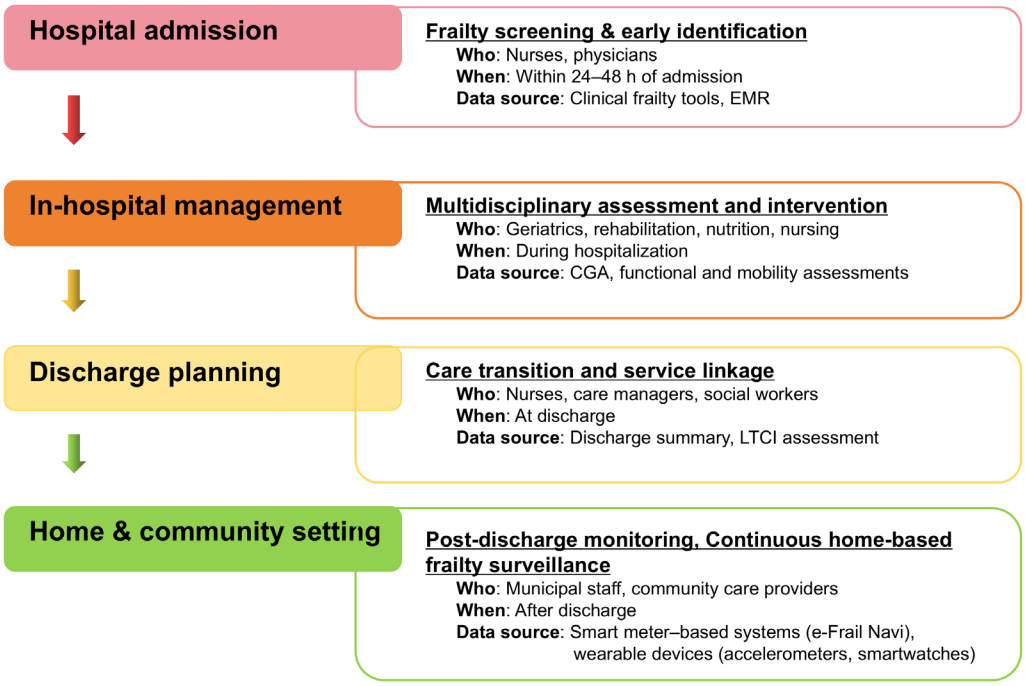

Figure 1. Continuous frailty monitoring across hospital and community settings in Japan.

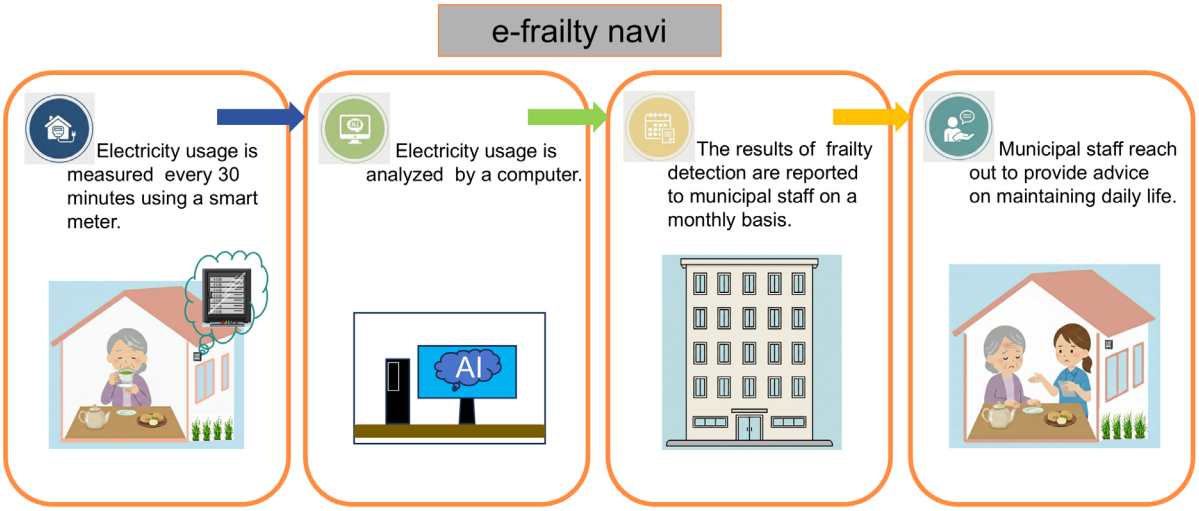

Figure 2. Structure of e-frailty navi (Source: Vol.97: Early Detection of Frailty Risk Using Smart Meter. Data — What Is "eFrailty Navi"?. *https://ene-fro.com/article/ef439_a1/*) (in Japanese)

outcomes, coordination of care, or utilization of long-term care — are still lacking. In addition, heterogeneity in data quality, limited standardization, and unresolved ethical and governance issues further constrain widespread implementation. On the whole, digital frailty detection shows promise in Japan, but its role remains complementary rather than substitutive, underscoring the need for integrated hybrid models supported by prospective, real-world validation studies.

3.1. Household electricity–based AI detection

Japan has taken significant steps toward utilizing technology to address the limitations of conventional methods of assessing frailty. The integration of household electricity usage data with artificial intelligence (AI) algorithms has emerged as a promising approach for early detection and monitoring of frailty (*26,27*). As shown in Figure 2, one of the pioneering efforts in this field is the "e-Frailty Navi" system, developed collaboratively by the Chubu Electric Power Company and the data science firm JDSC. This system collects anonymized data on electricity consumption patterns within individual households, particularly those of elderly residents. By analyzing fluctuations in electricity usage over time — such as changes in appliance use,

cooking times, or heating patterns — the AI algorithm can infer daily routines and detect deviations that may indicate early signs of physical or cognitive decline. For instance, a noticeable delay in morning electricity use could suggest delayed wake-up times, potentially pointing to fatigue or depression. Similarly, decreased evening activity may signal social withdrawal or mobility issues. Reduced usage of kitchen appliances may reflect decreased appetite or difficulty preparing meals — both of which are associated with frailty. Importantly, this approach requires no active participation from the older adult and is thus suitable even for those with cognitive impairment or reluctance to use wearable technology. When behavioral anomalies are detected, alerts are sent to care managers or municipal welfare departments, enabling early intervention. Some local governments in Japan have already incorporated the system into community-based integrated care networks. The technology aligns with national policy goals to promote "aging in place," prevent the progression of frailty, and reduce unnecessary hospital admissions and long-term care facility placements.

This approach offers several unique advantages. First, monitoring is non-intrusive and poses a minimal burden , as older adults do not need to wear sensors or modify their daily routines. Second, passive data collection is particularly suitable for individuals living alone or those reluctant to adopt wearable technologies. Third, Japan's social structure — characterized by the advancement of a super-aged population and a well-developed community-based integrated care system — allows electricity-based monitoring to function as a natural extension of routine "watch-over" activities. Nevertheless, several methodological and ethical challenges remain. Distinguishing behavior-related signals from confounding factors — such as travel, family visits, or changes in household composition — is nontrivial. Long-term governance of data, mechanisms to obtain residents' consent, and frameworks for cross-sector information-sharing also need to be carefully designed. Further evidence from large-scale cohorts is needed to validate generalizability, assess regional variability, and ensure the robust integration of electricity-based monitoring into Japan's long-term care and frailty prevention systems.

3.2. Integration of wearable devices

Wearable devices represent another rapidly expanding modality in Japan's digital frailty surveillance landscape. Wrist-worn accelerometers, and smartwatches are increasingly used to continuously capture real-world physiological and behavioral data, including step count, gait speed, gait stability metrics, and intensity of physical activity (*28-31*). These continuous streams provide dynamic insights into key domains of frailty, and particularly a decline in mobility and reduced physical reserve. A recent Japanese study (*31*) has demonstrated that gait parameters collected from wearable devices over a 7-day period can be used to accurately classify older adults as frail or non-frail and predict adverse outcomes such as hospitalization or mortality.

Despite these advances, several limitations must be addressed. Sustained compliance with device wear remains a major barrier, particularly among very old adults or those with cognitive impairment. Data representativeness is a concern because wearable users tend to be healthier, tech-literate, and more active than the broader high-risk population. Moreover, long-term longitudinal evidence linking sensor-derived metrics to clinically meaningful outcomes — such as a transition to long-term care, fractures, or disability — is still limited. Standardization of sensor modalities, validation across diverse living environments, and cross-device calibration remain necessary for nationwide deployment.

3.3. EMR-based frailty flags

In Japanese medical settings, electronic medical records (EMRs) are increasingly being explored as a tool for automated frailty detection (*32,33*). This approach leverages routinely collected clinical information, including age, comorbidity profiles, polypharmacy status, hospitalization history, laboratory findings, and functional status indicators, to generate algorithm-based frailty "flags" at the point of care. EMR-based detection models offer significant advantages. They require no additional devices and seamlessly integrate into existing clinical workflows, thereby enabling routine screening without added burden. For hospitalized older adults, automated frailty flags can trigger early comprehensive geriatric assessment (CGA), prompt prehabilitation before surgery, assist in discharge planning, and support coordinated interventions from rehabilitation and nutrition teams.

However, several challenges impede widespread implementation. The quality and structure of EMR data vary substantially across hospitals, reducing model generalizability. Functional measures crucial for frailty assessment — such as gait speed, sit-to-stand performance, or detailed Activities of Daily Living/ Instrumental Activities of Daily Living (ADL/IADL) scores — are often absent or inconsistently recorded. Ethical considerations also arise regarding secondary data use without explicit patient consent and the potential impact of frailty labeling on clinical decision-making. Moreover, smaller regional hospitals and clinics may lack the infrastructure or personnel needed to maintain EMR-integrated risk algorithms. At present, Japan has only limited real-world examples of fully deployed EMR-based frailty flagging systems, highlighting the need for further pilot studies, national data standardization efforts, and robust governance frameworks.

Although national digital initiatives such as the My Number Card (Myna Insurance Card) have been

promoted as infrastructure to link community screening data to hospital medical records, their practical impact on frailty-informed care has thus far been limited (*34*). Incomplete adoption, insufficient interoperability with hospital information systems, lack of standardized data formats, and persistent concerns regarding privacy governance continue to hinder effective data integration. As a result, frailty information is often assessed repeatedly yet remains poorly shared across care transitions. Importantly, these challenges are not unique to Japan but reflect a global issue in aging societies, underscoring the need for secure and interoperable frameworks to translate frailty assessment into coordinated clinical action.

4. Global status of electronic frailty screening

As digitalization progresses, electronic frailty screening is increasingly being incorporated into healthcare practices across the globe. Electronic frailty screening has progressed furthest in England, where the National Health Service (NHS) Electronic Frailty Index (eFI) (*35*) has been embedded into primary-care electronic health records and adopted at scale. The NHS eFI is a pragmatic, record-based frailty screening tool that operationalizes 36 health deficits comprising approximately 2,000 Read codes. The score is strongly predictive of adverse outcomes and has been validated in around 900,000 patient records. It presents an output as a score, with higher scores indicating the increasing possibility of a person living with frailty and hence being vulnerable to adverse outcomes. In a large validation study conducted by Clegg *et al*. (*36*), the eFI was found to effectively identify mild, moderate, and severe frailty in older adults and demonstrate strong predictive ability for outcomes such as mortality, hospital admission, and entry into long-term care. The eFI is a technically simple, automatable algorithm combined with policy backing and vendor use that can enable population-level identification of frail individuals while posing a minimal additional clinician burden.

In Canada, electronic frailty screening has gradually emerged through regionally driven initiatives rather than as a nationally standardized program. The earliest implementation can be traced to the CARES program in 2014, where an electronic comprehensive geriatric assessment (eCGA) was incorporated to generate a frailty index (eFI-CGA) for community-dwelling older adults (*37*). Subsequent research efforts adapted the original UK 36-deficit eFI to the Canadian primary care context, leading to the development of a Canadian eFI derived directly from electronic medical record (EMR) data (*38*). Validation studies have demonstrated strong correlations between the Canadian eFI and traditional CGA-based frailty measures, supporting its clinical applicability in primary care settings (*39*). In recent years, several provinces have integrated eFI-based tools into web-based platforms, enabling automated frailty identification during routine clinical encounters (*40*). Despite these advances, Canada still lacks a unified national frailty screening framework, and the degree of implementation varies across jurisdictions. Nonetheless, the progressive incorporation of EMR-based eFI tools highlights a growing commitment to early detection and management of frailty in Canadian healthcare.

In Australia, the implementation of electronic frailty screening has progressed primarily through research-driven initiatives and the increasing availability of electronic health records (EHRs). A retrospective study (*41*) has indicated that eFI derivation began around 2017–2018, when large-scale primary care datasets from more than 700 general practices were used to calculate a 36-deficit eFI for over 79,000 adults age ≥ 70. This study demonstrated the feasibility of deriving frailty status directly from routine clinical records and revealed clear gradients of mild, moderate, and severe frailty among community-dwelling older adults. Subsequent work expanded the use of eFI to residential aged-care settings and acute hospital environments, including ongoing national research initiatives such as the eFI QH Project (*42*), which aims to integrate a validated digital eFI into Queensland's integrated EMR system to support real-time clinical decision-making. Although Australia does not yet have a unified national policy mandating frailty screening, the progressive incorporation of eFI tools across primary care, care for the elderly, and hospital systems highlights a growing commitment to scalable, data-driven frailty identification in an aging population. A 2022 survey of Australian healthcare professionals reported that only approximately 44% had received any training related to frailty, and just 14% had undergone training specifically focused on frailty (*43*). These findings underscore the need to prioritize training and education for healthcare professionals in the future. The Australian Frailty Network (AFN) (*44*) which was established in 2023, aims to generate new knowledge to improve health outcomes, ensure that evidence-based management strategies are effectively translated into clinical practice, and strengthen national capacity in multidisciplinary and translational frailty research. Although frailty screening and frailty-informed care have not yet been fully incorporated into routine clinical practice, the AFN has explicitly identified the promotion of integrating frailty assessment and management into clinical practice guidelines as one of its core missions. Thus, Australia's national policy support and nationwide commitment to addressing frailty are already evident; however, the system is still in the process of institutionalization and standardization.

Singapore's development of frailty screening has progressed through a combination of policy-driven initiatives and clinical implementation. Early frailty screening activities were introduced in hospital and community settings around 2017, primarily using

conventional assessment tools such as the Clinical Frailty Scale *(45)*. A major milestone occurred in 2023, when the Ministry of Health released the National Frailty Strategy, which outlined a nationwide framework to enhance the identification, monitoring, and management of frailty across the health and social care systems (*46*). This strategy emphasized the role of primary care in early detection and called for standardized, evidence-based approaches to support healthy aging. Building on this policy direction, implementation efforts accelerated through programs such as IMPACTFrail (*47*), a translational initiative scheduled for rollout across five polyclinics in 2025 to operationalize frailty and intrinsic capacity screening in routine primary care. While Singapore has not yet established a nationwide electronic frailty index comparable to the United Kingdom's eFI, its current trajectory demonstrates a clear, policy-supported commitment to promoting integrated frailty screening, including digital and system-level approaches, within both clinical and community settings.

International comparisons suggest actionable insights to overcome these barriers. Across these jurisdictions, common factors facilitating successful electronic frailty screening include the following. First, only routinely collected primary-care data are used, therefore requiring no extra data entry or patient burden; once implemented in EHR systems the calculation is automated, enabling effortless population-level identification of frail individuals. Second, the eFI was endorsed and promoted by national bodies and integrated into policy and commissioning levers, so practices had both clinical and organizational incentives to adopt it. Third, major EHR vendors and systems embedded the eFI in clinical software, facilitating a seamless technical rollout across virtually all general practices. Finally, the eFI's large-scale validation provided the empirical confidence needed for national implementation and for linking frailty identification to service reconfiguration.

4. Discussion

The necessity of a hybrid frailty screening model in Japan arises from the unique structural and clinical characteristics of its health-care and long-term care systems. Unlike many Western countries where frailty screening primarily serves as risk stratification, frailty identification in Japan is closely linked to eligibility for services, positioning frailty as a clinical determinant of care access (*48*). Tools such as the Kihon Checklist were explicitly designed to detect future dependence on long-term care and are widely used across community and hospital settings. In hospital and community settings, implementation of frailty screening tools by nursing staff has been associated with the initiation of targeted clinical care plans that include rehabilitation, nutritional optimization, and risk-appropriate discharge planning. Studies show that proactively identifying frail patients using bedside assessment protocols leads to the application of evidence-based interventions and improved clinical outcomes (*49*) and that nurse-led frailty management strategies improve physical function and nutritional status in older adults (*50*). Moreover, Japan's community-based integrated care system emphasizes continuity across hospital, community, and home settings, framing frailty as a longitudinal condition requiring ongoing monitoring and care coordination rather than a static diagnosis. A hybrid model offers a solution that aligns with Japan's care philosophy, workforce structure, and policy framework. Rather than replacing clinical assessment, digital tools should function as complementary extensions that enhance temporal resolution, support early detection, and reinforce continuity across care settings.

Despite growing enthusiasm for digital frailty detection, this review highlights that digital-only solutions are unlikely to fully address Japan's frailty challenges. Standalone digital approaches capture only partial dimensions of frailty and remain vulnerable to selection bias, data incompleteness, and ethical concerns. Importantly, frailty in Japan is not merely a detection problem but a care-navigation problem, requiring interpretation, prioritization, and translation into individualized nursing and multidisciplinary interventions. Digital tools can efficiently identify risk signals, but they cannot replace clinical judgment or patient-centered care planning. These findings support a hybrid model in which brief screening tools, nursing assessment, and digital signals are combined within structured care pathways, ensuring both scalability and clinical relevance.

Future research should prioritize several areas. First, validation studies comparing tool performance across acute, subacute, and community settings are needed to establish context-appropriate selection frameworks. Second, real-world implementation studies should examine how frailty screening influences clinical decision-making, care transitions, and long-term outcomes, rather than focusing solely on predictive accuracy. Third, ethical and governance frameworks must be developed to address consent, data ownership, and the potential unintended consequences of frailty labeling, particularly in digital surveillance models. Finally, interdisciplinary research integrating geriatrics, nursing science, health informatics, and policy analysis will be essential to designing frailty assessment systems that are not only accurate, but also equitable, acceptable, and actionable with regard to Japan's super-aged population.

5. Conclusion

To promote the national implementation of frailty assessment, Japan may need to develop a standardized core frailty dataset and its integration into EMRs.

Aligning frailty assessment with national clinical guidelines and linking screening to policy would also encourage adoption. Overall, the momentum of frailty screening in Japan will depend on coordinated efforts involving clinical guidelines, data standardization, and policy alignment. Lessons from international models such as the NHS eFI indicate that technological capacity alone is insufficient; robust institutional frameworks are essential for nationwide adoption.

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