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Research Report

Effectiveness of Nursing Interventions for Overcoming Clinical Inertia in Diabetes Management: A Literature Review Exploring Applicability in Japan

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Key words

clinical inertia, diabetes, nursing interventions, literature review

Abstract

Objective: This review aims to comprehensively examine how nurse-led interventions for patients with type 2 diabetes, who exhibit clinical inertia or are at high risk of developing it, can contribute to overcoming delays in treatment intensification. The review also evaluates the feasibility of implementing such interventions within the Japanese healthcare system by synthesizing evidence from international studies.

Methods: Following the PRISMA-ScR guidelines, a literature search was conducted using CINAHL and MEDLINE for original articles published between 1999 and 2024 related to "clinical inertia" and "diabetes." Studies focusing on healthcare professionals other than nurses, such as physicians and pharmacists, inaccessible articles, and review papers were excluded. Ultimately, 10 studies were selected and analyzed.

Results: Most of the included studies were interventional in design and primarily implemented by nurse practitioners or certified diabetes educators. Interventions such as insulin titration, blood glucose monitoring, and patient education contributed to treatment intensification, which led to improvements in HbA1c, blood pressure, LDL cholesterol, and patient satisfaction.

Conclusion: Nurse-led initiatives demonstrated effectiveness in intensifying treatment and improving clinical indicators. These findings suggest that overcoming clinical inertia requires the development of care models that include continuing education and interprofessional collaboration. In Japan, the dissemination of such care models is expected to enhance the quality of diabetes management and promote further research in this area.

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Introduction

Diabetes mellitus is a common metabolic disorder characterized by chronic hyperglycemia, which, if inadequately managed, can lead to severe complications, including cardiovascular disease, nephropathy, and neuropathy[1]. These complications substantially diminish patients' quality of life and contribute to escalating healthcare costs and societal burdens. In Japan, as of 2021, an estimated 11 million individuals are affected by diabetes, with over 90% diagnosed with type 2 diabetes (T2DM)[2]. Although treatment guidelines underscore the importance of appropriate glycemic control[3], only approximately 33% of patients meet the recommended HbA1c levels. Delays in treatment intensification further exacerbate the risk of complications[4][5].

Clinical inertia-a failure to initiate or intensify treatment despite recognition of the need plays a pivotal role in this delay[6]. In T2DM management, clinical inertia is widespread, with international studies indicating that 18.1% to 85.8% of patients may be affected[7]. Contributing factors include healthcare providers' decision-making patterns, patient non-adherence, and systemic limitations, all of which impede the timely escalation of therapy. As such, overcoming clinical inertia has emerged as a critical challenge in diabetes care[8].

Recent international research increasingly points to nurses' significant contribution to mitigating clinical inertia. Nurse-led interventions have demonstrated improvements in glycemic control and timely treatment adjustments. For example, nurse-led care models and interventions supporting patients' self-management have proven effective in improving HbA1c levels and promoting treatment adherence[9–12]. Nurses often serve as key facilitators in patient education, motivation, and follow-up, encouraging more active patient engagement in their treatment regimens. Furthermore, systematic reviews suggest that nurse-led care may also be cost-effective, potentially reducing the overall healthcare burden associated with poorly controlled diabetes[12].

In contrast, research on clinical inertia in the Japanese healthcare context is notably limited. A search of the Igaku Chuo Zasshi (Japana Centra Revuo Medicina) using the term "clinical inertia" yielded only six relevant studies, none of which focused on nurse-led interventions. This absence of evidence may reflect entrenched clinical structures in Japan, where nursing autonomy in direct therapeutic decision-making is limited, and the concept of clinical inertia has yet to be fully recognized as a critical factor in diabetes management. Indeed, legal and systemic constraints often confine nurses to supportive roles, with primary responsibility for medical treatment lying predominantly with physicians. Even the introduction of the Japanese Nurse Practitioner (JNP) system—intended to delegate aspects of physicians' work to nurses—has revealed ambiguity regarding how far JNPs can independently manage or revise treatment plans, as JNPs frequently act "on behalf of" physicians without explicit legal definitions of their scope of practice[13]. This lack of clarity can diminish nurses' autonomy in proposing timely treatment intensification and potentially reinforce clinical inertia in real-world practice[14].

Moreover, the current medical fee reimbursement system tends to fix the division of roles within medical institutions—particularly in clinics—making it challenging to modify treatment policies promptly. Coupled with the uncertain legal liability that JNPs perceive when performing advanced procedures or prescribing medication, this environment may hinder the proactive nurse-led interventions that have shown promise in international contexts[13][14]. The lack of discourse on nurses' potential role in addressing clinical inertia underscores a pressing research gap.

These gaps highlight the urgent need to investigate how nurse-led strategies can effectively mitigate clinical inertia in the Japanese context. We must begin by examining the evidence from overseas, where nurse-led interventions have been demonstrated to improve blood glucose control and enhance timely treatment. By adapting established models from overseas to the Japanese healthcare system, it will be possible to propose tailor-made interventions that will not

only improve the quality of diabetes care but also potentially reshape the scope and influence of nursing in Japan. Identifying how nursing interventions can mitigate clinical inertia is essential to improving patient outcomes, optimizing resource allocation, and improving the overall quality of diabetes management in Japan.

This review aims to comprehensively examine how nurse-led interventions for diabetic patients who already exhibit clinical inertia or are at high risk of developing it can overcome delays in treatment intensification (situations where treatment intensification, such as changing treatment or adding medication, is required but not implemented).

Objectives

1. Assess the effectiveness of nurse-led interventions in reducing clinical inertia among diabetes patients by synthesizing outcomes—such as treatment intensification rates and glycemic control—from relevant international studies.

2. Evaluate the feasibility of implementing these interventions in Japan's healthcare setting, mainly focusing on clinic-centered diabetes care, to inform future strategies for improving treatment intensification and overall diabetes management.

Methods

1. Study Design

This study employed a scoping review approach following the methodological framework proposed by Arksey and O'Malley [15]. This framework systematically guides the processes of identifying research questions, conducting a comprehensive literature search, selecting relevant studies, extracting data, and synthesizing findings. Applying this method allowed us to map the current international evidence on how nurse-led interventions can reduce clinical inertia in T2DM management.

2. Operational definition of this study

In this review, clinical inertia is defined as the failure of healthcare providers to initiate or intensify therapy despite recognizing that therapeutic changes are necessary when treatment goals remain unmet [16]. This concept initially emerged from research on chronic conditions, including diabetes [17].

3. Literature Search Method

The literature search was conducted using CINAHL and MEDLINE, focusing on the keywords "Clinical Inertia" and "Diabetes Mellitus." Informed by the earliest recognized use of the term clinical inertia by Cook et al. in 1999 [17], we included original articles published between 1999 and 2024. The final search was completed on Febru-

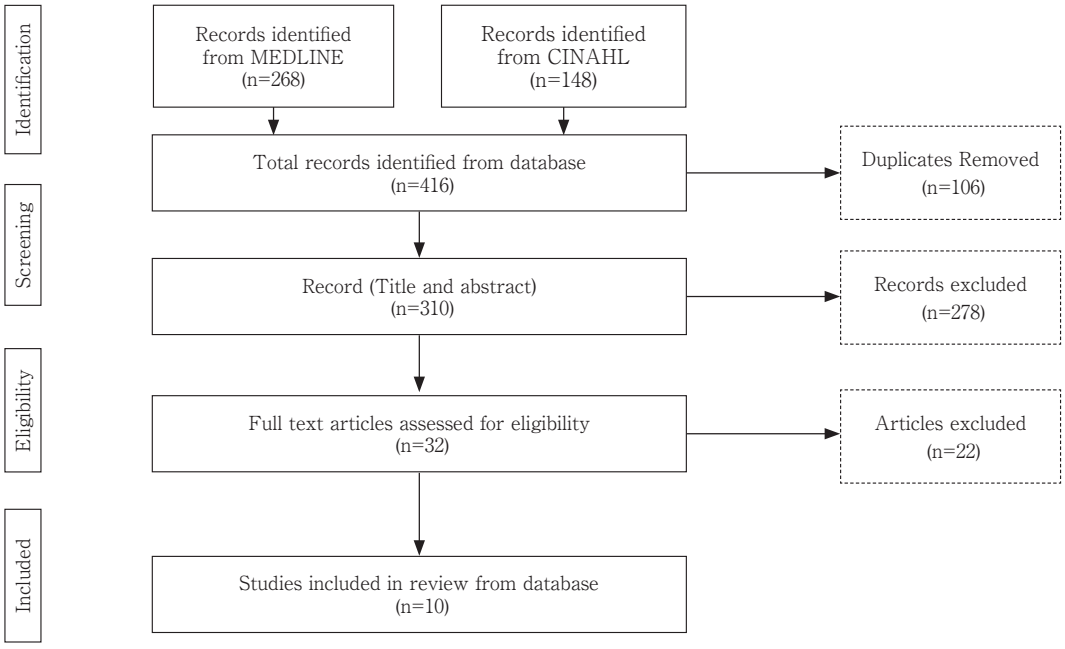

Figure 1. PRISMA Flowchart of Study Selection Process for International Studies

ary 7, 2024. A total of 416 articles were identified, of which 106 duplicates were removed. The titles and abstracts of the remaining 310 articles were screened. Studies focusing solely on physicians, pharmacists, or other non-nurse providers, as well as inaccessible articles, were excluded to ensure an emphasis on nurse-led interventions. After this screening, 32 articles were selected for full-text review, resulting in 10 articles that met the inclusion criteria and were included in this review (Figure 1).

4. Analysis Method

This scoping review was conducted in accordance with the PRISMA-ScR (Preferred Reporting Items for Systematic reviews and Meta-Analyses extension for Scoping Reviews) guidelines, an extension of the PRISMA statement [18]. The selected articles were examined to clarify the roles, skills, and qualifications of nurses involved in diabetes management and the range of interventions they employ. The effectiveness of various nursing approaches—such as patient education, medication adjustments, interdisciplinary team care, and remote monitoring—was analyzed to determine their impact on clinical inertia and diabetes-related outcomes.

Results

1. Research Trends in International Studies (Table 1)

Of the 10 studies reviewed, one was published before 2009, five between 2010 and 2015, and four between 2016 and 2019. The studies involved various types of nurses, including Nurse Practitioners (NPs) in six studies, Certified Diabetes Educators (CDEs) in two, clinic nurses in one, and case manager nurses in one. Additionally, one study involved an interdisciplinary medical team that included nurses.

2. Methods of Nursing Interventions in International Studies (Table 1)

The nursing interventions identified in the reviewed studies can be broadly classified into four categories: patient education, medication adjustments, interdisciplinary team care, and remote monitoring.

Patient education emerged as a crucial element in several studies. For instance, one study focused on nurse-led education sessions for diabetes patients that emphasized lifestyle management and the use of GLP-1 receptor agonists to enhance patients' self-management capabilities [19]. Another study evaluated a program in which nurses provided point-of-care HbA1c testing along with patient education. This approach sought to improve patients' awareness of their blood glucose levels and reinforce self-management practices [20].

Medication adjustments were also a key intervention, with nurses actively initiating or intensifying therapy. In one example, NPs and physician assistants collaborated with physicians to implement basal-bolus insulin therapy, leading to more frequent insulin adjustments and better overall diabetes management [16].

Interdisciplinary team care further demonstrated the value of nursing expertise. One study involved NPs and primary care physicians working collaboratively with evidence-based treatment algorithms, integrating nursing perspectives into decision-making around treatment intensification [11]. Similarly, interdisciplinary teams, including nurses and CDEs, established insulin initiation protocols that helped patients achieve and maintain improved glycemic control over time [21][22].

Remote monitoring intervention provided continuous patient support through technological means. In one study, asynchronous data sharing via electronic health records enabled CDEs to monitor patients' blood glucose levels and intervene promptly [23]. Another study utilized phone and email follow-ups by CDEs, ensuring frequent patient contact and timely guidance, particularly for medication management [24].

3. Clinical Evaluation and Intervention Results in International Studies (Table 1)

The effectiveness of nurse-led interventions was assessed using diverse clinical and patient-reported outcomes, including HbA1c levels, blood pressure, lipid profiles, treatment intensification rates, and patient satisfaction and quality of life indicators.

HbA1c reduction consistently emerged as a key indicator of improved diabetes management.

Table 1－1 Summary of Studies Extracted from the Literature Review in International Studies

Author (Year) [Reference]	Participants / Inclusion Criteria	Study Design	Definition of Clinical Inertia	Intervention	Methods	Clinical Inertia-Related Outcomes	Other Outcomes
Willens et al. (2011) [11]	・Primary care setting for T2D adults ・Reviews team-based interventions from various studies	QE	・Suboptimal therapy escalation (glycemia/BP/lipids) despite guidelines ・Patients needing frequent follow-up but had delayed/inadequate med changes in busy primary care	・Interdisciplinary team care: MDs + APNs (NPs) + clinical pharmacists ・Nurses/pharmacists do med management, education, frequent follow-up ・PCP retains overall oversight ・Summarized structured nurse/pharmacist-led models from multiple trials	・Often included protocols or physician oversight for RNs/pharmacists to adjust meds ・Frequent calls/in-person visits to track progress, reinforce education, escalate therapy	・Consistently higher medication intensification with nurse/pharmacist interventions ・Several studies showed A1C drops (~0.6–1.0%), improved BP/lipids ・Team-based approaches outperformed usual care in bridging guideline gaps	・Some noted decreased clinical inertia & better preventative measures (flu shots, foot exams, smoking cessation) ・Others found improved patient satisfaction, possible cost-benefit
Mackey et al. (2014) [16]	・N=171 (222 hospitalizations) vs. N=543 (665 hospitalizations) ・Inclusion: adult inpatients (non-ICU) with T2D, LOS ≥ 3 days	RC	Failure to intensify insulin (basal-bolus) despite hyperglycemia	・Inpatient NP/PA (CDE-certified) team for insulin therapy (initiation, dose adjustment, discharge prescribing) + patient education ・Control: standard care without endocrinology consult	・Primary teams consulted endocrinology for complex diabetes ・NP/PA evaluated patients, planned insulin regimen changes, staff endocrinologist-approved ・Insulin administered and POC-BG measured to gauge therapy intensification/outcomes	・Basal–bolus insulin use: 80% with NP/PA vs. 34% controls ($p<.01$) ・Multivariate: NP/PA involvement ↑ odds of basal-bolus by 3.66 (95% CI 2.36–5.67) ・NP/PA care correlated with lower mean POC-BG 24 h pre-discharge ($p=0.042$)	・Despite higher baseline severity in the NP/PA group, discharge glucose improved ・No significant difference in hypoglycemia
Carol (2017) [19]	・45 patients over 8 months (42 T2D, 3 T1D), mean age ~63 ・21 not on insulin, 24 on insulin at baseline ・Inclusion: mainly HbA1C ≥ 64 mmol/mol (8.0%) not improving under usual care	Pre-post	"Failure to intensify timely" leading to suboptimal control	・Enhanced monthly diabetes clinic (45-min) with practice nurse + DSN ・Patient-centered nurse mentored by DSN ・Support for complex cases (GLP-1 RA or insulin starts)	・Longer visits for lifestyle counseling, medication adjustments ・Promoted patient ownership, provided "Diabetes Handbook," signposting to DESMOND/DAFNE ・Rechecked HbA1C ~ 3 months later	・Many started insulin or intensified oral meds/GLP-1 RA/SGLT2i ・Among 41 with follow-up; all had HbA1C ↓ (range 0.2–6.9%) ・Some refused intensification but still improved slightly with lifestyle changes	・Weight changes varied (20 lost, 14 gained, two unchanged) ・Clinic approach improved DSN involvement and staff mentoring

Table 1－2 Summary of Studies Extracted from the Literature Review in International Studies

John et al. (2019) [20]	・N= 74 T2D ・Mean age 50–70, predominantly African American (61%) women (76%), with high poverty/uninsured. ・Inclusion: T2D, A1C> 7 %, no severe anemia/advanced disease/pregnancy. Exclusion: new T2D w/o baseline A1C, pregnancy, advanced complications.	Pre-post	Not escalating meds/care plan despite A1C> 7 %	・Implemented A1C POCT for immediate results + face-to-face intensification + DSME at same visit. Repeated measures: baseline (3 – 6 mo pre), POCT visit, then 3 -mo follow-up. Used a DCA Vantage Analyzer (NGSP-certified) onsite.	・Staff identified eligible patients in morning huddles. ・Capillary blood tested (~ 6 min), results discussed, meds adjusted, lifestyle coaching. If A1C> 7 %, a 3 -mo recheck was scheduled. Interventions included new drug starts, dose escalations, and insulin or GLP-1 RA.	・Medication intensification rose from 23.8% (baseline) to 88.1% (initial POCT) (p<0.001), then 65.7% at three mo if A1C> 7 %. Markedly reduced inertia. A1C initially rose from 8.98% to 9.93% (possibly regression), then dropped to 9.21% at three mo (p=0.008).	・Under-resourced setting with major social determinants limiting self-care. Despite that, same-day POCT + immediate intensification improved A1C and intensification rates.
Furler et al. (2014) [21]	・N= 18 T2D ・Inclusion: T2D with suboptimal control (HbA1C>7.5%), not on insulin ・Practices allowed PNs to lead insulin starts under GP supervision	QE	Delayed or no insulin therapy escalation for persistent hyperglycemia	・“Stepping Up” nurse-led insulin start approach (basal glargine, 10 U start, + 2 U q3 days) ・PN leads education, GP final prescriber ・Simple protocol, continuity, frequent contact in primary care ・Study DNE/endocrinologist available if needed	・Practice briefing visit: introduced structured approach, clarifying roles of GP & PN ・A single 3 -hour training session for GPs and PNs on insulin therapy, motivational interviewing, dose titration ・Regular PN–patient contact (in-person or phone) for dose adjustments, with GP oversight	・14/18 started insulin within 3 mo, HbA1C decreased from 8.4% to 7.5% ・Nurse-led approach addressed “psychological insulin resistance.” ・Insulin starts integrated into routine practice; no need for specialty referral	・PN–GP teamwork, simple algorithm, local accountability ・Time demands, PN funding, peer support needed
Manski-Nankervis et al. (2017) [22]	・N=266 T2D ・Inclusion: T2D, HbA1C ≥ 7.5%, ≥ 2 oral agents max, or judged insulin-ready ・Exclusion: age>80, eGFR<30, unstable comorbidity, or on insulin	RCT	Failure to initiate/intensify therapy (esp. insulin) despite hyperglycemia.	・“Stepping Up” model: practice-based insulin initiation ・GPs & nurses trained, plus RN-CDE mentor for intensification ・Control: usual care 12 months, then optional 2 -hr training but no RN-CDE mentorship	・During RCT, RN-CDE guided nurse-led insulin start/titration under GP ・After 12 mo, RN-CDE left. Control got minimal training. ・Data on A1C, insulin dose, weight, oral meds at 6, 12, 18, 24 mo	・At 12 mo, 69.9% in intervention started insulin vs. 22.2% control ・At 24 mo, 71.3% vs. 31.0% on insulin ・HbA1C ~1.3% drop sustained in the intervention (7.6% vs. 8.0% at 24 mo, p=0.04) ・No severe hypoglycemia	・No significant weight difference ・Control used more DPP-4i; both groups used metformin widely
Greenwood et al. (2015) [23]	・N= 90 T2D adults (30–70 yrs) ・HbA1C 7.5–10.9% (58–96) ・Inclusion: T2D on oral or non-insulin injectables, Eng-speaking, Internet/3G, baseline HbA1C 7.5–10.9% ・Exclusion: severe comorbidities (ESRD, advanced retinopathy, etc.)	RCT	Persistent high HbA1C lacking timely therapy intensification	・Telehealth remote monitoring (Care Innovations Guide tablet) for “paired glucose testing” pre/post meals + daily “health sessions.” ・CDEs gave asynchronous EHR-based feedback (“virtual visits”) monthly calls. ・Control: usual nurse phone coordination w/o structured telemonitoring	・Weekly CDE review of flagged SMBG data in a “stoplight” system. ・Patients tested pre-/post-meal, data sent to a standard protocol, CDE posted recommendations to PCP via EHR, monthly phone follow-ups. ・Control group had routine phone nurse mgmt only	・At 6 mo, telehealth group A1C -1.11% vs. -0.70% in controls (p=0.005). Medication changes are strongly linked to a bigger A1C drop. Paired glucose + CDE asynchronous feedback →, more timely adjustments, reducing inertia.	・Improved self-care (carb spacing p=0.04, glucose monitoring p=0.001, foot care p=0.02). No severe hypo/hyperglycemia. No difference in knowledge or self-efficacy.

Table 1－3 Summary of Studies Extracted from the Literature Review in International Studies

Zgibor et al. (2017) [24]	・N=240 T2D adults (Intervention: n=175, Control: n=65, 12-mo intervention). ・Inclusion: T2D≥1 yr, age≥18, out of target on ≥1 measure(HbA1C≥7%, BP≥140/80, LDL≥100). Exclusion: non-ambulatory, pregnancy, severe cognitive, upcoming surgery, dialysis, or non-English.	RCT	No escalation of therapy despite uncontrolled glycemia, BP, or LDL	・CDEs in intervention practices using pre-approved algorithms for meds (glucose/BP/LDL). ・CDEs placed "pending" med orders, provided self-management education and escalated as needed. ・Control had standard care ± monthly support groups. 12 mo follow-up.	・Intervention patients had baseline + quarterly visits with CDE (~2 hr initially, 30–60 min at follow-ups). ・CDE reviewed labs, recommended med changes for PCP to sign, and gave education. Some phone/email follow-ups. Data from baseline, 3, 6, and 12 mo were compared.	・Intervention significantly ↓HbA1C from 8.8% to 7.8% vs. control 8.2%→8.3% (p=0.004 difference). Higher glucose-lowering med intensification in intervention, especially for HbA1C>8%. No significant difference exists in intensification for BP/lipids or final BP/LDL.	・Both groups decreased LDL (no difference). No significant BP difference (intervention started lower). At 12 mo, 11% of intervention achieved all 3 ABC goals vs. 1.5% control (p=0.02).
Gabbay et al. (2013) [25]	・N=545 T2D ・Inclusion: age 18–75 yrs, T2D≥1 yr, A1C>8.5% or BP>140/90 or LDL>130. Exclusion: nursing home, non-English/Spanish.	RCT	Failure to intensify therapy if glycemia/BP/LDL remains uncontrolled	・2-year RCT: usual care vs. nurse case managers (NCMs) using motivational interviewing (MI). NCM visits ~q2w initially, then monthly–quarterly, focusing on behavior change, meds, self-care, screening, and PCP communication.	・NCM visits ~1 hr for labs, lifestyle, and adherence checks. Phone/email used as needed. NCMs had standing orders for labs/screenings and recommended med titrations to PCP. NCMs had intensive MI training + monthly fidelity checks with audio recordings (BECCI).	・NCM prompting improved systolic BP more in the intervention (131 vs. 135 mmHg, p<0.05). Both groups had significant within-group improvement in A1C, LDL, and diastolic BP, but no difference at 2 years—likely overshadowed by concurrent QI in usual care.	・Depression (CES-D) improved more in intervention (14→10 vs. 15→14, p=0.02), distress (PAID) showed a trend (p=0.08). Complication screening (eye/foot/kidney) is significantly higher. No difference in SDSCA or DTSQ.
Ziemer et al. (2006) [26]	・N=4038 T2D outpatient ・Inclusion: T2D in primary care tracked over 3 years.	QE	Not intensifying therapy despite inadequate glycemic control	・Informatics system tracked each visit's labs and meds in/out. Then generated: (1) decision support reminders (pt-specific dose/type suggestions), (2) provider-specific feedback: 1-on-1 "report cards" with an endocrinologist every 2 wks, showing intensification rates and outcomes.	・Data stored in Oracle DB. Reminders displayed flowsheet plus recommended med changes for poor control. Feedback involved short 1-on-1 sessions (every 2 wks) with an endocrinologist reviewing "report cards." Providers are randomized to control, reminders, feedback, or both.	・Therapy intensification improved significantly in feedback arms (~35%→52% in year 1, sustained). Reminder-only or control arms improved briefly, then declined. In multivariate analysis, feedback independently predicted intensification (p<0.001), intensification independently improved glycemic control (p<0.001).	・Better intensification improved A1C across 3 yrs.

T2D: type 2 diabetes, QE: quasi-experimental study, BP: blood pressure, APN: advanced practice nurse, NP: nurse practitioner, PCP: primary care physician, RN: registered nurse, LOS: length of stay, RC: retrospective cohort, PA: physician assistant, CDE: certified diabetes educator, POC-BG: point-of-care blood glucose, HbA1C: hemoglobin A1C, Pre-post: pre-post comparison study, DSN: diabetes specialist nurse, GLP-1 RA: glucagon-like peptide-1 receptor agonist, SGLT2i: sodium–glucose cotransporter 2 inhibitor, GP: general practitioner, eGFR: estimated glomerular filtration rate, RCT: randomized controlled trial, DPP-4i: dipeptidyl peptidase-4 inhibitor, ESRD: end-stage renal disease, SMBG: self-monitoring of blood glucose, LDL: low-density lipoprotein, MI: motivational interviewing, CES-D: Center for Epidemiologic Studies Depression scale, PAID: Problem Areas In Diabetes, SDSCA: Summary of Diabetes Self-Care Activities, DTSQ: Diabetes Treatment Satisfaction Questionnaire.

Studies reported significant decreases in HbA1c levels, ranging from 0.2% to 6.9%, following NPs- and DSNs-led education and support focusing on GLP-1 receptor agonists and lifestyle changes[19]. For example, after excluding patients with missing data, mean HbA1c levels dropped from 9.82% to 8.23% over eight months ($p < 0.001$)[19].

Another study using an algorithm-based management approach led by primary care physicians and NPs found a 0.63% reduction in HbA1c over 12 months in the intervention group compared to a 0.15% reduction in the control group[11]. Similarly, stepped-care models and insulin initiation protocols implemented by nurses and inter-interdisciplinary teams resulted in sustained improvements in glycemic control from three[21] to 24 months[22].

Remote monitoring approaches also yielded significant improvements in HbA1c levels. In one study, patients receiving ongoing, asynchronous feedback on their blood glucose measurements experienced more significant HbA1c reductions from 8.46% to 7.35% over six months, compared to a decrease from 8.16% to 7.46% in the control group[23]. Likewise, standardized protocols led by CDEs contributed to notable HbA1c improvements in multiple follow-up points[24]. Beyond glycemic metrics, several studies evaluated blood pressure and lipid profiles. For example, an intervention involving nurse case managers trained in motivational interviewing achieved significant diastolic blood pressure reduction from 78 mmHg to 74 mmHg in the intervention group and from 80 mmHg to 74mmHg in the control group[25]. The same intervention also improved LDL cholesterol levels, which declined from 127 mg/dL to 100 mg/dL in the intervention group, compared to a reduction from 128 mg/dL to 102 mg/dL in the control group[25]. Additionally, these improvements were associated with decreased depression scores and lower diabetes-related distress, underscoring the multifaceted benefits of nursing interventions. Treatment intensification, especially concerning insulin therapy, was another critical outcome. In one study, patients supported by physician assistants and NPs were significantly more likely to initiate basal-bolus insulin therapy, leading to better peri-discharge blood glucose control[16]. This finding highlights the importance of proactive, timely medication adjustments in overcoming clinical inertia. In addition, an informatics-supported intervention employing algorithm-driven medication adjustments showed a marked increase in treatment intensification during the first year and led to improved long-term diabetes management ($p < 0.001$)[26]. This underscores how systematic decision support can further reduce clinical inertia and sustain better glycemic control.

Nurse-led interventions positively influenced patient-reported outcomes such as quality of life and treatment satisfaction. In NPs-led collaborative care models, participants reported higher satisfaction and improved self-management behaviors[11]. Similarly, patients receiving nurse-led support experienced reduced diabetes-related distress and enhanced mental health indicators[25].

Discussion

This review indicates that nurse-led interventions substantially improve clinical outcomes in diabetes management and play a crucial role in mitigating clinical inertia. Enhanced glycemic control, improved blood pressure and lipid profiles, and increased patient satisfaction collectively underscore nurses' significant contribution to optimizing diabetes care. Recent reviews also suggest that nurse-led models can offer cost-effective solutions; by providing timely treatment intensification and reducing preventable complications, nurse-led interventions may lower hospital admissions and emergency visits rates, thereby alleviating overall healthcare expenditures[12].

In T2DM patients, a 1-year delay in treatment intensification increases the risks of MI, HF, stroke, and CVE by up to 67%. Among those with HbA1c >7% and no CVD, risks rise by up to 80%[27]. Poor treatment adherence is a significant factor, with only 50% of patients fully adhering[28]. Nurse-led interventions effectively address these issues. By synthesizing global evidence, this study highlights how nurses' involvement in patient education, medication titra-

tion, interdisciplinary collaboration, and remote monitoring is central to reducing clinical inertia.

1. An examination of the effects of nurse-led interventions on clinical inertia based on international literature

This study highlights the diversity and effectiveness of nurse-led interventions in addressing clinical inertia within diabetes management. International literature reveals that nurses contribute significantly to improving clinical indicators, such as HbA1c, systolic and diastolic blood pressure, and LDL cholesterol, through various approaches. These include patient education, medication adjustments, interdisciplinary teamwork, and telemonitoring. NPs and diabetes-certified nurses are pivotal in improving patient outcomes and fostering self-management skills. Such interventions have been shown to enhance clinical metrics, improve patient satisfaction, and reduce diabetes-related distress, demonstrating the critical role of nurses in diabetes care [19)20)29)].

Globally, nurse-led interventions have successfully addressed clinical inertia by providing patient-centered and adaptable care. For instance, patient education delivered by nurses has been shown to significantly improve HbA1c levels [20)]. By educating patients on medication adherence, lifestyle modifications, and diabetes management, nurses empower individuals to take active roles in their health. Specialized diabetes care provided by DSNs and CDEs enhances patients' understanding of their condition and promotes confidence in self-management, effectively reducing patient-related clinical inertia [29)].

From a system perspective, nurse-led integration of electronic health records (EHRs) and telemedicine has improved diabetes care. Telemedicine for blood glucose monitoring allows nurses to identify and address health issues promptly, enhancing patient outcomes [23)24)]. Such approaches underscore the adaptability and effectiveness of nurse-led interventions in diverse healthcare settings.

Additionally, the lack of research after 2020 suggests a stagnation in academic exploration, potentially due to multiple interrelated factors. First, the COVID-19 pandemic profoundly disrupted clinical research activities, as many planned or ongoing studies in chronic disease management were delayed or halted. In particular, healthcare professionals, including inpatient diabetes specialist nurses, were frequently redeployed to COVID-19 units, reducing the workforce available for diabetes-focused projects [30)]. Second, funding shortfalls and shifted policy support—as resources were diverted toward urgent infectious disease research—further constrained the ability to investigate clinical inertia in chronic care [31)]. Third, shifting healthcare priorities—such as the rapid pivot to digital health solutions and the acute focus on infection control—may have inadvertently deprioritized nurse-led interventions specifically targeting clinical inertia [32)]. Finally, the heightened workload and emotional burden on nurses responding to pandemic demands likely hindered their capacity to initiate or continue new studies on diabetes management. These converging factors will help explain why few studies emerged post-2020.

2. Nurse-led interventions in Japan to prevent medical inertia: issues and potential for adaptation

While nurse-led interventions have achieved significant success internationally, their implementation in Japan faces unique challenges and opportunities for growth. A key issue is the limited recognition of clinical inertia within the Japanese healthcare system, compounded by a lack of Japan-specific literature addressing how nurse-led interventions can specifically mitigate this phenomenon. Although the global research gap after 2020 has been noted (section 5.1), this scarcity is further amplified by systemic and legal constraints that shape nurses' professional roles in Japan.

Moreover, systemic barriers hinder Japanese nurses from performing advanced clinical roles, primarily due to the absence of a robust NP system. Unlike NPs in countries such as the United States, who independently manage patients and drive innovative care models [33-35)], Japanese nurses often operate within restrictive frameworks that limit their autonomy [36)]. The slow adoption of task-specific training programs, such as the

"Specified Medical Acts Training," further restricts nurses' capacity to address complex care needs like diabetes management. While the program equips nurses with essential procedural skills, it emphasizes safety and efficiency rather than fostering advanced decision-making competencies[36]. It is widely recognized, however, that enhancing nurses' decision-making abilities is crucial for improving patient outcomes in complex care settings[37]. Expanding these programs to include advanced clinical decision-making and patient management skills is essential to enhance their impact and align with the growing complexity of healthcare needs.

Legal constraints still significantly limit the scope of nursing practice in Japan. Unlike their counterparts in other countries, Japanese nurses are restricted from independently diagnosing conditions or prescribing treatments[36]. On the other hand, the Ministry of Health, Labour, and Welfare has introduced policies to promote nurses' autonomy. In particular, guidelines for task-shifting and task-sharing have been developed to encourage the delegation of specific medical tasks from physicians to nurses, with the goal of improving healthcare efficiency and maximizing the potential of the nursing workforce[38]. These guidelines allow nurses to take on more complex tasks, such as patient assessments and certain diagnostic activities, under supervision or in collaboration with physicians. This initiative is designed to address the shortage of healthcare professionals and improve the quality of patient care. It also aims to enhance nurses' roles in managing clinical conditions, which could contribute to addressing clinical inertia. However, despite these progressive policies, legislative reforms are still necessary to fully empower nurses and align their roles more closely with NPs in countries like the United States and Australia, enabling them to manage clinical inertia proactively.

Together, these obstacles help explain why recent research—significantly beyond 2020—remains sparse in Japan. Not only did the pandemic interrupt research globally, but Japan's unique legal and institutional frameworks have also curtailed nurse-led initiatives that might otherwise fill the gap identified in section 5.1. Consequently, advancing the discussion on the introduction of a nurse practitioner system and enhancing existing training programs may serve as key policy reforms. These efforts, along with the promotion of focused research on nurse-led strategies, could substantially strengthen initiatives to reduce clinical inertia in diabetes care in Japan.

3. Importance of addressing clinical inertia in Japanese clinics

In Japan, many patients with type 2 diabetes receive ongoing care primarily in clinic settings rather than large hospital centers. These clinics often have limited staff and resources, and consultation times tend to be brief, emphasizing physician-led assessments. Such conditions can inadvertently contribute to clinical inertia if treatment intensification is delayed or overlooked. Indeed, a global review reported that up to 50% of the population worldwide receives 5 minutes or less per primary care consultation, which may limit opportunities for comprehensive diabetes management[39]. Moreover, data from Japan suggests that consultation times may be as short as 6–10 minutes, raising concerns about whether patients receive adequate assessment and counseling, especially for chronic conditions like diabetes[39].

Nurse-led interventions in clinics, therefore, have significant potential to address these gaps by providing proactive patient education, lifestyle counseling, and early identification of suboptimal glycemic control. For instance, when nurses can perform regular check-ups or telemonitoring, they may detect rising HbA1c levels early and initiate prompt discussions with physicians about treatment adjustments, thereby mitigating clinical inertia in these smaller, community-based practices. However, systemic and legal revisions—including broader recognition of nurses' decision-making authority and adequate reimbursement for nurse-led services—are crucial to implementing these strategies effectively.

Despite these challenges, considerable opportunities exist to adapt successful international models to the Japanese context. Integrating tele-

medicine into routine diabetes care is one promising avenue. Remote monitoring allows healthcare providers to deliver personalized care by addressing patients' daily needs and unique circumstances[23]. This approach could significantly enhance the scope of nursing practice in Japan, particularly in rural or underserved areas, by enabling nurses to respond more effectively to patient needs, thus improving outcomes and reducing clinical inertia. In recent years, Japan has also begun to provide insurance coverage for telemedicine[40], and this expansion of telemedicine reimbursement may enhance nurses' ability to monitor patients and promptly adjust care plans regularly. Such measures could potentially reduce clinical inertia by facilitating earlier treatment intensification. For instance, studies have shown that timely remote follow-up and nurse-led telemonitoring can improve glycemic control and increase medication titration rates, leading to fewer delays in therapy escalation[23]. Nevertheless, while insurance coverage is a crucial step, additional research is needed to confirm whether and how such telemedicine services will effectively reduce clinical inertia in the Japanese context, given the abovementioned legal and institutional constraints.

Furthermore, developing a tailored NP framework in Japan could empower nurses to take on advanced roles, such as conducting patient assessments, adjusting treatment plans, and providing continuous education. Clarifying the distinctions between NPs and Japan's NPs can help inform strategies for adapting international best practices. Future research should evaluate the feasibility and effectiveness of nurse-led interventions, including telemedicine, and conduct cross-national comparisons to adapt successful models to Japan's healthcare system.

Institutional support remains essential to address these systemic, educational, and legal barriers. Policymakers must prioritize expanding training opportunities and granting greater autonomy to nurses, enabling them to lead interventions against clinical inertia. The increasing number of nurses completing "Specified Medical Acts Training" highlights a growing recognition of the need for specialized skills. However, this progress must be matched with systemic changes to support nurses in these advanced roles.

By tackling these issues and leveraging available opportunities, Japan can construct a dynamic framework for nurse-led interventions, transform its approach to managing diabetes, and reduce clinical inertia. Focusing on clinics, where many T2DM patients receive regular care, is especially important. These efforts would improve patient outcomes and foster a more sustainable healthcare system, ensuring timely treatment intensification and better chronic disease management at the community level.

4. Limitations

Several limitations must be considered. First, this review is based mainly on English-language studies conducted in countries where the nursing profession may differ in scope and autonomy from Japan. Cultural, institutional, and regulatory differences may influence the applicability of these findings. Second, while this study provides a broad overview of nurse-led interventions, it does not fully explore patient perspectives or the dynamic interplay among healthcare team members. Future research should incorporate patient and interprofessional viewpoints and cross-cultural comparisons to develop more nuanced and context-specific interventions.

Conclusion

International evidence strongly supports the efficacy of nurse-led interventions in reducing clinical inertia and improving diabetes outcomes. Although Japan faces significant challenges—such as limited nursing autonomy, insufficient recognition of clinical inertia, and underutilized advanced nursing roles—there is considerable potential for adapting and implementing proven international strategies. By strengthening institutional support, reforming regulatory frameworks, and expanding nurse training programs, nurses in Japan can assume more advanced roles in patient assessment, medication titration, and education. Additionally, integrating telemedicine can enhance timely treatment intensification and foster proactive diabetes management.

Notably, some international reviews suggest that nurse-led care models may also be cost-effective, as they can help prevent complications and potentially reduce hospital admissions. However, further research is needed to confirm whether similar cost-saving effects are attainable under Japan's unique legal, financial, and organizational structures. Collaboration among policymakers, healthcare professionals, and researchers will be essential to establish a sustainable and practical framework for nurse-led interventions that not only improve diabetes management but also maintain affordability and access. Ultimately, developing and implementing these strategies could enhance the overall quality of patient care, reduce healthcare costs, and improve the quality of life for individuals with diabetes in Japan.

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糖尿病管理における臨床的慣性の克服に向けた看護介入の有効性
―日本における適用可能性を探る文献レビュー―

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キーワード
臨床的惰性，糖尿病，看護介入，文献レビュー

要　旨

【目的】本研究は、臨床的惰性（治療が必要と認識されながら開始・強化されない状態）が糖尿病管理に与える影響に着目し、看護師主導の介入がその軽減に寄与するかを国際的な研究成果をもとに評価するとともに、日本の医療現場での適用可能性を検討することを目的とする。

【方法】PRISMA-ScRに準拠し、CINAHLとMEDLINEを用いて1999～2024年の「臨床的惰性」と「糖尿病」に関する原著論文を検索した。医師や薬剤師などの医療従事者以外に焦点を当てた研究、アクセス不能な論文、レビュー論文を除外し、最終的に10件を抽出・分析した。

【結果】対象の多くは介入研究であり、ナース・プラクティショナーや糖尿病療養指導士が主に実施していた。インスリン調整、血糖モニタリング、患者教育を通じて治療強化が図られ、HbA1c、血圧、LDLコレステロールの改善や患者満足度の向上に寄与していた。

【結論】看護師主導の取り組みにより治療強化や検査値の改善効果が認められた。これを踏まえ、臨床的惰性の克服には継続教育や多職種連携を含むケアモデルの構築が重要と考えられる。日本においても、これらのケアモデルの普及により糖尿病管理の質向上と研究の発展が期待される。