



Type 1 diabetes in older populations

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In recent decades, life expectancy among people with type 1 diabetes has improved substantially in many high-income countries and well resourced health-care settings, highlighting persistent global inequities in survival for people with type 1 diabetes living in low-income and middle-income countries. Simultaneously, the growing proportion of individuals living into older adulthood in some settings highlights the need to look beyond insulin and glucose to consider the global health systems and wider determinants of health that shape health and longevity in the setting of type 1 diabetes. The goal of this Review is to integrate the psychosocial, environmental, and societal challenges associated with ageing and type 1 diabetes including disease burden, health system and organisational responses, self-care, and caregiver support. Additionally, we identify key research gaps for the future, considering the life course of people with type 1 diabetes in the context of where they live.

Introduction

The global population is ageing, with a growing proportion of individuals living into older adulthood while managing chronic conditions, such as type 1 diabetes.¹ Older adults, defined by WHO as people older than 60 years,¹ often have complex, overlapping care needs that require individualised and age-responsive, rather than standardised, approaches to chronic disease management.²

Over the past two or three decades, the demographics of type 1 diabetes have shifted to include a greater proportion of older adults,³ reflecting a population comprising both individuals with youth-onset and adult-onset disease.⁴ Importantly, although global mortality rates have notably decreased over this same period, these improvements have been most concentrated in high-income countries (HICs),⁵ or optimally resourced health-care settings. These disparities highlight persistent global inequities in access to insulin, other medications, and requisite medical supplies for people with type 1 diabetes living in low-income and middle-income countries (LMICs) and resource-constrained settings. At the same time, the shifting demographics in HICs and optimally resourced health-care settings have highlighted numerous emerging issues at the intersection of type 1 diabetes management and ageing, including challenges at the individual, community, organisational, and environmental level.

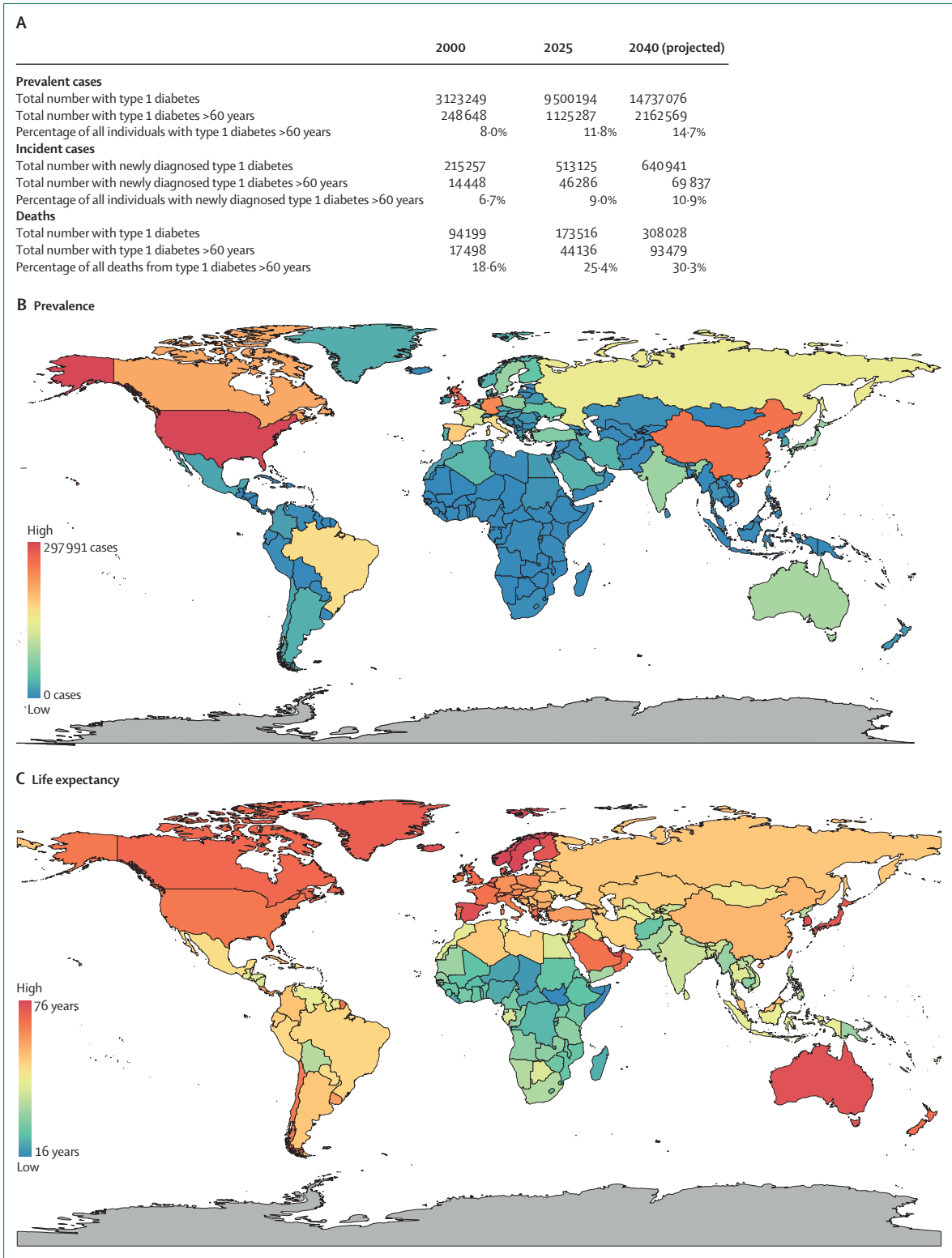
From a clinical perspective, older adults with type 1 diabetes could face challenges spanning a higher burden of complications, comorbidities, and age-related conditions, multilevel barriers to advanced diabetes technology use, unique risk–benefit trade-offs for adjunctive therapies, and complexities around selecting individualised glucose targets, which are addressed elsewhere.^{6–9} This Review adopts a global perspective on ageing and type 1 diabetes, integrating information on different aspects of disease burden and self-care challenges, care partner roles and support, and health system and organisational responses. We also aimed to identify key research gaps for the future.

The burden of type 1 diabetes in ageing populations

Global incidence of type 1 diabetes

The incidence of type 1 diabetes across the life course follows a bi-modal distribution, peaking during teenage years (~9 cases per 100 000 person-years) and after age 70 years (~9–10 cases per 100 000 person-years).⁵ Based on data from the International Diabetes Federation (IDF) Type 1 Diabetes Index, in 2025, older adults made up 9·0% of all new cases of type 1 diabetes, and from 2000 to 2025, estimated incident type 1 diabetes cases occurring at age 60 years or older increased from 14 448 to 46 286 (figure 1A).⁵ Thus, the population of older adults with type 1 diabetes comprises two overlapping subgroups—individuals ageing with youth-onset type 1 diabetes (ie, diabetes diagnosed in childhood or adolescence) and those developing adult-onset type 1 diabetes.^{1,8}

Whereas type 1 diabetes diagnosed in youth typically presents with an acute and distinct clinical onset, adult-onset disease often progresses more gradually, with notable heterogeneity in presentation and disease course that can be difficult to distinguish from type 2 diabetes, particularly in the presence of insulin resistance and higher BMI.⁴ Clinical suspicion for adult-onset type 1 diabetes is often low, which can contribute to misclassification and delays in initiating insulin therapy and other necessary treatments.^{6,8,10} The apparent increase in incidence of type 1 diabetes among middle-aged (typically defined as approximately age 40–64 years) and older adults might reflect true increases in new cases of type 1 diabetes. It might also reflect improved awareness, detection, and surveillance of adult-onset type 1 diabetes, particularly in HICs, driven by increased use of islet autoantibody and C-peptide testing, and along with earlier recognition of ketosis-prone or acute metabolic presentations. The increase could also reflect declining age-specific mortality in those at risk of developing type 1 diabetes. The relative contribution of each mechanism to the rise in adult-onset type 1 diabetes cases cannot be reliably quantified



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For Type 1 Diabetes Index see <https://www.t1dindex.org/>

Figure 1: Global projections of type 1 diabetes burden and geographical disparities in prevalence and life expectancy among older adults with type 1 diabetes (A) Global projections of prevalent cases, incident cases, and deaths attributable to type 1 diabetes in 2000, 2025, and 2040, including the proportion occurring in adults aged 60 years or older.⁵ (B) Geographical distribution of prevalent type 1 diabetes cases by country in 2025 among individuals aged 60–99 years.⁵ (C) Estimated life expectancy at age 10 years of individuals diagnosed with type 1 diabetes by country, 2025.⁵ Original author-submitted figure was generated in R using author-verified code, with initial code drafts assisted by Claude (Anthropic).

with existing data and likely varies substantially by geography, health-care setting, and across health systems.

Global prevalence of type 1 diabetes

According to data from the IDF Type 1 Diabetes Index,⁵ there were 9.5 million individuals living with type 1 diabetes worldwide in 2025. Among these, 11.8% were aged 60 years and older (figure 1A).⁵ Globally, the peak prevalence of type 1 diabetes appears to be in adults aged 45–49 years.³ Crucially, from 1990 to 2019, the global age-standardised prevalence of type 1 diabetes in older adults (≥ 65 years) rose from 400 to 514 per 100 000 individuals, reflecting an average annual increase of 0.86%.⁵

Global disparities in type 1 diabetes survival and care

IDF data suggest that Europe and North America have the highest number of older adults living with type 1 diabetes, whereas sub-Saharan Africa and southeast Asia have the lowest (figure 1B), with differences potentially reflecting disparities in type 1 diabetes life expectancy (figure 1C).

Globally, survival for older adults with type 1 diabetes has improved dramatically in many HICs and optimally resourced health-care settings over the last three decades, where the life expectancy gap between those with type 1 diabetes compared with those without diabetes has narrowed to about 10–15 years.^{5,11,12} Simultaneously, disparities in life expectancy have widened in LMICs, with 2021–2025 data reporting a remaining life expectancy of a child aged 10 years at diagnosis in 2021 of 13 years in LMICs, compared with 65 years in HICs.¹³

Underlying disparities in diagnosis and access to care, medications, and technologies contributing to these trends are shown in the table. These factors ultimately stem from profound challenges of type 1 diabetes care in LMICs, especially from insulin unavailability, unaffordability, and issues related to storage.¹⁴ For countries where insulin has only recently become

available (ie, within the past several decades), few people with youth-onset diabetes have survived into older adulthood.^{15,16}

Many LMICs rely on international aid programmes to subsidise type 1 diabetes care, yet sustainability, consistent delivery of care, and holistic care remain challenges for such programmes.^{17,18} Moreover, to date, donor-supported programmes have primarily targeted children and adolescents, leaving older adults with little to no support.^{19,20} Many regions in LMICs are prone to supply chain disruptions that can affect access to insulin, a major issue for people with type 1 diabetes of all ages. Other infrastructural barriers, such as insufficient cold chain storage capabilities, can limit insulin availability, especially in rural or remote areas. Insufficient national registries and databases in LMICs can additionally impair effective forecasting of insulin needs as well as supply procurement and management.^{19,21–24} There are also barriers to accessing other advances in cardiovascular and kidney risk-factor management, such as medications that confer cardiorenal protection, in LMICs and settings where availability and affordability of these therapies are scarce.

Gaps in the epidemiological evidence

Currently, integrated and standardised global epidemiological data on type 1 diabetes across the lifespan remains scarce, particularly in LMICs. Population registries remain an ideal data source for surveillance, but most countries are without the resources to develop and sustain these databases. There are challenges related to misclassification of type 1 diabetes. In many LMICs, death could occur before a type 1 diabetes diagnosis, resulting in under-reporting. Moreover, mortality data are insufficient and often outdated; accurate data of age-specific incidence and survival by periods are essential to clarify the drivers of change particularly in type 1 diabetes prevalence.

Challenges of ageing with type 1 diabetes

Type 1 diabetes requires chronic and relentless management of blood glucose and, over time, further

	Healthy longevity	Morbidity and mortality
All settings	Access to insulin, adjunctive medications, and diabetes technologies; provider availability and proximity; identification of and support for individualised barriers to care and self-management; reduced stigma of disease	Misclassification of diabetes type and delayed diagnosis; limited access to requisite medications, supplies, and endocrinology care
High-income countries	Comprehensive and coordinated care teams, including cognitive and psychosocial care; care provider support and education; ageing-specific education and peer support resources	Racialised and socioeconomic disparities in health-care access and diabetes outcomes; polypharmacy and high health-care burden; financial toxicity; clinical inertia and ageism; limited care partner support for independent management; loss of broader social support networks, isolation; inadequate health-care policies and coordinated care for geriatric diabetes management
Low-income and middle-income countries	Urbanicity and proximity to supply chains and storage; community care provider support; public health resources and data infrastructure; non-governmental third-party organisation support	Disruptions in supply chains or barriers to accessing insulin and requisite supplies; limited access to endocrinology care and geriatric care providers; geopolitical factors, including conflict and natural disasters, impacting access to treatment and care; limited local resources for diabetes education and management support

Table: Structural and health system determinants of type 1 diabetes outcomes across global income settings

management of developing complications in other physiological systems, including the eyes, cardiorenal systems, nervous system, and extremities. Ageing introduces increased risk for additional chronic conditions and changes to social and environmental context that often interact with and complicate diabetes management. The intersection of these challenges can present different sets of issues for subgroups diagnosed in youth versus adulthood.

Glucose management and safety

Just as in type 2 diabetes, the risk of severe hypoglycaemia increases with age, along with a greater risk for associated morbidity and mortality.^{25,26} Yet, the burden of severe hypoglycaemia is markedly greater in older people with type 1 diabetes. In a prospective cohort of US adults aged 60 years or older with insulin-treated diabetes, the incidence proportion of severe hypoglycaemia over 12 months was substantially higher in those with type 1 diabetes compared with type 2 diabetes (42·3% vs 17·8%, respectively), corresponding to an approximately 2·4-fold greater burden in the type 1 diabetes population.²⁷ Risk of severe hypoglycaemia is difficult to mitigate, as all individuals with type 1 diabetes require lifelong insulin therapy. Moreover, among older adults with type 1 diabetes who were diagnosed in youth, longer disease duration can increase the risk of hypoglycaemia unawareness.^{28,29} When glycaemic goals are revised to account for age and overall health status, adjusting to these changes can be challenging for clinicians, patients, and families.³⁰

Major age-related changes impacting diabetes self-care

Older age could also bring additional changes that affect an individual's ability to self-manage type 1 diabetes. Conditions like advanced retinopathy and other visual impairments can create significant challenges in insulin management, hindering the ability to read insulin labels, measure doses accurately, or navigate insulin pump interfaces. Reduced manual dexterity can complicate handling insulin pens, syringes, infusion sets, and pump buttons, especially for adult-onset patients who could be adapting to new regimens for self-care.³¹ Older adults can face skin issues around pump or sensor insertion sites and adhesive bandages, with particular challenges, such as bleeding or bruising, compounded by common use of antiplatelet and anticoagulant medications.³¹ Lipodystrophy is more common in type 1 diabetes than type 2 diabetes. Data from 400 individuals with diabetes in Thailand suggests the highest rates of lipodystrophy occurs among individuals with longstanding (≥ 10 years) type 1 diabetes, with a prevalence of more than 55% in this group.³² Lipodystrophy could contribute to irregular insulin absorption and unexplained episodes of hyperglycaemia and hypoglycaemia.

Although the menopausal transition typically precedes older adulthood years, glycaemic, cardiometabolic, and

musculoskeletal consequences could have lasting implications for women ageing with type 1 diabetes.³³ Decline in oestrogen and progesterone concentrations during and after menopause are associated with higher insulin resistance, which can translate to increased or fluctuating insulin needs.³⁴ Some vasomotor symptoms of menopause that could persist into older adulthood (hot flashes, palpitations, and night sweats) are similar to hypoglycaemic symptoms and can impair recognition of severe hypoglycaemic events.³³ Post-menopausal physiological changes could also affect diabetes management for older women with type 1 diabetes, including adverse changes in cardiovascular disease risk factors, metabolic health, and bone health.³³ Despite these risks, many providers do not receive training on the interactions between post-menopausal and type 1 diabetes physiology; thus, women with type 1 diabetes often do not receive age-specific and sex-specific guidance on insulin adjustment, symptom interpretation, or management strategies tailored to the menopausal transition and the post-menopausal period.³⁵ More research and clinical guidance on hormone replacement therapy among women with type 1 diabetes might also be needed, given implications for glycaemia, cognitive ageing, bone health, other geriatric outcomes, and the importance of initiation timing for brain health benefits.³³

Finally, emerging literature also highlights direct links between diabetes and geriatric syndromes, which include conditions such as frailty and cognitive impairment, that occur at higher frequency with ageing. Timing of diagnosis of type 1 diabetes in an older adult's life can impact cognitive and functional status, and multiple prospective cohort studies such as the US-based DCCT/EDIC and SOLID cohorts suggest that longer duration of diabetes is associated with poorer outcomes, such as hypoglycaemic unawareness and cognitive dysfunction.^{36,37} A proposed, integrated model for these key age-related comorbidities is shown in figure 2. Much about frailty and its relationship with diabetes is derived from type 2 diabetes research,³⁸ where long-term exposure to hyperglycaemia might play a role.³⁹ There is also concern that frailty, which involves changes in weight, appetite, physical activity, and muscle mass, can lead to substantial and often rapid shifts in insulin requirements. This is particularly problematic for older adults with type 1 diabetes, who depend on insulin doses yet require close monitoring and timely dose adjustments to avoid hypoglycaemia.^{9,40}

Type 1 diabetes is independently associated with mild to moderate cognitive dysfunction across the lifespan, even before older adulthood, although risk increases with age based on data from HICs.^{36,41,42} In a nationwide Swedish cohort with 14·3 years of follow-up, individuals with type 1 diabetes had approximately double the risk of all-cause dementia compared with matched controls.⁴³ Additional modifiable risk factors include history

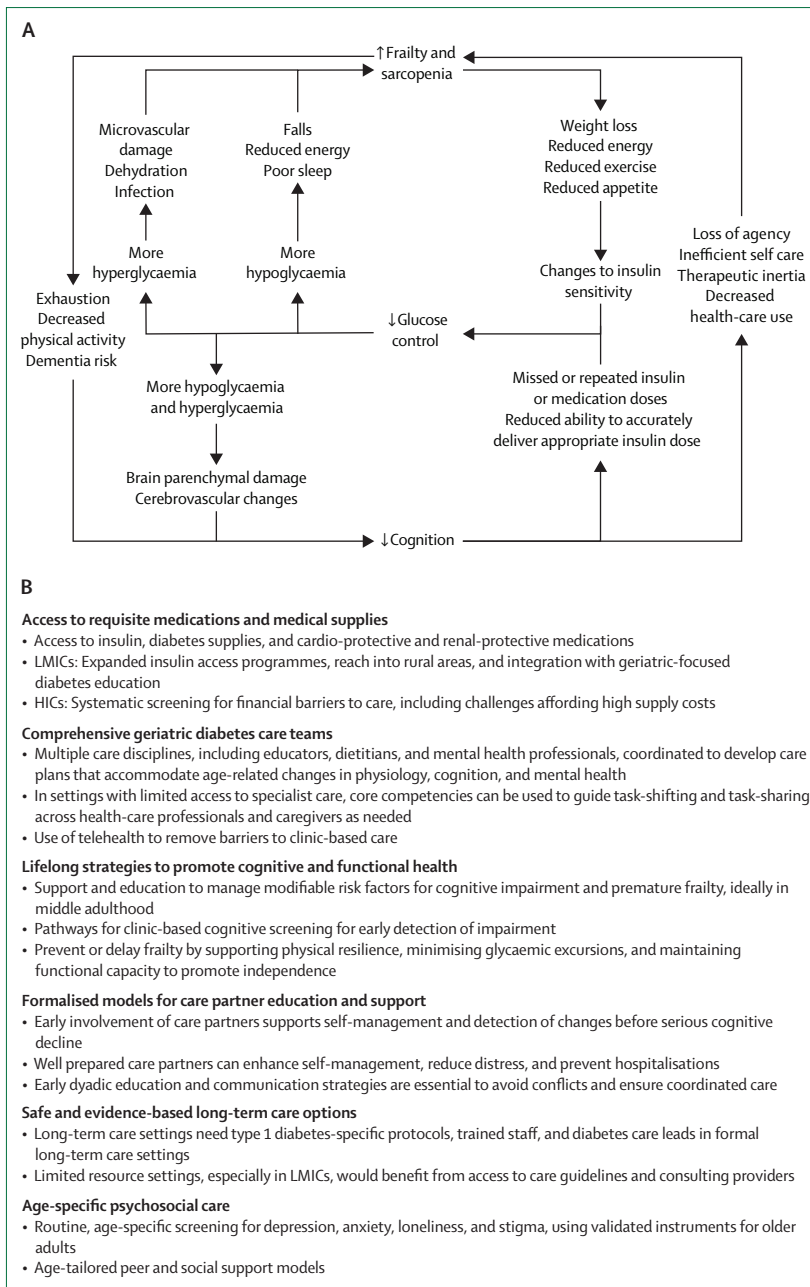


Figure 2: Inter-relationships among frailty, glycaemic control, and cognitive decline in older adults with diabetes and essential care needs of an age-responsive system for type 1 diabetes in geriatric populations (A) Relationships between diabetes glycaemic control and frailty and cognition showing mechanisms by which decreased glycaemic control causes or mediates increased frailty and decreased cognition. (B) Essential care needs for older people with type 1 diabetes as a comprehensive global model for care infrastructure. LMICs=low-income and middle-income countries. HICs=high-income countries.

of youth-onset disease,^{36,37,41,42,44–46} exposure to prolonged hyperglycaemia, recurrent severe hypoglycaemia, microvascular complications, episodes of diabetic ketoacidosis, and additional cardiovascular risk factors.^{36,37,43,47–51}

Age-associated cognitive decline and dementia directly impair execution of fundamental type 1 diabetes self-management tasks, such as insulin dosing, carbohydrate

counting, glucose monitoring, and recognising or responding to hypoglycaemia.^{52,53} Cognitive impairment in older adults with type 1 diabetes, including those with long-standing disease and adult-onset disease, increases the risk of insulin administration errors, insulin injection omissions, hypoglycaemia unawareness, and inability to safely manage acute glycaemic events.^{26,54–56}

The role of informal and formal care partners

Informal care partners for older adults, defined as unpaid family, friends, and significant others who provide essential support for daily living, health condition management, and medical care, are necessary components of diabetes care for older adults with type 1 diabetes as they age.²⁶ Over half of adults with diabetes have an unpaid care partner who regularly assists with diabetes management.⁵⁷ Globally, caregiving structures vary, with paid and formal care playing a larger role in many HICs, whereas the burden of medical care might be more likely to fall on informal caregivers or unpaid family members in LMICs,^{58,59} although the data on diabetes care specifically remains scarce.

Care partners are often involved in detecting changes in diabetes and related conditions, including hypoglycaemia, hyperglycaemia, and other diabetes complications, cognitive changes or lapses, mismatches between management data and behaviour (missed boluses or delayed treatment), changes in activities of daily living relevant to diabetes (medication adherence, supplies organisation, and appointment keeping), and noticing declines in vision or fine motor dexterity that interfere with self-management.^{60–62} However, older adults with type 1 diabetes and their care partners might not always know what support is needed or have the necessary skills to optimise diabetes management.⁶³ Therefore, care partners should be included in diabetes self-management education and decision making when possible.

In particular, cognitive and functional decline could accelerate a transition from independent management to increasing care partner involvement with diabetes management.^{60,61,64,65} Yet, there is a shortage of research specifically on ageing-related type 1 diabetes transitions of care-to-care partners, and few studies reporting psychosocial impacts among care partners of older adults with type 1 diabetes. Most research on care partners is limited to the USA and Europe, but is increasing elsewhere.⁶⁶ In the USA, care partners can face substantial burdens around increased health-care use and transitions of care, including a lack of involvement in discharge planning, increased caregiving responsibilities, and difficulty navigating the health-care system.⁶⁷ Informal caregiving can be costly due to lost productivity and time demands on care partners, and formal caregiving services are often expensive.^{58,68} Research is needed to characterise the care partner burden in LMICs and low-resource health-care settings,⁶⁹ which might be particularly pronounced.

Formal caregivers, defined as professional care providers with formal training in care provision related to specific medical conditions, ranging from experienced live-in practitioners to practitioners at long-term care facilities and visiting nurse services are often required by older adults.⁷⁰ This reliance on formal providers can be more prevalent in high-income settings, especially in urban areas, with significant variability in patient outcomes. Quality of care is often dependent on factors like the provider to adult ratio, training or certifications, additional health-care access and coordination with care teams, and residential status.⁵⁹

Building age-responsive systems for type 1 diabetes care

Effectively addressing the challenges of type 1 diabetes care in older adults necessitates enhanced clinical management and comprehensive support for individuals and their families. Yet, there are few care guidelines for type 1 diabetes that are specifically tailored to the needs of older adults, including both those with chronic and adult-onset disease.

Health systems and policy that promote access to medical supplies

Globally, the most fundamental need for type 1 diabetes care across the lifespan is consistent, equitable, and affordable insulin and requisite diabetes supplies, access to broader advances in cardiorenal protection, and ongoing, age-adapted diabetes education and educational materials. Although reliable access to insulin and diabetes supplies is essential at all ages, older adults with type 1 diabetes can be disproportionately affected by supply disruptions due to increased dependence on formal health systems, comorbidities, functional limitations, and reduced capacity to manage informal or out-of-pocket procurement pathways.

Although donor-supported initiatives in LMICs have contributed to improved survival rates in some settings, they are yet to be integrated into formal health systems for individuals of all ages, which threaten adoption and sustainability of the activities beyond the donation period. Moreover, these initiatives are not available in all LMICs and, where available, are concentrated in urban settings, leaving rural settings underserved. Additionally, patient support does not often extend past age 30 years. Thus, policy changes beyond donor-supported initiatives could be required to ensure sustained access, as well as access to adjunctive medications for broader cardiovascular and kidney risk factor management.

Even in HICs with available insurance coverage, the high cost of supplies or insufficient insurance coverage can limit access to insulin, other medications, and supplies for diabetes technologies. Primary costs associated with type 1 diabetes management are greater relative to type 2 diabetes and people without diabetes,⁷¹

even in countries where insulin is provided by the government. Policy reform to provide cheaper therapeutics and supplies, promote limits for out-of-pocket costs, expand coverage for essential therapies, supplies, and emerging diabetes technologies under public insurance plans might help to reduce financial barriers and improve access to the regimens that promote safe and healthy ageing.

Access to a comprehensive geriatric diabetes care team

Care for older adults with type 1 diabetes should involve regular assessment of multiple domains of wellbeing—social, medical, psychological, behavioural, cognitive, and functional—through a structured, multidimensional evaluation.²⁶ For older adults with type 1 diabetes, complexity of the treatment regimens often requires specialised care by an endocrinologist or a diabetologist, with co-management by a geriatrician or other subspecialist, on a case-by-case basis. Diabetes education is important across the lifespan, as approaches to diabetes self-care in earlier adulthood might need to be adjusted over time due to changes in health status or changing standards of care. Practical discussions of changes in physiology associated with ageing that could affect diabetes management are well suited for nurses, pharmacists, dietitians, physical therapists, and occupational therapists. Although social workers and psychologists or neuropsychologists are less common in adult diabetes care settings compared to paediatric settings, access to these specialties is important for geriatric type 1 diabetes populations. Finally, recognising the link between modifiable lifespan risk factors, including glycaemic management, and later-life cognitive outcomes and frailty is essential for effective diabetes care across the lifespan.⁷² Providing education and strategies to manage potentially modifiable risk factors for dementia, in addition to approaches to mitigate glycaemic excursions and supporting physical resilience, are particularly important for older adults with type 1 diabetes.^{26,43,48,54,73} Each of these services might need to be differentially emphasised across individuals with youth-onset and adult-onset disease.⁴

Notably, access to such a multidisciplinary care team might be less often available in many LMICs and settings where health-care access might be scarce (ie, rural settings), in which case optimal care can be guided by a core set of tasks and skills to be consistently met, regardless of who provides them. These skills could include safe insulin administration and dose adjustment; glucose monitoring and interpretation; recognition and management of hypoglycaemia and hyperglycaemia; diabetes technology use and troubleshooting; skin and infusion site care; and support for cognitive, visual, and functional limitations. Framing care around these competencies highlights opportunities for shifting and sharing roles and responsibilities across health-care professionals, and where needed, family

members or care partners, allowing responsibilities to be adapted to local workforce capacity and healthcare infrastructure.

Telehealth and telemedicine resources for remote chronic disease management were underused until demand increased during the COVID-19 pandemic. This model of health-care delivery has promise specifically when paired remote diabetes education and continuous glucose monitoring, and when sufficient time for education for older adult patients can be provided.^{74–76} This avenue can be used in both HICs and LMICs where access to multidisciplinary care teams is scarce for care of type 1 diabetes.

Formalised structures for care partner education and support

Support from care partners, if properly prepared for their role, has the potential to facilitate diabetes self-management and improve health outcomes, prevent hospitalisations, improve glucose monitoring, and decrease diabetes distress in older adults living with diabetes.^{57,77–80} Early involvement of care partners, before the onset of significant functional and cognitive decline, could identify so-called near misses before significant adverse impacts occur and allows for care partners to learn diabetes management skills from the patient. Therefore, dyadic education is needed early in the care trajectory, and even at the time of diagnosis in adult-onset cases.⁸¹ This education should include communication strategies that promote open-ended questions and reflective listening, while avoiding criticism, blame, and poorly timed discussions. Supportive, rather than critical or overprotective, care partner behaviours and autonomy-supporting communication are consistently linked to better relationship quality, greater patient self-efficacy, and reduced distress; conversely, overprotection and conflict amplify relationship strain.^{81–83} Beyond dyadic education, care partners themselves can also benefit from regular check-ins and professional support.

Safe and evidence-based long-term care options

In addition to training and support for informal care partners, formal caregivers and health-care systems might also require enhanced training to effectively meet the needs of older adults with type 1 diabetes. In HICs, where large populations of frail older adults live in long-term care, most do not have type 1 diabetes-specific protocols and have insufficient resources, including staff education or access to specialists to maintain diabetes technology, requiring substantial training to ensure safe and effective use.^{26,84} As more people live into older adulthood with type 1 diabetes, there will be an increasing demand on formal caregiving including long-term care settings to accommodate the care needs of this population.⁵⁹ Studies that focus on barriers to management of type 1 diabetes in long-term care and multicomponent education efforts for staff members caring for people with type 1 diabetes can

help to overcome this care gap. The situation is more challenging in low-resource settings, where medication availability and staff training might be particularly minimal. Care guidelines reflecting these differences across settings are needed to standardise type 1 diabetes care in long-term care, and at scale.

Age-specific psychosocial care

Timely identification and interventions for psychosocial challenges are a necessary component of diabetes care.⁸⁵ However, there is little research available on the type 1 diabetes-specific psychosocial needs of older adults, and few studies have validated existing type 1 diabetes-specific instruments for assessing key psychosocial constructs in this age group, and even fewer examined differences between populations with youth-onset versus adult-onset disease. For example, fear of hypoglycaemia, a concept that has been extensively studied in younger populations, has not been well explored among older populations in whom risk of hypoglycaemia is increased.⁸⁶ Similarly, diabetes distress has only recently emerged, with 2024 data from the US-based T1D Exchange Registry and online community suggesting overall lower rates of distress in older populations with long-standing disease (36% with elevated scores, compared with approximately 50% in some studies with younger cohorts), as well as shifts in the sources of distress with age (higher financial, management, and complication-related distress, coupled with relatively low interpersonal, shame, and resource distress).⁸⁷

Independent of chronic disease management, the physiological process of ageing leads to various psychological changes that increase susceptibility to depression and anxiety,⁸⁸ which can be more prevalent among older adults.⁸⁹ Further compounding these issues are the presence of societal factors, including age-related stigma and changing or diminishing social support,⁸⁵ which can drive loneliness and associated chronic disease risk.⁹⁰ Enhanced social support is associated with improved chronic disease self-management^{91,92} and peer support improves diabetes outcomes.⁹³ More research is needed to develop and evaluate peer support interventions designed explicitly for older adults with type 1 diabetes.

New models of patient agency

Building an age-responsive system for type 1 diabetes care requires a robust model of patient agency that emphasises patients' active participation in their care rather than as passive recipients of medical care, knowledge, and tools.⁹⁴ Older adults with type 1 diabetes, regardless of their setting, need comprehensive diabetes care that centres them as people with expertise and valuable experiences in a diabetes care team, and responds when the ability to independently perform self-management tasks change.⁹⁵ As a result, patient agency for older adults with type 1 diabetes can be defined by

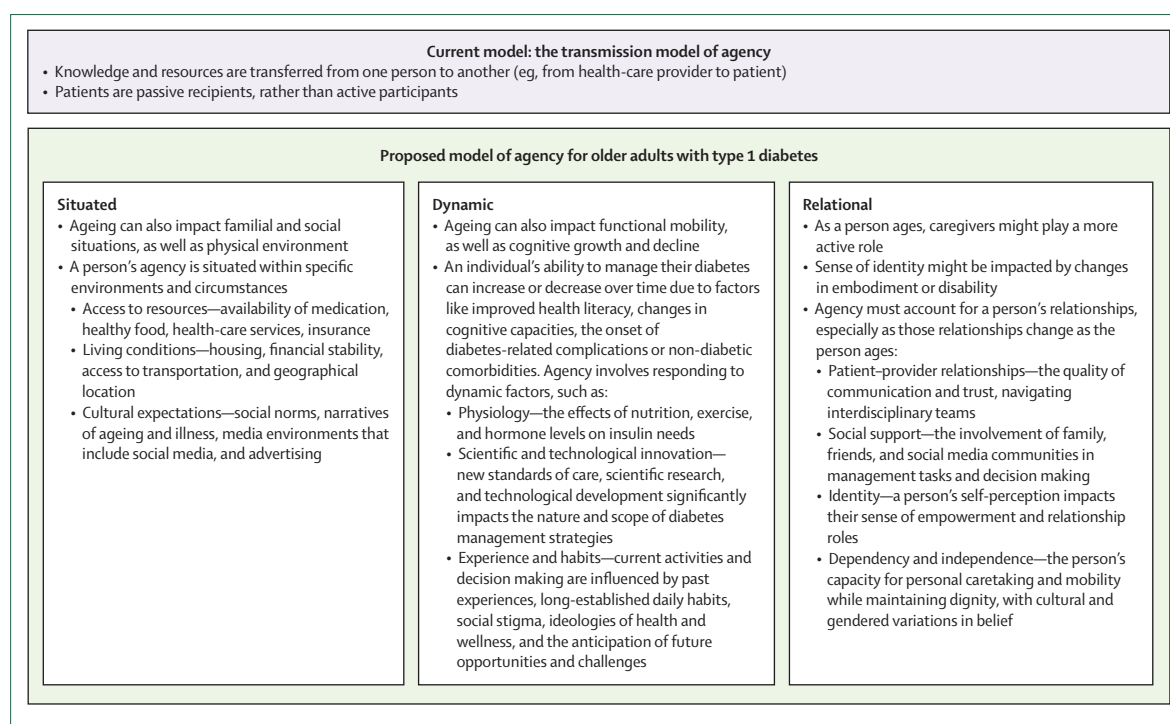


Figure 3: A novel, age-related model of agency for older adults with type 1 diabetes to reduce stigma and promote person-centred care

three main features: it is situated, dynamic, and relational^{94–97} (figure 3), and care must, therefore, adapt to the specific capacities and environment of that individual, at that time. Such a situational, dynamic, and relational approach also helps to mitigate diabetes stigma because it insists on the recognition that living healthy with diabetes is an ongoing, complex process, and not evidenced by so-called compliance or a specific behaviour.

Global research priorities

Looking ahead, the need to understand and address the challenges of ageing with type 1 diabetes is increasingly urgent, and more research is needed to guide best practices for individuals with type 1 diabetes, their families, and the providers and systems that support them. Notably, translational, clinical, and behavioural research on type 1 diabetes in older adults remains more scarce than in younger populations. Furthermore, much of the existing evidence is derived from older adults who have survived into later life with type 1 diabetes, potentially introducing survivor bias towards individuals with sustained access to insulin, diabetes technology, and comprehensive health care, and those with fewer complications and greater social support. Further research is needed to identify the determinants of survival and healthy ageing among people with type 1 diabetes, including potential differences between youth-onset and adult-onset disease. Key research priorities as identified by expert opinion are



Figure 4: Global research priorities for older adults living with type 1 diabetes
LMICs= low-income and middle-income countries.

summarised in Figure 4 and include: (1) globally integrated epidemiology and health services data collection; (2) age-friendly treatment adaptation for older adults with type 1 diabetes; (3) research to reduce

Search strategy and selection criteria

References for this Review were identified through searches of PubMed, spanning Sept 1, 2025 to Dec 31, 2025, for articles published with no date restrictions, using a combination of the search term “type 1 diabetes” and other relevant terms related to older adults, including “older adults”, “elderly”, “geriatrics” and “aging.” Additional articles were identified through searches in the authors’ personal files, Google Scholar, and by searching references in reviews, clinical consensus guidelines, and international clinical guidelines. Iterative search strategies were deployed to identify primary research across each main section of the Review, with a focus on representation across all major global regions, per the IDF’s Type 1 Diabetes Index classifications. For contemporary epidemiological figures, we analysed publicly available data from IDF’s Type 1 Diabetes Index.

morbidity; (4) development and validation of tools for psychosocial research; (5) attention to women’s health considerations; and (6) study of health-care delivery models and policy to support healthy ageing with type 1 diabetes.

Conclusions

Life expectancy among people with type 1 diabetes has improved substantially in many HICs and well resourced health-care settings, highlighting persistent global inequities in survival for people with type 1 diabetes living in LMICs and in resource-constrained settings. Most importantly, the resources needed to address gaps in type 1 diabetes care and infrastructure are highly disparate globally and will become increasingly so as older populations with type 1 diabetes increase. International collaboration is essential to identify inequities, fill gaps in care, and support the development of effective, context-specific solutions (eg, new infrastructure is needed for global surveillance).

At the same time, a growing population of individuals with type 1 diabetes living into older adulthood underscores the need for health systems to address the organisational, societal, and care challenges associated with ageing with the condition. Considering these issues not only through the lens of the individual patient, but also through that of the global communities, health systems, and environments that shape longevity, will inform the next century of care, data, resources, and infrastructure needed to anticipate and embrace the challenges of ageing with type 1 diabetes.

Contributors

ARK, PKY, JJN, and MM conceptualised and developed the manuscript outline. ARK and PKY conducted literature searches for manuscript conceptualisation and review subtopics. All authors participated in drafting the initial manuscript. ARK and PKY performed essential revisions of the draft. All authors reviewed, provided feedback, and approved the final version of the manuscript.

Declaration of interests

ARK has received devices from Dexcom for clinical trials provided to the University of North Carolina at no cost. MM received institutional grant funding from Dexcom, provided authorship for UpToDate, served on the scientific advisory board for Abbott, and served as president in a volunteer role for the International Geriatric Diabetes Society. JJN has received payments to self from Proteomics International, travel funding as a member of the American Diabetes Association board of directors, and payments for non-promotional continuing education from Pharmacy Times, Postgraduate Healthcare Education, and the Med Learning Group. SK received speaker fees from Eli Lilly, Novo Nordisk, and Cipla. All other authors declare no competing interests.

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