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Review Article

Conceptual Framework for Integrating Continence Screening and Management into 'Usual' Diabetes Care

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Abstract

The association between diabetes and urinary incontinence is well documented, especially in older people and those with multimorbidities. Urinary incontinence is a highly stigmatised and distressing condition that causes many people to conceal the symptom and delay seeking diagnosis and treatment. Both diabetes and urinary incontinence have direct physical, psychological and emotional effects on individuals and their families and their quality of life. Moreover, both share common risk factors such as advanced age, obesity and multimorbidity.

This paper describes the association between the two conditions, outlines key issues to be considered, and proposes a framework to integrate continence screening and management into usual diabetes care and screening for undiagnosed diabetes in people presenting with urinary incontinence. Early initiation of comprehensive diabetes-related care for people with urinary incontinence may improve function and quality of life and reduce unnecessary, burdensome treatment and could have economic benefits. Integrating continence screening and management into usual diabetes care and screening could also reduce the number of missed opportunities for timely discussion about urinary incontinence between clinicians and people with diabetes.

Keywords: *Urinary Incontinence; Diabetes; Hyperglycaemia; Continence Care; Conceptual Framework*

Introduction

The association between diabetes and urinary incontinence (UI) is well documented from ancient writing when diabetes was known as the 'pissing evil' and pisse prophets made a living from uroscopy. UI is the complaint of any involuntary leakage of urine [1]. It has a profound effect on the psychosocial wellbeing of individuals, families, care providers and incurs significant costs to society [2,3]. It is implicated in increased length of stay in hospital and mortality [4]. In older people, UI also increases the risk of falls, infections and pressure ulcers and is an independent predictor of admission to a residential aged care facility [5,6].

The problem is that UI is largely ignored in national and international diabetes management guidelines. The paper draws on the literature to provides a background on diabetes, UI and lower urinary tract symptom (LUTS); discusses the link between the conditions; and highlights a gap in the care and management of people with diabetes and UI. The aim of the paper is to propose a conceptual framework to integrate incontinence screening and management into usual diabetes care and screening for undiagnosed diabetes in people presenting with UI.

Overview of diabetes

The global prevalence of diabetes is 463 million people, or 9.3% of adults aged 20-79 years, with estimates indicating that one in every two cases go undiagnosed [7]. In Australia, 1.7 million people have diabetes [8]. Diabetes is an Australian health priority. There are three main types of diabetes: Type 1 (T1DM), Type 2 (T2DM) and Gestational Diabetes (GDM). Type 1 Diabetes is an autoimmune condition that is usually diagnosed in children and young adults, but it can also occur in older people. Type 2 Diabetes (T2DM) is a progressive condition in which the body becomes resistant to the normal effects of insulin and/or gradually loses the capacity to produce enough insulin in the pancreas [9]. Gestational Diabetes (GDM) refers to diabetes first diagnosed in pregnancy. T1DM, T2DM and GDM should not be confused with Diabetes Insipidus, which is an unrelated endocrine disorder.

Eighty-five percent of people diagnosed with diabetes have T2DM. In young to middle aged individuals, T2DM is mainly associated with obesity [10]. In older people it is associated with older age, frailty and multimorbidity [11-15]. Gruneir and colleagues [14] found 90% of older adults with T2DM in Ontario, Canada, had at least one other chronic condition and 40% had five or more chronic conditions. Significantly, most of these conditions also predispose people to UI.

Diabetes is the most prevalent, costly and complex chronic disease and is associated with neuropathic and microvascular changes that lead to long and short term complications if blood glucose, lipids and blood pressure are not maintained close to normal ranges [7,16]. A HbA1c (an average blood glucose over the preceding three months) of ≥ 7% is associated with inflammatory changes and tissue and organ damage that contribute to diabetes-related complications such as cardiovascular and/or renal disease [16-18]. Hyperglycaemia and polyuria can lead to serious adverse events such as ketoacidosis and hyperglycaemic hyperosmolar states, which contribute to polyuria, dehydration, confusion, falls, pain and increased risk of death [19]. Renal disease, including neurogenic bladder occurs in 64% of T1DM and 79% T2DM. Indeed, diabetes is a leading cause of death globally: one person with diabetes dies every six seconds somewhere in the world. A concerning finding is that many people have symptoms of T2DM long before it is actually diagnosed [20]. LUTS, such as UI could be an early indicator of T2DM.

'Usual' diabetes care encompasses early diagnosis, treatment, and screening for complications [16,20,21]. Screening for, and monitoring people with diabetes' complication status includes monitoring renal function, neuropathic changes and inter-current infections, including urinary tract infections. However, standard screening for these conditions may miss or misinterpret UI and other LUTS.

Overview of UI and LUTS

The global prevalence of UI ranges from 9.9% to 36.1% and is twice as high in older women as in older men [22]. Approximately 4.2 million Australians aged 15 years and older living in the community have UI and 1.3 million have faecal incontinence (FI), which represents 21% of the community-dwelling population with UI, FI, or both [23]. Incontinence can affect any person at any age and is associated with a range of health conditions, particularly neurological conditions that affect a person's mobility and cognition [24]. It is also a common symptom in the last two years of life [25].

The ability to maintain urinary continence (bladder control) depends on the bladder capacity to stretch and store urine until it is socially acceptable to void and on a competent sphincter mechanism and an intact neurological system that co-ordinates urethral and bladder function to shift from storage to voiding. Therefore, any condition that affects neural control of the bladder or damages anatomic structures that facilitate urethral closure can compromise the continence mechanism and result in UI.

The International Continence Society (ICS) classifies UI as a lower urinary tract symptom (LUTS) [26]. LUTS are either storage symptoms, voiding symptoms, or post-voiding symptoms [26]. UI is the involuntary loss or urine experienced during the bladder storage phase. There are several type of UI: the main ones being urgency UI, stress UI, mixed UI and disability associated UI (See table 1) [26]. Disability-associated UI results from the functional inability to reach a toilet/urinal in time because of a physical and/or mental impairment [26]. People with UI can experience a range of symptoms. For example, UI can also develop when a person is unable to empty their bladder completely, which leads to voiding difficulties and presents as either acute or chronic urinary retention. Symptoms may include a slow stream, splitting or spraying of the stream, an intermittent stream, hesitancy, straining or a terminal dribble, which men with benign or malignant diseases of the prostate often experience. Although many people with voiding symptoms are aware of the sensations of bladder filling and urgency, people who have a peripheral neurologic disorder such as diabetes, alcohol abuse, or Guillain-Barré syndrome may have reduced or absent sensation [27].

	Term		
Storage symptoms	Increased urinary frequency	Voiding that occurs more frequently than deemed normal by the individual (or caregivers).	
	Increased daytime urinary frequency	Voiding that occurs more frequently during waking hours than previously deemed normal by the individual (or caregivers).	
	Nocturia	The number of times urine is passed during the main sleep period. Having woken to pass urine for the first time, each urination must be followed by sleep or the intention to sleep.	
	Polyuria	Urine excretion volume over 24 h noticeably larger than the previous experience.	
	Bladder filling (sensory symptoms)	Abnormal sensations experienced during bladder filling, including an increased, decreased or absent bladder filling sensation, and urgency.	
	Urinary incontinence	The involuntary loss or urine experienced during the bladder storage phase.	
		Stress UI	Involuntary leakage on effort or exertion, or on sneezing or coughing [1]
		Urgency UI	Involuntary leakage accompanied by or immediately preceded by urgency [1]
		Mixed UI	Involuntary leakage associated with urgency and also with exertion, effort, sneezing or coughing [1]
		Enuresis	Intermittent (noncontinuous) UI that occurs during periods of sleep
		Continuous UI	Continuous involuntary loss of urine
		Insensible UI	UI where the person is aware of urine leakage but unaware of how or when it occurred.
		Overflow incontinence	UI in the symptomatic presence of an excessively (over-) full bladder (no cause identified).
		Disability-associated UI	UI related to the presence of a functional inability to reach a toilet/urinal in time because of a physical (e.g. orthopedic, neurological) and/or mental impairment
Voiding symptoms	Hesitancy	A delay in initiating voiding (when the individual is ready to pass urine).	
	Paruresis	The inability to initiate voiding in public (i.e. voiding in the presence of other persons) despite there being no difficulty in private	
	Episodic inability to void	The occasional inability to initiate voiding despite relaxation and/or an intensive effort (by abdominal straining, Valsalva maneuver or suprapubic pressure).	
	Staining to void	Describes the muscular effort used to either initiate, maintain or improve the urinary stream.	
	Slow urinary stream	Complaint of a urinary stream perceived as overall slower than previous performance or in comparison with others	
	Intermittency	Urine flow, which stops and starts, on one or more occasion, during micturition.	
	Terminal dribbling	During the final part of voiding, there is noticeable slowing of the flow to drops or a trickling stream.	
	Spraying (spitting) or urinary stream	The urine passage is a spray or split rather than a single directional stream.	
	Position-dependent voiding	Having to adopt specific positions to be able to void spontaneously or to improve bladder emptying, for example, needing to void in a seated position.	
	Dysuria	Pain, burning, other discomfort, or difficulty during voiding. Discomfort may be intrinsic to the lower urinary tract (e.g., bladder or urethra), external, or referred from other adjacent similarly innervated structures, for example, lower ureter.	
	Hematuria	The passage of visible blood mixed with urine. This may be initial (at the beginning), terminal (at the end) or total (throughout bladder emptying).	
	Urinary retention	An inability to empty the bladder completely	
	A terminal dribble	During the final part of voiding, there is noticeable slowing of the flow to drops or a trickling stream.	
Post-voiding symptoms	Feeling of incomplete (bladder) emptying	The bladder does not feel empty after voiding has ceased	
	Need to immediately re-void	Further voiding is necessary soon after passing urine	
	Post-voiding incontinence	A further involuntary passage (incontinence) of urine or dribbling following the completion of voiding	
	Post-micturition urgency	Persistent urgency post-voiding.	

Table 1: *ICS terminology for LUTS [26].*

The most common cause of UI in women is neuromuscular damage to the pelvic floor due to childbirth, which results in stress UI. Women with stress UI can be treated with either surgery or conservative interventions. The latter include pelvic floor muscle training with or without biofeedback and electrical stimulation. The most common reasons for UI in men are benign or malignant diseases of the prostate and their subsequent treatment [28]. Pelvic floor muscle training and other conservative interventions are also helpful for men with post prostatectomy stress UI.

Another common cause of UI that affects both men and women is an overactive bladder (OAB). The International Continence Society (ICS) defines OAB as 'a symptom syndrome defined by the presence of urgency, with or without urge incontinence, but usually with frequency and nocturia in the absence of infection or other obvious aetiology' [1]. OAB usually causes a sense of urgency, 'a sudden compelling desire to pass urine, which is difficult to defer' [1] and/or urge incontinence. The pathophysiology of the OAB is not clearly understood, however causes are most probably multifactorial. OAB is more common in people with suprapontine lesions such as cerebrovascular disease and Parkinson's disease and people with spinal cord lesions above the lumbosacral level [28]. Treating OAB-associated UI depends on diagnosing and treating the underlying causes and contributing factors.

Although UI is common in *all* age groups, it is more common among women, older people and people with neurological conditions [24]. More than 24% of community-dwelling older people experience moderate to severe UI and a significant proportion have both UI and FI [29-32]. Both symptoms are common among people living in aged care homes, where up to 72% of people have regular UI, 42.3% have FI, especially those with dementia, and 18 - 34% have diabetes [33-37].

In older people, the aetiology of UI is usually multifactorial and may relate to both pathophysiological and non-pathophysiological factors [38]. Non-pathophysiological factors include impaired mobility or functional skills, impaired cognition, environmental factors, polypharmacy and multimorbidity. A recent retrospective chart audit of people referred to a multidisciplinary continence clinic in Vancouver (n = 225) found 40% had Charlson Comorbidity Index > 6 and were on > 5 prescribed medicines and 52% were functionally dependent. The average age was 76: range 29 - 102 [39].

Symptoms of UI often respond to lifestyle interventions in people with and without diabetes. Phelan and colleagues [40] examined the effect of weight loss on the prevalence, incidence, and resolution of weekly or more frequent UI in a sample of 2,739 overweight/obese women with type 2 diabetes. The women were randomized into an intensive lifestyle weight loss intervention (ILI) or a diabetes support and education (DSE) control condition. After 1 year of intervention, the ILI group in this sub-study lost 7.7 ± 7.0 kg compared with a 0.7 ± 5.0 kg loss for DSE. At 1-year, fewer women in ILI reported UI (25.3% for ILI vs. 28.6% for DSE, $p = 0.05$). Each 1 kg of weight lost was associated with a 3% reduction in the odds of developing UI ($p = 0.01$), and weight losses of 5 - 10% reduced these odds by 47% ($p = 0.002$). The same research group also examined the effects of lifestyle interventions compared to DSE among 1,910 overweight/obese men with type 2 diabetes [41]. They found men in the ILI group lost significantly more weight than those in the DSE group and had a corresponding 38% reduction in the odds of UI at one year. Therefore, intensive lifestyle intervention should be considered for the treatment of UI and other LUTS in overweight/obese men and women with T2DM.

Despite improvements with lifestyle interventions, many people regard UI as a normal part of ageing and a social rather than a symptom of an underlying and potentially treatable condition [42,43]. A large survey of 2,022 older women with UI in Canada found than two-thirds thought UI was a normal part of ageing [44]. Similarly, a survey of 162,871 adults who attended a General Practitioner in Hungary found 20% had very little information about UI, and 40% had little information [45]. UI is not life threatening, but it causes significance remediable distress and reduces quality of life [2,3]. Significantly, incontinence is a highly stigmatised condition, which may partially account for the fact that most people delay seeking help until symptoms become disabling or visible [46]. The delay is partly due to misconceptions about the aetiology of UI and the belief that it is untreatable.

Diabetes and UI and LUTS

Significantly, UI and other LUTS can present as an early indicator of undiagnosed diabetes as well as a consequence or complication of diabetes. In terms of the latter effect, it is likely that the long-term neuropathic and microvascular complications of T1DM and T2DM have various effects on bladder function that predispose individuals, especially women, to UI and other LUTS [47]. A large survey showed 75% of men and women with longstanding T1DM have concurrent LUTS [48]. Wessells., *et al*. [48] collected data at two time points from participants in the Diabetes Control and Complications Trial Epidemiology of Diabetes Interventions and Complications Cohort: 2010 and 2011 (n = 508 women and 551 males). Sixty-five percent of women and 68% of males had at least one LUT. A noteworthy finding was that a high HbA1c (> 8.54%) was associated with increased risk of urologic complications in both genders [48]. A survey of 162,871 adults in Hungary found 41% reported T2DM [45].

Historically, the condition denoted by a spectrum of LUTS among people with diabetes was termed 'diabetes cystopathy' or bladder cystopathy [49]. These symptoms were described as decreased bladder sensation, poor contractility with an associated post-void residual urine [49]. However, advances in the science of bladder and bowel function have led to new standardised terminology for symptoms and the recognition that people with and without diabetes can experience variable symptoms, including storage, voiding and post-voiding symptoms.

In terms of the type of LUTS people with diabetes are likely to experience, an analysis of 1,461 non pregnant adult women found both urge and stress UI were significantly more common among women who were diabetic and pre-diabetic ($P < 0.001$) [47]. Arrellano-Valdez., *et al.* [50], found almost 50% of males and females with diabetes had symptoms consistent with reduced bladder filling and sensation and poor contractility. Thus, diabetes increases the risk of high post-void residual urine volume and a UTI, especially if the person is hyperglycaemic. Polyuria and nocturia are also common concurrent symptoms, which may relate to hyperglycaemia. Similarly, symptoms such as UI, urgency and frequency may occur due to a UTI caused by a high post-void residual, which in turn relates to poor glycaemic control in people with diabetes. All such symptoms can be indicators of undiagnosed diabetes or poor glycaemic control.

Currently, the mechanisms by which diabetes contributes to the onset, development or severity of UI and LUTS is not well defined. However, what is clear is that both conditions share some risk factors such as advanced age, multimorbidity and neuropathic and microvascular complications. Additional shared risk factors in women are a high body mass index (obesity) (BMI > 30 kg/m^2) and the use of oral oestrogen [47,48]. Other research has identified the duration of diabetes, insulin treatment, peripheral neuropathy, and retinopathy are important risk factors for UI among women with diabetes [51-53].

In men, the association between diabetes and UI is less clear [54]. However, men with diabetes are just as likely as women to develop neuropathic and microvascular diabetes complications that affect the bladder. Urologic symptoms such as UI in men also occur from conditions such as benign prostate hyperplasia or prostate cancer. Insulin like Growth Factor may have a role in prostatic hyperplasia by increasing prostate tissue growth in men with diabetes and there may be cross activity of IGF and insulin receptors [55,56].

Another group that warrants consideration are women with gestational diabetes. Barbosa., *et al.* [57] found women who had experienced gestational diabetes were significantly more likely to have UI and weakened pelvic floor muscles two years postpartum than normoglycemic pregnant women. Supervised pelvic floor muscle training programs that are companied by training of approximately 12 weeks may prevent or decrease the frequency and severity of UI symptoms in this population [58].

UI and LUTS are associated with lower quality of life, higher levels of psychiatric symptoms and health-related quality of life in women and men and the association persists after accounting for diabetes complications and being treated for depression [59]. Significantly, Wessells., *et al.* [48] suggested continence care will become an important driver of quality diabetes care in the future. The high prevalence

of UI among people with diabetes and its impacts highlight the need to include continence assessment, management and/or referral in current diabetes guidelines.

Conceptual framework for integrating incontinence screening and management into usual diabetes care

Although there is a significant body of research about UI, this evidence is not included in the annual diabetes complication screening recommendations (annual cycle of care) or commonly used 'diabetes guidelines' [9,20]. For example, although the National Institute for Health and Care Excellence (NICE) guideline about T2DM in adults mentions UI, it does not provide information about assessment or management [21]. Thus, the individual and collective impact of UI may be unknown to many diabetes clinicians.

Prevention and early diagnosis and management are essential to the optimal care of people with diabetes and UI. Both conditions are global issues that are increasing in prevalence and both respond to lifestyle interventions, particularly weight loss interventions. Diabetes clinicians are in an ideal position to identify people with UI and to provide appropriate information and/or refer them to continence experts for specific advice to help reduce the impact of the symptoms on their life. Diabetes clinicians could ask people with diabetes appropriate questions that help those with UI to disclose their condition and seek appropriate assessment and care.

Clinicians should consider a range of diabetes related conditions/factors and their effects on bladder and lower urinary tract function to better integrate continence screening and management into usual diabetes care (Table 2). Ideally, these conditions should be included in UI risk assessment tools as well as diabetes complication risk screening protocols. Several factors need to be considered when planning care for people with diabetes and UI (Table 3). To help clinicians better identify patients with UI, develop and implement personalised continence care in diabetes care plans early, and refer patients to continence experts for definitive diagnosis and education, we designed a conceptual framework that integrates continence screening and management with usual diabetes care and the diabetes/chronic disease trajectory (Figure 1).

Diabetes factors	Definition	Possible association with UI
Hyperglycaemia	Elevated levels of glucose in the blood	Glucose in urine acts as an irritant to the bladder. It also increases the risk of UTIs and bacteremia. Longer-term effects include cognitive changes, which may cause disability-associated UI.
Hypoglycaemia	Low levels of glucose in the blood	Cognitive changes that can cause disability-associated UI.
Ketoacidosis	Metabolic acidosis caused by an abnormally high concentration of ketone bodies in the blood and body tissues.	Contribute to polyuria, dehydration, confusion, falls, pain and death (25). Increase the risk of microvascular and macrovascular complications resulting in renal disease, retinopathy, cardiovascular disease and various types of neuropathy or mortality
Hyperglycaemic hyperosmolar state	A complication of diabetes mellitus in which high blood sugar results in high osmolarity without significant ketoacidosis.	
Glucose variability	Fluctuating blood glucose level	
Long term high HbA1c (> 7%)	Refers to glycated haemoglobin.	
Diabetic Retinopathy	Occurs when the tiny blood vessels inside the retina at the back of the eye are damaged as a result of diabetes.	Unclear association but may contribute to disability-associated UI.
Medications	Some medicines such as diuretics and GLMs can cause euglycaemic ketoacidosis	
Multimorbidity	The presence of two or more chronic medical conditions in an individual	High treatment burden, increase risk of polypharmacy, and lower quality of life. Potential effects on mobility and cognition – resulting in disability-associated UI.
Polypharmacy	The use of five or more regular medications	Increased risk of adverse drug interactions that affect ability to function.
Obesity	An excess of body fat	Increases intra-abdominal pressure that exerts downwards pressure on the pelvic floor and compromises the continence mechanism, particularly in women – resulting in stress UI.

Table 2: *Diabetes factors associated with UI.*

Clinical Considerations	Why They Matter	Things to Think About	Suggested Assessment	Outcome Indicators
Age and gender	UI can occur at any age but older people are at increased risk. Older people may have cognitive impairment/dementia, which increases the risk of UI. UI is more common in women but also occurs in men. UI affects self-care capacity, dignity and quality of life. People are reluctant to disclose their bladder and bowel symptoms and they can be missed.	The person may have UI or other LUTS e.g. nocturia, UTI. The possibility of coexisting UI during periods of hyperglycaemia and nocturia. The potential underlying causes of UI. Undertaking a basic assessment – ask relevant questions. Referring the person to a continence expert and or for comprehensive geriatric assessment	The Incontinence Symptom Severity Index (62) e.g. over the past month: • How often have you had a sensation of not emptying your bladder completely after you finished urinating, had a weak stream or had to push or strain to urinate? • How often have you found it difficult to postpone urination? • How many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning? • How many times during the day did you typically have to urinate? • How often have you had urine leakage related to activity such as coughing, sneezing, or exercise? • How often have you leaked because of a strong urge to urinate • If you leak with activity, over the past month, at what level of activity did you experience leakage? • How often have you used pads for protection? The ICIQ-UI Short Form (63) • How often do you leak? • How much urine do you usually leak (whether you wear protection or not)? • Overall, how much does leaking urine interfere with your everyday life? • When does urine leak? The AUSDrisk and the ADA risk tools are used to screen for T2DM.	People with diabetes and coexisting UI risk factors (Table 2) are screened for UI and LUTS in all care settings. People screened at risk of UI and LUTS are referred for comprehensive assessment and management. People presenting with UI and LUTS are screened for undiagnosed diabetes, especially older people and those with one of more of the conditions listed in table 2.

Diabetes factors associated with UI	Hyperglycaemia is associated with short and long-term diabetes complications. Short term complications • Infections such as UTIs and other infections. Long term complications • Retinopathy • Nephropathy • Dementia • Gastroparesis	When and how to ask about UI (how to ask relevant questions in a way that helps people disclose their symptoms). When to undertake basic UI screening/ assessment. Include UI assessment in the RACGP Annual Cycle of Care but also consider undertaking an assessment when health status changes. Whether there is a need to review the diabetes management plan if hyperglycaemia is prolonged. Related risks e.g. cognitive changes, falls, dehydration, discomfort, effects on quality of life, infection risk. Inadequate absorption of nutrient and oral medicines in the presence of gastroparesis	Ask about/consider UI and other bladder symptoms during episodes of hyperglycaemia and during annual complication screening	UI screening is included in the diabetes annual cycle of care and documented in the person's medical record. People presenting with bladder symptoms are screened for undiagnosed diabetes. People with diabetes have a personalised sick day care plan that includes managing UI. Hyperglycaemia is identified and managed early to prevent polyuria, dehydration and electrolyte loss that can lead to DKA or HHS and hospital admission.

Medicines	Consider whether SGLT-2, diuretics and metformin could be contributing to actual or potential UI or FI. Ask about complementary medicines use. Some herbal medicines affect the urinary tract.	The effects of cardiovascular, renal and/or gastrointestinal disease on medicine distribution, metabolism and excretion, and therefore effectiveness. Use non-medicine options where safe and evidence-based e.g. to manage constipation. Need for micronutrient replacement e.g. vitamin B_{12} with Metformin. Anaemia can be associated with renal disease and metformin.	Medicines review. Medicines self-management review. Anaemia can contribute to low/normal HbA1c and be misleading about actual glycaemic status.	Medicine reviews are documented in the person's medical record. People with diabetes are provided with personalised medicine education. Medicines likely to cause adverse events are stopped or doses adjusted before medical and surgical procedures when indicated e.g. metformin and SGLT-2 medicines. The safety of these medicines should be reassessed after the individual recovers from the episode and the medicine recommenced when safe.
Weight	UI is associated with obesity	Whether it is possible to improve diet and activity to manage weight. Effects of weight on joints. Presence of sarcopenia and/or frailty where weight loss is often contraindicated. Weight loss > 10KG in the preceding six months may be an indicator of reduced life expectancy.	Monitor weight and provide appropriate advice about weight management. Rapid weight loss may be a prognostic indicator of reducing life expectancy.	Person's weight is monitored and documented.
Diet and activity	These affect weight and general health as well as risk of UI.	Whether it is possible to make dietary changes. Consider risk of micronutrient deficiency and benefits of supplements e.g. iron and vitamin B_{12}.	Dietary assessment. Frailty status.	The individual has a documented personalised diet and activity plan

Table 3: *Factors for clinicians to consider when planning care for people with diabetes.*

Disease trajectory	Screening, management and care planning
Well and functionally independent • Functional assessment including diabetes-self care. • HbA1c and episodes of hyperglycaemia/hypoglycaemia. • Medicine-related adverse event risk screening. • Continence risk screening. • If indicated, ask about social factors such as visiting the toilet more than eight times per day, urinary urgency, nocturia, smelly or discoloured urine, whether the person reduces their fluid intake and avoids travelling long distances, has constipation or diarrhoea.	Usual diabetes management but consider whether HbA1c and blood glucose target ranges are safe and whether hyperglycaemia could exacerbate or contribute to incontinence. Preventative care: health screening e.g. for cancer, vaccination status and dental checks. Treat reversible inter-current illness that could contribute to incontinence or be caused by a UTI. Fluid restriction can lead to dehydration and confusion. UTI can be 'silent' (present without classical symptoms) in people with diabetes. Medicine review to manage medicines that can contribute to incontinence e.g. Metformin and antibiotics (diarrhoea) SGLT-2 inhibitors (urinary frequency) Diet review to manage obesity if indicated but consider the risk of weight loss on older people's sarcopenia and frailty status. Tailor sick day care plans to individual risk and to minimise hyperglycaemia and its effects on continence. Create opportunities that enable the individual to disclose continence isues. Provide advice about weight management, drinking sufficient fluid to avoid dehydration and electrolyte changes, avoid bladder irritants such as alcohol, and fully empty their bladder. Consider opportunities for appropriate exercise including opportunistic exercise.
Declining function • Comorbidities • Polypharmacy • Foot leg ulcers • Severe hypoglycaemia • Depression, social isolation • Frailty • Falls • Cognitive changes or dementia • Social isolation • Incontinence (UI and/or FI) • Carer burden – a predictor of the care recipient admission to a care home	Continue complication assessments including screening for UI and FI. Refer for continence/geriatric assessment and management advice. Assess frailty status before surgery and before and after hospitalisation. Regular medicine reviews and stop medicines where possible. Revise HbA1c and other target ranges to avoid hypo and hyperglycaemia. Undertake continence screening. May need protein and other supplements if malnourished and losing weight. Provide/reinforce continence education such as managing weight and diet, allowing time to fully empty the bladder, signs and symptoms of UTI and how to report them. Treat reversible inter-current illness such as UTI.
Significant deficits • Falls • Frequent admission to hospital or emergency department • Declining will to live • Self-rated future health • Carer not able to cope • Approaching the end of life	Incontinence can occur at the end of life and cause distress and affect the person's dignity. Palliative care/geriatric assessment and review Advance Care Directive. Medicine review may continue insulin in T1DM, consider stopping GLMs and commencing insulin in T2DM. Offer dignity therapy if available.

Figure 1: *Conceptual framework for integrating continence screening and management with usual diabetes care and the diabetes/chronic disease trajectory.*

The framework highlights the need for comprehensive assessment and care planning, consistent with the Australian Commission on Safety and Quality in Health Care (ACSQHC) Standards, and the Aged Care Quality Standards, which are currently being implemented throughout Australia [60,61]. Although the framework has not been formally evaluated, it could help clinicians and policy makers integrate continence screening and management into usual diabetes care. In the process, stigma will be reduced and people with diabetes could be more likely to disclose their UI symptoms to clinicians and significant others.

Summary and implications for practice

Older age is a risk factor for diabetes as well as multiple comorbidities, many of which are implicated in UI. As the population ages, the number of people living with T1DM, T2DM and bladder or LUTS will substantially increase. UI is closely associated with diabetes and many of the associated complications. It also occurs in people with diabetes for non-diabetes-related reasons. Both conditions can rob people of their quality of life, dignity and personhood.

Diabetes experts, especially diabetes educators are in an ideal position to screen people with diabetes for UI. Similarly, continence experts are in an ideal position to identify people with undiagnosed diabetes. Information about UI, including how to undertake a basic continence assessment, should be included in diabetes education courses focussing on identifying the presence of these symptoms, and the need for early referral for diagnosis and treatment or management.

Conclusion

Helping people seek treatment or live with UI and diabetes is a key aspect of supporting an individual's dignity and personhood. The new conceptual framework adds value to existing diabetes management and incontinence nursing care by linking ways to screen for UI and integrate incontinence care into existing diabetes care practices. Although the framework is not formally tested, the model is based on relevant evidence and makes clinical sense. It could improve the care of people with diabetes and incontinence.

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Conflict of Interests

The authors declare no conflict of interest

Author Contributions

Both authors contributed equally to the conceptualisation, planning, writing and final approval of this review.

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