

# Urinary Incontinence: Diagnostic Evaluation and First-Line Treatment

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## Abstract

Urinary incontinence is defined as involuntary leakage of any amount of urine that negatively affects the individual's hygienic and social status. It is an important public health problem because it has a high prevalence and incidence. Due to various social prejudices, it is often neglected and unreported. It is also characterized by its chronic appearance and complications such as decreased quality of life, sexual dysfunction and symptoms of anxiety and depression. The financial burden for symptomatic, conservative and surgical treatment of urinary incontinence is high. Both women and men are reluctant to seek medical help, and they most often use coping strategies to deal with urinary incontinence symptoms, which include the use of incontinence aids such as adult diapers and pads.

We conducted a systematic review of high-quality randomized controlled studies and of other review articles to compare circumstances surrounding the diagnostic evaluation and first-line treatment of urinary incontinence in women and men according to International Continence Society guidelines. Because urinary incontinence can occur during any stage of life, diagnostic and therapeutic approach is different in women and men. Social stigmatization created due to urinary incontinence may harm a person's self-confidence and cause many negativities at a social level.

Timely recognition of the type and severity of symptoms of urinary incontinence is necessary to reduce the occurrence of the aforementioned complications.

(Radoja I, Degmečić\* D. Urinary Incontinence: Diagnostic Evaluation and First-Line Treatment. SEEMEDJ 2020; 4(1); 63-73)

Received: Feb 29, 2020; revised version accepted: Apr 2, 2020; published: Apr 27, 2020

KEYWORDS: urinary incontinence, cystoscopy, urodynamics, ultrasonography, parasympatholytics

## Introduction

The International Continence Society (ICS) has defined new terminology for lower urinary tract symptoms (LUTS), clinical signs and conditions. LUTS is now divided into symptoms occurring during storage of urine within the bladder (incontinence of urine, urgency, nocturia, nocturnal enuresis, overactive bladder syndrome, increased frequency of urination, nocturnal polyuria), symptoms during micturition (dysuria, abnormalities of urine flow) and symptoms after urination (feeling of incomplete bladder emptying, dripping of urine after urination) (1). The most common LUTS occurring in women is urinary incontinence (UI) and the most common LUTS in both sexes is overactive bladder syndrome (OAB). UI is a symptom of involuntary leakage of urine subjectively reported by patients, or a clinical sign of involuntary leakage of urine objectively established by a physician (1). The amount of involuntary leakage of urine considered abnormal has not yet been defined, nor has the impact of UI on the psychological, physical and social functioning of the patient. The new definition specifies that UI is not a disease, but a symptom or clinical sign occurring due to various diseases of the neurological system, lower urinary tract, and muscles of the pelvic floor. Diseases that can cause the onset of UI can be temporary and permanent, neurogenic or non-neurogenic (3). UI can manifest as an occasional involuntary leakage of a small amount urine or as the complete inability to retain urine within the bladder.

Given the complex aetiology of UI and the situations in which it occurs, UI is divided into several types. According to the ICS, the most common types of UI are stress urinary incontinence (SUI), urgency urinary incontinence (UUI) and mixed urinary incontinence (MUI) (1). SUI is defined as involuntary leakage of urine during coughing, sneezing or another physical activity. It is most common in women, but it is also present in some men who underwent prostate cancer surgery. UUI is defined as the

observation of involuntary leakage from the urethral orifice associated with the individual reporting of the sensation of a sudden, compelling desire to void. Unlike SUI, this type of incontinence is unpredictable, it can happen at any time and it is independent of physical activity and bladder fullness. MUI is characterized by an involuntary loss of urine associated with urgency and also on effort or physical exertion, including sporting activities, or on sneezing or coughing. Other types of UI include postural UI, nocturnal enuresis, continuous UI, insensible UI and coital UI (4). UI is generally caused by the failure of pelvic floor muscles, the inability of the internal and external sphincter to withstand increased urinary bladder and abdominal pressure occurring during daily activities, or it can be a result of involuntary contractions of the bladder detrusor muscle. In most cases, women and men postpone seeking help from primary care health professionals. Usually, this is because they believe that this is a normal condition occurring due to pregnancy and vaginal delivery in women, due to an enlarged prostate and complications of prostate surgery in men, or due to older age in both women and men. Another reason is because they are not familiar with modern treatment possibilities.

## Prevalence and etiology of urinary incontinence

UI is estimated to affect more than 450 million people worldwide and is three times more common in women than in men, regardless of the type of UI (5). In the total adult population of both sexes in the United States of America (USA), the prevalence of UI ranges from 5% to 50%. UI can occur at any age, but the prevalence increases with age and affects approximately 40% of older women and approximately 15% of older men (6). Currently, there are no data on the prevalence and incidence of UI in Croatia, but it is probably similar to those from the USA. According to the latest research, the prevalence of UI in women and men of all ages, ranges from 20 to 50%, and the incidence of UI ranges from

15 to 30% (7). The prevalence of UI increases with age and, therefore, amounts to 38% in patients over 60 years of age (8). The public health impact of UI is very high because the proportion of older adults in the total population of the USA and other developed Western countries is increasing. According to recent scientific studies, SUI is the most common type of UI, with prevalence ranging from 10 to 39% (9). MUI is the next most common type of UI with a prevalence of 7% to 25% (10). UUI occurs very rarely with a prevalence of 1% to 7% (10). UUI occurs more frequently as part of OAB. OAB is defined as urinary urgency, usually accompanied by increased urination frequency during the day and increased urination frequency during sleep (i.e. nocturia), with or without UUI, and in the absence of a urinary tract infection or another obvious disease of the urinary bladder (e.g. bladder cancer) (4). OAB is often of idiopathic genesis or a consequence of a neurological disease, associated with excessive activity of the bladder detrusor muscle. The prevalence of OAB ranges from 2% to 53% (11). Normal total capacity of an adult bladder is approximately 400 to 500ml of urine. During the day, approximately 1400 ml of urine is produced, depending on the type and volume of the fluids we drink. The frequency of voiding is usually 2 to 3 times a day, and up to 1 time during the night. The normal desire for micturition occurs at a volume of 50% of normal total bladder capacity. Some or most of these physiological functions and parameters are impaired in patients with UI, and are most commonly caused by the following: pelvic floor muscle disorders, bladder mucosa and detrusor muscle disorders, neurological diseases such as cerebrovascular stroke (CVS), multiple sclerosis (MS), dementia and Parkinson's disease (12). UI can also occur in patients with psychological disorders such as schizophrenia, depression, and anxiety, or as a side effect of certain psychiatric medications (13). UI may also be associated with the onset of fecal incontinence, constipation and anorectal pain (14). Neurological signals within multiple micturition centers and neural pathways (e.g. pontine micturition center, periaqueductal gray, pyramidal tracts), which control the response to changes in pressure within the bladder, are often

insufficient in older age. This can result in the loss of voluntary and autonomous control of lower urinary tract functions (15). Risk factors for SUI in women are the number of childbirths, injuries to the organs and muscles of the pelvis during childbirth, episiotomies, children with high birth weight and hysterectomies (16).

The occurrence of SUI in men is associated with radical prostatectomy, because of the damage inflicted to the neural structures, the intrinsic urethral sphincter, and muscles and ligaments of the pelvic floor (12). Indications for hysterectomy and prostatectomy can be various benign and malignant diseases of the uterus or prostate. Annually, there are 170,000 new cases of prostate cancer and 60,000 new cases of uterine cancer in the USA (17, 18). In case of a localized prostate cancer, the therapeutic methods of choice are a radical prostatectomy or primary radiotherapy with curative intent. Depending on the surgical method, experience, and skill of the surgeon, the incidence of UI after a radical prostatectomy can range up to 40% (19). In most cases, these men have SUI, but they can also have MUI with a previously unrecognized UUI component (20). Occurrence of UUI or MUI is very common in men and women after they undergo primary radiotherapy for prostate and uterine cancer. This is because the bladder mucosa is damaged by irradiation and becomes sensitive to changes in the volume and chemical composition of urine.

The pathophysiology of SUI includes damaged or weakened internal urethral sphincter of the bladder neck and pelvic floor muscles that support the bladder neck and urethra (16). Pelvic floor muscles are composed of deep and superficial muscle fibers and connective fibers. They participate in a very complex anatomical and physiological relationship that maintains maximum urethral closure pressure in order to prevent leakage of urine. The relaxed bladder neck and pelvic floor muscles allow the bladder to empty. In women, the maximum urethral closure pressure and functional urethral length decrease with age. Mechanisms that cause incontinence in older men are detrusor overactivity and internal sphincter insufficiency. In both sexes, bladder capacity and compliance

decrease with age, while excessive contractions of the bladder detrusor and residual urine simultaneously increase, which may cause UI (21). Increased body mass index (BMI), family history of UI and older age are also associated with the onset of UI (22). As abdominal and bladder pressure increase, the pelvic floor muscles cannot tighten sufficiently enough to hold the urine within the bladder, and, therefore, the intravesical pressure overcomes the maximum urethral closure pressure resulting in urine leakage.

Neurological diseases such as dementia, CVS and MS, and bladder diseases such as chronic cystitis and cystocele, can all cause excessive detrusor contractions with consequent UUI or hypermobility of the bladder neck and urethra with consequent SUI (23). The prevalence of dementia in European countries ranges from 6 to 18% in people over 65, and from 30 to 50% in people over 85 (24, 25). In Croatia, approximately 250 people per 100,000 inhabitants experience CVS annually (26). The prevalence of patients with MS in Croatia is 143 patients per 100,000 inhabitants (27). Some scientific studies predict an increase in the total number of CVS cases by as much as 34% in European countries in the period from 2015 to 2035, and they also predict an increase in the number of CVS survivors (28). The prevalence of Parkinson's disease in the US is 572 patients per 100,000 inhabitants (29). CVS and Parkinson's disease are more common in men, while dementia and MS are more common in women (30).

## Diagnostic evaluation of urinary incontinence

In Croatia, family physicians and gynecologists play a leading role in the early identification of UI in primary care. Basic diagnostic methods that can be implemented within primary care include medical history, bladder diary, urinalysis, plain radiography and ultrasonography of the urinary tract with a focus on post-void residual (PVR) urine. After a primary care assessment, women are referred to a urogynecologist and men are referred to a urologist. Diagnostic evaluation of LUTS in urological and urogynaecological

outpatient clinics includes detailed specific medical and sexual history, bladder diary, neurologic examination, prostate and genital examination in men, gynecological examination in women, and urethrocystoscopy. The causes of UI are obvious only in uncomplicated cases and a subsequently provided diagnosis is usually based on anamnestic data and a clinical examination. Some cases, however, are very complex and, therefore, a thorough and extensive assessment of UI symptoms is required in order to provide a correct diagnosis and initiate appropriate treatment. During the evaluation, it is useful to perform a urinalysis, a urine culture test and a urethrocystoscopy. Urinalysis and urine culture tests can detect urinary tract infections, hematuria, glycosuria, pyuria, crystalluria, and proteinuria. Urethrocystoscopy is mandatory because it can confirm or exclude diseases such as bladder cancer or urolithiasis. If necessary, it is advisable to refer women and men with UI to a neurourology and urodynamics specialist for further diagnostic evaluation and treatment. Urodynamics is defined as the measurement of physiological parameters relevant to the function of the lower urinary tract (1). Urodynamics in women and men commonly involves uroflowmetry with a full bladder, but without a catheter, measurement of PVR, filling cystometry, a urethral pressure profile and pressure-flow studies (31). In complicated cases, such as post-prostatectomy incontinence and complications of transvaginal mesh surgery, a videourodynamic investigation with simultaneous measurement of urodynamic parameters must be performed, along with a radioscopy of the bladder filled with contrast medium in order to gain insight into the storage and micturition phase.

Sometimes it is difficult to explain the pathophysiology of LUTS only by correlating the patient's symptoms with the results of the urodynamic studies. Additional diagnostic tools may include computed tomography (CT) of the upper and lower urinary tract, and magnetic resonance imaging (MRI) of the brain and spinal cord for purposes of detecting tumors, aneurysms, injuries or other conditions. CT and

MRI can also be used to monitor the activity and progression of the disease that caused the UI.

## Treatment of urinary incontinence

Women and men are reluctant to seek professional help and talk about UI problems and related disorders such as sexual dysfunction, anxiety and depression. UI can cause a decrease in social interactions and physical activity, loss of self-esteem, depression, fear of involuntary leakage in society, avoidance of sexual relations and decreased productivity at work. In most cases, patients postpone going to the physician because they are not fully aware of the treatment options for UI, which can be very successful.

As first-line treatment, physicians most commonly use various incontinence aids and strategies to cope with UI problems such as changing their lifestyle. If incontinence aids are not sufficiently effective, patients need to change multiple pieces of the same type of aid or combine different types of aids during a 24-hour period. Because of this, the costs of UI treatment and the financial burden on the healthcare system may be increased and the quality of life (QOL) may be significantly reduced. In older women and men, the problems and costs of UI treatment are increasing. The world's fastest-growing elderly population includes persons aged 85 and over, and it will increase by as much as 12 times by 2025, while the number of people aged 100 and older will increase 15 times, i.e. from the current 210,000 to 3.2 million (32). In Croatia, in 2001, there were 693,540 people older than 65 and 42,553 people older than 85 (33). Depending on the underlying disease causing the UI and depending on the types of UI treatment, there are predictable costs of treatment (e.g. medication, surgery, and hospital stay costs) and unpredictable treatment costs (e.g. treatment of adverse drug effects and possible complications of surgery). Larger share (50-75%) of UI treatment costs is attributed to body care

products, laundry detergents, incontinence pads and diapers (34). The total annual cost of UI treatment in the US is very high and in 2000 it was estimated at 19.5 billion dollars (35, 36). The most recent estimate of total annual cost of UI treatment in the USA for all age groups was over 16 billion dollars, which is higher than the annual direct cost of treating breast, ovarian, and cervical cancers altogether (37, 38). According to one study, a person with more severe UI symptoms and a greater impact of UI on QOL spends approximately 900 dollars annually for incontinence aids and body care products (39). Another study found that the daily use of UI aids of one person with symptoms of UI results in an annual cost of 1825 dollars (approximately 150 dollars per month) (39). These differences may stem from the type and effectiveness of incontinence aids, primarily in terms of their power to absorb urine. The cost of treating one patient with UUI or MUI with antimuscarinic drugs alone, without absorbents, ranges from 95 to 290 dollars per month, depending on the type of drug (40). There are no data on the costs of treating UI in Croatia, but we can assume that they are very similar to the previously mentioned data.

In case of contraindications for surgery or pharmacotherapy, a symptomatic treatment that includes only incontinence aids that have a good overall effect can reduce treatment costs and improve the QOL. Depending on the type of UI, the choice of first-line treatment includes conservative methods such as: counselling about lifestyle changes (e.g. weight control, avoiding or reducing intake of alcoholic and other diuretic drinks, reducing fluid intake during the day and before bedtime), bladder training (keeping a bladder diary, delaying the need to urinate, increasing the amount of time between urination), use of incontinence aids (e.g. pads, diapers), pharmacotherapy (e.g. antimuscarinics, mirabegron), pelvic floor muscle exercises, biofeedback, extracorporeal magnetic innervation therapy and functional electrostimulation of pelvic floor muscles. Treatment results of most conservative methods depend on the patient's motivation and co-operation, except in the case of incontinence

aids, such as diapers and pads, where treatment results depend on the absorption capacity and comfort. Treatment of SUI focuses on strengthening the supportive pelvic floor muscles by applying various conservative and surgical methods. The method of choice in UUI treatment is the stabilization of detrusor overactivity by using pharmacotherapy. In the case of MUI, it is necessary to treat the predominant symptomatology component. The most common surgical methods for SUI treatment are the periurethral injection of bulking agents, insertion of pubovaginal slings and colposuspension. If pharmacotherapy proves to be inefficient in treating UUI, either intravesical application of Onabotulinum toxin A or a sacral neuromodulation is indicated. All of the above-mentioned surgical methods include higher costs when compared to conservative methods, and they also include treatment of complications and a number of days spent in the hospital. Treatment of these complications may include the use of incontinence aids. Some patients have absolute and relative contraindications and an increased risk of complications related to conservative and surgical treatments that are otherwise recommended according to the guidelines of the European Association of Urology (EAU) and ICS (41). These include diseases such as a recently experienced heart attack, blood clotting disorders, uncontrolled arterial hypertension, heart rhythm disturbances, the presence of metal implants and heart rhythm electro-stimulators, and glaucoma. These patients can be recommended to use incontinence aids, make lifestyle changes, train their bladder, and do pelvic floor muscle exercises as part of the prescribed therapeutic method in order to help maximize the therapeutic effect. Incontinence aids can also improve the QOL of patients until a proper diagnosis of LUTS is made and treatment initiated. They can also be a permanent solution for patients who have an increased risk of developing complications during the implementation of diagnostic and therapeutic methods related to UI.

Achieving effective and discreet urinary retention with the use of incontinence aids is one of their most important features and it helps improve the users' QOL (42). The most common products used for UI symptoms in men and women are incontinence pads and diapers. They absorb urine after one or more episodes of involuntary urine leakage, depending on their power of absorption. These products protect against leakage, odour, and prevent moisture from getting onto the genital area and skin. Other products that can be used with UI patients include waterproof bed sheets and urinary condoms. Waterproof bed sheets can be washed in the washing machine and reused, but they can also be disposable. They are placed under normal bed sheets and above the mattresses, and they absorb urine. Incontinence pads and diapers have a hydrophobic layer that absorbs urine below the surface, allowing the genital skin to remain dry. They are usually a temporary measure for improving the QOL, as they provide safety and confidence during the day and help maintain a normal social life. Tampons are not recommended for use in women with UI, but they can be useful in situations, such as exercise, as their position can affect bladder neck lifting. This is due to the very close anatomical relationship of the vagina and bladder neck. Menstrual pads should also be avoided when dealing with UI issues. A lot of women use menstrual pads instead of incontinence pads. However, they do not have the same technology and, therefore, these pads remain wet and can cause chronic skin changes, contact dermatitis, and fungal infections. In patients experiencing involuntary leakage of smaller amounts of urine, incontinence pads are more comfortable to wear. In patients experiencing involuntary leakage of moderate to large amounts of urine, which occur several times a day, it is usually necessary to use diapers with a greater absorption capacity, in comparison to that of incontinence pads, or use a combination of both types of supplies. For practical reasons, mostly due to their shape and size, incontinence pads are mostly used by mobile patients who can go to the toilet on their own. Unlike diapers, pads are more discreet as they are not noticeable under clothing and are

easy to put on and remove. In most cases, diapers are used by immobile patients, with or without cognitive impairment, who cannot go to the toilet on their own and who do not need to change supplies frequently. Diapers can absorb greater amounts of urine, but because they need to be fixated with adhesive tapes, they are not practical for removing and repositioning during bladder training or for personal hygiene related reasons. Incontinence pads are more convenient to remove and reuse during bladder training, but they do not have the same absorption power as diapers, meaning that more incontinence pads need to be used during the day.

## Discussion

According to EAU guidelines and World Health Organisation Guidelines on Integrated Care for Older People (WHO ICOPE), first-line of treatment for UI symptoms includes lifestyle changes, bladder training, pelvic floor exercises and incontinence aids (43-45). With the help of incontinence aids, it is possible to prevent involuntary leakage on clothing, eliminate the unpleasant odour of urine and reduce the possibility of bacterial infections and chronic dermatitis on the mucous membrane and skin of the genital region. The use of these aids is very important in patients who cannot undergo active treatment by other conservative or surgical methods due to contraindications, and in patients who refuse active treatment. It should be noted that, in most cases, these aids are used in patients who have UUI or MUI with a predominant UUI component due to the different aetiology of these types of UI. Because the onset of SUI symptoms is predictable, various behavioural strategies, such as bladder emptying before a physical activity, can help avoid episodes of involuntary urine leakage, and, consequently, the use of these aids is minimized. UUI is unpredictable because an overactivity of the bladder detrusor can occur at any time and, therefore, implementing similar strategies does not have a positive effect. One of the strategies used by patients with UUI is the mapping of toilets, meaning that they keep a record on the locations of toilets in a city, shopping centres,

and public institutions. UUI patients are advised to change their lifestyle, train their bladder and use incontinence aids.

Pharmacotherapy with antimuscarinic and beta-agonist mirabegron is also indicated as first-line therapy in patients with UUI. Some patients may have contraindications for pharmacotherapy. Contraindications to antimuscarinic pharmacotherapy include acute or chronic urinary retention, digestive system diseases (e.g. toxic megacolon), myasthenia gravis, narrow-angle glaucoma, renal failure requiring haemodialysis and severe impairment of liver functions. Contraindications for pharmacotherapy with mirabegron include severe uncontrolled hypertension, defined as systolic blood pressure  $\geq 180$  mmHg and diastolic blood pressure  $\geq 110$  mmHg. If there are any contraindications for pharmacotherapy, patients will be provided with incontinence aids. They will also have to change their habits, train their bladder, and implement other behavioural strategies.

The prevalence of neurological diseases and malignant diseases of the genitourinary system is high, and they usually include UI as a consequence. Thanks to modern diagnostic and therapeutic options, the QOL of these patients has greatly improved and their life prolonged. As a result, there are more and more patients with some degree of disability and symptoms of UI. In these patients, a specific approach to treatment and rehabilitation is required in order to maintain their cognitive and motor skills and help them control the UI symptoms. Neurological diseases can cause immobility or impaired mobility, depending on their degree and the level of neurological damage, and this can cause complications such as deep vein thrombosis and decubital ulcers (44). Bladder function in these patients is often neglected, as is the fact that they often have symptoms of UI. It is very important that verticalization and mobility of these patients be restored in a timely manner through daily bladder training. It is also important to restore their bladder capacity and increase the muscle strength of detrusors, and also to prevent other complications. If patients are immobile and spend most of their 24 hours

in a supine or sitting position, the sensory and motor functions of the bladder may deteriorate. When training the bladder, patients are advised to urinate during the day while retaining urine to a certain extent before going to the toilet.

If patients have UI, they must use certain types of aids that will hold the urine until they go to the toilet. Diapers would be the most appropriate choice because they have a greater capacity to absorb urine in comparison to incontinence pads. A negative feature of diapers is that they are not as discreet as pads, because they are larger and noticeable under clothing. This can cause fear of an unpleasant odour of urine, social prejudice, anxiety, depression, decreased QOL and social stigmatization (45). Incontinence pads are more discreet than diapers, but because of their lower absorption capacity, patients usually change up to 7 pads a day (45). This inflicts a huge financial burden on the health system. UI aids of an adequate type and size are required in order to prevent the detection of UI symptoms in social situations. This is achieved by reducing the absorption effect of episodes and the volume of involuntary leakage of urine during 24 hours. In addition, they also help reduce the possibility of complications, such as skin and genital mucosal damage. All patients with UI use some kind of an incontinence aid, regardless of the type and severity of UI symptoms. There are significant differences in design, absorption capabilities and other features between UI aids. There are also significant individual differences in personal attitudes of patients with UI and in their desires for incontinence treatment. Some aids are better designed for men than for women, for example, some aids have better absorption capabilities. Depending on the type and duration of physical and social activities, UI patients usually combine several types of aids and use multiple pieces of aids, especially incontinence pads, over a 24-hour period. Reducing the financial burden on the healthcare system could be achieved by providing patients with better-designed UI aids suitable for different circumstances and activities for 24-hour periods. With the help of these conservative first-line treatment methods,

patients can maintain an active lifestyle and improve sexual function and their QOL (46, 47). UI is a multidisciplinary problem and all physicians involved in the care of people with UI need to be well informed about the new scientific research data regarding diagnosing and treating of UI, as well as of other LUTS.

## Conclusion

With the help of primary prevention measures, women and men should be educated and encouraged to seek help from a family physician, gynaecologist or urologist if they have UI symptoms. After reviewing the patient's medical history, and performing a physical exam, these healthcare professionals can determine the type of UI and begin appropriate treatment, if possible. A three-day bladder diary and various screening questionnaires, such as International Consultation of Incontinence Questionnaire – Short Form and King's Health Questionnaire, are useful in the evaluation of the type and severity of UI symptoms. Sometimes it is very difficult to identify the type of UI and it is, therefore, necessary to refer the patient to a neurourologist for a urodynamic assessment. There are many conservative and surgical treatment methods for UI. In most patients, we can achieve full continence status or a major improvement in alleviating UI symptoms so that a normal lifestyle can be maintained. There are many aids that can be prescribed to patients who have symptoms of UI, such as incontinence pads and diapers, which have different urine absorption properties. UI aids can improve the QOL until proper treatment is initiated, or they can be a permanent solution in patients with contraindications for pharmacological or surgical treatment.

**Acknowledgement.** None.

## Disclosure

**Funding.** No specific funding was received for this study.

**Competing interests.** None to declare.

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