BJUI
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Guideline of guidelines: urinary incontinence in women

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Keywords

urinary incontinence, overactive bladder, diagnosis, stress urinary incontinence, urgency urinary ncontinence

Key Points

- Guidelines are not exhaustive, but practical evidence-based reviews of 'index patients'.
- Evaluation should include detailed history and characterisation of urinary incontinence (UI).
- Guidelines suggest a stepwise approach to treat both urgency UI and stress UI, starting with conservative therapy, advancing to more invasive procedures as needed
- Urodynamics should be used when it will change management and if there is recurrent UI after failure of invasive treatments.
- When treating women with mixed UI, focus on treating the predominant symptom.

Introduction

Urinary incontinence (UI) is a common disease, with prevalence rates as high as 44–57% in middle-aged and post-menopausal women [1]. Those with UI may experience physical, functional, and psychological limitations and diminished quality of life (QoL) at home and at work [2]. The financial burden of UI care is significant, with an estimated direct cost of $19.5 billion (American dollars) in the USA alone [3].

UI can be classified into a number of different categories, with stress UI (SUI) and urgency UI (UUI) being the most common. Many professional organisations have created guidelines to help clinicians navigate the diagnosis and evaluation of UI, as well as the treatments including conservative, pharmacological, and surgical. The methodologies upon which most guidelines are based are similar, starting with systematic reviews and grading of available literature (Table A1). Organisations then make recommendations with different definitions and strengths (Table A2). Guidelines are not exhaustive, but rather serve as a practical review of evidence-based management of 'index patients'.

The present 'Guideline of guidelines,' updated from a 2016 publication [4], reviews various international guidelines that have been updated at different time intervals and provides an updated summary of the important similarities and differences on the management of UI in women.

Methodology

We performed a Medical Literature Analysis and Retrieval System Online (MEDLINE)/PubMed search for the period of January 2010 to May 2019, to identify relevant guidelines for addressing UI in women. We also manually searched the websites of the following national and international societies to identify relevant guidelines for inclusion in this review: the AUA, European Association of Urology (EAU), National Institute for Health and Care Excellence (NICE), American Urogynecologic Society (AUGS), American College of Obstetrics and Gynecology (ACOG), Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (SUFU), Canadian Urological Association (CUA), and the ICS.

We used the Appraisal of Guidelines for Research and Evaluation (AGREE) II instrument [5] to describe the guidelines reviewed. When provided, supplementary material was reviewed and included in our analysis. The present paper's authors found that all guidelines drew upon high-quality literature and thus had high values for the 'Rigour of Development', and generally had excellent description of scope, purpose, and applicability, with clear presentation of topics. However, several of the guidelines were limited in describing contributing authors' conflicts and competing interests, and at times the intended user of the guideline was not clearly articulated. Scores were assigned based on careful review of the guidelines and material provided.

 | doi:10.1111/bju.14927
Published by John Wiley & Sons Ltd. www.bjui.org

Ultimately, the AGREE analysis is meant to comment on the reader's ease of ascertaining the topics the AGREE analysis touches upon. Low scores may therefore be given for difficulty determining the answers to these topics in the body of work, although the answers may be present. It is important to note that several of these guidelines were not intended as exhaustive review articles, but rather as an accessible and applicable resource for clinicians. As a result, although all these guidelines are excellent in many of the domains of the AGREE II analysis, they receive low scores in certain areas that may have been beyond the intent of their work. We think all of these guidelines are robust, for which reason they were included in our present review. Lower scores on the AGREE II analysis should not be interpreted as less reliable recommendations, but instead as not adhering strictly to all factors considered as complete by the AGREE instrument. Overall, all guidelines were assigned high scores, validating their high quality (Table A3).

Guidelines Reviewed

The guidelines reviewed in this manuscript, as well as the year of publication and/or update, are summarised in Table 1.

The EAU first published guidelines on UI in 2001 and initially used both the International Consultation on Incontinence (ICI) [6] and the NICE [7] literature reviews as their underlying framework. Subsequent updates have focussed on literature reviews integrating studies from databases such as MEDLINE, Excerpta Medica dataBASE (EMBASE), and Cochrane Libraries. Guidelines are updated annually and the most recent update from 2019 was used for this review. In 2018, the EAU guidelines transitioned to a modified Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) system [8], where the grade of recommendations was changed from 'A,' 'B,' and 'C' previously, to 'Strong' or 'Weak'. The strength of each recommendation is determined by the balance between desirable and undesirable consequences of alternative management strategies, the quality of the evidence (including certainty of estimates), and nature and variability of patient values and preferences.

The AUA initially focussed on surgical management for female SUI and created a meta-analysis from literature review in 1997 [9], most recently updated in conjunction with the SUFU in 2017 [10]. Their goal is to provide standards, recommendations and options to guide clinicians on the management of SUI (Table 2). This will be referred to as the AUA/SUFU SUI guideline; however, this organisation also has a separate guideline, also in collaboration with SUFU, specifically on the diagnosis and treatment of overactive bladder (OAB), updated in 2019 [11] (referred to as the AUA/SUFU OAB guideline); and a 2012 guideline [12] on the use of urodynamic studies (UDS) in adults (referred to as the AUA/SUFU UDS guideline).

The ACOG routinely publishes 'Practice Bulletins', which are evidence-based documents that summarise current information on techniques and clinical management of gynecological issues. Similar to the old EAU guidelines, the ACOG recommendations are based on quality and quantity of evidence graded A–C. The ACOG, in collaboration with the AUGS, initially published a Practice Bulletin on UI in Women in 2005, which was revised in 2015, and reaffirmed in 2018 (referred to as the ACOG guideline) [13].

Other guidelines exist, such as the continued work of the ICI, which collaborates with the International Scientific Committee to produce clinical recommendations for practitioners, initially published in 1998. The ICI produced its sixth edition of recommendations in 2017 on a vast number of topics initially analysed by sub-committees. Relevant committees include 'Surgery for Urinary Incontinence in Women', 'Pharmacological Treatment of Urinary Incontinence' and 'Evaluation and Treatment of Urinary Incontinence, Pelvic Organ Prolapse and Faecal Incontinence' [6,14]. Recommendations are based on review of the available published literature, as well as the subjective opinion of their group of recognised experts in the field.

The NICE initially published guidelines on the management of UI in women in 2006, with multiple subsequent updates, most recently in 2019 [7]. Similarly to the ICI, this complete guideline is combined with recommendations for the management of pelvic organ prolapse (POP). This group uses a systemic review of the available literature to create their

Table 1 Guidelines reviewed.

Guideline	Year of publication/most recent update
European Association of Urology (EAU)	2019
International Consultation on Incontinence (ICI)	2017
American College of Obstetrics and Gynecology/American Urogynecologic Society (ACOG)	2015
National Institute for Health and Care Excellence (NICE)	2019
American Urologic Association (AUA)/Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction (SUFU)	
Surgical treatment of Stress Urinary Incontinence in Women (AUA/SUFU SUI)	2017
Urodynamic Studies in Adults (AUA/SUFU UDS)	2012
Diagnosis and Treatment of Overactive Bladder (Non-Neurogenic) in Adults: (AUA/SUFU OAB)	2019

Table 2 Initial evaluation.

Recommendation	ACOG	AUA/SUFU SUI	AUA/SUFU OAB	EAU	ICI	NICE
Detailed history with emphasis on characterisation of UI	•	•	•	•	•	•
Detailed partum history	•			•		
Exclude other disease processes (e.g., malignancy, ectopic ureter, etc.)	•			•		
Bowel history	•	•	•		•	
Physical examination including pelvic examination and assessment of pelvic floor musculature	•	•	•	•	•	•
Neurological examination	•	•			•	
Stress test for objective demonstration of SUI	•	•				
Bladder/voiding diary				•	•	•
ICIQ for initial assessment					•	
Questionnaires when standardised assessment is needed				•		

own evidence synthesis and recommendations [15]. Of note, unlike society guidelines published in the USA, the NICE guidelines put a clear emphasis on cost analysis given the financial implications of their widespread use within the NHS in the UK.

The CUA last updated guidelines on UI in 2012 and these were included in the predecessor to this 'Guideline of guidelines' [4]; due to the lack of an updated guideline we did not include them in the present review [16]. Prominent groups, such as the Royal Australian College of General Practitioners, have also produced guidelines on management of UI [17]; however, many groups, including this one, draw upon the previously mentioned guidelines to form their recommendations. In an effort to avoid redundancy and create a concise summary, these other guidelines are not specifically discussed.

Results

Initial Evaluation

History and Physical Examination

All guidelines require a detailed history in the initial evaluation of UI (Table 2). The consensus amongst all guidelines is clinicians should elicit a characterisation of the type of UI with a focus on severity, degree of bother, and presence (or absence) or urgency or mixed symptoms.

The guidelines all emphasise the importance of taking a complete and thorough medical and surgical history, and considering other disease processes that may present as and/or complicate UI. The NICE and EAU guidelines explicitly state the importance of identifying elements in a patients history that would prompt referral to a specialist such as associated pain, haematuria, a history of recurrent UTI, pelvic surgery or radiotherapy, constant leakage suggesting a fistula, faecal incontinence (NICE only), voiding difficulty, or suspected neurological disease.

The physical examination is an important part of the evaluation and diagnosis of UI, and while there is little high-quality evidence to suggest it improves care, all guidelines concur that it is an essential part of the assessment of patients presenting with UI. The guidelines concur that evaluation should include general status (mental status, obesity, mobility), an abdominal examination, and a pelvic examination with an assessment of pelvic floor muscles and evaluation for POP.

The ACOG, ICI and AUA/SUFU SUI guidelines recommend performing a neurological evaluation in all patients presenting with UI, whereas the EAU and NICE do not specifically recommend this for the standard patient with UI. The AUA/SUFU OAB guidelines recommend an examination of the lower extremities for oedema, to assess for potential fluid shifts during periods of postural change.

All guidelines discuss that the diagnosis of SUI can be made on physical examination if there is objective demonstration of urinary leakage with an increase in abdominal pressure (positive cough stress test). The AUA guidelines specifically state that a stress test should be part of the minimum evaluation of a patient presenting with UI. The AUA/SUFU SUI guideline provides a 'Clinical Principle' that SUI should be assessed with a comfortably full bladder and demonstrated before any surgical intervention.

Questions and Questionnaires

The ICI and NICE recommend the use of a 3-day voiding diary for initial evaluation of UI to document the frequency of micturition, volumes of urine voided, UI episodes, and use of incontinence pads. The NICE cautions that the optimal duration of a voiding diary is unclear (Evidence Level 4), but states that women with UI or OAB should be encouraged to complete a diary for ≥3 days to cover variations in their usual activities, such as both working and leisure days. The EAU similarly recommends a diary of ≥3 days (Strong, Evidence Level 2b), but unlike the ICI and NICE who recommend use in all patients, qualify the recommendation

for diaries stating they should be used when standardised assessment is needed.

When compared to other international guidelines, American guidelines are less stringent in their recommendation for patient completion of a voiding diary. The AUA/SUFU SUI guideline and the AUA/SUFU OAB guideline do not have a blanket recommendation for all patients with UI to complete a voiding diary, but state that a 3–7 day diary is useful to document baseline symptoms and assess treatment efficacy, and may be useful in some patients. Similarly, the ACOG guideline does not recommend a diary in all patients, but states that a voiding diary can be a useful adjunct to the patient history and found that typically 3–5 days will provide sufficient clinical data.

Questionnaires The scope and aim of the various guidelines may result in different conclusions about the utility and evidence behind the use of questionnaires, with some more highly recommended than others.

The ICI gives a Grade A recommendation to the use of the ICI Questionnaire (ICIQ) as part of the initial assessment of UI, with the use of additional questionnaires when a more detailed assessment is needed.

The EAU gives a 'Strong' recommendation for the use of a validated and appropriate questionnaire in standardised assessments, i.e., to monitor a change after an intervention. In their literature review, they found that some questionnaires (Questionnaire for Urinary Incontinence Diagnosis [QUID], Three Incontinence Questions Questionnaire [3IQ]) have the potential to discriminate UI types in women [18,19], whereas in men the ICIQ Urinary Incontinence Short Form (ICIQ-UI-SF) has been found not to differentiate UI types [20]. The EAU acknowledged that many studies looking at the validity and reliability of urinary symptom questionnaires were done in patients without UI, and there was no evidence to show that these questionnaires have an impact on treatment outcomes for UI.

The AUA looked at two systemic reviews evaluating the ability of eight different questionnaires in diagnosing UI [21,22] and found the strength of evidence supporting the use of questionnaires in diagnosing SUI to be low. Both the AUA and NICE guidelines recommend the use of high-quality questionnaires in quantifying the impact of symptoms on QoL and assessing outcomes after treatment. Similarly, the ACOG does not include a specific guidelines statement on the use of questionnaires, but states that validated questionnaires can be used to evaluate bother, severity, and the relative contribution of UUI and SUI symptoms [23]. In any international centre involved in clinical research involving UI, validated questionnaires are undeniably useful in providing objective measures of patient symptoms and treatment outcomes.

Initial Diagnostic Tests

All guidelines on UI agree upon a urine analysis (UA) as an initial diagnostic test. Similar to others, the EAU guideline supports checking a UA in all patients with UI, as UI may worsen during or be a symptom of a UTI [24,25]. Additionally, they looked at the evidence for treating asymptomatic bacteriuria in elderly nursing home patients with UI and found that these patients do not benefit from treatment of asymptomatic bacteriuria (Evidence Level 2). Along these lines, the NICE guidelines specifically state that in women with UI and a negative UA, a urine culture should not be sent, consequently decreasing the use of unnecessary tests and burden to the healthcare system.

Most guidelines agree that post-void residual urine volume (PVR) should be checked if patients are having symptoms of incomplete emptying or examination findings are concerning for a distended bladder (Table 3). The AUA/SUFU SUI (Clinical Principle) and ACOG (Level A) recommend assessment of PVR in all patients, which is important to evaluate for overflow UI and document appropriately in any patient considering surgery. The AUA/SUFU OAB guidelines recommends that PVR be assessed only in specific situations; the NICE and EAU recommend checking PVR in patients with complicated UI, voiding dysfunction, recurrent UTI (NICE), and in those who are undergoing treatments that may worsen voiding dysfunction (EAU). While many guidelines simply acknowledge that interpretation of PVR must be done cautiously, as there is no consensus on an abnormal threshold [26], the ACOG defines a normal PVR as <150 mL, which was based on findings from the Value of Urodynamic Evaluation (ValUE) trial, which used this threshold as an exclusion criteria and subsequently found this level to be sufficient to forgo further testing in women undergoing SUI surgery [27].

Guidelines are mixed on the use of pad testing in the assessment of UI. The EAU (Weak) and the AUA (Recommendation) support pad testing when quantification of UI is required. The EAU found Level 2 evidence for pad tests in the diagnosis of UI [28] and states that repeat tests after treatment can provide an objective outcome measure [29]. The ICI states that pad testing is optional for the routine evaluation of UI and, if carried out, suggests a 24-h test. In their review, the NICE found evidence supporting the use of pad testing to be contradictory and of poor quality, and does not recommend the use of pad testing in the routine assessment of UI in women, but qualify that it may be useful in evaluating treatment effect (Evidence Level 4). In men, studies have shown that perception of pad use closely agrees with the number of pads used in a 24-h test [30].

When evaluating female SUI on physical examination, most guidelines discuss that an assessment of urethral mobility

Table 3 Diagnostic tests.

Recommendation	ACOG	AUA/SUFU SUI	AUA/SUFU OAB	EAU	ICI	NICE
Urine analysis	•	•	•	•	•	•
PVR in all patients	•	•				
PVR in specific situations			•	•	•	•
Pad testing for quantifying UI	•	•		•		
Pad testing for monitoring change after treatment						•
Routine imaging not recommended	•	•	•	•	•	•
Cystourethroscopy not recommended in routine UI	•	•	•	•	•	•

may guide treatment decisions. The AUA (Expert Opinion) and ACOG (Level C), both state that the physical examination of women with SUI should include an assessment of urethral mobility. The cotton swab or 'Q-tip' test has been the traditional method to assess urethral mobility [31]; however, studies have shown that a visual assessment of urethral mobility by an experienced examiner is a valid alternative, which is preferred by women [32]. The NICE guidelines specifically recommend against the use of the Q-tip test (as well as the Bonney, Marshall and Fluid-Bridge tests) in the assessment of UI (Evidence Level 4).

Guidelines agree with a high level of evidence that routine imaging is not recommended unless there is concern for other underlying pelvic disorders. There is agreement that routine cystoscopy should not be performed in patients with uncomplicated UI.

There are certain indications where the initial diagnostic testing is not sufficient. The AUA, for example, recommends further evaluation in the following circumstances: OAB symptoms, haematuria, history of prior pelvic surgery (especially prior anti-UI procedures), neurogenic bladder, an elevated PVR, high-grade POP, a negative stress test with SUI symptoms, an uncertain diagnosis, and, perhaps most importantly, the patient' s willingness to undergo these studies.

Further evaluation may include cystoscopy, UDS, imaging studies, pad testing, and voiding diaries. In some clinical scenarios, a fistula can be a cause of UI, and therefore tests with dyes to stain urine can help. The use of dyes is included in the appendix of the EAU guidelines, but no specific recommendation is made.

UDS

UDS are a series of tests that can be invaluable for managing LUTS (Table 4). The questions that arise surrounding UDS usually focus on the timing of this test during the management algorithm, patient populations in whom UDS are indicated, and in what situations do UDS help predict outcomes of interventions.

All guidelines agree that UDS are not necessary prior to treatment of uncomplicated SUI in a female that is demonstrated on examination, and is most useful when results will alter management. The basis for this recommendation stems from the ValUE trial, a large multicentre randomised controlled trial (RCT) that showed no difference in surgical outcomes for 630 women with uncomplicated SUI undergoing office evaluation alone compared to UDS in addition to office evaluation [27], as well as smaller studies demonstrating similar results [33]. For non-surgical patients, the EAU cites evidence that although preliminary UDS may influence choice of treatment, they did do alter the clinical outcome of conservative or drug therapy [34].

The AUA/SUFU SUI guideline does not specifically recommend against preoperative UDS in patients with uncomplicated SUI, but instead states that physicians may omit UDS testing in this population (Conditional Recommendation, Evidence level B) and may perform UDS in non-index patients (Expert Opinion). The AUA/SUFU OAB guidelines state that UDS should not be performed in the initial evaluation of an uncomplicated patient (Clinical Principle).

The ACOG and NICE guidelines do not recommend UDS for patients with uncomplicated SUI demonstrated on examination, but do recommend performing UDS before SUI surgery for women with UUI predominant or mixed UI (MUI), voiding dysfunction, anterior or apical POP, prior surgery for SUI, or when the type of UI is unclear.

The AUA/SUFU UDS guideline made a total of 19 statements about UDS on four disease states: SUI/POP; OAB, UUI and MUI; neurogenic bladder; and LUTS. For example, if symptomatic SUI is not seen on UDS, it recommends repeat stress testing with urethral catheter removal. This is based on studies by Maniam et al. [35] and Huckabay et al.[36], who report that 50% of women with SUI will fail to demonstrate SUI with a catheter in place; however, they will have objective SUI after the catheter is removed. It gives an 'Option' when stress-testing women with high-grade POP that the POP be reduced to assess for occult SUI [37]. Almost all of the statements made about UI are based on Grade C evidence strength or 'Expert Opinion'. The AUA/SUFU UDS guidelines have not been updated since publication in 2012 and information on

Table 4 UDS.

Guideline	Recommendation
ACOG	Preoperative UDS is not necessary prior to surgery in patient with uncomplicated SUI (Level A)
AUA/SUFU	
AUA/SUFU SUI	May omit UDS for the index patient desiring treatment when SUI is clearly demonstrated (Conditional Recommendation; Evidence Level: Grade B)
	May perform UDS in non-index patients with SUI (Expert Opinion)
AUA/SUFU UDS	Perform UDS when it is important to determine if altered compliance, DO or other urodynamic abnormalities are present (or not) when considering invasive treatment (Option; Evidence Strength: Grade C)
	May perform UDS in patients with evidence of SUI on physical examination if considering invasive treatment (Option; Evidence Strength: Grade C)
AUA/SUFU OAB	UDS should not be used in the evaluation of an uncomplicated patient (Clinical Principle)
EAU	Do not use for uncomplicated UDS (Strong)
	Use UDS if the findings may change the choice of invasive treatment (Weak)
ICI	Use UDS if results will alter treatment
NICE	Do not perform UDS in patient with uncomplicated SUI demonstrated on examination.
	Perform UDS prior to SUI surgery for women with urge predominant or MUI, voiding dysfunction, anterior or apical POP, or previous surgery for SUI

UDS will likely be included in pertinent AUA disease-specific guidelines in the future.

Conservative Management

All guidelines recommend a trial of conservative treatment before invasive therapy because these therapies cause the least risk of harm (Table 5). Conservative therapies include behavioural therapy, physical therapy, and scheduled voiding.

Behavioural therapy is recommended early in the treatment algorithm for both UUI and SUI. The EAU gives a 'Strong' recommendation for bladder training as a first-line therapy for patients with UUI or MUI, and prompted voiding for adults with UI who are cognitively impaired. The ICI and AUA/SUFU OAB guidelines both recommend bladder training with grades A and B, respectively.

The EAU found that amongst women with UI there is conflicting evidence on whether fluid modification improves UI (Evidence Level 2) and gives a 'Weak' recommendation to review the type and amount of fluid intake in patients with UI. The AUA/SUFU OAB and NICE guidelines states clinicians can consider advising women with UI or OAB and a high- or low-fluid intake to modify their fluid intake accordingly.

While there is little evidence to suggest that smoking cessation will improve UI (Evidence Level 4 by the EAU) [38], it gets a Grade A recommendation from the EAU in line with good medical practice.

The EAU notes that while caffeine reduction does not improve UI [39,40] (Evidence Level 2) it gives a 'Strong' recommendation to advise adults with UI that reducing caffeine intake may improve symptoms of urgency and frequency. Similarly, the NICE and ICI guidelines recommend a trial of caffeine reduction for women with OAB.

There is good evidence that weight loss in obese patients is beneficial in improving UI [41,42] and the EAU, ICI, NICE, and AUGS guidelines all include this as a recommendation for overweight patients with UI. Weight reduction evidence is cited in the AUA/SUFU OAB guidelines [42] in their discussion of behavioural therapy, but no formal recommendation with regards to weight loss is given.

The EAU found that there is a consistent association between a history of constipation and the development of UI (Evidence Level 3), and while there is no consistent evidence in adults that the treatment of constipation alone improves UI (Evidence Level 4), they give a 'Strong' recommendation

Table 5 Conservative management.

Recommendation	ACOG	AUA/SUFU SUI	AUA/SUFU OAB	EAU	ICI	NICE
Scheduled voiding	•		•	•	•	
Fluid management	•		•			•
Smoking cessation				•		
Avoidance of caffeine	•		•	•	•	•
Weight loss	•		•	•	•	•
Treatment of constipation	•			•		
PFMT for UUI	•		•		•	
PFMT for SUI and MUI	•	•	•	•	•	•
Offer incontinence pads and/or contaminant devices for the management of UI				•		
Counsel women with SUI on the availability of non-surgical options, e.g., continence pessary	•	•				
PTNS for UUI			•	•	•	

to give patients with constipation and UI information on bowel management.

Pelvic floor muscle therapy (PFMT) provides stabilisation of the urethra and increases urethral closure pressures. Guidelines all agree that PFMT is recommended for SUI and UUI, and that when undergoing PFMT, patients should allow 3 months to see results. The literature clearly supports that PFMT improves UI and QoL in women with SUI, MUI and UUI [43,44]. The EAU specifies that the first-line use of PFMT should include elderly and post-natal populations [45]. The NICE guidelines acknowledge that while surgery for SUI many be more effective than PFMT, given the increased risks associated with surgery and the fact that PFMT may be as effective as surgery in up to half of women with SUI [46], they retain their prior recommendation from 2006 that PFMT be used a first-line treatment for women with SUI and MUI.

The AUA states as a 'Clinical Principle' that women with SUI or stress-predominant MUI should be counselled about the availability of other non-surgical options or vaginal devices (e.g., continence pessary). The ACOG cites literature from an RCT, which found improved patient satisfaction for PFMT when compared to pessary use [47]. The EAU found Level 2a evidence that vaginal devices may improve SUI in select groups, but does not give a formal recommendation with regards to their use [48]. The NICE guidelines address pessary use for POP, but not UI alone. The EAU gives a 'Strong' recommendation to offer incontinence pads and/or containment devices for the management of UI.

Posterior tibial nerve simulation (PTNS) is used in patients with UUI and OAB. The EAU and AUA/SUFU OAB guidelines both recommend its use in patients who have failed antimuscarinics [49]; the EAU considers PTNS to be a 'conservative therapy', whereas it is classified as a 'third-line' option in the AUA/SUFU OAB guideline. On the contrary, the NICE found that there was limited evidence evaluating the effectiveness of PTNS over alternative treatments, with limited outcome evidence supporting its use. As a result, the NICE recommends against PTNS unless conservative management has failed and the patient does not want botulinum toxin (BTX) type A or sacral nerve stimulation (SNS), and further recommends that patients be counselled that there is insufficient evidence to recommend the use of PTNS to routinely treat OAB.

Guidelines do not account for every patient scenario and do not give explicit timelines for when to abandon conservative therapies for more definitive treatment. For example, in a patient with significant UI who is interested in definitive treatment, a clinician may think it is clinically reasonable to forgo attempts at conservative management and peruse medical or surgical management at initial presentation. Specific cases like this example may not be captured in the methodology or aims of these works.

Drug Therapy

Antimuscarinics are recommended as first- or second-line treatment for UUI by all guidelines and there is good evidence that they are superior to placebo [50]. The EAU cites evidence from >40 studies comparing antimuscarinic drugs to one another and notes that most of these studies are industry sponsored with primary outcomes of OAB symptoms and UUI generally analysed as a secondary outcome. They found limited Level 1b evidence that one antimuscarinic drug is superior to an alternative antimuscarinic drug for cure or improvement of UUI, and that while higher doses of antimuscarinic drugs are more effective to cure or improve UUI, this must be weighed with the higher risk of side-effects. Similarly, the AUA/SUFU OAB guidelines counsel clinicians with a 'Standard' (Evidence Strength Grade B) that they should offer symptomatic patients medication, with similar efficacy noted between all these oral medications.

The EAU and AUA/SUFU OAB guidelines give a 'Standard'/'Strong' recommendation that extended release (ER) formulations should be preferentially prescribed over immediate release (IR) formulations, if available, for lower rates of dry mouth; the preference for ER is new to the EAU guidelines in 2017. The NICE recommends initiating therapy at the lowest dose and offering transdermal formulations in patients who cannot tolerate oral medications. The EAU gives a 'Strong' recommendation to encourage early review (of efficacy and side-effects) of patients on antimuscarinic medication for UUI and the AUA/SUFU OAB guidelines state as a 'Clinical Principle' that clinicians should manage constipation and dry mouth with bowel management, fluid management, dose modification or alternative antimuscarinic before abandoning effective antimuscarinic therapy. The ACOG guidelines propose that while evidence has not demonstrated the combination of anticholinergic medication and behavioural therapy to be more effective than medication alone, further research on combining behavioural changes with pharmacological management is needed given the high rates of medication discontinuation.

The ICI recommends a trial of 8–12 weeks to assess efficacy of drugs, with consideration of an alternative drug if initial therapy is poorly tolerated. The AUA/SUFU OAB guidelines support this idea with a 'Clinical Principle' to consider dose modification, combined therapy with an oral β_3-adrenoceptor agonists, or trial of another antimuscarinic or oral β_3-adrenoceptor agonists, if symptoms are not controlled or for significant adverse drug effects. The NICE recommends counselling patients on common adverse effects and that full

benefits may not be achieved until 4 weeks after initiation. Additionally, they recommend that women who remain on long-term medicine for OAB or UI be offered a review of medications in primary care every 12 months, or every 6 months if they are aged >75 years.

The EAU, NICE and AUA/SUFU OAB guidelines address concerns surrounding antimuscarinic use in the elderly. The EAU gives a 'Strong' recommendation that long-term antimuscarinic treatment should be used with caution in elderly patients, especially those who are at risk of, or have, cognitive dysfunction. The NICE specifically states that oxybutynin should not be used in frail, older women, as the risk of impairment of daily functioning is common. As a 'Clinical Principle', the AUA/SUFU OAB guidelines state that antimuscarinics should not be offered to patients with narrow-angle glaucoma without approval from the patient's ophthalmologist, and also to use with caution in patients with impaired gastric emptying or history of urinary retention.

The AUA/SUFU OAB, EAU and ICI guidelines recommend that either oral antimuscarinics or β_3-adrenoceptor agonists can be offered as initial pharmacological treatment for OAB (with or without UI). The AUA/SUFU OAB guidelines cite Grade B evidence that mirabegron is as efficacious as antimuscarinic therapy, and may have lower rates of constipation and dry mouth [51]. The EAU gives a 'Strong' recommendation to offer mirabegron, but advises that patients should be informed that possible long-term side-effects remain uncertain. The NICE focusses on the acquisition cost of medication, and recommends mirabegron as an option for OAB only if antimuscarinic drugs are contraindicated, ineffective, or have unacceptable side-effects. The AUA/SUFU OAB and EAU guidelines state that clinicians may consider combined therapy with an antimuscarinic and β_3-adrenoceptor agonist for patients refractory to monotherapy with either drug along (Option, Grade B) [52–54].

Duloxetine inhibits the presynaptic re-uptake of neurotransmitters serotonin and norepinephrine in the sacral spinal cord, which is thought to increase stimulation of the pudendal nerve and therefore tone of the urethral striated sphincter. The EAU found Level 1b evidence that while duloxetine does not cure UI, it may improve SUI and UUI in patients with MUI. However, there are high rates of discontinuation due to significant gastrointestinal and CNS side-effects. They give a 'Strong' recommendation to use duloxetine only in select patients with symptoms of SUI when surgery is not indicated and in patients with MUI unresponsive to other treatments who are not seeking cure. Further, they give a 'Strong' recommendation to titrate the dose when initiating or withdrawing therapy due to adverse events. The ICI recommends duloxetine for temporary improvement in UI. Similarly, the NICE guidelines state that duloxetine can be offered as a second-line treatment to women with predominant SUI in those who prefer pharmacological management or who are not surgical candidates, warning that patients should be counselled about adverse events. Duloxetine is not approved for use for UI in the USA (Table 6).

The EAU found Level 1b evidence that desmopressin reduces UI within 4 h of administration; however, continuous use does not provide improvement or cure [55]. They give a 'Strong' recommendation to offer its use to patients for short-term relief of daytime UI and recommend patients should be counselled that the European Union and the USA Food and Drug Administration (FDA) does not license this medication for this purpose. The NICE recommends desmopressin to reduce nocturia in women with UI or OAB, although caution its use in those with cystic fibrosis or aged >65 years with cardiovascular disease or hypertension.

The ICI, EAU and NICE give recommendations to use topical hormonal therapy in women with UI and findings of vulvovaginal atrophy. The ACOG, EAU and NICE all cite evidence that oral conjugate equine oestrogens can increase the risk or worsen pre-existing UI in women [56,57]. The EAU recommends discussing an alternative hormone replacement therapy for women with UI on oral conjugate equine oestrogens. The NICE specifically recommends against systemic oestrogen to treat UI.

Surgical Management for Female SUI

The overall goal of surgical management should be to improve or cure UI (Table 7). An individual surgeon's experience along with patient preference factors into the type of surgical intervention offered. With this caveat in mind, many of the guidelines provide recommendations on how to counsel and decide between the various interventions. The guidelines reviewed cured/dry rates, as well as long-term cure rates for the different types of surgeries. The EAU gives a 'Strong' recommendation to inform women that any vaginal surgery may have an impact on sexual function, which is generally positive [58].

Open colposuspension was historically considered the 'gold standard' surgical treatment for SUI, so a large body of research uses this technique as the comparator. Generally speaking, guidelines concur that for women seeking surgical cure for SUI the mid-urethral sling (MUS), autologous fascial sling (AFS) and colposuspension, are all viable treatment options each with their unique set of risks and benefits. Bulking agents may be useful in certain populations and are thought to be 'low risk, low reward' with only short-term improvement in SUI. Of note, unlike other guidelines, while the ACOG does review evidence on various surgical options, they do not provide pointed recommendations for surgical approaches in the treatment of SUI (Table 8).

Table 6 Drug therapy.

Recommendation	ACOG	AUA/SUFU OAB	EAU	ICI	NICE
Antimuscarinics as first- or second-line treatment for UUI	•	•		•	•
Antimuscarinics to patients who have failed conservative management			•		
Similar efficacy between oral antimuscarinics			•		
Antimuscarinics: ER formulation preferential to IR due to lower rates of dry mouth		•	•		
Antimuscarinics: trial of 8–12 weeks to assess efficacy of drugs				•	
Antimuscarinics: Consider dose modification or trial of another antimuscarinic if ineffective or adverse drug effects		•	•		•
Antimuscarinics: caution use in elderly		•	•		
Option to offer β_3-adrenoceptor agonist as initial pharmacological therapy for UUI	•	•	•	•	
Offer β_3-adrenoceptor agonist if anticholinergic cannot be used					•
Offer combined antimuscarinic and β_3-adrenoceptor agonist if monotherapy unsuccessful		•	•		
Duloxetine as second-line for use in SUI and MUI for patients not interested in surgery			•	•	•
Duloxetine should be initiated and withdrawn with dose titration because of high risk of adverse events			•		
Desmopressin for short-term relief of daytime UI (advise drug is not licensed for this indication)			•		
Offer topical hormonal therapy for women with UI if vulvovaginal atrophy present	•		•		•
Discuss alternative HRT for women with UI on oral conjugate equine oestrogens			•		
Do not use systemic oestrogen to treat UI	•				•

Table 7 Surgical treatment for SUI.

Recommendation	ACOG	AUA/SUFU SUI	EAU	ICI	NICE
Inform women that any vaginal surgery has an impact on sexual function, which is generally positive			•		
Open or laparoscopic colposuspension technique as option for women with SUI	•	•	•	•	•
Inform women undergoing colposuspension of longer operation time, hospital stay, recovery, and risk of POP and voiding dysfunction postoperatively			•		
MUS as option for treatment of uncomplicated SUI	•	•	•	•	•
TMUS and RMUS have equivalent cure rates	•		•		
Do not offer TMUS unless there are specific clinical circumstances that retropubic space should be avoided					•
Do not use 'top-down' RMUS outside of a clinical trial					•
Do not use single-incision slings outside of a clinical trial					•
Single-incision slings may be offered, but patients should be warned about lack of long-term data	•	•	•	•	
Counsel women undergoing periurethral bulking about need for repeat injections		•		•	•
Do not recommend periurethral bulking agents to women seeking a permanent cure for SUI				•	
May offer prophylactic anti-UI procedure at the time of POP repair after informed decision making	•	•	•		
Do not offer anti-UI procedure at the time of POP repair in continent women				•	•
AUS as an option for women with complicated SUI with warning of high complication and mechanical failure rate				•	
Do not offer AUS to women with SUI unless prior surgery has failed					•

Table 8 Procedural/surgical treatment for UUI.

Recommendation	ACOG	AUA/SUFU OAB	EAU	ICI	NICE
Botox for UUI refractory to medical management	•	•	•	•	•
Ensure women are willing to perform self-catheterisation prior to BTX injection		•	•		
Ensure women are willing to perform self-catheterisation OR accept temporary indwelling catheter prior to BTX injection					•
If adequate symptom relief with 100 U Botox with duration <6 months, consider increasing to 200 U					•
Offer SNS to patients who have failed conservative or pharmacological treatment	•	•	•	•	
Offer SNS to patients who have not responded to BTX or are unwilling to accept the risk of needing to catheterise					•
Consider augmentation cystoplasty in patients with refractory UUI who have failed conservative management and are willing to self-catheterise		•	•	•	•
Consider urinary diversion in patients with refractory UUI who have failed conservative management and are willing to accept at stoma		•	•		•
Only offer urinary diversion if patients have been warned about small risk of malignancy			•		

Colposuspension, either open or laparoscopic, has mostly been supplanted by the MUS, but is still recommended as an option by all guidelines for the management of SUI. The AUA cites data from the Stress Incontinence Surgical Treatment Efficacy Trial (SISTEr) [59], which favoured the autologous fascia pubovaginal sling (PVS) over the Burch

colposuspension due to lower rates of re-treatment at 5 years (4% vs 13%), but feels it remains a viable option for women who wish to avoid the morbidity of a facial harvest and also wish to avoid mesh, particularly if undergoing a simultaneous abdominal procedure. The EAU gives a 'Strong' recommendation to inform women undergoing colposuspension that there is a longer duration of surgery, hospital stay and recovery, as well as a high risk of developing POP and voiding dysfunction postoperatively [60].

All guidelines recommend a MUS as a potential surgical treatment for SUI. The EAU, AUA, ACOG and ICI do not state a preference for the retropubic MUS (RMUS) compared to the transobturator MUS (TMUS) and cite evidence that the two have equivalent cure rates [61,62]. The ICI states that long-term data are insufficient to draw conclusions regarding long-term comparable efficacy between RMUS and TMUS; the AUA acknowledges the lack of data but states preliminary data appears to favour the durability of the RMUS; and the EAU found that while RMUS and TMUS had equivalent patient-reported outcomes at 5 years (Level 1a), RMUS had higher objective patient-reported cure rates at 8 years (Level 1b) [63]. The NICE recently updated guidelines to recommend against using a TMUS unless there is a specific clinical circumstance that necessitates avoidance of the retropubic space. This was based on a systemic review and economic analysis that showed TMUS was worse when compared to RMUS for outcomes of composite cure and patient satisfaction/patient-reported improvement ~1 year after surgery [64].

The AUA found in their review of the literature that the 'in-to-out' and 'out-to-in' technique for TMUS were equivalent, and while they identified some data favouring the 'bottom-up' approach for the RMUS in terms of improved subjective cure rates [62] and lower rates of voiding dysfunction [65], they felt this was insufficient to make a recommendation for one technique over the other. The EAU cites Level 2a evidence that long-term data shows no difference in efficacy for the skin-to-vagina vs vagina-to-skin direction of both RMUS and TMUS [66,67], but found that the 'top-down' approach for RMUS is associated with a higher risk of voiding dysfunction [62]. The NICE guidelines explicitly recommend against using the 'top-down' approach for RMUS.

Single-incision slings are shorter than standard length MUS and do not pass through the retropubic or obturator spaces. Some single-incision slings, such as the TVT-Secur and Minitape, have been withdrawn from the market; however, outcomes data from these devices are included in meta-analyses and remain part of the available evidence [68]. The AUA and ICI give Grade B recommendations that single-incision slings may be offered as treatment for uncomplicated SUI but advise warning patients about the immaturity of evidence regarding their efficacy and safety. The EAU guidelines recommend warning women being offered a single-incision sling that long-term effectiveness remains uncertain. The NICE guidelines do not recommend use of single-incision slings outside of a clinical trial.

All guidelines agree that the AFS is a viable treatment option for women with SUI; the ICI notes that it is the most widely evaluated biological sling and is an effective and durable treatment (Level 1). The AUA, EAU and ICI cite evidence that the AFS is more effective than colposuspension for improvement of SUI, but associated with a higher rate of postoperative voiding dysfunction [69]. The ACOG guidelines discuss that the role for PVS is limited to women who decline or are not candidates for MUS, and recommend the use of PVS for women with severe SUI and a non-mobile fixed urethra, patients undergoing concomitant urethral reconstruction, and patients with prior mesh complications. On the contrary, the NICE guidelines state a preference for PVS over MUS, but note that some women may prefer to accept the risk of mesh complications associated with a MUS in exchange for a shorter hospital stay, avoidance of general anaesthesia, and avoidance of a larger abdominal incision and associated risk of wound complications.

Bulking agents are periurethral injections that allow for improvement in SUI that are recommended as an option by all guidelines, especially for poor surgical candidates. The EAU determined that while improvement is often short term (12 months) (Level 1b), there are fewer adverse risks compared with open surgery (Level 2a) [70]. Similarly, the ACOG recommends the use of bulking agents for women with intrinsic sphincteric deficiency, recurrent SUI after surgical failure, and poor surgical candidates (Level B). The ICI cites Level 4 data that there may be some benefit to bulking agents in women with SUI following pelvic radiation [71].

The artificial urinary sphincter (AUS) has been used to treat some females with SUI as a salvage procedure under special circumstances (e.g., neurogenic sphincter dysfunction) and as a primary procedure in some centres [72–77]. The EAU advises warning women that while cure is possible, even in expert centres there is a high risk of complications, mechanical failure or need for explantation (Weak). The NICE guidelines recommend against AUS as an option for treating SUI in women unless previous surgery has failed.

In women with POP, the severity of UI symptoms, especially SUI, may be masked by the prolapse itself and can become symptomatic after surgical correction. The EAU cites Level 1a evidence that continent women with POP are at risk of developing UI after POP repair. Further, they found that six women need to be treated to prevent one woman from developing *de novo* subjective SUI after POP repair, and 20 to prevent one woman from undergoing an additional MUS

[78]. The AUA/SUFU SUI guidelines give a Grade C recommendation that physicians may perform a MUS, PVS or colposuspension at the time of POP surgery and discuss that shared decision-making should be used when deciding whether or not to perform a concomitant UI procedure. The ACOG gives a Level A recommendation that Burch colposuspension at the time of abdominal sacrocolpopexy [59] and RMUS at the time of vaginal POP surgery may decrease the risk of postoperative SUI in women without preoperative SUI [79]. The EAU gives a 'Strong' recommendation to offer simultaneous surgery for POP and UI in women who have symptomatic or unmasked SUI, although they recommend warning women of the increased risk of adverse events with combined surgery compared to POP surgery alone. Similar to the AUA they advocate for shared decision-making with regards to prophylactic treatment of UI at the time of POP in continent women, giving a 'Strong' recommendation to inform patients of the need to balance risk of *de novo* SUI, as well as the increased risk of adverse events with combined surgery. On the contrary, the NICE and ICI guidelines recommend against anti-UI procedures at the time of POP repair in continent women. The NICE guidelines state that this was based on the available literature, which has found that POP surgery on its own may improve SUI such that SUI surgery is not needed, as well as the increased risks of concurrent surgery and the lack of information about whether concurrent anti-UI surgery is more effective and durable [78,80–82].

Mesh Complications

Given recent governmental regulatory statements and the medical legal ramifications, the AUA/SUFU SUI guideline directly addresses the use of synthetic slings. They acknowledge that there are unique complications related to mesh insertion; and prior to selecting a synthetic sling recommend that physicians discuss potential benefits, risks, and the FDA safety communication regarding slings, to allow patients to make a goal-oriented, informed decision.

Since the prior 'Guidelines of guidelines' on UI in 2016 [4], the NICE guidelines have taken a stronger stance on the use of synthetic mesh. They now recommend giving patients undergoing RMUS written information about the implant and advising them that it is permanent and complete removal might not be possible. Furthermore, the NICE guidelines recommend that surgeons use a device manufactured from type 1 macroporous polypropylene mesh and consider using a sling that is coloured for high visibility for ease of insertion and revision.

The AUA and ACOG guidelines explicitly recommend against placing a synthetic sling at the time of planned urethral reconstruction (e.g., urethral diverticulectomy or fistula repair or if the urethra is inadvertently injured).

Additionally, the AUA recommends physicians strongly consider avoiding mesh in patients who are risk of poor wound healing such as those with significant scarring, poor tissue quality or following radiation therapy (Expert Opinion).

Procedural/surgical Management for UUI

For patients with UUI, after failure of conservative and medical therapy, surgical interventions can be offered, most commonly BTX injections or sacral neuromodulation by SNS with augmentation cystoplasty and urinary diversion as a last resort.

The EAU, AUA/SUFU OAB, ACOG, and NICE guidelines all recommend treatment with 100 U of BTX for UUI refractory to medical management. The ICI gives BTX type A (Botox) Grade A recommendation for use in women with refractory UUI/OAB, although they do not specify a treatment dose. The NICE guidelines further specify that BTX may be offered to both patients with detrusor overactivity (DO), as well as patients with OAB in whom UDS have not demonstrated DO, if symptoms have not responded to non-surgical management. Studies have shown durable efficacy for patients with idiopathic DO with dose–response curves >150 U contributing minimally to symptom improvement; this in combination with the fact that the need for self-catheterisation is also dose dependent has led to the commonly used dose of 100 U [83]. The NICE is the only guideline to recommend considering a higher dose of BTX (200 U) for women with non-neurogenic UUI, specifically for use in women with adequate symptom relief, but an effect duration of <6 months [84,85]. The AUA/SUFU OAB guidelines give a 'Standard' (Grade B Evidence) recommendation that patients being offered BTX must be able and willing to return for frequent PVR evaluation and to perform self-catheterisation if necessary. Similarly, the EAU gives a 'Strong' recommendation that patients receiving BTX be willing to perform self-catheterisation and be warned of UTI risk. The NICE guidelines are broader stating patients undergoing BTX should either be willing to perform self-catheterisation or accept a temporary indwelling catheter.

Sacral neuromodulation (via SNS) refers to stimulation of the nerves that innervate the bladder and pelvic floor to treat lower urinary tract dysfunction. Studies have shown >50% improvement in original symptoms by ~50% of patients at long-term follow-up, with cure rates of UUI of 15% [86,87]. In contrast to PTNS, SNS studies have reported frequent adverse events including pain at the stimulator site, pain at the lead site, lead migration, infection/irritation, electric shock, and need for surgical revision. The EAU, AUA/SUFU OAB, ACOG and ICI guidelines all recommend the use of SNS in patients who have UUI refractory to conservative or pharmacological treatments and consider SNS and BTX to be

positioned equally on a treatment algorithm. The NICE guidelines, which focus the most on cost efficiency, suggest a preference for BTX and recommend SNS in those who have not responded to BTX, or who are not prepared to accept the risk of catheterisation. While no guideline explicitly recommends a technique for the test phase of SNS, the EAU found Level 4 evidence that the use of tined, permanent electrodes in a staged approach results in more patients receiving the final implant than occurs with temporary test stimulation. The AUA/SUFU OAB guidelines note that patients being offered SNS should be counselled on the need for periodic device replacements and that patients must accept that diagnostic MRI is contraindicated. They give SNS a Grade C recommendation based on the predominance of observational studies with small sample sizes, limited number of unique patient groups, and limited information on protocols used to maintain symptom control.

Augmentation cystoplasty is a drastic intervention for refractory UUI that is associated with high rates of short- and long-term complications, and necessitates lifelong follow-up [88]. The EAU, AUA/SUFU OAB, ICI and NICE guidelines discuss this as a treatment option for patients who have failed less invasive treatments and are willing to self-catheterise. The NICE guidelines outline that women should be counselled about the risk of bowel disturbances, metabolic acidosis, mucus production and/or retention in the bladder, UTI, urinary retention, and the risk of malignancy in the augmented bladder. The EAU, AUA/SUFU OAB, and NICE guidelines also recommend offering urinary diversion to patients with refractory UUI who have failed other treatments and are willing to accept a stoma, and the EAU guidelines specify that patients should be warned about the small risk of malignancy.

Complicated UI

There are generally two broad categories for patients who have complicated UI: MUI and failed surgical therapy. For MUI, most guidelines recommend focussing on and treating the predominant symptom. The NICE guidelines discuss that for a women with stress predominant MUI, the benefit of non-surgical management and medicines for OAB should be discussed before offering surgery. The EAU gives a 'Strong' recommendation to counsel patients that the success of SUI surgery for MUI is decreased when compared with treating SUI alone and that a single treatment may not cure UI [89,90].

For patients who have failed prior SUI surgery, the EAU gives a 'Weak' recommendation to inform women that the outcome of a surgical procedure, when used as a second-line treatment, is generally inferior to its use as a first-line treatment, both in terms of reduced effectiveness and increased risk of complications. They recommend considering a secondary synthetic sling, colposuspension or autologous sling as first options in these patients.

Conclusions

The topic of UI is vast and includes subtleties and intricacies regarding diagnosis, treatment, and varied patient populations and disease states. The guidelines discussed in the present review all have similar suggestions for the initial evaluation and use of conservative therapies. It is generally agreed that the initial evaluation should include a thorough history and tools to quantify and qualify the degree of UI. For patients with uncomplicated SUI, invasive testing and imaging should be avoided, and UDS should be reserved for more complicated cases where the results will guide treatment decisions.

As expected, there is more variability when it comes to recommendations for invasive measures. Over the past 3 years, since the initial 'Guideline of guidelines' on UI was published [4] there has been a trend towards recommending ER antimuscarinics over IR formulations to avoid dry mouth. Additionally, more guidelines now recommend the use of a β_3-adrenoceptor agonist as a viable first-line pharmacological agent or for use combined with antimuscarinics in patients that have failed either monotherapy alone.

It is generally agreed upon that MUS is recommended for the patient with uncomplicated SUI, although it is important to counsel patients appropriately before implantation of a synthetic material. Recent data have favoured the RMUS over the TMUS, although the NICE guidelines are the only ones to preferentially recommend this approach. With regards to RMUS, newer data have favoured the 'bottom-up' over the 'top-down' approach. There is discordance amongst the guidelines with regards to prophylactic treatment of SUI at the time of POP repair in a continent woman; the AUA, ACOG and EAU guidelines discuss a prophylactic anti-UI procedure as an option in this population, whereas the NICE and ICI guidelines specifically recommend against it.

This is in no way a complete analysis of each guideline, but summarises some of the salient similarities and differences. As with any guideline or recommendation, if evidence is limited it does not necessarily imply that there is no role for the test or intervention in question, but rather a recommendation cannot be made based on the available evidence. However, there are situations when evidenced-based medicine debunks myths or dogma and thus the efforts that have been put forth in these documents are critical to continue to advance the field of UI.

Reviewing multiple guidelines has also highlighted the considerable redundancy that exists. Organisations that conduct such systematic reviews and structuring of guidelines are often duplicating efforts. Although it is reassuring, as a

consumer of the guideline, to know that independent efforts arrive at the same conclusions, in some cases more formalised collaboration could be argued as a more efficient methodology.

There are other factors that may motivate organisations to undertake the endeavour of creating their own 'guideline'. While guidelines such as the EAU and ICI are international, the ACOG and AUA/SUFU guidelines are produced by national societies, whereas the NICE guidelines are not only national, but also sanctioned by the NHS who provides healthcare to the majority of citizens. Differences in available devices or medications, different regulatory bodies, unique needs of their patient populations, implications for national spending and cost containment, and the ability to highlight options of those they consider 'expert', may all influence the conclusions drawn by these various organisations.

Conflict of Interest

Dr Rachael Sussman and Dr Raveen Syan have no disclosures. Dr Benjamin Brucker has the following disclosures: Watkins Conti (advisor), Boston Scientific (investigator), Allergan (speaker, consultant, investigator), Urovant (advisor).

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Appendix 1

Table A1 Definitions used for level of evidence in clinical guidelines.

	EAU	AUA/SUFU	ACOG	ICI	NICE
1	1a Evidence obtained from meta-analysis of randomised trials 1b Evidence obtained from at least one randomised trial	A) Well-conducted RCT or exceptionally strong observational studies	Evidence obtained from at least one properly designed RCT	Evidence usually involves meta-analysis of RCTs or a good quality RCT, or 'all or none' studies in which no treatment is not an option	Meta-analyses or systematic reviews of RCTs with: 1++ very low risk of bias 1+ low risk of bias 1– high risk of bias
2	2a Evidence obtained from one well-designed controlled study without randomisation 2b Evidence obtained from at least one other type of well-designed quasi-experimental study	B) RCTs with some weaknesses of procedure or generalisability or generally strong observational studies	2 (1) Evidence obtained from well-designed cohort or case-control analytic studies, preferably from more than one centre or research group. 2 (2) Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence. 2 (3) Evidence obtained from multiple time series with or without the intervention. Dramatic results in uncontrolled experiments also could be regarded as this type of evidence	Includes 'low' quality RCT (e.g. <80% follow-up) or meta-analysis (with homogeneity) of good quality prospective 'cohort studies'	2++ systematic reviews of case-control or cohort studies 2+ well-conducted case-control or cohort studies 2– case-control or cohort studies with risk of confounding or bias
3	Evidence obtained from well-designed nonexperimental studies, such as comparative studies, correlation studies and case reports	C) Observational studies that are inconsistent, have small sample sizes or have other problems that potentially confound interpretation of data	Opinions of respected authorities, based on clinical experience, descriptive studies, or reports of expert committees	Good quality retrospective 'case-control studies' where a group of patients who have a condition are matched appropriately with control individuals who do not have the condition or good quality 'case series' where a complete group of patients all, with the same condition/disease/therapeutic intervention, are described, without a comparison control group	Non-analytical studies (for example, case reports, case series)
4	Evidence obtained from expert committee reports or opinions or clinical experience of respected authorities		N/A	Expert opinion were the opinion is based not on evidence but on 'first principles' (e.g. physiological or anatomical) or bench research	Expert opinion, formal consensus

Table A2 Definitions used for clinical guidelines regarding grade of recommendation. The terms 'Standard', 'Recommendation' and 'Option', and the respective definition, are included in order of increasing degree of flexibility of the recommendation.

	EAU	AUA/SUFU	ACOG	ICI	NICE
A	Strong: desirable effects of an intervention clearly outweigh the undesirable effects, or clearly do not	**Standard:** Directive statement that an action should (benefits outweigh risks/burdens) or should not (risks/burdens outweigh benefits) be taken based on Grade A (high quality; high certainty) or B (moderate quality; moderate certainty) evidence	Recommendations are based on good and consistent scientific evidence.	Depends on consistent Level 1 evidence, often means recommendations are effectively mandatory and placed within a clinical care pathway. May follow Level 2 evidence; however, needs a greater body of evidence if based on anything except Level 1 evidence	At least one meta-analysis, systematic review, or RCT where Evidence Level is 1++ or 1+ with consistent results, or evidence drawn from the NICE technology appraisal
B		**Recommendation:** Directive statement that an action should (benefits outweigh risks/burdens) or should not (risks/burdens outweigh benefits) be taken based on Grade C (low quality; low certainty) evidence	Recommendations are based on limited or inconsistent scientific evidence.	Depends on consistent Level 2 and/or 3 studies, or 'majority evidence' from RCTs	Body of evidence includes 2++ studies with overall consistency of results or extrapolated from 1++ or 1+ studies
C	Weak: Trade-offs are less certain – either because of low quality evidence or because evidence suggests that desirable and undesirable effects are closely balanced	**Option:** Non-directive statement that leaves the decision regarding an action up to the individual clinician and patient because the balance between benefits and risks/burdens appears equal or appears uncertain based on Grade A (high quality; high certainty), B (moderate quality; moderate certainty), or C (low quality; low certainty) evidence	Recommendations are based primarily on consensus and expert opinion.	Depends on Level 4 studies or 'majority evidence' from Level 2/3 studies or Delphi processed expert opinion	Body of evidence with 2 + studies or extrapolated from 2++ studies
D		**Clinical Principle**: a statement about a component of clinical care that is widely agreed upon by urologists or other clinicians for which there may or may not be evidence in the medical literature **Expert Opinion:** a statement, achieved by consensus of the Panel, that is based on members' clinical training, experience, knowledge, and judgment for which there is no evidence	N/A	No recommendation possible: where evidence is inadequate or conflicting and when expert opinion is delivered without a formal analytical process, such as by Dephi	Evidence Level 3 or 4, or extrapolated from 2+ studies, or based on formal consensus *D (GPP): good practice point recommendation based on experience of guideline development group

Table 11 AGREE II instrument scores obtained from three reviewers.

	EAU	NICE	ICI	AUA/SUFU SUI	AUA/SUFU OAB	AUA/SUFU UDS	ACOG
Domain 1: Scope and Purpose	100	100	100	100	100	100	100
Domain 2: Stakeholder Involvement	90	100	71	86	86	86	67
Domain 3: Rigor of Development	100	100	100	100	100	100	61
Domain 4: Clarity of Presentation	100	100	100	100	100	100	100
Domain 5: Applicability	82	100	100	100	100	100	100
Domain 6: Editorial Independence	100	100	29	68	57	57	14
Overall	100	100	71	86	86	86	57

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Abbreviations: ACOG, American College of Obstetrics and Gynecology/American Urogynecologic Society; AFS, autologous fascial sling; AGREE, Appraisal of Guidelines for Research and Evaluation; AUGS, American Urogynecologic Society; AUS, artificial urinary sphincter; BTX, botulinum toxin; CUA, Canadian Urological Association; DO, detrusor overactivity; EAU, European Association of Urology; ER, extended release (formulations); FDA, USA Food and Drug Administration; ICI, International Consultation on Incontinence; ICIQ, ICI Questionnaire; IR, immediate release; MEDLINE, Medical Literature Analysis and Retrieval System Online; (R)(T)MUS, (retropubic) (transobturator) mid-urethral sling; NICE, National Institute for Health and Care Excellence; OAB, overactive bladder; PFMT, pelvic floor muscle therapy; POP, pelvic organ prolapse; PTNS, posterior tibial nerve simulation; PVS, pubovaginal sling; QoL, quality of life; RCT, randomised controlled trial; SUFU, Society of Urodynamics, Female Pelvic Medicine and Urogenital Reconstruction; UA, urine analysis; UDS, urodynamic studies; (M)(S)(U)UI, (mixed)(stress)(urge) urinary incontinence; ValUE, Value of Urodynamic Evaluation (trial).