Development of a new patient-reported outcome (PRO) measure on the Impact of Nighttime Urination (INTU) in patients with nocturia—Psychometric validation

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Aims: To psychometrically evaluate the Impact of Nighttime Urination (INTU) questionnaire, a new patient-reported outcome measure developed to assess the impact of nocturia on health and functioning in a multicenter, behavioral modification (fluid restriction) study.

Methods: Participants aged 50-95 years with at least two voiding episodes/night for ≥6 months completed voiding diaries and the INTU on 3 consecutive days during weeks 1 and 2 (same day recall) and completed the Pittsburgh Sleep Quality Index (PSQI) and Nocturia Quality of Life Questionnaire (N-QOL) at baseline and days 8 and 15. Psychometric evaluations of the INTU were conducted.

Results: Rasch analysis showed the INTU to be a unidimensional construct, with most items located on the severe end of the symptom severity continuum. In addition to an Overall Impact Score (10 items), exploratory factor analysis affirmed by confirmatory factor analysis identified two domains: Daytime (six items) and Nighttime (four items) Impact Scores (comparative fit index = 0.968; root mean square error of approximation = 0.08). Concurrent validity met prespecified hypotheses, indicating similarity of concepts with the PSQI (correlation [\( r \) = 0.627]) and N-QOL (\( r = -0.784 \)) total scores. The INTU differentiated among patients with different nocturic episode frequencies (\( P < 0.05 \) for all three summary scores). Statistically significant decreases were observed in mean Overall and Nighttime Impact Scores at week 2 versus week 1 in responders, indicating that the instrument can detect changes in response to symptom improvements.

Conclusions: The INTU questionnaire demonstrated robust measurement properties and is a suitable tool for assessing the patient-reported impact of nocturia on health and functioning.

KEYWORDS
functioning, health, health-related quality of life, nocturia, patient-reported outcome measure
1 | INTRODUCTION

Nocturia, defined as the need to wake up to void during the night, is considered one of the most bothersome of the lower urinary tract symptoms.\(^1\) Although the impact of nocturia varies from person to person, those who experience two or more nocturic episodes per night report a substantial impairment in their health and functioning.\(^2,3\) Using this definition, the prevalence of nocturia has been estimated to be approximately 3-15% in young adults 20-30 years of age, 5-40% in individuals aged 50-60 years, and 20-60% in those who are 70-80 years of age.\(^4\) Nocturia is thus an important cause of interrupted sleep across the age spectrum. Previous clinical trials have demonstrated treatment efficacy in patients with nocturia, including reductions in nocturnal urine output and nocturnal voids.\(^5-9\) However, there is limited information on patient perception of treatment benefit as assessed by patient-reported outcome (PRO) measures.

To assess the effect of the condition and the benefits of treatment, PRO measures must accurately measure the impact of nocturia on health and functioning. In addition, the instrument must have the ability to detect changes in response to treatment, be easy to use, and have a short recall period, such as 24 h. If the instrument is to be used in a clinical trial, it must be developed and validated in a population similar to the study population. Here, we describe the validation of a new PRO measure, the Impact of Nighttime Urination (INTU) questionnaire. This instrument was developed following current recommended guidance for PRO measures, using a series of iterative, semistructured interviews of 28 patients with nocturia. The INTU was devised based on concepts covered in existing tools such as the Nocturia Quality of Life (N-QOL) questionnaire.\(^10\) A phased approach was used, with each round of the questionnaire evaluated with open-ended concept elicitation, followed by cognitive debriefing, to assess every item in the instrument and guide modifications to each iteration of the instrument. The final INTU is a 10-item questionnaire that assesses the most proximal impacts of nocturia on health and functioning, and was designed for use in clinical trials for the treatment of nocturia. Development of the INTU is described in a companion paper (Abrams et al, under review). Data from patients enrolled in a study entailing a nonpharmacological intervention of behavioral modification restricting evening fluid intake were used for psychometric validation of the INTU questionnaire.

2 | MATERIALS AND METHODS

The study recruited individuals 50-95 years of age with a documented diagnosis of nocturia, defined as having at least two voiding episodes per night for at least 6 months. Participants were recruited for this 2-week study from 18 centers in the United States during July and August 2013; all provided informed consent. Institutional Review Board (Copernicus Group) approval was obtained in advance of the study (Tracking#: ADE1-13-210). Participants had to be willing and able to complete a voiding diary and a health and functioning questionnaire unaided, and to restrict their evening fluid intake (ie, behavioral modification) during the second half of the 2-week study period. Exclusion criteria were diabetes insipidus or syndrome of inappropriate antidiuretic hormone, uncontrolled diabetes mellitus, congestive heart failure (New York Heart Association Class III or IV), or any medical conditions that would interfere with the ability to comply with study procedures. Individuals taking loop diuretics, having a daytime urinary frequency of more than eight episodes per day, with a history of a sleep disorder or syndrome that disrupted sleep in the past 6 months, with work or lifestyle activities that interfere with nighttime sleep, with a history or evidence of polydipsia or thirst disorders, or experiencing nocturnal enuresis (nighttime incontinence) were also excluded.

This study used a behavioral modification intervention of fluid restriction to examine the relationship between participants’ responses on a nightly voiding diary and the Patient Global Impression of Change (PGI-C), Pittsburgh Sleep Quality Index (PSQI), and N-QOL questionnaires with those of the INTU before and after the intervention. A brief description of each questionnaire and study procedures are provided below.

2.1 | Study instruments

The INTU is a 10-item PRO instrument with results scored on a 0-100 scale, where higher scores indicate worse impact. The INTU has a same-day recall period and includes six items that assess the effects of nocturia on daytime activities and four items that measure the nighttime impact of nocturia. Details of the items and response options are reported elsewhere (Abrams et al, submitted).

The nightly voiding diary is a five-item patient-administered instrument used to capture data regarding the frequency of sleep disruptions and wake-up times during the previous night. The PGI-C questionnaire asks patients to self-assess the change in their nocturia symptoms over 1 week, and the response is rated on a 7-point Likert scale, anchored at 1, “Very much improved” and 7, “Very much worse.” The PSQI measures the quality of an individual’s sleep over the past week, including the individual’s sleeping habits.\(^11,12\) The N-QOL\(^10\) is a 13-item questionnaire with two domains: a Sleep/Energy domain and a Bother/Concern domain. A 1-week recall period was used for each questionnaire.

Data for the INTU questionnaire validation were collected from all participants, who attended the study center on day 1 and returned on days 8 and 15 for follow-up visits. On day 1,
participants were screened for entry into the study and baseline demographic and health information was collected. Participants also completed baseline assessments using the PSQI and the N-QOL questionnaires. Participants were asked to complete the nightly voiding diary and the INTU questionnaire on three consecutive days during week 1. The INTU was to be completed at the end of the day following the night for which the nightly voiding diary was completed. On day 8, participants described their experience during week 1 using the PGI-C, PSQI, and N-QOL questionnaires. Participants were instructed to maintain their usual habits including fluid intake in the evening and that prior to sleep. At week 2 of the study, those participants who met the requirements for inclusion (more than two nocturic episodes on each diary night, with a minimum of six nocturic episodes overall) were instructed to maintain their usual fluid intake up to 8 pm each evening and stop fluid intake from 8 pm until the start of the next day, and to complete the voiding diary and the INTU as they did in week 1. On day 15, participants completed the PGI-C, PSQI, and N-QOL for week 2 (Table 1).

2.2 | Evaluation of psychometric properties of the INTU

Item distribution, floor and ceiling effects, and interitem correlations were investigated for each of the 10 items in the INTU. Item distribution was described by the frequency and percentage of each response option of the INTU items on day 5. Items with significant floor or ceiling effects (ie, a high percentage of patients selecting the lowest [floor] or highest [ceiling] impact possible) were reviewed for exclusion from scoring algorithms. Pearson or Spearman’s correlations were used to assess interitem correlations in order to investigate redundancy of item concepts. Mean-square infit and outfit statistics were calculated on the Rasch model to determine whether a given item contains more variance than the model is able to predict. The model was considered a misfit if the infit or outfit value was high for the responses proximal or distal to the item location, respectively. Local independence between individual INTU items was evaluated using person separation indices to assess whether the items are sufficiently distinct and are able to distinguish among different degrees of symptom severity. Reliability statistics were calculated to evaluate whether the items appropriately estimated the full range of symptoms that patients may be experiencing (person reliability) and whether the response scale captured symptom severity (item responsivity).

Exploratory and confirmatory factor analyses (EFA and CFA) were conducted to evaluate relationships among INTU items with underlying factors. EFA ascertains whether items can be grouped into health domains (factors) that reflect different aspects of nocturia symptom impacts. CFA tests the

| TABLE 1 | Schedule of assessments |
|------------------------------------------------|
| **Completed forms on each day (days 1-15)** | **Week 1, days 1-7** | **Week 2, days 8-15** | **Fluid restriction** |
| Informe Consent Form (ICF)\textsuperscript{d} and Medical Record Release\textsuperscript{e} | \checkmark | | |
| Case Report Form (CRF) | \checkmark | | |
| Demographic and Health Information Form (DHIF) | \checkmark | | |
| Questionnaire on the Impact of Nighttime Urination (INTU)\textsuperscript{f} | \checkmark | \checkmark | \checkmark |
| Nightly Voiding Diary\textsuperscript{f} | \checkmark | \checkmark | \checkmark |
| Patient Global Impression of Severity (PGI-S)\textsuperscript{g} | \checkmark | | |
| Patient Global Impression of Change (PGI-C) | \checkmark | \checkmark | |
| Pittsburgh Sleep Quality Index (PSQI) | \checkmark | \checkmark | \checkmark |
| Nocturia Quality of Life Questionnaire (N-QOL) | \checkmark | \checkmark | \checkmark |

\textsuperscript{a}Baseline measure.
\textsuperscript{b}Assessed in clinic (Days 1, 8, 15).
\textsuperscript{c}Assessed at home (Days 4, 5, 6, 11, 12, 13).
\textsuperscript{d}The ICF was completed by both the patient and clinician/site coordinator.
\textsuperscript{e}Completed by clinician/site coordinator.
\textsuperscript{f}Alternative schedule: During week 1, nightly voiding diaries could be completed in the mornings of days 5, 6, and 7, capturing nightly voids of days 4, 5, and 6, and INTU questionnaires would then be completed in the evenings of days 5, 6, and 7. During week 2, nightly voiding diaries could be completed in the mornings of days 12, 13, and 14, capturing nightly voids of days 11, 12, and 13, and INTU questionnaires would then be completed in the evenings of days 12, 13, and 14.
\textsuperscript{g}The PGI-S was administered; however, these data were not used in analysis. Instead, data collected from the Nightly Voiding Diary and the DHIF were used.
modeled factor structure of the observed items resulting from EFA. Standardized regression loadings were examined to assess the strength of the relationship between items and the underlying domains.

Internal consistency reliability (the extent to which a set of items measure the same general concept) for the proposed scoring of the INTU was estimated using Cronbach’s alpha coefficient for each domain based on data from day 5. Test-retest reliability was assessed using INTU data from days 4 and 6 for participants with the same number of nocturic events on both days. As part of construct-related validity, known-groups analysis was performed by considering scores for subgroups of participants corresponding to the number of episodes per night reported in the Nighttime Urinary Voiding Diary as mild (two to three), moderate (three or more to four) or severe nocturia (four or more). Data were taken from week 2, and mean differences between groups were derived from a pooled t-test (two groups) or one-way analysis of variance (for multiple groups). Additionally, convergent (strong correlations) and discriminant (weak correlations) validity were assessed by examining Spearman correlations between the three INTU scores (for week 1) and scores from the PSQI and N-QOL (for day 8).

### TABLE 2 Patient characteristics: demographic and health information

| Patient characteristic, n (%) | N = 193 |
|------------------------------|---------|
| Age, years, mean ± SD        | 66.5 ± 8.8 |
| Male                         | 105 (54.4) |
| Race                         |         |
| Black or African American    | 21 (10.9) |
| White/Caucasian              | 163 (84.5) |
| Other                        | 9 (4.7)  |
| Patient-reported work status (some reported >1) | |
| Employed full-time           | 49 (25.4) |
| Employed part-time           | 28 (14.5) |
| Homemaker                    | 10 (5.2)  |
| Retired                      | 96 (49.7) |
| Student                      | 1 (0.5)   |
| Unemployed                   | 11 (5.7)  |
| Other                        | 7 (3.6)   |
| Annual household income (excludes 30 patients who did not report income) | |
| Under $25,000                | 50 (25.9) |
| $25,000 to $49,000           | 21 (26.4) |
| $50,000 to $74,999           | 47 (24.4) |
| $75,000 to $99,999           | 25 (13.0) |
| $100,000 and over            | 20 (10.4) |
| Patient self-report of health in general | |
| Poor                         | 0        |
| Fair                         | 13 (6.7) |
| Good                         | 66 (34.2) |
| Very good                    | 92 (47.7) |
| Excellent                    | 22 (11.4) |
| Patient self-reported severity of nocturia (based on DHIF) | |
| 2.0-3.0 episodes/night (mean) | 90 (46.6) |
| >3.0-4.0 episodes/night (mean) | 83 (43.0) |
| >4.0 episodes/night (mean)   | 20 (10.4) |
| Patient report of nocturic episodes at week 1 (based on patient diary) | |
| >0-<2 episodes/night          | 1 (0.5)  |
| 2-3 episodes/night           | 123 (63.7) |
| >3 episodes a night          | 67 (34.7) |
| Patient self-reported quality of life in relation to nocturia | |
| Poor                         | 4 (2.1)  |
| Fair                         | 42 (21.8) |
| Good                         | 83 (43.0) |
| Very good                    | 54 (28.0) |
| Excellent                    | 10 (5.2)  |
| Clinician-reported severity of patients’ nocturia | |
| 2.0-3.0 episodes/night (mean) | 89 (46.1) |

(Continues)
2.3 Exploratory analysis of clinically important difference and responsiveness

A preliminary investigation into the clinically important difference was conducted for the INTU summary scores using anchor- and distribution-based methods. The fluid restriction intervention was expected to have only a minimal impact on patient response; thus, these analyses were exploratory. Using the anchor-based method, responsiveness was assessed by comparing the mean change in INTU scores at week 1 compared with week 2 using responder definitions as follows: respondents with one-grade change in PGI-C score, two-grade change in PGI-C score, 50% reduction in nocturic episodes, and mean decrease of one nocturic episode per night.

3 RESULTS

A total of 193 participants were enrolled. Mean (standard deviation) age was 66.5 (8.8) years and 54.4% were male (Table 2). Approximately half (46.6%) the participants reported having two to three episodes per night, and 43.0% reported four episodes per night. Participant diary entries for week 1 indicated that 63.7% experienced two to three nocturic episodes per night, and 34.7% experienced at least three episodes per night.

More than 90% of participants completed each INTU assessment for both weeks. Most items were skewed toward the lower impact responses except for item 9 (“How bothered were you by having to get out of bed to go to the bathroom last night”), for which 73.1% responded “Somewhat” or “Quite a bit” (responses 2 and 3). No notable ceiling effects were observed but floor effects were observed for seven items. All items had interitem correlations (<0.80), indicating that none were redundant. None of the items exhibited significant misfit in the Rasch analysis. Person separation for the INTU was 2.33, while separation reliability was 0.84, both of which were above prespecified separation index and reliability thresholds. Thus, the items were sufficiently well separated in terms of item difficulty, responses were reliable and the INTU items showed a strong unidimensional construct. Most items were located on the severe end of the symptom severity continuum, suggesting that the INTU is an appropriate measure to assess the impact of nocturia in patients with substantial symptom burden.

EFA yielded a two-factor model, thus supporting the need for nighttime and daytime domain scores. Items 1–4 showed strong factor loadings (correlations) on the Daytime Impact

| Item | EFA Factor loadings | 2-Factor CFA Factor loadings |
|------|---------------------|------------------------------|
| INTU item 1. Have you had difficulty concentrating? | Factor 1, Daytime Impact Score | Factor 2, Nighttime Impact Score | Factor 1, Daytime Impact Score | Factor 2, Nighttime Impact Score |
| INTU item 2. Have you felt tired? | 0.689* | −0.036 | 0.661 | N/A |
| INTU item 3. Have you had difficulty getting things done? | 0.636* | 0.250* | 0.848 | N/A |
| INTU item 4. Have you been irritable? | 0.701* | −0.005 | 0.680 | N/A |
| INTU item 5. Have you been concerned about having to get up tonight to urinate? | 0.489* | 0.083 | 0.602 | N/A |
| INTU item 6. How rested did you feel this morning? | −0.001 | 0.654* | N/A | 0.710 |
| INTU item 7. Did getting up out of bed to go to the bathroom this morning cause you to start your day earlier than you would have liked? | 0.334* | 0.266* | 0.634 | N/A |
| INTU item 8. How difficult was it to get enough sleep last night? | 0.131 | 0.449* | N/A | 0.622 |
| INTU item 9. How bothered were you by having to get out of bed to go to the bathroom last night? | 0.229* | 0.497* | N/A | 0.730 |
| INTU item 10. How drowsy did you feel? | −0.006 | 0.874* | N/A | 0.871 |

CFA, confirmatory factor analysis; CFI, comparative fit index; EFA, exploratory factor analysis; INTU, Impact of Nighttime Urination; N/A, not applicable; RMSEA, root mean square error of approximation.

Model fit statistics for two-factor CFA were as follows: RMSEA = 0.08; CFI = 0.968.

*EFA was performed on data collected on day 4.

*CFA was performed on data collected on day 11.

*P < 0.05.
Score and items 5 and 7–9 showed strong loadings on the Nighttime Impact Score (Table 3). Items 6 (“How rested did you feel this morning?”) and 10 (“How drowsy did you feel?”) showed loadings on both factors; however, the item content seemed to be more appropriately suited for the Daytime Impact Score. CFA for the two-factor model showed good model fit (comparative fit index, 0.968; root mean square error of approximation, 0.08). Standardized regression loadings for all items were ≥0.50. Examination of the modification indices as compared to the overall chi-square for the proposed two-factor model for CFA results did not indicate any potentially redundant or misfitting items. These results suggested that there was no need for revision or removal of any of the 10 items.

Based on the results of the Rasch and factor analyses, three scoring algorithms were identified for further evaluation: Daytime Impact Score calculated from Items 1–4, 6, and 10; Nighttime Impact Score calculated from Items 5 and 7–9; and Overall Impact Score calculated from the average of the Daytime Impact Score and Nighttime Impact Score. Both mean and worst scores (ie, the highest score) over the 3-day period were identified for each scoring algorithm. The three identified scoring algorithms (scores) were further tested for reliability and validity.

All three scores had acceptable internal consistency as indicated by a Cronbach’s alpha coefficient of 0.881 (Overall Impact Score), 0.834 (Daytime Impact Score) and 0.776 (Nighttime Impact Score). Removal of any of the individual items from any of the three scores showed only a slight decrease in Cronbach’s alpha, indicating that all items are appropriate for inclusion in the respective scores. Acceptable test-retest reliability was noted for all three scores with intraclass correlation coefficient values of 0.895 (Overall Impact Score), 0.811 (Daytime Impact Score) and 0.882 (Nighttime Impact Score). Known-groups values for all three scores increased with increasing nocturic episode frequency (severity), and differences between severity subgroups were statistically significant ($P < 0.01$), demonstrating that the INTU can distinguish among patients with different symptom severity.

Correlations between the three INTU scores and those from the PSQI and N-QOL were determined to assess convergent and discriminant validity. Strong negative correlations, reflecting the opposite scoring conventions of the two instruments, were noted for the N-QOL total score and for the two subdomains (Sleep/Energy and Bother/Concern), with correlation coefficients ranging between $-0.511$ and $-0.784$ (Table 4), indicating that similar concepts measured by the N-QOL are correlated with similar concepts measured by the INTU. Correlation coefficients for the PSQI total score and the three INTU scores ranged from 0.589 to 0.627, suggesting a strong relationship between sleep quality and impact on the individual, while correlation coefficients for most of the relevant individual PSQI items were between 0.3 and 0.6, indicating a moderate to strong correlation.

At week 1 following the fluid restriction intervention, 63 participants experienced a one-grade change in PGI-C, 14 participants experienced a 50% reduction in nocturic episodes, and 119 reported no change from baseline. Exploratory responsiveness analysis of the proposed Overall, Daytime, and Nighttime Impact Scores found a range of estimates: mean improvement (standard deviation) of 3.20 points (10.99) for patients with a one-grade

| TABLE 4  Convergent and discriminant validity: correlations for INTU mean scores for week 1 with PSQI and N-QOL scores for day 8 |
|---|
| **Concurrently administered measures** | $N^a$ | **Overall impact score** | **Daytime impact score** | **Nighttime impact score** |
| PSQI | | | | |
| Duration of sleep | 192 | 0.366 | 0.315 | 0.377 |
| Sleep disturbance | 186 | 0.330 | 0.323 | 0.269 |
| Sleep latency | 192 | 0.313 | 0.293 | 0.277 |
| Days dysfunction due to sleepiness | 189 | 0.592 | 0.606 | 0.502 |
| Sleep efficiency | 192 | 0.336 | 0.310 | 0.325 |
| Overall sleep quality | 192 | 0.537 | 0.518 | 0.492 |
| Need meds to sleep | 191 | 0.205 | 0.182 | 0.193 |
| PSQI: Total | 182 | 0.629 | 0.589 | 0.590 |
| N-QOL | | | | |
| Sleep/energy | 183 | $-0.766$ | $-0.741$ | $-0.679$ |
| Bother/concern | 186 | $-0.641$ | $-0.511$ | $-0.689$ |
| N-QOL: Total score | 190 | $-0.776$ | $-0.690$ | $-0.755$ |

N-QOL, Nocturia Quality of Life Questionnaire; PSQI, Pittsburgh Sleep Quality Index.

$^a$The analysis includes only patients with both correlational measures at the specified time points.
change in PGI-C to a mean improvement of 9.87 points (14.00) for patients with a 50% reduction in nocturic events for the average Overall Impact Score. Improvements in the INTU mean Overall Impact score and the mean Nighttime Impact score between week 1 and week 2 for fluid restriction responders were statistically significant ($P < 0.05$). Known-group analysis performed on these scores showed that the Overall Impact and Nighttime Impact scores were able to differentiate between responses among patients with different numbers of episodes/night, with more frequent nighttime urination resulting in greater symptom impact as measured by the INTU ($P < 0.05$ for all comparisons).

4 | DISCUSSION

Assessment of the impact of nocturia on patients’ health and functioning is important for the development of effective treatments. Perception of the impact of nocturia can vary among individuals and may not correlate with symptom severity; therefore, assessing patients’ perspectives is an important component of measuring treatment efficacy. The INTU was developed to address limitations of instruments existing at the time, (Abrams et al, submitted) such as validation in both men and women and in all nocturia etiologies. The 24-h recall period for the INTU reduces responder bias when addressing the impacts of nocturia occurring the previous night, and allows detection of intervention-induced changes in as little as 1 week. The INTU focuses on the proximal, rather than distal, impact of nocturia. As concepts become more distal, it becomes more difficult for patients to attribute the distal concept to the condition of interest (eg, nocturia), and there is an increasing chance that factors other than the condition of interest, may influence patients’ responses. The two INTU subscales help distinguish between the daytime and nighttime effects of nocturia.

The findings of this comprehensive psychometric validation demonstrate that the INTU questionnaire provides a robust measure of the impact of nocturia on health and functioning, and is in line with current recommendations for the development of PRO measures. The INTU showed no notable ceiling effect for any of the individual items. Although floor effects were observed for some items, this may be driven by the 47% patients in this study who had had moderate symptoms (two to three nocturia episodes/night). No redundancy was noted for the concepts within the INTU, and results of Rasch analysis indicate that the instrument is able to capture the impact of nocturia across the entire range of severity. Thus, the INTU is suitable for measuring the impact of nocturia, including in patients with multiple nocturic episodes. Convergent and discriminant validity was demonstrated by correlations between the INTU scores and the total scores from the N-QOL and the PSQI. Test-retest reliability was good, as was the internal consistency of the summary scores.

This study has two main limitations. First, approximately 50% of participants in this study had two to three nocturia episodes/night and only 10% had more than four episodes/night, whereas clinical trials are likely to involve more patients with higher nocturia frequency. However, the study findings suggest that the INTU is able to assess the impact of severe symptoms as well as changes in symptoms. Secondly, as the behavioral intervention of fluid restriction was shown to only have a small effect on the reduction of nocturic void, it did not substantially impact the nocturia outcome in this study (few patients met any of the four responder definitions), which was reflected by the small changes in INTU scores. Further testing of the INTU in a therapeutic clinical trial setting is warranted to better understand the sensitivity of the instrument to assess changes resulting from symptom improvement.

5 | CONCLUSIONS

The results of this multicenter study demonstrate that the INTU questionnaire, developed in line with current guidance for PRO measures, demonstrated robust measurement properties. The ability to quantify disease impact makes the INTU a clinically relevant nocturia-specific PRO measure to evaluate treatment benefit in interventional studies of adult patients with nocturia.

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CONFLICT OF INTEREST

Jason B. Bennett has served as a consultant/advisor to Allergan plc and as a study investigator for SPC-SER120-DB4-201301. Kristin Khalaf Gillard, an employee of Xcenda, has served as consultant/advisor to Allergan plc. Benjamin Banderas, an employee of Adelphi Values, served as a study investigator and has served as a consultant/advisor to Allergan plc. Steven Abrams is an employee of Allergan plc. Linda Cheng and Seymour Fein are employees of Serenity Pharmaceuticals, LLC.
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