

Associations between the Patient Perception of Bladder Condition score and overactive bladder syndrome symptoms at baseline and upon treatment

Sandra Schönburg¹  | Sandra Murgas²  | Paolo Fornara¹ | Martin C. Michel³ 

¹Department of Urology and Kidney Transplantation, Martin-Luther-University, Halle (Saale), Germany

²APOGEPHA Arzneimittel GmbH, Dresden, Germany

³Department of Pharmacology, Johannes Gutenberg University, Mainz, Germany

Correspondence

Martin C. Michel, Department of Pharmacology, University Medical Center, Johannes Gutenberg University, Langenbeckstr. 1, Mainz 55131, Germany.

Email: marmiche@uni-mainz.de

Abstract

Background: Patient-reported outcomes such as the Patient Perception of Bladder Condition (PPBC) score are frequently used to characterize overactive bladder syndrome (OAB) patients and their treatment outcomes. However, little information is available on the relationship of such scores to OAB symptoms at the individual patient level.

Methods: We have performed a post hoc analysis of two large noninterventional studies ($n = 1345$ and 745) in which patients received propiverine extended release (30 or 45 mg/day) for 12 weeks to determine the strength of nonparametric correlations between PPBC and OAB symptoms at baseline, after treatment and with treatment-associated changes thereof.

Results: PPBC was not correlated with age but with episode frequencies of urgency, incontinence, micturitions, and nocturia, but the strength of correlations was only moderate (Spearman rank correlation coefficient 0.2045–0.3553). Similarly moderate correlations were observed after treatment and when changes in PPBC were compared to those of OAB symptoms, although these correlations were somewhat stronger.

Conclusions: PPBC is only moderately correlated to OAB symptoms indicating that it characterizes patients beyond what is captured by their symptoms.

KEYWORDS

nonparametric analysis, overactive bladder syndrome, patient perception of bladder condition, symptom score

Abbreviations: CI, confidence interval; IQR, interquartile range; NIS, noninterventional study; OAB, overactive bladder; PPBC, patient perception of bladder condition; PROM, patient-reported outcome measure; QoL, quality of life.

This is an open access article under the terms of the Creative Commons Attribution-NonCommercial-NoDerivs License, which permits use and distribution in any medium, provided the original work is properly cited, the use is non-commercial and no modifications or adaptations are made.

© 2022 The Authors. *Neurourology and Urodynamics* published by Wiley Periodicals LLC.

1 | INTRODUCTION

Based on the definition of the overactive bladder syndrome (OAB) by the International Continence Society,^{1,2} studies of the severity of the condition and of treatment effects typically focus on the (mostly diary-derived) variables of urgency, incontinence, frequency, and nocturia. While urgency is the defining symptom for OAB (1; 2), incontinence and frequency are the symptoms most often used as primary endpoints, at least partly because of requirements from regulatory agencies for phase III studies. However, it has been found that these symptoms only partly describe clinical reality. Different symptoms may be particularly bothersome for a given patient, and the OAB symptoms are only poorly correlated to each other.^{3,4}

Patient-reported outcome measures (PROM) are increasingly used as well to characterize OAB patients, sometimes even as primary outcome parameter of studies. They are typically based on symptom scores that at least to some extent reflect the impact of OAB and/or its treatment on quality of life (QoL) in general and on disease specific QoL in particular.^{5,6} Many PROM are available in the field of OAB research⁷ including the King's Health Questionnaire, overactive bladder questionnaire (OABq), overactive bladder symptom score (OABSS), or the Patient Perception of Bladder Condition score (PPBC). The latter consists of a single question ("which of the following statements describes your bladder condition best at the moment?") and six options ranging from "does not cause me any problems at all" to "causes me many severe problems." It has been validated for content⁸ and for test–retest validity.⁹ Moreover, validated translations exist for 16 languages including German.¹⁰ Accordingly, the PPBC has been used to define fulfillment of inclusion criteria or to assess the impact of treatment on disease specific QoL in many controlled and noninterventional studies, including treatment with muscarinic receptor antagonists such as darifenacin, fesoterodine, oxybutynin, propiverine, solifenacin, or tolterodine, with β_3 -adrenoceptor agonists such as mirabegron, or with onabotulinum toxin.

The general observation is that treatments improving OAB symptoms such as urgency, incontinence, frequency, or nocturia also improve the PPBC score and other indicators of QoL.¹¹ However, the situation is less clear at the single-patient level: the original validation report⁸ and one large, noninterventional study (NIS) found that baseline levels of PPBC correlated only moderately with those of OAB symptoms.³ Moreover, these studies had all been based on use of tolterodine and no comparable data exist with other OAB treatments. Thus, it remains unclear what drives PROM such as the PPBC. Therefore, we have analyzed data from two previously reported large NIS

based on administration of propiverine extended release (ER)^{12,13} to explore how PPBC and its changes upon treatment relate to OAB parameters such as urgency, incontinence, frequency, and nocturia.

2 | MATERIALS AND METHODS

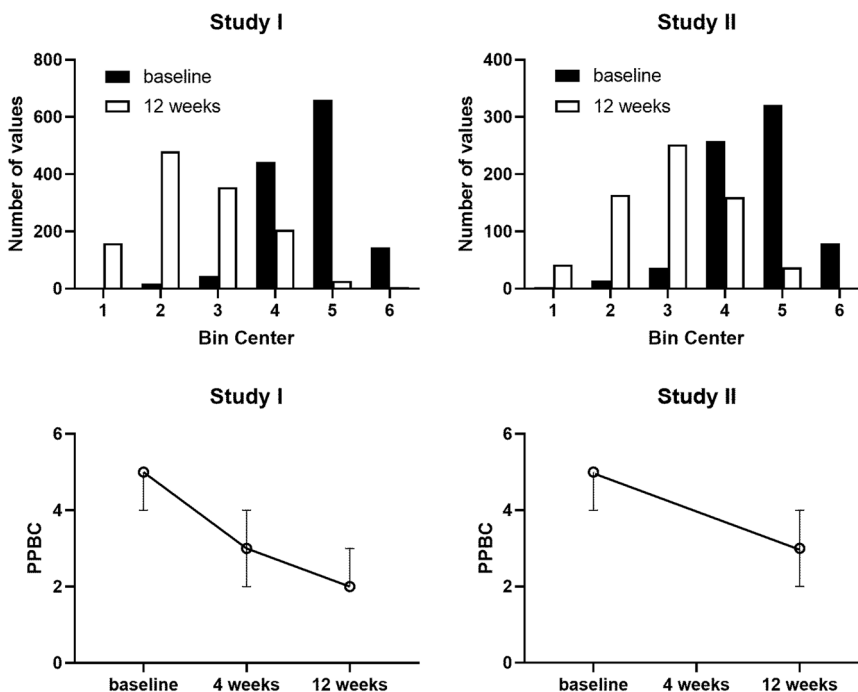
The present work analyzes data from two previously reported NIS^{12,13} in which patients seeking treatment of OAB symptoms received propiverine ER (30 or 45 mg/day) based on physician's judgment for a planned observational period of 12 weeks ($n = 1335$ and 745 , respectively). Details of the study design and primary study outcomes have been reported previously.^{12,13}

The present findings should be considered as a post hoc analysis because the analyses presented here had not been defined before performing the study and after initial summarizing results had been seen; however, the protocols for the analyses were finalized before the analyses related to the present study question were performed. All analyses were performed identically for both studies. In this regard, study I was considered as hypothesis-generating and study II was used to explore the robustness of the findings (not as a formal hypothesis-testing study).

Because PPBC is an ordinal variable, all data are reported as medians with interquartile ranges (IQR) and correlation analyses were based on nonparametric Spearman rank correlations. The use of medians, IQR, and nonparametric analysis is further supported by the observation that the distribution histogram of baseline PPBC from both studies indicated a skewed distribution (Figure 1).

We determined median values of PPBC at baseline and after 12 weeks (in study I also after 4 weeks) and median intra-individual alterations of PPBC between baseline and Week 12. In a next step we performed nonparametric correlation analysis of baseline values of PPBC with age and with those of urgency, incontinence, frequency, and nocturia and performed similar analyses for the end-of-study values. Finally, we performed nonparametric correlation analyses for rank changes of PPBC from baseline to end-of-treatment with corresponding %changes of urgency, incontinence, frequency, and nocturia. Correlation of baseline values was performed in parallel for all patients and excluding those lacking a given OAB symptom at baseline (i.e., those with a reported baseline value of 0 such as OAB dry patients not having incontinence). Strength of correlation was determined by Spearman's correlation coefficient r with its 95% confidence interval. r^2 was used to describe the fraction of variability in PPBC that could mathematically be attributed to that in the other variables.

FIGURE 1 Distribution of PPBC at baseline and after 12 weeks of treatment (upper row) and median PPBC with 95% confidence intervals over time (lower row) in studies I and II. PPBC, patient perception of bladder condition.



All data analyses were performed using the Prism 9.3.1 software (GraphPad Software, Los Angeles, CA, USA). Based on the exploratory nature of the analyses, all calculated *p* values are descriptive only and not intended to be hypothesis-testing. Moreover, only univariate correlation analyses were performed based on the exploratory nature of the analyses.

3 | RESULTS

3.1 | Descriptive results

The distribution of PPBC at baseline was highly skewed with rank 5 (“my bladder condition causes me severe problems”) being most frequent, followed by rank 4 (“my bladder condition causes me (some) moderate problems”; Figure 1). Following 12 weeks of treatment, the distribution remained highly skewed but exhibited a major shift to lower ranks, now rank 2 (“my bladder condition causes me some very minor problems”) and rank 3 (“my bladder condition causes me some minor problems”) being reported most frequently in Studies I and II, respectively (Figure 1).

Out of 1216 and 647 analyzable patients in studies I and II, some exhibited an unchanged PPBC (87 and 94) whereas almost all others exhibited improvement, typically by 1–3 ranks. While the number of patients exhibiting an improvement by 5 ranks was low in either study (13 and 4), these were more than those reporting a worsening (8 and 2). Accordingly, the median

baseline PPBC rank in both studies was 5 (IQR 4; 5). It improved over time with a median change after 12 weeks of treatment of 2 ranks (IQR study I; 1; 3 and study II; 1; 2) to reach median scores of 2 (IQR 2; 3) and 3 (IQR 2; 4) in studies I and II, respectively (Figure 1). Baseline and treatment-associated changes for urgency, incontinence, frequency, and nocturia have previously been reported.¹³

3.2 | Associations of PPBC at baseline

PPBC was not associated with age in either study (Table 1). In contrast, PPBC correlated with urgency, incontinence, frequency, and nocturia (Spearman rank correlation $p < 0.0001$). However, the correlations were of moderate strength only in both studies with r ranging from 0.2045 to 0.3553 (Table 1), indicating that only 4%–13% (r^2 0.04–0.13) of the variability of PPBC could mathematically be attributed to that in any of the other OAB variables. Similar findings were obtained when only patients exhibiting a given symptom at baseline were included in the analyses (Table 1).

3.3 | Associations of PPBC after 12 weeks of treatment

After 12 weeks of treatment, PPBC and other OAB parameters were also correlated (Table 2). Strength of correlation as assessed by the correlation coefficient r

TABLE 1 Correlation of PPBC and OAB symptoms at baseline reported as *r* and its 95% confidence interval based on Spearman rank correlation (except for age, all *p* < 0.0001).

	Study I		Study II	
	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>
Analyses based on all patients				
Age	0.0175 (−0.0385 to 0.0733)	1305	0.0453 (−0.0307 to 0.1208)	707
Urgency	0.3528 (0.2992–0.4041)	1136	0.2573 (0.1796–0.3318)	614
Incontinence	0.3108 (0.2557–0.3640)	1135	0.2932 (0.2139–0.3687)	569
Frequency	0.3553 (0.3052–0.4035)	1288	0.3413 (0.2719–0.4071)	697
Nocturia	0.2045 (0.1502–0.2575)	1298	0.3203 (0.2499–0.3872)	697
Analyses based only on patients reporting a given symptom at baseline				
Urgency	0.3495 (0.2955–0.4014)	1121	0.2639 (0.1853–0.3391)	597
Incontinence	0.3140 (0.2472–0.3779)	775	0.1868 (0.0878–0.2822)	402
Frequency	0.3553 (0.3052–0.4035)	1288	0.3413 (0.2719–0.4071)	697
Nocturia	0.1897 (0.1341–0.2442)	1249	0.3284 (0.2573–0.3960)	675

Abbreviations: OAB, overactive bladder; PPBC, patient perception of bladder condition.

TABLE 2 Correlation of PPBC and OAB symptoms after 12 weeks of treatment reported as *r* and its 95% confidence interval based on Spearman rank correlation (all *p* < 0.0001).

	Study 1		Study 2	
	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>
Urgency	0.4905 (0.4421–0.5359)	1070	0.5160 (0.4502–0.5762)	555
Incontinence	0.3665 (0.3114–0.4191)	1053	0.4354 (0.3616–0.5037)	531
Frequency	0.4907 (0.4448–0.5340)	1183	0.4762 (0.4118–0.5358)	636
Nocturia	0.4279 (0.3790–0.4745)	1195	0.4580 (0.3924–0.5189)	637

Abbreviations: OAB, overactive bladder; PPBC, patient perception of bladder condition.

ranged from 0.3665 to 0.5160. Thus, posttreatment correlations appeared stronger than those of baseline symptoms but remained of moderate strength, that is, 13.4%–26.6% of the variability in PPBC could mathematically be attributed to that in OAB symptoms. Correlations between intra-individual improvements of PPBC rank and of %changes of OAB parameters were also observed and correlation coefficients ranged from 0.3709 to 0.5746, that is, were of moderate strength (explaining 13.8%–33.0% of PPBC variability; Table 3).

4 | DISCUSSION

Various OAB treatments improve PROM such as PPBC at the group level, and the present NIS confirm this. While such improvements are routinely observed to occur concomitant with improvements of diary-based OAB symptoms in randomized controlled trials and NIS,^{3,14–22}

other than the original validation study⁸ apparently only one previous study (all based on tolterodine) has explored relationships between PPBC and OAB symptoms at the single-patient level and was limited to analysis of baseline values.³ The present analyses confirm those findings and extends them to treatment-associated improvements.

4.1 | Critique of methods

We have chosen to perform our analyses based on data from two NIS because PROM such as PPBC report on patient perception, and perceptions may be different under real-world conditions as compared to the artificial situation of being part of a randomized, double-blind trial. Despite large external validity (representing patients in a real-world setting), they have limited internal validity because of lacking a control group. Therefore, NIS data should not be abused to claim efficacy and tolerability in absolute terms;

TABLE 3 Correlation of improvement of PPBC (change of number of ranks) and OAB symptoms (%change) after 12 weeks of treatment reported as *r* and its 95% confidence interval based on Spearman rank correlation (all *p* < 0.0001).

	Study 1		Study 2	
	<i>r</i>	<i>n</i>	<i>r</i>	<i>n</i>
Urgency	0.4396 (0.3869–0.4895)	1008	0.5067 (0.4397–0.5681)	548
Incontinence	0.3709 (0.3030–0.4350)	697	0.4821 (0.3979–0.5583)	375
Frequency	0.5181 (0.4734–0.5601)	1163	0.5746 (0.5183–0.6260)	633
Nocturia	0.3896 (0.3376–0.4393)	1135	0.4555 (0.3884–0.5177)	614

Note: % improvements of frequency were smaller than for the other parameters because normal frequency is not 0; also note that only patients with at least 1 incontinence episode at baseline were included in the calculation of incontinence improvement.

Abbreviations: OAB, overactive bladder; PPBC, patient perception of bladder condition.

moreover, the data do not allow to estimate how much of the observed findings may be attributable to a placebo effect. However, this was not necessary because the efficacy of propiverine had been documented in many randomized trials including comparisons to placebo^{23–26} or to other muscarinic antagonists.^{25–28}

The present data are likely to be representative for real-world OAB patients because the observed efficacy (improvement in OAB symptoms) in the two studies was similar to that observed in previous NIS with propiverine ER.^{29,30} Moreover, the observed baseline PPBC values (mostly rank 4–5) and treatment-associated changes thereof were similar to those observed at baseline in RCT,^{14,21,22} open-label trials,^{17–19} and NIS^{3,15,16} with propiverine and various other OAB drugs.

The reporting of means and use of parametric statistical tests are only meaningful for continuous variables exhibiting a normal distribution. However, the PPBC is an ordinal variable, which should be reported as medians or distributions and analyzed by nonparametric tests. While this has been done in the original validation studies,⁸ few other studies in the field have followed that example.^{3,15,18} Despite being scientifically unsound, many studies have reported PPBC as means, for instance,^{19,21,22} which ignores that PPBC is an ordinal variable. Moreover, we report correlations of treatment-associated improvements concomitantly based on % improvements because the latter are largely unaffected by baseline severity.^{12,31} As we did not observe associations between baseline PPBC and age, it was not considered to be necessary to perform multivariate analysis with age as explanatory covariable.

4.2 | Correlation analyses

OAB is defined by the presence of urgency, but frequency and/or nocturia frequently are also observed.^{1,2} Further, about one-third of OAB patients are incontinent.^{32,33} The latter already suggest that the various OAB symptoms may

exhibit only a limited correlation. Clinical experience suggests that OAB symptoms often exhibit different severity within a patient, and that patients are differentially bothered by the various symptoms. Accordingly, it was found that the severity of urgency, incontinence, frequency, and nocturia at the single-patient level is moderately correlated at best.^{3,4,34} Apparently, this also applies to the PPBC.

The original validation study of the PPBC was based on one prospective open-label and one placebo-controlled trial with tolterodine and found that the PPBC was highly responsive to improvement of OAB symptoms upon treatment at the group level.⁸ However, correlation coefficients *r* as derived from Spearman rank analysis were only 0.1–0.4. A later NIS also based on tolterodine data confirmed rather weak relationships between PPBC and OAB symptoms at baseline.³ The present two NIS based on a different treatment, propiverine, confirm the weak correlations of PPBC with OAB symptoms at baseline, after treatment and with treatment-associated changes thereof. Similar to earlier observations,⁸ we found that correlations strengthen somewhat but remain moderate at best if data after treatment or treatment-associated changes are assessed.

Apparently, weak associations are not specific for the PPBC because a similarly weak association had been observed for other PROM including the OABq subscales,⁸ the OABSS,^{19,35} the Indevus Urgency Severity Scale,^{4,35} the Urgency Perception Scale, and the general health and bladder problem questions of the King's Health Questionnaire.⁴ This consistent finding across multiple PROM and various study designs including randomized, controlled trials, prospective open-label studies, and NIS supports the assumption that the subjective distress caused by OAB is not predominantly or even exclusively due to any of the four symptoms of urgency, incontinence, frequency, and nocturia. This reflects the clinical observation that individual patients are differentially bothered by a single symptom.

A possible explanation for the weak to moderate associations is that OAB is also influenced by

psychological comorbidities like depression or anxiety disorders. Lai et al. reported that 27.5% and 48% of OAB patients suffer from depression and anxiety disorders, respectively.^{36,37} The OAB patients with these psychological comorbidities exhibited greater incontinence symptoms, a greater bother due to OAB and a greater negative impact on their QoL. It has also been found that OAB can negatively affect sleep QoL with depression and thus, in the sense of a self-enforcing negative cycle, worsens the depression.³⁸ Therefore, the OAB syndrome cannot be only reduced to urgency, urge incontinence, frequency, and nocturia. We recommend that the evaluation of OAB patients at baseline and of treatment outcomes should include at least one PROM. While none of the available PROM exhibits clear superiority over others, the PPBC has the advantage of being based on a single question, which makes administration in routine praxis easy.

AUTHOR CONTRIBUTIONS

Sandra Schönburg, Sandra Murgas, and Martin C. Michel conceptualized the analyses. Sandra Murgas designed the underlying studies. Martin C. Michel analyzed the data. Sandra Schönburg and Martin C. Michel drafted the manuscript. All authors provided critical intellectual input into the manuscript and approved its final version.

ACKNOWLEDGEMENT

No funding was received for the present analyses, but the underlying studies had been funded by APOGEPHA. Open Access funding enabled and organized by Projekt DEAL.

CONFLICTS OF INTEREST

Sandra Schönburg is a consultant and/or lecturer for A.M.I, AstraZeneca, Boston Scientific, and Omega Pharma. Sandra Murgas is an employee of APOGEPHA. The remaining author declares no conflict of interest. Martin C. Michel is a consultant, investigator and/or lecturer to APOGEPHA, Astellas, Dr. Willmar Schwabe, GSK, and Sanofi-Aventis.

DATA AVAILABILITY STATEMENT

The underlying data will be made available to qualified investigators upon reasonable request.

ETHICS STATEMENT

Both studies were based on §67, 3 of the German Drug Act and had been approved by the ethical committee of the state board of physicians in Saxony, Germany (Sächsische Landesärztekammer EK-BR-14/12-1 and EK-BR-18/14-1). Due to the noninterventional character of the analyzed studies and availability of pseudonymized data only, no patient consent was obtained.

ORCID

Sandra Schönburg  <http://orcid.org/0000-0002-1530-263X>

Sandra Murgas  <http://orcid.org/0000-0001-9867-7383>

Martin C. Michel  <http://orcid.org/0000-0003-4161-8467>

REFERENCES

1. Abrams P, Cardozo L, Fall M, et al. The standardisation of terminology of lower urinary tract function: report from the standardisation sub-committee of the International Continence Society. *NeuroUrol Urodyn.* 2002;21:167-178.
2. D'Ancona C, Haylen B, Oelke M, et al. The International Continence Society (ICS) report on the terminology for adult male lower urinary tract and pelvic floor symptoms and dysfunction. *NeuroUrol Urodyn.* 2019;38:433-477.
3. Michel MC, Oelke M, Goepel M, Beck E, Burkart M. Relationships among symptoms, bother, and treatment satisfaction in overactive bladder patients. *NeuroUrol Urodyn.* 2007;26:190-195.
4. Michel MC, Oelke M, Vogel M. Which single-item measures of overactive bladder symptom treatment correlate best with patient satisfaction? *NeuroUrol Urodyn.* 2011;30:510-514.
5. Coyne KS, Kvasz M, Ireland AM, Milsom I, Kopp ZS, Chapple CR. Urinary incontinence and its relationship to mental health and health-related quality of life in men and women in Sweden, the United Kingdom, and the United States. *Eur Urol.* 2012;61:88-95.
6. Agarwal A, Eryuzlu LN, Cartwright R, et al. What is the most bothersome lower urinary tract symptom? Individual- and population-level perspective for both men and women. *Eur Urol.* 2014;65:1211-1217.
7. Lin Y-T, Chou EC-L. Assessment of overactive bladder (OAB)—symptom scores. *Incont Pelvic Floor Dysfunct.* 2009;3(suppl 1):9-14.
8. Coyne KS, Matza LS, Kopp Z, Abrams P. The validation of the patient perception of bladder condition (PPBC): a single-item global measure for patients with overactive bladder. *Eur Urol.* 2006;49:1079-1086.
9. Matza LS, Thompson CL, Krasnow J, Brewster-Jordan J, Zyczynski T, Coyne KS. Test-retest reliability of four questionnaires for patients with overactive bladder: the overactive bladder questionnaire (OAB-q), patient perception of bladder condition (PPBC), urgency questionnaire (UQ), and the primary OAB symptom questionnaire (POSQ). *NeuroUrol Urodyn.* 2005;24:215-225.
10. McKown S, Abraham L, Coyne K, Gawlicki M, Piau E, Vats V. Linguistic validation of the N-QOL (ICIQ), OAB-q (ICIQ), PPBC, OAB-S and ICIQ-MLUTSsex questionnaires in 16 languages. *Int J Clin Pract.* 2010;64:1643-1652.
11. Khullar V, Chapple C, Gabriel Z, Dooley JA. The effects of antimuscarinics on health-related quality of life in overactive bladder: a systematic review and meta-analysis. *Urology.* 2006;68:38-48.
12. Amiri M, Murgas S, Stang A, Michel MC. Do overactive bladder symptoms and their treatment-associated changes exhibit a normal distribution? Implications for analysis and reporting. *NeuroUrol Urodyn.* 2020;39:754-761.

13. Amiri M, Schneider T, Oelke M, Murgas S, Michel MC. Factors associated with decisions for initial dosing, up-titration of propiverine and treatment outcomes in overactive bladder syndrome patients in a non-interventional setting. *J Clin Med*. 2021;10:311.
14. Zinner N, Kobashi KC, Ebinger U, et al. Darifenacin treatment for overactive bladder in patients who expressed dissatisfaction with prior extended-release antimuscarinic therapy. *Int J Clin Pract*. 2008;62:1664-1674.
15. Schneider T, Arumi D, Crook TJ, Sun F, Michel MC. An observational study of patient satisfaction with fesoterodine in the treatment of overactive bladder: effects of additional educational material. *Int J Clin Pract*. 2014;68:1074-1080.
16. Wagg AS, Herschorn S, Carlsson M, Fernet M, Oelke M. What are the chances of improvement or cure from overactive bladder? A pooled responder analysis of efficacy and treatment emergent adverse events following treatment with fesoterodine. *NeuroUrol Urodyn*. 2021;40:1559-1568.
17. Staskin DR, Rosenberg MT, Dahl NV, Polishuk PV, Zinner NR. Effects of oxybutynin transdermal system on health-related quality of life and safety in men with overactive bladder and prostate conditions. *Int J Clin Pract*. 2008;62:27-38.
18. Shin JH, Kim A, Choo MS. Additional low-dose antimuscarinics can improve overactive bladder symptoms in patients with suboptimal response to beta 3 agonist monotherapy. *Investig Clin Urol*. 2017;58:261-266.
19. Liu M, Wang J, Yang Y, et al. Overactive bladder symptom score to evaluate efficacy of solifenacin for the treatment of overactive bladder symptoms. *Chin Med J (Engl)*. 2014;127:261-265.
20. Rogers R, Bachman G, Jumadilova Z, et al. Efficacy of tolterodine on overactive bladder symptoms and sexual and emotional quality of life in sexually active women. *Int Urogynecol J*. 2008;19:1551-1557.
21. Chapple CR, Cardozo L, Nitti VW, Siddiqui E, Michel MC. Mirabegron in overactive bladder: a review of efficacy, safety, and tolerability. *NeuroUrol Urodyn*. 2014;33:17-30.
22. Liao CH, Chen SF, Kuo HC. Different number of intravesical onabotulinumtoxinA injections for patients with refractory detrusor overactivity do not affect treatment outcome: a prospective randomized comparative study. *NeuroUrol Urodyn*. 2016;35:717-723.
23. Jünemann KP, Hessdörfer E, Unamba-Oparah I, et al. Propiverine hydrochloride immediate and extended release: comparison of efficacy and tolerability in patients with overactive bladder. *Urol Int*. 2006;77:334-339.
24. Mazur D, Wehnert J, Dorschner W, Schubert G, Herfurth G, Alken RG. Clinical and urodynamic effects of propiverine in patients suffering from urgency and urge incontinence. *Scand J Urol Nephrol*. 1995;29:289-294.
25. Yamaguchi O, Marui E, Kakizaki H, et al. Randomized, double-blind, placebo- and propiverine-controlled trial of the once-daily antimuscarinic agent solifenacin in Japanese patients with overactive bladder. *BJU Int*. 2007;100:579-587.
26. Yamaguchi O, Uchida E, Higo N, Minami H, Kobayashi S, Sato H. Efficacy and safety of once-daily oxybutynin patch versus placebo and propiverine in Japanese patients with overactive bladder: a randomized, double-blind trial. *Int J Urol*. 2014;21:586-593.
27. Jünemann KP, Halaska M, Rittstein T, et al. Propiverine versus tolterodine: efficacy and tolerability in patients with overactive bladder. *Eur Urol*. 2005;48:478-482.
28. Madersbacher H, Halaska M, Voigt R, Alloussi S, Höfner K. A placebo-controlled, multicentre study comparing the tolerability and efficacy of propiverine and oxybutynin in patients with urgency and urge incontinence. *BJU Int*. 1999;84:646-651.
29. Kessler-Zumpe PL, Murgas S, Neumann G, Richter AE. Therapie der überaktiven Blase mit Propiverin ER. *Urologe*. 2009;48:1346-1351.
30. Oelke M, Murgas S, Baumann I, Schnabel F, Michel MC. Efficacy of propiverine ER with or without α -blockers related to maximum urinary flow rate in adult men with OAB: results of a 12-week, multicenter, non-interventional study. *World J Urol*. 2011;29:217-223.
31. Landis JR, Kaplan S, Swift S, Versi E. Efficacy of antimuscarinic therapy for overactive bladder with varying degrees of incontinence severity. *J Urol*. 2004;171:752-756.
32. Temml C, Heidler S, Ponholzer A, Madersbacher S. Prevalence of the overactive bladder syndrome by applying the International Continence Society definition. *Eur Urol*. 2005;48:622-627.
33. Irwin DE, Milsom I, Hunskaar S, et al. Population-based survey of urinary incontinence, overactive bladder, and other lower urinary tract symptoms in five countries: results of the EPIC study. *Eur Urol*. 2006;50:1306-1315.
34. Michel MC, de la Rosette JJ, Piro M, Schneide T. Comparison of symptom severity and treatment response in patients with incontinent and continent overactive bladder. *Eur Urol*. 2005;48:110-115.
35. Chuang FC, Hsiao SM, Kuo HC. The overactive bladder symptom score, international prostate symptom score-storage subscore, and urgency severity score in patients with overactive bladder and hypersensitive bladder: which scoring system is best? *Int NeuroUrol J*. 2018;22:99-106.
36. Lai HH, Shen B, Rawal A, Vetter J. The relationship between depression and overactive bladder/urinary incontinence symptoms in the clinical OAB population. *BMC Urol*. 2016;16:60.
37. Lai HH, Rawal A, Shen B, Vetter J. The relationship between anxiety and overactive bladder or urinary incontinence symptoms in the clinical population. *Urology*. 2016;98:50-57.
38. Przydacz M, Golabek T, Dudek P, et al. Overactive bladder symptoms negatively affect sleep quality of patients with depression. *Int NeuroUrol J*. 2021;25:59-68.

How to cite this article: Schönburg S, Murgas S, Fornara P, Michel MC. Associations between the Patient Perception of Bladder Condition score and overactive bladder syndrome symptoms at baseline and upon treatment. *NeuroUrol Urodyn*. 2022;1-7. doi:10.1002/nau.24960