

**Introduction & Objectives**

The aim of this systematic review was to assess the efficacy and adverse events of conservative or surgical treatments for idiopathic overactive bladder (IOAB), namely botulinum toxin (BoNTA), sacral neuromodulation (SNM), transcutaneous or percutaneous tibial nerve stimulation (TTNS, PTNS).

**Results**

16 articles met our inclusion criteria, referring to 13 different RCTs. Overall, 13, 12, 8 and 7 RCTs assessed the effects on nocturia, frequency, incontinence, and urgency episodes, respectively. BoNTA resulted superior to placebo in reducing all the symptomatology. Contrasting results were reported for PTNS vs TTNS and BoNTA and neuromodulation. Results are depicted in figure 1.

As the clinical trials used different questionnaires, we could not directly compare the efficacy of the treatments, all of which provided an improvement in quality of life and patient’s satisfaction. Uncomplicated Urinary Tract Infection (UTI) was the most frequently reported adverse event (AE). However, the used definitions for UTI differed between studies. Discontinuations due to AEs were infrequent.

**Materials & Methods**

This systematic review study is conducted based on PRISMA guidelines. After PROSPERO registration, in which PICO was described, a comprehensive literature search was done in PubMed, EMBASE and Cochrane CENTRAL from inception to December 1, 2021. We restricted language to English, Italian and Dutch. We included only randomized controlled trials (RCTs) with at least 12 weeks of treatment. The risk of bias was assessed Revised Cochrane Risk of Bias Assessment Tool.

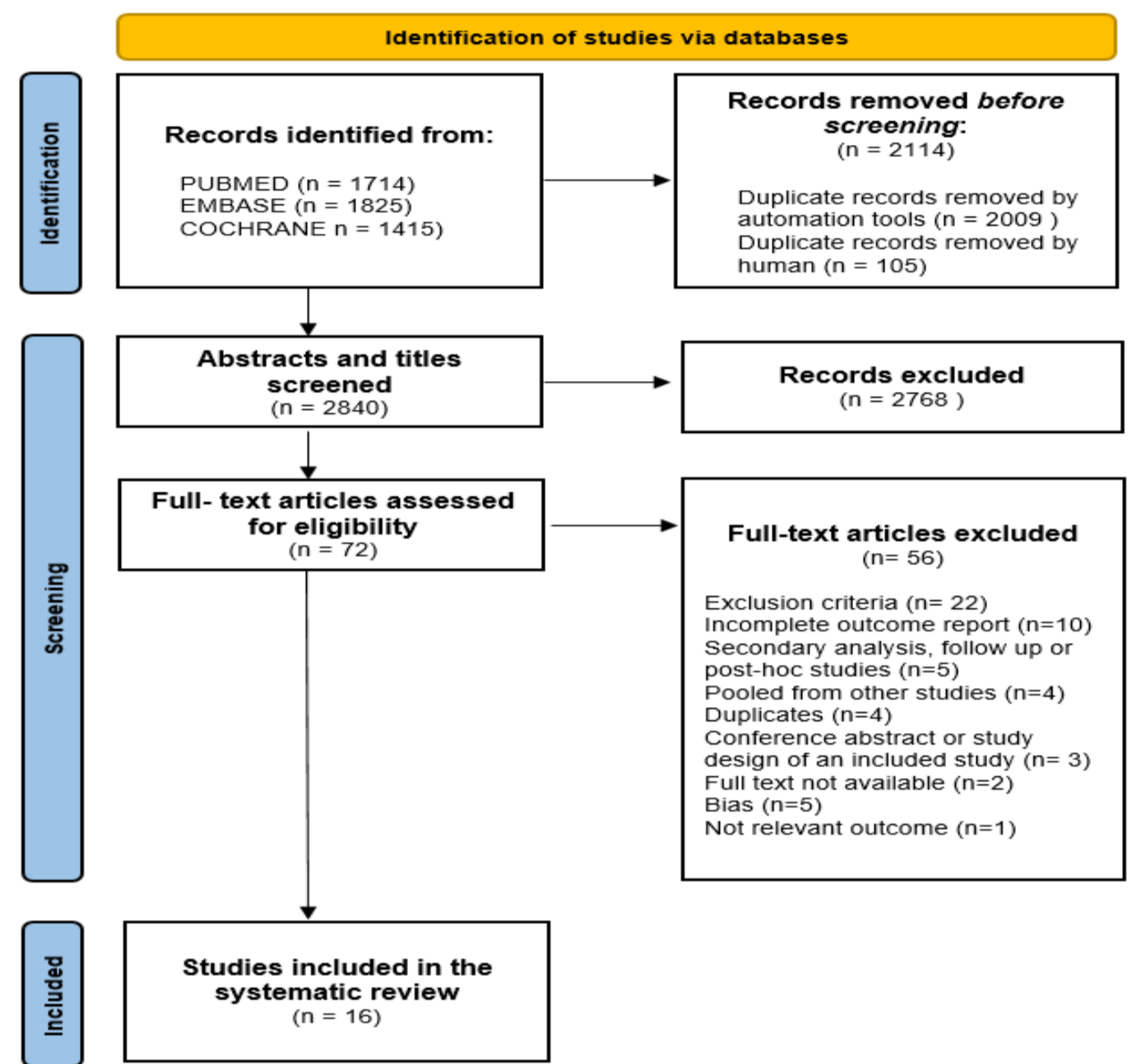


Figure 1: Summary of the extracted data of voiding diaries

Study	Arm	Urinary Incontinence episodes per 24 h			Frequency episodes per 24 h			Urgency episodes per 24 h			Nocturia episodes per 24 h		
		Pre	Post	Change	Pre	Post	Change	Pre	Post	Change	Pre	Post	Change
Amundsen, 2016	BoNTA 200 U *	6.00 (3.00)		-4.02 (2.92) *			-1.12 (2.92) *				1.70 (1.20)		-0.40 (1.13) *
	SNM	5.80 (2.70)		-3.50 (2.96) *			-0.84 (2.93) *				1.70 (1.40)		-0.26 (1.11) *
Ramirez-Garcia, 2019	PTNS	1.50 (2.00)	0.60 (1.60)	-0.90	10.40 (2.50)	9.80 (0.90)	-0.60	8.20 (3.00)	7.00 (3.90)	-1.20	1.70 (1.40)	1.50 (1.20)	-0.20
	TTNS	1.60 (3.00)	0.90 (2.80)	-0.70	10.60 (3.70)	9.10 (2.70)	-1.50	8.70 (3.80)	6.70 (4.00)	-2.00	1.80 (2.10)	1.50 (1.70)	-0.30
Chapple, 2013	BoNTA 100 U *	5.50 (3.80)		-2.95 (3.57)	12.00 (4.00)		-2.56 (3.44)	9.10 (4.60)		-3.67 (4.42)	2.20 (1.50)		-0.54 (1.36)
	Placebo	5.70 (3.90)		-1.03 (3.02)	11.80 (3.60)		-0.83 (2.56)	8.80 (4.50)		-1.24 (3.86)	2.10 (1.50)		-0.25 (1.09)
de Sa Dantas Bezerra	BoNTA 300 U *										5.10 (5.40)	2.10 (2.00)	-3.00
	BoNTA 500 U *										3.60 (1.80)	2.20 (1.80)	-1.40
Dmochowski 2010, Rovner 2011, Fowler 2012	Placebo				10.47 (3.29)		-1.19				1.76		-0.04
	BoNTA 50 U *				10.90 (2.73)		-2.19				1.74		-0.36
	BoNTA 100 U *				11.47 (3.23)		-3.10				1.99		-0.59
	BoNTA 150 U *				10.93 (3.56)		-2.69				2.56		-0.93
	BoNTA 200 U *				10.96 (2.56)		-2.81				1.74		-0.54
	BoNTA 300 U *				10.80 (2.87)		-3.03				2.13		-1.00
	BoNTA 500 U *				10.80 (2.87)		-3.03				2.13		-1.00
El-Hefnawy, 2021	BoNTA 100 U **				5.70 (2.90)		-2.96	4.68 (1.90)		-3.70	3.30 (1.70)		-1.06
	BoNTA 100 U *				6.20 (4.10)		-3.60	5.02 (1.40)		-3.77	3.60 (1.62)		-1.37
McCammon, 2021	BoNTA 100 U *	5.40 (3.20)		-3.40 (3.69)	10.20 (3.00)		-2.60 (2.71)	4.90 (3.09)		-3.30 (4.49)	2.20 (1.43)		-0.70 (1.34)
	Placebo	6.00 (3.80)		-1.70 (3.23)	11.10 (3.40)		-1.30 (2.62)	5.30 (3.47)		-1.70 (3.24)	2.10 (1.43)		-0.40 (1.28)
Nitti, 2017	BoNTA 100 U *	5.50 (3.60)		-2.65 (3.33)	12.00 (4.30)		-2.15 (3.03)	8.50 (4.70)		-2.93 (4.23)	2.20 (1.50)		-0.45 (1.28)
	Placebo	5.10 (3.20)		-0.87 (2.83)	11.20 (3.10)		-0.91 (2.67)	7.90 (3.70)		-1.21 (3.86)	2.00 (1.30)		-0.24 (1.10)
Peters, 2010	Sham				12.30 (3.20)	9.80 (2.80)	-2.40 (2.50)	8.00	5.00	-2.00 †	2.90 (1.60)	2.10 (1.40)	-0.70 (1.20)
	PTNS				12.40 (3.00)	11.00 (3.10)	-1.50 (2.40)	8.30	3.70	-3.70 †	2.90 (1.70)	2.60 (1.60)	-0.30 (1.40)
Schreiner, 2021	TTNS + BT + Kegel				7.80 (3.10)	6.00 (1.40)	-1.70				3.50 (1.60)	1.60 (1.50)	-1.80 (1.40)
	BT + Kegel				7.90 (2.50)	7.50 (2.30)	-0.40				3.00 (1.10)	2.30 (1.30)	-0.70 (1.10)
Sherif, 2017	PTNS	4.70 (1.02)	2.60 (0.70)	-2.10	12.20 (1.20)	6.90 (0.80)	-6.30				4.80 (0.90)	2.80 (0.70)	-2.00
	BoNTA 100 U **	4.30 (1.06)	2.40 (0.70)	-1.90	12.70 (0.90)	6.40 (1.04)	-5.30				5.20 (0.90)	2.50 (0.60)	-2.70
Yokoyama, 2020	BoNTA 100 U *	7.01 (4.78)		-3.42 (0.38)	12.20 (3.71)		-1.87	9.18 (4.78)		-3.40 (0.43)	1.71 (1.48)		-0.30 (0.13)
	Placebo	6.12 (3.87)		-1.25 (0.38)	12.72 (3.33)		-0.42	9.54 (4.18)		-1.17 (0.42)	1.86 (1.41)		0.03 (0.13)
Zonic-Imamovic, 2021	PTNS	3.30 (2.40)	1.20 (1.00)	-2.10	14.10 (3.90)	6.80 (2.80)	-7.30				1.70 (1.30)	0.70 (0.70)	-1.00
	TTNS	3.80 (1.80)	2.40 (1.40)	-1.40	12.90 (4.40)	9.40 (3.40)	-3.50				1.90 (1.40)	1.30 (1.00)	-0.60

**Conclusions**

To our knowledge, this study represents the first attempt to comprehensively summarize conservative and surgical treatments for IOAB. After systematic review of the literature, no clear superiority of a single option could be demonstrated. However, due to the numerosity of the evidence supporting BoNTA, this might be considered the first invasive option given its efficacy and good tolerability profile. Future research should focus on comparison of other treatments options for OAB which are greatly underrepresented in current literature