

Tabell 4.2.1 Inkluderade studier som har undersökt reliabilitet och systematiska fel vid tryck-flödesmätning. Fullständig tabell i Bilaga 1.

Author, year reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Eri et al, 2001 [9] Norway	Moderate 84 men	Randomised study, moderate to severe symptoms, prostate volume >30 ml, Q_{max} <12 ml/s, residual urine <300 ml, $PdetQ_{max}$ >45 cm H ₂ O, mean age 69.8 years SD 5.8	Not stated	Within session AG-number 10.7 cm H ₂ O and 19.2% lower at 2nd measurement. Long term no change
Hansen et al, 1997 [15] Denmark	Moderate 110 men	Men submitted due to LUTS, urodynamic study, 43–88 years	Not stated	SD Q_{max} 3.3, $PdetQ_{max}$ 13.1, 2nd measurement Q_{max} ns lower, $PdetQ_{max}$ sign 2.8 cm H ₂ O lower
Hansen et al, 1999 [10] Denmark	Moderate 22 men	Men with LUTS, 58–81 years	Not stated	$PdetQ_{max}$ 9 and 6 cm H ₂ O lower within session, Q_{max} and between sessions ns
Hashim et al, 2007 [11] Multinational	Moderate 114 men	Drug trial, LUTS suggestive of BOO, IPSS >11, Q_{max} <12 ml/s, prostate volume >30 ml, 51–84 years	Residual urine >250 ml, PSA <1.5 or >10.0, previous surgery, acute urinary retention, urethral manipulation or drug treatment short time before study	Intraclass Correlation Coefficient BOOI 0.76, BCI 0.75. BOOI 4.6 and BCI 8.0 lower at 2nd measurement
Kortmann et al, 2000 [20] Multinational	Moderate 200 men	Pretreatment pressure-flow studies	Not stated	SD AG-number intraexam 10.0, inter-examin 3.7, combined 10.7 cm H ₂ O

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Author, year reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Kranse et al, 2003 [17] The Netherlands	Moderate 131 men	Unselected males performing pressure-flow studies	Not stated	SD Q_{max} 2.0 ml/s, $PdetQ_{max}$ 8.9, BOOI 9.7, W20 1.85
Madsen et al, 1995 [18] USA	Moderate 25 men	Symptoms of BPH, screening for drug trial	Not stated	SD Q_{max} 1.44, $PdetQ_{max}$ 8.84
Rosier et al, 1995 [19] The Netherlands	Moderate 91 men	Untreated BPH patients or evaluation after treatment	Not stated	Mean absolute diff Q_{max} 1.2; $PdetQ_{max}$ 10.2; URA 5.8
Sonke et al, 2000 [16] The Netherlands	Moderate 89 men	LUTS suggestive of BOO, living in neighborhood	Medication, severe problems during first examination	AG-number intraindividual SD 14, URA 7, $PdetQ_{max}$ 12 cm H ₂ O and Q_{max} 2 ml/s
Tammela et al, 1999 [13] Multi-national	Moderate 216 men	LUTS due to benign prostatic enlargement	Previous LUT disease except BPE, previous treatment	SD $PdetQ_{max}$ 10.6; 12.5; 14.5%. 2nd and 3rd measurement sign lower $PdetQ_{max}$. Interobserver 0.92; 0.94; 0.96
Witjes et al, 1996 [12] The Netherlands	Moderate 178 men	Consecutive patients with LUTS and BPH managed with watchful waiting, 64 years SD 8	Not stated	Mean absolute difference Q_{max} 2.3, $PdetQ_{max}$ 15.6, URA 7. $PdetQ_{max}$ sign lower at 2nd measurement, 3.7 cm H ₂ O, Q_{max} and URA ns
Valentini et al, 2005 [14] France, Canada, USA	Moderate 71 men	BPH, TURP or drug trial, 45–86 years	Voided volume <100 ml, Q_{max} <2 ml/s, urethral catheter falling out	AG-number 3 cm H ₂ O lower at 2nd measurement. SD 13.7 cm H ₂ O

BCI = bladder contractility index; BOO = bladder outlet obstruction; BPE = benign prostatic enlargement; BPH = benign prostatic hyperplasia; IPSS = international prostate symptom score; LUTS = lower urinary tract symptoms; PSA = prostate-specific antigen; Q_{max} = maximum flow rate; TURP = transurethral resection of the prostate; URA = urethral resistance factor

Tabell 4.2.2 Inkluderade studier avseende förmågan att förutsäga behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Pressure-flow study	Reference test	Results	Study quality Comments
Ball et al, 1986 [30] UK	84 men TURP or open operation 5 years earlier, flow and pressure-flow measurements	1 man Not stated	Standard technique	Subjectively better after surgery	Significantly lower PdetQ _{max} in men with poor result, 53 vs 101 cm H ₂ O	Moderate
Gotoh et al, 1999 [22] Japan	74 men TURP, subjective symptoms, Q _{max} <15 ml/s, 50–86 years	Not stated Neurogenic bladder	Transurethral, 6+8 Ch catheter, rectal balloon, Menuet Urodynamic System, Dantec, Schäfer obstruction grade and contractility, values read manually	Subjective outcome 6–8 weeks after TURP	LR+ 0.74 LR– 0.85	Moderate Too short follow-up

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Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Pressure-flow study	Reference test	Results	Study quality Comments
Ignjatovic, 1997 [31] Yugoslavia	48 men Moderate–severe symptoms, enlarged prostate, TURP	Not stated Not stated	Transurethral 9 or 6 Ch catheter	IPSS <8 after TURP	With pressure-flow criteria as indication 90% success compared to 86% with IPSS+Q _{max} and 63% with conventional criteria	Moderate Obstruction not defined
Javlé et al, 1998 [23] UK	55 men TURP, IPSS >12, Q _{max} <13 ml/s, residual urine 60–300 ml, 55–85 years	2 men Prostate cancer, PSA >4, previous surgery, neurogenic bladder	5 + 8 Ch urethral catheters, rectal balloon catheter, Schäfer obstruction grade and contractility	Improvement after TURP: IPSS <50% and/or <7, Q _{max} >50% and >15 ml/s, PVR >50% and <60 ml	LR+ 3.12 LR– 0.38	Moderate Short follow-up
Knutson et al, 2001 [24] Sweden	37 men Patients with low resistans accepting watchful waiting and patients with moderate–severe obstruction electing watchful waiting	0 men Not stated	Classification with DAMPF, otherwise not described	No new treatment during watchful waiting	DAMPF >42 LR+ 2.6 LR– 0.37 DAMPF >65 LR+ 4.9 LR– 0.70	Moderate
Kuo et al, 1993 [25] Taiwan	400 men Diagnosis of BPH and operated, with and without a catheter, 45–96 years (TURP 335, Open op 16, TUIP 49) (202 cystometry, 146 voiding pressure)	Not stated Not stated	Infusion rate 50 ml/s, included Urethral Pressure Profile	Outcome of surgery; patient satisfied with voiding condition, improved irritative symptoms and Q _{max} >15 ml/s	LR+ 1.20 LR– 0.57	Moderate Wide definition of obstruction and high prevalence
Radomski et al, 1995 [32] Canada	50 men Acute urinary retention, 50–85 years	0 men Chronic retention, neurologic disease, suspicion of prostate cancer, previous prostatic surgery	Within 2 weeks after retention	Voiding without catheter post-operatively after TURP	LR+ 1.4 LR– 0.59	Moderate

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Tabell 4.2.2 fortsättning

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Pressure-flow study	Reference test	Results	Study quality Comments
Rodrigues et al, 2001 [29] Brazil	277 men TURP, symptoms suggestive of obstruction, worsening at clinical follow-up or following drug treatment, 51–91 years	40 men Not stated	Transurethral with peridural catheter, groups according to Pdet Q_{max} performed day before surgery without influencing treatment decision	Change in IPSS and bother question after TURP	Correlation 0,9 calculated on group means	Moderate Almost no improvement if Pdet Q_{max} < 40 cm H ₂ O
Tanaka et al, 2006 [28] Japan	92 men LUTS/PH considered appropriate candidates for TURP, age >50 years	Not stated Prostate cancer, urinary retention, previous prostatic surgery	18 gauge suprapubic catheter, rectal balloon catheter, filling with Foley catheter	Outcome of TURP according to Homma; symptom, bother question and Q_{max}	LR+ 1.02–1.83 LR– 0.38–0.88	Moderate
Tubaro et al, 1995 [26] Europe	100 men Low-effect TUMT, Madsen-Iversen score >7, Q_{max} <15 ml/s, residual urine <300 ml, bilobar prostatic enlargement, >45 years	Not stated Prostate or bladder cancer, neurogenic bladder, pelvic metallic implant, pacemaker, bladder stone, stricture, prostate length <35 mm, pelvic surgery, hemostatic disorder	Curves read manually by two examiners	Improvement after TUMT: Madsen-Iversen score >50%; Q_{max} >3 ml/s	Evaluation with IPSS LR+ 3,3 LR– 0,45 Evaluation with Q_{max} LR+ 14,8 LR– 0,15	Moderate Cut-off was constrictive vs compressive obstruction which selects low Q_{max} . Diagnostic accuracy with Q_{max} is therefore over-estimated
Turner et al, 1998 [27] USA	50 men Alfa-blocker treatment, LUTS presumed to be caused by BPH, IPSS >9	6 men Previous surgery, prostate cancer, stricture, finasteride within 6 months, alpha-blocker within 1 month	Transurethral 8 Ch catheter, 14 Ch rectal catheter, AG-number	Outcome of doxazosin treatment: IPSS >50% improvement	LR+ 0.88 LR– 1.4	Moderate Treatment with low effect

BPH = benign prostatic hyperplasia; IPSS = international prostate symptom score; PSA = prostate-specific antigen; Q_{max} = maximum flow rate; TUMT = transurethral microwave thermotherapy; TURP = transurethral resection of the prostate

Tabell 4.3.1 Inkluderade studier som har undersökt reliabilitet. Fullständig tabell i Bilaga 1.

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Barry et al, 1995, [6] USA	Moderate 300 men	Placebo group of finasteride study, LUTS, enlarged prostate, $Q_{max} < 15$ ml/s, voided volume > 150 ml, residual urine < 350 ml	Evidence of prostate cancer, infection, prostatitis, neurogenic bladder	$SD_{intra\text{ind}}$ 2.8 ml/s
Folkestad et al, 2004, [7] Sweden	Moderate	Random sample from general population, 26–76 years	Voiding problems, practical difficulties to perform home flow measurements	< 55 years all vol SD 4.0 same vol 3.2, non-parametric -9.0 to 7.0 ; -6.2 to 5.0 . > 55 years 2.8; 2.2; -6.5 to 5.0 ; -4.3 to 4.3
Itoh et al, 2006, [8] Japan	Moderate 13 men of 206 + 13	50–88 years, LUTS, completed examinations	Prostate cancer, stricture, other lower urinary tract diseases	$r=0,812$ Spearman rank correlation
Jepsen et al, 1998 [9] USA	Moderate 300 men	The placebo group of a finasteride study, LUTS, enlarged prostate, $Q_{max} < 15$ ml/s, voided volume > 150 ml, residual urine < 350 ml	Elevated creatinine or liver enzymes, severe allergy, previous surgery, drug or alcohol abuse, prostate cancer, stricture, infection, neurologic disorder	Difference between two measurements Range about -5 to 6 ml/s
Matzkin et al, 1993 [10] USA	Moderate 26 men	Placebo group in drug trial, 56–79 years, prostatism, prostate size > 30 g, $Q_{max} < 15$ ml/s	Prostate cancer, serious neurological disease, stricture	$SD_{intra\text{ind}}$ 2.0 ml/s

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Tabell 4.3.1 fortsättning

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Sonke et al, 1999 [11] The Netherlands	Moderate 212 men, 2 544 flows	LUTS suggestive of BOO or bladder dysfunction, mean age 62.1 SD 8.7 years	Previous treatment, not able to handle the portable flowmeter	$SD_{intra\text{ind}}$ 2.4 ml/s at Q_{max} 10 ml/s
Sonke et al, 2002 [12] The Netherlands	High 208 men	Men with LUTS examined with home flowmeter	None	$SD_{intra\text{ind}}$ 1.5 ml/s
van de Beek et al, 1997 [14] The Netherlands	High 21 men + 4 duplicates	21 randomly selected flow curves	Not relevant	Normal? Interobserver kappa 0.41 Intraobserver 79% same evaluation
Witjes et al, 2002 [13] The Netherlands	High 223 men, 1 147 flows	Randomly chosen patients from a randomised trial	None	$SD_{interobs}$ 2.1–3.0 ml/s

BOO = bladder outlet obstruction; LUTS = lower urinary tract symptoms; Q_{max} = maximum flow rate; SD = standard deviation

Tabell 4.3.2 Inkluderade studier avseende flödesmätning (Q_{max}) förmåga att diagnostisera avflödeshinder och förutsäga behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Flow measurement	Reference test	Results	Study quality Comments
Abrams, 1977 [35] Great Britain	53 (33+20) men TURP or retropubic prostatectomy, benign histology	Not stated Prostate cancer, stricture, previous urological or pelvic surgery	E.M.T. 435, Elema-Schönander, M. 81 Mingograf recorder, Voided volume not stated, visual inspection	Subjective outcome, symptom score, Q_{max} postoperatively	Mean Q_{max} preop: All 8.0 ml/s Unimproved symptom score 11.0 ml/s Unimproved Q_{max} 10.5 ml/s differences sign	Moderate
Boci et al, 1999 [15] Sweden	25 men Symptomatic BPH, 54–82 years	1 no pressure-flow Prostate cancer, stricture, previous urological or pelvic surgery	Office UFS 1005, NEC, portable flowmeter PUF 2000, MMS, manually read curves	Pressure-flow, 5 Ch urethral and 12 Ch rectal catheters, Lin-PURR. Unobstructed DAMPF <56 cm H ₂ O	10 ml/s LR+ infinite LR– 0.59 14 ml/s LR+ 3.50 LR– 0.00 Correlation –0.62	Moderate Mean Q_{max} of home flow rates analysed Pearson correlation coefficient
Botker-Rasmussen et al, 1999 [16] Denmark	29 Volunteers, no LUTS when interviewed carefully, age 51–85	Not stated Past or present urological complaints	Urolyn 1000, Dantec, standing	5 Ch transurethral catheter, saline, 50 ml/min, Menuet or DISA URO-system 21F16 2100, Dantec or Urolyn 1000, Dantec, Abrams-Griffiths nomogram	10 ml/s LR+ infinite LR– 0.67 15 ml/s LR+ 1.05 LR– 0.53	Moderate
Caffarel et al, 2008 [17] Great Britain	95 Pressure-flow study, attendees at a LUTS clinic, performed flow measurement and at least 2 of IPSS, IPSS bother question, PSA and postvoid residual urine	45 Voided volume at flow measurement <150 ml, performed less than 2 IPSS, IPSS bother question, PSA and PVR	Voided volume >150 ml	According to Good Urodynamic Practise	BOOI 20 cm H ₂ O LR+ 1.5 LR– 0.27 BOOI 40 cm H ₂ O LR+ 2.8 LR– 0.37	Moderate
Comiter et al, 1996 [18] USA	205 Adult men with LUTS performing multiple video-urodynamics, Q_{max} , piso or MUPP gradient not missing, mean age 68.3 years	Not stated Bladder cancer, hematuria, spinal cord injury, Parkinson's disease, multiple sclerosis	Standing, cut-off value 12 ml/s	Filling with radiocontrast, micturitional urethral pressure profile, 10 Ch triple lumen catheter, gradient >10 cm H ₂ O obstructed	LR+ 3.0 LR– 0.30 –0.48 Pearson correlation coefficient	Moderate

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Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Flow measurement	Reference test	Results	Study quality Comments
D'Ancona et al, 1999 [36] The Netherlands	247 men Treatment with TUMT, >45 years, PV >30 ml, Madsen SS >7, Q _{max} <15 ml/s, PVR <350 ml	At least 26 men Neurogenic disorders, prostatic cancer, earlier surgery, indwelling catheter, median lobe	Voided volume >100 ml, otherwise not described	Improvement after TUMT in either IPSS, Q _{max} or LinPURR	OR 1.14 for poor Q _{max} response, ns. Multiple regr Q _{max} only prognostic for flow rate response and not when LinPURR is included in analysis	Moderate
Dib et al, 2008 [19] Brazil	50 LUTS, diabetes, age 47–86 years	0 Prostate cancer, bladder stones or tumour, previous surgery, renal failure, pelvic radiation, neurological disease	Q _{max} , method not described	Pressure-flow study, according to ICS, Schäfer grade ≥2 obstructed	10 ml/s LR+ 5.2 LR– 0.48 12 ml/s LR+ 4.7 LR– 0.35 15 ml/s LR+ 1.7 LR– 0.33	Moderate Wide definition of obstruction, only diabetics
Dorflinger et al, 1986 [37] USA	84 men TURP, indication om non-urodynamic data, 50–91 years	30 men Prostate cancer, prostatic or pelvic surgery, serious neurologic or psychiatric disease. Stricture and infection temporarily excluded	Not described	8.3 Ch urethral and 18 Ch rectal catheter, water, resistance = Pdet/Q _{max} ² . Subjective outcome graded 1–5	No sign difference in outcomes, 100 (<7) and 84% (>7) better or much better	Moderate Why not cut-off at 10.5 ml/s?
DuBeau et al, 1998 [20] USA	111 men LUTS patients, community-dwelling or institutional older men, >51 years	12 incomplete data Gross hematuria, urinary retention, inability to void, prostate or bladder cancer, stricture, neurologic disorder, dementia	Not described, Q _{max} was read manually	Micturitional urethral pressure profile (>10 cm H ₂ O pressure drop obstructed) corroborated by pressure-flow	10 ml/s LR+ 1.96 LR– 0.62	Moderate An algorithm with Q _{max} , age and PVR much better
Hansen et al, 1997 [38] Sweden	172 men Treatment with TURP (110) or TUMT (62)	Not stated None	Dantec Urodyn 2000, patients not voiding >100 ml excluded, manual reading not stated	Outcome after TURP or TUMT 2 questions: much better–much worse, treatment still needed	Correlation 0.07	Moderate Spearman correlation coefficient

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Tabell 4.3.2 fortsättning

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Flow measurement	Reference test	Results	Study quality Comments
Hong et al, 2003 [39] South Korea	437 LUTS, diagnosis of BPH, medication at least 3 months	Not stated Prostate cancer, previous surgery, other condition affecting urinary tract, severe disease	Q_{max} , Dantec Urodyn 1000	Not satisfied with continuing medical therapy, surgery	Multivariate Hazard ratio 0.97 ns	Moderate Age, IPSS and prostate volume sign
Ignjatovic, 1997 [40] Yugoslavia	48 LUTS, enlarged prostate, candidate for TURP	Not stated Not stated	Strong desire to void, 2 measurements and the highest value selected	Transurethral examination with a 9 Ch double lumen catheter or two 6 Ch catheters, Schäfer nomogram	Low Q_{max} sign better outcome	Moderate
Ko et al, 1995 [28] Canada	121 Symptoms of prostatism, 67.9 years	18 Not stated	Q_{max} , method not described	Pressure-flow study, 8 Ch transurethral catheter, manual reading, Schäfer grade	0.17 Pearson correlation coefficient	Moderate
Kranse et al, 2002 [32] The Netherlands	131 men Performed pressure-flow study and had a free flow rate performed before	42 no free flow None	Dantec 1000 with 5 Hz low pass filter	Pressure-flow, same flowmeter, 0,6 s time lag, obstruction according to ICS	Cut-off 15.1 ml/s 21% of pressure-flow studies can be avoided, 5% of obstruction may be missed	Moderate
Kuo et al, 1993 [34] Taiwan	400 Diagnosis of BPH and operated, with and without a catheter, 45–96 years (TURP 335, Open op 16, TUIP 49) (flow measurement 217)	Not stated Not stated	Q_{max} and flow pattern were evaluated	Patient satisfied with voiding condition, improved irritative symptoms and $Q_{max} > 15$ ml/s	10 ml/s LR+ 2.18 LR– 0.39 15 ml/s LR+ ; 1.35 LR– 0.12	Moderate
Kuo, 1999 [21] Taiwan	324 men LUTS, 45–88 years, prostate volume <60 ml	Not stated Acute urinary retention, neuropathy, diabetes, acute infection, previous TURP	Highest of free flow rate and flow rate during pressure-flow study. Not described	Pressure-flow, first 7 Ch transurethral catheter which was changed to suprapubic, 10 Ch rectal balloon, video, EMG, 20% urographin in saline. Obstruction if $PdetQ_{max} > 50$ cm H ₂ O and $Q_{max} < 15$ ml/s, if low pressure and low Q_{max} video	10 ml/s LR+ 1.62 LR– 0.60 15 ml/s LR+ 1.26 LR– 0.47 Correlation –0.28	Moderate Wide definition of obstruction. Pearson correlation coefficient

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Tabell 4.3.2 fortsättning

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Flow measurement	Reference test	Results	Study quality Comments
Marya et al, 1992 [33] India	500 Men scheduled for abdominal, perineal or scrotal surgery, 51–76 years	0 Not stated	DISA 2100 Uro-system, voided volume >150 ml	Postoperative (scrotal, lower abdomen) retention	6 ml/s LR+ infinite LR– 0.88 10 ml/s LR+ 5.6 LR– 0.71 15 ml/s LR+ 1.25 LR– 0.15	Moderate
Reynard et al, 1996 [22] Great Britain	165 men LUTS suggestive of BPO, 50–84 years	8 no pressure-flow Diabetes, infection, Previous surgery, evidence of prostate cancer, medication	Dantec Urodyn 1000, visual inspection, 4 flows, 17 patients only 3	Pressure-flow, Dantec Menuet or Dantec 5500, 1.1 mm outer diameter urethral catheter, saline ICS normal + equivocal = unobstructed	8 ml/s LR+ 11.09 LR– 0.83 10 ml/s LR+ 6.04 LR– 0.65 12 ml/s LR+ 4.32 LR– 0.51 15 ml/s LR+ 2.07 LR– 0.37	Moderate Calculations for best Q_{max} of 3 flows. Figures for best of 1, 3 or 4 in paper. Mean Q_{max} increased for every flow
Reynard et al, 1998 [23] Europe and Asia	1 272 men LUTS, BPE, >45 (45–88) years	81 no flow, 339 no pressure-flow Prostate cancer, neurological disease, diabetes, previous surgery, medication	0–3 flows, not described	Pressure-flow, not described, Schäfer grade 0–2 unobstructed	10 ml/s LR+ 1.56 LR– 0.76 15 ml/s LR+ 1.32 LR– 0.49 Correlation –0.3, age-corrected –0.29, volume-corrected –0.2 to –0.25	Moderate Spearman correlation coefficient

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Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Flow measurement	Reference test	Results	Study quality Comments
Schacterle et al, 1996 [24] USA	134 men Adult males referred for urodynamics	Not stated Neurological disease	Not described	Micturitional urethral pressure profile, <10 cm H ₂ O unobstructed	10 ml/s LR+ 3.25 LR- 0.47 15 ml/s LR+ 1.60 LR- 0.24 Correlation -0.45	Moderate Pearson correlation coefficient
Schou et al, 1993 [25] Denmark	54 Referral for BPH, urodynamic investigation, 38-88 years	4 Diagnosis of other disease than BPH	Q _{max} , method not described	Pressure-flow study, Dantec Urodyn 5500, 3.5 Ch suprapubic catheter, rectal balloon, Abrams-Griffiths diagram	10 ml/s LR+ 3.29 LR- 0.43 15 ml/s LR+ 1.61 LR- 0.31	Moderate
Slawin et al, 2006 [41] USA	4 325 3 randomised dutasteride trials, moderate-severe LUTS, prostate volume >30 ml, PSA 1.5-10 ng/ml, >50 years	Not stated Not stated	Q _{max} , method not described	Acute urinary retention or BPH-related surgery	Multivariate Hazard ratio 0.60 (0,50-0,73) sign	Moderate IPSS ns, BII, earlier alfablocker, PV, PSA, Q _{max} , dutasteride sign i multivariatana-lys. Q _{max} most important
Steele et al, 2000 [26] USA	204 men Men with LUTS, mean age 66.7, SD 7.5 years	Not stated Previous treatment, neurologic history, co-morbid disease, stricture, prostate cancer	Not described	Pressure-flow, transurethral catheter 7 Ch, ICS criteria, equivocal classified by slope	10 ml/s LR+ 1.83 LR- 0.45	Moderate
van Venrooij et al, 1995 [27] The Netherlands	211 BPH symptoms, urodynamic study, 45-86 years	4 + 20% Not stated	Q _{max} , voided volume >150 ml	Pressure-flow, 5 Ch transurethral and 14 Ch rectal catheters, Schäfer grade, >1 obstructed	10 ml/s LR+ 1.14 LR- 0.90 12 ml/s LR+ 1.47 LR- 0.64 15 ml/s LR+ 1.37 LR- 0.43	Values calculated from figure. Wide definition of obstruction

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Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Flow measurement	Reference test	Results	Study quality Comments
van Venrooij et al, 1996 [29] The Netherlands	196 men Men with prostatism, >50 years, pressure-flow study performed when evaluation suggested BOO, reliable pressure-flow relation, Flow with VV >150 ml	Not stated Cystometric bladder capacity, PVR, TRUL not performed	Not described, voided volume >150 ml	Pressure-flow, 5 Ch urethral and 14 Ch rectal catheter, saline	Correlation Pearson -0.37 Kendall -0.22	Moderate Kendall correlation coefficient
van Venrooij et al, 2004 [30] The Netherlands	160 men LUTS, 50–85 years, all examinations, voided volume >150 ml, reliable pressure-flow relationship	Not stated According to International Consensus Committee	Not described	Obstruction according to AG-number, URA and Schäfer grade. Execution not described	Correlation AG-number -0.41 URA -0.48 Schäfer grade -0.43	Moderate Kendall correlation coefficient
Vesely et al, 2003 [31] Sweden	153 men LUTS and suspected BOO	Not stated Neurogenic bladder, positive ice water test	Not described Mean Q_{max} of home flow rates analysed	Pressure-flow, UroDyn UD2000, MMS, obstruction according to DAMPF. Execution not described	Correlation -0.41	Moderate Pearson correlation coefficient

BOO = bladder outlet obstruction; BPH = benign prostatic hyperplasia; Hz = herz; IPSS = international prostate symptom score; LinPURR = linear passive urethral resistance relation; LR = likelihood ratio; LUTS = lower urinary tract symptoms; MUPP = mic-turitional urethral pressure profile; PVR = post-void residual urine; Q_{max} = maximum flow rate; TRUL = transurethral microwave thermotherapy of lower urinary tract symptoms; TUMT = transurethral microwave thermotherapy; TURP = transurethral resection of the prostate

Tabell 4.4.1 Inkluderade studier som har undersökt reliabilitet. Fullständig tabell i Bilaga 1.

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Folkestad et al, 2004 [2] Sweden	Moderate	Random sample from general population, 26–76 years	Voiding problems, practical difficulties to perform home flow measurements	<55 years all vol SD 2.0 same vol 2.0, non-parametric –2.4 to 5.3; –2.4 to 5.0. >55 years 3.5; 2.9; –4.0 to 9.7; –4.0 to 6.5

SD = standard deviation

Tabell 4.4.2 Inkluderade studier avseende tidsmiktions förmåga att diagnostisera lågt flöde och förutsäga behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Timed micturition	Reference test	Results	Study quality Comments
Hansen et al, 1997 [5] Sweden	172 men 110 TURP 62 TUMT	Not stated Voided volume <100 ml	Asked to perform 10 measurements, mean used	Flow measurement, Urodyn 2000 Dantec, voided volume >100 ml, visual inspection not stated Subjective outcome	Correlation Qmax 0.41 Outcome 0.04	Moderate Correlation with Q _{max} should probably be negative Q _{max} Pearson Outcome Spearman
Zdanowski et al, 1995 [4] Sweden	421 men Prostatism	92 no timed micturition, 262 or 189 no flow rate Neurologic disease, severe heart disease, suspicion prostate cancer, indwelling catheter	Asked to perform 10 measurements, mean used	Flow measurement, not described	Correlation -0.36	Moderate Pearson correlation coefficient

TURP = transurethral resection of the prostate; TUMT = transurethral microwave thermotherapy; Q_{max} = maximum flow rate

Tabell 4.5.1 Inkluderade studier som har undersökt reliabilitet för parametrar beräknade från miktionslista. Fullständig tabell i Bilaga 1.

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Homma et al, 2002 [3] Japan	Moderate 80	Frequency and/or incontinence, mentally fit, stable symptoms, 14 men and 60 women, 63.5 ± 11.3 years	Urinary tract infection, obstruction, bladder tumor, bladder stone	Number of micturi-tions day: SD 1.35 Nocturnal micturi-tions and incon-tinence episodes: SD square root of number of events (Poisson distribu-tion)

SD = standard deviation

Tabell 4.5.2 Inkluderade studier avseende förmågan för miktionslista att diagnostisera avflödes hinder. Fullständig tabell i Bilaga 1.

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Frequency-volume chart	Reference test	Results	Study quality Comments
van Venrooij et al, 2004 [6], The Netherlands	160 men LUTS suggestive of BPH, performed all examinations, 65.3 years SD 7.7	Not stated Exclusion criteria according to International Consensus Committee on BPH	At least 24 h voiding diary	Pressure-flow study analysed according to ICS, urethral resistance factor and Schäfer grade	Correlation mean voided volume ICS -0.23 URA -0.25 Schäfer grade -0.23	Moderate Kendall and Gibbons correlation coefficient

BPH = benign prostatic hyperplasia; ICS = international continence society; LUTS = lower urinary tract symptoms

Tabell 4.6.1 Inkluderade studier som har undersökt reliabilitet och systematiska fel vid mätning av resturin. Fullständig tabell finns i Bilaga 1.

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Beacock et al, 1985 [6] Great Britain	Moderate 15, 25 examinations	Investigation for BOO, 55–80 years	Not stated	US 8 ml less, SD difference 23 ml
Birch et al, 1988 [7] Great Britain	Moderate 30	TURP patients	Not stated	1/3 small variation 2/3 large variation, single measurement not useful
Dunsmuir et al, 1996 [8] Great Britain	Moderate 40	Volunteers, BPH according to DRE and PSA, 55–82 years	Anticholinergics, urinary tract infection	Between individuals 57%, CI 93–252 ml, within individuals 42%, CI 55–228 ml
Kjeldsen-Kragh, 1988 [9] Denmark	Moderate 20, 107 examinations	Neurogenic bladder	Not stated	Mean difference 28, 11, 16%

BOO = bladder outlet obstruction; BPH = benign prostatic hyperplasia; CI = confidence interval; DRE = digital rectal examination; PSA = prostate-specific antigen; SD = standard deviation; TURP = transurethral resection of the prostate

Tabell 4.6.2 Inkluderade studier avseende förmågan för resturin att förutsäga lågt maximalt flöde, avflödes hinder och/eller behandlingsresultat. Fullständig tabell finns i Bilaga 1.

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Residual urine	Reference test	Results	Study quality Comments
Botker-Rasmussen et al, 1999 [13] Denmark	29 Volunteers, no LUTS when interviewed carefully, age 51–85	Not stated Past or present urological complaints	With 5 Ch catheter before urodynamic study	5 Ch transurethral catheter, saline, 50 ml/min, Menuet or DISA URO-system 21F16 2100, Dantec or Urodyn 1000, Dantec, Abrams-Griffiths nomogram	LR+ 0.00 LR–1.17	Moderate
Bruskewitz et al, 1997 [21] USA	249 men TURP arm of randomised study TURP vs WW, clinical BPH	Not stated <55 years, previous surgery or radiation, nonambulatory status, ongoing infection, prostate or bladder cancer, PVR >350 ml, neurogenic bladder, serious medical condition	Not described	Improvement in IPSS or bother score after TURP	Improvement IPSS: <100 ml 10.6 >100 ml 9.5 ns Improvement bother score <100 ml 36 >100 ml 26 sign	Moderate IPSS 10.6 vs 9.5 ns, bother 36 vs 26 sign
Caffarel et al, 2008 [20] Great Britain	95 Pressure-flow study, attendees at a LUTS clinic, performed flow measurement and at least two of IPSS, IPSS bother question, PSA and postvoid residual urine	45 Voided volume at flow measurement <150 ml, performed less than two IPSS, IPSS bother question, PSA and PVR	Method not described	Q_{max} , voided volume >150 ml	0.37	Moderate Pearson correlation coefficient
D'Ancona et al, 1999 [22] The Netherlands	247 Treatment with TUMT, >45 years, PV >30 ml, Madsen SS >7, Q_{max} <15 ml/s, PVR <350 ml	At least 26 Neurogenic disorders, prostatic cancer, earlier surgery, indwelling catheter, median lobe	Residual urine, method not described	IPSS, Q_{max} or resistance after TUMT	OR, evaluation with IPSS 1.0; Q_{max} 1.0; LinPURR 1.0 Multivariate analysis ns x 3	Moderate
Ding et al, 1997 [12] Singapore	126 Persisting LUTS after correction of infection and obstipation, age >65 years	Not stated Previous surgery, aphasia, urethral stricture	Method not described	10 Ch + epidural urethral catheters, rectal balloon catheter, Dantec Menuet, obstruction = slope >2 ml/s cm H ₂ O or pmuo >40 cm H ₂ O	LR+ 0.92 LR– 1.05	Moderate Many patients had cerebro-vascular disease or Parkinson's disease

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Tabell 4.6.2 fortsättning

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Residual urine	Reference test	Results	Study quality Comments
Hong et al, 2003 [24] South Korea	437 LUTS, diagnosis of BPH, medication at least 3 months	Not stated Prostate cancer, previous surgery, other condition affecting urinary tract, severe disease	Residual urine, diagnostic ultrasound bladder scan, BVI 3000 (Diagnostic Ultrasound Corp)	Not satisfied with continuing medical therapy, surgery	Multivariate Hazard ratio 1.00 ns Age, IPSS and prostate volume sign	Moderate
Ignjatovic, 1997 [23] Yugoslavia	48 men LUTS, enlarged prostate, candidate for TURP	Not stated Not stated	Catheterized before pressure-flow study	IPSS after TURP	Improvement IPSS: >100 ml 10 <100 ml 8 ns	Moderate
Kuo, 1999 [10] Taiwan	324 men LUTS, prostate volume <60 ml, 45–88 years	Not stated Acute urinary retention, neuropathy, diabetes, acute urinary infection, previous TURP	The least of catheterized after free flow and calculated after pressure-flow	Video pressure-flow study, suprapubic epidural catheter, 10 Ch rectal balloon catheter, PdetQ _{max} >50 cm H ₂ O obstructed, low pressure and Q _{max} <15 ml/s obstruction decided by video	LR+ 1.7 LR– 0.11	Moderate Wide definition of obstruction
Mochtar et al, 2006 [14] The Netherlands	942 men Clinical BPH, watchful waiting or alfa-blocker, PSA <10, residual urine 200 ml or less	28 men Prostate or bladder cancer, neurogenic bladder	Transabdominal US, ellipsoidal formula	TRUL; Q _{max} ; Urodyn 1000; Schäfer grade; Invasive treatment during 5 years follow-up	Correlation Prostate vol <±0.15; Qmax <±0.15; Schäfer grade 0.15 Hazard ratio 1.9–4.1	Moderate Spearman correlation coefficient HR ns in multivariate analysis but sign in univariate
Ockrim et al, 2001 [15] Multinational	384 men Interventional therapy considered, 64 years SD 12.3	Not stated Neurological disease, previous treatment, insufficient data documentation	Transabdominal US	Q _{max} ; Pressure-flow study, best of 2 voids, VV >100 ml; 8 Ch transurethral catheter, BOOII	Correlation Qmax –0.26 BOOI 0.30	Moderate Probably Pearson correlation coefficient
Oelke et al, 2007 [11] Multinational	168 men >40 years, LUTS or prostate volume >25 ml	8 men BPH-treatment, previous pelvic surgery, neurogenic deficit, prostate cancer, PSA >4	SonoDIAG-NOST360, Philips, 3.5 MHz	Pressure-flow, Ellipse, Andromeda, according to good urodynamic practise, CHES classification, A1–2, B1 non-obstructed, experienced residents	LR+ 1.25 LR– 0.66	High

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Tabell 4.6.2 fortsättning

Author, year, reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Residual urine	Reference test	Results	Study quality Comments
Roehrborn et al, 1999 [25] USA	3 040 men Randomised study, moderate-severe LUTS, $Q_{max} < 15$ ml/s, voided volume > 150 ml, enlarged prostate, negative biopsy if PSA 4–10, 64 years SD 7	Not stated Prostate and bladder cancer, PSA < 10 , BPH treatment, chronic prostatitis, recurrent urinary tract infections	Not described	Acute urinary retention or surgical therapy	AUROC 0.52–0.60	Moderate
Schacterle et al, 1996 [19] USA	134 men Referral urodynamic study, mean age 68 years	Not stated Overt neurological disease	Catheterization	Micturitional urethral pressure profile, gradient > 9 cm H ₂ O obstruction	Obstruction 145 ml no obstruction 90 ml, sign	Moderate
van Venrooij et al, 1996 [17] The Netherlands	196 men LUTS, clinical judgement suggests bladder outlet obstruction, > 50 years	Not stated According to International Consensus Committee on BPH, voided volume < 150 ml, missing examinations	Residual urine, method not described	Q_{max} not described; pressure-flow study, 5 Ch transurethral catheter, Schäfer grade	$Q_{max} - 0.21$ Schäfer grade 0.13 ns	Moderate Pearson correlation coefficient, Schäfer grade 2–6 = obstruction
Vesely et al, 2003 [16] Sweden	153 men LUTS and suspected BOO, no neurological disease	Not stated Positive ice water test	UA 1082, Buel & Kjaer, formula not stated	Q_{max} ; Pressure-flow study, UroDyn UD 2000, MMS, DAMPF	Correlation $Q_{max} - 0.22$; DAMPF 0.18	Moderate Pearson correlation coefficient
Walden et al, 1995 [18] Sweden	70 men Candidate for TURP or TUMT, Madsen-Iversen score > 8 , $Q_{max} < 15$ ml/s, ASA calss 1–3, 46–86 years	Not stated Neurologic or mental disorder, indwelling catheter, PVR > 350 ml, prostate or bladder cancer, infection, previous BPH treatment	Transabdominal US	Pressure-flow, Uro Gyn UD2000, MMS, suprapubic catheter, rectal balloon catheter, Schäfer grade	No correlation	Moderate

BOO = bladder outlet obstruction; BPH = benign prostatic hyperplasia; IPSS = international prostate symptom score; LR = likelihood ratio; LUTS = lower urinary tract symptoms; PSA = prostate-specific antigen; PVR = post-void residual urine; Q_{max} = maximum flow rate; TUMT = transurethral microwave thermotherapy; TURP = transurethral resection of the prostate; US = ultrasound; WW = watchful waiting

Tabell 4.7.1 Inkluderade studier som har undersökt reliabilitet och systematiska fel vid storleksmätning av prostata med ultraljud. Fullständig tabell i Bilaga 1.

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Aarnink et al, 1996 [2] The Netherlands	Moderate 247	Consecutive examinations	None	Best formulas in decreasing order: $h^2 \cdot w$, $(h \cdot w^*)/3$, $h \cdot w^* \cdot l$, $((h+l)/2)^3$
Aarnink et al, 1996 [14] The Netherlands	High 30	Men with LUTS, 38–83 years	None	Pearson $r=0.99$. Mean variation 3,4 and 3.5%, 3,6 and 3.2 ml. Maximum variation 11,1 resp 10.0%, 30 resp 21 ml
al-Rimawi et al, 1994 [8] Canada	Moderate 21	Symptoms of obstruction, enlarged prostate at DRE, $Q_{max} < 15$ ml/s, randomised finasteride trial	Not stated	TRUS underestimate 23%, variation between sessions 10–12%, combining simplicity and correlation with MRI usual ellipsoid formula best $r=0.81$
Cabello Benavente et al, 2006 [18] Spain	Moderate 33+37	Radical prostatectomy or retropubic prostatectomy, no tertiary lobe, good delimitation of prostate and transition zone with US	Previous prostatic surgery	Correlation US vs specimen weight: Total volume 0.79; Transition zone volume 0.84
Elliot et al, 1996 [11] Canada	Moderate 6	Cadaver prostates, 25–100 ml	Not stated	SD 0.43 ml or 1.7%. Error >4 ml compared to reference
Eri et al, 2002 [3] Norway	High 41	Placebo group of BPH trial	Not stated	Ellipsoidal formula SD 6.04 Planimetry SD 5.14 Ellipsoidal formula 5.7 ml smaller

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Tabell 4.7.1 fortsättning

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Griffiths et al, 2007 [16] Australia	Moderate 13	Healthy men without prostatic disease, 54–64 years	Not stated	ICC för TRUS: total volume 0.96; central volume 0.73; trans-perineal US similar
Hendriks et al, 1991 [10] The Netherlands	Moderate 9, 20	Cadavers and patients	Not stated	Planimetry SD 1.61 ml
Huang Foen Chung et al, 2004 [17] The Netherlands	Moderate 100	From screening study PC or longitudinal urodynamic study of volunteers	Not stated	TRUS, correlation coefficient for 2 measurements 0.84
Kimura et al, 1995 [4] Japan	Moderate 5+5+5+5	Prostate cancer, BPH + surgery, BPH + hormonal therapy, hematospermia or bladder tumor	Not stated	Ellipsoidal formula with 3 axes at right angles best, angles are important, rotational ellipsoid formula worse
Littrup et al, 1991 [5] USA	Moderate 20, 100	In vitro models and consecutive patients	Not stated	Ellipsoid formula better than rotating ellips
Miyazaki et al, 1983 [9] Japan	Moderate 19, 226, 14	Healthy men, TURP patients, open prostatectomy patients	Not stated	Regression analysis US vs specimen weight. Open prostatectomi $r=0.83$ slope=0.72 TURP $r=0.83$ slope=0.53
Passas et al, 1994 [6] Spain	Moderate 40	Open prostatectomy for BPH, 55–82 years	Not stated	US overestimate weight 17 g Best formula is $((T+AP)/2)^3$
Rahmouni et al, 1992 [12] USA	Moderate 48	Radical prostatectomy, cancer stage A or B	Previous TURP	TRUS underestimate specimen weight. Mean 35.5 vs 50.6 ml. SD 16.8 assuming weight is correct

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Tabell 4.7.1 fortsättning

Author, year, reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Sajadi et al, 2007 [15] USA	Moderate 1 309	SEARCH database, radical prostatectomy after 1995	Androgen deprivation, radiation therapy, T1a, T1b, missing data	TRUS correlation coefficient 0.69. Mean difference 9.6 ml SDdiff 11.4. Relative difference 22.9% SD 20.6 median rel error 41% for TRUS vol <20 ml, 17–21% for vol >20 ml. Absolute error 12 ml for vol <20 ml and 18 ml for vol >20 ml
Tewari et al, 1996 [13] USA	Moderate 36, 48	LUTS, Q_{max} <15 ml/s, PVR <300 ml, PSA <40, randomised finasteride study	Prostate cancer, neurogenic bladder	US vs MRI SD 6.8 ml, 19.9%, US vs specimen weight SD 28 ml, 34.6%
Tong et al, 1998 [20] Canada	High 15, 4+4 observers	Images from patients	Not stated	SD intra obs 9.5 ml, relative 11.5%, inter obs 11.6, relative 13.5%
Yip et al, 1991 [7] Hong Kong	Moderate 61	Autopsy specimens without prostatic pathology	Not stated	Regression with longitudinal and anteroposterior diameter best and better than ellipsoid formula
Yuen et al, 2002 [21] Singapore	Moderate 22	TURP, retention or severe symptoms, 56–79 years	Not stated	Prostate volume 2.7 and 9.2 ml smaller at bladder volumes 400 and 500 ml

BPH = benign prostatic hyperplasia; DRE = digital rectal examination; ICC = intraclass correlation coefficient; LUTS = lower urinary tract symptoms; Q_{max} = maximum flow rate; TRUS = transrectal ultrasound; TURP = transurethral resection of the prostate

Tabell 4.7.2 Inkluderade studier avseende TRUL:s (prostatavolymen) förmåga att diagnostisera avflödes hinder och förutsäga behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	TRUS	Reference test	Results	Study quality Comments
Agrawal et al, 2008 [31] Nepal	100 men Diagnosis of BPH, age 67.5 years, SD 8.5, range 48–85 years	Not stated Previous surgery, prostate cancer, urethral stricture, neuropathic bladder	Abdominal US	Q_{\max} , flow measurement not described	–0.419	Moderate Pearson correlation coefficient
Elliot et al, 1996 [11] Canada	6 Cadaver prostates, 25–100 ml	Not stated Not stated	5 MHz side-firing probe, ATL UM-9, Advanced Technology Laboratories, fixed probe holder recording 2D images at different angles, own computer program for 3D reconstruction, planimetry of slices	Water displacement in graduated cylinder.	1,00	Moderate
Girman et al, 1995 [32] USA	471 men Men 40–79 years, 55% response rate, 25% invited for examination	Not stated Prostate cancer, prostatic surgery, conditions interfering with voiding except BPH	Ellipsoidal formula	Q_{\max} , portable flowmeter	Correlation –0.21	Moderate Spearman correlation coefficient
Kaplan et al, 1995 [25] USA	61 men Symptomatic prostatism	Not stated Prostate cancer, neurogenic bladder, previous therapy	Bruel & Kjaer 1846 with 1850 radial and 8537 longitudinal probes, ellipsoidal formula, one examiner	Pressure-flow, 10 Ch transurethral catheter, Lifetech Janus system, Dantec 1000 flowmeter	Correlation Q_{\max} –0.20, Pdet Q_{\max} 0.13	Moderate Transision zone volume better Pearson correlation coefficient
Kojima et al, 1997 [29] Japan	85 men Moderate to severe symptoms according to IPSS, performed TRUS and pressure-flow study, 51–89 years	Not stated Neurogenic bladder, prostate cancer, urethral stricture	Chair-type scanner, SSD 520, Aloka, 5.0 MHz, planimetry with 5 mm intervals, Finetec Image Measuring System	Q_{\max} not described, 5 Ch transurethral catheter, rectal catheter, polygraph system, Nihon Koden	Q_{\max} 0.11, Pdet Q_{\max} 0.35, AG-number 0.36, Schäfer grade 0.35	Moderate PCAR better sensitivity 0.77 and specificity 0.75

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Tabell 4.7.2 fortsättning

Author, year reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	TRUS	Reference test	Results	Study quality Comments
Kuo et al, 1993 [42] Taiwan	400 men Diagnosis of BPH and operated, with and without a catheter, 45–96 years (TURP 335, Open op 16, TUIP 49)	10 without TRUS Not stated	Prostatic size and intravesical growth were evaluated	Patient satisfied with voiding condition, improved irritative symptoms and $Q_{max} > 15$ ml/s	Between large and small adenoma LR+ 5.07 LR– 0.69 Between small and no adenoma LR+ 1.19 LR– 0.49	Moderate
Kurita et al, 1996 [35] Japan	64 men BPH diagnosed from history, symptoms, physical examination, TRUS, biopsy if elevated PSA, treatment with tamsulosin, 55–88 years	4 men Prostate cancer, prostatitis, bladder stones, stricture, diabetic neuropathy, urinary retention, previous surgery, severe disease	One examiner, 5 MHz, Aloka UST-670P-5 with SSD-2000 us system, formula for ellipsoid	Q_{max} , voided volume >150 ml, Dantec UD 5500	Correlation 0.05	Moderate Pearson or Spearman correlation coefficient
Kurita et al, 1996 [34] Japan	43 men BPH diagnosed from history, symptoms, physical examination, TRUS or X-ray, treatment with TUMT	0 men Prostate cancer, urinary retention, neurogenic bladder, infection, stricture, previous therapy	TRUS, one examiner, Aloka SSD-650CL with UST-665P-5 transducer, 5 MHz, ellipsoidal formula	Q_{max} , Dantec UD 5500, voided volume >150 ml	Correlation 0.12	Moderate Spearman correlation coefficient
Kurita et al, 1997 [33] Japan	128 men BPH diagnosed from history, symptoms, physical findings, TRUS or X-ray, 51–80 years, IPSS >13 or $Q_{max} < 15$ ml/s, biopsy if elevated PSA or suspicious DRE, randomised drug trial	7 men Prostate cancer, prostatitis, stricture, diabetic neuropathy, urinary retention, previous therapy	Aloka SSD-2000 with UST-670P-5, ellipsoid formula, one examiner	Q_{max} , Dantec UD 5500	Correlation –0.04	Moderate Spearman correlation coefficient
Kurita et al, 1998 [36] Japan	331 (64 AUR) Symptomatic BPH, with and without acute urinary retention, IPSS >7, 51–84 years	14 with prostate cancer Prostate cancer, prostatitis, stricture, neurogenic bladder, chronic urinary retention, TURP or drug treatment for BPH	One examiner, SSD 2000, Aloka, UST-670P-5 probe, 5 MHz, ellipsoidal formula	Q_{max} , UD 5500, Dantec	–0.37	Moderate Pearson correlation coefficient, PCAR worse

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Tabell 4.7.2 fortsättning

Author, year reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	TRUS	Reference test	Results	Study quality Comments
Lepor et al, 1997 [37] USA	93 men Referral for BPH, elevated PSA or abnormal DRE, biopsy if elevated PSA, abnormal DRE and life expectancy >10 years	Not stated Prostate cancer	TRUS, Bruel & Kjaer 1846 with B551 transducer, 7.5 MHz, ellipsoidal formula	Q _{max} , not described	Correlation -0.40	Moderate Spearman correlation coefficient
Lim et al, 2006 [22] Singapore	114 men LUTS suggestive of BPE, >50 years	19 incomplete data Previous pelvic surgery, previous pelvic trauma, radiation therapy, diabetic cystopathy, neurogenic bladder, high PSA had biopsy before inclusion	Transabdominal, not described otherwise, reference to previous paper	According to ICS, AG-number, not described otherwise	Between 0.31 and 0.51	Moderate IPP and PSA are also evaluated. IPP best, PSA second best
Marberger et al, 2000 [44] Multinational	4 222, 2 785 with TRUS Patients from 3 randomised finasteride trials, at least two moderate but no more than two severe symptoms, enlarged prostate, PSA <10 ng/ml, PVR <151 ml, Q _{max} 5–15 ml/s and voided volume >150 ml	Not stated Prostate cancer	Not stated	Acute urinary retention assessed by investigator and an independent endpoint committee	LR+ 1.52 LR- 0.65	Moderate
Mariappan et al, 2007 [46] Great Britain	57 of 121 men Men with AUR, >50 years, clinically benign prostate, retention volume <1 500 ml	0 men Prostate cancer, neurological disease, severe disease, prostatic surgery, stricture, renal insufficiency, anticholinergics, previously failed TWOC, did not receive alpha-blocker	Machine not stated, 7 MHz, ellipsoidal formula, PV and IPP measured	Successful trial without catheter	LR+ 2.45 LR- 0.41	Moderate Sensitivity estimated from graph
Milonas et al, 2003 [38] Lithuania	Patients with BPH, mean age 68.3 years	Neurogenic bladder, prostate cancer	Siemens Sonoline SI-250, 5–7.5 MHz, ellipsoidal formula	Acute urinary retention	LR+ 1.63 LR- 0.61	Moderate Values from graph

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Tabell 4.7.2 fortsättning

Author, year reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	TRUS	Reference test	Results	Study quality Comments
Ockrim et al, 2001 [26] Great Britain, Italy	384 men Consecutive patients, 64 years (SD 12.3), interventional treatment considered	<10% with missing data Neurologic disease, previous therapy	TRUL, Sonoline SI 250, Siemens, ellipsoidal formula	Pressure-flow, 8 Ch transurethral catheter, Q _{max} , best of two voidings, BOOI	Correlation using log volumes, total vol 0.40. Transition zone 0.43, transition zone index 0.42	Moderate Pearson? Prostate volume combined with Q _{max} and residual urine is also given
Ohtani et al, 1999 [43] Japan	56 men TURP, 53–84 years	Not stated Previous treatment, neurogenic bladder, prostate and bladder cancer	Aloka SSD-1200 with UST 671, 5/7.5 MHz, ellipsoid formula	Q _{max} , flowmetry not described; Improvement in IPSS, bother and Q _{max}	Correlation Qmax 0.05; Change in: IPSS 0.22 Bother 0.11 Qmax 0.35	Moderate Pearson correlation coefficient TZV and TZI better than prostate volume
Rathaus et al, 1991 [19] Israel	Patients with BPH undergoing suprapubic prostatectomy	Not stated	Transperineal US, 5 MHz, ellipsoid formula	Suprapubic prostatectomy, specimen weight	0.89	Correlation coefficient not stated, large prostates underestimated
Reis et al, 2008 [24] Brazil	LUTS, normal urinalysis, age 64.9 years (56–73)	Previous surgery, neoplasia, bladder stone, neurological abnormality, alpha-blocker, anticholinergics, antiandrogens	Abdominal US, Toshiba Powervision 6000, 3–6 MHz, >100 ml in bladder	Pressure-flow study according to Goos Urodynamic Practise, BOOI	LR+ 2.23 LR– 0.45	Area under ROC 0.72, values from figure
Rosier et al, 1995 [27] The Netherlands	521 men Men with LUTS who performed pressure-flow studies	Not stated Not stated	Kretz Combison 330, 7.5 MHz, planimetry with 4 mm intervals	Pressure-flow, transurethral, 8 Ch catheters, microtip, MMS UD 2000 system, URA, pmuo, Atheo, Schäfer class Q _{max} , pressure-flow	Correlation Qmax –0.20 PdetQmax 0.29 pmuo 0.32 Atheo –0.19 URA 0.32	Moderate PPV: Schäfer grade 2–6 0.80 URA 0.69
Slawin et al, 2006 [45] USA	3 randomised trials, >50 years, PSA 1.5–10, enlarged prostate, IPSS >7	Not stated in this paper	Prostate volume, method not described	Acute urinary retention or surgical intervention	Hazard ratio 1.29 sign	Moderate
Steele et al, 2000 [23] USA	LUTS, 66.7 years (SD 7.5)	Prostate cancer, stricture, previous therapy, neurologic history, significant disease	TRUS, 7.5 MHz	Pressure-flow, 7 Ch urethral catheter, 8 Ch rectal catheter, ICS diagram	LR+ 1.94 LR– 0.53	Moderate

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Tabell 4.7.2 fortsättning

Author, year reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	TRUS	Reference test	Results	Study quality Comments
Tan et al, 2003 [47] Singapore	100 men Acute urinary retention, 50–90 years	0 Prostatic cancer, recurrent or chronic retention, infection, hydronephrosis, renal impairment, neurologic disease	Transabdominal US, 3.5 MHz, not described otherwise	Trial without catheter, successful if $Q_{max} > 10$ ml/s and PVR < 100 ml	Same mean prostate volume in both groups	Moderate
Terris et al, 1998 [39] USA	42 men TRUS + biopsy, no BPH, infection or prostate cancer diagnosis	Not stated Androgen and radiation therapy, incomplete data, no consent	Ellipsoid formula, $T^2 \cdot AP$ and T^3 used as diameters for PV < 80 and > 80 ml respectively	Q_{max} , not described	Correlation –0.33	Moderate TZ better Pearson correlation coefficient
Tewari et al, 1995 [48] USA	Symptoms of BPH, $Q_{max} < 15$ ml/s, PVR < 300 ml, randomized finasteride trial	Prostate cancer, PSA > 40, high creatinine or liver function tests	Siemens SI-200, 5, 6 and 7.5 MHz, ellipsoidal formula, one examiner	Change in Q_{max} , not described	42.4 vs 36.7 ml	Moderate TZI better
Tsakamoto et al, 2007 [40] Japan	LUTS, 2 measurements of prostate volume, 69.5 years SD 6.5	Prostate cancer, surgery or hormonal treatment between visits	TRUS, Bruel & Kjaer type 2002, ellipsoidal formula	Q_{max} , method not described	–0.03	Moderate Spearman correlation coefficient
Vesely, 2003 [30] Sweden	153 men LUTS and suspected BOO without neurological disease, 48–86 years	Not stated Not stated	Bruel & Kjaer UA 1082, ellipsoidal formula	Pressure-flow study, Uro Dyn 2000, MMS, DAMPF	Correlation Q_{max} –0.16 DAMPF 0.36	Moderate Pearson correlation coefficient
Vesely et al, 2003 [41] Sweden	946 men LUTS suggestive of BPE referred to dept of urology	592 men Biopsy if suspicion of cancer, prostate cancer excluded, incomplete investigations	Bruel & Kjaer UA1082r, ellipsoidal formula	Uro Dyn 2000, MMS, voided volume > 125 ml, visual inspection not stated Q_{max}	Correlation –0.18	Moderate Spearman correlation coefficient
Watanabe et al, 2002 [28] Japan	51 men LUTS, men 49–84 years	0 men Stricture, bladder neck stenosis	Abdominal US, Toshiba SSA-2604, 3,75 MHz, ellipsoid formula	Pressure-flow, Dantec UD5500, transurethral 8 Ch and rectal balloon, URA and Schäfer grade	Correlation 0.69	Moderate Pearson?

AG-number = Abrams-Griffiths number ; AP = anterior-posterior diameter; AUR = acute urinary retention; BOO = bladder outlet obstruction; BPH = benign prostatic hyperplasia; DAMPF = adjusted mean PURR factor; DRE = digital rectal examination; ICS = International Continence Society; IPP = intravesical prostatic protrusion; IPSS = international prostate symptom score; LUTS = lower urinary tract symptoms; LR = likelihood ratio; PCAR = presumed circle area ratio; PPV = positive predictive value; PVR = post-void residual urine; Q_{max} = maximum flow rate; ROC = receiver operating characteristic; SD = stan-

dard deviation; TRUL = transurethral microwave thermotherapy of lower urinary tract symptoms; TRUS = transrectal ultrasound; TUIP = transurethral incision of the prostate; TUMT = transurethral microwave thermotherapy; TURP = transurethral resection of the prostate; TWOC = trial without catheter; TZI = transition zone index; TZV = transition zone volume; URA = urethral resistance factor; US = ultrasound

Tabell 4.8.1 Inkluderade studier som har undersökt reliabilitet. Fullständig tabell i Bilaga 1.

Author Year Reference Country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Cheng et al, 2004 [3] China	High	Consecutive patients with acute urinary retention	Not stated	Correlation between examiners 0.57, 0.54 and 0.64 Underestimations are larger than overestimations
Pinsky et al, 2006 [2] USA	Moderate	One arm of screening study, men 55–74 years	Prostate, pulmonary, colorectal cancer, finasteride	SDinterobserver 11.1 ml SDintraobserver 11.3 ml Average error: 1 measurement 13 ml, 47% Average of 3–4 measurements and same observer 5 ml, 12%

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Tabell 4.8.1 fortsättning

Author Year Reference Country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Roehrborn et al, 1997 [4] USA	Moderate	471 men Subsample from Olmsted county epidemiological study, 40–79 years. Previous surgery, prostate cancer urinary tract disease other than BPH excluded	74 men Not stated	Underestimation 48–59% for different sizes
	Moderate	480 men Subsample from epidemiological study, 40–79 years, moderate–severe symptoms, $Q_{max} < 15$ ml/s or unable to void 150 ml	Not stated	Small prostates overestimation 3–18% Underestimation. 30–39 ml 9–12% 40–49 ml 25–34% >50 ml 25–34%
	Moderate	1 222 men Randomised drug trial, 45–80 years, moderate–severe symptoms, $Q_{max} < 15$ ml/s	Not stated	The variability varied between examiners
	Moderate	100 50–75 years, moderate–severe symptoms, $Q_{max} < 15$ ml/s	Not stated	

Q_{max} = maximum flow rate

Tabell 4.8.2 Inkluderade studier avseende rektalpalpationens (prostatavolymen) förmåga att diagnostisera avflödeshinder och förutsäga behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Digital rectal examination	Reference test	Results	Study quality Comments
Bohnen et al, 2007 [5] The Netherlands	1 524 men All men 50–75 years in the population	50% + 164 men Prostate or bladder cancer, neurogenic disorder	Estimates in increments of 5 ml	Transrectal ultrasound, Bruel & Kjaer, 7 MHz, planimetry	Area under ROC curve: 30 ml 0.69 40 ml 0.74 50 ml 0.82	Moderate
Kumar et al, 2000 [7] Great Britain	40 men AUR, men	0 men Prostate cancer, urethral or penile disease, pelvic colon cancer, neurogenic bladder, high PSA	One urologist	Successful trial without catheter and follow-up up to 20 months	27.5 vs 15.9 ml sign	Moderate
McNeill et al, 2004 [8] Great Britain	34 men Successful TWOC	0 men None	Admitting urologist, 3 categories: <20, 21–50 and >50 ml	No new AUR and no surgery	20 ml LR+ 1.77 LR– 0.23 50 ml LR+ 3.08 LR– 0.70	Moderate
Meyhoff et al, 1981 [6] Denmark	75 men, 32 open op Moderately enlarged prostate, benign at DRE, randomized trial TURP vs open operation, 53–87 years	0 men None	Urologic residents or specialists	Specimen weight at open operation	Correlation 0.27	High Spearman correlation coefficient
Pinsky et al, 2006 [2] USA	DRE 35323, TRUS 653 One arm of screening study, men 55–74 years	Not stated Prostate, pulmonary, colorectal cancer, finasteride	Nurses, >100 examinations, length and width estimated in 0.5 cm increments, ellipsoid formula	TRUS, ellipsoid formula	Correlation Single measurement 0.30 Corrected for examiner 0.41 Average error 13 ml, with correction for examiner 5 ml	Moderate

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Tabell 4.8.2 fortsättning

Author, year reference country	Inclusion: Number Criteria	Exclusion: Number Criteria	Digital rectal examination	Reference test	Results	Study quality Comments
Roehrborn et al, 1997 [4] USA	471 men	74 men	One especially trained nurse	TRUS, Bruel & Kjaer, 7,5 MHz, radiologists	Correlation 0.40	Moderate Pearson correlation coefficient. Underestimation of volume
	Subsample from Olmsted county epidemiological study, 40–79 years. Previous surgery, prostate cancer urinary tract disease other than BPH excluded	Not stated				
	480 men	Not stated	One urologist	TRUS, Bruel & Kjaer 7,5 MHz, one urologist	Area under ROC curve: 30 ml 0.78 40 ml 0.83 LR+1.60 LR– 0.32 Correlation 0.56	Moderate Pearson correlation coefficient. Underestimation of large prostates, overestimation of small ones
	1 222 men	Not stated	Several urologists	TRUS, Bruel & Kjaer 7.5 MHz, several urologists	Area under ROC curve: 30 ml 0.74 40 ml 0.74 Correlation 0.48	Moderate Pearson correlation coefficient. Underestimation of large prostates, overestimation of small ones
100	Not stated	One urologist	TRUS, Dornier Performa 7.5 MHz, one urologist	Area under ROC curve: 30 ml 0.97 40 ml 0.96 LR+1.52 LR– 0.00 Correlation 0.90	Moderate Pearson correlation coefficient. Underestimation of large prostates, overestimation of small ones	

AUR = acute urinary retention; BPH = benign prostatic hyperplasia; DRE = digital rectal examination; LR = likelihood ratio; Q_{max} = maximum flow rate; ROC = receiver operating characteristic; TRUS = transrectal ultrasound; TURP = transurethral resection of the prostate; TWOC = trial without catheter

Tabell 4.9.1 Inkluderad studie som har undersökt reliabilitet för PSA. Fullständig tabell i Bilaga 1.

Author, year reference country	Study quality Number	Inclusion criteria	Exclusion criteria	Reproducibility etc
Barry et al, 1995 [5] USA	Moderate 300	Placebo group, moderate–severe symptoms, enlarged prostate, $Q_{max} < 15$ ml/s	Voided volume < 150 ml, residual urine > 350 ml, prostate cancer, neurogenic bladder, prostatitis, urinary infection	SD 0.88

Q_{max} = maximum flow rate; SD = standard deviation

Tabell 4.9.2 Inkluderade studier avseende förmågan för PSA att diagnostisera prostataförstoring, lågt flöde eller obstruktion och att predicera behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Bo et al, 2003 [11] Italy	569 men 60–90 years, admitted to geriatric or urologic ward, if PSA >4 negative biopsy	Not stated Prostate cancer, drug that could influence PSA, prostatic phlogosis	Immulite 2000, before DRE and TRUS	TRUS, 5 MHz, radiologists, ellipsoid formula	Correlation 0.54	Moderate Pearson correlation coefficient
Bohnen et al, 2007 [9] The Netherlands	1 688 of 3 924 men Men 50–75 years in one municipality	50% Prostate cancer, biopsy if PSA >4	Not described	TRUS, Bruel & Kjaer, 7 MHz, planimetric method with 5 mm intervals TRUS, 30; 40; 50 ml	30 ml LR+ 2.45; LR– 0.41 40 ml LR+ 3.76; LR– 0.27 50 ml LR+ 5.25; LR– 0.19	Moderate
Bosch et al, 1995 [12] The Netherlands	502 men Prostate cancer screening, response rate 35%, one half randomised to screening	3 men Prostate cancer, PSA >10, previous surgery, refusal of TRUS	Hybritech assay	TRUS, Bruel & Kjaer, 7 MHz, planimetry 5 mm intervals	Correlation 0.58	Moderate Spearman correlation coefficient
Caffarel et al, 2008 [7] Great Britain	95 men Pressure-flow study, attendees at a LUTS clinic, performed flow measurement and at least two of IPSS, IPSS bother question, prostate specific antigen and postvoid residual urine	45 men Voided volume at flow measurement <150 ml, performed less than two IPSS, IPSS bother question, PSA and PVR	Method not described	Q _{max} , voided volume >150 ml	Correlation 0.22	Moderate Pearson correlation coefficient
Chung et al, 2006 [3] South Korea	5 716 men LUTS, IPSS>8, Q _{max} <15 ml/s, 50–80 years, biopsy if PSA >4	Not stated Acute prostatitis, infection, 5-ARI, PSA >10	Elecsys, Architect or Immulite, calibration against Stanford 90:10 PSA Calibrator	TRUS, 7.5 MHz, ellipsoid formula	Area under ROC curve: 30 ml 0.76 40 ml 0.81 50 ml 0.83	Moderate Results for age-groups in paper

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Tabell 4.9.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Clements et al, 1992 [13] Great Britain	50 men Benign digital rectal examination, benign transrectal ultrasound, benign histology at TURP, 53–86 years	Not stated Not stated	Immuno-radio-metric assay, Hybritech	TRUS, Bruel & Kjaer 1846, 4 or 7 MHz, planimetric method, 0.5 cm intervals	Correlation 0.62	Moderate Pearson correlation coefficient
D'Ancona et al, 1999 [32] The Netherlands	247 men Treatment with TUMT, >45 years, PV >30 ml, Madsen SS >7, Q _{max} <15 ml/s, PVR <350 ml	At least 26 men Neurogenic disorders, prostatic cancer, earlier surgery, indwelling catheter, median lobe	PSA, method not described	IPSS, Q _{max} or resistance after TUMT	Odds ratio Univariate analysis: IPSS 0.88 sign Q _{max} 1.01 ns pQ 0.91 sign Multivariate analysis: all 3 ns	Moderate
Dutkiewicz et al, 1995 [14] Poland	112 men Diagnosed with BPH, 48–85 years	Not stated Not stated	Enzyme immunoassay PSA Beckmann kit	Abdominal ultrasound, ellipsoid formula	Correlation 0.34	Moderate Correlation coefficient not stated
Fukatsu et al, 2003 [27] Japan	122 men TURP because of BPH, 53–87 years	0 men Prostate cancer	Immulyze-PSA kit, no prostatic manipulation	SSD-520, Aloka, 5 MHz, ellipsoid formula	0.51	Moderate Pearson correlation coefficient
Furuya et al, 2000 [15] Japan	204 men TURP or open operation, 52–92 years	11 men Urinary retention, prostatitis, androgen deprivation, testosterone treatment	Tandem-R kit, Eiken kit converted to Tandem-R values, before DRE or urethral manipulation	TRUS, ellipsoid formula	Correlation 0.50	Moderate
Furuya et al, 2001 [1] Japan	218 men LUTS, high PSA or abnormal DRE, BPH at biopsy	Not stated Not stated	Tandem-R kit, before DRE or other prostatic manipulation	TRUS, ellipsoid formula	Correlation 0.40	Moderate Pearson correlation coefficient, odd population

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Tabell 4.9.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Hong et al, 2003 [35] South Korea	437 men LUTS, diagnosis of BPH, medication at least 3 months	Not stated Prostate cancer, previous surgery, other condition affecting urinary tract, severe disease	Not described	Change from drug therapy to surgery	Multivariate analysis PSA ns	Moderate Age, IPSS and prostate volume sign
Hosseini et al, 2005 [28] Iran	104 men Referral for BPH surgery, urinary retention, gross haematuria, failed medical therapy, age >50 years	18 men Malignancy, liver disease, previous prostatic surgery, antiandrogen therapy, post-operative death, prostate cancer	Microwell Eliza kit	TRUS, ellipsoid formula	0.70	Moderate Pearson correlation coefficient
Kirschenbaum et al, 1996 [16] USA	55 men Moderate symptoms, clinical diagnosis of BPH, finasteride treatment, 59–88 years, biopsy if PSA >4 or suspicious DRE	0 men None	Tandem-R, Hybritech	TRUS, 3.5 MHz, Aloka chair mounted scanner, planimetry	Correlation 0.57	Moderate Pearson correlation coefficient
Laguna et al, 2002 [31] The Netherlands	404 men TUMT, mean age 66, range 44–89 years, follow-up 1 year	16 men Previous treatment, neurogenic disorder	Tandem-R kit	IPSS. Bother question and Q _{max} after TUMT	Area under ROC curve: IPSS <8 0.56 Bother question 1 or 2 0.59 Q _{max} >12 ml/s 0.57	Moderate
Lepor et al, 1994 [17] USA	42 men PSA >4 or suspicious digital rectal examination, 50–79 years	21 men Prostate cancer	Not stated	TRUS, Bruel & Kjaer 1846 with transducer 8551, 7.5 MHz, ellipsoid formula	Correlation 0.53	Moderate Pearson correlation coefficient
Lim et al, 2006 [6] Singapore	114 men LUTS suggestive of BPE, 52–88 years, biopsy if high PSA	19 men Previous surgery, radiation, neurogenic bladder disorder	Not stated	Pressure-flow study according to ICS	>1.5 µg/l: LR+ 1.67 LR– 0.44 >4 µg/l: LR+ 2.14 LR– 0.78	Moderate

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Tabell 4.9.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Liu et al, 2007 [30] Taiwan	148 men Free health screening, mean age 59.8 years, quartiles 54, 61 and 66 years	Not stated Malignancy, liver cirrhosis, men taking hormones, anti-androgens, antifungal agents, steroids, surgical or medical therapy for BPH	Immulite 2000	TRUS, 7 MHz, type 2001 medical Ultrasound Scanner, B&K Medical, probe 8551, ellipsoid formula	0.464	Moderate Pearson correlation coefficient
Marberger et al, 2000 [34] Multinational	4 222, 4 198 with PSA Patients from 3 randomised finasteride trials, at least 2 moderate but no more than 2 severe symptoms, enlarged prostate, PSA <10 ng/ml, PVR <151 ml, Q _{max} 5–15 ml/s and voided volume >150 ml	326 men Prostate cancer	Not stated	Acute urinary retention assessed by investigator and an independent endpoint committee	LR+ 1.41 LR– 0.25	Moderate Low cut-off, ≥1.4 µg/l
Milonas et al, 2003 [18] Lithuania	68 men LUTS suggestive of BPO, age 67.3 SD 7.35	Not stated Acute urinary retention, prostate cancer, neurogenic bladder disorder	Not described	TRUS, Siemens Sonoline SI.250, 5–7.5 MHz, ellipsoid formula, two examiners	Correlation 0.62	Moderate Pearson correlation coefficient
Ojea Calvo et al, 1994 [19] Spain	44 men Patients with histologically confirmed BPH, age not stated	Not stated Not stated	IRMA I125, before manipulation	Abdominal ultrasound, ellipsoid formula	Correlation 0.13	Moderate Pearson correlation coefficient
Roehrborn et al, 1999 [26] USA	3 040 men Moderate–severe symptoms, enlarged prostate, Q _{max} <15 ml/s, biopsy if PSA 4–10	Not stated Prostate or bladder cancer, previous surgery, prostatitis, recurrent infections, alpha-blocker or antiandrogen treatment, PSA >10	Hybritech assay	Acute urinary retention or surgery during finasteride or placebo treatment	Area under ROC curve 0.53–0.70	Moderate

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Tabell 4.9.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Roehrborn et al, 2000 [2] USA	Subset of placebo group, moderate–severe symptoms, enlarged prostate, Q_{\max} <15 ml/s, biopsy if PSA 4–10	Prostate or bladder cancer, PSA >10, prostatitis, recurrent infections, previous surgery	Hybritech assay	Change in volume measured by MRI; pretreatment MRI	Area under ROC curve 0.79. PSA better than prostate volume	Moderate
Roehrborn et al, 2001 [36] USA	3 798 men Placebo group of 4 finasteride trials, moderate or severe symptoms, enlarged prostate, Q_{\max} <15 ml/s, biopsy if PSA 4–10	8% PSA >10	Hybritech assay	Spontaneous acute urinary retention during placebo treatment	Area under ROC curve 0.72	Moderate Prostate volume better than PSA
Romics et al, 1997 [20] Hungary	131 men 49–90 years, histologically proven BPH at operation	Not stated None	Hybritech kit	Suprapubic US, Kretz-Combison 310	Correlation 0.63	Moderate Correlation coefficient not stated
Sanchez Sanchez et al, 1995 [21] Spain	163 men Prostatectomy, histology benign, 50–90 years	Not stated Not stated	Immunoenzymatic assay with monoclonal antibodies	Abdominal ultrasound, 3.5 MHz, ellipsoid formula	Correlation 0.61	Moderate Pearson correlation coefficient
Scattoni et al, 1999 [29] Italy	Waiting list for open surgery of BPH	Suspicion of prostate cancer	Prostatus Free/Total assay, Delfia Reagents, 2 weeks prior to prostatic manipulation	TRUS with Ansaldo AU 560, multiplanar transducer, 5–7 MHz, ellipsoidal formula	Correlation 0.57	Moderate
Shim et al, 2007 [10] South Korea	3 566 men LUTS, 50–80 years, negative biopsy if PSA >10	135 men Surgery or radiation, 5-AR, prostate cancer, indwelling catheter, infection, acute urinary retention	Izotop, before examination, blood stored <1 week at –70 C	TRUS, Ultramake 9, 7.0 MHz, radiologist, estimation not described	Area under ROC curve 30 ml 0.80 40 ml 0.86 50 ml 0.90	Moderate

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Tabell 4.9.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Slawin et al, 2006 [33] USA	4 325 men 3 randomised trials, >50 years, PSA 1.5–10, enlarged prostate, IPSS >7	Not stated Not stated in this paper	Not stated	Acute urinary retention or surgical intervention during dutasteride or placebo treatment	Multivariate analysis Hazard ratio 1.35	Moderate BII, prostate volume, Q_{max} , previous alpha-blocker, on-going dutasteride were also sign
Stephan et al, 1997 [22] Germany	54; 36; 44 Healthy men; men with prostatic cancer; BPH patients, 32 benign surgical specimen, 12 clinical diagnosis	Not stated Not stated	Immulite PSA kit	TRUS, Combison 330	Correlation 0.66	Moderate Spearman correlation coefficient
Svindland et al, 1996 [23] Norway	55 men Randomised study of lueprolide in BPH	14 men Not stated	Enzyme immunoassay, Abbott laboratories, Frozen at -20, 2–4 weeks after biopsy	TRUS, Bruel & Kjaer 1846 and transducer 8531, mean of two planimetries, one examiner	Correlation 0.66	Moderate Correlation coefficient not stated
Tan et al, 2003 [37] Singapore	Acute urinary retention, mean age 71, range 50–90	Prostate cancer, recurrent or chronic retention, UTI, bilateral hydronephrosis, renal impairment, neurological disease	Method not described	Successful voiding with $Q_{max} > 10$ ml/s and residual urine <100 ml	Successful 12 μ g/l Unsuccessful 17.7 μ g/l	Moderate
Terris et al, 1998 [24] USA	42 men Referral for biopsies, 50–82 years	(18) Prostate cancer, treatment for BPH, LUTS, infections	Not stated	TRUS, one examiner, ellipsoid formula, T^2 * AP om <80 ml otherwise T^3	Correlation 0.41	Moderate Pearson correlation coefficient
Tsukamoto et al, 2007 [8] Japan	67 men LUTS, 2 prostate volume measurements, 55–82 years	PSA 7, Q_{max} 25 Prostate cancer, surgery or hormonal treatment between measurements	Not described	TRUS, Bruel & Kjaer, type 2002, ellipsoid formula, 5 examiners Q_{max} , not described	Correlation Prostate volume 0.65 Q_{max} -0.03	Moderate Spearman correlation coefficient

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Tabell 4.9.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	PSA	Reference test	Results	Study quality Comments
Vesely et al, 2003 [25] Sweden	946 men LUTS, 45–91 years, biopsy if suspected malignancy	592 men Prostate cancer, not complete examinations	Not described	TRUS, Bruel & Kjaer UA 1082r, ellipsoid formula	Correlation 0.54	Moderate Spearman correlation coefficient

BII = BPH Impact Index; BPH = benign prostatic hyperplasia; DRE = digital rectal examination; IPSS = international prostate symptom score; PSA = prostate-specific antigen; ROC = receiver operating characteristic; TRUS = transrectal ultrasound; TURP = transurethral resection of the prostate

Tabell 4.10.1 Inkluderade studier som har undersökt reliabilitet. Fullständig tabell i Bilaga 1.

Author Year Reference Country	Study quality Number	Inclusion criteria	Exclusion criteria	Repro-ducibility etc
Badia et al, 1998 [12] Spain	Moderate 59	Diagnosis of BPH made by urologist, >50 years, able to understand and answer questions; 18–49 years, same centers, men without current problems and history or present diagnosis of urinary tract symptoms	Prostata cancer, diabetes, neurologic disease, current prostatitis, urinary infection, kidney stones, psychiatric disorder, pelvic trauma or surgery, catheter, drugs affecting bladder function	ICC 0.87 Pearson 0.92
Barry et al, 1992 [13] USA	Moderate 76+59	Believed to have definite clinical BPH; non-urologic complaints in general medical practise	Previous surgery	Pearson 0.92
Barry et al, 1993 [14] USA	Moderate 219	Symptoms suggesting BPH	Prostate or bladder cancer, urethral stricture, previous surgery, less likely to return for follow-up, drug treatment	ICC 0.82 (n=185)
Barry et al, 1995 [10] USA	Moderate 274	Patients considered to have BPH of a urologist after a standardized evaluation	Not stated	Mean difference -1.0 SD 2.69
Barry et al, 1995 [15] USA	Moderate 1 229	Randomised study, diagnosis of BPH, Q_{max} 4–15 ml/s, voided volume 125–500 ml, IPSS >7, no antihypertensive agent other than diuretics and ACE inhibitors, 45–80 years	Prostate cancer, stricture, pelvic irradiation, surgery, PSA >12, neurologic disease, urinary infection, drug treatment	ICC 0.74

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Tabell 4.10.1 fortsättning

Author Year Reference Country	Study quality Number	Inclusion criteria	Exclusion criteria	Repro-ducibility etc
el Din et al, 1996 [11] The Netherlands	High 71	LUTS, 44–83 years	Not stated	Mean difference 1.6 SD 3,04
Lujan Galan et al, 1997 [17] Spain	Moderate 513	TURP or open operation, 50–86 years	Not stated	Pearson 0.76 Spearman 0.71 Kendall 0.50
Quek et al, 2001 [19] Malaysia	Moderate 237	BPH, TURP, stable condition; renal stones, no or mild symptoms, freedom from major diseases, no LUTS treatment,	Analphabetism, major medical history, physical disability; treatment for urological problems	ICC 0.77
Quek et al, 2005 [18] Malaysia	Moderate 39; 29	BPH, TURP, stable condition; renal stones, no or mild symptoms, freedom from major diseases, no LUTS treatment,	Analphabetism, major medical history, physical disability; treatment for urological problems	ICC >0.93 in both groups
Stoevelaar et al, 1996 [16] The Netherlands	Moderate 1 703; 58	Referral to urologic department, <50 years	Not stated	Spearman 0.67

Tabell 4.10.2 Inkluderade studier avseende symtomskalors förmåga att diagnostisera prostataförstoring, lågt Q_{max} och avflödes hinder, samt att förutsäga behandlingsresultat. Fullständig tabell i Bilaga 1.

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	Symptom score	Reference test	Results	Study quality Comments
Barry et al, 1993 [14] USA	219 Symptoms suggesting BPH	At least 21 Prostate or bladder cancer, urethral stricture, previous surgery, less likely to return for follow-up, drug treatment	IPSS	TRUS, prostate volume, ellipsoid formula* 1.05. Flow rate measured up to 3 times with local equipment. Voided volume >150 ml. Highest Q_{max} used	Correlation Prostate volume -0.09 Q_{max} -0.07	Moderate Pearson correlation coefficient
Barry et al, 2000 [32] USA	1 229 Diagnosis of BPH, IPSS >7, Q_{max} 4–15 ml/s, voided volume >125 ml, residual urine <300 ml, 45–80 years	Not stated Not stated	IPSS, mean of 2	Prostate volume measured by TRUS, method not described. Flow rate, not described	Correlation Prostate volume -0.06 Q_{max} -0.17	Moderate Pearson correlation coefficient
Bosch et al, 1995 [34] The Netherlands	554 Randomised community sample, 55–74 years	52, 35% participating PSA >10, prostate cancer, previous surgery, refusing TRUS	IPSS	TRUS, Bruel & Kjaer, 7 MHz, planimetry. Flow rate, Urodyn 1000, Dantec	Correlation Prostate volume 0.19 Q_{max} -0.18	Moderate Spearman correlation coefficient
Chuang et al, 2003 [46] Taiwan	99 TURP, 30% acute urinary retention	Not stated Prostate cancer, previous prostatic surgery	IPSS	Improvement in IPSS after TURP	≥7 points LR+ 3.5 LR- 0.26 ≥10 points LR+ 2.6 LR- 0.33	Moderate Cut off selected at analysis, regression towards the mean
D'Ancona et al, 1999 [30] The Netherlands	247 Treatment with TUMT, >45 years, PV >30 ml, Madsen SS >7, Q_{max} <15 ml/s, PVR <350 ml	At least 26 Neurogenic disorders, prostatic cancer, earlier surgery, indwelling catheter, median lobe	IPSS	Poor response after TUMT evaluated by IPSS, Q_{max} or resistance (Schäfer grade and URA)	Univariate OR IPSS 0.80 Q_{max} 0.96 pQ 0.97 multivariate analysis nsx3 Correlation Q_{max} ns Schäfer grade ns URA ns	Moderate Regression towards the mean

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Tabell 4.10.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	Symptom score	Reference test	Results	Study quality Comments
Eckhardt et al, 2001 [25] The Netherlands	565 LUTS, >50 years, voided volume >150 ml at uroflow, residual urine and prostate volume measurement performed	5 % According to the International Consensus Committee on BPH	IPSS	TRUS, not described Pressure-flow study, 5 Ch transurethral catheter	Correlation Prostate volume ns Schäfer grade ns	Moderate Kendall-Gibbons correlation coefficient
Ezz el Din et al, 1996 [20] The Netherlands	729 LUTS and/or BPH, 63.5 years SD 8.4	Not stated Voided volume <150 ml	IPSS	TRUS, planimetry; Q _{max} TRUS, Kretz Combison, 7.5 MHz, planimetry; Dantec Urolyn 1000	Correlation 0.03; -0.20	Moderate Spearman correlation coefficient
Girman et al, 1995 [35] USA	471 Random sample, 40–79 years	Not stated Prostate surgery, prostate cancer, conditions interfering with voiding except BPH	Score similar to IPSS	TRUS, ellipsoid formula Flow rate, portable device	Correlation Prostate volume 0.18 Q _{max} -0.35	Moderate Pearson correlation coefficient
Hakenberg et al, 1997 [37] Australia	112 TURP, LUTS, 55–88 years	7 Previous surgery, prostate cancer	IPSS	Result of TURP, improvement in IPSS. Flow rate	≥7 points LR+ 2.76 LR- 0.45 ≥10 points LR+ 3.03 LR- 0.18 Correlation Q _{max} ns	Moderate Regression towards the mean Spearman correlation coefficient

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Tabell 4.10.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	Symptom score	Reference test	Results	Study quality Comments
Hald et al, 1991 [6] Denmark	29 Uncomplicated BPH, waitinglist for surgery, 46–84 years	0 Not stated	Dan-PSS	Flow rate, method not described	Q _{max} <10ml/s Comb score >20 LR+ 1,1 LR– 0,91 Sympt score >13 LR+ 0,98 LR– 1,02 Both score >13 LR+ 0,81 LR– 1,22 Correlation Q _{max} –0,12	Moderate Calculated from table Pearson correlation coefficient
Hong et al, 2003 [47] South Korea	437 LUTS, diagnosis of BPH, medication at least 3 months	Not stated Prostate cancer, previous surgery, other condition affecting urinary tract, severe disease	IPSS	Not satisfied with continuing medical therapy, surgery	Multivariate hazard ratio 1.082	Moderate Age, IPSS and prostate volume sign
Ko et al, 1995 [26] Canada	121 Symptoms of prostatism, 67,9 years	18 Not stated	IPSS	Flow rate methods not described. Pressure-flow study, 8 Ch transurethral catheter, manual reading	Correlation Q _{max} 0,13 Schäfer grade 0,14	Moderate Pearson correlation coefficient –0,13 is probably correct
Kojima et al, 1997 [42] Japan	929 Screening, >55 years	Not stated Prostate cancer or stone, prostatitis	IPSS	TRUS, chair-type scanner, planimetry	Correlation Prostate volume 0,07	Moderate Pearson correlation coefficient Partially same as Taneike [44]

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Tabell 4.10.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	Symptom score	Reference test	Results	Study quality Comments
Netto Junior et al, 1996 [21] Brazil	227 Urinary symptoms attributed to BPH, IPSS >7, 51–80 years	Not stated Prostate cancer, pelvic irradiation, neurogenic bladder, urinary infection, stricture, hydronephrosis, stone disease, drug treatment within 2 weeks	IPSS	Pressure-flow study, 6 and 8 Ch-catheters transurethrally, Urosystem-DS-5600. Own definition of obstruction: obstruction when Pdet _{Q_{max}} >100 cm H ₂ O or when Pdet-t _{Q_{max}} >75 cm H ₂ O and Q _{max} <12 (age 46–55) or <9 ml/s (age >55)	LR+ 2.21 LR– 0.45	Moderate
Pannek et al, 1998 [31] Germany	25 TURP, symptomatic uncomplicated BPH, benign histology, 65.8 years	Not stated Neurologic disease, bladder cancer, diabetes, acute urinary tract infection	IPSS, Dan-PSS	Pressure-flow study, suprapubic or 8 Ch transurethral catheter, Urolyn 8000, Wiest Co; AG-diagram, Schäfer grade and Pdet _{Q_{max}} . Clinical outcome	Area under ROC curve <0.65 Correlations	Moderate
Schacterle et al, 1996 [22] USA	134 LUTS, performed urodynamic study, IPSS, flow rate and residual urine, 68.0 years SD 6.6 and 67.6 years SD 10.8	Not stated Neurologic disease	IPSS	MUPP, >9 cm H ₂ O obstructed. Flow rate standing	Obstruction LR+ 1.03 LR– 0.99 Correlation Q _{max} 0.04	Moderate Pearson correlation coefficient
Schou et al, 1993 [49] Denmark	54 Referral for BPH, urodynamic investigation, 38–88 years	4 Diagnosis of other disease than BPH	Dan-PSS	Pressure-flow study, Dantec Urolyn 5500, 3.5 Ch suprapubic catheter, rectal balloon, Abrams-Griffiths diagram	No sign difference	Moderate
Slawin et al, 2006 [48] USA	4 325 3 randomised trials, >50 years, PSA 1.5–10, enlarged prostate, IPSS >7	Not stated Not stated in this paper	IPSS	Acute urinary retention or surgical intervention	Hazard ratio 1.17 ns	Moderate BPH Impact Index better
Steele et al, 2000 [27] USA	204 LUTS, 66.7 years SD 7.5	Not stated Previous therapy for voiding dysfunction, neurological history significant co-morbid disease, history of urethral stricture or prostate cancer	IPSS	Pressure-flow study, 7 Ch transurethral and 8 Ch rectal catheters, visual inspection, ICS classification, slope <2 and Pdetmin <40 unobstructed, Pdet _{Q_{max}}	Correlation 0.18	Moderate Pearson correlation coefficient

Tabellen fortsätter på nästa sida

Tabell 4.10.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	Symptom score	Reference test	Results	Study quality Comments
Taneike et al, 1997 [44] Japan	647 Screening, >55 years	Not stated Prostate cancer or stone, prostatitis	IPSS	TRUS, chair-type scanner, planimetry	Correlation Prostate volume 0.08	Moderate Pearson correlation coefficient
Terris et al, 1998 [45] USA	42 TRUS + biopsy, no BPH, infection or prostate cancer diagnosis	Not stated Androgen and radiation therapy, incomplete data, no consent	IPSS	TRUS, ellipsoid formula, T ² *AP and T ³ used as diameters for PV <80 and >80 ml respectively	Correlation Prostate volume 0.21	Moderate Pearson correlation coefficient
Tsukamoto et al, 2007 [38] Japan	67 LUTS, 2 measurements of prostate volume, 69.5 years SD 6.5	22 Prostate cancer, surgery or hormonal treatment between visits	IPSS	TRUS, Bruel & Kjaer type 2002, ellipsoid formula, Q _{max}	Correlation Prostate volume -0.16 Q _{max} -0.08	Moderate Spearman correlation coefficient
van Venrooij et al, 1995 [29] The Netherlands	211 BPH symptoms, urodynamic study, 45–86 years	4 Not stated	IPSS	Pressure-flow study, 5 Ch transurethral and 14 Ch rectal catheters	Correlation Schäfer grade -0.02	Moderate Pearson correlation coefficient
van Venrooij et al, 1996 [28] The Netherlands	196 LUTS, clinical judgement suggests bladder outlet obstruction, >50 years	Not stated According to International Consensus Committee on BPH, voided volume <150 ml, missing examinations	IPSS	TRUS, prostate volume; Q _{max} ; pressure-flow study, Schäfer grade. TRUS, not described Flow rate, not described Pressure-flow study, 5 Ch transurethral catheter	Correlation Prostate volume 0.03 Q _{max} -0.12 Schäfer grade 0.02	Moderate Pearson correlation coefficient
Yalla et al, 1995 [23] USA	78 Prostatism, urodynamic study, 66.0 years SD 8.9	Not stated Prostate cancer, previous surgery, neurologic disease	IPSS, self-administered, help if needed	Micturitional urethral pressure profile. Obstruction if pressure gradient >0 cm H ₂ O	IPSS >7: LR+ 0.85 LR- infinity IPSS >19: LR+ 0.93 LR- 1.03 Correlation 0.25	Moderate Pearson correlation coefficient

Tabellen fortsätter på nästa sida

Tabell 4.10.2 fortsättning

Author, year, reference, country	Inclusion: Number Criteria	Exclusion: Number Criteria	Symptom score	Reference test	Results	Study quality Comments
Yano et al, 2004 [24] Japan	59 Flow rate suggestive of BPO, prostate volume >20 ml with adenoma, 51–80 years	Not stated Acute or chronic retention, infection, bladder stone, renal impairment, prostate surgery, prostate cancer or other condition interfering with voiding	IPSS	TRUS, not described Flow rate, not described Pressure-flow study, 4.6 Ch transurethral catheter	Correlation Prostate volume 0.26 Q_{max} -0.38 Schäfer grade and AG-number ns	Moderate Spearman correlation coefficient

BPH = benign prostatic hyperplasia; IPSS = international prostate symptom score; MUUP = micturitional urethral pressure profile; PSA = prostate-specific antigen; Q_{max} = maximum flow rate; TRUS = transrectal ultrasound; TUMT = transurethral microwave thermotherapy; TURP = transurethral resection of the prostate; URA = urethral resistance factor