MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA:

PRACTICE VARIATION AND APPROPRIATENESS OF CARE

CIP-GEGEVENS KONINKLIJKE BIBLIOTHEEK, DEN HAAG

Stoevelaar, Herman Johan

Management of benign prostatic hyperplasia: practice variation
and appropriateness of care/Herman Johan Stoevelaar.
Proefschrift Erasmus Universiteit Rotterdam.
Met samenvatting in het Nederlands.
ISBN 90-9009998-0
NUGI 743
Trefw.: benigne prostaathyperplasie; praktijkvariatie; kwaliteit van zorg.

Cover: Frouke Feijen, Leeuwarden
Printed by: Ridderprint, Ridderkerk

MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA: PRACTICE VARIATION AND APPROPRIATENESS OF CARE

DIAGNOSTIEK EN BEHANDELING VAN BENIGNE PROSTAATHYPERPLASIE: PRAKTIJKVARIATIE EN GEPASTE ZORG

Proefschrift

ter verkrijging van de graad van doctor
aan de Erasmus Universiteit Rotterdam
op gezag van de rector magnificus prof.dr P.W.C. Akkermans M.A.
en volgens besluit van het college voor promoties.
De openbare verdediging zal plaatsvinden op
woensdag 27 november 1996 om 11.45 uur

door

Herman Johan Stoevelaar

Geboren te Hengelo (O)

PROMOTIECOMMISSIE

Promotores:	Prof.dr. A.F. Casparie
	Prof.dr. R.A. Janknegt
Overige leden:	Prof.dr. J.P. Mackenbach
	Prof.dr. F.H. Schröder
	Prof. R. van Strik

The studies in this thesis were financially supported by Merck, Sharp & Dohme, Haarlem, The Netherlands.

In memory of my parents

To Clary, Fleur and Julia

PREFACE

In 1991, I took my first research steps in the field of prostatic diseases by contributing to a cost-of-illness study on benign prostatic hyperplasia (BPH). In a fruitful and pleasant cooperation with professor Eddy Van Doorslaer, who supervised this study, and Kees van de Beek, urologist at the University Hospital of Maastricht, I soon became fascinated by the innovational turbulence that characterizes the diagnostic and therapeutic management of this common disease. In the absence of data about how urologists deal with these technological innovations, we made a study proposal in order to gain more insight into the decision making process in daily clinical practice. In our attempts to obtain financial funding for this study, we were lucky to have the unconditional support of Hans Vermeulen. Hans, your faith in our ideas and your efforts to convince others have been decisive for realizing this study.

The multicentre approach we chose carried with it the involvement of a large number of persons, and necessitates 'multiperson' acknowledgements. I will mention them in 'order of appearance'.

Kees van de Beek can be considered as the urological co-parent of this study. Together we worked out the design and data collection strategies, discussed the results, and prepared a number of publications and presentations. Kees, in our discussions on how things would work out, we did not always reach full agreement. Fortunately, we shared the same interest in French wines, and several times our discussions ended in making a bet with the loser forfeiting a nice 'chateau'. Many bottles have been exchanged, and I hope many will follow.

Without exception, the 39 urologists and residents who participated in the study offered complete cooperation in the complex and extensive data collection. The interesting discussions that I had with many of them convinced me of the strong notion of quality of care that exists among urologists, and of their willingness to critically consider their own practice.

At the operational side of data collection, the tremendous efforts of nurses and assistants should be mentioned. With never a word of complaint, you collected the numerous questionnaires and medical records for us. Thanks to all of you.

As the quality of a study depends heavily on the accuracy of the data, the role of data managers is crucial.

Tijs van Bezeij and Eddy Otte, medical students from the universities of Rotterdam and Maastricht respectively, fulfilled this role with great dedication and good sense for local circumstances. Tijs and Eddy, thanks to your exertions, we had the availability of a very clean and complete database.

The contributions of the people for whom this study is intended can only be acknowledged in anonimity. Thanks to the 1414 patients for their time and willingness to complete the long questionnaires, which had often to be done under less than ideal circumstances.

As the scope of our studies had changed from technology assessment to quality of care, professor Ton Casparie took over the task as supervisor. Ton, your excellence in the field of practice variation and appropriateness assessment helped me to discover the relationship between the various elements of our study, which has certainly improved the 'internal consistency' of this thesis. Additionally, you put your finger on the many major and minor blots of the draft versions, thereby saving me from potential embarrassment.

The particular urological issues in this thesis were guarded by professor Ruud Janknegt from the University Hospital of Maastricht. Ruud, I appreciate that you were always prepared to elucidate the complex pathofysiological and urodynamic aspects of BPH.

The translation of raw data into meaningful information necessitated the involvement of a number of experts, of whom I would like to mention three persons in particular.

When I asked Joseph McDonnell, statistician, to help me with 'some' statistical analyses, I had no idea that this would be the start of a unique collaboration and friendship. Joseph, at the beginning I had some problems in understanding your comments and advices. When I asked whether something was yes or no, many times you answered 'how long is a piece of string?' Retrospectively, this comment has been invaluable for my understanding of the caveats associated with the statistical analysis of data. In addition, the way in which we together worked out the various analyses makes the expression statistical 'support' to an understatement. Your thorough insights and creativity strongly determined the analytical course of our studies. Finally, your endless patience in correcting my English not only confirms the unique opportunity of having a native speaker colleague, but also that of having good friends.

The suggestions of Dr. Huub Nijs significantly contributed to the solution of a number of problems in the field of clinical epidemiology. Huub, our discussions were not only very fruitful, but also very agreeable, not in the last place because they often ended in reflections about our common passion, music.

Of all 'informal' help I experienced from my colleagues of the 'third floor', the efforts of Maiwenn Al, mathematician, should be mentioned in particular. Maiwenn, I could not only always make an appeal on your knowledge in complex mathematical issues, you also found the time to help me with software problems and graphical matters.

With regard to to the finishing touch of this book I am indebted to Frouke Feijen for designing the beautiful cover and to Ronald Kouwenhoven who took care of the printing.

The last phase of finishing this thesis was overshadowed by the death of my mother. Although the indescribable, empty feeling of now missing both parents remains, I gratefully remember the warmth, affection and understanding that I received from both of you, and which has formed the basis of what I am and what I have achieved. I am sure you would have been proud of me.

Clary, your being a nurse facilitated to talk about my research, and helped me to better understand the nature of daily clinical practice. Far more important, you were always there when I needed you most.

Our little daughters Fleur and Julia are gifted with the characteristics, most essential for being a scientist: curiosity, creativity, and the ability to be fascinated by every detail of daily life. I hope I have learned a lot from both of you.

Oudewater, September 30th, 1996

CONTENTS

CHAPTER 1

INTRODUCTION

The prostate: a small but troublesome organ

Many elderly men will wistfully remember the days that their voiding pattern was like that of the boy on the cover. As age increases, many physical changes take place, often resulting in the appearance of more or less significant health problems or 'inconveniences of old age'. Voiding dysfunction is a typical problem of elderly men. In many cases, this has its cause in a small but sometimes very troublesome organ: the prostate. The prostate gland is situated under the bladder, surrounding the proximal part of the urethra (see figure 1). A normal adult prostate is about the size and shape of a chestnut, and weighs about twenty grammes.[1] Its exact function is unclear. Although the prostatic secretion, discharged into the urethra during ejaculation, has been thought to have some role in sustaining the sperm and to facilitate its passage into the uterus,[2] it has been proven not to be essential for the fertilization process.[3]

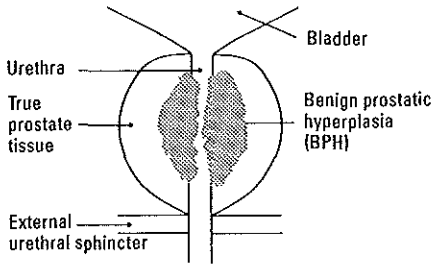


Figure 1 - Prostate containing hyperplastic tissue.

The majority of the voiding problems in elderly men is due to benign prostatic hyperplasia (BPH), a nonmalignant enlargement of the central part of the prostate. Basically, BPH refers to a histological change of prostatic tissue, consisting of the proliferation of small nodules.[4] As was demonstrated in various autopsy studies, this histopathological (microscopic) condition is very common in elderly males, varying from 32-52% in the age group of 51-60 years to 77-99% in men of 81 years and older.[1]

About half of the men with microscopic hyperplasia develop macroscopic enlargement of the prostate.[5] As a result of its anatomical location, an enlargement of the central part of the prostate may cause pressure on the urethra, resulting in an increased resistance to urinary flow. This outflow obstruction can lead to a variety of urinary symptoms and other clinical manifestations such as urinary tract infections, acute urinary retention, bladder stones and renal failure. The causes of BPH are largely unknown. The only conditions that have been proved to predetermine the development of BPH are the presence of normal functioning testes and advancing age. Several theories have been postulated about the pathogenesis of BPH, the preliminary empirical derivates of which suggest that BPH results from a complex interaction of hormonal and non-hormonal factors.[6]

Clinical manifestions of BPH

Although for many decades, the sequence prostate enlargement -> outflow obstruction -> symptoms has been the basis for treatment of micturition problems in elderly men, the relationship between these three conditions is ambiguous. Figure 2 illustrates this relationship, as described by Hald (1989).[7] The overlapping circles indicate that the three conditions may occur independently or may coexist. Prostatic enlargement does not necessarily lead to urinary symptoms. It is estimated that about half of the men with prostate enlargement will develop symptoms.[5] However, these symptoms, often referred to as 'prostatism', are not specific for prostatic obstruction, and could also be due to other diseases of the lower urinary tract.[8-13]

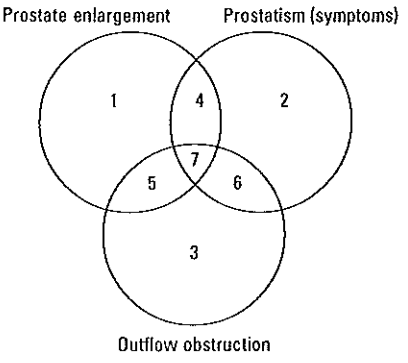


Figure 2 - Relationship between the main aspects of clinical BPH after Hald (1989).[7]

The relationship between outflow obstruction (a physiologic condition determined by the extent of urethral resistance) and prostatic enlargement is also ambiguous. Men with small prostates could be severely obstructed, whereas obstruction can be totally absent in men with very large prostates. Probably, this can be explained by the fact that obstruction is not only caused by prostatic enlargement (static component), but could also be due to a dynamic component (adrenerg innervation of the muscular part of the prostate).[14] In addition, there are several other concurrent causes of bladder outflow obstruction such as urethral stricture and bladder neck sclerosis. Although occuring less frequently, there are patients with prostate enlargement and physiologic obstruction but without symptoms ('silent' BPH).[15-22] Besides urinary symptoms and outflow obstruction, there are several other clinical manifestations of BPH. An often traumatic experience is the occurrence of acute urinary retention, the total inability to void, which requires immediate intervention (catheterisation). From a recent Dutch multicentre study, it was estimated that about 12-18% of all patients who had been referred to the department of urology for BPH, presented with this condition.[23] Other complications secondary to BPH, mostly developing over a long period, are recurrent urinary tract infections, bladder decompensation, bladder stones and renal failure.

Many studies have shown that there are no or only poor correlations between the three most important properties of BPH (prostate volume, symptoms and extent of physiologic outflow obstruction), both for clinical populations[24-29] and community-based samples.[30-31] In general, the diagnosis of clinical BPH is based on the coexistence of these factors. However, it has been supposed that only a minority of the patients who are treated with a clinical diagnosis of BPH, as made by physicians in daily practice, fullfil all three criteria.[32] Because there is no commonly accepted definition of clinical BPH, it is not possible to establish general prevalence figures. Several studies have focused on different (combinations of) aspects of BPH, the results of which will be discussed in the next section.

Prevalence of symptomatic BPH

Since the clinical importance of BPH stems mainly from the micturition problems it could cause, most of research in this field take symptomatology as a starting point. Over the last decade, many studies have been dedicated to the community-based prevalence of BPH-related symptoms.

In most studies, symptomatology is measured using questionnaires about the existence of particular voiding problems. In general, a division is made between obstructive symptoms (e.g. weak urinary stream, sensation of incomplete emptying of the bladder and postvoid dribbling) and irritative symptoms such as an increased frequency of voiding and a suddenly emerging urgent desire to void. Due to differences in the questionnaires used, the results of the earlier studies are hardly comparable. In order to enable uniform measurements, the American Urological Association developed and validated a symptom questionnaire[33] that was accepted as the International Prostate Symptom Score (IPSS) at the first World Health Organization Consultation on BPH (Paris, 1991).[34] The IPSS consists of 7 questions about the presence of both irritative and obstructive symptoms, on the basis of which a symptom score can be calcultated (range 0-35). The total scores are divided into three categories: mild (0-7), (moderate (8-19), and severe (≥ 20).

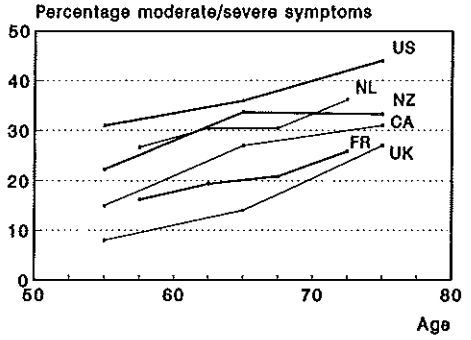


Figure 3 - Prevalence of moderate to severe symptoms in community-based samples in the United States[35] (US), The Netherlands[30 (NL)], New Zealand[36] (NZ), Canada[37] (CA), France[38] (FR), and the United Kingdom[39] (UK).

Figure 3 gives an overview of the community-based prevalence figures for moderate to severe symptoms from studies that use approximately the same instruments, and from which comparable figures have been published. The prevalence figures vary from about 10-30% for men between 50-60 years of age to 25-45% in the age group of 70-80 years. It is difficult to say whether the considerable variation between the countries reflect real differences in symptom levels or are due to differences in the composition of the respective study populations. In addition, it is also likely that cultural factors influence the perception of symptoms and/or answer categories.

Although all studies show that the prevalence of BPH-related symptomatology increases with age, its natural course shows considerable variation. In longitudinal follow-up studies (periods varying between 1 and 5 years), on average 25% of the men reported worsening of their symptoms, wereas 50% remained stable and 25% reported spontaneous improvement.[40-44] As mentioned in the previous section, the symptoms on which the indexes are based are not specific for BPH. The diagnosis of clinical BPH needs to be confirmed by other manifestations of the disease of which the existence of prostate enlargement and signs of prostatic obstruction are the most important ones. Enlargement of the prostate can be assessed by digital rectal examination (DRE) or, more accurately, by transrectal ultrasonography (TRUS). Bladder outflow obstruction (BOO), whether or not due to prostatic enlargement, can be determined by pressure-flow studies.[45] While this diagnostic test is fairly invasive, it is not suitable for use in community-based research. The second best procedure is the assessment of the maximum flow rate (Q_{max}, expressed in ml/s) by uroflowmetry, a non-invasive and relatively simple test that also can be used in non-clinical settings. However, a decreased maximum flow rate can be used only as a rough indication of voiding dysfunction due to prostatic enlargement. In general, a flow rate < 10 ml/s is considered as a strong indication for the existence of outflow obstruction, whereas a flow rate > 15 ml/s is highly suggestive for the absence of this condition.[46] Table 1 gives an overview of the results of various studies on the community-based prevalence of BPH-related properties, using different combinations and cut-off points. Almost all combinations show an age-dependent component, and the inclusion of more criteria leads to lower prevalence figures. Nevertheless, large differences exist between the results of studies that use approximately the same criteria. It is not clear whether this is to be ascribed to differences between populations or to methodologic issues.

Prevalence of treated BPH

For many decades, surgery has been the most important treatment for BPH. In most cases, resection of obstructive prostatic tissue is performed by a transurethral procedure (TURP). For patients with large prostates, a transabdominal approach is indicated. In many western countries, prostatectomy is one of the most frequently performed operations in elderly males, and is associated with considerable health care expenditures.

Table 1 - Overview of the community-based prevalence (percentages by age group) of clinical BPH from studies using different criteria.

Country and year of publication	Criteria			Age-groups									
	Symptoms[a]	Prostate enlargement[b]	Obstruction/ poor flow[c]	40	45	50	55	60	65	70	75	80	85
United States (1990)[47]	Symptomatic, not specified	DRE positive (size not specified)			27		50		69		79		85
The Netherlands (1995)[48]	IPSS > 7	TRUS > 30						10	22	22	28		
United States (1993)[49]			Q_{max} < 15		24	26	30	43	45	50	58	69	
			Q_{max} < 10		6	5	6	12	21	22	29	35	
United Kingdom (1994)[50]	Maine score > 11		Q_{max} < 15		18		21		40		50		
Scotland (1991)[51]	Symptom score (Fowler) > 11[d]	TRUS > 20	Q_{max} < 15[d]		14		24		43		40		
The Netherlands (1995)[48]	IPSS > 7	TRUS > 30	Qmax < 15					9	20	19	27		
	IPSS > 7	TRUS > 30	Qmax < 10					6	16	14	17		

[a] Different questionnaires were used; IPSS = International Prostate Symptom Score; the values mentioned indicate roughly the existence of moderate to severe symptoms.

[b] Prostatic enlargement assessed by either digital rectal examination (DRE) or transrectal ultrasonography (TRUS); weights/weights in grammes or cm^3 (roughly similar).

[c] Outflow obstruction/poor flow determined by uroflowmetry. Values represent peakflow in ml/s.

[d] One of these criteria (in the presence of prostate enlargement) was sufficient for the diagnosis of BPH

For the Netherlands, the total direct health care costs for BPH in 1989 were estimated at about 124 million guilders, of which approximately 90% concerned surgical treatment.[52] Figure 4 shows the age-specific surgery rates for BPH in the Netherlands for 1992.

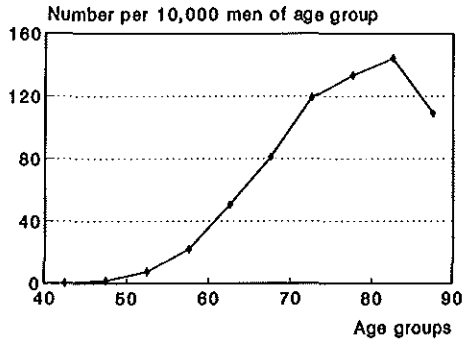
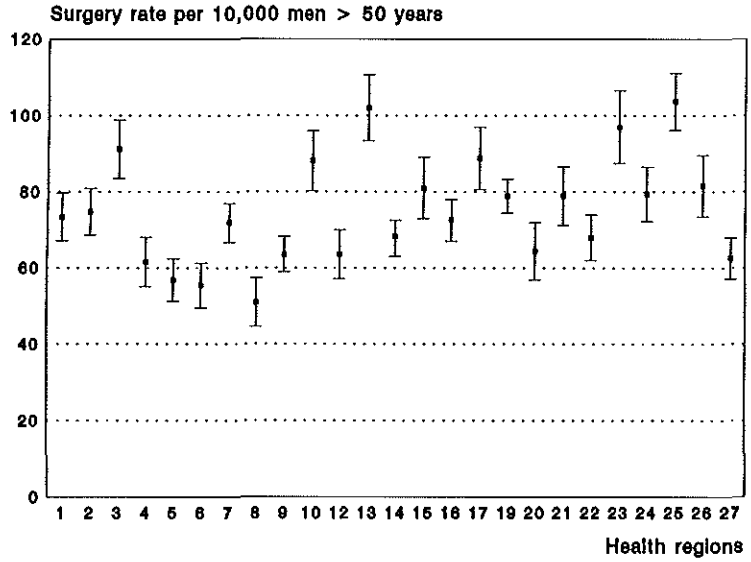


Figure 4 - Age-specific rates for BPH surgery, the Netherlands, 1992. Calculated on the basis of data of the national register of hospital admissions (SIG)[53] and demographic data of the Central Office for Statistics (CBS).[54]

Under the age of 50 years, surgery for BPH is rare. For older men, the rates steadily increase till the age of 85. The lower rate in men aged 85 years and older is probably due to contraindications for surgery, resulting from the large comorbidity within this group. Based on these figures, the probability that a 40-year old man with an average life expectancy (75 years), will undergo surgery for BPH can be estimated as being approximately 20 percent. Several studies have shown considerable differences in the age-adjusted rates for prostatectomy not only between countries, but also between small areas within individual countries.[55-65] Large variations were also found in surgery rates between small areas in the Netherlands (see figure 5). It has been argued that the variability in surgery rate is associated with uncertainty and lack of consensus concerning the indications for prostatectomy, rather than to differences in the organization and financing of health care.[57, 66] Other factors that probably co-determine surgery rates are the help-seeking behaviour of men with urinary symptoms, which has been demonstrated to be associated with the degree of bothersomeness and worry (irrespective of the symptom severity),[67-68] as well as with socio-economic class[67] and cultural/educational backgrounds.[36] However, the explanations for the large variations in surgery for BPH are far from conclusive.

Figure 5 - Variaton in surgery rates for BPH between health regions; the Netherlands, 1992. The division in 27 health regions is used for hospital planning purposes. Some of the regions represent an entire province, other large cities. Because of small numbers of operations, regions 10 and 11, and 17 and 18 have been taken together.
Rates per 10,000 male residents ≥ 50 years, and confidence intervals, based on the Poisson distribution. Surgery data derived from the national register of hospital admissions (SIG)[53] and demographic data from the Central Office for Statistics (CBS).[54]



To some extent variability of the indication for surgery is also reflected in the time trends for prostatectomy (see figure 6). From 1972 to 1982, the total rate substantially increased, a phenomenon that is also seen in most other western countries,[63, 69] due almost entirely to the diffusion of TURP. In the same period, this procedure has become much safer. Between 1972 and 1992, the in-hospital mortality dropped from 2.4 to 0.5 percent.[70] But since TURP has become more widespread, it is also conceivable that the proportion of less severe cases has increased, reducing the mortality: the less risky the operation, the broader the indication. In addition, the mean length of hospital stay has declined steadily during this period, both for TURP (22 days in 1972, 10 days in 1992) and for open prostatectomy (29 versus 13 days).[70]

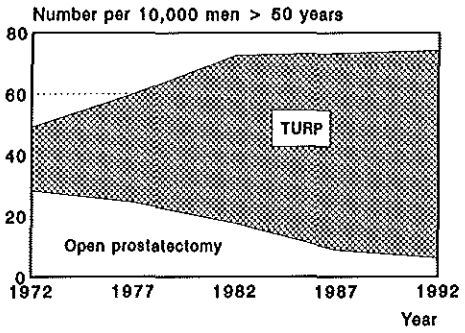


Figure 6 - Development in the rate of prostatectomy; the Netherlands, 1972-1992. Patient data derived from the national register of hospital admissions (SIG)[70] and demographic data from the Central Office for Statistics (CBS).[71]

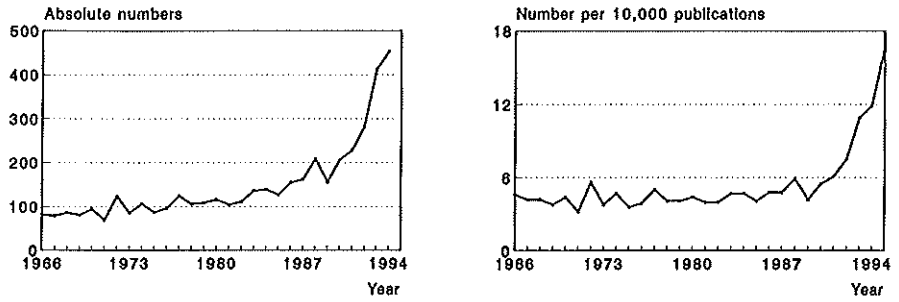
Although there are several other factors that have contributed to the reduction of the duration of hospital stay (e.g. changed medical opinions and financial incentives for hospitals such as prospective budgeting),[72] this is also associated with improvements in operation techniques and peri-operative care, probably resulting in a broader indication for surgery. From 1982 to 1992, a stabilization of the surgery rate can be seen, maybe due to 'market saturation'. Studies from other countries show a steady decrease in the surgery rates since about 1987, which is assumed to be associated with the increasing availability of alternative treatments or changes in treatment preferences of patients and physicians.[69, 73] Probably, these developments are the prelude of a new era in the management of BPH.

Developments in the management of BPH

Over the last few years, a remarkable interest in diseases of the prostate can be noticed. Much attention has been paid to prostatic diseases on television, some countries organized a special week of the prostate, patient organizations have been funded, and even a special telephone information service was established. The growing attention is also present in the scientific literature. When reviewing the MEDLINE data for BPH, we can see a rapid increase, both absolute and relative, in the number of journal articles that focus on this disease (see figure 7).

The growing public and scientific interest can be explained by several factors. Firstly, demographic changes reveal an increase in the absolute number of men afflicted by prostate diseases. Secondly, socio-cultural developments have created a more open climate to discuss voiding problems, and have led to lower acceptance of these problems as a normal part of ageing.

Figure 7 - Development of the number of journal articles which focus on BPH, retrieved from MEDLINE; absolute numbers (left) and number per 10.000 articles (right)



Subsequently, this could have resulted in lower barriers to seek medical help. But probably the most important explanation lies in the development of many new diagnostic and therapeutic technologies that have been introduced over the last 10-15 years. Before 1980, the only diagnostic tools available for the evaluation of elderly men with urinary symptoms consisted of the patient's medical history, physical examination (including digital rectal examination), and urinalysis. Blood tests, cystoscopy and radiography were complementary used to detect renal and bladder damage, and to rule out concurrent diagnoses. After making the diagnosis of clinical BPH, treatment choice concerned only one question: whether or not to operate. This situation has been stable for many decades. As is shown in table 2, there has been an explosion of innovations after 1980, both in the field of diagnostics and therapy. Most diagnostic innovations have been introduced during the eighties, whereas new treatments emerged after 1990.

With respect to diagnostics, the major changes stem from developments in the field of ultrasonography and urodynamics. Transabdominal and transrectal ultrasonography have improved the morphologic assessment of bladder and prostate. In addition, they enable the accurate measurement of the postvoid urine volume (PVR) in a simple and non-invasive way. Kidney ultrasonography has replaced the radiographical imaging of the upper urinary tract (intravenous urography) as a means to detect renal damage (dilation) secondary to BPH. Uroflowmetry, a diagnostic test that records the force of the urinary stream during voiding, has become a routine procedure for men presenting with signs and symptoms of BPH.

Table 2 - Overview of the introduction of conventional and new diagnostic and therapeutic technologies for BPH.

	Diagnostics	Therapy
Before 1980	Medical history Physical examination Digital rectal examination Blood tests (creatinine) Urinalysis Cystoscopy Radiography	Transurethral resection of the prostate (TURP) Open prostatectomy
1980-1990	Kidney ultrasonography Bladder ultrasonography Prostate ultrasonography Uroflowmetry Pressure-flow studies Blood tests (PSA) Flexible cystoscopy	Transurethral incision of the prostate (TUIP)
After 1990	Standardized symptom scores	Medication: . α-blockers . 5-α-reductase-inhibitors Balloon dilation Urethral stents Microwave therapy: . hyperthermia . thermotherapy Laser prostatectomy Ultrasound therapy Transurethral needle ablation Electrovaporization Watchful waiting

Whereas this test, if properly performed, is believed to be an excellent means in discriminating normal and abnormal voiding,[45] it is not suitable to identify the existence of bladder outflow obstruction. To this end, another type of urodynamic investigation has been developed, namely pressure-flow studies. Because of its invasiveness, this test is not used as a routine procedure.

Although testing for prostate-specific antigen (PSA) is meant for the diagnosing of prostate cancer, it has become a routine procedure in elderly men with voiding problems. Technical improvement of cystoscopy (development of flexible scopes) has contributed to reduce pain and discomfort for patients undergoing this procedure. Standardized symptom scores, of which the American Urological Symptom Index has been accepted as the international standard questionnaire (IPSS),[33] are more and more used in clinical practice, particularly to monitor the course of symptoms following treatment.

Extension of the therapeutical arsenal mainly took place after 1990. The only alternative treatment which was introduced in the period 1980-1990 was transurethral incision of the prostate (TUIP). Although this surgical technique, consisting of incision of the prostate capsule without the removal of tissue, has been described before 1980 as an alternative for TURP in patients with small prostates,[74] its establishment in daily practice started between 1985 and 1990, after the publication of some comparative studies.[76-77] After 1990, especially the introduction of two types of medical therapies, namely α-blockers and 5-α-reductase-inhibitors, have received much attention. These two types of medication affect different aspects of prostatic obstruction. Whereas α-blockers relax the bladder neck and prostate smooth muscle (dynamic component), 5-α-reductase-inhibitors are intended to reduce the prostate volume (static component).

Besides medication, a number of so-called minimally invasive technologies have been introduced, for many of which the effectiveness and indication are far from conclusive. Most of these technologies were orginally developed in other medical disciplines (e.g. stents, balloon dilation), and it seems that almost all technical medical findings of the last decade have been tried out for BPH. Thus, we can speak of a strong technology push in this respect. Finally, watchful waiting can be mentioned as a new therapeutic option. It differs from the conventional choice of 'doing nothing' in the sense that new diagnostic tools enable to accurately monitor the course of BPH in patients without active intervention. As part of the development of practice guidelines for BPH, McConnell et al (1994)[78] conducted a comprehensive meta-analysis on the results of evaluation studies for several types of treatment. On the basis of this analysis a balance sheet was constructed (see table 3) which gives an overview of the potential benefits and risks of the treatment options for which sufficient scientific evidence was available.

Table 3 - Balance sheet for treatment outcomes, based on metanalysis.[78]

Direct treatment outcomes		Surgical options			Nonsurgical options		
	Balloon dilation	TUIP	Open surgery	TURP	Watchful waiting	α-blockers	Finasteride
1. Chance for improvement of symptoms (90% CI)	37-76%	78-83%	94-99.8%	75-96%	31-55%	59-86%	54-78%
2. Degree of symptom improvement (% reduction in symptom score)	51%	73%	79%	85%	Unknown	51%	31%
3. Morbidity/complications associated with surgical or medical treatment (90% CI), about 20% of all complications assumed to be significant	1.8-9.9%	2.2-33.3%	7.0-42.7%	5.2-30.7%	1-5% complications from BPH progression	2.9-43.3%	13.6-18.8%
4. Chance of dying within 30-90 days of treatment (90% CI)	0.7-9.8% (high-risk/ elderly patients)	0.2-1.5%	1.0-4.6%	0.5-3.3%	0.8% chance of death ≤ 90 days for 67-year old man		
5. Risk of total urinary incontinence (90% CI)	Unknown	0.06-1.1%	0.3-0.7%	0.7-1.4%	Incontinence associated with ageing		
6. Need for operative treatment for surgical complications in future (90% CI)	Unknown	1.3-2.7%	0.6-14.1%	0.7-10.1%	0		
7. Risk of impotence (90% CI)	No longterm follow-up available	3.9-24.5%	4.7-39.2%	3.3-34.8%	About 2% of men age 67 become impotent per year.Long-term data on α-blockers are not available.		2.5-5.3% (also decreased volume of ejaculate
8. Risk of retrograde ejaculation (% of patients)	Unknown	6-55%	36-95%	25-99%	0	4-11%	0
9. Loss of work time (days)	4	7-21	21-28	7-21	1	3.5	1.5
10. Hospital stay (days)	1	1-3	5-10	3-5	0	0	0

Overall, the surgical options reveal the best results regarding symptom improvement, but are also associated with a higher rate of complications than nonsurgical treatments. Except for some absolute indications for surgery (e.g. refractory urinary retention and the presence of bladder stones), no hard criteria exist for the choice between the various treatment modalities. The guidelines recommend watchful waiting for patients with mild symptoms and without complications, whereas for other patients treatment should be chosen on the basis of physicians' opinions and patients' preferences.[78]

Management of BPH in urological practice: making decisions in a dynamic scientific environment

The availability of new diagnostic tools and therapeutic options have considerably changed the daily routine for BPH-patients in urological practice. Though extension and refinement of diagnostics aim to facilitate and to optimize the diagnosis making process, and though the development of new therapies should enable more adequate treatment choices for different groups of BPH-patients, the explosion of technologies also carries the risk of uncontrolled diffusion and inappropriate application. As a consequence, large differences may arise in the quality of care between institutions or individual providers. For urologists in daily practice, it is not easy to keep abreast of the current state of science, and to translate its findings to their particular patient populations. On average, one article per day on BPH is published, with results and conclusions often contradicting those of other papers. This tremendous amount of information considerably enlarged the 'arena of uncertainty', of which John Wennberg spoke about in 1988 in reference to the indications for prostatectomy.[66] In a recent editorial of the Journal of Urology, McConnell illustrated the professional confusion with an anecdote about a postgraduate course on BPH, at the end of which a urologist stood up 'to state courageously that he believed that he knew less at the completion of the course than he did at the beginning'.[79]

In order to enhance appropriate care for BPH (i.e. according to scientific insights), several organizations have published practice guidelines and recommendations on the diagnostic evaluation and treatment choice.[78, 80-82] However, these guidelines are not automatically adopted by local physicians.

Barriers related to the characteristics of doctors (knowledge, skills, attitude) and worksetting (opinions of colleagues, practice organization, financial resources) do impede the translation of guidelines into day-to-day practice.[83]

Currently, little is known about this day-to-day management of BPH in urological practice. Are there differences in practice patterns, and if so, do these differences reflect variations in quality of care (e.g. underuse or overuse of particular facilities or procedures)? What are the determinants of differences between practice patterns? How should we handle undesirable practice variations?

This thesis rises to the challenge of answering these questions. The principal concepts upon which it is based are practice variation and appropriateness of care. These concepts will be discussed in the next section.

Practice variation and appropriateness of care

Over the last few decades, several studies have documented large differences in the rates of use of medical services at different levels (countries, small areas, institutions, individual providers). Various terms have been used for these differences, such as geographic variation, small area variation and practice variation, generally indicating the level of measurement. It has been argued that these variations could be indicative for the inappropriate use of services. In areas or institutions with relatively high utilization rates, people may be undergoing unnecessary treatment (overuse), while in that with low rates, people will probably not receive sufficient care to meet their health needs (underuse).[84] However, there are several problems in drawing such inferences.

- Firstly, differences in utilization may be influenced by various factors which are dependent on the level of measurement. For example, whereas differences in health care systems or in populations (e.g. morbidity) could explain the variations between countries or regions, at the micro-level the variation is more likely to be associated with differences in attitudes or opinions between individual providers.[85] Although the majority of the variation studies concern analyses at more aggregate levels (countries, regions, provinces), it has been postulated that differences in 'practice style' (micro-level), are the dominant cause of variation in health care utilization.[59]

According to Wennberg, these practice styles refer to 'clinical decision rules held idiosyncratically by individual physicians [not] based on reasonably well-tested hypotheses concerning outcomes of care'.[86] In his view, differences in these decision rules stem from professional uncertainty and lack of consensus on the diagnosis and treatment of many medical conditions.[59] Wennberg considered these findings as an indirect proof of the inappropriate provision of care, due to professional uncertainty at the micro-level, and he stressed the importance of more informed clinical decision making, the development of guidelines and standards, and better undergraduate and postgraduate education.[87]

However, the relationship between health care utilization and physicians' practice style is still hypothetical. In most studies, the conclusion about practice style was based on residual inference: after correcting for the influence of other potential determinants (e.g. patient case-mix, number of physicians, facilities available), the remaining unexplained share of the variation was attributed to differences in practice style. Thus, the evidence is only indirect, and there could be several other (not measured) variables that explain the variation. By nature, practice style is a micro phenomenon for which there are no satisfactory proxys at aggregate levels (regions, provinces, small areas). In order to affirm or reject the practice style hypothesis, studies at the microlevel (individual practices) are needed,[88] taking into account all the potential determinants of variation (both patient and physician characteristics).

- Secondly, even if the practice style hypothesis is true, the question arises as to whether variations in practice patterns between individual providers indicate differences in quality of care. This question touches the issue of appropriateness assessment. There have been developed several methods to assess the appropriateness of care, of which that of the Rand Corporation is most well-known. In this method, the use of a particular procedure is defined as appropriate after balancing its benefits and risks in comparison with other procedures, or with doing nothing. Expert panel consensus techniques are used to assess the appropriateness of particular procedures for different indications.[89] Other methods of appropriateness assessment have gained also increasing interest in the last few years, such as those of the Cochrane Collaboration[90] and the United States Agency for Health Care Policy and Research (AHCPR).[91]

In the Cochrane Collaboration, scientists from all over the world cooperate to provide comprehensive overviews of the effectiveness of several diagnostic procedures and treatments, based on a systematic review of the literature and meta-analysis ('evidence-based medicine'). These systematic reviews are periodically updated, and their availability on computer disc and via Internet enables the easy access of the 'actual state state of science'.
In the AHCPR approach, systematic literature review and meta-analysis are also used to define appropriate care (balance of benefits and risks) in a particular field. The results of these analyses are then used in the development of practice guidelines. As mentioned in the previous section, the AHCPR has also published guidelines on the management of BPH.[78] To our knowledge, no studies have been performed to evaluate whether current practice is in accordance with the AHCPR guideline statements.
Although many studies have been undertaken on appropriateness assessment, the relationship between appropriateness of care and practice variation is largely unknown. In the few studies that have explicitly paid attention to this issue, no evidence was found that suggests that differences in appropriateness rates explain variations in use. However, several methodological problems, both with regard to variation analysis and the assessment of appropriateness, prevent definitive conclusions about the relationship between these entities. Particularly, the sensitivity of instruments currently used to detect inappropriateness of care, is debatable.[85]
o Finally, many studies have taken particular medical or surgical procedures as the starting point to analyze differences in utilization. This method does not allow the detection of potential underuse or substitution with other diagnostic or therapeutic procedures.[85] Because different treatments can be rather similar with regard to benefits and risks, focusing on one procedure or treatment can be misleading. Particularly in the field of BPH, for which many new technologies have become available, it is therefore necessary to take the clinical problem as the basis of variation analysis.
In the previous section, we hypothesized that the rapid technological changes in the field of BPH may have led to a diversity in practice patterns, probably associated with differences in quality of care. The above-mentioned findings about practice variation and appropriateness of care have made clear that analyses at an aggregate level (e.g. regional) are not suitable to investigate this hypothesis.

This thesis therefore takes the microlevel of individual urologists as a starting point to examine practice variation and appropriateness of care in the day-to-day management of BPH in urological care.

Aims and design of this study

As current insights in practice variation and appropriateness of care do not allow a comprehensive a priori study design, we chose an incremental approach of several substudies, for which the aims of each study are determined by the results of the preceding one. The central study aims are:

- To describe current management of BPH in daily urological practice.
- To examine the extent of practice variation and its determinants.
- To explore the relationship between practice variation and appropriateness of care.
- To identify the pathways that can lead to a reduction of undesirable practice variation.

We started with a prospective multicentre study which aimed to document current management for BPH in urological practice, and to examine the extent of practice variation and the determinants of the variation. For both the diagnostic evaluation (chapter 2) and treatment choice (chapter 6), a considerable extent of practice variation was found, which was associated not only with characteristics of patients, but also with background variables of the providers (type of hospital, urologist's experience). Because the latter were assumed to indicate differences in opinions between providers, additional studies were undertaken to gain insight into the existing ideas about diagnostics and treatment choice for BPH.
Firstly, a panel study was undertaken to determine the extent of agreement about treatment choice in randomly selected cases of BPH (chapter 7). This study showed not only very divergent treatment choices for similar cases, but also indicated that considerable differences exist in opinions about the appropriate diagnostic work-up for patients with BPH. We then inventarized the particular opinions about the appropriate diagnostic work-up (chapter 3) and preferences for treatment choice (chapter 8) within the group of urologists who were involved in the multicentre study, and subsequently related these ideas to their actual practice decisions.

The very strong relationship which was found to exist between opinions and preferences on the one hand and actual practice behaviour on the other hand, points to consistency between thinking and doing. In order to gain insight into the scientific validity of the ideas reported, thereby indirectly assessing the appropriateness of the clinical decisions, we compared these ideas with currently available practice guidelines and recommendations (chapters 9 and 10). In addition, after feedback of individual versus group data, the urologists involved were asked to give their opinions about practice variation and appropriateness of current management of BPH, as well as about the necessity for (further) consensus development (chapter 11).

The empirical part of this thesis also contains the results of two side-studies which focus on specific aspects of practice variation, namely variation in defining BPH (chapter 4) and variation in the interpretation of diagnostic outcomes (chapter 5). In chapter 12, a quality improvement model for the management of BPH is proposed, the application of which can be used to reduce inappropriate practice variation. This continuous program aims to adjust daily clinical practice for the dynamics of science on a structured and permanent basis.

For reasons of clarity, the study results are grouped into three parts. Part I (chapters 2-5) concerns the studies about variation in the diagnostic evaluation of BPH. In part II (chapters 6-8), the results about differences in treatment choice are presented. Part III focuses on the assessment of appropriateness of current practice and on the methods to reduce undesirable practice variation (chapters 9-12).

REFERENCES

1. Berry SJ, Coffey DS, Walsh PC, Ewing LL. The development of human benign prostatic hyperplasia with age. J Urol 1984;132:474-9.
2. Hamand J. Prostate problems. London: Thorsons, 1991.
3. Coffey DS. The molecular biology, endocrinology, and physiology of the prostate and seminal vesicles. In: Walsh PC, Retik AB, Stamey TA, Vaughan ED jr, eds. Campbell's Urology, 6th ed. Philadelphia: Saunders Company, 1992.
4. McNeal JE. Origin and evolution of benign prostatic enlargement. Invest Urology 1978;15:340-5.
5. Isaacs JT, Coffey DS. Etiology and disease process of benign prostatic hyperplasia. Prostate 1989;2(suppl):33-50.

6. Bosch JLHR. Epidemiological and pathophysiological aspects of benign prostatic hyperplasia. Chapter 1: the pathogenesis of benign prostatic hyperplasia. PhD thesis. Rotterdam: Erasmus University, 1995.
7. Hald T. Urodynamics in benign prostatic hyperplasia: a survey. Prostate 1989;2(suppl):69-77.
8. Chancellor MB, Rivas DA, Keeley FX, Lotfi MA, Gomella LG. Similarity of the American Urological Association symptom index among men with benign prostate hyperplasia (BPH), urethral obstruction not due to BPH and detrusor hyperreflexia without outlet obstruction. Br J Urol 1994;74:200-3.
9. Chai TC, Belville WD, McGuire EJ, Nyquist L. Specificity of the American Urological Association voiding symptom index: comparison of unselected and selected samples of both sexes. J Urol 1993;150:1710-3.
10. Chancellor MB, Rivas DA. American Urological Association symptom index for women with voiding symptoms: lack of index specificity for benign prostate hyperplasia. J Urol 1993;150:1706-8.
11. Lepor H, Machi G. Comparison of AUA symptom index in unselected males and females between fifty-five and seventy-nine years of age. Urology 1993;42:36-40.
12. Yalla SV, Sullivan MP, Lecamwasam HS, DuBeau CE, Vickers MA, Cravalho EG. Correlation of American Urological Association symptom index with obstructive and nonobstructive prostatism. J Urol 1995;153:674-80.
13. Stoevelaar HJ, Van de Beek C, Nijs HGT, Casparie AF, McDonnell J, Janknegt RA. The symptom questionnaire for benign prostatic hyperplasia: an ambiguous indicator for an ambiguous disease. Br J Urol 1996;77:181-5.
14. Janknegt RA, Rollema HJ, Beek C van de. Urodynamic studies necessary for correct diagnosis in prostatism (in Dutch). Ned Tijdschr Geneeskd 1994; 138:1751-6.
15. Mukamel E, Nissenkorn I, Boner G, Servadio C. Occult progressive renal damage in the elderly male due to benign prostatic hypertrophy. J Am Geriatr Soc 1979;27:403-6.
16. Powell PH, Smith PJB, Feneley RCL. The identification of patients at risk from acute retention. Br J Urol 1980;52:520-2.
17. George NJR, Feneley RCL, Roberts JBM. Identification of the poor risk patient with prostatism and detrusor failure. Br J Urol 1986;58:290-5.
18. Nissenkorn I, Savion M, Servadio C. Renal and bladder function recovery after prostatectomy in patients with a chronic residual urine above 1,000 ml. Eur Urol 1988;14:434-6.
19. Parys BT, Machin DG, Woolfenden KA, Parsons KF. Chronic urinary retention - a sensory problem? Br J Urol 1988;62:546-9.
20. Sacks SH, Aparicio SA, Bevan A, Oliver DO, Will EJ, Davison AM. Late renal failure due to prostatic outflow obstruction: a preventable disease. BMJ 1989;298:156-9.
21. Sarmina I, Resnick MI. Obstructive uropathy in patients with benign prostatic hyperplasia. J Urol 1989;141:866-9.

22. Ghose RR. Prolonged recovery of renal function after prostatectomy for prostatic outflow obstruction. BMJ 1990;300:1376-7.
23. Stoevelaar HJ, Van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.
24. Barry MJ, Cockett ATK, Holtgrewe HL, McConnel JD, Sihelnik SA, Winfield HN. Relationship of symptoms of prostatism to commonly used physiological and anatomical measures of the severity of benign prostatic hyperplasia. J Urol 1993;150:351-8.
25. Abrams PH, Feneley RCL. The significance of symptoms associated with bladder outflow obstruction. Urol Int 1978;33:171.
26. Andersen JT, Nordling J, Walter S. Prostatism. I. The correlation between symptoms, cystometric and urodynamic findings. Scand J Urol Nephrol 1979;13:229-36.
27. Neal DE, Styles RA, Powell PH, Thong J, Ramsden PD. Relationship between voiding pressures, symptoms and urodynamic findings in 253 men undergoing prostatectomy. Br J Urol 1987;60:554-9.
28. Frimodt-Moller PC, Jensen KM-E, Iversen P, Madsen PO, Bruskewitz RC. Analysis of presenting symptoms in prostatism. J Urol 1984;132:272-6.
29. Van de Beek C, Rollema HJ, Boender H, Wolfs GGMC, Knottnerus JA, Janknegt RA. Relationship between AUA symptom score and objective pressure-flow parameters. Neurourol Urodyn 1993;12:369.
30. Bosch JLHR, Hop WCJ, Kirkels WJ, Schröder FH. The International Prostate Symptom Score in a community-based sample of men between 55 and 74 years of age: prevalence and correlation of symptoms with age, prostate volume, flow rate and residual urine volume. Br J Urol 1995 75:622-30.
31. Chute CG, Guess HA, Panser LA, Johnson CL, Jacobsen SJ, Oesterling JE, Lieber MM. The non-relationship of urinary symptoms, prostate volume, and uroflow in a population based sample of men. J Urol 1993;149:356A.
32. Bosch JLHR. Epidemiological and pathophysiological aspects of benign prostatic hyperplasia. Chapter 2: The natural history and prevalence of benign prostatic hyperplasia: a review. PhD thesis. Rotterdam: Erasmus University, 1995.
33. Barry MJ, Fowler FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett ATK. The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 1992;148:1549-57.
34. Cockett ATK, Aso Y, Chatelain C, Denis, Griffiths K, Khoury S, et al, eds. Proceedings of the International Consultation on Benign Prostatic Hyperplasia (BPH). Jersey: Scientific Communication International, 1991.
35. Chute CG, Panser LA, Girman CJ, Oesterling JE, Guess HA, Jacobsen SJ, Lieber MM. The prevalence of prostatism: a population-based survey of urinary symptoms. J Urol 1993;150:85-9.
36. Nacey JN, Morum P, Delahunt B. Analysis of the prevalence of voiding symptoms in Maori, Pacific Island, and Caucasian New Zealand men. Urology 1995;46:506-11.

37. Norman RW, Nickel JC, Fish D, Pickett SN. 'Prostate-related symptoms' in Canadian men 50 years of age or older: prevalence and relationships among symptoms. Br J Urol 1994;74:542-50.
38. Sagnier PP, MacFarlane G, Richard F, Botto H, Teillac P, Boyle P. Results of an epidemiological survey using a modified American Urological Association symptom index for benign prostatic hyperplasia in France. J Urol 1994;151:1266-70.
39. Hunter DJW, McKee CM, Black NA, Sanderson CFB. Urinary symptoms: prevalence and severity in British men aged 55 and over. J Epidemiol Community Health 1994;48:569-75.
40. Garraway WM, Armstrong C, Auld S, King D, Simpson RJ. Follow-up of a cohort of men with untreated benign prostatic hyperplasia. Eur Urol 1993;24:313-8.
41. Barham CP, Pocock RD, James ED. Who needs a prostatectomy? Review of a waiting list. Br J Urol 1993;72:314-7.
42. Ball AJ, Feneley RCL, Abrams PH. The natural history of untreated 'prostatism'. Br J Urol 1982;53-613-6.
43. Craigen AA, Hickling JB, Saunders CRG, Carpenter RG. Natural history of prostatic obstruction. J Roy Coll Gen Practit 1969;18:226-32.
44. Birkhoff JD, Wiederhorn AR, Hamilton ML, Zinsser HH. Natural history of benign prostatic hypertrophy and acute urinary retention. Urology 1976;7:48-52.
45. Rollema, H.J.: Uroflowmetry. In: Siroky MB, Krane RJ. Clinical neurourology; 2nd edition (201-44). Boston: Little & Brown, 1991.
46. Gerstenberg TC, Andersen JT, Klarskov P, Ramirez D, Hald T. High flow infravesical obstruction in men: symptomatology, urodynamics and the results of surgery. J Urol 1982;127:943-5.
47. Guess HA, Arrighi HM, Metter EJ, Fozard JL. Cumulative prevalence of prostatism matches the autopsy prevalence of benign prostatic hyperplasia. Prostate 1990;17:241-6.
48. Bosch JLHR, Hop WCJ, Kirkels WJ, Schröder FH. Natural history of benign prostatic hyperplasia: appropriate case definition and estimation of its prevalence in the community. Urology 1995;46(suppl):34-40.
49. Girman CJ, Panser LA, Chute CG, Oesterling JE, Barrett DM, Chen CC, Arrighi HM, Guess HA, Lieber MM. Natural history of prostatism: urinary flow rates in a community-based study. J Urol 1993;150:887-92.
50. Jolleys JV, Donovan JL, Nanchahal K, Peters TJ, Abrams P. Urinary symptoms in the community: how bothersome are they? Br J Urol 1994;74:551-5.
51. Garraway WM, Collins GN, Lee RJ. High prevalence of benign prostatic hypertrophy in the community. Lancet 1991;338:469-71.
52. Stoevelaar HJ, Van Doorslaer EKA, Van de Beek C. Burden of illness of benign prostatic hyperplasia; the Netherlands, 1989. Rotterdam: Institute for Medical Technology Assessment (Erasmus University), 1991.
53. Stichting Informatievoorziening Gezondheidszorg (SIG). Data on patients, discharged from hospital in 1992 with benign prostatic hyperplasia (BPH) as primary or secondary diagnosis. (data-tape). Utrecht: SIG, 1994.

54. Centraal Bureau voor de Statistiek (CBS). Age composition of the Netherlands, January 1st, 1992. Maandstatistiek Bevolking (CBS) 1992, pp.30-31.
55. Wennberg J, Gittelsohn A. Small area variations in health care delivery. A population-based health information system can guide planning and regulatory decision-making. Science 1973;182:1102-8.
56. Gittelsohn AM, Wennberg JE. On the incidence of tonsillectomy and other common surgical procedures. In: Bunker JP, Barnes BA, Mosteller F, eds. Costs, risks and benefits of surgery (91-106). New York: Oxford University Press, 1977.
57. McPherson K, Strong PM, Epstein A, Jones L. Regional variations in the use of common surgical procedures within and between England and Wales, Canada and the United States of America. Soc Sci Med 1981;15:273-88.
58. McPherson K, Wennberg JE, Hovind OB, Clifford P. Small-area variations in the use of common surgical procedures: an international comparison of New England, England, and Norway. N Engl J Med 1982;307:1310-4.
59. Wennberg J, Gittelsohn A. Variations in medical care among small areas. Sci Am 1982;246:120-34.
60. Simpson A. Variations in operation rates in New Zealand. N Z Med J 1986;99:798-801.
61. Chassin MR, Brook RH, Park RE, Kessy J, Fink A, Kosecoff J, Kahn K, Merrick N, Solomon DH. Variations in the use of medical and surgical services by the Medicare population. N Engl J Med 1986;314:285-90.
62. McPherson K. International differences in medical care practices. Health Care Financing Review 1989 (annual supplement):9-20.
63. Sejr T, Andersen TF, Madsen M, Roepstorff C, Bilde T, Bay-Nielsen H, Blais R, Holst E. Prostatectomy in Denmark. Regional variation and the diffusion of medical technology 1977-1985. Scand J Urol Nephrol 1991;25:101-6.
64. Carlisle DM, Valdez RB, Shapiro MF, Brook RH. Geographic variation in rates of selected surgical procedures within Los Angeles County. Health Serv Res 1995;30:27-42.
65. Gittelsohn A, Powe NR. Small area variations in health care delivery in Maryland. Health Serv Res 1995;30:295-317.
66. Wennberg JE, Mulley AG, Hanley D, Timothy RP, Fowler FJ, Roos NP, Barry MJ, McPherson K, Greenberg ER, Soule D, Duboiz T, Fisher E, Malenka D. An assessment of prostatectomy for benign urinary tract obstruction. JAMA 1988;259:3027-30.
67. MacFarlane GJ, Sagnier PP, Richard F, Teillac P, Botto H, Boyle P. Determinants of treatment-seeking behaviour for urinary symptoms in older men. Br J Urol 1995;76:714-8.
68. Roberts RO, Rhodes T, Panser LA, Girman CJ, Chute CG, Oesterling JE, Lieber MM, Jacobsen SJ. Natural history of prostatism: worry and embarrassment from urinary symptoms and health care-seeking behavior. Urology 1994;43:621-8.

69. Lu-Yao GL, Barry MJ, Chang CH, Wasson JH, Wennberg JE. Transurethral resection of the prostate among Medicare beneficiaries in the United States: time trends and outcomes. Prostate Patient Outcomes Research Team (PORT). Urology 1994;44:692-8.
70. Stichting Informatievoorziening Gezondheidszorg (SIG). Data on surgical treatment of patients, discharged from hospital with benign prostatic hyperplasia (BPH) as primary or secondary diagnosis, period 1972-1992. Utrecht: SIG, 1996.
71. Centraal Bureau voor de Statistiek (CBS). Age composition of the Netherlands, January 1st, 1972-1992. Maandstatistiek Bevolking (CBS) 1972-1992.
72. Casparie AF, Hoogendoorn D. Effects of budgeting on health care services in Dutch hospitals. Am J Publ Health 1991;81:1442-7.
73. Breslin DS, Muecke EC, Reckler JM, Fracchia JA. Changing trends in the management of prostatic disease in a single private practice: a 5-year followup. J Urol 1993;150:347-50.
74. Orandi A. Transurethral incision of the prostate. J Urol 1973;110:229-31.
75. Orandi A. Transurethral incision of prostate (TUIP): 646 cases in 15 years-a chronological appraisal. Br J Urol 1985;57:703-7.
76. Orandi A. Transurethral incision of prostate compared with transurethral resection of prostate in 132 matching cases. J Urol 1987;138:810-5.
77. Dorflinger T, Oster M, Larsen JF, Walter S, Krarup T. Transurethral prostatectomy or incision of the prostate in the treatment of prostatism caused by small benign prostates. Scand J Urol Nephrol 1987;104(suppl):77-81.
78. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Agency for Health Care Policy and Research, Public Health Service, 1994. AHCPR publication no.94-0582.
79. McConnell JD. Editorial: benign prostatic hyperplasia. J Urol 1995;154:402-3.
80. Schlatmann TJM. Benign prostatic hyperplasia; recommendations for diagnosis and treatment in 1992 (in Dutch). Ned Tijdschr Geneeskd 1992;136:2414-7.
81. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the International Consultation on benign prostatic hyperplasia (BPH), patronized by World Health Organization (WHO), Paris, June 28-30 1993. Jersey, UK: Scientific Communication International, 1993.
82. National Health and Medical Research Council. Treatment options for benign prostatic hyperplasia (BPH). Canberra, Australia: Australian Government Publishing Service, 1994.
83. Lomas J, Anderson GM, Domnick-Pierre K, Vayda E, Enkin MW, Hanna WJ. Do practice guidelines guide practice? N Engl J Med 1989;321:1306-11.
84. Anonymous. Small-area variations: what are they and what do they mean? Health Services Research Group. Can Med Assoc J 1992;146:467-70.
85. Casparie AF. The ambiguous relationship between practice variation and appropriateness of care; an agenda for further research. Health Policy 1996;35:247-65.

86. Wennberg JE. Small area analysis an the medical outcome problem. In: Sechrest L, Perrin E, Bunker J, eds. Conference Proceedings: Research methodology, strengthening causal interpretations of non-experimental data (177-206). Rockville: AHCPR, 1990.
87. Wennberg JE. Dealing with medical practice variations: a proposal for action. Health Aff 1984;4:6-32.
88. Stano M. Variations analysis. J Health Polit Policy Law 1991;16:573-88.
89. Chassin MR, Kosecoff J, Park RE, Winslow CM, Kahn KL, Merrick NJ, Keesy J, Fink A, Solomon DH, Brook RH. Does inappropriate use explain geographic variations in the use of health care services. A study of three procedures. JAMA 1987;258:2533-7.
90. Kleijnen J, De Vet HCW, Rinkel GJE, Keirse MJN. The Cochrane Collaboration; systematic reviews of knowledge from randomized studies (in Dutch). Ned Tijdschr Geneeskd 1995;139:1478-82.
91. Clinton JJ, McCormick K, Besteman J. Enhancing clinical practice. The role of practice guidelines. Am Psychol 1994;49:30-3.

PART I

VARIATION IN DIAGNOSTIC PRACTICE PATTERNS

CHAPTER 2

VARIATION IN THE DIAGNOSTIC EVALUATION OF BENIGN PROSTATIC HYPERPLASIA IN UROLOGICAL PRACTICE

Adapted from: Stoevelaar HJ, Van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.

INTRODUCTION

In chapter 1, we described the large number of technological innovations for the diagnostic evaluation in elderly men with voiding problems. The extension of the diagnostic arsenal is partly associated with changing insights into the aetiology of prostatism. It is now believed that prostatism is due not only to a static obstruction of the urethra (adenoma), but can also be caused by a dynamic component (adrenergic innervation of the muscular part of the prostate), as well as by a changed contractility of the detrusor muscle.[1] The changing insights have led to a growing interest in, and application of urodynamic investigations, of which uroflowmetry and pressure-flow studies are the most important ones for the evaluation of elderly men presenting with voiding problems. Other important developments concerned the introduction of different applications of ultrasonography, and the prostate-specific antigen (PSA) test.
In order to enhance the appropriate diagnostic evaluation of elderly men with voiding problems, several recommendations and guidelines have been published.[2-5] However, it is not known which diagnostic choices are actually made in daily clinical practice, and to which factors these choices are related. In this chapter, we report the results of a multicentre study which aims to:

- describe current diagnostic practice patterns for BPH among urologists.
- analyze variation between these patterns and to gain insight into its determinants.

PATIENTS AND METHODS

Study population

The initial study population consisted of 1703 consecutive male patients ≥ 50 years, newly referred to a urologist in a selection of 12 practices, situated in 13 hospitals. This selection was based on geographic area (5 provinces), hospital size (3 large, 5 middle-sized, and 5 small hospitals), and function (2 university hospitals, 1 peripheral teaching hospital, and 10 hospitals without teaching facilities). The initial inclusion of all male patients ≥ 50 years, irrespective of their reason for consultation, was necessary because some measurements (e.g. symptomatology) had to be performed before the first visit to the urologist. Inclusion of patients took place between December 1992 and November 1994. The intake periods for the hospitals varied between 3 months and 1 year, dependent on the population size. Patients who were physically or mentally unable to complete the initial questionnaire were excluded from participation.

Data collection

The data collection consisted of three parts:

- Patient questionnaire. At their first visit to the outpatient clinic (before seeing the urologist), all patients were requested to complete a questionnaire about symptomatology, bothersomeness of symptoms, and sexual function (see appendix 1). This questionnaire was adapted from the English language version of the American Urological Association.[6]
- Urologist questionnaire. After completion of the diagnostic work-up, the urologists filled out a questionnaire on the diagnosi(e)s made (see appendix 2). Patients without BPH (according to the urologist) were subsequently excluded from further participation. For BPH patients, the urologists also had to indicate which diagnostic procedures they had used to make the diagnosis of BPH (see appendix 2).
- Medical record study (see appendix 3). For all BPH patients, the following information was retrieved from their medical records:
  - physician who referred the patient to the department of urology (general practitioner, other medical specialist), as well as the reason for referral
  - medical history
  - outcomes of diagnostic procedures

Determinants of diagnostic choices

Variation in diagnostic choices was analyzed using logistic regression methods. As explanatory variables we included both patient characteristics and characteristics of the urologist and the work setting (see table 1). The goodness-of-fit of the logistic models was studied using the Hosmer-Lemeshow test.[7]

RESULTS

Response and characteristics of the population

In total 1414 patients (83.0%) were included in the study. The most important reasons for not participating were physical or mental problems which prevented the completion of the questionnaire (7.6%), patient's refusal (4.1%), and language/reading problems (3.1%). The number of patients varied between 39 to 141 for small hospitals (total n=440), and between 71 to 146 for the larger hospitals (total n=481). The two university clinics together counted for 493 patients. In total 27 urologists and 12 residents were involved in the study. In 670 of the 1414 men (47.4%) who completed the initial questionnaire, the diagnosis of BPH was made by their urologists. Mean age of the BPH patients was 65.6 years (SD 7.9). For 148 of the 670 BPH patients (22.1%), other urologic problems were also diagnosed, among which chronic prostatitis/prostatodynia (5.7%), diseases of the upper urinary tract (3.4%), bladder outlet obstruction not due to BPH (bladder neck sclerosis, meatal stenosis and urethral stricture, 2.4%), carcinoma and tumours of the bladder (1.9%), abnormalities of the penis (2.1%) and scrotum (1.6%), impaired detrusor function (1.0%), and erectile dysfunction (1.9%). In addition, for 2.5% of the patients, other diseases that possibly influence the micturition (e.g. M. Parkinson, diabetes mellitus) were diagnosed. With respect to the patients for whom data on referral were complete (96%), 88% were referred by their general practitioner, and 9% by another medical specialist. Self-initiated consultation took place in 3% of all patients.

Table 1 - Variables, used to explain the variation in diagnostic choices.

Variable		Categories	
	low	moderate	high
Patient			
Age (years)	50-64	65-74	≥ 75
Obstructive symptom score[a]	0-4	5-11	12-20
Irritative symptom score[a]	0-3	4-8	9-15
Urologic comorbidity	yes/no		
Emergency referral[b]	yes/no		
History of BPH[c]	yes/no		
Urologist			
Experience (years)	< 5	5-10	> 10
Resident?	yes/no		
Practice in teaching hospital?	yes/no		

[a] Based on the subdivision of the American Urological Association symptom questionnaire for BPH.[6] This questionnaire consisted of 7 questions about voiding problems, divided into 4 obstructive and 3 irritative symptoms.

[b] Acute urinary retention < 1 week before referral.

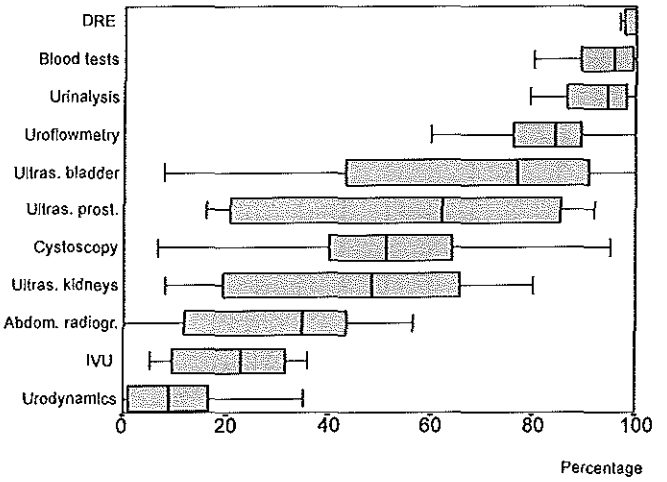
[c] Information retrieved from the medical record. It concerns a completed episode of BPH.

Use of diagnostic tests and variation in practice patterns

The most frequently performed diagnostic procedures were digital rectal examination (97.9%), urinalysis (92.3%), blood tests (86.6%) and uroflowmetry (84.4%). It should be mentioned that in an unknown proportion of the patients, laboratory tests had already been performed before referral, which in some patients were, and in other patients were not repeated by the urologist. Ultrasonography also appeared to have an important role in the diagnostic process. Ultrasonographic evaluation of the bladder was performed in 72.1% of all cases, while for prostate and kidneys the percentages were 48.6 and 46.9 respectively. About half of the patients (51.1%) underwent a cystourethroscopy.

Less frequently performed procedures were abdominal radiography (30.8%), intravenous urography (23.2%) and urodynamic investigation (14.0%).
There were considerable differences between the 12 practices (see figure 1). The variation in the use was significant for almost all procedures.
The only procedures for which low variation (interquartile range) was found were digital rectal examination (97-100%), blood tests (88-100%) and urinalysis (86-99%). Highest variation was found for ultrasonography of the prostate (interquartile range 19-86%), kidneys (19-68%), and bladder (42-91%).

Figure 1 - Variation in diagnostics between the 12 practices. The ends of the boxes correspond with the 25th and 75th percentiles. The line in the box is the median. The ends of the whiskers indicate the total range without extremes (cases with values more than 3 box-lengths from the left or right edge of the box).



The relationship between several patient and urologist characteristics (see table 1) and diagnostic choices was studied using logistic regression methods. Based on the results of this analysis (see statistical addendum), a probability profile was constructed (table 2) to express the estimated chance of a certain diagnostic procedure for different options. The variables patient's age and a history of BPH proved to be significant only for the use of uroflowmetry: patients of 75 years and older, as well as patients with a previous episode of BPH did have a somewhat lower chance of this procedure, when compared to the reference patient.

Table 2 - Probability of a certain diagnostic procedure (percentage) for different options, compared to a reference patient[a]. The blanks indicate no significant differences in comparison with the reference patient.

	IVU[b]	ABD. RAD.[c]	ULTRA. KIDNEY[d]	ULTRA. BLADD.[e]	URO-FLOW.[f]	ULTRA. PROST.[g]	CYSTO-SCOPY	UDI[h]
Reference patient[i]	18	23	32	62	90	58	41	8
Younger patient (< 65 years)					88			
Older patient (≥ 75 years)					81			
Emergency referral				28	46		20	
Urologic comorbidity	27				82	48	53	
History of BPH					80			
Milder irritative symptoms						55	38	3
More severe irritatieve symptoms						44	49	4
Milder obstructive symptoms	27							8
More severe obstructive symptoms	23							16
Less experienced urologist (< 5 years)	13	14	52	83		53		4
More experienced urologist (> 10 years)	26	28	53	59		39		4
Resident		32			98	72		
Teaching hospital		45	44	79			64	48

In case of an emergency referral (acute urinary retention), the likelihood of having bladder ultrasonography, uroflowmetry and cystoscopy was considerably lower, which is certainly associated with the immediate placement of an indwelling catheter. The presence of urologic comorbidity was associated with a lower probability of uroflowmetry and prostate ultrasonography, and a higher probability of intravenous urography and cystoscopy. In general, the contribution of differences in symptomatology was ambiguous, both for the obstructive and irritative symptoms. With respect to intravenous urography, a U-shape association existed: both patients with less and patients with more severe irritative symptoms were more likely to undergo this procedure. Severe irritative symptoms were associated with a lower chance of prostate ultrasonography and a higher chance of cystoscopy. However, the differences were not very large. A more pronounced situation was found for the use of urodynamic studies for which a considerable higher probability was found for patients with severe obstructive symptoms. The urologist's experience was of significant meaning in 6 out of 8 diagnostic procedures. The chance of radiography was higher for more experienced urologists, while ultrasonography of kidneys and bladder was more frequently performed by those with less than 5 years of experience. Residents (urologists-in-training) apparently made more use of abdominal radiography, uroflowmetry and prostate ultrasonography. The variable teaching hospital was positively associated with the use of 5 of the 8 procedures. The most pronounced differences were found for urodynamic investigation: the chance that a BPH patient underwent this procedure, irrespective of other characteristics, was about six times as high in teaching clinics than it was in general hospitals.

Legend to table 2

[a] A reference patient is defined as follows: age between 65 and 74 years, no emergency referral, without urologic comorbidity and/or a history of BPH, and having moderate obstructive and irritative symptoms. In addition, his urologist is moderate experienced (between 5 and 10 years), practising in a non-teaching hospital.

[b] IVU = intravenous urography, [c] ABD.RAD. = abdominal radiography,

[d] ULTRA.KIDN. = kidney ultrasonography, [e] ULTRA.BLADD. = bladder ultrasonography,

[f] URO.FLOW. = uroflowmetry, [g] ULTRA.PROST. = prostate ultrasonography, [h] UDI = urodynamic investigation.

[i] For example, a reference patient has a 18 percent probability of IVU.

DISCUSSION

This study showed a considerable variation in the use of diagnostic procedures in men with benign prostatic hyperplasia. On the one hand, the variation proved to be associated with patient characteristics such as age, symptomatology, morbidity and medical history. These findings stress the importance of case-mix adjustment when studying practice variation. On the other hand, the variation was associated with background variables of the urologists involved (type of hospital, experience), irrespective of patient characteristics. It is unlikely that this is due to structural differences (e.g. availability of devices, differences in reimbursement). We assume the variation can be attributed to differences in opinions about the usefulness of particular diagnostic tests. The next research step should therefore comprise an analysis of the explicit criteria that are used in the decision making process about diagnostics. Subsequently, a comparison of these criteria with scientific insights can be used to assess the appropriateness of the current diagnostic evaluation of patients with BPH in urological practice.

SUMMARY AND CONCLUSIONS

This study analyzed the diagnostic evaluation of 670 consecutive BPH patients, newly referred to the department of urology in one of 12 urological practices, selected by region, size and function of the hospital.
The most frequently performed procedures (> 80%) were digital rectal examination, urinalysis, blood tests, and uroflowmetry. Kidney ultrasonography was far more used than radiographical imaging of the upper urinary tract (47 vs 23%). About half of the patients underwent cystourethroscopy and/or prostate ultrasonography. Invasive urodynamic investigations (pressure-flow studies) were performed in only 14% of all cases.
Diagnostic patterns differed significantly between the practices. Highest variation (interquartile range) was found for ultrasonography of the prostate (19-86%), kidneys (19-68%), and bladder (42-91%), and lowest variation for digital rectal examination (97-100%), blood tests (88-100%) and urinalysis (86-99%).

In logistic regression analysis, this variation proved to be associated with both patient characteristics (age, symptomatology, comorbidity and medical history) and background variables of the urologists involved (experience, type of hospital, urologist/resident).
These results raise the question whether current practice is in accordance with 'appropriateness of care'. Therefore, further research is recommended to gain insight into the explicit criteria used by urologists for the choice of particular diagnostic tests, and to compare these with the scientific standards.

REFERENCES

1. Janknegt RA, Rollema HJ, Van de Beek C. Urodynamic studies necessary for correct diagnosis in prostatism (in Dutch). Ned Tijdschr Geneeskd 1994;138:1751-6.
2. Schlatmann TJM. Benign prostatic hyperplasia; recommendations for diagnosis and treatment in 1992 (in Dutch). Ned Tijdschr Geneeskd 1992;136:2414-7.
3. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the International Consultation on benign prostatic hyperplasia (BPH), patronized by World Health Organization (WHO), Paris, June 28-30 1993. Jersey, UK: Scientific Communication International, 1993.
4. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0582.
5. National Health and Medical Research Council. Treatment options for benign prostatic hyperplasia (BPH). Canberra, Australia: Australian Government Publishing Service, 1994.
6. Barry MJ, Fowler FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett ATK. The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 1992;148:1549-57.
7. Hosmer DW, Lemeshow S. Applied logistic regression. Chapter 5: Assessing the fit of the model (135-75). New York: John Wiley & Sons, 1989.

ADDENDUM

Results of logistic regression analysis, on the basis of which the probability profiles (see table 2) were computed.

Reference classes for regression:

Patient characteristics:

- Age	50-64 years
- Obstructive symptom score	0-4 (mild)
- Irritative symptom score	0-3 (mild)
- Urologic comorbidity	Absent
- Emergency referral	No
- History of BPH	No

Urologist characteristics:

- Experience	< 5 years
- Resident/certified urologist	certified
- Function of hospital	general

Intravenous urography

Variable	B	S.E.	Sig
Obstructive symptoms			0.031
Moderate	-0.51	0.239	
Severe	-0.19	0.264	
Comorbidity	0.52	0.219	0.017
Urologist's experience			0.004
5-10 years	0.41	0.236	
> 10 years	0.89	0.264	
Constant	-1.41	0.263	

Abdominal radiography

Variable	B	S.E.	Sig
Urologist's experience			0.013
5-10 years	0.67	0.280	
> 10 years	0.90	0.309	
Resident	1.11	0.336	0.001
Teaching hospital	0.99	0.230	0.000
Constant	-1.85	0.261	

Kidney ultrasonography

Variable	B	S.E.	Sig
Urologist's experience			0.000
5-10 years	-0.84	0.206	
> 10 years	0.01	0.240	
Teaching hospital	0.50	0.193	0.010
Constant	0.09	0.183	

Bladder ultrasonography

Variable	B	S.E.	Sig
Emergency referral	-1.45	0.477	0.002
Urologist's experience			0.000
5-10 years	-1.10	0.263	
> 10 years	-1.25	0.291	
Teaching hospital	0.82	0.246	0.001
Constant	1.61	0.244	

Uroflowmetry

Variable	B	S.E.	Sig
Emergency referral	-2.35	0.494	0.000
Patient's age			0.083
65-74 years	0.19	0.264	
≥ 75 years	-0.55	0.327	
Comorbidity	-0.67	0.259	0.010
History of BPH	-0.81	0.359	0.025
Resident	1.49	0.486	0.002
Constant	1.98	0.201	

Prostate ultrasonography

Variable	B	S.E.	Sig
Irritative symptoms			0.014
Moderate	0.14	0.215	
Severe	-0.42	0.236	
Comorbidity	-0.42	0.202	0.038
Urologist's experience			0.004
5-10 years	0.24	0.223	
> 10 years	-0.52	0.265	
Resident	0.85	0.285	0.003
Constant	-0.04	0.248	

Cystoscopy

Variable	B	S.E.	Sig
Emergency referral	-0.99	0.465	0.033
Irritative symptoms			0.042
Moderate	0.13	0.216	
Severe	0.47	0.235	
Comorbidity	0.49	0.203	0.016
Teaching hospital	0.94	0.181	0.000
Constant	-0.51	0.197	

Urodynamic investigastion (pressure-flow studies)

Variable	B	S.E.	Sig
Obstructive symptoms			0.025
Moderate	-0.02	0.373	
Severe	0.75	0.402	
Irritative symptoms			0.008
Moderate	1.01	0.393	
Severe	0.32	0.442	
Urologist's experience			0.021
5-10 years	0.81	0.310	
> 10 years	0.07	0.396	
Teaching hospital	2.34	0.304	0.000
Constant	-4.25	0.520	

CHAPTER 3

UROLOGISTS' OPINIONS ON DIAGNOSTICS FOR BENIGN PROSTATIC HYPERPLASIA (BPH) AND THEIR RELATIONSHIP WITH CLINICAL PRACTICE DECISIONS

Partly based on: Stoevelaar HJ, Van de Beek C, Casparie AF, McDonnell J, Nijs HGT, Janknegt RA. Urologists' opinions on diagnostics for benign prostatic hyperplasia (BPH) and their relationship with clinical practice decisions. Submitted for publication.

INTRODUCTION

As was demonstrated in the previous chapter, there are large differences in the diagnostic evaluation of BPH among urologists. Important explanatory variables of this variation included both patient characteristics (symptomatology, comorbidity, history of BPH, emergency referral) and background characteristics of the urologists such as experience and type of hospital.[1] We assume these associations point at variation in opinions about the usefulness of particular diagnostic procedures, rather than to differences in the availability and reimbursement of health care services or devices.
To test this hypothesis, an additional study was undertaken which aims:

- to inventarize the opinions about the appropriate use of distinguished diagnostic procedures for the evaluation in elderly men with micturition problems
- to assess the impact of these opinions on the actual use of diagnostics

MATERIALS AND METHODS

The study population consisted of the 39 urologists and urological residents who were involved in our multicentre study on diagnostics and treatment choice for BPH (see chapter 2). They diagnosed in total 670 consecutive BPH patients, for whom data were collected on symptomatology and bothersomeness (patient questionnaire), diagnosis and diagnostic procedures performed (urologist questionnaire), and diagnostic outcomes (medical record).

As the study aimed at documenting daily urological practice, no mandatory instructions were given with regard to the diagnostic work-up. After inclusion of all patients, the urologists were sent a postal questionnaire in which they were asked to indicate whether they performed the following diagnostic procedures or tests as standard, complementary or seldom/never in patients suspected to have BPH:

o Radiography:	plain abdominal radiography
	intravenous urography
o Ultrasonography:	kidney
	bladder
	prostate
o Urodynamics:	uroflowmetry
	pressure-flow study
o Urethrocystoscopy	
o Blood tests:	prostate specific antigen (PSA)
	creatinine
o Urinalysis:	sediment
	culture
	cytology

The extent of agreement between the urologists was studied using frequency tables. Differences between subgroups by background variables (experience, type of hospital, resident) were analyzed using the X^2-statistic for nominal variables and the Spearman rank correlation test for ordinal variables. In order to assess the impact of particular opinions on actual diagnostic choices, for each procedure a separate multiple logistic regression analysis was performed including the following explanatory variables:

o Patient characteristics:
  - age (< 65, 65-74, ≥75 years)
  - irritative and obstructive symptoms (mild, moderate, severe)
  - urologic comorbidity (yes/no)
  - emergency referral (yes/no)
  - history of BPH

o Urologist characteristics:
  - experience (< 5, 5-10, > 10 years)
  - type of hospital (general/teaching)
  - resident (yes/no)

o Opinion on use of diagnostic test (standard, complementary, seldom/never)

The goodness-of-fit of the regression models was assessed using the Hosmer-Lemeshow test.[2]

RESULTS

Distributions of opinions and actual use of diagnostics

Table 1 gives an overview of the opinions about the use of diagnostic procedures, compared with data on actual use. To avoid bias due to the existence of other urological diseases, we took into consideration only patients without comorbidity (n = 522) who represent 78% of the total study population.

Table 1 - Opinions on the use of particular diagnostics (percentages), and actual use (mean) of these diagnostics in BPH patients without urologic comorbidity.
ST = standard, COM = complementary, S/N = seldom/never.

Procedure	Urologists' opinions (%)			Actual use
	ST	COM	S/N	mean (%)
Radiography				
. Plain abdominal	41	27	32	30
. IVU	-	6	94	21
Ultrasonography				
. Kidney	41	56	3	47
. Bladder	77	17	6	73
. Prostate	50	50	-	50
Urodynamic studies				
. Uroflowmetry	97	3	-	86
. Pressure-flow	11	62	27	14
Urethrocystoscopy	19	51	30	49
Blood tests				
. PSA	100	-	-	87
. Creatinine	92	5	3	78
Urinalysis				
. Sediment	100	-	-	89
. Culture	39	53	8	61
. Cytology	27	46	27	30

Procedures considered as standard by (almost) all urologists were blood tests (PSA, creatinine) and analysis of urine sediment. These tests were also the most frequently performed ones in practice. As was mentioned in chapter 2, an unknown proportion of the patients had already had blood and urine tests before their referral, which would explain why the actual percentages were lower than 100%

Although almost all urologists (94%) reported that they seldom or never performed intravenous urography (IVU), this investigation was still done in 21% of patients without comorbidity. We can not be certain on this point, but this is likely to be associated with the existence of specific symptoms (e.g. haematuria) which necessitate the use of IVU to rule out other urologic pathology.

For about half of the procedures, there were considerable differences in opinions between the urologists, the largests being seen for abdominal radiography, urethrocystoscopy and urine cytology.

No significant associations were found between opinions and the urologists' experience. When distinguishing between the type of hospitals (general versus teaching), significant differences were found for three procedures: urologists from teaching hospitals expressed to more routinely use plain abdominal radiography ($p < 0.01$), kidney ultrasonography ($p < 0.05$) and pressure-flow studies ($p < 0.01$), than did their colleagues from general hospitals. Residents more frequently mentioned the standard use of kidney ultrasonography ($p < 0.05$).

In general, the relationship between opinions and background characteristics was not very strong. This could point at an independent impact of both groups of variables on the actual use of diagnostics, which was further studied with logistic regression methods.

Relationship between opinions and practice decisions

Based on the results of the separate logistic regression analyses for each of the diagnostic procedures (see statistical addendum), a probability profile was constructed which compares the chances of a particular procedure for different values of the explanatory variables 'opinion' and urologist's background characteristics. To adjust for case-mix, the following patient characteristics were used as baseline data:

- Aged between 65 and 74 years
- Moderate irritative and obstructive symptoms
- No urologic comorbidity
- No emergency referral
- No history of BPH

Table 2 gives the probability profiles for the respective procedures. For each of the urologist's background characteristics and opinions, the most prevalent options (grey boxes) have been chosen as a basis for the calculation of the reference value. The blanks indicate no difference in comparison with the reference value. As an example on how this table has to be interpreted, the figures for urethrocystoscopy are discussed in detail.

A 'reference patient' (having the aforementioned characteristics), who attends a certified urologist with 5-10 years of experience in a general hospital, has a 56 percent probability of undergoing urethrocystoscopy when the urologist considers this procedure as complementary. Visiting a urologist with another opinion gives a much higher (standard: 77%) or lower (seldom/never: 23%) probability. Irrespective of other characteristics, the chance of cystoscopy is higher (69%) when the same patient attends a teaching hospital.

For three procedures (intravenous urography, PSA-test and sediment), no associations between opinions and actual use were seen, because the urologists' opinions were (almost) unanimous. Except for kidney ultrasonography, all other procedures showed strong associations: a urologist's consideration a test to be standard versus complementary, significantly increased the patient's chance of this procedure. For the extreme opinions (standard versus seldom/never), the differences were still larger, with exception of bladder ultrasonography and creatinine. Independent effects on actual use were also seen for the urologist's experience, type of hospital, and being a resident/urologist. In general, the impact of opinions on the probability of a respective procedure was more significant than were the effects of these background variables.

Table 2 - Probability of particular diagnostic tests for various values of opinions and background characteristics, compared to a reference patient.

Procedure	Opinions[a]			Urologist's experience (years)			Type of hospital[b]		Physician[c]	
	ST	COM	S/N	< 5	5-10	> 10	G	T	U	R
Abdominal radiography	61	35	9							
Intravenous urography				15	21	30				
Kidney ultrasonography				52	32	53	32	44		
Bladder ultrasonography	76	28	50				76	85	76	95
Prostate ultrasonography	91	31	NM[d]	29	31	5			31	57
Uroflowmetry	90	38	NM[d]						90	97
Pressure-flow study	21	9	4				9	30		
Urethrocystoscopy	77	56	23				56	69		
PSA-test				88	66	94	66	92		
Creatinine	87	14	69	82	87	69	87	95		
Sediment										
Urine culture	86	24	14	42	24	17	24	71	24	3
Urine cytology	73	23	23	22	23	11	23	54		

DISCUSSION

Over the last few years, there has been an increasing interest in the research of practice variation and its determinants. Casparie (1996) distinguishes between four types of potential determinants, namely patient characteristics (e.g. morbidity, consumerism), provider characteristics (practice style), institutional properties (facilities, practice organization), and environmental factors such as urbanization and referral practice of GP's.[3] Several studies have been carried out that used one or more of these characteristics to explain small-area variation, and many of these studies conclude that a large proportion of the variation is due to differences in practice style. Often, this conclusion is made solely on the base of residual inference, which means that small area variations remain existent after correction for other possible determinants. This method has been criticized by Stano (1991),[4] who argued that the tradional methods (at a more aggregate level) are not suitable to confirm or reject the practice style hypothesis, and concluded that more research at a micro level is needed.
Only a few studies have paid attention to the nature of practice style as a determinant of practice variation. Practice styles have been described as 'clinical decision rules held idiosyncratically by individual physicians [not] based on reasonably well-tested hypotheses concerning outcomes of care'.[5] To our knowledge, this is the first study that has attempted to identify these decision rules for diagnosing BPH in day-to-day practice, and to assess their impact on practice variation. We demonstrated that the variation in opinions about the appropriate diagnostic evaluation in elderly men with micturition problems is considerable, and that these opinions are strongly related with actual decisions. Additional independent effects were found for urologists' background characteristics such as experience and type of hospital.

Legend to table 2

[a] Opinions on diagnostics procedure: ST = standard, COM = complementary, S/N = seldom/never
[b] Type of hospital: G = general, T = teaching
[c] Physician: U = certified urologist, R = urological resident
[d] NM = not mentioned as an answer (empty category)

In general, the contribution of these variables to practice variation was much smaller than was found for opinions. Apparently, there is a strong association between thinking and doing. Further research should first focus on the scientific validity of particular opinions on diagnostics, in other words, to determine the extent to which these are in accordance with current insights about appropriateness of care. It has been demonstrated that physicians are highly confident about the appropriateness of their own choices (micro-certainty), while there is often no consensus at an aggegrate level (macro-uncertainty).[6] Therefore, much attention should be paid to the development of effective methods to alter these opinions as an indirect means to reduce undesirable practice variation.

SUMMARY AND CONCLUSIONS

This study assessed the impact of particular opinions about diagnostics in men suspected of having BPH on actual practice decisions. Thirty-nine urologists and residents, who were included in a descriptive multicentre study on the management of BPH, were questionned about the appropriate use (standard, complementary, seldom/never) for 13 diagnostic tests. Data on actual use of these test were retrieved from the medical records of 670 consecutive BPH patients who were diagnosed by one of these urologists. Using logistic regression methods, the impact of opinions and urologists' background characteristics (experience, type of hospital, resident/urologist) on actual use was studied, controlling for differences in patient characteristics (age, symptomatology, morbidity, acute/elective). For 7 out of the 13 procedures, the variation in opinions was considerable. The regression results showed very strong associations between these opinions and the actual decisions. Smaller, independent effects were seen for the urologists' background characteristics.
Further research should focus on the validity of the respective opinions, as well as on methods to change these opinions in case these are not in line with current scientific insights.

REFERENCES

1. Stoevelaar HJ, van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.
2. Hosmer DW, Lemeshow S. Applied logistic regression. Chapter 5: Assessing the fit of the model (135-75). New York: John Wiley & Sons, 1989.
3. Casparie AF. The ambiguous relationship between practice variation and appropriateness of care; an agenda for further research. Health Policy. 1996;35:247-65.
4. Stano M. Variations analysis. J Health Polit Policy Law 1991;16:573-88.
5. Wennberg JE. Small area analysis an the medical outcome problem. In: Sechrest L, Perrin E, Bunker J, eds. Conference Proceedings: Research methodology, strengthening causal interpretations of non-experimental data (177-206). Rockville, AHCPR, 1990.
6. Baumann AO, Deber RB, Thompson GG. Overconfidence among physicians and nurses: the 'micro-certainty, macro-uncertainty' phenomenon. Soc Sci Med 1991;32:167-74.

ADDENDUM

Results of logistic regression analysis, on the basis of which the probability profiles (table 2) were computed.

Reference classes for regression:

Patient characteristics:

-	Age	50-64 years
-	Obstructive symptom score	0-4 (mild)
-	Irritative symptom score	0-3 (mild)
-	Urologic comorbidity	Absent
-	Emergency referral	No
-	History of BPH	No

Urologist characteristics:

-	Experience	< 5 years
-	Resident/certified urologist	certified
-	Function of hospital	general

Urologist opinions on use of diagnostics:

- For all procedures, the opinion 'standard' has been used as the reference class

Intravenous urography

Variable	B	S.E.	Sig
Comorbidity	0.58	0.217	0.007
Urologist's experience			0.003
5-10 years	0.44	0.233	
> 10 years	0.90	0.263	
Constant	-1.74	0.190	

Abdominal radiography

Variable	B	S.E.	Sig
Opinion			0.000
Complementary	-1.10	0.222	
Seldom/never	-2.80	0.279	
Constant	0.46	0.168	

Kidney ultrasonography

Variable	B	S.E.	Sig
Urologist's experience			0.000
5-10 years	-0.84	0.206	
> 10 years	0.01	0.240	
Teaching hospital	0.50	0.193	0.010
Constant	0.09	0.183	

Bladder ultrasonography

Variable	B	S.E.	Sig
Emergency referral	-1.29	0.519	0.013
Resident	1.71	0.525	0.001
Teaching hospital	0.56	0.278	0.043
Opinion			0.000
Complementary	-2.10	0.288	
Seldom/never	-1.19	0.275	
Constant	1.17	0.139	

Uroflowmetry

Variable	B	S.E.	Sig
Emergency referral	-2.37	0.491	0.000
Comorbidity	-0.68	0.269	0.012
History of BPH	-0.98	0.364	0.007
Resident	1.29	0.493	0.009
Opinion			0.000
Complementary	-2.64	0.527	
Constant	2.16	0.167	

Prostate ultrasonography

Variable	B	S.E.	Sig
Comorbidity	-0.63	0.256	0.015
Irritative symptoms			0.023
Moderate	-0.33	0.262	
Severe	-0.78	0.288	
Urologist's experience			0.000
5-10 years	0.07	0.275	
> 10 years	-2.01	0.365	
Resident	1.15	0.369	0.002
Opinion			0.000
Complementary	-3.11	0.273	
Constant	2.56	0.390	

Urethrocystoscopy

Variable	B	S.E.	Sig
Emergency referral	-1.22	0.500	0.015
Irritative symptoms			0.012
Moderate	0.35	0.235	
Severe	0.76	0.257	
Teaching hospital	0.55	0.196	0.005
Opinion			0.000
Complementary	-0.93	0.284	
Seldom/never	-2.37	0.304	
Constant	0.83	0.309	

Pressure-flow studies

Variable	B	S.E.	Sig
Irritative symptoms			0.024
Moderate	0.94	0.395	
Severe	0.37	0.444	
Obstructive symptoms			0.034
Moderate	-0.05	0.376	
Severe	0.69	0.404	
Teaching hospital	1.39	0.344	0.000
Opinion			0.003
Complementary	-0.92	0.367	
Seldom/never	-1.80	0.533	
Constant	-2.23	0.608	

Prostate-specific antigen (PSA)

Variable	B	S.E.	Sig
Patient's age			0.025
65-74 years	-0.05	0.250	
≥ 75 years	1.09	0.428	
Comorbidity	-0.98	0.255	0.000
Urologist's experience			0.000
5-10 years	-1.34	0.328	
> 10 years	0.68	0.478	
Teaching hospital	1.72	0.384	0.000
Constant	2.07	0.340	

Creatinine

Variable	B	S.E.	Sig
Urologist's experience			0.002
5-10 years	0.31	0.355	
> 10 years	-0.75	0.331	
Teaching hospital	1.14	0.336	0.001
Opinion			0.000
Complementary	-3.65	0.386	
Seldom/never	-1.08	0.636	
Constant	1.55	0.282	

Urine sediment

Variable	B	S.E.	Sig
Emergency referral	-2.03	0.463	0.000
History of BPH	-1.31	0.362	0.000
Irritative symptoms			0.013
Moderate	0.29	0.316	
Severe	1.19	0.413	
Constant	1.96	0.259	

Urine culture

Variable	B	S.E.	Sig
Emergency referral	-1.39	0.512	0.006
History of BPH	-0.98	0.394	0.013
Urologist's experience			0.012
5-10 years	-0.84	0.338	
> 10 years	-1.24	0.446	
Resident	-3.07	0.502	0.000
Teaching hospital	2.05	0.316	0.000
Opinion			0.000
Complementary	-2.97	0.263	
Seldom/never	-3.58	0.486	
Constant	2.64	0.335	

Urine cytology

Variable	B	S.E.	Sig
Patient's age			0.015
65-74 years	0.67	0.240	
≥ 75 years	0.05	0.372	
Emergency referral	-1.31	0.610	0.032
Urologist's experience			0.028
5-10 years	0.11	0.274	
> 10 years	-0.84	0.380	
Teaching hospital	1.36	0.291	0.000
Opinion			0.000
Complementary	-2.19	0.340	
Seldom/never	-2.20	0.406	
Constant	0.23	0.418	

CHAPTER 4

DIAGNOSING THE DIAGNOSIS; VARIATION IN DEFINITIONS OF BENIGN PROSTATIC HYPERPLASIA AMONG UROLOGISTS

Partly based on: Stoevelaar HJ, Van de Beek C, Nijs HGT, Casparie AF, McDonnell J, Janknegt, RA. The symptom questionnaire for benign prostatic hyperplasia: an ambiguous indicator for an ambiguous disease. Br J Urol 1996;77:181-5.

INTRODUCTION

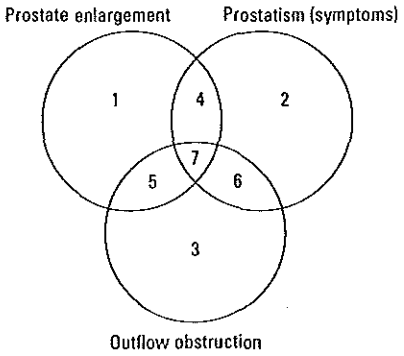
Based on the findings that are reported in chapter 6, it can be calculated that every Dutch urologist or urologist-in-training makes the diagnosis of benign prostatic hyperplasia (BPH) on average 3 to 4 times a week. As discussed in the introduction, the concept of clinical BPH is complex, and consists of three aspects, namely prostatic enlargement, prostatism (symptoms) and the existence of infravesical obstruction.[1] In many studies, the diagnosis of BPH is based on the individual opinions of urologists, without the use of standard diagnostics or definitions. This study examines the extent of agreement on the definition of BPH in a sample of Dutch urologists. In addition, it assesses the impact of differences in opinions as well as urologists' background characteristics (experience, type of hospital, certified/resident) on a patient's chance of being diagnosed with BPH.

MATERIALS AND METHODS

The study population is identical to that of our multicentre study (see chapter 2), which consisted of 39 urologists and residents in a sample of 13 hospitals, selected by size, function, and region. In total 1703 consecutive male patients, aged 50 years and older, newly referred to one of these urologists, were included in the study. At the first visit, all men were asked to complete the Dutch language version of the symptom questionnaire of the American Urological Association[2] which contains seven questions about the presence of both obstructive and irritative symptoms related to BPH (see appendix 1).

After diagnostic evaluation, the urologist filled out a questionnaire on the presence of BPH and/or other urological diseases (see appendix 2). The urologists' criteria used for the diagnosis of BPH were obtained by postal questionnaire, after the inclusion of all patients. They were asked to indicate the criteria they used, according to the model of Hald[1] (see chapter 1), which illustrates the relationship between the major components of clinical BPH (see figure 1).

Figure 1 - Question about the diagnosis of BPH, to be answered by the urologists.



Could you please mark the situations in which you diagnosed your patients with BPH? Multiple answers allowed.

Associations between opinions on the definition of BPH and physicians' background characteristics (certified/resident, extent of experience and type of hospital in which practising) were studied using logistic regression methods.

To assess the impact of differences in criteria on a patient's probability of being diagnosed with BPH, we also performed a logistic regression analysis, with the urologist's judgement on the presence of BPH (yes/no) as dependent variable. As explanatory variables we included symptomatology (obstructive/irritative symptoms), patient's age, and the criteria used for the diagnosis of BPH. In addition, the aforementioned urologists' background variables were also included in the model. The goodness-of-fit of the model was assessed with the Hosmer-Lemeshow test.[3]

RESULTS

Patient characteristics

In total, 1414 patients (83.0%) completed the initial symptom-questionnaire at the first visit to the out-patient clinic. The most important reasons for not participating were physical or mental problems which prevented the completion of the questionnaire (7.6%), patient's refusal (4.1%), and language/reading problems (3.1%); 86.9% completed the questionnaire with no omissions or inappropriate answers. In all, 670 patients (47.4%) were finally diagnosed with BPH by their urologist, of whom 522 (77.9%) had no other diagnoses. Important other diagnoses were diseases of the bladder, detrusor and urethra (11.2%), chronic prostatitis/prostatodynia (8.1%), diseases of the upper urinary tract (7.5%), penile-scrotal diseases (8.1%), prostate cancer (6.2%), impotence and infertility (4.7%) and no abnormalities (3.3%).

Urologist characteristics

In total 27 urologists and 12 residents, practising in 3 teaching and 9 general hospitals, were involved in the study. Of them, 37 (95%) returned the postal questionnaire on criteria for the diagnosis of BPH.

Criteria used to make the diagnosis of BPH

Table 1 gives the answers for the separate items of the Hald model. Almost all urologists (three probably misunderstood the question) agreed on the diagnosis of clinical BPH when all three conditions were present. For the single and double conditions, highest percentages were seen for those in which prostate enlargement is comprised.

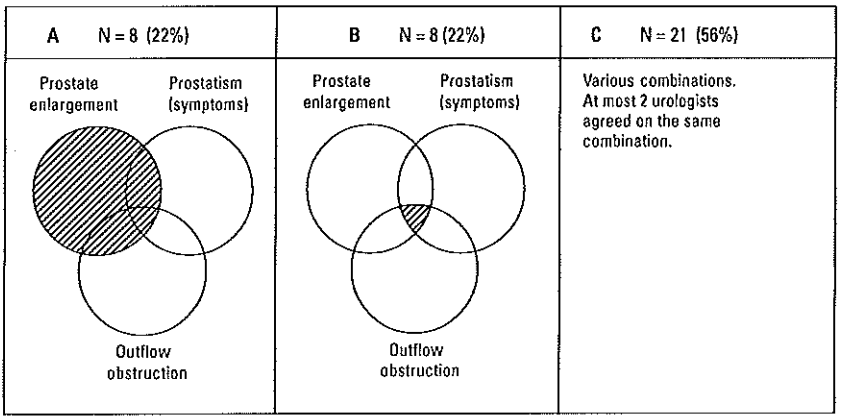
When looking at the combination of items (see figure 2), the answers were very heterogeneous. Of all urologists and residents (n = 37), eight answered that they established the diagnosis of BPH only when all three conditions (situation A) were present. Another eight considered hyperplasia as a conditio sine qua non for the diagnosis of clinical BPH (situation B). The answers of the other physicians (n = 21) showed no specific patterns.

Logistic regression analysis revealed no significant associations between particular opinions (separate criteria and combinations) and urologists' background variables (certified/resident, extent of experience, teaching/general hospital).

Table 1 - Criteria used to make the diagnosis of clinical BPH; scores on the separate items; absolute numbers and percentages of urologists (n=37).

	Condition	Number	Percentage
1	Hyperplasia	12	32
2	Prostatism	6	16
3	Infravesical obstruction	6	16
4	Hyperplasia/prostatism	18	49
5	Hyperplasia/infravesical obstruction	18	49
6	Prostatism/infravesical obstruction	12	32
7	All three conditions present	34	92

Figure 2 - Distribution of combinations of criteria for the diagnosis of clinical BPH.



Chance of the diagnosis BPH in relation to opinions

In the analysis on the effect of different opinions on a patient's chance of being diagnosed with BPH, the aforementioned three groups of opinions were considered as categories of the explanatory variable 'definition of BPH'. Based on the results of the logistic regression analysis (see statistical addendum), a probability profile was constructed to express the chance of the diagnosis of BPH, given the various options (table 2).

Table 2 - Probability of the diagnosis of clinical BPH for several characteristics, compared to a reference patient.[a]

Variable	Category	Probability of the diagnosis of BPH
Reference patient		0.32
Irritative symptoms	Moderate	0.47
	Severe	0.45
Obstructive symptoms	Moderate	0.59
	Severe	0.71
Age (years)	55	0.22
	75	0.44
Obstructive symptoms * age (years)	Moderate/55	0.57
	Moderate/75	0.62
	Severe/55	0.63
	Severe/75	0.78
Type of hospital	Teaching	0.15
Opinion on BPH	'Hyperplasia necessary'	0.21
	'All characteristics necessary'	0.31

[a] A reference patient is defined as follows: having mild irritative and obstructive symptoms, age 65 years, in a general hospital and treated by a urologist with no pronounced opinion on BPH.

A higher symptom level, particularly with respect to obstructive symptoms, increased the probability of a diagnosis of BPH. The obstructed score interacted with age; for the mild and severe categories, a higher age was positively associated with an increased probability that a patient would be diagnosed as having BPH. For the moderate group, the interaction was weak.

Definition of BPH also showed a significant effect. Urologists with a specific opinion were less likely to 'label' patients as having BPH than those with no pronounced opinion. Surprisingly, the type of hospital proved to play an important role; for patients attending general hospitals, the chance of being diagnosed with BPH was about twice as high as in those attending teaching hospitals.
The goodness-of-fit of the model, as assessed by the Hosmer-Lemeshow test,[3] was satisfactory (P = 0.106).

DISCUSSION

As was supposed by others,[4] this study demonstrated that there is little consensus in urologists' opinions on the definition of clinical BPH. In addition, the variation in opinion proved to be associated with the patient's chance of a final diagnosis of BPH. Although symptoms, in particular the obstructive ones, contributed most substantially to the probability of being 'labelled' with BPH, differences of definition were shown to co-determine this chance. Moreover, the kind of hospital (teaching/general) appeared to play a significant role in this respect. Regardless of other characteristics, patients in teaching hospitals had a lower probability of being diagnosed with BPH than did patients in general hospitals. We assume that this difference is associated with the use of urodynamic investigations, which are more prevalent in teaching hospitals,[5] and which enlarges the potential for differential diagnoses.[6]
The variation in definitions of clinical BPH probably reflects the changing insights into the aetiology of prostatism. Until recently, symptomatology in the presence of an enlarged prostate (determined by digital rectal examination) was considered as sufficient for making the diagnosis of clinical BPH. However, since the majority of elderly men do have a palpable enlarged prostate, symptomatology played the dominant role in diagnostics and treatment choice.
Recently, several studies have been published which focused on the discriminative power of standardized symptomscores for BPH versus specific control groups, including women.[7-12] The results of these studies indicate that symptom scores are not BPH-specific. Therefore, it has been suggested to replace the term 'prostatism' with 'lower urinary tract symptoms' (LUTS).[13]

Although in our study, a minority (16%) indicated that prostatism could be synonymous with clinical BPH, about half of the urologists still considered the combination of prostate enlargement and prostatism as sufficient to reach this diagnosis. Apparently, the evidence of infravesical obstruction is not convincing as a freestanding criterion (16%), nor is it very strong when combined with one other property (prostate enlargement or prostatism). The ultimate 'proof' for the diagnosis of clinical BPH is obviously the co-existence of all three conditions: nearly every urologist (three respondents most likely misunderstood the question) agreed on this combination to definitively represent clinical BPH. However, only 8/37 (22%) considered this trinity also as a necessary condition.

Besides the differences in opinions at a conceptual level, there is much discussion about the appropriate determination of the respective conditions, particularly with regard to infravesical obstruction. While some authors strongly advocate the use of pressure-flow studies to affirm or rule out this condition,[14] others doubt their additional value when compared to conventional and less invasive diagnostics.[15] Whether there is a need to reach consensus about the diagnosis of clinical BPH depends on the clinical relevance, i.e. its meaning for treatment choice. The development of many new treatment modalities, which are believed to affect only specific aspects of the BPH-complex,[6] necessitate further research and subsequent consensus development among urologists.

SUMMARY AND CONCLUSIONS

This chapter described a study on the variation in opinions about the diagnosis of clinical BPH in a sample of 39 urologists. Additionally, an analysis was performed on the impact of differences in opinions as well as urologists' background characteristics on the probability that a patient was diagnosed with BPH. The variation in opinions was significant. A patient's chance of a diagnosis of BPH varied with differences in opinions used, but was more strongly affected by the background variable 'type of hospital'. We assume these findings to reflect the changing insights into the aetiology of prostatism. Further research should be undertaken to identify clinically relevant distinctions in the properties of the BPH-complex.

REFERENCES

1. Hald T. Urodynamics in benign prostatic hyperplasia: a survey. Prostate 1989;2(suppl):69-77.
2. Barry MJ, Fowler FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett ATK. The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 1992;148:1549-57.
3. Hosmer DW, Lemeshow S. Applied logistic regression. Chapter 5: Assessing the fit of the model (135-75). New York: John Wiley & Sons, 1989.
4. Bosch JLHR, Hop WCJ, Kirkels WJ, Schröder FH. Natural history of benign prostatic hyperplasia: appropriate case definition and estimation of its prevalence in the community. Urology 1995;46(suppl.):34-40.
5. Stoevelaar HJ, Van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.
6. Janknegt RA, Rollema HJ, Van de Beek C. Urodynamic studies necessary for correct diagnosis in prostatism (in Dutch). Ned Tijdschr Geneeskd 1994;138:1751-6.
7. Chancellor MB, Rivas DA, Keeley FX, Lotfi MA, Gomella LG. Similarity of the American Urological Association symptom index among men with benign prostate hyperplasia (BPH), urethral obstruction not due to BPH and detrusor hyperreflexia without outlet obstruction. Br J Urol 1994;74:200-3.
8. Chai TC, Belville WD, McGuire EJ, Nyquist L. Specificity of the American Urological Association voiding symptom index: comparison of unselected and selected samples of both sexes. J Urol 1993;150:1710-3.
9. Chancellor MB, Rivas DA. American Urological Association symptom index for women with voiding symptoms: lack of index specificity for benign prostate hyperplasia. J Urol 1993;150:1706-8.
10. Lepor H, Machi G. Comparison of AUA symptom index in unselected males and females between fifty-five and seventy-nine years of age. Urology 1993;42:36-40.
11. Yalla SV, Sullivan MP, Lecamwasam HS, DuBeau CE, Vickers MA, Cravalho EG. Correlation of American Urological Association symptom index with obstructive and nonobstructive prostatism. J Urol 1995;153:674-79.
12. Stoevelaar HJ, Van de Beek C, Nijs HGT, Casparie AF, McDonnell J, Janknegt, RA. The symptom questionnaire for benign prostatic hyperplasia: an ambiguous indicator for an ambiguous disease. Br J Urol 1996;77:181-5.
13. Abrams P. New words for old: lower urinary tract symptoms for 'prostatism'. BMJ 1994;308:929-30.
14. Abrams P. In support of pressure-flow studies for evaluating men with lower urinary tract symptoms. Urology 1994;44:153-5.
15. McConnell JD. Why pressure-flow studies should be optional and not mandatory studies for evaluating men with benign prostatic hyperplasia. Urology 1994;44:156-8.

ADDENDUM

Results of logistic regression analysis, on the basis of which the probability profiles (table 2) were computed.

Reference classes for regression:

Patient characteristics:

- Age (years) continuous
- Obstructive symptom score 0-4 (mild)
- Irritative symptom score 0-3 (mild)

Urologist characteristics:

- Experience < 5 years
- Resident/certified urologist certified
- Function of hospital general

Opinion on BPH:

- Prostate enlargement is necessary condition

Probability of diagnosis of BPH

Variable	B	S.E.	Sig
Age (years)	0.05	0.012	0.000
Irritative symptoms			0.000
Moderate	0.62	0.152	
Severe	0.56	0.180	
Obstructive symptoms			0.000
Moderate	3.91	1.040	
Severe	2.57	1.380	
Obstructive symptoms * Age (years)			0.022
Moderate	-0.04	0.016	
Severe	-0.01	0.021	
Teaching hospital	-0.98	0.129	0.000
Opinion on BPH			0.015
No pronounced opinion	0.57	0.196	
All three conditions	0.49	0.205	
Constant	-4.69	0.794	

CHAPTER 5

VARIATION IN THE INTERPRETATION OF DIAGNOSTIC OUTCOMES; THE CASE OF UROFLOWMETRY

Based on: Van de Beek C, Stoevelaar HJ, McDonnell J, Nijs HGT, Casparie AF, Janknegt RA. Interpretation of uroflow curves by urologists. J Urol. Accepted for publication.

INTRODUCTION

Uroflowmetry is a routinely used non-invasive and simple diagnostic test in patients with lower urinary tract symptoms (LUTS). Although uroflowmetry has not been recommended as mandatory in the basic initial evaluation of men suspected of having benign prostatic hyperplasia (BPH),[1-2] its use is most common for this category of patients. In chapter 2 we demonstrated that in 84% of newly referred BPH-patients, uroflowmetry had been performed as an initial diagnostic procedure.[3]

Apart from the issue for which categories of patients uroflowmetry should be performed (appropriateness of indication), it is also important to consider how the procedure is performed, and how the results are interpreted (appropriateness of application). Several authors have focused on different problems concerning the validity and reliability of this test, which necessitate careful interpretation of the test outcome. These problems include representativeness of the test for the usual voiding pattern and artifacts,[4] reproducibility,[5] and association between outcome parameters and voided volume.[6]

Another important issue that has generated relatively little attention in the urological literature is the variation in the interpretation of uroflow results. Jørgensen et al (1990)[7] demonstrated a rather poor overall interobserver agreement in the classification of 176 uroflow curve patterns among six doctors with different degrees of experience with uroflowmetry. Agreement was better within the subgroup of doctors who had greater experience. Given the widespread use of uroflowmetry, most urologists can nowadays be considered as experienced in this field. This study focuses on differences in the use of uroflowmetry and the interpretation of its results in a representative sample of urologists. The study aims are threefold.

Firstly, it inventarizes the opinions of a representative panel of urologists about the use of uroflowmetry and the interpretation of its results. Secondly, it examines the diagnostic value of uroflowmetry as a free-standing test, by comparing urologists' opinions with actual diagnoses in a sample of randomly selected flow curves. Finally, it determines the inter-observer and intraobserver variability in the interpretation of flow curves.

MATERIALS AND METHODS

A panel of 58 urologists and residents was questioned about the use of uroflowmetry, and the relevance of several quantitative parameters for interpretation. The parameters that were selected included those as defined by the International Continence Society: voiding time (T100), flow time (TQ), time to maximum flow rate (TQ_{max}), maximum flow rate (Q_{max}), average flow rate (Q_{ave}) and voided volume (V_{comp}).[8]
In addition, the panel was asked to individually assess 21 flow curves and parameters with respect to normality and to make the most likely diagnosis. These cases were selected randomly from the outpatient registration of the University Hospital Maastricht, and concerned 19 men (aged between 14 en 78 years) and two women (aged 58 and 74 years respectively). Final diagnoses were confirmed by a complete urological work-up (cystoscopy and pressure-flow study if applicable). Attribution of cases to the various diagnostic categories was done using the following criteria:

- No abnormalities: no voiding complaints; no signs of prostatic obstruction from the basic evaluation.
- Benign prostatic hyperplasia: presence of lower urinary tract symptoms; prostate enlargement determined by DRE and/or prostate ultrasonography; no signs of other lower urinary tract pathology from the diagnostic evaluation.
- Urethral stricture: based on endoscopic evidence.
- Detrusor failure: based on pressure-flow analysis: no obstruction, decreased contractility.
- Dyssynergic bladder neck obstruction: typical intermittent flow curve, sustained by urodynamic and/or endoscopic findings.
- Mixed pathology (detrusor failure and benign prostatic hyperplasia): urodynamic evidence of prostatic obstruction and decreased contractility.

There were 4 cases for which no abnormalities could be diagnosed within the lower urinary tract (3 males and 1 female), 6 cases of BPH, 3 cases of urethral stricture (all males), 4 cases of detrusor failure (3 males and 1 female), 2 cases of dyssynergic bladder neck obstruction (both males), and 2 cases of mixed pathology (2 males with detrusor failure and BPH). All curves were recorded with a Dantec Urodyn 1000 flowmeter. All patients reported their voiding to be representative. Except for two cases, voided volumes were at least 150 ml. To determine the extent of intraobserver variability, four cases were included twice, bringing the total number of cases to 25. The panel was not informed about the inclusion of duplicate cases. Figures 1 to 6 give an overview of the flow curves and associated parameters presented to the panel, as well as the age, sex and diagnostic information of the patients involved, which were not shown to the panel. For each case, the panel members were asked to classify the curves as being normal, borderline, abnormal, or not evaluable. In addition, they were asked to choose the most likely diagnosis (BPH, urethral stricture, detrusor failure, dyssynergic bladder neck obstruction, not able to reach a diagnosis).

Agreement between panel opinions and actual diagnoses was expressed in percentages. To determine the extent of agreement between the panelists (interobserver agreement), kappa-values were calculated using the methods for multiple rater-agreement by Schouten[9] (weighted kappa for the ordinal variable 'normality') and Fleiss[10] (unweighted kappa for the nominal variable 'most likely diagnosis'). The extent of intra-observer agreement (4 cases) was determined by calculating the percentages of change between first and second opinion. All analyses were performed for the total group, as well as for subgroups by background characteristics (urologist's experience, type of hospital) of the panel members.

Legend to figures 1-6:

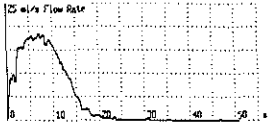
* Case presented twice

DRE Digital rectal examination
LUTS Lower urinary tract symptoms
PVR Postvoid residual urine
UTI Urinary tract infection

Figure 1 - Flow curves and parameters of patients without lower urinary tract abnormalities.

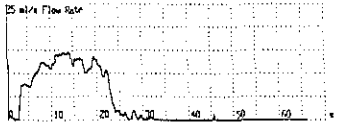
Case 1.1
Male, 69 years
Q_{max} = 19 ml/s
V_{comp} = 214 ml

Follow-up micro haematuria, cause unknown. No micturition complaints. DRE: 20-30 grams, benign aspect. PVR 0 ml. No further diagnostics and treatment.



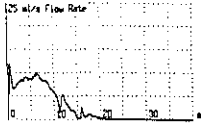
Case 1.2
Male, 75 years
Q_{max} = 15 ml/s
V_{comp} = 238 ml

Evaluation macro haematuria. No micturition complaints. DRE: 15 grams, benign aspect. PVR 0 ml. IVU: small lower calyceal stone. Treatment: watchful waiting.



Case 1.3
Male, 55 years
Q_{max} = 12 ml/s
V_{comp} = 100 ml

Check-up visit. No micturition complaints. DRE: 15 grams, benign aspect. PVR 0 ml. PSA: < 0.5 ng/ml. No further diagnostics and treatment.



Case 1.4
Female, 74 years
Q_{max} = 20 ml/s
V_{comp} = 315 ml

Evaluation macro haematuria. No voiding complaints. Cystoscopy: solitary bladder tumour. TUR-bladder: papillary superficial bladder tumour (PTAG-2). Therapy: cystoscopic follow-up.

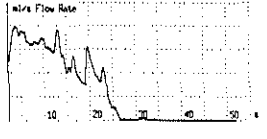
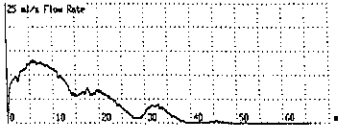


Figure 2 - Flow curves and parameters of patients with BPH.

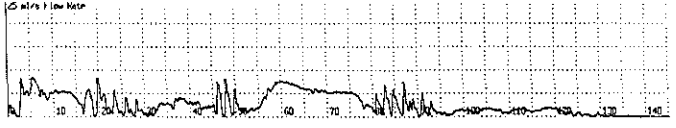
Case 2.1
Male, 69 years
Q_{max} = 13 ml/s
V_{comp} = 237 ml

Evaluation LUTS. DRE: BPH, 30 grams. Prostate ultrasonography: volume 27 ml, benign aspect. PVR 0 ml. Therapy: *α*-blocker.



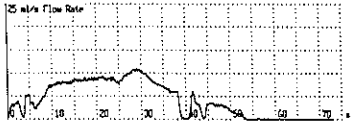
Case 2.2
Male, 65 years
Q_{max} = 9 ml/s
V_{comp} = 378 ml

Evaluation LUTS. DRE: BPH, 60 grams. Prostate ultrasonography: volume 68 ml, benign aspect. Pressure-flow analysis: obstruction, normal contractility. Cystoscopy: severe trabeculation, UP-length 2.0 cm. Therapy: Hryntschack prostatectomy, after which strong improvement of micturition complaints.



Case 2.3
Male, 74 years
Q_{max} = 11 ml/s
V_{comp} = 309 ml

Evaluation LUTS (mild) and erectile dysfunction. DRE: BPH, 25 grams. Prostate ultrasonography: volume 27 ml, benign aspect. PVR = 70 ml. Therapy: BPH, none; erectile dysfunction: intracavernosal injections.



Case 2.4*
Male, 62 years
Q_{max} = 13 ml/s
V_{comp} = 266 ml

Evaluation LUTS (mild). DRE: BPH, 30 grams. Prostate ultrasonography: volume 30 ml, benign aspect. PVR 10 ml. Therapy: watchful waiting.

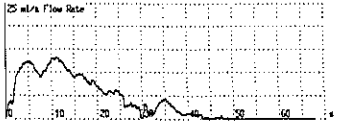


Figure 2 (continued) - Flow curves and parameters of patients with BPH.

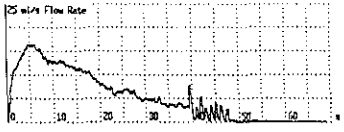
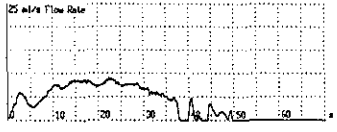
Case 2.5* Male, 62 years Q_{max} = 17 ml/s V_{comp} = 361 ml	Evaluation LUTS (severe). DRE: BPH, 30 grams. PVR 0 ml. Pressure-flow: normal contractility, moderate obstruction. Therapy: α-blocker.	
Case 2.6 Male, 74 years Q_{max} = 9 ml/s V_{comp} = 254 ml	Same patient as case 2.3. Follow-up investigation some days later (without diagnostic or therapeutic interventions).	

Figure 3 - Flow curves and parameters of patients with urethral stricture.

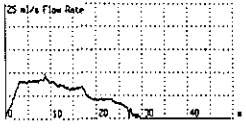
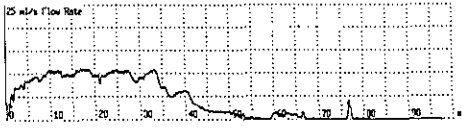
Case 3.1* Male, 43 years Q_{max} = 10 ml/s V_{comp} = 162	Recurrence of urethroperineal fistula with inflammation. Cystoscopy: proximal urethral stricture. Therapy: urethroplasty.	
Case 3.2 Male, 41 years Q_{max} = 11 ml/s V_{comp} = 390 ml	Evaluation LUTS (severe). Bladder ultrasonography: PVR 1200 ml (overflow). Cystoscopy: bladder neck stenosis. Therapy: suprapubic catheter (initial) and bladder neck incisions. Follow-up: no voiding symptoms, normal flow, PVR 0 ml.	

Figure 3 (continued) - Flow curves and parameters of patients with urethral stricture.

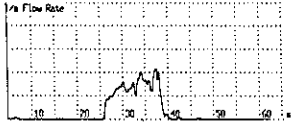
Case 3.3 Male, 33 years Q_{max} = 9 ml/s V_{comp} = 166 ml	Recurrent complaints (LUTS and UTI) after previous urethrotomy. Cystoscopy: proximal urethral stricture. Therapy: Sachse and clean intermittent catheterization.	
Case 3.4 Male, 14 years Q_{max} = 11 ml/s V_{comp} = 113 ml	Follow-up urinary retention after previous catherization. Cystoscopy: proximal urethral stricture.	

Figure 4 - Flow curves and parameters of patients with detrusor failure.

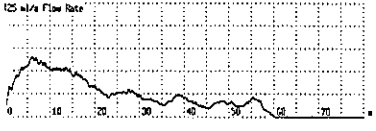
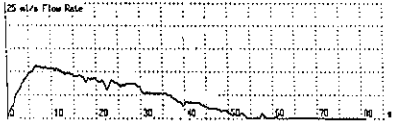
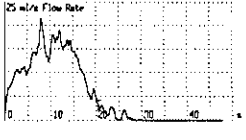
Case 4.1* Male, 78 years Q_{max} = 13 ml/s V_{comp} = 336 ml	Evaluation LUTS. DRE: BPH, 30 grams. Prostate ultrasonography: volume 28 ml, benign aspect. Pressure-flow analysis: no obstruction, low contractility. Therapy: watchful waiting.	
Case 4.2 Male, 48 years Q_{max} = 11 ml/s V_{comp} = 328 ml	Evaluation LUTS. DRE: small prostate, benign aspect. PVR 200 ml. Pressure-flow analysis: no obstruction, low contractility. Therapy: urecholine.	
Case 4.3 Female, 58 years Q_{max} = 22 ml/s V_{comp} = 257 ml	Evaluation LUTS in patient with spinal metastasis of lung cancer. Neurophysiologic investigation: conus laesion. Improvement after radiotherapy; follow-up: normal micturition.	

Figure 5 - Flow curves and parameters of patients with dyssynergic bladder neck obstruction.

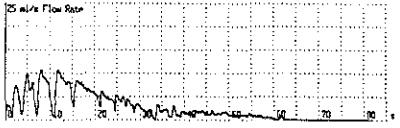
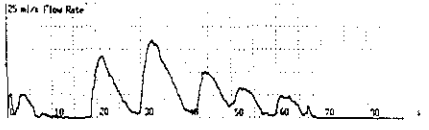
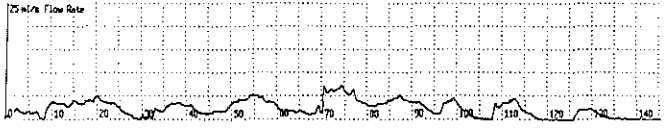
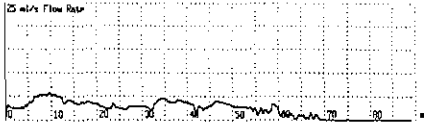
Case 5.1 Male, 36 years Q_{max} = 11 ml/s V_{comp} = 209 ml	Evaluation of LUTS. Cystoscopy: dyssynergic bladder neck, no stricture. No neurological abnormalities. Therapy: terazosin.	
Case 5.2 Male, 58 years Q_{max} = 17 ml/s V_{comp} = 304 ml	Evaluation LUTS. DRE: BPH, 30 grams. PVR 70 ml. Pressure-flow analysis: no obstruction, low contractility, intermittent flow curve. Therapy (investigational): aromatase-inhibitor.	

Figure 6 - Flow curves and parameters of patients with multiple pathology (detrusor failure and BPH).

Case 6.1 Male, 72 years Q_{max} = 7 ml/s V_{comp} = 363 ml	Recurrent LUTS after previous TURP for BPH. Pressure-flow analysis: moderate obstruction and decreased contractility. Cystoscopy: recurrent adenoma. Therapy: α-blocker.	
Case 6.2 Male, 53 years Q_{max} = 6 ml/s V_{comp} = 208 ml	Evaluation LUTS. DRE: BPH, 25 grams. PVR 100 ml. Cystoscopy: bilateral enlarged lobes. Pressure-flow analysis: mild obstruction, moderate decreased contractility. Therapy: α-blocker.	

RESULTS

Characteristics of the panel members

The panel consisted of 50 urologists and 8 residents, representing about one fifth of the total practising in the Netherlands. With respect to the urologists' background variables (year of certification, type of hospital), the panel proved to be representative for the total population of urologists in the Netherlands (comparison with information provided by the Dutch Association of Urology, personal communication).

Representativeness of the flow curves

When compared to the figures of our patient registration, the study sample proved to be representative with respect to age and sex: of all patients who undergo uroflowmetry at our outpatient clinic, about 75% are men of 50 years and older. Only 10% of the patients are female.

Visual inspection and relevant parameters

All urologists reported using uroflowmetry. Visual inspection, voided volume and Q_{max} were most frequently mentioned as relevant for interpretation (see table 1). In logistic regression analysis,[11] the use of visual inspection and nomograms proved to be associated with the type of hospital in which the urologists practise (general/teaching): visual inspection was more frequently mentioned by urologists from general hospitals than those practising in teaching hospitals (odds ratio 5.2, $p < 0.05$), while the opposite is true for the use of nomograms (odds ratio 0.28, $p < 0.05$). Those reporting the use of nomograms (26%), most frequently mentioned the Liverpool nomogram[12] (36%). No relationship was found between the use of specific quantitative parameters and background characteristics of the urologists.

Table 1 - Uroflow data, considered to be relevant for interpretation; percentages of panel members (n = 58)

Parameter/aspect	%
Voided volume	81
Visual inspection	77
Nomograms	26
Q_{max}	77
Q_{ave}	40
TQ_{max}	28
TQ	26
T100	23

Agreement between panel opinions and actual diagnoses

Four cases (see figures 1.1-1.4) concerned patients for whom no abnormalities within the lower urinary tract could be diagnosed. The panel opinions regarding normality of the curves are given in table 2. On average, more than half of the urologists considered the curves from persons with no abnormalities as borderline or abnormal. For only one case (fig. 1-1) did almost all panel members (93%) agree on the curve being normal. The curves of persons for whom some pathological condition of the lower urinary tract was evident (n = 21), were considered by the panel as abnormal or borderline in the majority of the cases (see table 2).

Table 2 - Normality of flow curves according to the panel, compared to actual diagnoses; percentages per category (row total = 100).

	Panel opinions (%)		
Actual diagnoses	Normal	Borderline	Abnormal
Normal (4 cases)	43	34	23
Abnormal (21 cases)	6	16	78

Table 3 shows the extent of agreement between actual diagnoses and those of the panel. In general, the agreement is very poor, being highest for BPH and dyssynergic bladder neck obstruction, for which the panel members (on average) predicted the actual diagnosis in only about half of the cases. In 12 of the 25 cases, the panel members considered another diagnosis as more likely than the actual diagnosis. For one BPH-patient (fig. 2-2), 71 percent of the urologists chose for dyssynergic bladder neck obstruction as diagnosis. In 4 of the 5 cases of urethral stricture (1 case included twice), the diagnosis of BPH was more frequently mentioned than the actual diagnosis. Similarly, in 3 of the 4 cases of detrusor failure (1 case included twice), the diagnosis of BPH was expressed to be more likely than detrusor failure. For the two cases of dyssynergic bladder neck obstruction (fig. 5), about half of the panel members agreed on this diagnosis. For one case (fig. 5-2), another 48 percent indicated that detrusor failure was the most likely diagnosis.

Table 3 - Agreement of panel opinions with actual diagnoses; percentages (row total = 100).

	Panel opinions (%)		
Actual diagnosis (# cases)	same	other	not possible
BPH (8)	54	23	23
Urethral stricture (5)	24	51	25
Detrusor failure (4)	8	66	26
Dyssynergic bladder neck obstruction (2)	50	41	9
BPH/detrusor failure (2)	24	67	9
No abnormalities (4)	39	26	35
Total (25)	36	40	24

Concerning the cases with mixed pathology (fig. 6), a considerable percentage (33 and 59% respectively) of the urologists mentioned urethral stricture as the most likely diagnosis. The mean number of correctly predicted diagnoses was 9.8. A minority (19%) predicted the actual diagnosis in more than half of the cases.

Interobserver agreement

Despite the fact that for about half of the cases the agreement among the panel members was higher than the agreement with the actual diagnoses, the interobserver agreement proved to be moderate (kappa 0.46) for normality, and poor (kappa 0.30) for the most likely diagnosis (see table 4). There were some small differences between the subgroups, but these were not significant.

Intraobserver agreement

None of the participants spontaneously expressed awareness of the inclusion of identical cases. For these four cases, intraobserver agreement was not very satisfactory: in 17-37% (mean 29%), different values were chosen for normality, and in 22-51% (mean 41%), another diagnosis was mentioned the second time.

Table 4 - Interobserver agreement (n=58) by extent of urologist's experience and type of hospital in which practising.

		Normality		Most likely diagnosis	
		weighted kappa	(SE)	kappa	(SE)
Experience	< 5 years	0.44	(0.080)	0.37	(0.052)
	5-10 years	0.48	(0.098)	0.29	(0.048)
	> 10 years	0.46	(0.100)	0.27	(0.045)
Type of hospital	general	0.46	(0.089)	0.31	(0.045)
	teaching	0.47	(0.084)	0.30	(0.046)
Total		0.46	(0.087)	0.30	(0.043)

DISCUSSION

Uroflowmetry has become one of the most used tests in patients with lower urinary tract symptoms. The diagnostic information produced by uroflowmetry consists of a visual curve and derived parameters. On average, our panel members considered peakflow, voided volume and the outcomes of visual inspection as the most relevant flow information. In several studies, it has been demonstrated that quantitative flow data are insufficient to make a differential diagnosis in patients with LUTS.[4] The meaning of the shape of the curve in this respect has been studied far less extensively. Tripathi and Shridar (1982) suggest standard patterns for patients with various types of LUTS.[13] Jørgensen et al (1992) demonstrated specific flow curves to be of some prognostic value for the need of surgical treatment in voiding problems among elderly males.[14] In addition, other authors mention flow curve patterns to be 'typical' for specific pathological conditions.[4, 15] A sound scientific base justifying the use of flow curve patterns in the differential diagnosis of LUTS is still lacking.
The large differences between actual diagnosis and panel opinions, as well as the large interobserver variation we found in this study supports the evidence that uroflowmetry is not a suitable instrument in making a differential diagnosis in patients with LUTS.

Although it is commonly accepted that uroflowmetry, if properly performed, is an excellent means to discriminate between normal and abnormal voiding,[4] our results necessitate the reconsideration of this assertion with respect to daily urological practice. Of course, we must take into account the rather artificial study setting, because no other relevant patient information (e.g. age, sex) was given besides the flow curves and parameters. However, such information would have been only useful to affirm or rule out some diagnoses on the base of epidemiological premises, since no age or sex specific uroflow nomograms have been proven to be valid. With respect to the group of elderly men with voiding problems, a major topic concerns the inability of uroflowmetry to distinguish between bladder outlet obstruction and impaired detrusor function.[16] Although there is much discussion about its proper indications,[17, 18] it is now commonly accepted that pressure-flow studies are the only means to distinguish between these two pathological conditions.[4] However, in daily urological practice, the urologists seem to rely heavily on the results of uroflowmetry in making the diagnosis in elderly males with LUTS. Recently, we found that the use of pressure-flow studies in patients with BPH is very modest (on average 14%), with considerable interpractice variation (0-33%).[3] In this light, the results of our panel study underscore the need for a critical review of the role of uroflowmetry in the diagnosis making process.

Several efforts are currently being made to improve the diagnostic value of uroflowmetry (e.g. by the construction of new variables),[4, 19] and to facilitate the interpretation of its outcomes by the use of software programs.[4] Although the results are promising, more extensive validation is necessary to determine their usefulness. Until standardized, reliable and valid procedures have been established, we remain sceptical about the diagnostic feasibility of uroflowmetry in daily practice, and we agree on the fear, as expressed recently by Jensen (1995) that this procedure is not only the most used, but probably also the most misused test in urology today.[20]

SUMMARY AND CONCLUSIONS

Uroflowmetry has become a routine investigation in patients with symptoms of the lower urinary tract (LUTS). Little is known about the variation in the use of uroflowmetry and in the interpretation of its outcomes.

This study aimed to inventarize the use of uroflow information, to investigate the diagnostic value of uroflowmetry as a freestanding test, and to examine the interobserver and intraobserver variation in the interpretation of uroflow curves.
A representative panel of 58 urologists was questioned about the relevance of visual inspection and flow parameters for interpretation. In addition, they individually assessed 25 randomly selected uroflow curves (both from patients with no abnormalities and from patients with various types of LUTS) on normality and most likely diagnosis. To investigate intraobserver agreement, four of these curves were included twice.
Voided volume (81%), visual inspection (77%), and Q_{max} (77%) were most frequently mentioned as relevant for interpretation. Large differences existed between panel opinions and actual case information. For 43% of the normal cases, the panel members considered the curves as being abnormal. Of the abnormal cases, 6% of the curves were regarded as being normal. In 36% of all cases, the urologists predicted correctly the actual diagnosis. Interobserver agreement was moderate for normality (kappa 0.46, SE 0.087) and poor for the most likely diagnosis (kappa 0.30, SE 0.043). Intraobserver agreement was also not very satisfactory: on average, for the 4 cases that were included twice, 29% of the panel members chose another option for normality, while 41% mentioned another diagnosis the second time.
These results necessitate the reconsideration of the diagnostic utility of uroflowmetry in daily urological practice.

REFERENCES

1. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0582.
2. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the 2nd International Consultation on Benign Prostatic Hyperplasia (BPH). Jersey: Scientific Communication International, 1993.
3. Stoevelaar HJ, Van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.

4. Rollema HJ. Uroflowmetry. In: Siroky MB and Krane RJ, eds. Clinical neurourology; 2nd edition (201-44). Boston: Little & Brown, 1991.
5. Golomb J, Lindner A, Siegel Y, Korczak D. Variability and circadian changes in home uroflowmetry in patients with benign prostatic hyperplasia compared to normal controls. J Urol 1992;147:1044-7.
6. Siroky MB, Olsson CA, Krane RJ. The flow rate nomogram: I.Development. J Urol 1979;122:665-8.
7. Jørgensen JB, Jensen KM-E, Klarskov P, Bernstein I, Abel I, Mogensen P. Intra- and inter-observer variations in classification of urinary flow curve patterns. Neurourol Urodyn 1990;9:535-9.
8. Abrams P, Blaivas JG, Stanton SL, Andersen JT. The standardisation of terminology of lower urinary tract function. The International Continence Society Committee on Standardisation of Terminology. Scand J Urol Nephrol 1988;145(suppl):5-19.
9. Schouten HJA. Statistical measurement of interobserver agreement. PhD thesis. Rotterdam: Erasmus University, 1985.
10. Fleiss JL. Statistical methods for rates and proportion; 2nd edition. New York: John Wiley, 1981.
11. Hosmer DW, Lemeshow S. Applied logistic regression. New York: John Wiley & Sons, 1989.
12. Haylen BT, Ashby D, Sutherst JR, Frazer MI, West CR. Maximum and average urine flow rates in normal male and female populations - the Liverpool nomograms. Br J Urol 1989;64:30-8.
13. Tripathi VNP, Sridhar M. Urodiagrams: a new method of uroflow pattern analysis. J Urol 1983;130:309-11.
14. Jørgensen JB, Jensen KM-E, Mogensen P, Klarskov P, Andersen JT. Urinary flow curve patterns and their prognostic value in males over the age of 50 years. Neurourol Urodyn 1992;11:473-81.
15. Noble JG. Bladder neck dyssynergia and prostatitis. In: Chapple, CR, ed. Prostatic obstruction (213-28). London: Springer Verlag, 1995.
16. Chancellor MB, Blaivas JG, Kaplan SA, Axelrod S. Bladder outlet obstruction versus impaired detrusor contractility: the role of uroflow. J Urol 1991;145:810-2.
17. McConnell JD. Why pressure-flow studies should be optional and not mandatory studies for evaluating men with benign prostatic hyperplasia. Urology 1994;44:156-8.
18. Abrams P. In support of pressure-flow studies for evaluating men with lower urinary tract symptoms. Urology 1994;44:153-5.
19. Nishimoto K, Iimori H, Ikemoto S, Hayahara N. Criteria for differentiation of normal and abnormal uroflowmetrograms in adult men. Br J Urol 1994;73:494-7.
20. Jensen KM-E. Uroflowmetry in elderly men. World J Urol 1995;13:21-3.

PART II

VARIATION IN TREATMENT CHOICE

CHAPTER 6

VARIATION IN TREATMENT CHOICE FOR BENIGN PROSTATIC HYPERPLASIA IN UROLOGICAL PRACTICE

Partly based on: Stoevelaar HJ, van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.

INTRODUCTION

For several decades, transurethral resection of the prostate (TURP) has been the gold standard for the treatment of symptomatic benign prostatic hyperplasia. In 1992, approximately 16,000 men underwent surgery for BPH in the Netherlands.[1] Over the last few years, a strong tendency towards less invasive therapies has become evident. These include new medical therapies (α-blockers, 5-α-reductase-inhibitors), laser prostatectomy, balloon dilation, thermotherapy and intra-urethral stents. As was discussed in chapter 1, also 'watchful waiting' can be seen as a new therapeutic regimen, because advances in the diagnosic area have enabled to accurately monitor the course of the disease, which distinguishes this option from 'doing nothing'.

The availability of new therapeutic possibilities means that urologists face new and sometimes complex choices. Although guidelines and recommendations have been developed to help urologists in making these choices,[2-6] it is not known which treatment decisions are actually made in daily clinical practice, and which factors influence the decision making process in this respect.

This study focuses on the current state of practice by:

- describing treatment choices for BPH in urological practice and
- analyzing differences in practice patterns and exploring their determinants.

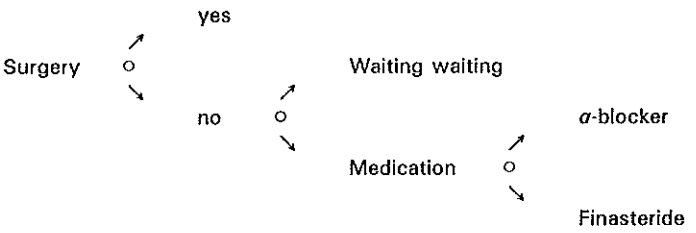
PATIENTS AND METHODS

Study population and data collection

The study population is identitical to that used for the analysis of variation in diagnostics (chapter 2), and consisted of 670 consecutive BPH-patients ≥ 50 years, newly referred to a urologist in a stratified sample of 12 practices, situated in 13 hospitals throughout the Netherlands. The diagnosis of BPH was based on the personal judgement of the urologist. For all patients, data were collected about symptomatology, bothersomeness and sexual function (patient questionnaire, see appendix 1), diagnostic procedures and outcomes (medical record, see appendix 3), and (considerations for) initial treatment decisions (urologist questionnaire, see appendix 2). For patients with an emergency referral, mostly due to acute urinary retention, additional data collection was required. While some of these patients could not be included because their situation prevented the completion of the initial questionnaire, other patients were 'missed' because their admission took place during the evening and night. Because acute patients are more likely to undergo surgery than do elective patients, exclusion of these patients could bias the figures for treatment choice for the total population of patients with BPH. In two hospitals, the medical records of all men who fullfilled the inclusion criteria (≥ 50 years, newly referred), but who were not included in the study, were screened on the diagnosis of BPH. For patients with BPH, data on treatment choice were subsequently documented. Because this additional study was very elaborative, it was restricted to two hospitals (one university hospital, one peripheral clinic),

Determinants of treatment choice

As was done in the study of diagnostics (chapter 2), the variation in treatment choice was analyzed using logistic regression methods. Because the dependent variable is not dichotomous (several types of treatment are possible), we performed a stepwise analysis. First, relevant explanatory variables were identified by inventarizing the arguments for treatment choice for individual cases, as mentioned in the urologist questionnaire. Subsequently, the association between patient variables and background characteristics of the urologist on the one hand (see table 1), and treatment choice on the other hand, was studied for the following dichotomous decision levels:



In order to integrally study the chance of the most common treatment choices for different characteristics of the patient and the urologist, these dichotomous regression analyses were extented to a polychotomous variant.[6-7] The Hosmer-Lemeshow test,[8] was used to asses the goodness-of-fit of the logistic models.

RESULTS

Acute versus elective patients

Only a small proportion (3.8%) of the patients included in the study presented with an acute condition (episode of acute urinary retention within 1 week before referral). As mentioned, this figure is not representative for the total of BPH-patients. One subgroup of the acute patients was excluded from the study on the basis of the selection criteria (ability to complete the symtom questionnaire before visiting the urologist), while another subgroup was admitted during the evening and night. In two hospitals, additional data collection for this group (medical records) showed the percentages of acute patients to be 12.5% (peripheral clinic) and 18.2% (university hospital) respectively.

Variation in treatment choice

Table 2 gives an overview of the initial treatment decisions for elective patients (study population without acute patients), as well as an estimate for the total population of BPH-patients corrected for the proportion of acute patients. In about one third of all patients, surgery was the initial treatment choice. In the majority of the surgical cases (81%), a trans-urethral resection of the prostate (TURP) was performed.

Table 1 - Variables, used to explain the variation in treatment choice.

Variable	Categories		
	low	moderate	high
Patient			
Age (years)	50-64	65-74	≥ 75
Obstructive symptom score[a]	0-4	5-11	12-20
Irritative symptom score[a]	0-3	4-8	9-15
Bothersomeness[b]	0-1	2-11	12-35
Sexual function[c]	yes/no		
Urologic comorbidity	yes/no		
Presence of bladder stones	yes/no		
Emergency referral[d]	yes/no		
History of BPH[e]	yes/no		
Maximum flow rate (Q_{max} in ml/s)	≥ 15	10-15	< 10
Postvoid residual urine (ml)	< 50	50-150	≥ 150
Prostate volume (ml)	≤ 20	20-50	≥ 50
Urologist			
Experience (years)	< 5	5-10	> 10
Resident?	yes/no		
Practicing in teaching hospital?	yes/no		

[a] Based on the subdivision of the American Urological Association symptom questionnaire for BPH.[9] This questionnaire consists of 7 questions about voiding problems, divided into 4 obstructive, and 3 irritative symptoms.

[b] Concerns the bother the patient experiences from his micturition complaints. For each complaint, the extent of bother could be expressed on a 5-point scale (not at all - very bothersome).

[c] Answer to the question 'Over the past several months, have you had any kind of sexual activity (intercourse, masturbation, et cetera)?

[d] Acute urinary retention < 1 week before referral.

[e] Information retrieved from the medical record. It concerns a completed episode of BPH.

For patients with an acute urinary retention, surgery was chosen about twice as often as for elective patients. For about one quarter of the patients, medication was prescribed, consisting of α-blockers (50%), finasteride (42%) and antispasmolytics (8%).

Watchful waiting was chosen for about half of the patients without an active intervention; for the other patients no follow-up appointments were made. A small group consisted of patients who were discharged with an indwelling catheter as a permanent solution, or for whom alternative treatment options (e.g. thermotherapy) were chosen. As was found in the use of diagnostics (chapter 2), there were large differences in treatment choice between the hospitals (see figure 1). The interquartile ranges were 24-42% (surgery), 32-49% (watchful waiting), 5-29% (α-blockers) and 0-17% (finasteride) respectively.

Table 2 - Initial treatment choices for elective and acute patients; percentages by subgroups; column totals are 100%

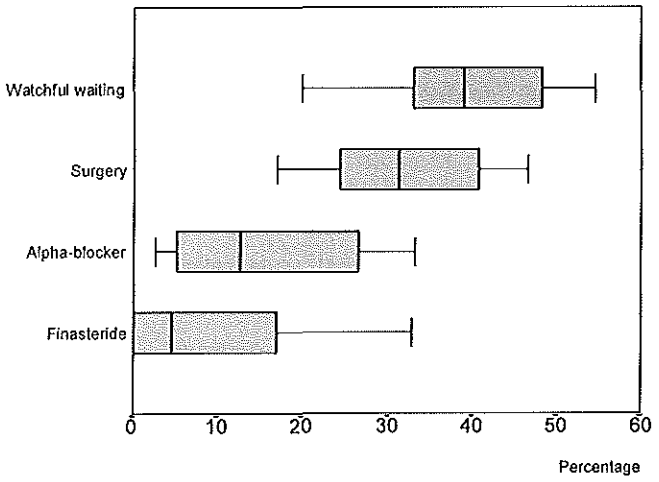
	Elective[a]	Acute[b]	Total[c]
Surgery			
o TURP	24	47	27
o Open surgery	3	12	5
o Laser prostatectomy	1	2	1
o Bladder neck incisions	1		1
Medication			
o α-blockers	15	2	13
o Finasteride	12	5	11
o Other	2		2
Other therapies	1	21	4
No active intervention			
o Watchful waiting	19	9	17
o No urological follow-up	22	2	19

[a] Patients from initial population (12 practices) without acute urinary retention < 1 week (n = 645).

[b] Patients with acute urinary retention < 1 week in control population (2 practices, n = 57).

[c] Weighted average; in the two hospitals for which the total population was studied, the percentages of acute patients were 12.5 and 18.2 respectively. The mean of these two percentages (15.35%) was taken as an estimate for the proportion of acute patients for the total population.

Figure 1 - Variation in treatment choice between the 12 practices. The ends of the boxes correspond with the 25th and 75th percentiles. The line in the box is the median. The ends of the whiskers indicate the total range without extremes (cases with values more than 3 box-lengths from the left or right edge of the box).



The impact of both patient characteristics and urologist's background variables on treatment choice was studied using a a stepwise logistic regression approach. First, analyses were performed for three particular decision levels, namely:

- Surgery versus non-surgical options
- Medication versus watchful waiting
- α-blockers versus finasteride

The results of these separate analyses (see addendum 1) were translated in a probability profile, comparing the estimated chances of particular therapies for different values of the explanatory variables (table 3).

Regarding the dichotomy surgery versus other options, it can be seen that the objective parameters (peakflow, postvoid residual urine and prostate volume) were associated with an increased probability of surgery. Severe bothersomeness also increased the likelihood of an operation. For the irritative symptom score, the results were U-shaped: the probability of surgery was highest for patients with moderate symptoms. The urologist's background variables were not significant for this dichotomy. The chance of medication versus watchful waiting was higher for patients with more irritative symptoms and for those with a poorer peakflow.

Table 3 - Probability (percentage) of particular treatment options at three dichotomous levels, compared to a reference patient.[a] The blanks indicate no significant difference in comparison with the reference patient.

		Surgery	Medication versus	Finasteride
		No surgery	Watchful waiting	α-blocker
Reference patient		31	38	32
Irritative symptoms	Milder	16	14	
	More severe	20	42	
Bothersomeness	Milder	35		
	More severe	55		
Urinary peakflow	Better	14	23	
	Worse	49	56	
Residual urine	Less	13		
	More	36		
Prostate volume	Less	21		
	More	46		
Urologist's experience	Less		63	46
	More		43	90
Type of hospital	Teaching			60

[a] A reference patient is defined as follows: having moderate irritative symptoms (4-8), and bothersomess (2-11); urinary peakflow 10-15 ml/s, postvoid residual urine < 50 ml, prostate volume 20-50 ml; his urologist has 5-10 years of experience, and is practising in a general hospital

In addition, this chance was influenced by the urologist's experience: less experienced urologists were more likely to prescribe medication than their older colleagues. When considering the differences between the two types of medication, the patient characteristics did not play a significant role. In contrast, the urologist's background variables showed large differences. The chance of finasteride was considerably higher for patients who attended a urologist with more than 10 years of experience, and for those in teaching hospitals.

In order to integrally study the patient's chances of one of the four most frequently chosen therapies, a polychotomous logistic regression analysis[6-7] was performed. The principles of this statistical method and its application on treatment choice in BPH are outlined in addendum 2. The variables that proved to be significant in the final model were urinary peakflow, postvoid residual urine, prostate volume, comorbidity, irritative symptoms, bothersomeness, sexual function, urologist's experience and type of hospital (see addendum 3). Table 4 shows how the probabilities (of hypothetical patients) varied for different values of these variables.
For the objective patient characteristics (peakflow, residual urine and prostate volume), it can be seen that poorer values generally resulted in higher probabilities of surgery, and in lower probabilities of watchful waiting. Concerning the two types of medication, the differences were not very large. Patients for whom other urologic diseases were also diagnosed had a somewhat lower chance of surgery, and a higher chance of watchful waiting. For the subjective patient characteristics, a more diffuse picture was seen: a higher irritative symptom score was associated with an increased probability of medication; for surgery and watchful waiting, this variable showed a U-shape association. With regard to bothersomeness, a higher probability of surgery and simultaneous lower probability of watchful waiting was only significant for severe cases.
For patients who reported to not be sexual active, the probability of finasteride was lower, while that of surgery was slightly higher. When looking at the influence of the urologist's characteristics, the most pronounced findings were the obvious higher preference for watchful waiting and lower preference for medication (both types together) in more experienced urologists.
The chance of surgery and medication was higher for patients who attended a general hospital, while for those in teaching hospitals more frequently was chosen for watchful waiting.

DISCUSSION

Similar to the use of diagnostics, large differences existed between the urologists with regard to treatment choice. The explanatory variables consisted of both patient characteristics and urologists' background variables.

Tabel 4 - Probability of a particular treatment choice (percentage) for different values of patient and urologist variables, in comparison with a reference patient;[a] row totals are 100%

		Probability of			
		Surgery	Watchful waiting	α-blocker	Finasteride
Reference patient		38	25	24	13
Urinary peakflow	Better	22	51	17	10
	Worse	54	12	23	11
Residual urine	Less	22	43	21	14
	More	42	28	18	12
Prostate volume	Less	28	35	12	25
	More	49	20	24	7
Comorbidity		23	38	23	16
Irritative symptoms	Milder	21	53	16	10
	More severe	27	29	27	17
Bother-someness	Milder	41	29	26	4
	More severe	53	14	26	7
Not sexual active		48	24	22	6
Urologist's experience	Less	32	11	31	26
	More	35	25	3	37
Type of hospital	Teaching	28	44	10	18

[a] Reference patient: urinary peakflow 10-15 ml/s; postvoid residual urine < 50 ml; prostate volume 20-50 ml; no urologic comorbidity; moderate irritative symptoms (4-8) and bothersomeness (2-11); sexual active; his urologist has 5-10 years of experience, and is practising in a general hospital

The latter were influential in the choice between the two types of medication, while patient variables played a more important role in the decision for surgery. It is difficult to say whether the considerable practice variation can be seen as an indication of inappropriateness of care. The recently published guidelines[2-5] leave much room to the physician's personal opinions, and do not give, for instance, diagnostic cut-off points for particular treatment options. However, given the considerable differences in effectiveness and side-effects of the respective therapies (see chapter 1, table 3), it seems desirable to reach the highest level of consensus as possible about the most suitable treatment for particular patient groups. Therefore, it is of primary interest to gain more insight into the urologists' agreement on treatment choice for similar cases of BPH. In addition, a detailed comparison of the underlying ideas with current scientific insights could provide information about the extent to which treatment choices are evidence-based, as an indirect means to assess the appropriateness of present practice patterns.

SUMMARY AND CONCLUSIONS

This study described the treatment choices for 670 consecutive BPH-patients (≥ 50 years), newly referred to one of 12 urological practices throughout the Netherlands. Watchful waiting (36%) and surgery (34%) were the most frequently chosen initial therapies, followed by medication, of which α-blockers (13%) and finasteride (11%) were the most important ones. In only 4% of the patients, an alternative type of treatment (e.g. thermotherapy) was chosen. Treatment choice for men who presented with acute urinary retention (13-18% of the total) differed considerably from that for elective patients. The decision for surgery was made for 61% of the acute patients versus 30% of the elective population. The variation in treatment choice between the practices was striking. The interquartile ranges were 24-42% (surgery), 32-49% (watchful waiting), 5-29% (α-blockers) and 0-17% (finasteride) respectively. Variables which proved to be significantly associated with treatment choice (logistic regression analysis), included both patient characteristics (symptomatology, bothersomeness, sexual function, peakflow, residual urine, prostate volume and comorbidity), and background characteristics of the urologists involved (experience, type of hospital).

Patient characteristics played a more important role in the decision whether or not to operate, while the urologists' characteristics dominated the choice between the two types of medication.
In the absence of well-defined criteria for treatment choice, it is not possible to judge whether the practice variation we found is indicative of inappropriateness of care. Further research is necessary to gain insight into the extent of agreement on similar cases of BPH, as well as into the underlying ideas upon which treatment choice is based.

REFERENCES

1. National Health Care Information Center (SIG). Information on patients, discharged with benign prostatic hyperplasia as primary or secondary diagnosis; the Netherlands, 1992. Utrecht: SIG, 1996 (data file).
2. Schlatmann TJM. Benign prostatic hyperplasia; recommendations for diagnosis and treatment in 1992 (in Dutch). Ned Tijdschr Geneeskd 1992;136:2414-7.
3. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the International Consultation on benign prostatic hyperplasia (BPH), patronized by World Health Organization (WHO), Paris, June 28-30 1993. Jersey, UK: Scientific Communication International, 1993.
4. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0582.
5. National Health and Medical Research Council. Treatment options for benign prostatic hyperplasia (BPH). Canberra, Australia: Australian Government Publishing Service, 1994.
6. Agresti A. Categorical data analysis. Chapter 9: Multinomial response models (306-46). New York: John Wiley & Sons, 1990.
7. Dessens J, Jansen W. Logistische modellen voor polytome afhankelijke variabelen. Kwantitatieve methoden 1992; 40:23-46.
8. Hosmer DW, Lemeshow S. Applied logistic regression. Chapter 5: Assessing the fit of the model (135-75). New York: John Wiley & Sons, 1989.
9. Barry MJ, Fowler FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett ATK. The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 1992;148:1549-57.

ADDENDUM 1

Results of dichotomous logistic regression analysis, on the basis of which the probability profiles (table 3) were computed.

Reference classes for regression:

Patient characteristics:

-	Irritative symptom score	0-3 (mild)
-	Bothersomeness score	0-1 (mild)
-	Urinary peakflow	≥ 15 ml/s
-	Postvoid residual urine	< 50 ml
-	Prostate volume	≤ 20 ml

Urologist characteristics:

-	Experience	< 5 years
-	Function of hospital	general

Surgery (versus no surgery)

Variable	B	S.E.	Sig
Irritative symptoms			0.018
Moderate	0.89	0.384	
Severe	0.28	0.445	
Bothersomeness			0.003
Moderate	-0.20	0.390	
Severe	0.80	0.435	
Urinary peakflow			0.000
10-15 ml/s	1.04	0.404	
< 10 ml/s	1.79	0.375	
Residual urine			0.000
50-150 ml	1.10	0.307	
≥ 150 ml	1.31	0.312	
Prostate volume			0.030
20-50 ml	0.51	0.391	
≥ 50 ml	1.16	0.461	
Constant	-4.13	0.639	

Medication (versus watchful waiting)

Variable	B	S.E.	Sig
Irritative symptoms			0.000
Moderate	1.30	0.371	
Severe	1.46	0.395	
Urinary peakflow			0.000
10-15 ml/s	0.74	0.345	
< 10 ml/s	1.48	0.341	
Urologist's experience			0.003
5-10 years	-1.01	0.301	
> 10 years	-0.80	0.366	
Constant	-1.52	0.423	

Finasteride (versus α-blocker)

Variable	B	S.E.	Sig
Urologist's experience			0.001
5-10 years	-0.62	0.463	
> 10 years	2.38	0.821	
Teaching hospital	1.18	0.456	0.009
Constant	-0.14	0.377	

ADDENDUM 2

Polychotomous logistic regression

In modelling the treatment choice of a physician, we used a generalised logistic regression model. The response is polychotomous and is nominal in nature, and takes as values 'operation', 'watchful waiting', 'α-blocker' or 'finasteride', corresponding to the possible decisions available to the physician.

The model has the form:

$$P_{\text{operation}} = \frac{e^{(\alpha'x)}}{1 + e^{(\alpha'x)} + e^{(\beta'x)} + e^{(\gamma'x)}}$$

$$P_{\text{watchful waiting}} = \frac{e^{(\beta'x)}}{1 + e^{(\alpha'x)} + e^{(\beta'x)} + e^{(\gamma'x)}}$$

$$P_{\alpha\text{-blocker}} = \frac{e^{(\gamma'x)}}{1 + e^{(\alpha'x)} + e^{(\beta'x)} + e^{(\gamma'x)}}$$

$$P_{\text{finasteride}} = 1 - P_{\text{operation}} - P_{\text{watchful waiting}} - P_{\alpha\text{-blocker}}$$

$$= \frac{1}{1 + e^{(\alpha'x)} + e^{(\beta'x)} + e^{(\gamma'x)}}$$

where x is a vector of patient characteristics and α, ß and γ are vectors of (unknown) coefficients (the first component of x is taken to be unity, thus the first components of α, ß and γ are the constants of the regression functions).

There are four possible outcomes and hence three regression functions (in general, for models with a r-level outcome, there are r-1 such functions). The probabilities are similar in form to those of the logistic regression model and can be interpreted as the chance that a patient with characteristics vector x receives an operation, watchful waiting, α-blocker or finasteride respectively.

In the (usual) logistic model, the data vector x appears only once in the denominator while in the generalised model x appears more than once. As a result of this, the coefficients are not so readily interpretable as in the case of logistic regression. In the simpler model, the probability functions are monotone functions of the individual regression coefficients. Under the generalised model, if the *i*th component α is positive, the probability $P_{operation}$ may not necessarily increase when the value of the *i*th component of x increases. This behaviour is due to the fact that a change in the value of any component of x will precipitate changes of differing magnitude in $e^{(\alpha'x)}$, $e^{(\beta'x)}$ and $e^{(\gamma'x)}$. If the increase in $e^{(\alpha'x)}$ is small while the increase in $e^{(\beta'x)}$ or $e^{(\gamma'x)}$ is large, $P_{operation}$ will decrease. Although this problem of interpretation seldom occurs, it is necessary to use caution in specifying precisely the effect of a change in a component of x will have on the probabilities. However, this does not prevent us from determining which variables are important in the decision process.

ADDENDUM 3

Results of polychotomous logistic regression analysis, on the basis of which the probability profiles (table 4) were computed.

Reference classes for regression:

Patient characteristics:

-	Irritative symptom score	0-3 (mild)
-	Bothersomeness score	0-1 (mild)
-	Sexual active?	No
-	Urologic comorbidity	Absent
-	Urinary peakflow	≥ 15 ml/s
-	Postvoid residual urine	< 50 ml
-	Prostate volume	≤ 20 ml

Urologist characteristics:

-	Experience	< 5 years
-	Function of hospital	general

Variable	α	SE	ß	SE	γ	SE	Sig
Irr. symp							0.003
- Moderate	0.35	0.48	-0.99	0.43	0.15	0.59	
- Severe	-0.24	0.53	-1.12	0.49	-0.01	0.64	
Bother							0.008
- Moderate	-1.35	0.61	-1.40	0.58	-1.33	0.70	
- Severe	-0.41	0.67	-1.37	0.65	-0.66	0.77	
Sex. active	-0.92	0.33	-0.66	0.34	-0.61	0.41	0.044
Comorbid.	-0.74	0.42	0.18	0.38	-0.31	0.49	0.060
Peakflow							0.000
- 10-15	0.27	0.51	-1.00	0.43	0.09	0.57	
- < 10	0.79	0.47	-1.56	0.42	0.23	0.54	
Residue							0.006
- 50-150	0.65	0.37	-0.48	0.36	0.24	0.45	
- ≥ 150	0.80	0.40	-0.30	0.40	0.01	0.49	
Prost.vol.							0.029
- 20-50	0.97	0.46	0.31	0.41	1.39	0.64	
- ≥ 50	1.90	0.61	0.81	0.59	2.05	0.80	
Experience							0.000
- 5-10	0.83	0.43	1.50	0.43	0.45	0.48	
- > 10	-0.29	0.43	0.48	0.42	-2.73	0.83	
Teaching	-0.66	0.38	0.21	0.38	-1.28	0.46	0.002
Constant	0.27	0.95	3.36	0.88	0.25	1.15	

CHAPTER 7

AGREEMENT ON TREATMENT CHOICE IN BENIGN PROSTATIC HYPERPLASIA AMONG UROLOGISTS

Based on: Stoevelaar HJ, Van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in urologists' opinions on treatment choice in benign prostatic hyperplasia (BPH). Eur J Publ Health. Accepted for publication.

INTRODUCTION

In the previous chapter, it was concluded that there are considerable differences between urologists with regard to treatment choice for patients with benign prostatic hyperplasia (BPH). The variation proved to be associated with both subjective patient characteristics (e.g. symptomatology and bothersomeness) and objective diagnostic findings such as prostate volume, urinary peakflow and volume of postvoid residual urine. Irrespective of these patient characteristics, it was shown that particular background characteristics of the urologists (experience, type of hospital) also play an important role in treatment decisions. Since the most frequently chosen therapies (surgery, watchful waiting, α-blockers and finasteride) are available for all urologists, and since no structural or financial incentives are likely to play an important role in this respect, we assume the case-mix adjusted variation to be related to differences in opinions between the urologists. As a first approach to gain more insight into these opinions, we conducted a panel study to examine the extent of agreement on treatment choice for selected cases of BPH.

MATERIALS AND METHODS

At a scientific meeting for urologists, 16 cases of BPH, selected from our multicentre study on diagnostics and treatment choice (see chapter 6), were presented to a panel of 58 urologists and residents. From each of the 4 most common therapies: surgery, watchful waiting, α-blockers, 5-α-reductase-inhibitors (finasteride), 4 cases were selected at random. For each of these cases, the following information was presented to the panel (see figure 1):

- Symptomatology and bothersomeness of symptoms. These items were expressed in two scores, based on the answers of the Dutch language version of the American Urologicial Association questionnaire.[1] These generally accepted and widely used scores indicate the severity of urinary symptoms and the bother the patient experiences from these symptoms.
- Medical history, including the reason for referral.
- Results of physical examination.
- Results of additional diagnostic procedures.

Subsequently, the members of the panel were asked to give their individual opinion on the most suitable therapy for each patient. To allow interim analysis, the urologists' choices were also registered with the aid of an interactive computer program. If any urologists considered the information presented to be insufficient to make a choice, they wre asked to write down which additional data were required.
The cases were presented in 2 series of 8. After each series, the 2 cases for which the extent of agreement was lowest, were discussed with the panel. After discussion, the panel was requested to give their opinions again.
Analysis of agreement was performed for opinions between the panelists (Fleiss' method for multiple raters)[2] and for panel opinions versus actual choices (percentages). In addition, the relationship between panel opinions and some background characteristics (urologist's experience, type of hospital) was studied, using logistic regression methods.[3]

RESULTS

Characteristics of the panel members

The panel consisted of 50 urologists and 8 residents. In total, there are 240 urologists and 48 residents practising in the Netherlands. Comparison of some background variables of the panel members (year of certification, type of hospital) with information provided by the Dutch Association of Urology (NVU, personal communication), showed the panel to be representative for the total population of urologists in the Netherlands.

Figure 1 - Example of case information presented to the panel.

MEDICAL HISTORY	Age	61 years
	Symptom score	20
	Quality of life score	4
	Reason for referral	progressive micturition problems: weak stream, nocturia 2-3 times, post-void dribbling
PHYSICAL EXAMINATION	DRE:	< 50 grams, not suspect
ADDITIONAL DIAGNOSTIC PROCEDURES	Abdominal radiography	no abnormalities
	Kidney ultrasonography	small cyst left lower pole
	Bladder ultrasonography	residual volume 235 ml
	Uroflowmetry	Q_{max} = 8 ml/s, V = 414 ml
	Prostate ultrasonography	volume = 20 ml, benign aspect
	Cystoscopy:	moderate trabeculation, high bladder neck, large median lobe
	Blood tests/urinalysis	no abnormalities

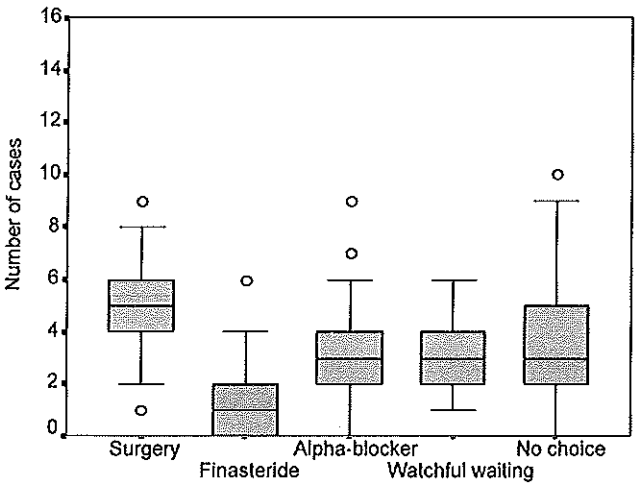
Response

Forty-nine of the 58 panel members filled out the questionnaire with no missing or invalid answers. For 7 participants, information was missing or invalid for at most 2 of the 16 cases. For 2 participants, the questionnaires were incomplete, and were therefore excluded from the analyses.

Agreement between the panelists

The variation in treatment choice between the panel members was considerable (see figure 2). For example, the median number of patients for which the panel members chose surgery is 5 of 16, but the individual choices ranged from 1 to 9.

Figure 2 - Variation in opinions on treatment choice among the panel members. The ends of the boxes correspond with the 25th and 75th percentiles. The line in the box is the median. The ends of the whiskers indicate the total range, without outliers (dots: cases with values between 1.5 and 3 box-lengths from the upper or lower edge of the box).



It is therefore not surprising that the overall agreement between the panelists was low (see table 1). Although the kappa values were higher when the category 'no choice' was excluded from the calculations, they still indicate poor agreement between the panel members.
Analyses with respect to differences between subgroups showed that the extent of agreement was somewhat lower for urologists with more than 10 years of experience, and for urologists who were practising in general hospitals. However, these differences were small.

No choice due to insufficient information

The percentage of cases for which the information was considered to be insufficient was much lower for surgery than it was for the other treatment options (see table 2). The extent to which this category was chosen by the panel, was associated with the urologist's experience and type of hospital (logistic regression analysis). Urologists with more experience (5-10 years, and > 10 years respectively), chose this option less frequently than their younger colleagues (odds ratios of 0.58 and 0.54 respectively, $p < 0.01$).

Table 1 - Agreement on treatment choice between the panel members (kappa values and standard errors), by extent of experience and work setting.

Subgroups	All categories		Category 'no choice' excluded	
	kappa	SE	kappa	SE
Experience				
< 5 years	0.30	0.012	0.56	0.021
5-10 years	0.30	0.015	0.55	0.024
> 10 years	0.28	0.007	0.41	0.010
Work setting				
general hospital	0.29	0.006	0.44	0.009
teaching hospital	0.32	0.008	0.53	0.013
Total	0.29	0.003	0.48	0.005

In addition, urologists practising in general hospitals made less use of the category 'no choice' than those in teaching hospitals (odds ratio of 0.65, $p < 0.01$). When this option was chosen, the panel members were asked to suggest which additional information was required. For these cases (23% of the total), pressure-flow study (44%) and cystoscopy (24%) were most frequently mentioned as additional procedures, required to reach a decision.

Panel opinions compared with actual treatment choices

The initial choices of the panel in comparison with the actual treatment decisions are shown in figure 3 (separate cases) and table 2 (aggregate data). When the category 'no choice' was excluded from the calculations, the percentage of agreement was highest for surgical cases (86%), followed by watchful waiting (66%), and medical therapies (53% and 28% respectively). For the cases of a particular treatment group, the most pronounced individual differences were found for watchful waiting. For the surgical cases, 14% of the panel members would have chosen a non-invasive treatment option (category 'no choice' excluded). Regarding medication (both types taken together), the panel preferred a surgical approach in 31% of the cases, while in 16% was chosen for watchful waiting.

For the cases for which the actual choice was watchful waiting, the panel indicated surgery (13%) and medication (21%) to be the most suitable therapy.

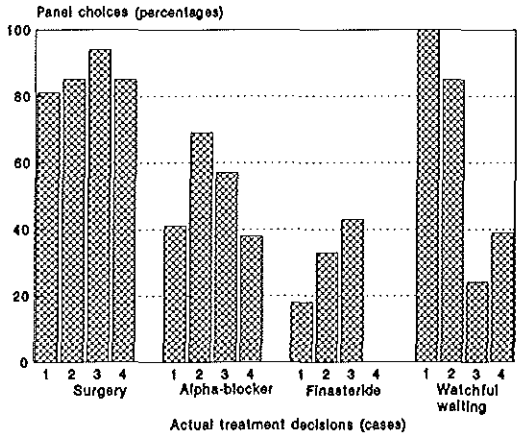


Figure 3 - Casewise comparison of panel opinions and actual treatment decisions; category 'no choice' excluded.

Table 2 - Panel choices (n=56), in comparison with actual treatment decisions (percentages by treatment group); row totals are 100%

	Panel choices				
Actual choice	Surgery	Finasteride	α-blocker	Watchful waiting	No choice possible
Surgery	76	3	9	0	12
Finasteride	22	16	22	17	23
α-blocker	24	5	37	5	29
Watchful waiting	9	7	8	47	29

Case discussion and re-choice

An interactive computer program was used to produce an interim overview of the results and to provide feedback to the panel. After each series of 8 cases, the 2 cases for which the agreement was lowest were discussed with the panel. The arguments, raised either in favour or against the various choices, showed mainly differences in attitude.

For example, for a 55 year old patient with moderate symptoms, 150 ml residual urine, and a peakflow of 10 ml/s, 1 urologist preferred medication because of the relatively young age of the patient ('in case of deterioration, surgery is still possible'), while the same factor was mentioned by another panel member as an argument against medication ('given a normal life expectancy, this patient has to use medication for several years; an operation will relieve his symptoms within a few weeks').

However, the discussion did not substantially influence the opinions of the panel. For the 4 cases for which the panel was asked to make a second choice, only 17-24% of the panel members changed their initial choice.

DISCUSSION

This panel study demonstrated that the variation in opinions among urologists about the most suitable therapy for randomly selected cases of BPH is considerable. Large differences existed both between panel choices and the actual treatment given, and between the opinions of the panel members. We must be aware of the rather artificial character of the session, and there is no assurance that the panel members, in daily clinical practice, would have behaved as they indicated. Nevertheless, we can conclude that at this theoretical level, the agreement was poor.

Although some extreme differences were found (surgery versus watchful waiting), the discussion concentrated mainly on the appropriate use of medication as the initial therapy in patients with BPH. However, the timing of the panel meeting should also be taken into consideration. When the meeting took place, most types of medication, in particular finasteride, had only recently been registered in the Netherlands. As is the case with many new technologies, the first phase of diffusion is characterized by a sceptical and hesitant attitude amongst the providers, due to lack of information and experience with respect to indication and (long-term) effectiveness.

Besides the lack of agreement on treatment choice, this study also indicated that there are large differences in opinions about the appropriate diagnostic evaluation of elderly men with voiding problems. In a number of the cases, many panel members indicated that no choice was possible, because urodynamic (pressure-flow) data was lacking. Such opinions were related to urologist's experience and type of work setting. Younger urologists and other urologists practising in teaching hospitals expressed the need for pressure-flow studies more often than those from general hospitals. These findings confirm the results of our multicentre study, in which it was concluded that the use of pressure-flow studies is strongly associated with the type of hospital,[4] as well as with particular opinions about the indication for this procedure. Although it is now commonly accepted that pressure-flow studies are a valuable tool in distinguishing between outflow obstruction and other pathologic conditions that could cause voiding complaints,[5] there is still much discussion about its proper indications and meaning for treatment choice.[6-7]
This study demonstrated that there are large differences in opinions on treatment choice for BPH choice among urologists. However, it does not provide insight into the particular nature of these opinions. Further research is needed to identify the different criteria that are used for treatment choice, and to assess the impact of these differences on practice variation.

SUMMARY AND CONCLUSIONS

This aim of this study was to examine the extent of agreement in a panel of urologists with respect to treatment choice in patients with benign prostatic hyperplasia (BPH).
From a prospective study on treatment choice for BPH (n = 670), a stratified sample of 16 patients was drawn, four each from the following actual treatment groups: surgery, 5-α-reductase-inhibitor, α-blocker, and watchful waiting. Detailed information on the results of the various diagnostic procedures of these patients was presented to a panel of 58 urologists. Subsequently, they were asked to give their individual opinion on the most suitable therapy for each patient. When the information presented was considered as insufficient to make a choice, each urologist was asked to write down which additional data were required.

In 23% of all cases, the information was considered to be insufficient for making an adequate choice. For these cases, urodynamic (pressure-flow) studies (44%) and cystoscopy (24%) were most frequently mentioned as necessary additional procedures. Agreement between the panel members was low. The kappa value for agreement amongst multiple raters was 0.29 (SE 0.003), when taking into account all categories, and 0.48 (SE 0.005) when the category 'no choice' was excluded. Analyses on agreement by extent of urologist's experience and work setting, showed no large differences between the subgroups. The overall agreement between actual treatment decisions and panel opinions was highest for surgery (86%), followed by watchful waiting (66%) and medical therapies (53% and 28% respectively).
We conclude that the variation in opinions on treatment choice for BPH among urologists is significant. Further research on the particular nature of these differences is recommended.

REFERENCES

1. Barry MJ, Fowler FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett ATK. The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 1992;148:1549-57.
2. Fleiss JL. Statistical methods for rates and proportion. 2nd edition. New York: John Wiley, 1981.
3. Hosmer DW, Lemeshow S. Applied logistic regression. New York: John Wiley & Sons, 1989.
4. Stoevelaar HJ, Van de Beek C, Casparie AF, Nijs HGT, McDonnell J, Janknegt RA. Variation in diagnostics and treatment of benign prostatic hyperplasia in urological practice (in Dutch). Ned Tijdschr Geneeskd 1996;140:837-42.
5. Janknegt RA, Rollema HJ, Van de Beek C. Urodynamic studies necessary for correct diagnosis in prostatism (in Dutch). Ned Tijdschr Geneeskd 1994;138:1751-6.
6. McConnell JD. Why pressure-flow studies should be optional and not mandatory studies for evaluating men with benign prostatic hyperplasia. Urology 1994;44:156-8.
7. Abrams P. In support of pressure-flow studies for evaluating men with lower urinary tract symptoms. Urology 1994;44:153-5.

CHAPTER 8

UROLOGISTS' PREFERENCES AS A DETERMINANT OF VARIATION IN THE TREATMENT CHOICE FOR BENIGN PROSTATIC HYPERPLASIA

Based on: Stoevelaar HJ, Van de Beek C, McDonnell J, Casparie AF, Nijs HGT, Janknegt RA. Determinants of variation in treatment choice for benign prostatic hyperplasia; a matter of preference. Submitted for publication.

INTRODUCTION

In chapter 6, we described the large variation that exists between urologists regarding the treatment choice in patients with benign prostatic hyperplasia (BPH). We demonstrated that this variation is associated not only with characteristics of patients, but also with characteristics of urologists (extent of experience, resident/certified) and their work setting (type of hospital). As the latter are only indicators of differences in decision making between groups of physicians, they do not provide insight into the underlying assumptions or ideas, leading to different practice patterns. The results of our panel study as described in chapter 7, strenghtened the assumption that practice variation is largely due to differences in opinions on, or preferences for, treatment choice for particular patient groups.
This study aims at determining specific treatment preferences and their influence on actual treament decisions.

MATERIALS AND METHODS

The study population consisted of the 39 urologists and residents who participated in our multicentre study (see chapter 6 for details). In this study, the urologists had been asked to complete a questionnaire on initial treatment choice and main considerations for their decisions for each of the 670 patients included (see appendix 2).
Subsequently, the various arguments mentioned by the urologists for individual cases, were categorized into the 23 diagnostic conditions.

		Surgery	α-blocker	Finas-teride	Watchful waiting
Urinary tract infection	Once				
	Recurrent				
Postvoid residual urine (ml)	< 150				
	≥ 150				
Prostatic size (grams/ml)	< 20				
	20-50				
	≥ 50				
Urinary peakflow (Q_{max} in ml/s)	< 10				
	10-15				
	≥ 15				
Presence of bladder stone(s)					
Acute urinary retention	Once				
	Recurrent				
Severity of symptoms	Mild				
	Moderate				
	Severe				
Type of symptoms (mainly)	Obstructive				
	Irritative				
Age (years)	< 60				
	≥ 60				
Mainly bladder neck obstruction					
Sexual function	Active				
	Not active				

After inclusion of all patients, the urologists were sent a postal questionnaire, in which they were asked to indicate whether they considered each of these conditions as an argument for or against, or of no significance in treatment choice (see figure 1).
The extent of agreement on opinions among the urologists was calculated for the total and subgroups of urologists by background characteristics (urologist's experience, type of hospital), using the Fleiss' method for multiple raters.[1]
Based on the sum of the answers per treatment option (columns), preference scales were constructed for each of the four therapies (theoretical range [-23, +23]). Analysis of internal consistence of the scales was performed using Cronbach's reliability analysis.[2]
The relationship between treatment preferences and actual treatment decisions was studied using a polychotomous logistic regression analysis,[3-4] with the actual treatment choice as dependent variable. As explanatory variables, we included the four treatment preference scores (after deletion of inconsistent items), as well as relevant patient's diagnostic characteristics and background characteristics of the urologist.

Figure 1 - Inventarization of urologists' arguments regarding treatment choice (postal questionnairre, after inclusion of all patients.

In our study, the most common treatment choices were:

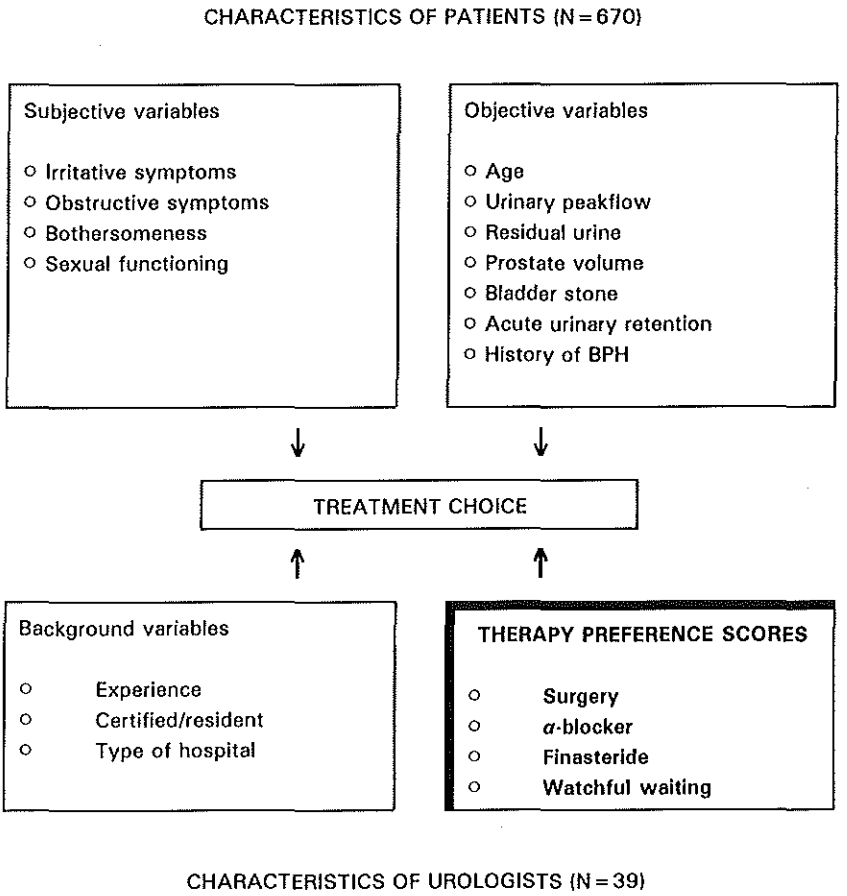
- Surgery
- α-blocker
- Finasteride
- Watchful waiting/no active intervention

Regarding the considerations for treatment choice in individual patients, a number of arguments were mentioned, which are listed in the next table. Would you please indicate for each argument whether you generally consider this as a criterion:

- In favour of a particular treatment (+)
- Against a particular treatment (-)
- Not significant for the choice of a particular treatment (0)

In fact, this model is an extension of the one we used for our first analysis of practice variation in treatment choice, as described in chapter 6. Figure 2 gives an overview of the explanatory variables included. For details about patient characteristics and urologists' background variables, see chapter 6.

Figure 2 - Overview of explanatory variables, used to explain variation in treatment choice for BPH. Urologists' treatment preferences have been added to the original model.



RESULTS

Agreement about arguments on treatment choice

The agreement on arguments used in favour or against the respective treatment modalities was poor. The overall interobserver agreement (kappa value) was 0.30 (SE 0.003). When distinguishing between the four types of treatment, the agreement was highest, but still poor, for the arguments for surgery (kappa 0.37, SE 0.006) and watchful waiting (kappa 0.35, SE 0.006). Very low values were found for α-blockers (kappa 0.19, SE 0.010) and finasteride (kappa 0.22, SE 0.006). Detailed analyses on agreement by background characteristics of the urologists (extent of experience, work setting, resident/certified) showed no significant differences between the subgroups.

Relationship between opinions and actual treatment decisions

The urologists' considerations about treatment choice for the separate diagnostic situations were aggregated to overall preference scales for each of the four treatment options (sum of the number of positive, neutral or negative values). The distributions of these sumscores are given in table 1. Surgery and α-blockers showed the largest mean positive scores, in contrast to the figures for finasteride and watchful waiting, for which the mean negative scores were larger. Reliablity analysis showed relatively poor internal consistency for the total scales per treatment option. Cronbach's α was low for the scales of surgery (0.17) and watchful waiting (0.49), and satisfactory for those of α-blockers (0.69) and finasteride (0.76). Analyses on the effects of rescaling demonstrated the dichotomy positive versus neutral/negative to reveal far more consistent scales, indicating perhaps that the distinction between the categories neutral and negative is not clearly made.

Table 1 - Mean positive, neutral and negative opinions (sum scores) and standard deviation (SD), by type of treatment.

	Opinions (sum scores)					
	Positive		Neutral		Negative	
Treatment	Mean	SD	Mean	SD	Mean	SD
Surgery	10.6	3.0	8.0	4.2	4.4	2.4
α-blocker	9.8	4.7	8.6	4.7	4.6	2.5
Finasteride	6.4	4.6	9.3	4.8	7.3	3.7
Watchful waiting	5.9	3.1	9.7	3.8	7.4	2.9

After correcting for inconsistent items, based on an analysis of item-total correlations, the α-values for the final scales were 0.73 (surgery), 0.81 (α-blocker), 0.84 (finasteride) and 0.72 (watchful waiting) respectively.
In order to assess their impact on treatment choice, these four treatment preference scores were included in the logistic regression model, together with patient characteristics and urologists' background variables. No interaction affects were found between background variables and treatment preferences of the urologists.
In the final regression model, the patient characteristics prostate volume, urinary peakflow, postvoid residual urine, irritative symptoms and bothersomeness proved to be significantly associated with treatment choice. Regarding the urologist variables, significant effects were seen for extent of experience and the preference scores for surgery, α-blocker, and finasteride. Based on the regression results (see statistical addendum), a probability profile was constructed, which expresses a patient's (estimated) chance of particular treatment options for different treatment preferences and background characteristics of the urologists (table 2). By the use of a 'reference patient', all figures were adjusted for differences in patient characteristics (case-mix).
Except for watchful waiting, the treatment preference scores were strongly associated with actual decions. Differences in low-high preferences revealed a 2.2 higher probability of surgery. For α-blockers and finasteride these ratios were 1.8 and 9.2 respectively. A stronger preference for surgery increased the probability of finasteride. Simultaneously, the probabilities of watchul waiting and α-blockers decreased.

Regarding medication, apparently there existed a dichotomy in the preference for either one or another type. A stronger preference for finasteride lowered the probability of an α-blocker, and vice versa. The chance of surgery was largely unaffected by differences in medication preferences. The choice for watchful waiting was negatively affected by stronger preferences for surgery and finasteride while, in contrast, a positive assocation existed with the preference for an α-blocker.

Table 2 - Probability (percentage) of particular treatment options for different opinions and background characteristics of urologists, compared to a reference patient.[a]

		Probability of actual treatment[b]			
		SU	WW	FI	AB
Reference patient		26	39	18	17
Treatment preferences					
Surgery	low (0)	15	53	7	25
	high (10)	33	22	35	10
α-blocker	low (0)	26	24	38	12
	high (10)	21	51	7	21
Finasteride	low (0)	25	50	5	20
	high (10)	20	22	46	12
Urologist's experience					
Less (< 5 years)		21	24	9	46
More (> 10 years)		18	35	3	44

[a] A reference patient is defined as follows: having moderate irritative symptoms and bothersomeness, peakflow 10-15 ml/s, prostate volume 20-50 ml, postvoid residual urine 50-150 ml. In addition, his urologist has moderate experience (5-10 years), and moderate treatment preferences (score 5) for surgery, α-blockers and finasteride.

[b] SU = surgery, WW = watchful waiting, AB = α-blocker, FI = finasteride

The urologist's experience showed independent heterogeneous effects on treatment choice. Younger urologists were obviously more prone to carry out some kind of active treatment, particularly medication. The estimated chance of an α-blocker was substantially smaller for patients who attended a urologist in the middle category (5-10 years of experience), while that of finasteride was larger.

DISCUSSION

In our attempt to explain practice variation, we examined the effect of the physicians' treatment preferences on actual decisions in patients with BPH, taking into consideration all commonly available treatment modalities.
Adjusted for case-mix, treatment preferences proved to be strong predictors of actual choices, thereby significantly contributing to the explanation of the large practice variation that exists between the urologists. In general, the findings are consistent with prior expectations; the preference for a certain treatment is positively associated with the actual chance of that option, simultaneously lowering the chances of other treatment forms. Some remarkable interactions were found; stronger preferences for surgery resulted also in larger chances of finasteride, while a similar association was seen for the α-blocker preference and the chance of watchful waiting. We can not be sure on this point, but this is likely to be ascribed to differences in general views on treatment of BPH. Whereas surgery and finasteride aim at improving the urinary flow by a reduction of the prostatic volume (static component of BPH), α-blockers are intended to relax the bladder neck and prostate smooth muscle (dynamic component). Our results in this respect probably reflect the existence of a division between urologists with a more direct approach, and those with a stronger propensity for conservative options as (initial) treatment choice.
The strong associations we found between treatment preferences and actual decisions point at consistency between thinking and doing. Because the preference scores were based on individual opinions about the appropriate treatment choice for particular diagnostic conditions, further research should compare these opinions with the current scientific insights. In the light of the common wish to reduce undesirable practice variation, these findings could be the starting point for further action.

SUMMARY AND CONCLUSIONS

This chapter described the results of a study that examined the impact of urologists' treatment preferences on actual treatment decisions for benign prostatic hyperplasia. The population consisted of 670 consecutive BPH patients ≥ 50 years, newly referred to 39 participating urologists, in a stratified sample of 12 practices throughout the Netherlands. Polychotomous logistic regression analysis was used to integrally study the impact of patient characteristics and urologists preferences on treatment choice.
The case-mix adjusted influence of particular preference scores on actual decisions was significant. Differences in low-high preferences revealed a 2.2 higher probability of surgery. For α-blockers and finasteride these ratios were 1.8 and 9.2 respectively. An additional, independent effect was seen for the urologist's extent of experience.
Given the strong associations between treatment decisions and actual practice decisions, further research should focus on the scientific validity of the underlying assumptions.

REFERENCES

1. Fleiss JL. Statistical methods for rates and proportion. 2nd edition. New York: John Wiley, 1981.
2. Cronbach LJ. Coefficient alpha and the internal structure of tests. Psychometrika 1951;16:297-334.
3. Agresti A. Categorical data analysis. Chapter 9: Multinomial response models (306-46). New York: John Wiley & Sons, 1990
4. Dessens J, Jansen W. Logistische modellen voor polytome afhankelijke variabelen. Kwantitatieve methoden 1992; 40:23-46.

ADDENDUM

Results of polychotomous logistic regression analysis, on the basis of which the probability profiles (table 2) were computed.

Reference classes for regression:

Patient characteristics:

-	Irritative symptom score	0-3 (mild)
-	Bothersomeness score	0-1 (mild)
-	Urinary peakflow	≥ 15 ml/s
-	Postvoid residual urine	< 50 ml
-	Prostate volume	≤ 20 ml

Urologist characteristics:

-	Experience	< 5 years
-	Surgery preference score	continuous
-	α-blocker preference score	continuous
-	Finasteride preference score	continuous

Variable	α	SE	ß	SE	γ	SE	Sig
Irr. sympt.							0.004
- Moderate	0.30	0.54	-1.07	0.47	0.46	0.70	
- Severe	-0.27	0.59	-1.16	0.53	0.48	0.76	
Bother							0.013
- Moderate	-1.12	0.65	-1.07	0.60	-0.92	0.76	
- Severe	-0.02	0.71	-1.11	0.68	-0.53	0.84	
Peakflow							0.000
- 10-15	0.75	0.55	-0.84	0.44	0.11	0.60	
- < 10	1.27	0.51	-1.39	0.43	0.25	0.56	
Resid. urine							0.000
- 50-150	0.86	0.41	-0.46	0.38	0.41	0.48	
- ≥ 150	1.28	0.43	-0.40	0.42	0.59	0.54	
Prost. vol.							0.016
- 20-50	0.89	0.48	0.12	0.41	0.99	0.65	
- ≥ 50	2.25	0.66	0.83	0.63	1.88	0.86	
Urol. exper.							0.000
- 5-10	1.18	0.42	1.46	0.40	1.69	0.50	
- > 10	-0.08	0.42	0.43	0.39	-1.20	0.83	
Preferences							
- Surgery	0.17	0.06	0.01	0.06	0.25	0.09	0.001
- α-blocker	-0.08	0.06	0.02	0.06	-0.22	0.08	0.007
- Finasteride	0.04	0.06	-0.02	0.05	0.28	0.08	0.000
Constant	-3.16	1.17	2.59	0.99	-4.27	1.53	

PART III

PRACTICE VARIATION AND APPROPRIATENESS OF CARE

CHAPTER 9

UROLOGISTS' OPINIONS ON THE DIAGNOSTIC EVALUATION OF MEN WITH BENIGN PROSTATIC HYPERPLASIA: ARE THEY IN ACCORDANCE WITH THE GUIDELINES?

Partly based on: Stoevelaar HJ, Van de Beek C, Casparie AF, McDonnell J, Nijs HGT, Janknegt RA. Urologists' opinions on the diagnostic evaluation of men with benign prostatic hyperplasia: are they in accordance with the guidelines? Submitted for publication.

INTRODUCTION

From our research on diagnostic practice patterns for BPH among urologists, two major conclusions can be drawn. Firstly, the case-mix adjusted variation in the use of particular tests is considerable, and secondly, this variation is largely determined by differences in opinions of individual physicians. The question is, however, whether these variations in opinion and related practice decisions reflect also differences in appropriateness of care. Recently, several guidelines and recommendations on the appropriate management of BPH, both national[1-3] and international,[4-6] have been published. In this chapter, we present the results of an analysis on the agreement between the urologists' opinions and the guideline recommendations concerning the use of various diagnostic tests in men with prostatism.

MATERIALS AND METHODS

Inventarization of opinions

The inventarization of the urologists' opinions on the appropriate use of diagnostics has been described in chapter 3. In summary, the 39 urologists and residents who were involved in our multicentre study received, after inclusion of all patients (November, 1994), a postal questionnaire in which they were asked to indicate whether they performed the following diagostic procedures or tests as standard, complementary or seldom/never in elderly males presenting with voiding problems:

Table 1 - Comparison of terminology and statements of WHO recommendations[4] and AHCPR guidelines[5] concerning the appropriate diagnostic evaluation of men with prostatism.

<table>
<tr><th colspan="2">WHO RECOMMENDATIONS</th><th colspan="2">AHCPR GUIDELINES</th></tr>
<tr><td>MANDATORY

Tests that should be done on every patient ≥ 50 years with complaints suggestive of bladder outlet obstruction</td><td colspan="2">○ Medical history
○ Physical examination and digital rectal examination
○ Urinalysis (dipstick or sediment)
○ Renal function assessment (creatinine)
○ Quantitative symptom assessment</td><td>RECOMMENDED

Tests to be used in the initial evaluation of all patients presenting with prostatism</td></tr>
<tr><td>RECOMMENDED

Tests of proven value in the evaluation of most patients; their use is strongly encouraged during initial evaluation</td><td colspan="2">○ Uroflowmetry
○ Residual urine (preferably by transabdominal ultrasonography)</td><td rowspan="3">OPTIONAL

Additional tests for which data are insufficient to demonstrate the value in routine patients for confirming the diagnosis of BPH and predicting the results of treatment. Moreover, the definition of normal and abnormal test values is uncertain. Results from these tests thus do not define BPH, and their use is not mandatory prior to a decision to treat.
Some tests may, nevertheless, be useful in selected patients if the diagnosis is uncertain following the initial evaluation.</td></tr>
<tr><td rowspan="2">OPTIONAL

Tests of proven value in the evaluation of selected patients; their use is left to the clinical judgement of the physician</td><td colspan="2">○ Pressure-flow study
○ Serum Prostate-specific antigen (PSA)</td></tr>
<tr><td>○ Transrectal ultrasound
○ Imaging of the upper urinary tract by ultrasonography/plain film or IVU
○ Urethrocystoscopy</td><td></td></tr>
<tr><td>NOT RECOMMENDED

Tests that do not provide useful information in the assessment of patients with prostatism and are not recommended in routine cases</td><td colspan="2">○ Filling cystometry (cystometrography)</td><td>NOT RECOMMENDED

Tests not recommended in routine cases</td></tr>
<tr><td colspan="2">○ Urethral pressure profile measurement
○ Electromyography of the external urinary sphincter</td><td>○ Transrectal ultrasound
○ Imaging of the upper urinary tract by ultrasonography/plain film or IVU
○ Urethrocystoscopy</td></tr>
</table>

digital rectal examination, radiography (plain abdominal radiography, intravenous urography, ultrasonography of kidneys, bladder and prostate, urodynamics (uroflowmetry, pressure-flow study), urethrocystoscopy, blood tests (prostate specific antigen, creatinine) and urinalysis (sediment, culture, cytology). The selection of these items was based on the actual use of diagnostic procedures in patients with BPH, derived from their medical records (see chapter 2 and appendix 3).

Selection of clinical practice guidelines for comparison with opinions

As mentioned in the introduction, several organizations have developed guidelines and recommendations on (aspects of) the management of BPH in urological practice. Among these, the two documents below offer the most comprehensive information about the appropriate diagnostic evaluation and treatment of men presenting with symptoms of prostatism.

- Recommendations of the International Consensus Committee, as adopted by the Second International Consultation on Benign Prostatic Hyperplasia (BPH), Paris, 27-30 June 1993.[4] The consultation was held under the patronage of the World Health Organization (WHO). The recommendations were compiled by the Consensus Committee from the conclusions of individual expert committees, based on literature review and expert opinions.
- Clinical Practice Guideline, published in 1994 by the Agency for Health Care Policy and Research (AHCPR) of the United States Department of Health and Human Services.[5] The guideline was prepared by an interdisciplinary, non-federal panel comprising health care professionals, after an extensive systematic literature review. Additionally, the validity, reliability and utility of the guideline was evaluated using peer review and field review.

Both the AHCPR guidelines and the WHO recommendations provide a structured diagnostic pathway in order to differentiate between BPH and other pathologic conditions, and to select the most adequate treatment modality.

Concerning the appropriate use of diagnostic tests, the respective reports use a somewhat different terminology for their recommendations. A comparison of the respective statements and terminologies is given in table 1.

Although there are semantic differences, the documents are essentially similar. Both documents recommend the same basic evaluation, to be applied in all patients ≥ 50 years, presenting with signs or symptoms of prostatism. As to additional diagnostic tests, the WHO recommendations 'strongly encourage' the use of uroflowmetry and the measurement of postvoid residual urine for most patients, while the AHCPR guidelines consider these tests as 'not mandatory prior to a decision to treat'. On other additional procedures, the statements differ only in their description. For example, transrectal ultrasound, imaging techniques for the upper urinary tract and cystoscopy are mentioned in the WHO recommendations as optional in patients for whom invasive treatment is contemplated; the AHCPR guidelines describe these tests as not recommended, except for patients electing invasive treatment.
As mentioned, some national recommendations have also been published. One of these is particularly concerned with the care for BPH patients in general practice[3], and will therefore not be discussed here. Another document, published somewhat earlier than the WHO recommendations and AHCPR guidelines, represents summarized statements of a small national task force of urologists, general practitioners and pharmacians on the management of BPH in both general and urological practice.[1] Finally, a committee of the Dutch Urological Association drew up a report on medical treatment of BPH (1993).[2] For the issues that can be compared to the statements of the WHO recommendations and AHCPR guidelines, the 'message' of these documents is quite similar. Because the WHO recommendations and AHCPR guidelines are most comprehensive and are based on explicit assessment of scientific literature, these were chosen for comparing the urologists' opinions in our study.

Comparison of opinions with guidelines

The urologists' opinions were compared with the guideline statements for the total group using frequency tables. An additional analysis was undertaken to investigate the relationship between opinions and knowledge, and reported application of the guidelines. To that aim, the following questions were included in a second postal questionnaire (summer, 1995).

- Do you know any published guidelines or recommendations on the management of BPH in urological practice? (yes/no)
- If yes, please give the names of authors or organizations who established these (open question).

- Have these guidelines or recommendations altered your personal management of BPH?

Differences in subgroups with respect to opinions and knowledge/application of guidelines were analyzed using X^2-statistics.

RESULTS

Response

For the questionnaire that inventarized the opinions (November, 1994), the response rate was 37/39. The second questionnaire, containing questions about knowledge and application of guidelines (summer, 1995), was sent only to those who had returned the first one. In total 35 urologists and residents also completed this second questionnaire.

Comparison of opinions and guidelines

Table 2 gives an overview of the urologists' opinions (n = 37) compared to the guideline statements. For digital rectal examination, urine sediment and (with few exceptions) creatinine measurement, the opinions reflect the statements of both guidelines that these tests be performed as standard. Remarkably, a considerable proportion of the urologists also mentioned urine culture and urine cytology as standard tests. The use of these tests is not discussed in the guidelines. The majority of the urologists considered uroflowmetry and bladder ultrasonography as routine procedures, which is in accordance with the WHO recommendations. As mentioned, in the AHCPR guidelines these tests are described as 'not mandatory prior to a decision to treat'. For 3 out of 5 additional tests, defined as 'not recommended in routine cases' (AHCPR) or 'of proven value in selected patients' (WHO), more than 40% of the urologists reported their use to be standard. Intravenous urography is the only test that is considered by almost every urologist as being not suitable in diagnosing BPH.

Relationship between opinions and knowledge of guidelines

In order to examine the relationship between urologists' opinions and their knowledge of guidelines, additional questions on this point were included in the second postal questionnaire. The answers are summarized in table 3. The existence of either the AHCPR guidelines or WHO recommendations was mentioned by only a minority (31%) of the urologists.

Table 2 - Comparison of urologists' opinions (n=37) with guideline statements concerning the appropriate use of diagnostic tests in men presenting with symptoms of prostatism.

	USA guidelines	WHO recommendations	Panel opinions (percentages)		
			Standard	Complementary	Seldom/never
Digital rectal examination	recommended	mandatory	100	-	-
Renal function (creatinine)	recommended	mandatory	92	5	3
Urinalysis					
Sediment	recommended	mandatory	100	-	-
Culture	not mentioned	not mentioned	39	53	8
Cytology	not mentioned	not mentioned	27	46	27
Uroflowmetry	optional	recommended	97	3	-
Bladder ultrasonogaphy	optional	recommended	77	17	6
Pressure-flow study	optional	optional	11	62	27
PSA	optional	optional	100		
Abdominal radiography	not recommended	optional	41	27	32
Intravenous radiography	not recommended	optional	-	6	94
Kidney ultrasonogaphy	not recommended	optional	41	56	3
Urethrocystoscopy	not recommended	optional	19	51	30
Prostate ultrasonography	not recommended	optional	50	50	-

Detailed analyses on the relationship between opinions and knowledge/reported application of the various (national and international) guidelines showed only two significant associations. Urologists who were familiar with the AHCPR or WHO guidelines reported more routine use of prostate ultrasonography ($p < 0.05$) and pressure-flow studies ($p < 0.05$). However, given the large number of associations studied, as well as the contradictory character of these results (both guidelines consider these tests only as optional), these findings are likely to be coincidental. All in all, we can conclude that knowledge and reported application of the guidelines did not discriminate between the urologists' opinions.

Table 3 - Extent of urologists' knowledge about the existence of guidelines and their reported influence on the management of BPH (percentage of responders, n=35).

Percentage of urologists knowing published guidelines or recommendations on diagnostics and treatment of BPH	68
Specification of guidelines known:	
USA guidelines	6
WHO recommendations	29
National recommendations[a]	43
Other[b]	20
Percentage of uologists reporting that guidelines or recommendations have altered their management of BPH in daily practice	34

[a] Including recommendations based on the opinions of a national task force (14%),[1] specific recommendations regarding medication (31%),[2] and standards for the management of BPH in general practice (14%).[3]

[b] Various documents, not considered to be real practice guidelines, e.g. the standardisation of terminology of the International Continence Society.[7] Brochures from pharmaceutical companies were also mentioned.

DISCUSSION

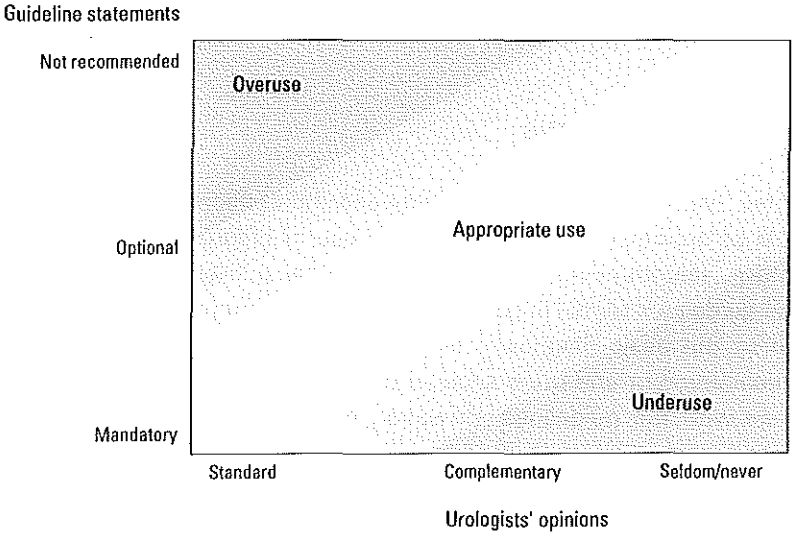
In this study, we compared the opinions about the diagnostic evaluation of BPH in a representative sample of Dutch urologists with the statements of two comprehensive practice guidelines. As regards the basic evaluation, the opinions were generally in accordance with the guidelines. Almost all urologists agreed on the mandatory use of digital rectal examination, measurement of serum creatinine and urine sediment analysis. For other components of urinalysis, a remarkably large proportion of the urologists mentioned the routine use of culture and cytology. The use of these procedures is not discussed in the guidelines. Urine culture could be useful in patients with presumptive urinary tract infections based on urinalysis findings or specific symptoms. Urine cytology could be part of the diagnosing process for bladder cancer. To our knowledge, there is no scientific evidence that justifies the use of these tests in the basic evaluation of men with prostatism.

The use of uroflowmetry and bladder ultrasonography (for measuring postvoid residual urine) as routine tests is advocated by the majority of the urologists, which is in line with the WHO recommendations. We did not inventarize the opinions on medical history and the use of standardized symptom scores. Regarding the former, we assume this to be a matter of course in the evaluation of all patients. At the time of our multicentre study (1993-1994), the use of standardized symptom questionnaires was, except for clinical studies, uncommon in the Netherlands. In both the WHO recommendations and AHCPR guidelines, a central role has been attributed to this diagnostic tool, particularly to discriminate between men for whom no active intervention is needed (mild or not bothersome symptoms, in the absence of abnormalities from the basic evaluation), and those for whom medication or surgery could be contemplated (moderate-severe symptomatology). Although we agree on the importance of careful symptom assessment in patients with prostatism - often symptoms are merely a reason to seek professional help - we recently expressed some concern about the use of standardized symptom questionnaires. Apart from their inability to discriminate between BPH and other pathologic conditions of the lower urinary tract, we found the test-reliability to be very low in patients $\geq$ 65 years, who account for about half of the men visiting a urologist with signs and symptoms of prostatism.[8]

With respect to particular additional procedures, in the guidelines referred to as 'useful for selected patients' (abdominal radiography, kidney ultrasonography and prostate ultrasonography), more than 40% of the urologists reported that they routinely used these tests. Opinions on the use of procedures that are strongly disencouraged in the guidelines (e.g. filling cystometry, urethral pressure profile measurement) were not examined because these tests were performed in none of the patients in our multicentre study. Apparently, the urologists' opinions are in accordance with the guideline statements in this respect.

To what extent do these findings indicate the existence of inappropriate elements in the use of diagnostic procedures for patients with prostatism? Inappropriateness of care may be associated with either overuse or underuse of particular procedures. Figure 1 illustrates the theoretical possibilities of overuse and underuse, assuming the guideline statements to be standards for appropriate diagnostics, and the urologists' opinions to be representative for their actual decisions (see chapter 3).

Figure 1 - Assessing the appropriateness of urologists' opinions by comparison with guideline statements.



Following this scheme, we may conclude that in our study population underuse is not an issue. In contrast, the danger of overuse is evident when considering that a large percentage of urologists reported the routine use of procedures which have been recommended only for selected cases. The potential overuse of particularly upper tract imaging and diagnostic cystoscopy in patients with BPH was recently also reported from a survey among American urologists.[9]
However, it is difficult to determine the exact proportion of overuse because the guidelines do not clearly specify the indications for procedures defined as 'optional'. In the absence of sound scientific evidence, the decision for the use of these procedures is left to the clinical judgement of the individual physician. Further basic and clinical research should be encouraged to fence in this urological 'no man's land'.
Although using an indirect and somewhat coarse method, we found no meaningful differences in opinions between physicians who reported that they knew and applied the guidelines, and those who did not. As was demonstrated in many studies, guidelines themselves do not garantee automatic adoption in day-to-day practice.[10] Changing physicians' opinions and behaviour is a delicate process, requiring a maximum of involvement and a tailored implementation program. In our view, the development of comprehensive quality improvement programs are needed to effectively translate the guidelines into practice.

SUMMARY AND CONCLUSIONS

In this chapter, we made a comparison between the opinions of a representative sample of urologists on the appropriate use of diagnostics (standard, complementary, seldom/never) for BPH and recently published comprehensive practice guidelines (AHCPR guidelines and WHO recommendations).
With regard to the basic diagnostic evaluation (digital rectal examination, creatinine measurement and urine sediment), the physicians' opinions were in accordance with the guidelines. However, a considerable percentage of the urologists reported also the standard use of some types of urinalysis (culture, cytology). These procedures are not mentioned in the guidelines, obviously because they should not have a place in the initial evaluation.

The use of uroflowmetry and measurement of postvoid residual urine by bladder sonography was also reported as a standard procedure by most urologists. The guidelines differ in their statements about these procedures (WHO: recommended for most patients; AHCPR: optional). For 3 out of 5 additional tests, which the guidelines recommend for use only in selected cases, more than 40% of the urologists reported their application to be routine.

Although there is much scientific uncertainty about the exact indications for many diagnostic procedures, our results suggest the overuse of particular tests.

No meaningful differences were seen between urologists who reported to be familiar with, and to have altered their practice on the basis of guidelines, and those who did not.

Further research is needed to refine the indications for the various diagnostic tests, as well as to find effective ways to translate guideline information into appropriate practice decisions.

REFERENCES

1. Schlatmann TJ. Benign prostatic hyperplasia; recommendations for diagnosis and treatment in 1992 (in Dutch). Ned Tijdschr Geneeskd 1992;136:2414-7.
2. Anonymous. Medical therapy of BPH: the role of general practitioner and urologist (in Dutch). Report of the Committee on Quality of Care. Utrecht: Dutch Urological Association, 1993.
3. Standard 'micturition problems in elderly men'; recommendations for general practitioners (in Dutch). Utrecht: Dutch Society of General Practitioners (NHG), 1994.
4. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the International Consultation on benign prostatic hyperplasia (BPH), patronized by World Health Organization (WHO), Paris, June 28-30 1993. Jersey, UK: Scientific Communication International, 1993.
5. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0582.
6. National Health and Medical Research Council. Treatment options for benign prostatic hyperplasia (BPH). Canberra, Australia: Australian Government Publishing Service, 1994.

7. Abrams P, Blaivas JG, Stanton SS, Andersen JT. The standardisation of terminology of lower urinary tract function. Scand J Urol Nephrol 1988;114(suppl):5-19.
8. Stoevelaar HJ, Van de Beek C, Nijs HGT, Casparie AF, McDonnell J, Janknegt RA. The symptom questionnaire for benign prostatic hyperplasia: an ambiguous indicator for an ambiguous disease. Br J Urol 1996;77:181-5.
9. Gee WF, Holtgrewe HL, Albertsen PC, Litwin MS, Manyak MJ, O'Leary MP, Painter MR. Practice trends in the diagnosis and management of benign prostatic hyperplasia in the United States. J Urol 1995;154:205-6.
10. Lomas J, Anderson GM, Domnick-Pierre K, Vayda E, Enkin MW, Hanna WJ. Do practice guidelines guide practice? N Engl J Med 1989; 321:1306-11.

CHAPTER 10

TREATMENT CHOICE FOR BENIGN PROSTATIC HYPERPLASIA (BPH); ARE UROLOGISTS' DECISIONS EVIDENCE-BASED?

Based on: Stoevelaar HJ, Van de Beek C, Casparie AF, McDonnell J, Nijs HGT, Janknegt RA. Treatment choice for benign prostatic hyperplasia (BPH); are urologists' decisions evidence-based? Submitted for publication.

INTRODUCTION

In our attempt to explain the large variation found for treatment choice in men with benign prostatic hyperplasia (chapter 6), we examined the relationship between the specific arguments considered by urologists to be important for treatment choice, and their actual practice decisions. At a cumulated level, these arguments proved to be strongly associated with the choice of particular treatment modalities (chapter 8). We therefore assumed that the urologists' practice decisions are consistent with their ideas about the selection of the most appropriate treatment for patients who meet particular diagnostic criteria. The next research step consists of the judgement of the validity of these ideas. In this chapter, we compare the urologists' opinions on treatment choice with current scientific insights.

MATERIALS AND METHODS

Study population and inventarization of arguments

A detailed description of the study population and methods is given in chapter 8. In summary, after inclusion of all patients, the 39 urologists and residents who were involved in our multicentre study were sent a postal questionnaire, in which they were asked to indicate whether they considered the following diagnostic conditions as an argument in favour, against, or as not significant for the choice of the most common treatment options (surgery, α-blockers, finasteride, watchful waiting/no active intervention):

o Acute urinary tract infection	once	recurrent	
o Urinary tract infection	once	recurrent	
o Presence of bladder stone(s)			
o Bladder neck obstruction			
o Urinary peakflow (ml/s)	> 15	10-15	< 10
o Postvoid residual urine (ml)	< 150	≥ 150	
o Prostate volume (ml)	< 20	20-50	≥ 50
o Severity of symptoms	mild	moderate	severe
o Type of symptoms	obstructive	irritative	
o Age (years)	< 60	≥ 60	
o Sexual function	active	not active	

The selection of these arguments was based on an inventarization of the urologists' considerations for treatment choice for individual cases (see appendix 2, question 6). Distribution of the answers was studied by the construction of confidence intervals of the mean score for each argument, using the following values: against (-1), not significant (0), and in favour (+1). When the normal construction could not be used in the construction of the confidence intervals, the bootstrap method[1] was used.

Comparison with scientific literature

In order to study the scientific support for the urologists' opinions, we made use of the results of the extensive literature searches on which the AHCPR guidelines[2] and international recommendations, established under the patronage of the World Health Organization (WHO)[3] were based. Some arguments mentioned by the urologists in our study were not discussed in the guidelines. For these issues, an additional literature search was performed, using the Medline database.

RESULTS

The figures 1-1 to 1-11 show the confidence intervals of the mean scores for each argument. A short interval close to the extreme vales +1 and -1 represents consensus about the argument being a strong indication in favour or against a certain therapy. The lengths of the intervals indicate the extent of variation in opinions.

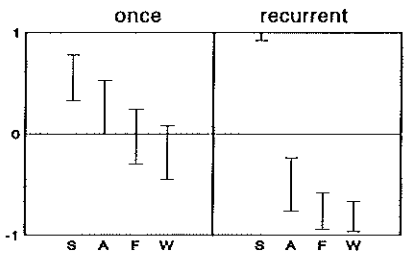
The strongest arguments are those in favour for surgery: recurrent acute urinary retention, volume of residual urine > 150 ml, severe symptoms, and the presence of a bladder stone. Relatively strong arguments against surgery are mild symptoms and a Q_{max} > 15 ml/s. The figures clearly show the lack of consensus as regards the indications for medical therapies.
With few exceptions (α-blockers in case of mainly irritative symptoms and bladder neck obstruction), the arguments in favour for medication are not clearly delineated. From the arguments against medication, recurrent acute urinary retention and the presence of a bladder stone are the strongest ones.
The presence of mild symptoms is the only argument for which the urologists expressed almost complete agreement in favour for watchful waiting. Recurrent acute urinary retention, a Q_{max} < 10 ml/s, severe symptoms, and recurrent urinary tract infections are obviously situations in which watchful waiting is not considered desirable.

Absolute indications for surgery

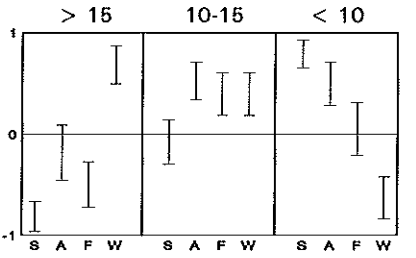
With respect to three important complications of BPH, acute urinary retention (figure 1-1), urinary tract infection (figure 1-7) and bladder stones (figure 1-8), the urologists' opinions are in accordance with the guidelines. In both the AHCPR and WHO guidelines, though neither refer to scientific evidence in the literature, refractory urinary retention, recurrent urinary tract infections, and the presence of bladder stones are considered as absolute indications for surgery. The guidelines do not provide information on the meaning of single events of acute urinary retention and urinary tract infection. In previous studies[4-6] it has been demonstrated that a considerable proportion of the patients with an episode of acute retention, eventually require surgical intervention. In our survey, the majority of urologists considered a single occasion of urinary retention as an argument for surgery. The rather neutral opinions as regards the meaning of a single UTI as an argument for treatment choice, reflect the commonly held belief that this characteristic is of little clinical importance, although no evidence was found in the literature to support this. The role of medication in patients with either urinary retention or urinary tract infection is yet unclear, since most trials used these characteristics as exclusion criteria. However, there is some evidence that α-blockers could prevent first occasions of acute urinary retention.[6] Recently, a similar effect has been reported for finasteride.[7]

Figure 1 - Distribution of urologists' opinions (n=39) on arguments for particular treatment choices in patients with benign prostatic hyperplasia: (1) in favour for a particular therapy, (0) neutral (considered as not significant for treatment choice), (-1) against a particular treatment modality. The I-bars represent the 95% confidence intervals around the mean.

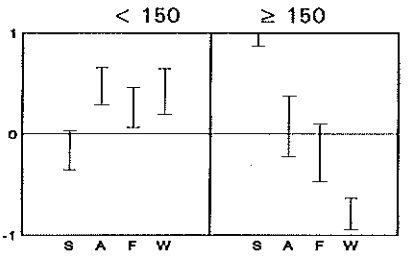
1.1 Acute urinary retention



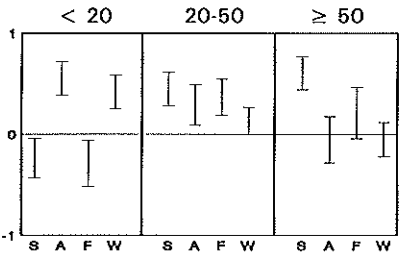
1.2 Peakflow (ml/s)



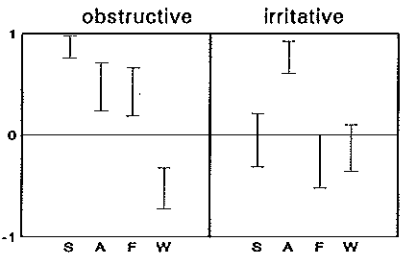
1.3 Residual urine (ml)



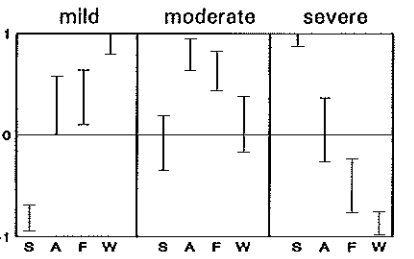
1.4 Prostate volume (ml)



1.5 Type of symptoms

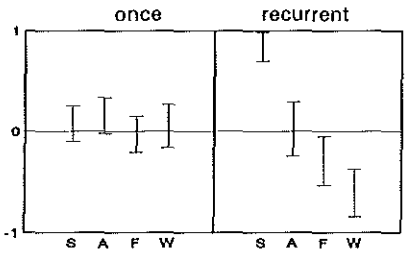


1.6 Severity of symptoms

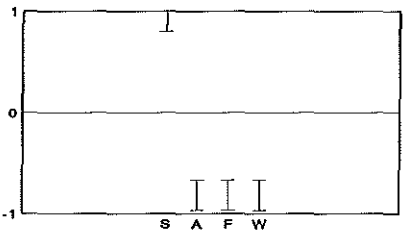


S surgery
A α-blocker
F finasteride
W watchful waiting/no active intervention.

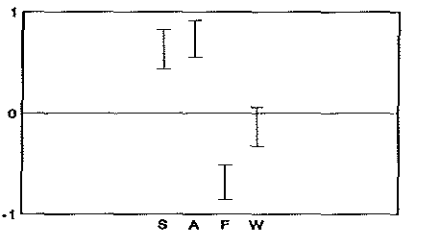
1.7 Urinary tract infection



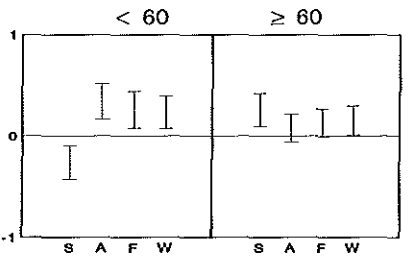
1.8 Bladder stone



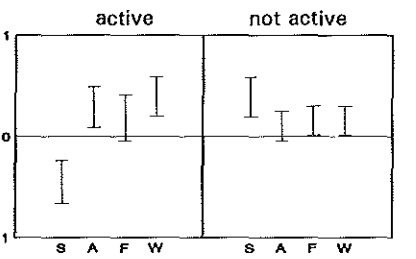
1.9 Bladder neck obstruction



1.10 Age (years)



1.11 Sexual function



Urinary peakflow

When peakflow decreases, there is a stronger preference for intervention, especially for surgery, while the opposite is true for watchful waiting (see figure 1-2). In some ways, these opinions reflect the former ideas of Abrams and Griffiths[8] and Andersen[9] who proposed peakflow values of 10 and 15 ml/s as cutoff points to classify obstructed and unobstructed voiding, thereby defining the criteria for treatment. Patients with a peakflow > 15 ml/s were considered as unobstructed and those with a peakflow < 10 ml/s as obstructed. Between 10 and 15 ml/s, pressure-flow studies were recommended to confirm or reject the diagnosis of obstruction. This classification has been widely used. Since then, several studies have shown the limited predictive value of this classification for the presence of obstruction and treatment outcomes.[10-13] Recent insights indicate that uroflowmetry, if properly performed, shows excellent discrimination between normal and abnormal voiding, but is not able to differentiate between infravesical obstruction and impaired detrusor contractility.[14] Since it has been shown that in a considerable proportion of patients with prostatism poor flow rates are caused by detrusor impairment rather than obstruction[15-17], additional pressure-flow studies might be useful for differential diagnosis, as a basis for adequate treatment choice. Although pressure-flow studies are commonly accepted as a useful additional diagnostic test, much discussion exists about the proper indications and the meaning of its results for treatment decisions.[18-19] As a consequence, neither set of guidelines attribute an explicit role to the results of either uroflowmetry or pressure-studies for treatment decisions, and leave much room to the urologists' individual insights.

Postvoid residual urine (PVR)

From figure 1-3 it can be seen that a PVR volume > 150 ml is considered as a strong argument in favour for surgery and against watchful waiting. However, according to both the AHCPR and WHO guidelines, the use of PVR as an argument in treatment choice is debatable. This is partly due to the wide intraindividual variation of PVR.[20-21] In addition, the predictive value of PVR for treatment outcomes is poor.[8, 22-23] From a recently published trial (preliminary results used in the guidelines), it was concluded that a high PVR predicts a higher failure rate for watchful waiting, when compared to TURP.[24]

However, most men with a high PVR did not require surgical intervention during a 3-year follow-up. Thus, there is no strong evidence to support the urologists' opinions on this point. The relatively modest effects of medical therapies on PVR[6, 25, 26-33] are in this respect of less clinical importance.

Prostate size

Figure 1-4 shows a positive relationship between prostate size and the preference for surgery, and a negative relationship with respect to α-blockers and watchful waiting. The negative attitude for finasteride for cases with small prostates is likely to be associated with one of the main properties of this drug, i.e. reduction of prostatic volume. However, since several studies have shown that prostate size does not correlate with severity of symptoms, urodynamic parameters for obstruction and treatment outcomes,[34-41] both the AHCPR and WHO guidelines conclude that this characteristic is not relevant for the decision as to whether or not to provide active treatment. When invasive treatment is required, assessment of the size and shape of the prostate might be useful in determining the most appropriate type of surgical intervention.

Type of symptoms

The survey results (figure 1-5) indicate a preference for active treatment, particularly surgery, in case of mainly obstructive symptoms, and a preference for α-blockers when irritative symptoms dominate. In neither the guidelines nor other literature could evidence be found to sustain these opinions. Firstly, from several trials and other studies, we can see that most patients with symptoms due to BPH present with a mix of both obstructive and irritative symptoms.[42, 26, 32-33, 43-45] The relative proportion of one or another type seems to be merely associated with the symptom questionnaire used. Secondly, the results of several trials show no pronounced differences in improvement of either obstructive or irritative symptoms for α-blockers[32-33, 43], finasteride[26] or surgery.[42] The urologists' opinions on this issue are probably associated with the effect of α-blockers on the dynamic component of BPH-related obstruction. However, there is no evidence that dynamic obstruction results in primarily irritative symptoms.

Severity of symptoms

The degree of symptom severity is strongly and positively associated with the urologists' preference for surgery, while a strong negative association exists for watchful waiting (figure 1-6). Although there are considerable differences between the urologists, medication seems to be most favoured in patients with moderate symptomatology. In the AHCPR guidelines, the standardized measurement of symptoms plays a central role in the recommendations for diagnosis and treatment choice. For patients with mild symptoms and no abnormal findings from the initial evaluation, no active treatment is recommended. In case of moderate or severe symptoms, surgical or other therapies can be considered, dependent on the results of additional diagnostic tests and patient's preference. Although the terminology is somewhat different, the same recommendations are found in the WHO recommendations. For patients with mild symptoms, the benefits of active treatment (slight symptom improvement) are obviously considered too low when balanced against the side effects of the active treatment modalities. From a recent study on watchful waiting versus surgery, it was concluded that surgery is to be preferred for men with moderate symptoms of BPH.[24]

Bladder neck obstruction

A strong preference for surgery and α-blockers was expressed for bladder neck obstruction. The use of finasteride is considered as inappropriate in this situation, most likely related to the fact the main property of finasteride is to reduce prostatic size, which is not relevant in case of bladder neck obstruction only. Although the AHCPR guidelines discuss the most appropriate surgical technique in case of small prostates (transurethral resection versus incision), no specific treatment recommendations are given with respect to this kind of pathology. We did not find any evidence in the literature which supports the use of α-blockers as beneficial in this particular situation.

Age and sexual functioning

A somewhat negative attitude towards surgery exists for younger men and for those who are sexual active. In the guidelines, no specific recommendations have been made on these issues.

With respect to sexual function, the AHCPR guidelines pointed out that there is much uncertainty as to whether the substantial incidence of impotence after prostate surgery, reported in several studies, is due to the intervention itself. From a recent trial (preliminary results reported in the guidelines), it was concluded that there are no significant differences in the 3-year incidence figures of impotence between surgically treated BPH-patients and those managed by watchful waiting.[24] The risk of retrograde ejaculation, most common after prostatectomy, has to be discussed with the patient when surgery is considered as a treatment option. For finasteride, some adverse effects have been reported on sexual function.[26] Obviously, these findings did not affect a negative attitude for finasteride in our panel.

DISCUSSION

The treatment recommendations of both the AHCPR guidelines and WHO recommendations are fairly global. In summary, they refer to three categories of decision making:

- For patients with mild symptoms and without abnormalities from the basic evaluation, watchful waiting is to be preferred.
- In case of particular complications of BPH (e.g. recurrent urinary tract infections, refractory urinary retention, bladder stones), surgery is indicated.
- For all other cases, the choice of treatment should depend on the urologist's personal judgement and the patient's preference.

At this global level, the urologists' opinions are largely in accordance with the guidelines. However, the grey area of decision making for the third category applies to the majority (approximately two-thirds) of the BPH-patients who had been referred to a urologist (own results, not published). Does that mean that for this category of patients any treatment option can be justified? This, of course, is dependent on the validity of the arguments used. There might be arguments that should not be used because they have been proved to be of no or less relevance for treatment choice. Other arguments that are used by urologists probably rely on common beliefs, but still lack scientific evidence.

In our comparison of the urologists' arguments for treatment choice with scientific evidence, we encountered a number of debatable issues, particularly those relating to prostate size, postvoid residual urine, and the use of α-blockers in case of mainly irritative symptoms or bladder neck obstruction.
Given the large variation in opinions about treatment choice, we feel that a discussion about the validity of the arguments used could be helpful in reducing the proportion of unappropriate decisions, even within the large grey area mentioned. However, changing physicians' opinions and performance is a delicate process requiring a systematic practice-based approach.[46] As a consequence of the rapidly changing scientific insights, a strategy of continuing medical education is required.

SUMMARY AND CONCLUSIONS

This chapter described the results of an inventarization of arguments used for treatment choice in a representative sample of urologists and residents. In addition, a comparison was made between these arguments and the statements of recently published comprehensive practice guidelines for the management of BPH. At a global level, the urologists' opinions were in accordance with the guidelines. However, within the grey area of decision making for which most BPH-patients who are being referred to a urologist meet the criteria (moderate-severe symptomatology without direct indications for surgery), the guidelines are fairly global and leave much room to the urologists' personal judgement. An analysis on the scientific validity of particular arguments pointed at the existence of a number of ideas that are debatable in the light of current insights.
In order to reduce the proportion of inappropriate decisions, further discussion about the validity of clinical practice decisions should take place, subsequently followed by systematic quality assurance.

REFERENCES

1. Efron B. The jackknife, the bootstrap and other reasampling plans. Philadelphia: Society for Industrial and Applied Mathematics, 1982.
2. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0582.
3. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the International Consultation on benign prostatic hyperplasia (BPH), patronized by World Health Organization (WHO), Paris, June 28-30 1993. Jersey, UK: Scientific Communication International, 1993.
4. Breum L, Klarskov P, Munck LK, Nielsen TH, Nordestgaard AG. Significance of acute urinary retention due to infravesical obstruction. Scand J Urol Nephrol 1982;16:21-4.
5. Craigen AA, Hickling JB, Saunders CRG, Carpenter RG. Natural history of prostatic obstruction: a prospective survey. J R Coll Gen Pract 1969;18:226-32.
6. Jardin A, Bensadoun H, Delauche-Cavallier MC, Attali. Alfuzosin for treatment of benign prostatic hypertrophy. Lancet 1991;337:1457-61.
7. Andersen JT, Ekman P, Wolf H, Beisland HO, Johansson JE, Kontturi M, Lehtonen T, Tveter K. Can finasteride reverse the progress of benign prostatic hyperplasia? A two year placebo-controlled study. Urology 1995;46:631-7.
8. Abrams P, Griffiths DJ. The assessment of prostatic obstruction from urodynamic measurements and from residual urine. Br J Urol 1979;51:129-34.
9. Andersen JT. Prostatism: clinical, radiological and urodynamic aspects. Neurourol Urodyn 1982;1:241-93.
10. Gerstenberg TC, Andersen JT, Klarskov P, Ramirez D, Hald T. High flow infravesical obstruction in men: symptomatology, urodynamics and the results of surgery. J Urol 1982;127:943-5.
11. Iversen P, Bruskewitz RC, Jensen KM-E, Madsen PO. Transurethral prostatic resection in the treatment of prostatism with high urinary flow. J Urol 1983;129:995-7.
12. Chancellor MB, Blaivas JG, Kaplan SA, Axelrod S. Bladder outlet obstruction versus impaired detrusor contractility: the role of uroflow. J Urol 1991;145:810-2.
13. Rollema HJ, Boender H, Van de Beek C, Janknegt RA, Wolfs GGMC, Knottnerus JA. Value of free uroflowmetry in the differential diagnosis of prostatism. Proceedings of the Urodynamic Society. San Antonio, 1993.
14. Rollema HJ. Uroflowmetry. In: Krane RJ, Siroky MB, eds. Clinical neuro-urology (201-44). Boston: Little, Brown and Company, 1991.
15. Blaivas JG. Urodynamics. The second generation. J Urol 1983;129:783.
16. Schaefer W, Ruebben H, Noppeney R, Deutz FJ. Obstructed and unobstructed prostatic obstruction. A plea for urodynamic objectivation of bladder outflow obstruction in benign prostatic hyperplasia. World J Urol 1989;6:198.

17. Rollema HJ, Van Mastrigt R. Improved indication and follow-up in transurethral resection of the prostate using the computer program CLIM: a prospective study. J Urol 1992;148:111-5.
18. McConnell JD. Why pressure-flow studies should be optional and not mandatory studies for evaluating men with benign prostatic hyperplasia. Urology 1994;44:156-8.
19. Abrams P. In support of pressure-flow studies for evaluating men with lower urinary tract symptoms. Urology 1994;44:153-5.
20. Birch NC, Hurst G, Doyle PT. Serial residual volumes in men with prostatic hypertrophy. Br J Urol 1988;62:571-5.
21. Bruskewitz RC, Iversen P, Madsen PO. Value of postvoid residual urine determination in evaluation of prostatism. Urology 1982;20:602-4.
22. Andersen JT. Prostatism III. Detrusor hyperreflexia and residual urine. Clinical and urodynamic apsects and the influence of surgery on the prostate. Scand J Urol Nephrol 1982;16:25-30.
23. Jensen KM-E, Jørgensen JB, Mogensen P. Urodynamics in prostatism III. Prognostic value of medium-fill water cystometry. Scand J Urol Nephrol 1988;114(suppl):78-83.
24. Wasson JH, Reda DJ, Bruskewitz RC, Elinson J, Keller AM, Henderson WG. A comparison of transurethral surgery with watchful waiting for moderate symptoms of benign prostatic hyperplasia. N Engl J Med 1995;332:75-9.
25. Anonymous. Finasteride (MK-906) in the treatment of benign prostatic hyperplasia. Prostate 1993;22:291-9.
26. Gormley GJ, Stoner E, Bruskewitz RC, Imperato-McGinley J, Walsh PC, McConnell JD, Andriole GL, Geller J, Bracken BR, Tenover JS, et al. The effect of finasteride in men with benign prostatic hyperplasia. N Engl J Med 1992;327:1185-91.
27. Beisland HO, Binkowitz B, Brekkan E, Ekman P, Kontturi M, Lehtonen T, Lundmo P, Pappas F, Round E, Shapiro D, et al. Scandinavian clinical study of finasteride in the treatment of benign prostatic hyperplasia. Eur Urol 1992;22:271-7.
28. Hansen BJ, Nordling J, Mensink HJA, Walter S, Meyhoff H-H. Alfuzosin in the treatment of benign prostatic hyperplasia: effects on symptom scores, urinary flow rates and residual volume. A multicentre, double-blind, placebo-controlled trial. Scand J Urol Nephrol 1994;157:169-76.
29. Janknegt RA, Chapple CR. Efficacy and safety of the alpha-1 blocker doxazosin in the treatment of benign prostatic hyperplasia. Eur Urol 1993;24:319-26.
30. Chapple CR, Carter P, Christmas TJ, Kirby RS, Brian J, Milroy EJG, Abrams P. A three month double-blind study of doxazosin as treatment for benign prostatic outlet obstruction. Br J Urol 1994;74:50-6.
31. Chapple CR, Christmas TJ, Milroy EJG. A twelve-week placebo-controlled study of prazosin in the treatment of prostatic obstruction. Urol Int 1990 1(suppl)47-55.
32. Lepor H, Auerbach S, Puras-Baez A, Narayan P, Soloway M, Lowe F, Moon T, Leifer G, Madsen P. A randomized, placebo-controlled multicenter study of the efficacy and safety of terzosin in the treatment of benign prostatic hyperplasia. J Urol 1992;148:1467-74.

33. Brawer MK, Adams G, Epstein H. Terazosin in the treatment of benign prostatic hyperplasia. Arch Fam Med 1993;2:929-35.
34. Roehrborn CG, Chinn HK, Fulgham PF, Simpkins KL, Peters PC. The role of transabdominal ultrasound in the preoperative evaluation of patients with benign prostatic hypertrophy. J Urol 1986;135:1190-3.
35. Simonsen O, Møller-Madsen B, Dorflinger T, Nørgåard JP, Jørgensen HS, Lundhus E. The significance of age on symptoms and urodynamic and cystoscopic findings in benign prostatic hypertrophy. Urol Res 1987;15:355-8.
36. Dorflinger T, Bruskewitz R, Jensen KM-E, Iversen P, Madsen PO. Predictive value of low maximum flow rate in benign prostatic hyperplasia. Urology 1986;27:569-73.
37. Bissada NK, Finkbeiner AE, Redman JF. Accuracy of preoperative estimation of resection weight in transurethral prostatectomy. J Urol 1976;116:291-2.
38. Meyhoff HH, Ingemann L, Nordling J, Hald T. Accuracy in preoperative estimation of prostatic size. A comparative evaluation of rectal palpation, intravenous pyelography, urethral closure pressure profile recording and cystourethroscopy. Scan J Urol Nephrol 1981;15:45-51.
39. Siroky MB, Olsson CA, Krane RJ. The flow rate nomogram: II. Clinical correlation. J Urol 1980;123:208-10.
40. Anikwe RM. Correlations between clinical findings and urinary flow rate in benign prostatic hypertrophy. Int Surg 1976;61:392-4.
41. Chute CG, Guess HA, Panser LA, Johnson CL, Jacobsen SJ, Oesterling JE, Lieber MM. The non-relationship of urinary symptoms, prostate volume, and uroflow in a population based sample of men. J Urol 1993;149:356A.
42. Barry MJ, Fowler FJ, O'Leary MP, Bruskewitz RC, Holtgrewe HL, Mebust WK, Cockett ATK. The American Urological Association symptom index for benign prostatic hyperplasia. J Urol 1992; 148:1549-57.
43. Caine M. Alpha-adrenergic blockers for the treatment of benign prostatic hyperplasia. Urol Clin N Amer 1990;17:641-9.
44. Chai TC, Belville WD, McGuire EJ, Nyquist L. Specificity of the American Urological Association voiding symptom index: comparison of unselected and selected samples of both sexes. J Urol 1993;150:1710-3.
45. Yalla SV, Sullivan MP, Lecamwasam HS, DuBeau CE, Vickers MA, Cravalho EG. Correlation of American Urological Association symptom index with obstructive and nonobstructive prostatism. J Urol 1995;153:674-9.
46. Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of the effect of continuing medical education strategies. JAMA 1995;274:700-5.

CHAPTER 11

UROLOGISTS' CONSIDERATIONS ABOUT PRACTICE VARIATION AND THE NEED FOR CHANGE

INTRODUCTION

In the previous chapters, we compared the urologists' opinions about the management of benign prostatic hyperplasia (BPH) with existing guidelines and the scientific literature upon which these were based. For both diagnostics and treatment choice, it was concluded that reconsideration of current practice patterns is desirable. Changing physicians' opinions and behaviour is a process that generally cannot be directed from an aggregate level. Very often, recommendations for change are launched from the 'ivory tower' of clinical experts and scientists, neglecting the values and opinions of those the recommendations are intended for. The natural resistance of people to alter long-established attitudes and behaviour,[1] in combination with the relative freedom of acting that stems from professonial autonomy, necessitate a careful approach with a maximum involvement of those the changes are concerned. In the behavioural sciences, a three-step model of planned change has been developed,[2,3] consisting of 'unfreezing' present behaviour (convincing individuals of the need of change), 'changing' (implementation of desirable changes), and 'refreezing' of changes (embedding changed behaviour patterns as the new norm).
As a first step in this process, it is necessary to measure the 'temperature' of current opinions and behaviour regarding the management of BPH in urological practice: to what extent are urologists convinced about the need for change, and are they willing to actively participate in the change process? In this chapter, we present the results of a survey that inventarized the urologists' reactions on the feedback of the results of our multicentre study, their opinions about the need for change, and their readiness to be involved in the change process.

METHODS

The multicentre study consisted of the documentation of current practice (chapters 2 and 6) and the inventarization of opinions about the appropriate management of BPH in urological practice (chapters 3 and 8).
In a final questionnaire (summer, 1995), the urologists were provided with complete feedback on their individual practice behaviour and opinions, and with that of the total study population. An example of the feedback format is given in figure 1. Subsequently, the urologists were questioned about the following issues:

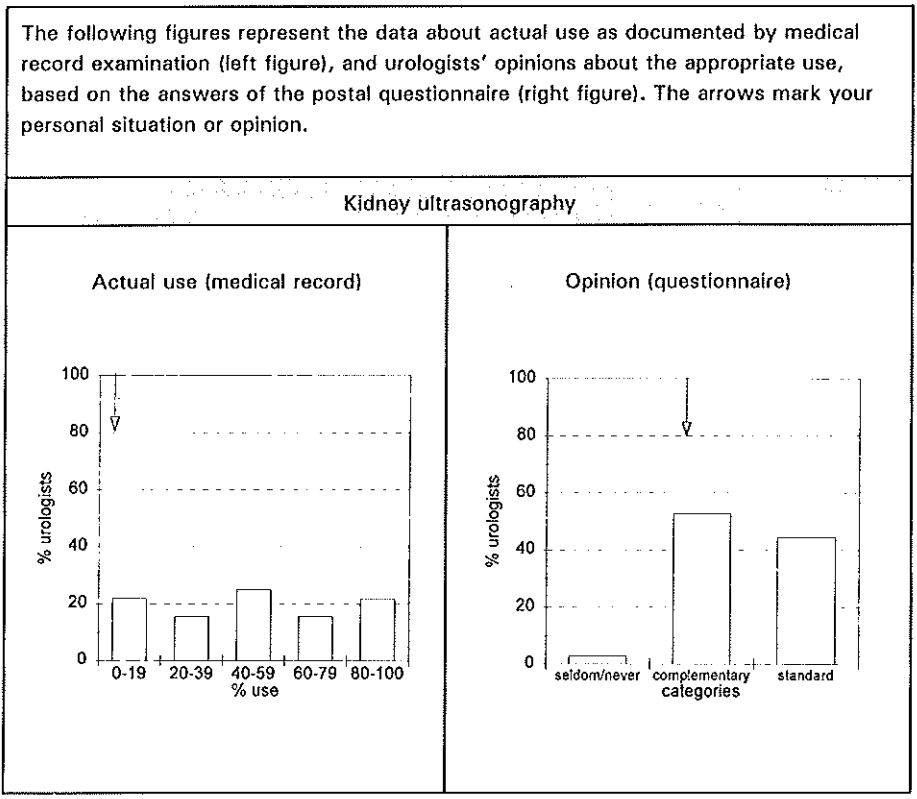
- Considerations about current practice:
  - Extent to which the variation among urologists was surprising.
  - Extent to which the feedback data on individual practice patterns and opinions was surprising.
  - Undesirability of practice variation.
  - Necessity to reach more agreement among urologists about the management of BPH in urological practice.

- Certainty about the effectiveness and indications of some new diagnostic and therapeutic technologies, and expected future use of these technologies. For diagnostics, pressure-flow studies were highlighted because there is currently much debate about the appropriate use of this test in the evaluation of men with prostatism.[4-5] Regarding new technologies, we included both therapies that already have achieved a place in daily practice (medication, laser prostatectomy), and therapies that are considered as experimental (thermotherapy, stents, balloon dilation).

- Need for consensus development and willingness to actively participate in consensus development and quality assurance activities.

For most issues, we used statements for which the urologists were asked to indicate the extent of agreement on a 5-point Likert scale (strongly agree, agree, neutral, disagree, strongly disagree). Analyses were performed for the total group, as well as for subgroups by background characteristics of the urologists (experience, resident/certified, type of hospital).

Figure 1 - Example of feedback information on actual use and opinions to urologists who participated in the multicentre study on management of BPH in urological practice (n=39).



RESULTS

Response

In total, 35 of the 39 urologists and residents who were involved in our multicentre study, returned the final questionnaire. For those who responded, almost no missing answers were noticed.

Considerations about variation in diagnostics

Table 1 summarizes the answers on the four questions about practice variation in diagnostics. Few urologists were surprised about the variation between urologists, or between the discrepancy between their personal opinions and actual practice behaviour. However, a majority (59%) did not agree on the statement that any individual diagnostic approach can be justified, while almost all urologists indicated that developing more agreement about the appropriate diagnostic evaluation for men with prostatism is desirable.

Table 1 - Urologists' considerations about variation in diagnostics; percentages of total (n=35); categories strong disagreement/disagreement and strong agreement/agreement are taken together.

	Statement	Agree	Neutral	Disagree
1.	I was surprised by the variation in diagnostics.	9	29	62
2.	I was surpised by the feedback results on my own practice.	12	17	71
3.	Every urologist has his own diagnostic approach; for the final outcomes, this makes no difference.	12	29	59
4.	It is important to reach agreement among (Dutch) urologists about the most appropriate diagnostic evaluation of men with signs and symptoms of prostatism	91	9	-

With regard to the urologists' background characteristics, only two significant associations were found; residents were somewhat more surprised about their own practice data than were the certified urologists ($p < 0.05$), and mentioned also more frequently that practice variation be undesirable ($p < 0.05$).

Opinions on the use of pressure-flow studies

The questions about pressure-flow studies included opinions on the certainty about their routine use in patients with prostatism, expectations about future use, and the need for more agreement among urologists concerning its application (see table 2). Although more than half of the urologists agreed that the results of pressure-flow studies are as yet too debatable to justify their routine use, about the same proportion expected greater use in the future. A weak correlation existed between the opinions on these two statements; urologists who tended to disagree with statement 1 were more likely to agree with statement 2 (R_s -0.34, $p < 0.05$). The majority of the urologists expressed the desirability of reaching more agreement about the use of pressure-flow studies. No significant differences in opinions were found between subgroups by urologists' background characteristics.

Table 2 - Urologists' opinions about the use of pressure-flow studies; percentages of total (n=35); categories strong disagreement/disagreement and strong agreement/agreement are taken together.

	Statement	Agree	Neutral	Disagree
1.	There is yet too much debate about the appropriate use of pressure-flow study to justify its routine use.	57	14	29
2.	In the next 5 years, I expect to make more use of pressure-flow studies in the diagnostic evaluation of prostatism.	63	26	11
3.	It is desirable to reach more agreement among (Dutch) urologists about the appropriate use of pressure-flow studies in prostatism.	89	9	3

Considerations about variation in treatment choice

The opinions about the variation in treatment choice (see table 3) were similar to those about diagnostics. The majority of the urologists was neither surprised about the existence of variation nor about the feedback data on their own practice.

Most urologists confirmed the need of reaching more agreement about treatment choice in patients with BPH, although this was less pronounced than was found for diagnostics and the use of pressure-flow studies. No significant associations were found between urologists' characteristics and opinions about treatment choice.

Table 3 - Considerations about variation in diagnostics; percentages of total (n=35); categories strong disagreement/disagreement and strong agreement/agreement are taken together.

Statement		Agree	Neutral	Disagree
1.	I was surprised by the variation in treatment choice.	9	27	65
2.	I was surpised by the feedback results on my own practice.	12	24	64
3.	It is important to reach more agreement among (Dutch) urologists about the most appropriate treatment choice for BPH.	77	11	11

Effectiveness and indications for new treatment modalities

For each of six new treatment modalities for BPH, the urologists were asked to give their opinion (agree - disagree, 5 point scale) on the following two statements: 'the effectiveness is debatable' and 'the indication is unclear'. The distribution of the answers are summarized in table 4. Not surprisingly, opinions on effectiveness and indications show similar patterns. Except for medication, there were strong correlations between these two issues per treatment option. Particularly with regard to balloon dilation and thermotherapy, the urologists expressed the effectiveness and indication were unclear. For other treatments, the opinions were more divided. However, for most therapies the percentages for agreement on uncertainty are higher than are those for agreement or neutrality. The only exception are α-blockers, for which about half of the urologists disagreed that the effectiveness is debatable and the indication is unclear. Again, no significant differences in opinions were found between subgroups.

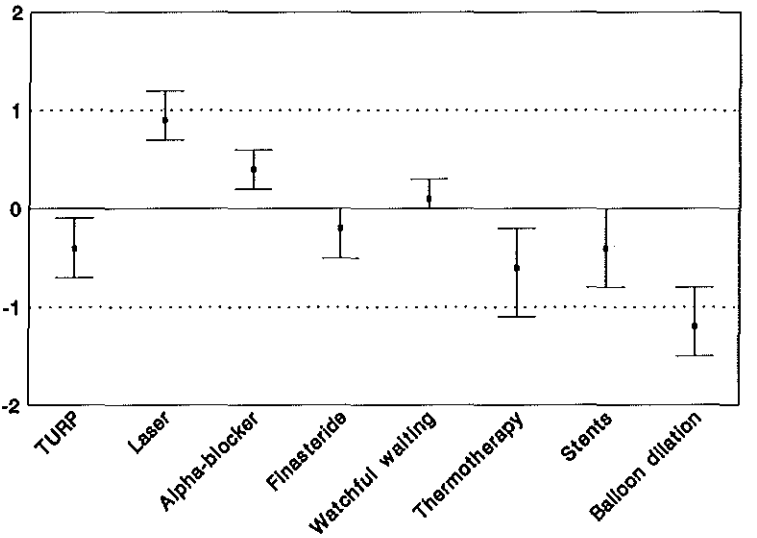
Table 4 - Opinions on the statements 'effectiveness debatable' (E) and 'indication unclear' (I); percentages of total (n=35); categories strong disagreement/disagreement and strong agreement/agreement are taken together.
Right column gives the Spearman rank correlation coefficients (R_s) for opinions on effectiveness and indication; * $p < 0.01$

		Agree	Neutral	Diasagree	R_s	P
Laser	E	56	9	35	0.70	*
prostatectomy	I	54	17	29		
α-blockers	E	29	21	50	0.32	
	I	28	26	46		
Finasteride	E	68	26	6	0.31	
	I	57	20	23		
Thermotherapy	E	79	9	12	0.70	*
	I	74	20	6		
Stents	E	53	15	32	0.79	*
	I	48	9	43		
Balloon dilation	E	91	6	3	0.61	*
	I	82	6	12		

Expectations about future use of (new) treatments for BPH

For the abovementioned new treatments as well as for the conventional therapies TURP (transurethral resection of the prostate) and watchful waiting, the urologists were asked whether they expected their use to increase, to remain stable, or to diminish in the next 5 years. The distributions of the answers are given in figure 2. On average, the use of laser prostatectomy and α-blockers was expected to increase, while for finasteride and watchful waiting no major changes were mentioned. For other treatments, particularly balloon dilation, the expectations tend to a decreased use in the near future.

Figure 2 - Urologists' expectations about future use of conventional and new treatments for BPH; mean and 95% confidence intervals of the answers based on a 5-point scale: strong decrease (-2) to strong increase (+2).



For only two treatments, the expectations about future use were correlated with the opinions about effectiveness and indication.
A stronger agreement that the indication is unclear is associated with lower expectations about the future use of thermotherapy (R_s -0.53, $p < 0.01$) and laser prostatectomy (R_s -0.44, $p < 0.05$). For thermotherapy, a similar figure was found with respect to the statement that the effectiveness is debatable (R_s -0.38, $p < 0.05$).

Need for consensus development and willingness to participating

Table 5 gives an overview of the answers on the questions about the desirability of consensus development for the management of BPH in urological practice, as well as the urologists' readiness to participate in consensus activities. Most urologists agreed on the necessitity of consensus development. Those who disagreed (n=8) were asked to motivate this opinion.

The following reasons were mentioned: too much scientific uncertainty to reach consensus (2), consensus about diagnostics desirable but not regarding treatment (2), consensus guidelines are not sufficient to meet patients' individual needs (1), consensus development is a utopic idea (1), and no clear opinion (2). The majority of urologists who were positive about consensus development reported readiness to attend the consensus meeting and to participate in subsequent quality assurance activities. About 60% of these physicians were also prepared to be involved in the establishment of the consensus document.

The opinions on consensus development and willingness to participate in the respective activities were not significantly associated with urologists' background characteristics.

Table 5 - Opinions on the desirability of consensus development for the management of BPH and readiness to actively participate; absolute numbers and percentages of total (n=35).

	Question	Affirmative Number	Affirmative Percentage
1.	In your opinion, is there a need for consensus development for the management of BPH in urological practice?	27	77
2.	If positive, are you prepared to participate in the following activities?		
	o Preparation of consensus document	16	46
	o Consensus meeting	23	66
	o Quality assurance project in which the impact of consensus guidelines on day-to-day practice will be studied	21	60

DISCUSSION

From this study, the following major conclusions can be drawn. Firstly, most urologists were neither surprised about the existing variation in both diagnostics and treatment choice, nor about the feedback data on their individual practice patterns. Secondly, the majority expressed the need to reach more agreement about the appropriate management of BPH, particularly with regard to the diagnostic evaluation. In general, there are no strong associations between particular opinions and the urologists' background characteristics.

In the introduction, we referred to a concept of behavioural change, consisting of unfreezing, change and refreezing. Do the results of this survey allow the conclusion that 'the temperature is high enough' to enable a smooth implementation of change activities? In our opinion, the positive attitude we found is a necessary but certainly not sufficient condition in the change process. Even if consensus on the appropriate management of BPH could be reached and the subsequent practice guidelines or recommendations were widely accepted, actual changes in day-to-day practice would not necessarily follow. As was argued by Eddy (1984), there is always a tension between the physician's desire to adopt a potentially beneficial change, and the confidence with familiar practice patterns.[6] Because 'a single shot is unlikely to get the message across',[7] much attention should be paid to the development of a structured implementation strategy that not only consists of 'multiple message shots', but also contributes to the 'refreezing' of desirable practice patterns.

SUMMARY AND CONCLUSIONS

From the results of our multicentre study on the management of BPH, described in previous chapters, we concluded that there are large differences in urologists' practice patterns, as well as in their opinions on the appropriate diagnostic work-up and adequate treatment choice. In this study, we inventarized the urologists' considerations about practice variation, after providing them complete feedback on individual and aggregate study results. Only a few urologists were surprised about the extent of practice variation (9%) or the feedback results on their own practice (12%).

However, a majority expressed the need for consensus development regarding diagnostic evaluation (91%), use of pressure-flow studies (89%), and treatment choice (77%). In addition, a considerable proportion reported willingness to actively participate in consensus meetings (66%), quality assurance projects (60%) or the preparation of consensus documents (46%).

Although this positive attitude is a necessary condition for succesful consensus development, it is not sufficient to guarantee its application in day-to-day practice. To realize actual and lasting changes, a structured implementation strategy is required.

REFERENCES

1. Lewin K. Field theory in social science: selected theoretical papers. New York: Harper & Brothers, 1951.
2. Lewin K. Frontiers in group dynamics: concept, methods, and reality in social science. Human Relations 1947;1:5-41.
3. Schein EH. Organizational Psychology, 3th edition (243-7). Englewood Cliffs, NJ: Prentice-Hall, 1980.
4. McConnell JD. Why pressure-flow studies should be optional and not mandatory studies for evaluating men with benign prostatic hyperplasia. Urology 1994;44:156-8.
5. Abrams P. In support of pressure-flow studies for evaluating men with lower urinary tract symptoms. Urology 1994;44:153-5.
6. Eddy DM. Variations in phycisian practice: the role of uncertainty. Health Aff 1984;3:74-89.
7. Farmer A. Medical practice guidelines: lessons from the United States. BMJ 1993;307:313-7.

CHAPTER 12

BRIDGING THE GAP BETWEEN SCIENCE AND PRACTICE: A CONTINUOUS QUALITY IMPROVEMENT MODEL FOR THE MANAGEMENT OF BENIGN PROSTATIC HYPERPLASIA

INTRODUCTION

In our research, described in the previous chapters, the decision making process of individual physicians was taken as a starting point to study practice variation. We have shown that, adjusted for case-mix, large differences exist in the diagnostic and treatment patterns for BPH among urologists and urological residents. Moreover, we demonstrated these differences to be strongly associated with physicians' opinions about the appropriate diagnostic work-up and treatment preferences.

A comparison of these opinions about diagnostics and arguments used for treatment choice with current scientific insights, as made explicit in recently published comprehensive recommendations and guidelines,[1,2] revealed several discrepancies which necessitate reconsideration of current practice. With regard to the routine diagnostic work-up of patients suspected of BPH, our results suggested the overuse of particular tests by a large proportion of the urologists involved. Appropriateness of care is not only a matter of 'doing the right thing' (appropriateness of indication) but also of 'doing things right' (appropriateness of application). A case-study on the interpretation of the outcomes of uroflowmetry, a diagnostic test widely used in the evaluation of men with prostatism, the results of which play a major role in treatment decisions, showed not only poor agreement between urologists, but also within individual observers.

As to treatment choice, an assessment of the appropriateness of decision making is much more difficult to make. In the absence of clear indications for particular treatments for the majority of patients presenting with signs and symptoms of prostatism, the guidelines leave much room to physicians' personal insights. However, a detailed analysis on the validity of arguments used for treatment choice demonstrated that some treatment opinions, held by many urologists, are debatable in the light of current scientific insights. The need for reconsideration of current practice was endorsed by the urologists who were involved in our study.

After providing them with the study results and feedback data on their individual practice, the majority expressed the need for (further) consensus development.

In this chapter we address the following issues:

- Do our study results necessitate the adjustment or refinement of the currently available guidelines?
- Are guidelines effective tools in reducing (undesirable) practice variation?
- How could we adjust day-to-day practice to the rapidly changing scientific insights?

Based on the results of these analyses, we propose a continuous quality improvement model that aims at narrowing the gap between science and practice in a structured and permanent way.

NEED FOR ADJUSTMENT AND REFINEMENT OF GUIDELINES ON BPH

In our view, the WHO recommendations[1] and AHCPR guidelines,[2] which are largely comparable in their statements (see figures 1 and 2), provide an excellent starting point for the improvement of the quality of care for patients with BPH. Nevertheless, our research revealed some critical issues that are not covered by the guidelines and which, in our view, necessitate the adjustment and refinement at some points. In discussing these matters, we will distinguish between the diagnostic evaluation and treatment choice for patients with prostatism.

Diagnostic evaluation

As described in chapter 9, there are considerable discrepancies between the guideline statements about the appropriate basic evaluation of men with prostatism and the opinions (and practice) of the urologists in our study. In this respect, application of the guidelines could reduce the overuse of these tests. A larger problem concerns procedures that are described in the guidelines as 'optional' and for which no clear indications are defined. The large percentage of patients who underwent certain optional tests (e.g. kidney ultrasonography and urethrocystoscopy), most likely also indicates the overuse of these tests. Further refinement of the guidelines is necessary to distinguish between cases in which these tests are 'probably useful' or 'certainly useless'.

Besides the appropriate indication for the use of diagnostic tests, the way in which the (results of the) tests are used is, naturally, a second important issue. The results of our case-study on uroflowmetry showed a large variation in the interpretation of uroflow curves. It might well be that this variation also exists for other diagnostic tests. In our view, additional consensus development about the appropriate application of particular tests and the interpretation of their outcomes is therefore desirable.

Treatment choice

In chapter 10 we examined the scientific rationale of arguments used for treatment choice in a representative sample of Dutch urologists. At a global level, the arguments mentioned were in accordance with the guideline statements. Almost all urologists agreed on the guideline treatment policies for patients at both ends of the morbidity continuum: for patients with only mild symptoms, watchful waiting should be the initial treatment choice, and for patients with particular complications due to BPH (e.g. bladder stones, refractory urinary retention), surgery is indicated. For the grey area between these extremes, which applies to approximately two-thirds of all patients referred to a urologist for BPH, the guidelines do not give specific recommendations. Treatment choice is left to the individual urologist in dialogue with his patient, after balancing the potential benefits and harms of the various modalities. However, some arguments, mentioned by a considerable proportion of the urologists, seem to be debatable in the light of current scientific insights. In order to rule out the use of ideas or arguments for which no scientific basis exist, we feel that (further) consensus development could be helpful as a means to reduce the proportion of inappropriate treatment decisions.

EFFECTIVENESS OF GUIDELINES

The AHCPR guidelines and WHO recommendations have been prepared by expert panels, based on both literature analysis and, where scientific evidence lacked, by consensus development among the participants of the respective panels. The results were then synthesized into recommendations and subsequently disseminated. This passive way of information transfer is often associated with disappointing compliance among local physicians who constitute the target group for the guidelines.[3-6]

Figure 1 - Decision diagram for the management of BPH, according to the WHO recommendations.[1]

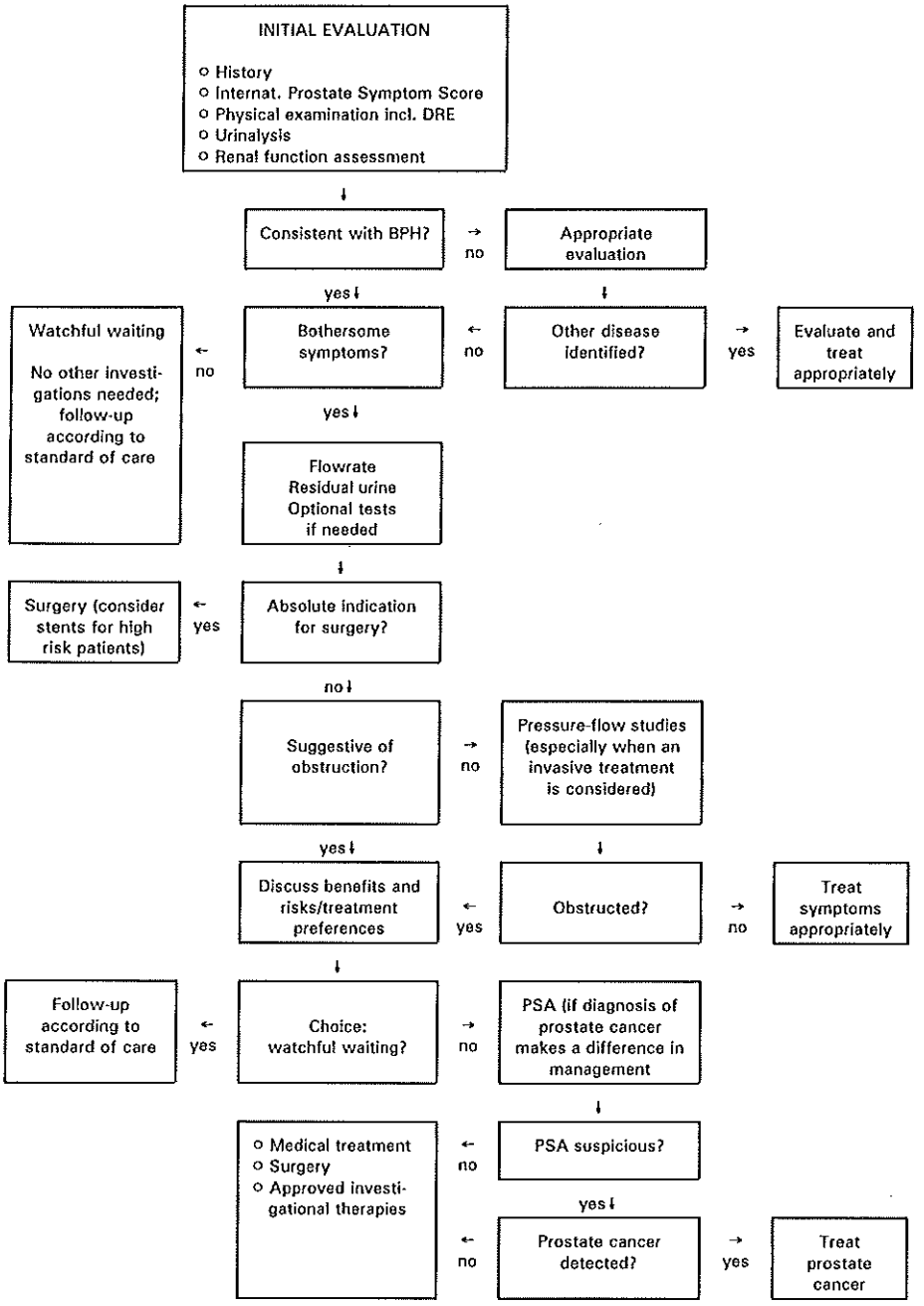
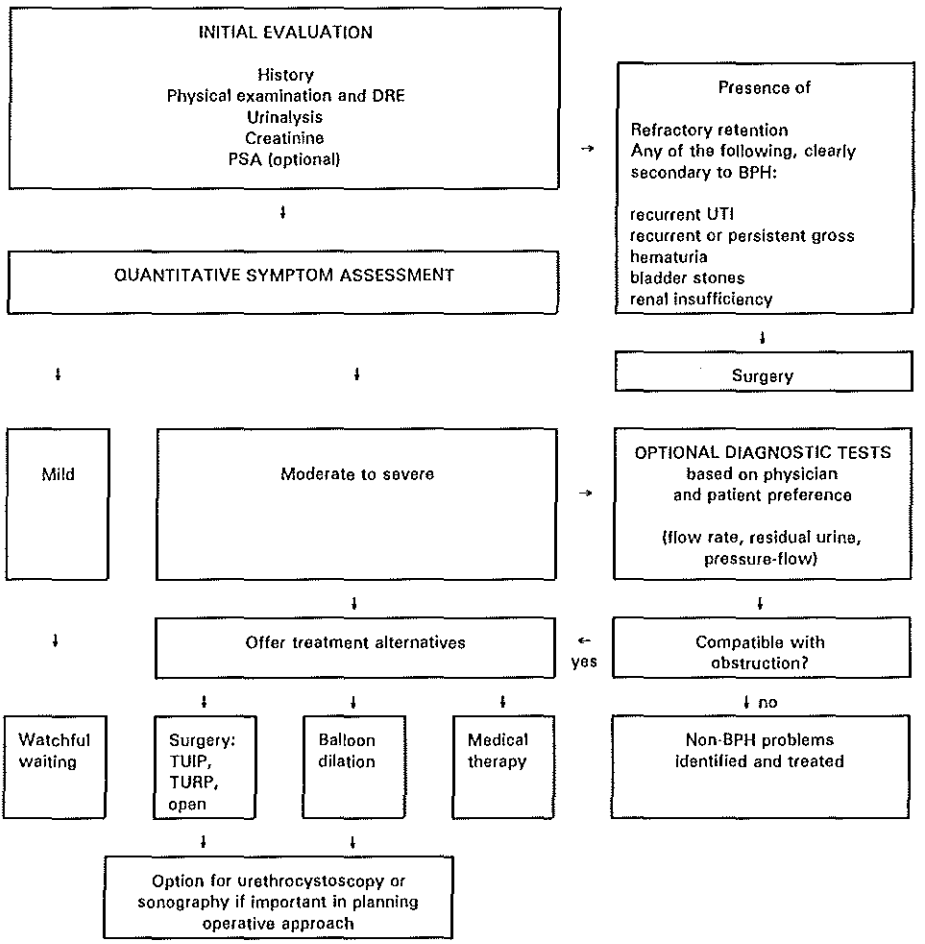


Figure 2 - AHCPR decision diagram for the management of BPH.[2]



The low compliance can only be partly explained by a lack of familiarity with the guidelines, and has more to do with resistance against change that stems from the tension between the perceived benefits of the guideline recommendations and the confidence with familiar practice patterns.[7-8] Another barrier, related to this issue, lies in the belief of many local physicians that the guidelines do not apply to their own patients, because the recommendations are often based on outcome studies conducted at research institutions, with patient populations differing from their own.[9]

Other factors that could impede the translation of guidelines into practice concern characteristics of the social and organizational worksetting (e.g. opinions of colleagues, practice organization, financial resources).[3]
Basically, the implementation of guidelines does not differ from other activities that aim to change (physician's) behaviour, and the research in this field can be useful to identify the critical success factors for making guidelines effective instruments for change in clinical practice. Based on a model from the communication sciences,[10] Klazinga (1994)[11] considers the implementation of guidelines as a set of hurdles that successively have to be taken during the implementation process:

- Getting attention
- Understanding
- Acceptance
- Attitude to change
- Intention to change
- Actual behavioural change
- Lasting change

Following the steps of this model, we will discuss the issues that are critical with regard to the BPH guidelines.

Getting attention

In a survey among the urologists in our multicentre study, we found that only a minority of the urologists were familiar with the WHO recommendations and the AHCPR guidelines. In the period between the survey and the publication of the guidelines (more than one year for the most recent ones), much attention has been paid to this subject in the urological and other medical journals, which almost all urologists reported as having read (own results, not published). National recommendations that were published in a (Dutch) medical journal were also poorly known while guidelines on medication, produced and disseminated by the urological society received somewhat more attention. The overwhelming amount of information with which physicians are confronted in daily practice, necessitates specific and creative measures to reach the target group.

Understanding

The content of the guideline should be clear and unequivocal. In the absence of hard scientific evidence, the guideline recommendations are often a compromise between opinions of various experts, resulting in vague or equivocal statements.[12] The current guidelines for BPH, particularly those of the AHCPR, are extremely clear and well-written. The AHCPR guidelines are also available in different versions for different users. A quick reference guide[13] contains an overview of the recommendations, with a well-structured decision diagram for diagnosis and treatment choice, as well as a balance sheet from which the benefits and harms of various treatment options can easily be compared (see chapter 1). In addition, a detailed report describing the guideline development process and the results of comprehensive literature reviews is available for those who wish to gain insight into the underlying premises.[2] Finally, as the guidelines allow a substantial role for patient preferences in the decision making process, a special brochure for this target group has been developed.[14]

By their simplicity, transparency and use of different formats for different target groups, the AHCPR guidelines definitely best fulfil the requirements with regard to 'understanding'. However, the use of only the short version[13] by clinicians, which is very likely to happen given the overload of information with which doctors are confronted, carries the risk that the guidelines defeat their own aims. As mentioned before, the summarized recommendations are only vigorous where sound scientific evidence was available. Many diagnostic and therapeutic issues for which evidence from the literature is scarce, are left to the judgement of the individual urologist. At this level, except perhaps for the standardized symptom measurement, most urologists will therefore recognize the decision diagram (see figures 1 and 2) as their own state of practice. This could result in leaving undone a critical review of individual decisions in the grey ('optional') area, for which the full text[2] contains very useful information. In our view, the potential strength of (particularly) the AHCPR guidelines, namely offering physicians a mirror to compare their practice decisions with a comprehensive overview of the current scientific insights, is jeopardized by the conciseness of the summarized recommendations and decision diagrams.

Acceptance

Acceptance of guidelines depends heavily on the credibility of the experts who established them and of the information sources used. At a more aggregate (national) level, professional bodies and scientific societies could play a dominant role in facilitating the acceptance of guidelines.[11] At a local level, the involvement of (local) opinion leaders is essential for the dissemination of new ideas to day-to-day practice.[15-17]

Attitude to change

As knowledge, understanding and acceptance are prerequisites for the implementation of guidelines, they do not automatically alter the physician's attitude to change his behaviour. A positive attitude is determined by the extent to which current practice is perceived as undesirable and agreement exists on the reasons to develop guidelines.[11] The opinions of the urologists involved in our multicentre study (see chapter 11) point at a positive climate for change. A large majority expressed the need for consensus development with regard to diagnostic evaluation, use of pressure-flow studies, and treatment choice.

Intention to change

As the aforementioned issues refer to general requirements of the process to 'unfreeze' current practice behaviour, the actual intention to change will depend on the opinions and habits that are in force in the local environment of individual physicians. Again, the committment of local opinion leaders or change agents is essential to convert attitude into actual intention to change.

Actual behavioural change

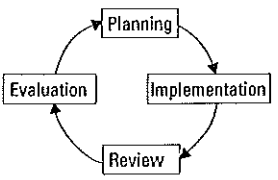
In this phase, familiar practice patterns have to be left, and new ones have to be adopted. Much attention should be paid to practical barriers in the micro-situation.[11] Nursing and support personnel have to be made familiar with new routines, patient forms and records may need adaption, and probably the scheduling of patients has to be altered.

For example, if the standardized measurement of symptoms by the use of a self-administered patient questionnaire is adopted as a new rule, extra time should be reserved, adequate space needs to be reserved to ensure privacy and untroubled completion of the questionnaire, and support must be available for patients who have problems with reading or interpretation of the questions. In addition, direct feedback is necessary to call attention to possible deviations from the guidelines. In this respect, several effective measures have been proved to be helpful, both during the consultation and thereafter, such as (computerized) reminder systems, feedback at individual and aggregate levels, medical audit and the use of electronic patient records.[18-19] Particularly with regard to the management of BPH, which not relates to only few specific measures, but which covers a full program of diagnostic tests and subsequent treatment choice, careful monitoring, feedback and positive reinforcement are crucial elements in the early phase of actual implementation.

Lasting change

A final part of the implementation process consists of measures or activities that ensure the long-term compliance with guidelines ('refreezing' of new behaviour). Without further incentives, the danger of relapsing into old patterns is obvious. Systematic feedback could be an incentive for lasting compliance with guidelines, although its impact is limited when not being part of an overall strategy of practice review.[20] In fact, guideline development and implementation is not different from the general cyclic process of quality improvement, as represented in the Deming-model (see figure 3).[21] After development (planning) and implementation, the effects of the guidelines on daily practice should be assessed. Practice guidelines aim at improving quality of care, eventually resulting in better patient outcomes. Where possible, these direct patient outcomes (e.g. improvement of symptoms, complications) should be part of the review.

Figure 3 - Deming cycle of quality improvement and assurance.



However, at the level of individual practices, this approach is not always possible, given the limited number of patients that can be reviewed as well as the long time period that is often required to obtain conclusive results.[11] Therefore, adequate intermediate outcome measures are needed, that could act as second best indicators for the quality of care delivered. Given the complexity and comprehensiveness of the BPH guidelines, several indicators for different issues will be needed. For example, the number and type of tests performed in the initial diagnostic evaluation may be simple and valuable indicators of both underuse and overuse. With respect to treatment choice, the construction of valid indicators is far more complex. Probably, the development of patient-treatment profiles, referring to a set of patient characteristics that matches one or more favourable treatment modalities, can be helpful in determining the extent to which treatment choices are in accordance with the guideline recommendations. The information derived from previous steps in the quality circle should then be evaluated, by comparing actual practice with the desired situation (guideline recommendations). Not only outcome results (difference between actual and desirable situation) are important, also information about the process is essential as it could be used to identify weaknesses in the guidelines or in the implementation activities. Based on the total evaluation results, the guideline aims and processes could be redefined or adjusted, as a starting point for the next quality loop.

GUIDELINES AND THE DYNAMICS OF SCIENCE

The rapidly changing scientific insights and the large number of new diagnostic and therapeutic technologies that are still becoming available carry with it the danger that guidelines are already (partly) obsolete at the moment they are published. A global assessment of developments in the last two years reveals the dynamics of science in the field of BPH. For example, two years ago, the preliminary results for laser-prostatectomy were promising, while those for hyperthermia were disappointing. As was described in the previous chapter, the opinions on these new technologies among practising urologists reflected these expectations. In the mean time, new study results became available that temper the initial enthusiasm for laser-prostatectomy, particularly as a result of considerable side-effects.

In contrast, technical improvements regarding hyperthermia (higher temperature) revealed significantly higher effectiveness in comparison with earlier versions, resulting in a renewed interest in this technology. Another example concerns the AHCPR guideline recommendation that for patients with moderate to severe symptoms, the type of treatment should be based on the physician and patient preference. Although this is still a valid recommendation, a recent study comparing watchful waiting and surgery demonstrated that patients with moderate symptomatology are more likely to benefit from an operation.[22] Thus, the temporal character of technology and science necessitate the periodic adjustment of the guidelines. This is not only warranted by the technological and scientific developments themselves, but is also desirable from a psychological perspective. As new ideas or insights emerge in the medical literature, whether they are important or not, they may cause confusion and discussion about the validity of current guidelines, thereby reducing the motivation for compliance. As we expressed the need for guidelines being part of a total and continuous quality program, it is obvious that a periodic 'check-up' of the current state of science should be embedded in this approach. Theoretically, the most appropriate moment to do such is 'at the top' of the Deming-cycle (see figure 3), where practice is evaluated and new aims are formulated.

A CONTINUOUS PROGRAM FOR QUALITY IMPROVEMENT IN BPH

In order to enhance appropriate care for BPH-patients in a dynamic scientific environment, there is a need for a flexible system for quality improvement that:

- provides incentives to comply with guidelines
- enables continuous evaluation of clinical care
- enables easy adjustment to new scientific insights

As we described, the compliance with guidelines heavily depends on a careful implementation strategy in which a passive and top-down approach is doomed to fail. In our view, maximum involvement of local physicians from the onset of guideline development is a necessary condition for succesful implementation of and compliance with these guidelines.

The usefulness of creating local committment was recently demonstrated by Karuza et al (1995)[8] who found (in a randomized controlled study) a significant positive effect of small group consensus methods on the compliance with a (general) guideline on influenza vaccination. Thus, local consensus methods are not only a means to reach agreement about appropriate care (outcomes), but could also be helpful in the successful adoption of guideline recommendations (process). Important drawbacks of local consensus methods concern both practical aspects (e.g. time consuming) and the scientific validity of the recommendations.[23] In addition, the danger of fragmentary recommendations is obvious. As a balance between the benefits and drawbacks of local and national methods, we suggest the following approach:

- National consensus and guideline development with a maximum of involvement of local physicians. The concept guidelines should be prepared by a multidisciplinary research panel consisting of health care professionals, and could take the AHCPR guidelines and WHO recommendations as a starting point. After the assessment and potential adjustment of these guidelines for recent scientific insights as well as for the critical issues we identified in our research, the concept text should be discussed with as many practicing physicians as possible. In this respect, there are two approaches that have been taken in the Netherlands. The consensus development program of the Dutch Organization for Quality Assurance in Hospitals (CBO) comprises a public meeting in which the concept guidelines are elucidated and discussed. Based on the results of this discussion the text is adjusted and submitted for comment to the professional body concerned. The final (approved) text is then broadly dissiminated among the relevant target groups, and is also published in a summarized version in national medical journals.[24] Another approach that aims at the participation of local physicians in consensus development, concerns the development of standards for general practice. In this method, 50 general practitioners, randomly selected from the total population of GP's, are asked to give their written comments on a particular concept text, prepared by a task force of experts.[24]
- Local implementation and monitoring strategies.

As for consensus development a national basis is desirable, the implementation and monitoring of guidelines into day-to-day practice cannot be directed from an aggregate level. Local programs are needed to ensure adequate use and lasting compliance. Such a program is most likely to be effective if it consists of a combination of measures at individual and more aggregate levels.

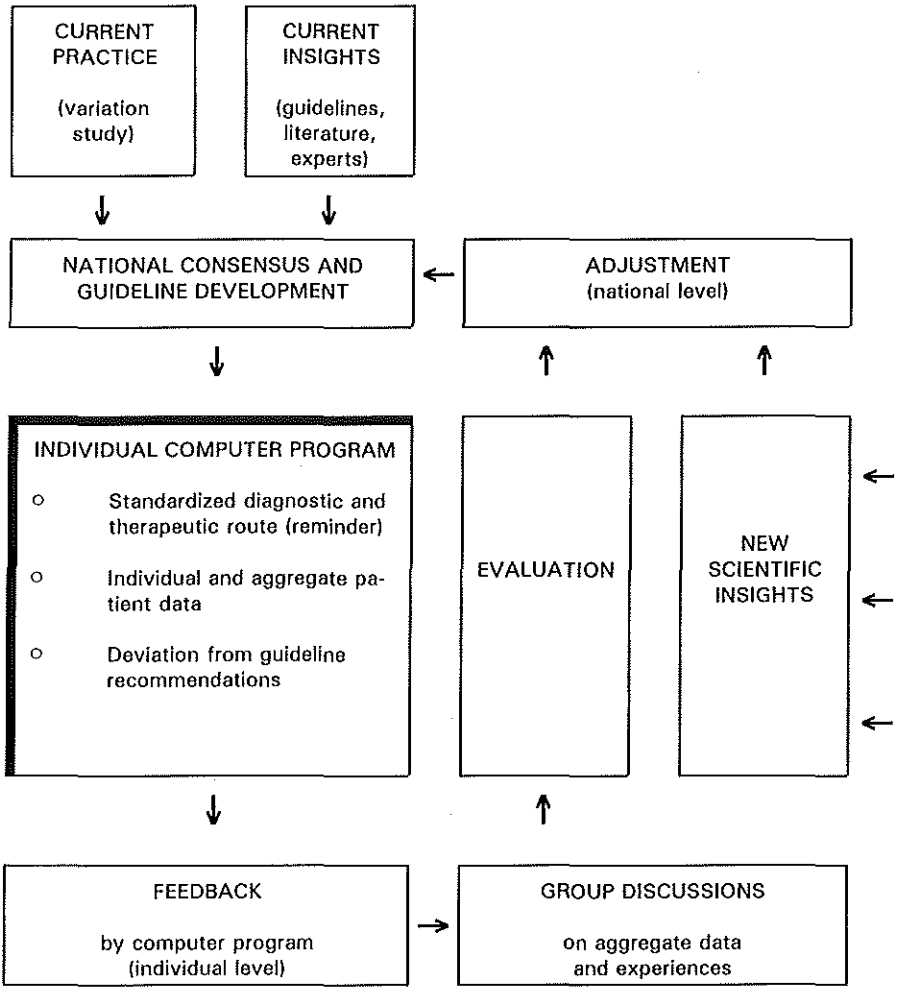
At the individual practice level, the physician should be provided with information about the guideline recommendations (reminders), as well as with feedback on his own performance. The effects of feedback are largest when the information is presented close to the time of decision making.[20] As mentioned, the BPH guidelines concern the total management of a complex health problem, from initial diagnostic evaluation to treatment choice. As such, the number of parameters to be included in a feedback program is considerable. Therefore, the use of computerized programs will be inevitable.

As the social context is also an important determinant of the behaviour of individual physicians, complementary activities focusing at groups of physicians can be helpful to reinforce desirable practice patterns. Group meetings, chaired by local or regional opinion leaders, should periodically discuss their experiences with individual programs. When computer programs are used, it is also possible to use summarized data to study the current state of practice, in comparison with the guideline recommendations.

- Use of local experiences to redefine national targets. The data on outcomes of and experiences with local projects can subsequently be the starting point to reconsider national policies and to formulate new objectives. Together with new scientific insights or developments, the guidelines should then be revised and incorporated in a new version of the quality loop.

This model of continuous quality improvement is illustrated in figure 4. It consists of national consensus and guideline development, based on the currently available guidelines, complementary recent literature, current practice insights and expert opinions. As mentioned, active involvement of local physicians is highly desirable, and seems not unrealistic given the need for consensus development and the readiness to participate in consensus activities, as expressed by the majority of urologists involved in our study.

Figure 4 - Schematic overview of a continuous quality improvement program for the management of BPH



In addition to the regular dissemination activities, we propose the establishment of local quality improvement projects, in which individual urologists are provided with a computer program that can be helpful as a reminder of the guideline recommendations, and that also enables direct feedback data of individual patients and totals. Where possible, it should also contain information about possible deviations from the guideline statements. The data on individual practice patterns and experiences with the system will then be discussed periodically (e.g. once per three months) with other participants during group meetings. Less frequently, but also on a regular basis (e.g. biannually), an evaluation of the local projects should take place, the results of which can be used to adjust or refine the guidelines, also taking into consideration new scientific developments. Of course, this model represents an ideal situation, and there is no hard evidence that such an approach will be workable and effective. Pilot studies are necessary to determine the potential merits and limitations of its components. However, we feel that a combination of both individual and more aggregate strategies on a permanent basis gives best hope of narrowing the gap between science and practice.

REFERENCES

1. Cockett ATK, Khoury S, Aso Y, Chatelain C, Denis L, Griffiths K, Murphy G, eds. Proceedings of the International Consultation on benign prostatic hyperplasia (BPH), patronized by World Health Organization (WHO), Paris, June 28-30 1993. Jersey, UK: Scientific Communication International, 1993.
2. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Clinical practice guideline for benign prostatic hyperplasia: diagnosis and treatment. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0582.
3. Lomas J, Anderson GM, Domnick-Pierre K, Vayda E, Enkin MW, Hanna WJ. Do practice guidelines guide practice? N Engl J Med 1989;321:1306-11.
4. Lomas J. Words without action? The production, dissemination, and impact of consensus recommendations. Ann Rev Public Health 1991;12:41-65.
5. Jacoby I, Rose M. Transfer of information and its impact on medical practice: the US experience. Int J Tech Assess Health Care 1986;2:107-16.
6. Kosecoff J, Kanouse DE, Rogers WH, McCloskey L, Winslow CM, Brook RH. Effects of the National Institutes of Health Consensus Development Program on physician practice. JAMA 1987;258:2708-13.

7. VanAmringe M, Shannon TE. Awareness, assimilation, and adoption: the challenge of effective dissemination and the first AHCPR-sponsored guidelines. Qual Rev Bull 1992;18:397-404.
8. Karuza J, Calkins E, Feather J, Hershey CO, Katz L, Majeroni B. Enhancing phycisian adoption of practice guidelines. Dissemination of influenza vaccination guideline using a small-group consensus process. Arch Intern Med 1995;155:625-32.
9. Volinn E, Diehr P, Ciol MA, Loeser JD. Why does geographic variation in health care practices matter? (And seven questions to ask in evaluating studies on geographic variation). Spine 1994;19(suppl):2092-2100.
10. Kok GJ. Een model voor gedragsverandering via voorlichting. Ned Tijdschr Psych 1985;40:71-6.
11. Klazinga N. Compliance with practice guidelines: clinical autonomy revisited. Health Policy 1994;28:51-66.
12. Woolf SH. Practice guidelines: a new reality in medicine. III: Impact on patient care. Arch Intern Med 1993;153:2646-55.
13. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Benign prostatic hyperplasia: diagnosis and treatment. Quick reference guide for clinicans. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0583.
14. McConnell JD, Barry MJ, Bruskewitz RC, Bueschen AJ, Denton SE, Holtgrewe HL, et al. Treating your enlarged prostate: patient guide. Rockville, MD: Department of Health and Human Services, 1994. AHCPR publication no.94-0584.
15. Greer A. The state of the art versus the state of science: the diffusion of new medical technology into practice. Int J Techn Assessm Health Care 1988;4:5-26.
16. Lomas J, Enkin M, Anderson GM, Hannah WJ, Vayda E, Singer J. Opinion leaders vs audit and feedback to implement practice guidelines. Delivery after previous cesarean section. JAMA 1991;265:2202-7.
17. Davis DA, Thomson MA, Oxman AD, Haynes RB. Changing physician performance. A systematic review of the effect of continuing medical education strategies. JAMA 1995;274:700-5.
18. Lomas J, Haynes R. A taxonomy and critical review of tested strategies for the application of clinical practice recommendations: from 'official' to 'individual' clinical policy. In: Battista R, Lawrence R, eds. Implementing preventive services. Am J Prev Med 1988;4:77-94.
19. Grimshaw JM, Russell IT. Achieving health gain through clinical guidelines. II: ensuring guidelines change medical practice. Qual Health Res 1993;3:45-52.
20. Mugford M, Banfield P, O'Hanlon M. Effects of feedback of information on clinical practice: a review. BMJ 1991;303:398-402.
21. Harteloh PPM, Casparie AF. Kwaliteit van zorg: van een zorginhoudelijke benadering naar een bedrijfskundige aanpak. 's-Gravenhage: VUGA, 1991.
22. Wasson JH, Reda DJ, Bruskewitz RC, Elinson J, Keller AM, Henderson WG. A comparison of transurethral surgery with watchful waiting for moderate symptoms of benign prostatic hyperplasia. N Engl J Med 1995;332:75-9.

23. Grol RTPM, Everdingen JJE van, Casparie AF. Invoering van richtlijnen en veranderingen. Utrecht: De Tijdstroom, 1994.
24. Casparie AF, Lombarts MJMH, Van Aken WG, et al. Consensus over medisch-specialistische richtlijnen. Utrecht: Centraal Begeleidingsorgaan voor de Intercollegiale Toetsing (CBO), 1995.

CHAPTER 13

SUMMARY AND CONCLUSIONS

Benign prostatic hyperplasia and its management in urological practice

Voiding problems are very common among elderly men, the majority of which are caused by benign prostatic hyperplasia (BPH). Basically, BPH refers to a histological (microscopic) change of the central part of the prostate. Almost all men, provided they live long enough, develop histological BPH. In about half of them, these histological changes result in actual (macroscopic) enlargement of the prostate. The enlarged prostate may cause outflow obstruction, possibly leading to a variety of urinary symptoms and other clinical manifestations such as urinary tract infections, urinary retention and renal failure. About half of the men with prostate enlargement will develop symptoms.

For many decades, the sequence prostate enlargement -> outflow obstruction -> symptoms has been the basis for treatment in elderly men with voiding problems. However, the relationship between these elements is ambiguous. Urinary symptoms are not necessarily due to prostate enlargement and/or outflow obstruction. In addition, the relationship between prostate enlargement and outflow obstruction is not very strong. Outflow obstruction can be totally absent in men with large prostates, whereas men with small prostates can be severely obstructed. There are also men with large prostates and severe obstruction, but without urinary symptoms.

The absence of a commonly accepted definition of clinical BPH impedes the establishment of general prevalence figures. The large differences between the results of several community-based prevalence studies are primarily due to the different criteria used. However, even in studies that use approximately the same definition, the prevalence figures show a considerable variation, and it is unclear whether this is due to differences between populations or to methodologic issues.

Large variations are also seen in the rate for prostate surgery, which has been the most important treatment for symptomatic BPH for many decades. Not only between countries, but also between small areas within these countries, the surgery rates differ considerably. It has been postulated that these differences are due to professional uncertainty and lack of consensus about the proper indication for prostatectomy.

Over the last few years, many important changes have taken place in the diagnostic evaluation and treatment of men with symptomatic BPH. Whereas 10-15 years ago, medical history and physical examination were the most important diagnostic tools for the evaluation of elderly men with voiding problems, nowadays a variety of imaging and urodynamic techniques is available that enables more accurate assessment of the extent of prostatic obstruction, and offers better possibilities to differentiate between BPH and other diagnoses, such as prostate cancer.
The development of many new diagnostic tools is partly associated with changing opinions on the aetiology of prostatism. New insights indicate that obstruction by a static component (the adenoma) is not the only cause, and that dynamic aspects (adrenerg innervation of the muscular part of the prostate), as well as changed contractility of the vesical detrusor may also play an important role.
The therapeutic arsenal also shows a considerable extension, particularly with less invasive therapies. These include new medical therapies (α-blockers, 5-α-reductase-inhibitors), laser prostatectomy, balloon dilation, thermotherapy and intra-urethral stents.

The explosion of technological innovations and the changing opinions on the causes of voiding problems in elderly men have significantly altered the decision making process in day-to-day practice. The availability of new diagnostic tools may improve the evaluation of the nature and severity of voiding symptoms, and new treatment options enable more tailored choices for different patient groups. Nevertheless, there is also the danger of uncontrolled diffusion and inappropriate application of these technologies.
In order to help urologists to make appropriate diagnostic and treatment decisions, several organizations have published practice guidelines and recommendations. However, there are several factors that thwart the translation of these guidelines into daily practice, such as the physician's personal knowledge and attitude, opinions of colleagues, and practice organization. Little is known about the day-to-day management of BPH in urological practice, and the way urologists make decisions in a dynamic technological and scientific environment. This thesis aims to describe current practice, to analyze differences between practice patterns, and to examine whether these differences indicate the existence of inappropriate elements in the provision of care for patients with BPH.

Because theoretical concepts and empirical evidence from other research were not sufficient for an a priori study design, an incremental approach of substudies was chosen, the aims of which were based on the results of the preceding ones.

Inventarization of current diagnostic and therapeutic practice patterns

The first step consisted of a multicentre study to inventarize current diagnostic and therapeutic practice patterns for BPH, to analyze practice variation, and to gain insight into its determinants. The initial study population consisted of 1414 consecutive male patients, aged 50 years and older, newly referred to the department of urology in one of 13 hospitals throughout the Netherlands. At first visit to the outpatient clinic, all patients completed a questionnaire on symptomatology, bothersomeness of symptoms, and sexual function. After completion of the diagnostic work-up, the urologists (n = 39) filled out a questionnaire concerning the final diagnosis made. Patients without BPH were subsequently excluded from further participation. For each BPH patient, the urologists were also asked which therapeutic regimen they had initiated, and what were the major considerations for their treatment decision. In addition, information about diagnostic procedures performed was retrieved from the medical records.

In 670 of the 1414 men (47%) who had completed the initial questionnaire, the diagnosis of BPH was made by their urologists. For these patients, variation in diagnostic and therapeutic choices was analyzed using logistic regression methods, including both patient characteristics and urologists' background characteristics (experience, general/teaching hospital, resident/certified) as explanatory variables.

For diagnostic practice patterns (chapter 2) as well as for treatment choices (chapter 6), large differences were found between the hospitals involved. With respect to diagnostics, highest variation (interquartile range) was found for ultrasonography of the prostate (19-86%), kidneys (19-68%), and bladder (42-91%), and lowest variation for digital rectal examination (97-100%), blood tests (88-100%) and urinalysis (86-99%). For treatment choice, interquartile ranges were 24-42% (surgery), 32-49% (watchful waiting), 5-29% (α-blockers), and 0-17% (5-α-reductase-inhibitor).

For both diagnostics and treatment choice, the variation proved to be associated with both patient characteristics (e.g. symptomatology) and physician characteristics (e.g. experience).

Because the associations between urologists' characteristics and practice decisions are not likely to be ascribed to organizational or financial factors (e.g. availability and reimbursement of services), we assumed that these point at variation in opinions and/or preferences with regard to particular diagnostic procedures and treatment options. Additional studies were undertaken to gain more insight into these opinions and preferences, and in their impact on practice decisions.
Because different methodological approaches were used for diagnostic and therapeutic choices, the results will be discussed separately.

Further studies on variation in the diagnostic evaluation

The first additional study was intended to inventarize the urologists' opinions about the appropriate use of particular diagnostic procedures, and to assess their impact on actual use (chapter 3). After inclusion of all patients of the multicentre study, the urologists and residents involved (n = 39) were sent a postal questionnaire in which they were asked to indicate the appropriate use (standard, complementary, seldom/never) of 13 diagnostic tests in patients suspected to have BPH. Logistic regression methods were used to study the impact of both opinions and urologists' background characteristics (experience, type of hospital, resident/certified) on the actual use of particular diagnostic procedures, controlling for differences in patient characteristics (age, symptomatology, comorbidity, acute/elective).
For about half of the procedures, there were considerable differences in opinions between the urologists. The regression results showed very strong associations between these opinions and the actual diagnostic decisions. Smaller independent effects were seen for the urologists' background characteristics. Obviously, a strong association exists between thinking and doing in this respect. Further research was recommended to assess the appropriateness of the urologists' opinions on diagnostics (see final section).
A second study focused on the agreement among urologists with respect to the definition of clinical BPH (chapter 4). In many studies, the diagnosis of BPH is based on the individual opinions of urologists, without the use of standard diagnostics or definitions. In our studies, we used the same approach because we wanted to study practice patterns from a 'real world' perspective, without interventions or protocols.

Insight into the variability of definitions used is important not only for the interpretation of the results of the research presented in this thesis, but also when considering those of other studies in which the diagnosis making is based on the individual judgement of physicians.

Opinions on the criteria used for the diagnosis of clinical BPH were obtained by a postal questionnaire, sent to the urologists involved in our multicentre study, after inclusion of all patients. The urologists were asked to indicate which combinations of criteria (prostate enlargement, symptoms, outflow obstruction) they considered as necessary to establish the diagnosis of clinical BPH.

The answers were very heterogeneous, and only two specific patterns were identified. Of the urologists who returned the questionnaire (37/39), eight considered the presence of prostate enlargement as necessary for the diagnosis of BPH and another eight mentioned to establish the diagnosis of BPH only when all three conditions were present. For the majority of the physicians, the answers showed no specific patterns. No significant associations were found between urologists' opinions and background characteristics (experience, certified/resident, general/teaching hospital).

Subsequently, we assessed the impact of differences in opinions and urologists' background characteristics on a patient's probability of being diagnosed with BPH. We therefore took into consideration the total initial population (all men $\geq$ 50 years, newly referred to a urologist; $n = 1414$), of whom 47% were diagnosed with BPH. For all these men, symptomatology was measured at first visit to the outpatient clinic. Logistic regression analysis revealed age and symptomatology to contribute most substantially to the probability of being labelled with BPH. Although not very pronounced, differences in opinions were found to co-determine this probability. Most striking was the finding that patients in teaching hospitals had a considerably lower probability of the diagnosis of BPH (irrespective of other characteristics), than did patients in general hospitals.

We assume this difference is associated with the more frequent use of urodynamic investigations in teaching hospitals, a technique that enlarges the potential for differential diagnoses.

The small number of control variables (age, symptomatology) did not allow definitive conclusions. In practice, the diagnosis of BPH will be made on the basis of several other conditions. Therefore, the differences in diagnosing patients with BPH are probably smaller.

Nevertheless, these findings suggest that some margins should be taken into account, when interpreting the results of studies in which the physician's judgement is the standard for the diagnosis of BPH.

Variation in the diagnostic evaluation may exist not only in the choice of particular diagnostic tests, but also in the way its results are interpreted. In chapter 5 we described the results of a case-study on variation in the interpretation of the diagnostic outcomes of uroflowmetry. As was demonstrated in our multicentre study, this test is performed in the majority of the BPH patients, and urologists seem to rely heavily on its results in diagnosis making and treatment choice.
A representative panel of 58 urologists and residents was asked to individually assess 25 randomly selected uroflow curves and quantitative parameters with regard to normality and most likely diagnosis. To investigate intraobserver agreement, four of these curves were included twice.
In only 36% of all cases, the urologists predicted correctly the actual diagnosis. Interobserver agreement was moderate for normality (kappa 0.46) and poor for the most likely diagnosis (kappa 0.30). Intraobserver variation was also not very satisfactory: for the cases that were included twice, different judgements were given the second time by 29% of the urologists with regard to normality of the curves, and by 41% for the most likely diagnosis. Although we have to take into account the rather artificial study setting (no other patient information was given besides the flow curves), these results necessitate the reconsideration of the proper application of uroflowmetry in day-to-day practice.

Further studies on variation in treatment choice

From the results of our inventarization on current practice, it was suggested that the large differences in treatment choice are probably associated with different opinions on the most adequate treatment choice for particular patient groups. In order to gain insight into the agreement among urologists about selected cases of BPH, we conducted a panel study, the results of which are described in chapter 7.
From the database of our multicentre study, a stratified sample of 16 patients was drawn, 4 each from the following treatment groups: surgery, 5-α-reductase-inhibitor, α-blocker, and watchful waiting. Detailed information on the results of the various diagnostic procedures of these patients were presented to a panel of 58 urologists.

Subsequently, they were asked to give their individual opinion on the most suitable therapy for each patient.
In 23% of all cases, the information was considered to be insufficient for making an adequate choice. Agreement between the panel members was low. The kappa value was 0.29 (SE 0.003), when taking into account all answer categories, and 0.48 (SE 0.005) when the category 'no choice' was excluded. Analyses on agreement by extent of urologist's experience and work setting, showed no large differences between the subgroups. The overall agreement between actual treatment decisions and panel opinions was highest for surgery (86%), followed by watchful waiting (66%) and medical therapies (53% and 28% respectively).

Although this study demonstrated that there are large differences in opinions on treatment choice for BPH, it did not provide insight into the particular nature of these opinions. Therefore, an additional study was conducted that aimed to identify particular treatment preferences, and their influence on practice decisions (chapter 8).
The study population consisted of the urologists who were involved in our multicentre study (n = 39). After inclusion of all patients, they were sent a postal questionnaire, in which they were asked to indicate whether they considered particular diagnostic conditions as favourable, against, or as not significant for the choice of the most frequently chosen therapies (surgery, watchful waiting, two types of medication). Subsequently, preference scales were constructed on the basis of the total scores per treatment option.
To assess the impact of preferences on actual decisions, we performed logistic regression analysis, including the patient diagnostic characteristics, as well as urologists' preference scores and background characteristics as explanatory variables.
The case-mix adjusted influence of particular preferences on actual decisions was significant. A 'reference' patient attending a urologist with a high preference for surgery had a 2.2 higher probability of an operation, compared to a urologist with a low surgery-preference. For α-blockers and finasteride these ratios were 1.8 and 9.2 respectively. An additional independent effect was seen for the urologist's extent of experience.
The strong associations between treatment preferences and actual practice decisions support previous assumptions that practice variation is largely determined by differences in opinions between individual physicians.

Studies on appropriateness of current management of BPH

From the aforementioned studies, it can be concluded that there are considerable differences in both the diagnostics and treatment choice for BPH, and that these differences are strongly associated with the urologists' individual opinions on the appropriate diagnostic evaluation and most adequate treatment choice. However, the question arised whether these findings also indicate differences in appropriateness of decision making. As an indirect means of appropriateness assessment, we compared the urologists' opinions with recently published practice guidelines of the United States Agency for Health Care Policy and Research (AHCPR) and the recommendations of the International Consensus Committee of the World Health Organization (WHO). Both documents were based on extensive literature review, and their statements are broadly similar.

In chapter 9, a comparison is made between the urologists' opinions on the appropriate use (standard, complementary, seldom/never) of various diagnostic procedures, and the guideline statements in this respect.
With regard to the basic evaluation (digital rectal examination, creatinine measurement and urine sediment), the physicians' opinions were in accordance with the guidelines. The use of uroflowmetry and measurement of postvoid residual urine by bladder sonography was also reported as a standard procedure by most urologists. The guidelines differ in their statements about these procedures (WHO: recommended for most patients; AHCPR: optional). For 3 out of 5 additional tests, which the guidelines recommend for use only in selected cases, more than 40% of the urologists reported their application to be routine. Although there is much scientific uncertainty about the exact indications for many diagnostic procedures, our results suggest the overuse of particular tests.
We concluded that further research is needed to refine the indications for the various diagnostic tests, as well as to find effective ways to translate guideline information into appropriate practice decisions.

Chapter 10 describes the arguments used by urologists for treatment choice in BPH compared to the guideline statements and the studies on which these are based. As a result of the lack of sound scientific evidence with respect to the indications for particular treatments, the guideline statements are only 'straightforward' for patients at the ends of the BPH-continuum.

In case of severe symptomatology and/or complications due to BPH, surgery is indicated. For patients with mild symptoms and without abnormalities from the basic evaluation, watchful waiting is to be preferred. For other patients (about two-thirds of the total group), treatment choice is left to the urologist's personal judgement and the patient's preference. At this global level, the urologists' opinions were largely in accordance with the guidelines.
However, as we assumed that lack of scientific evidence for treatment choice in 'grey area' patients does not imply that any treatment option within this group can be justified, we performed a detailed analysis of the scientific evidence for particular arguments used by the urologists. The results of this analysis pointed at the the existence of a number of ideas that are debatable in the light of current scientific insights. In order to reduce the proportion of inappropriate decisions, we recommended further discussion about the validity of clinical practice decisions and subsequent systematic quality assurance.

From the results of our studies, we concluded that reconsideration of current practice patterns is desirable. However, changing physicians' attitudes and behaviour is a delicate process, requiring maximum involvement of the target group. In order to determine the urologists' readiness for change, we conducted a survey in which we inventarized the urologists' considerations about practice variation, after providing them complete feedback on individual and aggregate study results (chapter 11).
Only few urologists were surprised about the extent of practice variation (9%) or the feedback results on their own practice (12%). However, a majority expressed the need for consensus development regarding diagnostic evaluation (91%), use of pressure-flow studies (89%), and treatment choice (77%). In addition, a considerable proportion reported willingness to actively participate in consensus meetings (66%), quality assurance projects (60%) or preparation of consensus documents (46%).
Although this positive attitude is a necessary condition for change, it is not sufficient. To realize actual and lasting changes, a structured implementation strategy is required.

Bridging the gap between science and practice

In chapter 12, we discussed the possibilities of practice guidelines to optimize current practice patterns for BPH, and to reduce the amount of undesirable practice variation.

Firstly, we discussed the issue whether our study results necessitate the adjustment or refinement of the currently available guidelines. As regards the diagnostic evaluation, we considered refinement to be needed for some procedures that are described in the guidelines as 'optional' (no clear indications given), and for which our study results strongly suggest the existence of overuse (e.g. kidney ultrasonography and cystoscopy). In addition, as the results of our case-study on uroflowmetry showed a large variation in the interpretation of test results, we recommended to include additional statements about the proper interpretation of diagnostic results.

For treatment choice, more attention should be paid to the decision making process in the grey area, in order to reduce the proportion of inappropriate decisions.

Secondly, we questionned the effectiveness of practice guidelines in changing physicians' practice patterns. From several studies, it has be concluded that the passive dissemination of guidelines is often associated with disappointing compliance at the local level. The implementation of guidelines requires a multi-approach strategy, and should be embedded in a total system of quality assurance.

A major problem in the development and implementation of guidelines stems from the temporal character of scientific insights upon which these are based, and that necessitates their periodic adjustment. Particularly in the field of BPH, this problem is obvious.

Based on the aforementioned considerations, we proposed a continuous quality improvement model, that aims at narrowing the gap between science and practice in a structured and permanent way. It consists of national discussion and consensus development with maximum involvement of local physicians, followed by local implementation and monitoring strategies. The local experiences with guidelines as well as changed scientific insights should be the basis for a periodic 'check-up' of national policies and for the formulation of new objectives.

SAMENVATTING

Benigne prostaathyperplasie: vóórkomen, diagnostiek en behandeling

Een bemoeilijkte mictie vormt een frequent voorkomend probleem onder oudere mannen. Een belangrijk deel van deze mictieproblemen wordt veroorzaakt door benigne prostaathyperplasie (BPH). In strikte zin heeft de term BPH betrekking op histologische veranderingen van het centrale deel van de prostaat. Deze microscopische veranderingen zijn bij een groot deel van de oudere mannen aanwezig. In ongeveer de helft van de gevallen resulteren de histologische veranderingen in feitelijke (macroscopische) vergroting van de prostaat. Als gevolg van druk op de urethra (plasbuis) kan afvloedbelemmering van urine ontstaan, hetgeen kan leiden tot mictieklachten en andere klinische verschijnselen zoals urineweginfecties en urineretentie. Ongeveer de helft van de mannen met macroscopische prostaatvergroting ontwikkelt mictieklachten.

De diagnostiek van BPH was in het verleden beperkt tot lichamelijk onderzoek en anamnestische gegevens. De enige effectieve therapie bestond uit de chirurgische verwijdering van obstructief prostaatweefsel. In de afgelopen decennia hebben zich echter belangrijke veranderingen voorgedaan op het gebied van zowel de diagnostiek als de behandeling van BPH. Het diagnostisch arsenaal werd uitgebreid met talrijke nieuwe technologieën waarvan de echoscopie en de urodynamica de belangrijkste zijn. Met deze nieuwe diagnostica kunnen grootte en consistentie van de prostaat nauwkeuriger worden vastgesteld, en kan een betere indruk worden verkregen van de mate van obstructie van de urinestroom. Op therapeutisch gebied is, met name in de afgelopen vijf jaar, een scala aan nieuwe, veelal minder invasieve behandelingsmogelijkheden beschikbaar gekomen. Deze omvatten medicamenteuze therapieën (α-blokkers, 5-α-reductase-remmers), ballondilatatie, thermo- en lasertherapie en intra-urethrale stents.

Hoewel de beschikbaarheid van deze nieuwe technologieën kan bijdragen aan een betere diagnostiek en meer toegesneden behandelingskeuze voor verschillende patiëntengroepen, bestaat tevens het gevaar van wildgroei en oneigenlijk gebruik.

Het doel van dit proefschrift is vierledig:

- Het beschrijven van de huidige diagnostiek en behandeling van BPH in de urologische praktijk.
- Het analyseren van verschillen in praktijkpatronen en de determinanten daarvan.

- Het onderzoeken van de relatie tussen praktijkvariatie en 'gepaste zorg'.
- Het identificeren van de wegen die kunnen leiden tot een vermindering van ongewenste praktijkvariatie.

Het proefschrift is gebaseerd op een incrementele benadering, bestaande uit verschillende deelstudies. De doelen van elke deelstudie zijn daarbij telkens gebaseerd op de resultaten van de voorgaande.

Inventarisatie van huidige diagnostiek en therapiekeuze

Omdat nagenoeg geen gegevens bestonden over het beleid bij BPH in de urologische praktijk, werd als eerste stap een inventarisatie verricht van huidige praktijkpatronen met betrekking tot diagnostiek (hoofdstuk 2) en therapiekeuze (hoofdstuk 6). In een gestratificeerde steekproef van 12 urologische praktijken, verspreid over Nederland, werden van 670 opeenvolgende, nieuw verwezen BPH-patiënten $\geq$ 50 jaar gegevens vastgelegd over mictieklachten, ondervonden hinder en sexueel functioneren (vragenlijst patiënt), diagnostische bevindingen (status), en initiële behandelingskeuze en motivatie daarvoor (vragenlijst uroloog). De praktijkvariatie werd aan de hand van kenmerken van patiënt en uroloog integraal geanalyseerd. De verschillen in zowel diagnostisch als therapeutisch beleid bleken aanzienlijk te zijn. Voor de diagnostische verrichtingen werd de grootste variatie (interkwartielafstanden) gevonden voor echo prostaat (19-86%), echo nieren (19-68%) en echo blaas (42-91%), en de kleinste variatie voor rectaal toucher (97-100%) en bloed- en urineonderzoek (respectievelijk 88-100% en 86-99%). Voor de belangrijkste therapiekeuzen bedroegen de interkwartielafstanden respectievelijk 24-42% (chirurgie), 32-49% (watchful waiting), 5-29% (α-blokkers) en 0-17% (5-α-reductase-remmer). Bij logistische regressie-analyse bleek deze variatie samen te hangen met kenmerken van de patient (case-mix), maar ook met kenmerken van de behandelaar (ervaring, type ziekenhuis waarin werkzaam). Omdat het niet waarschijnlijk is dat de verschillen in praktijkvoering tussen behandelaars verklaard kunnen worden door organisatorische en financiële factoren (bijvoorbeeld beschikbaarheid van apparatuur, verschil in beloningsstructuren), werd verondersteld dat verschillen in opvatting over 'gepast gebruik' of voorkeuren hier vooral debet aan zijn. Om deze hypothese te toetsen werden aanvullende studies geëntameerd. Omdat voor diagnostiek en therapiekeuze verschillende methoden zijn gebruikt worden de resultaten in het volgende separaat behandeld.

Variatie in diagnostiek

In de eerste aanvullende studie werden de meningen van urologen over het gepast gebruik van verschillende diagnostica geïnventariseerd (hoofdstuk 3). Hiertoe werd na afloop van de multicentrische studie aan alle deelnemende urologen (n=39) een vragenlijst gestuurd waarin men voor verschillende diagnostische verrichtingen de mate van gepast gebruik (standaard, aanvullend, zelden/nooit) diende aan te geven met betrekking tot de evaluatie van mictieklachten bij oudere mannen. Voor ongeveer de helft van deze verrichtingen bleken aanzienlijke verschillen van mening te bestaan. Vervolgens werd met behulp van logistische regressie-methoden de samenhang tussen deze meningen en het feitelijk gebruik geanalyseerd, waarbij rekening werd gehouden met verschillen in kenmerken van de patiënt (case-mix) en achtergrondkenmerken van de uroloog (ervaring, uroloog/assistent, type ziekenhuis). De samenhang tussen meningen en feitelijk gebruik bleek zeer sterk te zijn. Er bestaat in dit opzicht dus een zeer sterke relatie tussen denken en doen. Aanvullend onderzoek werd aanbevolen om nader inzicht te krijgen in de wetenschappelijke geldigheid van de verschillende denkbeelden (zie laatste deel van deze samenvatting).
Een tweede aanvullende studie was gericht op het verkrijgen van inzicht in de mate van overeenstemming over de diagnose 'klinische BPH' (hoofdstuk 4). Er bestaat hiervoor geen algemeen aanvaarde definitie, en in veel studies wordt voor het stellen van de diagnose uitgegaan van het impliciete oordeel van de betreffende behandelaar. Om inzicht te krijgen in de criteria die urologen in de dagelijkse praktijk hanteren voor het stellen van de diagnose BPH werden, eveneens door middel van een vragenlijst, de meningen geïnventariseerd van de urologen die betrokken waren bij de multicentrische studie. Gevraagd werd om aan te geven welke combinaties van de belangrijkste aspecten van BPH (prostaatvergroting, symptomen, infravesicale obstructie) gehanteerd werden voor het stellen van de diagnose klinische BPH. Ook op dit punt bleken de meningen sterk uiteen te lopen. Ongeveer eenvijfde van de urologen beschouwde uitsluitend prostaatvergroting als een noodzakelijke voorwaarde, en een even groot deel gaf aan de diagnose alleen te stellen indien aan alle drie voorwaarden was voldaan. Bij de overige urologen konden geen specifieke patronen worden vastgesteld.

Vervolgens werd nagegaan in welke mate verschillen van opvatting over de definitie van klinische BPH samenhangen met de kans op deze diagnose voor een willekeurige patiënt uit de populatie mannen ≥ 50 jaar, die werden verwezen naar de urologische polikliniek. Hiervoor werd gebruik gemaakt van de gegevens over de initiële studiepopulatie die, behalve de 670 BPH-patiënten, ook 744 mannen omvatte bij wie een andere diagnose was gesteld. Van alle mannen waren symptomatologie en achtergrondgegevens systematisch vastgelegd bij het eerste bezoek aan de polikliniek.
Uit de logistische regressie-analyse, waarbij meningen over de definiëring van BPH, patiëntkenmerken en achtergrondkarakteristieken van de uroloog als verklarende variabelen waren opgenomen, bleken leeftijd van de patiënt en symptomatologie het sterkst bepalend voor de kans op de diagnose BPH. Verschillen in gehanteerde definities waren, zij het in veel mindere mate, ook van invloed op deze kans. De meest opvallende bevinding was echter dat patiënten in opleidingsziekenhuizen, ongeacht andere kenmerken, een 2 keer zo lage kans hadden op de diagnose BPH dan patiënten die in een algemeen ziekenhuis werden gezien. Verondersteld wordt dat dit verschil vooral samenhangt met het in opleidingsklinieken frequentere gebruik van pressure-flow onderzoek, een diagnosticum dat de mogelijkheden voor differentiaal-diagnostiek vergroot.
Gezien het beperkte aantal controlevariabelen (leeftijd, symptomatologie) kunnen de resultaten van dit deelonderzoek slechts als indicatief worden beschouwd. In de dagelijkse klinische praktijk zullen bij het stellen van de diagnose BPH uiteraard meer criteria worden betrokken. Het is daarom aannemelijk dat de gevonden verschillen in werkelijkheid kleiner zijn. Niettemin kan worden geconcludeerd dat voorzichtigheid is geboden bij het interpreteren van de resultaten van onderzoek waarbij het impliciete oordeel van de behandelaar wordt gebruikt als standaard voor het stellen van de diagnose klinische BPH.

Bij variatie in de diagnostische evaluatie van oudere mannen met mictieklachten gaat het niet alleen om verschillen in het gebruik van verschillende diagnostica, maar zijn ook verschillen in de interpretatie van de testuitslagen van belang. In hoofdstuk 5 worden de resultaten beschreven van een case-studie over de interpretatie van de uitslagen van uroflowmetrie, een diagnostische test die bij vrijwel alle mannen met verdenking op BPH wordt verricht.

Aan een panel van 58 urologen werd gevraagd om 25 testuitslagen (curves en bijbehorende waarden) te beoordelen op normaliteit en meest waarschijnlijke diagnose. Om de intra-individuele variatie te bepalen, waren tevens 4 identieke curves opgenomen, zonder dat dit aan het panel bekend was gemaakt. In slechts eenderde van de gevallen bleek het panel in staat de werkelijke diagnose te voorspellen. De onderlinge overeenstemming tussen de panelleden was matig voor normaliteit (kappa 0.46), en slecht met betrekking tot de meest waarschijnlijke diagnose (kappa 0.30). Ook de intra-individuale overeenstemming (mening over indentieke casus) bleek niet bevredigend. Voor de identieke casus waren de percentages waarin de tweede keer een andere mening werd gegeven respectievelijk 29 (normaliteit) en 41 (meest waarschijnlijke diagnose).
Hoewel rekening moet worden gehouden met het kunstmatige karakter van de onderzoeksopzet (de curves werden gepresenteerd zonder verdere patiëntgegevens), stemmen deze onderzoeksresultaten tot nadere bezinning over de correcte toepassing van dit veel gebruikte diagnosticum.

Variatie in therapiekeuze

Voor het verkrijgen van inzicht in de rol die verschillende opvattingen of voorkeuren van behandelaars kunnen spelen bij de therapiekeuze voor patiënten met BPH werden twee deelstudies geëntameerd. De eerste deelstudie, beschreven in hoofdstuk 7, betrof het vaststellen van de mate van overeenstemming tussen behandelaars over de meest geschikte therapiekeuze voor een aantal gevallen van BPH. Aan een panel van 58 urologen werd gevraagd om voor 16 praktijkgevallen van BPH de behandeling van voorkeur kenbaar te maken. Deze praktijkgevallen waren at random geselecteerd uit het bestand van de multicentrische studie en representeren daarmee een doorsnede van de BPH-populatie. In het algemeen was de onderlinge overeenstemming laag (kappa 0.29 - 0.48). Er waren geen betekenisvolle verschillen in overeenstemming tussen subgroepen naar ervaring en type ziekenhuis.
De overeenstemming tussen de werkelijke praktijkkeuzen en de meningen van het panel was het grootst voor de chirurgische casus (86%), gevolgd door watchful waiting (66%) and medicamenteuze therapieën (respectievelijk 53 en 28%). Uit de discussie die volgde op de casusbespreking bleken de grootste controversen te bestaan over de indicatie voor medicamenteuze therapieën.

Om meer inzicht te krijgen in de achtergronden van de verschillende opvattingen over therapiekeuze alsmede over de samenhang tussen deze opvattingen en de daadwerkelijke therapiekeuze, werd een tweede deelonderzoek verricht (hoofdstuk 8). Door middel van een postale enquête werden de meningen van bij de multicentrische studie betrokken urologen geïnventariseerd over de geschiktheid van bepaalde therapieën voor verschillende diagnostische situaties. Op grond hiervan konden per uroloog preferentie-scores voor verschillende behandelingen worden berekend. Vervolgens werd nagegaan in hoeverre deze preferenties een rol spelen bij de daadwerkelijke therapiekeuze. Door middel van polytome logistische regressiemethoden werd de invloed van zowel patiëntkenmerken (o.a. diagnostische bevindingen), kenmerken van de uroloog (o.a. ervaring) en de verschillende therapiepreferenties op de werkelijke therapiekeuze integraal bestudeerd. De voor case-mix (verschil in patiëntkenmerken) gecorrigeerde invloed van preferenties op de behandelingskeuze was aanzienlijk. Een sterkere voorkeur van de behandelend uroloog voor een bepaalde behandeling bleek samen te hangen met een aanzienlijk grotere kans voor diens patiënten op die behandeling, en een lagere kans op andere therapeutische mogelijkheden.

Praktijkvariatie en gepaste zorg

Op grond van de hiervoor beschreven studies kan worden geconcludeerd dat er sprake is van een aanzienlijke variatie tussen urologen met betrekking tot de diagnostiek en therapiekeuze bij mannen met BPH, en dat deze variatie voor een belangrijk deel kan worden verklaard uit het bestaan van verschillende opvattingen c.q. voorkeuren met betrekking tot het te voeren beleid. De vraag rijst echter in welke mate deze variatie ook kan duiden op verschillen in kwaliteit van zorg. Als een indirecte benadering om te bepalen in welke mate de gevonden verschillen in praktijkvoering zich verhouden tot de vigerende opvattingen over 'gepaste zorg', werd een vergelijking tussen de meningen van de urologen uit onze studie en de aanbevelingen van de enkele jaren geleden gepubliceerde Amerikaanse (AHCPR) en internationale (WHO) richtlijnen voor de diagnostiek en behandeling van patiënten met BPH. Hoewel er verschillen in formulering en nuancering bestaan, is de strekking van beide richtlijnen ongeveer dezelfde.
In hoofdstuk 9 worden de meningen van urologen over het gepast gebruik van verschillende diagnostica vergeleken met de richtlijnen hieromtrent.

De resultaten van deze vergelijking geven aan dat er vooral sprake is van overgebruik. Voor een aantal diagnostische tests (3/5), waarvan het gebruik in de richtlijnen slechts wordt aanbevolen voor selecte gevallen, wordt door een groot deel van de urologen routinematige toepassing gerapporteerd.
Een vergelijking van door de urologen gehanteerde argumenten voor de behandelingskeuze bij BPH met de richtlijnen (hoofdstuk 10), laat zien dat de ideeën over patiënten aan de uiteinden van het BPH-continuüm (ernstige en milde gevallen) overeenkomen met de aanbevelingen.
Door het ontbreken van wetenschappelijk bewijs bestaat er echter een groot grijs gebied waarbinnen, volgens de richtlijnen, de behandelingskeuze dient te geschieden op basis van de persoonlijke inzichten van de behandelaar en de voorkeur van de patiënt. Dit grijze gebied betreft ongeveer tweederde van alle BPH-patiënten. Het gebrek aan wetenschappelijk bewijs betekent echter niet dat voor deze patiënten elke beslissing kan worden gerechtvaardigd. Uit een gedetailleerde analyse van de genoemde argumenten kwam naar voren dat een aantal hiervan, in het licht van de huidige wetenschappelijke inzichten, als discutabel kan worden aangemerkt.

Op grond hiervan wordt geconcludeerd dat herbezinning op de huidige praktijkvoering noodzakelijk is. In hoofdstuk 11 wordt verslag gedaan van een inventarisatie van de meningen van urologen over praktijkvariatie, de noodzaak voor verandering en de bereidheid tot participatie. Hoewel slechts weinigen (9%) verrast bleken te zijn over de bestaande verschillen in praktijkvoering, gaven de meeste urologen aan dat verdere consensusontwikkeling noodzakelijk is met betrekking tot diagnostiek (91%), het gebruik van pressure-flow studies (89%) en therapiekeuze (77%). Eveneens een meerderheid (66%) toonde zich bereid een actieve bijdrage hieraan te leveren.

Tussen wetenschap en praktijk

In hoofdstuk 12 worden de mogelijkheden van consensus- en richtlijnontwikkeling nader uitgewerkt. Allereerst wordt de vraag behandeld in hoeverre onze studieresultaten aanpassing en verfijning van de bestaande richtlijnen noodzakelijk maken. Op het gebied van de diagnostiek wordt aanbevolen om te komen tot een aanscherping van de indicaties voor die verrichtingen die in de richtlijnen als aanvullend worden omschreven.

Wat betreft de therapiekeuze dient meer aandacht te worden gegeven aan de besluitvorming in het grijze gebied, met name om 'oneigenlijke' beslissingen te voorkomen.
Vervolgens wordt ingegaan op de rol die richtlijnen kunnen spelen in het veranderen van de praktijkvoering. Uit verschillende studies is gebleken dat de passieve verspreiding van richtlijnen weinig effectief is. De implementatie van richtlijnen vereist een aanpak op verschillende niveaus, en dient te worden geïncorporeerd in een omvattend systeem van kwaliteitsbewaking en -bevordering.

Een ander belangrijk aandachtspunt wordt gevormd door beperkte geldigheidsduur van richtlijnen. De snelle wetenschappelijke en technologische ontwikkelingen op het gebied van BPH maken een regelmatige revisie noodzakelijk.
Op grond van de genoemde overwegingen wordt tenslotte een model voor continue kwaliteitsbevordering geschetst dat beoogt de afstand tussen wetenschap en praktijk te verkleinen op een structurele en permanente basis. Het model omvat landelijke consensus- en richtlijnontwikkeling, gevolgd door lokale implementatie- en monitoringprojecten. Door evaluatie van lokale ervaringen en het systematisch bijhouden van nieuwe ontwikkelingen dient periodiek het beleid op nationaal niveau te worden aangepast, en kunnen nieuwe doelen voor kwaliteitsverbetering worden geformuleerd.

APPENDIX 1

PATIENT QUESTIONNAIRE

The original patient questionnaire contained more questions, which were used for other study purposes. Only questions which were used for studies described in this thesis, are reproduced.

I. MICTURITION PROBLEMS

The following questions deal with your urination in the **PAST MONTH**. First read all the possible answers. Then mark **ONE BOX** for each question.

	Not at all	Seldom	Less than half the time	About half the time	More than half the time	Almost always
How often have you had to push or strain to begin urination?						
How often have you had a sensation of not emptying your bladder completely ?						
How often have you had to urinate again less than two hours after you finished urinating?						
How often have you found you stopped and started again several times when you urinated?						
How often did you find it difficult to postpone urination?						
How often have you had a weak urinary stream?						
	None	One time	Two times	Three times	Four times	Five or more times
How many times did you most typically get up to urinate from the time you went to bed at night until the time you got up in the morning?						

II. BOTHERSOMENESS OF MICTURION PROBLEMS

The following questions deal with any problems caused by your urinary complaints. Please indicate for each question **HOW BOTHERSOME** these problem were for you in the **PAST MONTH.** Again, mark one answer for each question. How bothersome was it to you that:

	Not applicable	Not bothersome	A little bothersome	Somewhat bothersome	Rather bothersome	Very bothersome
You had to push or strain to begin urination						
You had a sensation of not emptying your bladder						
You had to urinate frequently during the day						
You had to get up at night to urinate						
Your urinary stream stopped and started during urination						
You needed to urinate with little warning						
Size and force of your urinary stream was impaired						

III. SEXUAL FUNCTION

Over the **PAST SEVERAL MONTHS,** have you had any kind of sexual activity (intercourse, masturbation, et cetera?)

☐ Yes ☐ No

APPENDIX 2

UROLOGIST QUESTIONNAIRE

Punch card print

CHOICE OF TREATMENT STUDY IN BPH

UROLOGIST QUESTIONNAIRE

Please complete this questionnaire if you:

- have made a **diagnosis** for this patient
- have decided on an (initial) **therapeutic regimen**

Name urologist _____

1. **Date** _____ (month) _____ (day) _____ (year)

2. Which **diagnosis(es)** have you made for this patient?

☐ _____

☐ _____

☐ _____

3. Is **BPH** one of these diagnoses?

☐ No ----------> patient is excluded of further study

☐ Yes

4. Which diagnostic measures or findings have led to the **diagnosis of BPH**? (multiple answers allowed).

☐ Symptomatology

☐ IVU

☐ Kidney ultrasonography

☐ Uroflowmetry

☐ Cystoscopy

☐ Hematology: _____

☐ Urinalysis: _____

☐ Other: _____

☐ Digital rectal examination

☐ Abdominal radiography

☐ Bladder ultrasonography

☐ Prostate ultrasonography

☐ Urodynamic study

5. Which **therapeutic regimen** will you initiate for BPH? (multiple answers allowed)

a. ☐ Surgical intervention
- ☐ TURP
- ☐ Prostatectomy
- ☐ Other: _____

b. ☐ Watchful waiting
- ☐ Outpatient check-ups
- ☐ Refer back to GP
- ☐ Other: _____

c. ☐ Medication:
- ☐ 5-alpha-reductase inhibitor
- ☐ α-blocker
- ☐ Hormonal
- ☐ Other: _____

d. ☐ Other treatment:
- ☐ Catheterization
- ☐ Hyperthermia
- ☐ Balloon dilation
- ☐ Stent
- ☐ Other: _____

e. ☐ No therapy initiated

SEE BACK

6. What is/are your major **consideration(s)** for this **choice of therapy?**

☐ _____

_____

☐ _____

_____

☐ _____

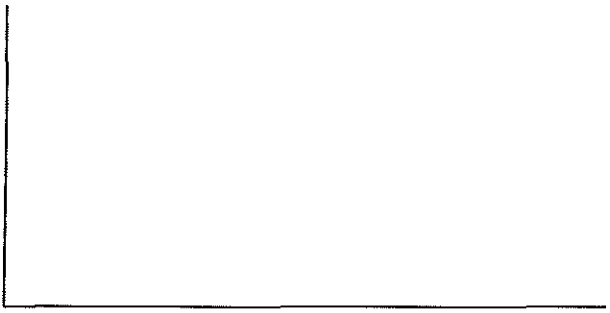
_____

☐ _____

_____

APPENDIX 3

MEDICAL RECORD STUDY



Punch card print

CHOICE OF TREATMENT STUDY IN BPH

MEDICAL RECORD INFORMATION

	Day	Month	Year
Date of record study	☐☐	☐☐	☐☐☐☐

REFERRAL

1. Who referred this patient to the urologist?

☐ GP

☐ Specialist, namely _____

☐ Other, namely _____

2. Date of referral (referral letter):

☐☐ Day ☐☐ Month ☐☐☐☐ Year

3. What is the reason for referral? (referral letter)

4. ☐ Acute patiënt ☐ Elective patiënt

5. Has your patient been hospitalized?

☐ No

☐ Yes ☐☐ Day ☐☐ Month ☐☐☐☐ Year

MEDICAL HISTORY

6. Has patient had a prostate operation before?

☐ No

☐ Yes a. _____ for _____ Year 19___

b. _____ for _____ Year 19___

7. Has patient had other urologic operations?

☐ No

☐ Yes, namely a. _____ Year 19___

b. _____ Year 19___

c. _____ Year 19___

8. Is patient familiar with:

a. ☐ BPH ----------> Year 19___

b. ☐ Prostate cancer ----------> Year 19___

c. ☐ Other urologic diseases, namely:

a. _____ Year 19___

b. _____ Year 19___

c. _____ Year 19___

9. At the time of his first visit, was patient familiar with one of the following diseases?

☐ Diabetes mellitus ☐ Multiple sclerose

☐ M. Parkinson ☐ Alcoholism

☐ Other diseases that may affect urine production, storage or excretion, namely:

a. _____

b. _____

10. At the time of his first visit, did patient use drugs from any of the following categories?

☐ Parasympaticolytics: _____

☐ Antibiotics: _____

☐ Drugs that may affect urine production, storage or excretion:

a. _____

b. _____

DIAGNOSTIC MEASURES AND RESULTS

11. **Digital rectal examination**

☐ Not performed

☐ < 50 gram ☐ ≥ 50 gram

☐ Carcinoma suspected ☐ Carcinoma not suspected

☐ Other findings:

_____

12. ☐ **INTRAVENOUS UROGRAPHY (IVU)**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings

☐ No abnormalities

☐ Dilatation ☐ L ☐ R

☐ Cyst ☐ L ☐ R

☐ Stone ☐ L ☐ R

☐ Tumour ☐ L ☐ R

☐ Other findings:

_____

13. ☐ **ABDOMINAL RADIOGRAPHY**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings

☐ No abnormalities

☐ Kidney stone ☐ L ☐ R

☐ Ureter stone ☐ L ☐ R

☐ Bladder stone ☐

☐ Prostatic calcification

☐ Bladder shadow

☐ Other findings:

_____

14. ☐ **KIDNEY ULTRASONOGRAPHY**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings

- ☐ No abnormalities
- ☐ Dilation ☐ L ☐ R
- ☐ Cyst ☐ L ☐ R
- ☐ Stone ☐ L ☐ R
- ☐ Tumour ☐ L ☐ R
- ☐ Other findings:

_____

15. ☐ **BLADDER ULTRASONOGRAPHY**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings

- ☐ No abnormalities
- ☐ Stone
- ☐ Medium lobe
- ☐ Tumour
- ☐ Residue ☐☐☐☐ ml
- ☐ Other findings:

_____

16. ☐ **UROFLOWMETRY**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings
- ☐ Q_{max} ☐☐ ml/sec.
- ☐ Volume ☐☐☐ ml
- ☐ Stricture
- ☐ Abnormal curve:

_____

- ☐ Other findings:

_____

17. ☐ **PROSTATE ULTRASONOGRAPHY**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings
- ☐ No abnormalities
- ☐ Volume ☐☐☐ ml
- ☐ Prostate calcification
- ☐ Hypodensity
- ☐ Hyperdensity
- ☐ Other findings:

_____

18. ☐ **URETHROCYSTOSCOPY**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Type ☐ Rigid ☐ Flexible

Findings
- ☐ No abnormalities
- ☐ Urethral stricture
- ☐ Residue ☐☐☐ ml
- ☐ UP length ☐☐,☐ cm
- ☐ Bladder neck sclerosis
- ☐ Medium lobe
- ☐ Cystitis
- ☐ Bladder stone
- ☐ Bladder tumour
- ☐ Other findings:

_____

19. ☐ **URODYNAMIC EXAMINATION**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings
- ☐ No abnormalities
- ☐ Obstruction
- ☐ Instable bladder
- ☐ Low contractility
- ☐ Other findings:

_____

20. ☐ **HEMATOLOGY 1**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings PSA ☐☐☐ ng/ml

Creatinine ☐☐☐ µmol/l

Hb ☐☐☐ mmol/l

21. ☐ **HEMATOLOGY 2**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings PSA ☐☐☐ ng/ml

Creatinine ☐☐☐ µmol/l

Hb ☐☐☐ mmol/l

22. ☐ **URINALYSIS 1**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings Albumen ☐☐☐☐

Glucose ☐☐☐☐

Sediment ☐ Abnormal ☐ Normal

Culture ☐ < 10^5 ☐ ≥ 10^5

23. ☐ **URINALYSIS 2**

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

Findings Albumen ☐☐☐☐

Glucose ☐☐☐☐

Sediment ☐ Abnormal ☐ Normal

Kweek ☐ < 10^5 ☐ ≥ 10^5

24. ☐ **OTHER DIAGNOSTICS**

a. Type _____ Findings _____

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

b. Type _____ Findings _____

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

OTHER MEASURES

25. Was patient catheterized in the **DIAGNOSTIC PHASE?**

☐ No

☐ Yes -> Number of times ☐☐

First catheterization ☐☐ D ☐☐ M ☐☐☐☐ Y

Last catheterization ☐☐ D ☐☐ M ☐☐☐☐ Y

26. Were other measures taken in the **DIAGNOSTIC PHASE?**

☐ No

☐ Yes, namely:. a. _____

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

b. _____

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

27. Were drugs prescribed in the **DIAGNOSTIC PHASE?**

☐ No

☐ Yes, namely: a. _____

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

b. _____

Date ☐☐ D ☐☐ M ☐☐☐☐ Y

28. Dates of visits in the **DIAGNOSTIC PHASE:**

1st visit	☐☐ D	☐☐ M	☐☐☐☐ Y
2nd visit	☐☐ D	☐☐ M	☐☐☐☐ Y
3rd visit	☐☐ D	☐☐ M	☐☐☐☐ Y
4th visit	☐☐ D	☐☐ M	☐☐☐☐ Y
5th visit	☐☐ D	☐☐ M	☐☐☐☐ Y
6th visit	☐☐ D	☐☐ M	☐☐☐☐ Y
7th visit	☐☐ D	☐☐ M	☐☐☐☐ Y
8th visit	☐☐ D	☐☐ M	☐☐☐☐ Y
9th visit	☐☐ D	☐☐ M	☐☐☐☐ Y
10th visit	☐☐ D	☐☐ M	☐☐☐☐ Y

29. **REMARKS**

CURRICULUM VITAE

After attending the Gymnasium at the Ichthus College in Enschede, Herman Stoevelaar (1958) studied music (majoring in classical guitar) at the Conservatorium in Twente.
In 1980, he abandoned his musical career and began his training as a radiological assistant. In this capacity, he worked at the Ikazia Ziekenhuis in Rotterdam until 1985.
Between 1985 and 1989, he studied Health Care Policy and Management at the Erasmus University, Rotterdam.
After graduation, he was appointed as a research fellow at the Institute for Medical Technology Assessment (iMTA), where he first participated in studies into physical disabilities. Thereafter, he was involved in several studies on the diagnostics and treatment of benign prostatic hyperplasia, which have been the basis of this thesis.
In 1996, he became an assistant professor at the Institute for Health Care Policy and Management (iBMG). His research focuses on the assessment and implementation of new medical technologies.
Herman Stoevelaar is married to Clary Feijen en has two daughters, Fleur en Julia.