International Urology and Nephrology (2019) 51:1297–1302
https://doi.org/10.1007/s11255-019-02196-0

UROLOGY - ORIGINAL PAPER

Assessment of men's risk thresholds to proceed with prostate biopsy for the early detection of prostate cancer

Kevin Koo[1,2] · **Elias S. Hyams**[1]

Received: 11 April 2019 / Accepted: 4 June 2019 / Published online: 11 June 2019

Abstract

Purpose To delineate the range of "risk thresholds" for prostate biopsy to determine how improved prostate cancer (CaP) risk prediction tools may impact shared decision-making (SDM).

Methods We conducted a cross-sectional survey study involving men 45–75 years old attending a multispecialty urology clinic. Data included demographics, personal and family prostate cancer history, and prostate biopsy history. Respondents were presented with a summary of the details, risks, and benefits of prostate biopsy, then asked to indicate the specific risk threshold (% chance) of high-grade CaP at which they would proceed with prostate biopsy.

Results Of a total of 103 respondents, 18 men (17%) had a personal history of CaP, and 31 (30%) had undergone prostate biopsy. The median risk threshold to proceed with prostate biopsy was 25% (interquartile range 10–50%). Risk thresholds did not vary by race, education, or employment. Personal history of CaP or prostate biopsy was significantly associated with lower mean risk thresholds (19% vs. 32% [$P=0.02$] and 23% vs. 33% [$P=0.04$], respectively). In the lowest versus highest risk threshold quartiles, there were significantly higher rates of CaP (36% vs. 1%, $P=0.01$) and prior prostate biopsy (46% vs. 17%, $P<0.01$).

Conclusions Men have a wide range of risk thresholds for high-grade CaP to proceed with prostate biopsy. Men with a prior history of CaP or biopsy reported lower risk thresholds, which may reflect their greater concern for this disease. The extent to which refined risk prediction tools will improve SDM warrants further study.

Keywords Prostate cancer · Biopsy · Shared decision-making · Risk · Patient counseling

Introduction

Shared decision-making (SDM) is the preferred approach to care for men of average risk considering prostate-specific antigen (PSA) screening for the early detection of prostate cancer [1]. Men who have elevated PSA or other increased risks for prostate cancer may elect to undergo prostate biopsy. A primary aim of SDM is to consider patient preferences in the setting of competing reasonable approaches to care. In the course of SDM, quantitative risk information regarding the risks and projected outcomes of prostate biopsy may be shared with patients. For example, the Prostate Cancer Prevention Trial (PCPT) risk calculator may be used to provide objective data on the risk of high-grade cancer, and can inform men's decisions whether to proceed with biopsy [2, 3]. Newer risk stratification tools, such as the four-kallikrein panel [4–6] and the Prostate Health Index [7], have improved risk prediction by increased accuracy of risk estimates compared to traditional PSA metrics or clinical nomograms [8–10].

It is not clear, however, how patients interpret and apply quantitative risk data in their prostate biopsy decision-making. For instance, some men have a priori concern or discounting of risk that may motivate them to pursue biopsy independent of risk prediction. In addition, while a certain risk level may propel one patient to proceed with a biopsy, the same level may be acceptable to another patient based

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s11255-019-02196-0) contains supplementary material, which is available to authorized users.

✉ Kevin Koo
kkoo@jhmi.edu

[1] Section of Urology, Department of Surgery, Dartmouth-Hitchcock Medical Center, Lebanon, NH, USA

[2] Department of Urology, Johns Hopkins University School of Medicine, 600 North Wolfe Street, Baltimore, MD 21287, USA

on personal background, anecdotal experience, and subjective preferences as reasons to defer a biopsy. It is plausible that men's preferences generally coalesce around a certain "risk threshold," but this has not been systematically studied. Understanding the distribution of patients' preferences is important to assess whether refined risk prediction tools, which purport more accurate pre-biopsy estimation of risk, will meaningfully impact decision-making for most patients. While novel serum and urinary biomarkers for prostate cancer have improved predictive power, they remain imperfectly calibrated and have associated cost and administrative burdens [11–15]. It remains unclear whether the modified risks will factor into decision-making above or below thresholds to affect decisions.

In the context of declining PSA testing and prostate biopsies, leading to decreased incidence of localized prostate cancer, incorporating patients' preferences during SDM may be a valuable strategy to guide the use of newer risk prediction tools [16]. In this exploratory study, we investigated the range of men's risk thresholds to proceed with prostate biopsy, to better understand variation in patient preferences and determine how improved statistical prediction of prostate cancer risk may impact patient and clinician decision-making.

Methods

We conducted a cross-sectional survey study. Consecutive men 45–75 years old presenting to a multispecialty urology clinic were invited to complete a survey at the time of registration. The inclusion age range was selected to represent a population of men who would be likely to have heard of prostate cancer as a condition and might be considering PSA testing for the purpose of early detection of prostate cancer. Men who had been presented with the survey at a prior visit during the study period were excluded. No identifying patient information was collected, and completed surveys were returned by respondents in sealed envelopes prior to departing the clinic.

Surveys contained two parts. Respondents were first presented with a summary of the details, risks, and benefits of transrectal ultrasound-guided prostate biopsy, which paralleled the information about prostate biopsy in a SDM format that would be presented to men during a clinic visit. The risks of biopsy and differences and distinguishing features between high- and low-grade prostate cancer were described. Participants were then asked to indicate the chance, or "risk threshold," of finding a higher-grade (i.e., Gleason score ≥ 7) prostate cancer on prostate biopsy that would motivate them to proceed. Responses were indicated on a matrix containing percentages from 1 to 50%, or respondents could write in a percentage if greater than 50.

The second part of the survey included demographic and medical background questions including education, job status, personal and family prostate cancer history, and prostate biopsy history including experience with complications, which were defined as pain, bleeding, or infection warranting hospital admission. Surveys that contained responses to at least 75% of the background questions (the final section of the survey) were considered complete, and the data were included in the analysis. The survey is available in Online Resource 1.

Data were compiled for descriptive analysis. Statistical comparisons of demographic characteristics and reported risk thresholds were performed using ANOVA, Mann–Whitney U test, and Fisher's exact test, and considered significant at $P < 0.05$.

The study was reviewed by our institutional review board and granted exempt status as minimal risk research.

Results

Of 194 men who were eligible and invited to participate, 103 completed the survey (53% response rate). Mean age was 61 years (interquartile range 56–66.5). 99 (96%) respondents had completed at least a high-school education. 70 (68%) respondents were employed; 39 (38%) reported an annual income of less than $50,000. 44 (43%) men reported a personal history of any cancer, including 18 (17%) who reported a prostate cancer diagnosis. 20 (19%) respondents reported a family history of prostate cancer, including seven (7%) cases of lethal prostate cancer. 31 (30%) of the men reported having undergone a prostate biopsy in the past, and 11 (11%) men had experienced a complication after the biopsy. The sample is summarized in Table 1.

The mean risk threshold for high-grade prostate cancer to proceed with prostate biopsy was 30%, and the median was 25% (range 1–100%, interquartile range 10–50%). Figure 1 shows the distribution of risk thresholds. Respondents' risk thresholds did not vary significantly by race, education, or employment (all $P > 0.05$). Thresholds were higher for men with lower income; men with an annual income less than $25,000 had a mean risk threshold of 46%, compared with a risk threshold of 28% in the $25,000–$50,000 group, 36% in the $50,000–$100,000 group, and 32% in the greater than $100,000 group ($P = 0.048$).

Men who reported a personal history of prostate biopsy or prostate cancer had significantly lower mean risk thresholds. The mean threshold for men who reported a prostate cancer diagnosis was 19% vs. 32% for men without prostate cancer ($P = 0.02$). Similarly, the mean risk threshold for men who had undergone prostate biopsy was 23% vs. 33% for men who had never had a biopsy ($P = 0.04$). Having a family history of prostate cancer, including lethal prostate cancer,

Table 1 Demographics and clinical history of the study sample

Characteristics	$N=103$	%
Mean age (range)	61 (47–75)	
Highest educational attainment		
Did not graduate high school	5	4.9
Graduated high school	48	46.6
Graduated college	26	25.2
Graduated graduate or professional school	24	23.3
Race		
White/Caucasian	97	94.2
Asian/Pacific Islander	2	1.9
Hispanic/Latino	1	1.0
African/African–American	0	0.0
Other	3	2.9
Employment status		
Employed	70	68.0
Not employed	4	3.9
Retired	28	27.2
Annual income, $1000s		
< $25	12	11.7
$25–50	27	26.2
$50–100	43	41.7
> $100	15	14.6
Personal history of cancer	44	42.7
Personal history of prostate cancer	18	17.5
Family history of prostate cancer	20	19.4
Family history of lethal prostate cancer	7	6.8
Ever had a prostate biopsy	31	30.1
Ever had complications after prostate biopsy	11	10.7

or a personal history of complications after biopsy did not significantly affect respondents' thresholds.

The sample was divided into quartiles based on a risk threshold of 10% at the 25th percentile and 50% at the 75th percentile. Comparing the lowest and highest quartiles, men who had the lowest thresholds for biopsy had significantly higher rates of personal history of prostate cancer (36% vs. 1%, $P=0.01$) and prior prostate biopsy (46% vs. 17%, $P<0.01$). No differences were found in the demographic variables between the groups, including age, education, employment, and income (all $P>0.05$).

Discussion

Patient-centered SDM can help men who are considering a prostate biopsy weigh the risks and benefits of the procedure and the information it may provide in the early management of prostate cancer. We report an exploratory survey study on the breadth of men's risk thresholds to proceed with biopsy. The results demonstrate a wide range of risk thresholds (Fig. 1), underscoring considerable variation in patient perspectives with regard to disease risk. The median risk threshold was 25%, which was considerably higher than expected, with a wide interquartile range (10–50%). Men's risk thresholds were not associated with educational attainment or employment status, but men who reported having undergone a prostate biopsy or diagnosed with prostate cancer indicated significantly lower risk thresholds. Among men in the lowest versus highest quartiles based on their

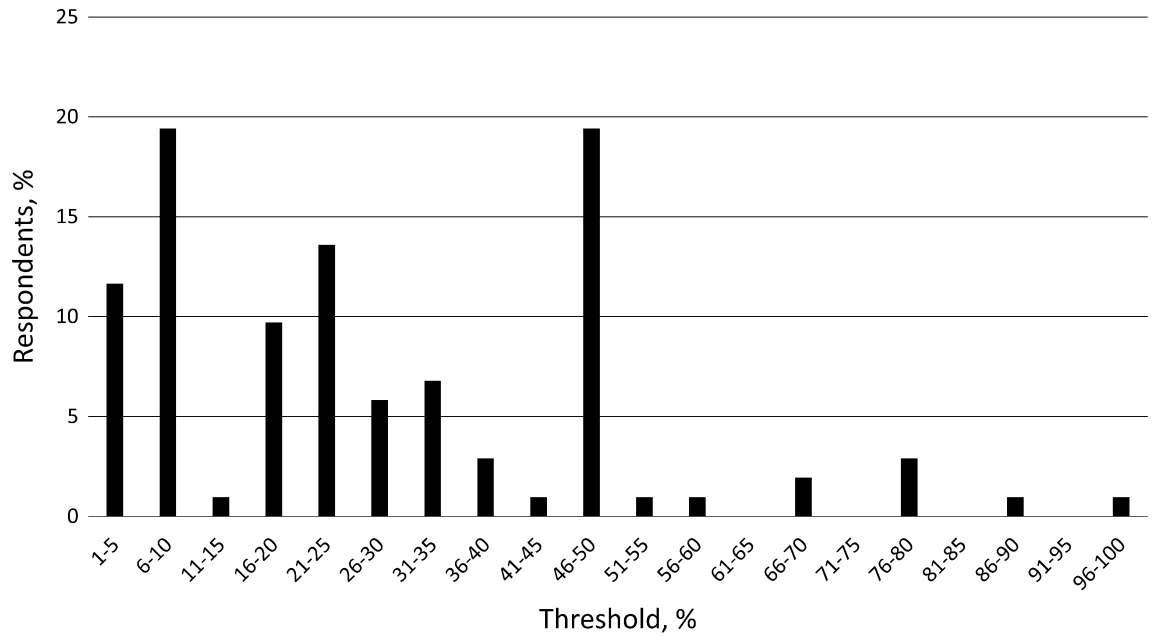

Fig. 1 Distribution of risk thresholds of high-grade prostate cancer to proceed with prostate biopsy

risk thresholds, those who indicated low risk thresholds had much higher rates of prior biopsy and personal prostate cancer without significant differences in age, education, or employment.

This is the first study to assess men's risk thresholds to proceed with prostate biopsy using the SDM format adopted by many multidisciplinary prostate cancer clinics, including ours. The study adds to our understanding of how men may contextualize concepts of risk and uncertainty when considering their preferences for biopsy. The breadth of men's preferences is consistent with prior work about the characteristics of an ideal diagnostic test for prostate cancer. In a survey study of a hypothetical non-invasive test that would be performed instead of a prostate biopsy, about two-thirds of patients and three-fourths of urologic oncologists would accept a false-negative rate of 5–20% to avoid the adverse effects of a biopsy, while one in four respondents indicated that a 99% negative predictive value would be required to accept the test [17]. Patients' thresholds to proceed with biopsy may also differ in consequential ways from their urologists'; in one series of men undergoing prostate biopsies, the urologists' threshold to recommend biopsy was primarily influenced by patient age and life expectancy, but not by a negative prior biopsy [18]. This is in contrast to the subgroup of patients in the present study who had undergone a prostate biopsy or had been diagnosed with prostate cancer; this group indicated significantly lower thresholds to proceed with biopsy, likely based on greater concern for cancer and prior deliberation about the risks and benefits of biopsy. Although the study sample was not exclusive to men presenting to the clinic for prostate cancer discussions, the group included middle-aged male urology patients for whom prostate cancer risk discussions were relevant, and the findings overall suggest a diversity of opinion for what constitutes "actionable" risk.

The results underscore the importance of individualized, patient-centered counseling rather than strict use of cut-offs to proceed with biopsy. Indeed, while historically PSA levels less than 4 ng/mL and greater than 4 ng/mL were considered "normal" and "abnormal", respectively, this view has been minimized in favor of an understanding of PSA as representing a continuum of risk, consistent with the spectrum of risk thresholds reported by the men in our study. Of note, while the four-kallikrein panel uses a cut-off of greater than 7% as an "abnormal" result, which is based on validation studies showing a very low risk of metastatic progression at 10 years under this threshold, the test also reports a numerical risk on a continuous scale that may be useful in decision-making [19].

Several limitations should be noted. First, participants were recruited from a general urology sample rather than patients specifically referred for prostate cancer risk discussions. The range of preferences and risk thresholds to proceed with biopsy may be different among patients who have previously been diagnosed with prostate cancer or have undergone biopsies. While the intention of this study was to assess general preferences in a male urological patient population, future studies might refine this question in a subpopulation of patients at higher risk or having greater concern for prostate cancer. While the limited sample size was thought to be adequate for this exploratory study, a larger sample may help to reduce the statistical "noise" of outliers and clarify whether there is less dispersion in patients' preferences. Second, we used a numerical matrix display to ascertain patients' risk thresholds. This is consistent with the style used in the PCPT nomogram [2]. We contemplated several visual approaches, such as a thermometer-style display on which participants would mark their preferences on a linear scale between 0 and 100. We selected the matrix display as the most visually comprehensible to patients while also concrete in terms of indicating a specific numerical threshold. Third, we used our multidisciplinary clinic SDM model and the PCPT nomogram to develop the survey instrument. Because the use and patterns of prostate imaging (e.g., multiparametric magnetic resonance imaging) for pre-biopsy risk stratification were not consistent or widespread at the time of the study, we did not include this variable in the survey; as pre-biopsy imaging rates increase, the impact on men's decision to proceed with biopsy will be important to study. Similarly, as recommendations for biopsy in biopsy-naïve men versus men with a prior negative biopsy continue to evolve, the influence of these recommendations on men's risk thresholds merit investigation. We also based the complications of TRUS biopsy that were discussed in the survey on the major complications included in the PCPT nomogram; some guidelines and studies have categorized less severe side effects, such as hematuria or epididymitis, as complications [20]. Finally, our population was racially homogeneous and generally highly educated (about half had at least a college degree), which reflects the population served by our institution. Whether diverse populations contemplate prostate cancer risk data differently merits further investigation. Similarly, the optimal practices for SDM in different racial, cultural, and socioeconomic groups should be clarified.

Despite the limitations of this exploratory work, the study has several important implications. The range of men's risk thresholds to proceed with biopsy suggests that shifting risk prediction through improved calibration of biomarkers may or may not significantly affect patients' decision-making. If a risk-stratifying test demonstrates risk at the extremes (e.g., 2% risk or 80% risk of aggressive cancer), these tests would be expected likely to drive decisions; on the other hand, moderate or marginal changes in risk within a probabilistic "gray zone" would likely be less helpful. While additional tests (e.g., Prostate Health Index) or biomarker assays may

enhance the predictive ability of conventional risk calculators for high-risk disease [21, 22] and purport to drive cost-savings due to deferred biopsy or surgery [23, 24], it is not yet clear whether, for example, the incorporation of the four-kallikrein panel in routine risk prediction algorithms impacts decisions compared to PCPT risk calculations to the point that patients' decisions for biopsy are significantly altered. Accounting for the wide variation in patient preferences and risk thresholds, it is important to individualize SDM counseling and candidly discuss and study how novel tools impact decision-making and outcomes.

The results underscore a continued need to engage patients and incorporate their preferences to achieve successful SDM. Prostate cancer SDM typically involves complex concepts surrounding risk and probability, such as data from large trials of PSA screening that are the basis of risk/benefit discussions. Prior work has suggested that men's ability to interpret and apply risk data are significantly influenced by their understanding of quantitative concepts, or numeracy, which may vary depending on demographic and socioeconomic factors [25]. Decision aids have been demonstrated to mitigate these gaps and increase overall knowledge to facilitate decision-making, particularly among vulnerable or medically underserved populations [26]. However, the successful implementation of decision aids in prostate cancer SDM appears to require a rigorous, comprehensive strategy involving personnel training and continuous process improvement goals, which have been suggested to underlie the observed changes in decision-making, rather than the decision aids themselves [27]. In addition, while clinicians often explain options, risks, and benefits in an SDM setting, the patient engagement aspect that is required for preference-driven decision-making may be lacking [28]. The individualization of risk prediction in prostate cancer may have other benefits, such as an increased perception of psychological control that can facilitate decisions [29]. Further study of men's risk thresholds and biopsy preferences will help to refine these engagement strategies and identify the patients whose decision-making would be most likely to benefit from the incorporation of newer risk prediction tools.

Conclusions

Men who are considering prostate biopsy report a wide range of high-grade prostate cancer risk thresholds to proceed with biopsy. Men with a prior history of prostate cancer or prostate biopsy indicate lower thresholds to proceed, which may reflect their greater concern for and exposure to this disease. The findings underscore the importance of individualized discussions about prostate cancer risk with men in an SDM setting. It remains unclear to what extent refined risk prediction tools will improve SDM or influence men's biopsy decisions; further study of risk thresholds in larger and more diverse populations may help to clarify patient perspectives.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional research committee and with the 1964 Helsinki declaration.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Carter HB, Albertsen PC, Barry MJ, Etzioni R, Freedland SJ, Greene KL et al (2013) Early detection of prostate cancer: AUA guideline. J Urol 190(2):419–426. https://doi.org/10.1016/j.juro.2013.04.119
2. Thompson IM Jr, Leach RJ, Ankerst DP (2014) Focusing PSA testing on detection of high-risk prostate cancers by incorporating patient preferences into decision making. JAMA 312(10):995–996. https://doi.org/10.1001/jama.2014.9680
3. Ankerst DP, Boeck A, Freedland SJ, Jones JS, Cronin AM, Roobol MJ et al (2014) Evaluating the prostate cancer prevention trial high grade prostate cancer risk calculator in ten international biopsy cohorts: results from the Prostate Biopsy Collaborative Group. World J Urol 32(1):185–191. https://doi.org/10.1007/s00345-012-0869-2
4. Benchikh A, Savage C, Cronin A, Salama G, Villers A, Lilja H et al (2010) A panel of kallikrein markers can predict outcome of prostate biopsy following clinical work-up: an independent validation study from the European Randomized Study of Prostate Cancer Screening, France. BMC Cancer 10:635. https://doi.org/10.1186/1471-2407-10-635
5. Gupta A, Roobol MJ, Savage CJ, Peltola M, Pettersson K, Scardino PT et al (2010) A four-kallikrein panel for the prediction of repeat prostate biopsy: data from the European Randomized Study of Prostate Cancer screening in Rotterdam, Netherlands. Br J Cancer 103(5):708–714. https://doi.org/10.1038/sj.bjc.6605815
6. Vickers A, Cronin A, Roobol M, Savage C, Peltola M, Pettersson K et al (2010) Reducing unnecessary biopsy during prostate cancer screening using a four-kallikrein panel: an independent replication. J Clin Oncol 28(15):2493–2498. https://doi.org/10.1200/JCO.2009.24.1968
7. Loeb S, Catalona WJ (2014) The Prostate Health Index: a new test for the detection of prostate cancer. Ther Adv Urol 6(2):74–77. https://doi.org/10.1177/1756287213513488
8. Nordstrom T, Vickers A, Assel M, Lilja H, Gronberg H, Eklund M (2015) Comparison between the four-kallikrein panel and prostate health index for predicting prostate cancer. Eur Urol 68(1):139–146. https://doi.org/10.1016/j.eururo.2014.08.010
9. Chiu PK, Roobol MJ, Teoh JY, Lee WM, Yip SY, Hou SM et al (2016) Prostate health index (PHI) and prostate-specific antigen (PSA) predictive models for prostate cancer in the Chinese population and the role of digital rectal examination-estimated prostate volume. Int Urol Nephrol 48(10):1631–1637. https://doi.org/10.1007/s11255-016-1350-8

10. Ng CF, Chiu PK, Lam NY, Lam HC, Lee KW, Hou SS (2014) The Prostate Health Index in predicting initial prostate biopsy outcomes in Asian men with prostate-specific antigen levels of 4–10 ng/mL. Int Urol Nephrol 46(4):711–717. https://doi.org/10.1007/s11255-013-0582-0
11. Alford AV, Brito JM, Yadav KK, Yadav SS, Tewari AK, Renzulli J (2017) The use of biomarkers in prostate cancer screening and treatment. Rev Urol 19(4):221–234. https://doi.org/10.3909/riu0772
12. Kornberg Z, Cooperberg MR, Spratt DE, Feng FY (2018) Genomic biomarkers in prostate cancer. Transl Androl Urol 7(3):459–471. https://doi.org/10.21037/tau.2018.06.02
13. Kearns JT, Lin DW (2018) Improving the specificity of PSA screening with serum and urine markers. Curr Urol Rep 19(10):80. https://doi.org/10.1007/s11934-018-0828-6
14. Eskra JN, Rabizadeh D, Pavlovich CP, Catalona WJ, Luo J (2019) Approaches to urinary detection of prostate cancer. Prostate Cancer Prostatic Dis. https://doi.org/10.1038/s41391-019-0127-4
15. Schmid M, Trinh QD, Graefen M, Fisch M, Chun FK, Hansen J (2014) The role of biomarkers in the assessment of prostate cancer risk prior to prostate biopsy: which markers matter and how should they be used? World J Urol 32(4):871–880. https://doi.org/10.1007/s00345-014-1317-2
16. Lee DJ, Mallin K, Graves AJ, Chang SS, Penson DF, Resnick MJ et al (2017) Recent changes in prostate cancer screening practices and epidemiology. J Urol 198(6):1230–1240. https://doi.org/10.1016/j.juro.2017.05.074
17. Sayyid RK, Dingar D, Fleshner K, Thorburn T, Diamond J, Yao E et al (2017) What false-negative rates of non-invasive testing are active surveillance patients and uro-oncologists willing to accept in order to avoid prostate biopsy? Can Urol Assoc J 11(3–4):118–122. https://doi.org/10.5489/cuaj.4182
18. Roumiguie M, Beauval JB, Bordier B, Filleron T, Rozet F, Ruffion A et al (2015) What risk of prostate cancer led urologist to recommend prostate biopsies? Prog Urol 25(16):1125–1131. https://doi.org/10.1016/j.purol.2015.08.007
19. Bioreference Laboratories (2017) 4Kscore results interpretation and test characteristics reference card. https://4kscore.com/4kscore-test-for-physicians/physicians-booklet/. Accessed 5 Feb 2019
20. Mottet N, van den Bergh RCN, Briers E, Cornford P, Santis MD, Fanti S et al (2019) EAU guidelines: prostate cancer. https://uroweb.org/guideline/prostate-cancer/#5. Accessed 3 Jun 2019
21. Foley RW, Maweni RM, Gorman L, Murphy K, Lundon DJ, Durkan G et al (2016) European Randomised Study of Screening for Prostate Cancer (ERSPC) risk calculators significantly outperform the Prostate Cancer Prevention Trial (PCPT) 2.0 in the prediction of prostate cancer: a multi-institutional study. BJU Int 118(5):706–713. https://doi.org/10.1111/bju.13437
22. Loeb S, Shin SS, Broyles DL, Wei JT, Sanda M, Klee G et al (2017) Prostate Health Index improves multivariable risk prediction of aggressive prostate cancer. BJU Int 120(1):61–68. https://doi.org/10.1111/bju.13676
23. Dijkstra S, Govers TM, Hendriks RJ, Schalken JA, Van Criekinge W, Van Neste L et al (2017) Cost-effectiveness of a new urinary biomarker-based risk score compared to standard of care in prostate cancer diagnostics—a decision analytical model. BJU Int 120(5):659–665. https://doi.org/10.1111/bju.13861
24. Voigt JD, Dong Y, Linder V, Zappala S (2017) Use of the 4Kscore test to predict the risk of aggressive prostate cancer prior to prostate biopsy: overall cost savings and improved quality of care to the us healthcare system. Rev Urol 19(1):1–10
25. Koo K, Brackett CD, Eisenberg EH, Kieffer KA, Hyams ES (2017) Impact of numeracy on understanding of prostate cancer risk reduction in PSA screening. PLoS One 12(12):e0190357. https://doi.org/10.1371/journal.pone.0190357
26. Gokce MI, Wang X, Frost J, Roberson P, Volk RJ, Brooks D et al (2017) Informed decision making before prostate-specific antigen screening: initial results using the American Cancer Society (ACS) Decision Aid (DA) among medically underserved men. Cancer 123(4):583–591. https://doi.org/10.1002/cncr.30367
27. Arterburn D, Wellman R, Westbrook EO, Ross TR, McCulloch D, Handley M et al (2015) Decision aids for benign prostatic hyperplasia and prostate cancer. Am J Manag Care 21(2):e130–e140
28. Holmes-Rovner M, Montgomery JS, Rovner DR, Scherer LD, Whitfield J, Kahn VC et al (2015) Informed decision making: assessment of the quality of physician communication about prostate cancer diagnosis and treatment. Med Decis Making 35(8):999–1009. https://doi.org/10.1177/0272989X15597226
29. Huntley JH, Coley RY, Carter HB, Radhakrishnan A, Krakow M, Pollack CE (2018) Clinical evaluation of an individualized risk prediction tool for men on active surveillance for prostate cancer. Urology 121:118–124. https://doi.org/10.1016/j.urology.2018.08.021