

# BMJ Open Values and preferences of men for undergoing prostate-specific antigen screening for prostate cancer: a systematic review

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## ABSTRACT

**Objectives** To investigate men's values and preferences regarding prostate-specific antigen (PSA)-based screening for prostate cancer.

**Design** Systematic review.

**Data sources** We searched MEDLINE, EMBASE, PsycINFO and grey literature up to 2 September 2017.

**Eligibility criteria** Primary studies of men's values and preferences regarding the benefits and harms of PSA screening.

**Data extraction and synthesis** Two independent reviewers extracted data and assessed risk of bias with a modified version of a risk of bias tool for values and preferences studies, the International Patient Decision Aid Standards instrument V.3 and the Cochrane Collaboration risk of bias tool.

**Results** We identified 4172 unique citations, of which 11 studies proved eligible. Five studies investigated PSA screening using a direct choice study design, whereas six used decision aids displaying patient-important outcomes. The direct choice studies used different methodologies and varied considerably in the reporting of outcomes. Two studies suggested that men were willing to forego screening with a small benefit in prostate cancer mortality if it would decrease the likelihood of unnecessary treatment or biopsies. In contrast, one study reported that men were willing to accept a substantial overdiagnosis to reduce their risk of prostate cancer mortality. Among the six studies involving decision aids, willingness to undergo screening varied substantially from 37% when displaying a hypothetical reduction in mortality of 10 per 1000 men, to 44% when displaying a reduction in mortality of 7 per 1000. We found no studies that specifically investigated whether values and preferences differed among men with family history, of African descent or with lower socioeconomic levels.

**Conclusion** The variability of men's values and preferences reflect that the decision to screen is highly preference sensitive. Our review highlights the need for shared decision making in men considering prostate cancer screening.

**Trial registration number** CRD42018095585.

## Strengths and limitations of this study

- We systematically searched for and assessed the quantitative values and preferences related to benefits and harms of prostate-specific antigen (PSA) screening among men considering screening, to inform a linked BMJ Rapid Recommendations guideline.
- We used rigorous systematic review methodology, and a guideline panel of frontline clinicians, methodologists and patient partners identified patient-important outcomes related to PSA screening.
- We did not identify studies that explicitly asked men about the thresholds of benefits and harms related to PSA screening that would be important to them.
- Most studies included several characteristics of screening options (eg, costs and time intervals), which might influence the willingness to undergo screening more than potential benefits and harms.
- A meta-analysis was not possible, thus we reported a narrative summary of the included studies.

## INTRODUCTION

Population prostate-specific antigen (PSA)-based screening for prostate cancer remains controversial. Although PSA screening leads to increased incidence of prostate cancer, it results at best in a small absolute reduction in disease-specific mortality (1 fewer deaths per 1000 men over 10 years).<sup>1</sup> It is unclear whether the overall benefits of screening outweigh the potential harms and burden resulting from the cascade of diagnostic imaging and biopsies (eg, bleeding, pain, infections and hospital readmissions), as well as complications from subsequent prostate cancer treatment (eg, urinary incontinence, erectile dysfunction or bowel-related complaints).<sup>1</sup> This uncertainty is reflected by a lack of consensus across international guidelines,<sup>2-7</sup> as well as the important variability of the screening practices worldwide.<sup>8-14</sup>

## Box 1 Linked articles in this BMJ Rapid Recommendation cluster

- ▶ Tikkinen KAO, Dahm P, Lytvyn L, *et al*. Prostate cancer screening with prostate-specific antigen (PSA) test: a clinical practice guideline. *BMJ* 2018;362:k3581. doi:10.1136/bmj.k3581.<sup>2</sup>
- ▶ Summary of the results from the Rapid Recommendation process
- ▶ Ilic D, Djulbegovic M, Jung JH, *et al*. Prostate cancer screening with prostate-specific antigen (PSA) test: a systematic review and meta-analysis. *BMJ* 2018;362:k3519. doi:10.1136/bmj.k3519.<sup>1</sup>
- ▶ Systematic review and meta-analysis of all available randomised trials that assessed PSA based screening for prostate cancer.
- ▶ Vernooij RWM, Lytvyn L, Pardo-Hernandez H, *et al*. Values and preferences of men for undergoing prostate-specific antigen screening for prostate cancer: a systematic review. *BMJ Open* 2018.
- ▶ MAGICapp (<https://app.magicapp.org/public/guideline/n32gkL>).
- ▶ Expanded version of the results with multilayered recommendations, evidence summaries, and decision aids for use on all devices.

Because prostate cancer will often—although not always—remain indolent, and result in substantial overdiagnosis and overtreatment, the decision to undergo PSA screening is highly preference-sensitive. Men who place a high value in avoiding complications from biopsies and subsequent treatment may be more likely to decline screening, whereas men who place a higher value in even a small reduction of prostate cancer, as well as those who are more concerned to rule out the diagnosis, are likely to choose screening.<sup>2</sup> Decision aids may facilitate understanding of the benefits and harms of alternative choices in decision making, and help men to make a decision in line with their own values and preferences.<sup>15 16</sup>

A large cluster randomised trial of PSA testing conducted among 419 582 British men in general practices triggered a BMJ Rapid Recommendation (RapidRec) guideline<sup>2 17</sup>—a series of trustworthy recommendations published in response to potentially practice-changing evidence.<sup>18</sup> An international panel appraised the whole body of evidence in an updated systematic review of the benefits and harms of PSA screening for prostate cancer,<sup>1</sup> and issued a recommendation<sup>2</sup> (box 1). Men's preferences about undergoing screening, when presented with information about the potential benefits and harms, remains unclear. To inform the RapidRec guideline work, we conducted this systematic review to examine men's values and preferences regarding prostate cancer screening.

## METHODS

The study protocol was registered in the International Prospective Register of Systematic Reviews: CRD42018095585. We followed the Meta-analysis of Observational Studies in Epidemiology (MOOSE) reporting guidelines for this article (see online supplementary appendix I).

## Eligibility criteria

We included studies that reported men's stated preference to screen or not to screen, based on their values and

preferences concerning PSA screening patient-important benefits and harms, as defined by the BMJ RapidRecs guideline panel.<sup>2</sup> Additionally, we examined the stated intention to undergo screening based on information regarding the patient-important outcomes presented in decision aids. We excluded: (1) analyses of data that were not reported by patients (eg, databases of health records) or on outcomes outside the perspective of men considering prostate cancer screening; (2) studies reporting only outcome prioritisation, time trade off, health state values or willingness to pay; (3) studies reporting only access to screening; (4) studies on knowledge or awareness about screening; (5) cost-effectiveness studies; (6) qualitative studies; (7) case report and case series and (8) studies published in a language other than English.

## Search strategy

We searched MEDLINE, EMBASE and PsycINFO from 1980 to 2 September 2017, using a combination of keywords and MeSH/EMTREE terms related to prostate cancer and cancer screening, and applied a search filter for patient's values and preferences<sup>19</sup> (see online supplementary appendix II). Additionally, we searched the conference abstracts from the annual meetings of the European Association of Urology and American Urological Association from 2007 to 2017. We also searched through Google for 'prostate cancer screening' and 'values and preferences', reviewing the first five pages of results. References of the included studies were screened to identify other potentially eligible studies.

## Study selection and quality assessment

We screened titles and abstracts, as well as full-text screening, independently and in duplicate by paired reviewers (RV, LL, HP, CC, LA, KC). Disagreements were resolved by consensus or consultation with a third reviewer (TA). The risk of bias was assessed independently and in duplicate. For studies that reported men's stated preferences about prostate cancer screening (eg, discrete choice experiments), we used a risk of bias tool developed specifically for values and preferences studies.<sup>20</sup> For studies that investigated the effect of decision aids on men's intentions to undergo screening, we used two instruments, similar to a recent study of decision aids for prostate cancer screening.<sup>21</sup> First, we assessed the risk of bias using a modified version of the Cochrane Collaboration risk of bias tool addressing randomisation sequence generation, concealment, blinding of data collectors, blinding of data analysts and missing data—separately for each outcome. For each criterion, studies were judged to be at either high, unclear or low risk of bias. Additionally, we evaluated the decision aids using a modified version of the International Patient Decision Aid Standards instrument V.3 for screening.<sup>22</sup> We rated each criterion as met or not met. The full risk of bias assessments can be found in the online supplementary appendix III.

## Data collection and presentation

Two reviewers extracted the data from the included studies, independently and in duplicate, using a standardised form, including: first author, publication year, study design (eg, discrete choice experiment, decision aids study), setting, number of participants, participant's demographics (eg, age, previous screening, prostate cancer family history). For decision-aids studies, we reported the intention to screen after exposure to the decision aids. Due to the heterogeneity of the data, we summarised the study results in a narrative format.

## BMJ Rapid Recommendations and patient involvement

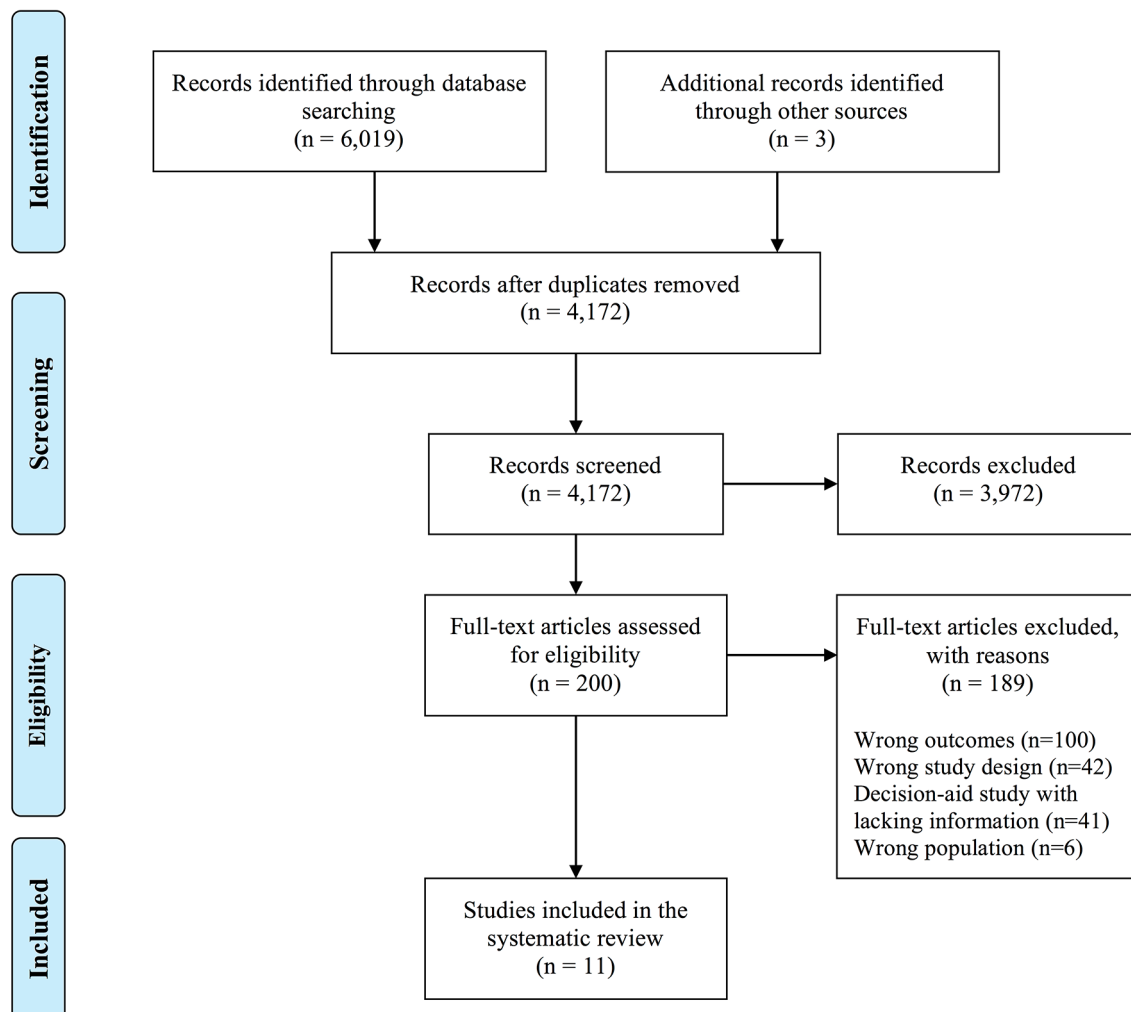
A panel of clinicians, including urologists, family doctors, methodologists and men considering screening, were responsible for creating rapid and trustworthy recommendations.<sup>1,2</sup> Three men eligible for PSA screening were members of the guideline panel that informed the protocol for this review, and received personal training and support to optimise contributions throughout the guideline development process. These panel members identified and prioritised patient-important outcomes, and led the discussion on values and preferences. The guideline panel defined

the population and all patient-important outcomes of interest, as well as practical issues related to PSA screening. To provide the guideline panel with the best available evidence, a linked systematic review was conducted that summarised outcomes related to the benefits and harms of PSA screening.<sup>1</sup> The BMJ RapidRec panel developed recommendations using the Grading of Recommendations, Assessment, Development and Evaluation framework, and considered both the evidence from the systematic review on the effectiveness and safety of PSA screening, and the evidence from this review on men's values and preferences.<sup>23</sup> Finally, the results of the two reviews and the panel deliberations were used to inform the online consultation decision aids generated from the evidence summary supporting this BMJ RapidRec,<sup>2</sup> available online through the MAGICapp ([www.magicapp.org](http://www.magicapp.org)).

## RESULTS

### Study characteristics

We identified 4172 unique citations, of which 200 proceeded to full-text review (see online supplementary appendix IV for the reasons of exclusion). Eleven



**Figure 1** Flow chart of the search strategy and evidence selection of the included studies.

**Table 1** Characteristics of the included studies

Study	Design	Country	Years of data collection	Number of participants	Age (mean, SD)	Previous PSA screening	Family history of prostate cancer
Studies reporting direct choice related to PSA screening acceptability							
Cantor <i>et al</i> <sup>24</sup>	DCE	USA	1997–1998	168	56 (NR)	Ever=50% Unsure=14%	17% have relative with prostate cancer
de Bekker-Grob <i>et al</i> <sup>25</sup>	DCE	The Netherlands	2013	1000	63.3 (5.2)	NR	51% know someone with prostate cancer
Howard <i>et al</i> <sup>26</sup> and Pignone <i>et al</i> <sup>29</sup>	DCE	Australia and USA	2011	911	59.8 (5.6)	Ever=20.9% Within past year=42%	0%
Howard <i>et al</i> <sup>27</sup>	DCE	USA	NR	662	55 (9)	Ever=44.6% Within past year=28.1%	0%
van den Bruel <i>et al</i> <sup>28</sup>	DCE	UK	2014	490	46.9 (range: 19–87)	Ever=53.8%	NR
Studies of decision aids reporting men's willingness to undergo PSA screening							
Gattellari and Ward <sup>30</sup>	RCT	Australia	NR	258	54 (8.55)	NR	NR
Petrova <i>et al</i> <sup>31</sup>	RCT	USA	NR	256	36 (13)	Ever=18%	27% had a friend or a relative diagnosed with prostate cancer
Sheridan <i>et al</i> <sup>32</sup>	RCT	USA	NR	188	60 (9)	Ever=70%	20% had any family history
Sheridan <i>et al</i> <sup>33</sup>	RCT	USA	NR	775	NR	Ever=80%	NR
Taylor <i>et al</i> <sup>34</sup>	RCT	USA	2007–2011	1893	56.9 (6.8)	Ever=86.3% Within past year=59.3%	23% had family history
Wilt <i>et al</i> <sup>35</sup>	RCT	USA	1998	342	72.8 (8.4)	Within past year=31%	14%

DCE, discrete choice experiment; NR, not reported; PSA, prostate-specific antigen; RCT, randomised controlled trial.

studies were ultimately eligible for our review (figure 1). Of the included studies, five investigated men's stated preferences regarding prostate cancer screening,<sup>24–28</sup> and six investigated men's willingness to undergo screening when presented with a decision aid.<sup>29–34</sup>

The studies were all conducted in high-income countries: Australia (1), The Netherlands (1), the UK (1), the USA (7) and both the USA and Australia (1) (table 1). The proportion of men who had previously undergone prostate cancer screening prior to study participation varied from 0% to 80% across studies. Similarly, the proportion of men with prostate cancer family history varied from 0% to 27%. In one study, 51% of the included men reported to know someone that had prostate cancer without any further definition.<sup>25</sup> Of the studies that reported their funding source (82%), all were sponsored by public grant institutions. About half of the studies (55%) stated

that the authors did not have any relevant conflicts of interest, and the other studies did not report about authors' conflicts of interest.

### Study quality

Most stated preference studies were of moderate to high risk of bias, usually due to limitations in the attrition and data analysis domains (table 2). One study included participants from the general population<sup>25</sup>; however, the other studies mainly referred to outpatients or research panel participants. However, most of the studies did not report enough information to assess the attrition bias, only de Bekker-Grob *et al.*<sup>25</sup> reported the survey response rate (46%).<sup>25</sup> Only one study was considered at low risk of bias in the measurement instrument subdomain.<sup>26</sup> In this study, the authors adequately used an instrument for electing the relative importance of valid and reliable outcomes, administered the instrument in the intended

**Table 2** Risk of bias of the included studies that investigated the direct choice regarding the values and preferences of men related to PSA screening

Domain	Subdomain 2: completeness of data				Subdomain 3: measurement instrument	Subdomain 4: measurement accuracy	Subdomain 5: data analysis
	Subdomain 1: sample selection	Was the attrition sufficiently low to minimise the risk of bias?	Was the instrument used for eliciting relative importance of outcomes valid and reliable?	Was the instrument administered in the intended way?			
Cantor <i>et al</i> <sup>24</sup>	Probably yes	Unclear	Probably no	Probably yes	Probably yes	The investigators did not formally test the understanding, but there was evidence suggesting adequate understanding.	Probably no
de Bekker-Grob <i>et al</i> <sup>25</sup>	Yes	Probably no	Yes	Yes	Probably yes	The investigators did not formally test the understanding, but there was evidence suggesting adequate understanding.	Probably no
Howard <i>et al</i> <sup>26</sup> and Pignone <i>et al</i> <sup>29</sup>	Probably yes	Unclear	Yes	Yes	Yes	The investigators did not formally test the understanding, but there was evidence suggesting adequate understanding.	Probably no
Howard <i>et al</i> <sup>27</sup>	Probably yes	Unclear	Yes	Probably yes	Yes	The investigators did not formally test the understanding, but there was evidence suggesting adequate understanding.	Yes
van den Bruel <i>et al</i> <sup>28</sup>	Yes	Unclear	Probably yes	Probably yes	Yes	The investigators did not formally test the understanding, but there was evidence suggesting adequate understanding.	Probably no

way and used a valid representation of the outcome. None of the studies formally tested the understanding of the used instruments.

The decision-aids studies were mostly of low to moderate risk of bias; however, there were several methodological limitations (see online supplementary appendix V). One study applied adequate random sequence generation and allocation concealment.<sup>33</sup> Due to the nature of the intervention, most patients were aware of the allocated intervention. Moreover, blinding procedures for the outcome collector or analysts were not reported; however, risk of bias for random allocation or blinding was not considered important for this review since we are interested solely in the results after exposure. Four studies described the amount of missing data.<sup>29 32–34</sup> Furthermore, most studies described the aim of screening, but only two (33%) decision-aids studies included information about the rates of diagnostic test accuracy. Similarly, less than half of the decision aids in the included studies described the next steps in the patient's pathway after obtaining the screening result (positive or negative).

### Stated preferences related to PSA screening

In total, there were five studies on men's stated preferences related to prostate cancer screening, all of which were discrete choice experiments.<sup>24–29</sup> One study included a discrete choice experiment, as well as a balance sheet task (unlabelled descriptions of the options).<sup>26 29</sup> Although studies displayed estimates on patient-important benefits (risk reduction of prostate cancer-specific mortality) and harms (eg, increased unnecessary biopsies, unnecessary treatment, risk of incontinence and bowel problems and risk of impotence), the objectives of the studies differed and the outcomes reported were heterogeneous. A meta-analysis was therefore not possible, and we summarised the evidence narratively (table 3).

The study by de Bekker-Grob *et al*<sup>25</sup> investigated how much men are willing to forego screening, if it involved a small benefit in prostate cancer mortality, in order to decrease the likelihood of unnecessary biopsies, unnecessary treatments and more frequent screening.<sup>25</sup> For example, participating men were willing to trade a 2.0% (95% CI 1.6 to 2.4) and 1.8% (95% CI 1.3 to 2.3) decrease in mortality risk reduction, for a 10% decrease in unnecessary treatment risk and unnecessary biopsy risk, respectively.

In the study by Howard *et al*, participating men were asked how many extra men who would experience unnecessary biopsies or incontinence and bowel problems were acceptable in order to avoid one prostate cancer death.<sup>27</sup> These results are stratified by age, and were markedly different between the age categories. Men aged 50–59 years were willing to accept 233 in 10000 (95% CI 224 to 242) extra men with unnecessary biopsies to avoid one prostate cancer death in 10000 men screened, whereas both younger (aged 40–49 years) and older (aged 60–69 years) men accepted fewer unnecessary biopsies. Similarly, men aged 50–59 years were willing to accept 72 in 10000 (95% CI 69 to 75) extra men with incontinence or bowel problem to avoid

one prostate cancer death in 10000 men screened, but this was lower in both younger and older men.<sup>27</sup>

In the study by van den Bruel *et al*,<sup>28</sup> the authors examined the number of cases of overdiagnosis that the men were willing to accept for a reduction in cancer-specific mortality.<sup>28</sup> To reduce the prostate cancer mortality by 10% and 50%, the participating men were willing to accept 126 (95% CI 100 to 150) and 231 (95% CI 200 to 250) cases of overdiagnosis in 1000 people screened, respectively. The authors concluded that there was variability in the acceptability of overdiagnosis in cancer screening.

Finally, in the study reported by Pignone *et al*<sup>29</sup> and Howard *et al*,<sup>26</sup> the chances of prostate cancer diagnosis, prostate cancer mortality, biopsies and developing impotence or incontinence as a result of screening were included, and men were asked about their willingness to undergo screening using three different values elicitation techniques.<sup>26</sup> The proportion of men who wanted to undergo PSA screening compared with no screening ranged from 20% to 44%.

### Studies of decision aids and men's intentions to undergo screening

In total, we identified six studies in which decision aids displaying screening-related patient-important outcomes (eg, prostate cancer diagnosis, prostate cancer mortality risk, unnecessary biopsy risk) were presented to men, and asking for their willingness to get screened.<sup>30–35</sup> The decision aids presented information in different ways, which resulted in considerable heterogeneity in how outcomes were reported (table 4).

The study by Gattellari *et al*,<sup>30</sup> presented a prostate cancer diagnosis in 10% of the men aged up to 75 years, whereas Sheridan *et al*<sup>32</sup> presented a prostate cancer diagnosis of 5% of men aged 50 years and 25% of men aged 70 years.<sup>30 32</sup> Furthermore, Taylor *et al*<sup>34</sup> used a prostate cancer diagnosis of 16% of all men, and Wilt *et al*<sup>35</sup> presented that 10% of all men get prostate cancer.<sup>34 35</sup> Although variability in the presentation of the outcome prostate cancer mortality was identified, the quantitative effect estimates were comparable, since all studies report a prostate cancer mortality of around 1%–3%. Finally, two studies included quantitative information on the effect of unnecessary biopsies and treatment. This includes a proportion of 30% of the men that experience serious infection due to biopsies,<sup>33</sup> and a larger variability on the unnecessary treatment information, from 30% sexual and urinary problems due to treatment to 2% unnecessary treatments.<sup>31 33</sup>

## DISCUSSION

### Principal findings

We have conducted the first systematic review of values and preferences of men from the general population related to their willingness to undergo prostate cancer screening. Overall, there was considerable heterogeneity across men's values and preferences regarding the important benefits and harms related to prostate cancer screening. Several,

**Table 3** Results of the studies reporting direct choice related to PSA screening acceptability

Study	Outcome/presentation	Results
Cantor <i>et al</i> <sup>24</sup>	Preference for PSA screening or no screening, based on individualised decision-analytic model.	<ul style="list-style-type: none"> <li>▶ 28.6% of men preferred screening to no screening.</li> <li>▶ 34.5% of couples (men and their wives) preferred screening to no screening.</li> </ul>
de Bekker-Grob <i>et al</i> <sup>25</sup>	Willingness to trade per cent decrease in screening-related mortality risk reduction (from 3.5% to 3.2%, 10% RRR; 2.8%, 20% RRR; 2.5%, 30% RRR; 1.8%, 50% RRR), per cent decrease in burden from unnecessary biopsies (20%, 40%, 60%, 80%) and unnecessary treatments (0%, 20%, 50%, 80%).	<ul style="list-style-type: none"> <li>▶ 2.0% decrease in screening-related mortality risk reduction (95% CI 1.6 to 2.4) for 10% less risk of unnecessary treatment.</li> <li>▶ 1.8% decrease in screening-related mortality risk reduction (95% CI 1.3 to 2.3) for 10% less risk of unnecessary biopsies.</li> </ul>
Howard <i>et al</i> <sup>26</sup> and Pignone <i>et al</i> <sup>29</sup>	Preference for a PSA screening option compared with a no screening option, based on a discrete choice experiment*, and balance sheet task (unlabelled description of benefits and harms)†, over 10 years.	<ul style="list-style-type: none"> <li>▶ Balance sheet: 43.7% prefer the PSA screening option.</li> <li>▶ Discrete choice experiment: 20.2% prefer the PSA screening option.</li> </ul>
Howard <i>et al</i> <sup>27</sup>	Preference for the number of men who would experience screening-related harms (unnecessary biopsies, incontinence/bowel problems) to avoid one prostate cancer death in 10 000 men screened.	<p><b>Men aged 40–49 years:</b></p> <ul style="list-style-type: none"> <li>▶ 65 in 10 000 (95% CI 59 to 70) extra men with unnecessary biopsies.</li> <li>▶ 31 in 10 000 (95% CI 28 to 34) extra men with incontinence/bowel problems.</li> </ul> <p><b>Men aged 50–59 years:</b></p> <ul style="list-style-type: none"> <li>▶ 233 in 10 000 (95% CI 224 to 242) extra men with unnecessary biopsies.</li> <li>▶ 72 in 10 000 (95% CI 69 to 75) extra men with incontinence/bowel problems.</li> </ul> <p><b>Men aged 60–69 years:</b></p> <ul style="list-style-type: none"> <li>▶ 153 in 10 000 (95% CI 149 to 158) extra men with unnecessary biopsies.</li> <li>▶ 54 in 10 000 (95% CI 52 to 55) extra men with incontinence/bowel problems.</li> </ul>
van den Bruel <i>et al</i> <sup>28</sup>	Willingness to accept overdetected to trade off reduction in prostate cancer-specific mortality.	<p>10% prostate cancer-specific reduction in mortality, 126 cases (95% CI 100 to 150) of overdetected per 1000 people screened:</p> <ul style="list-style-type: none"> <li>▶ 5.5% (95% CI 3.7 to 7.9) accepts no overdetected at all.</li> <li>▶ 7.1% (95% CI 5.0 to 9.8) accepts overdetected in the complete population</li> </ul> <p>50% prostate cancer-specific reduction in mortality, 231 cases (95% CI 200 to 250) of overdetected per 1000 people screened:</p> <ul style="list-style-type: none"> <li>▶ 4.5% (95% CI 2.8 to 6.7) accepts no overdetected at all.</li> <li>▶ 9.2% (95% CI 6.8 to 12.1) accepts overdetected in the complete population.</li> </ul>

\*Discrete choice experiment, levels of attributes, over 10 years: chance of prostate cancer diagnosis 40 in 1000, 60 in 1000 or 80 in 1000 with screening, vs 40 in 1000 with no screening; chance of dying from prostate cancer 2 in 1000, 3 in 1000 or 4 in 1000 with screening, vs 4 in 1000 with no screening; chance of having a prostate biopsy as a result of screening 0 in 1000, 240 in 1000 or 330 in 1000 with screening, vs 0 in 1000 with no screening; chance of becoming impotent or incontinent as a result of screening 0 in 1000, 10 in 1000 or 20 in 1000 with screening, vs 0 in 1000 with no screening.

†Balance sheet task, features of options, over 10 years: chance of prostate cancer diagnosis for 40 out of 1000 men with no screening, vs 80 out of 1000 men with screening; chance of dying from prostate cancer for 4 out of 1000 men with no screening, vs 3 out of 1000 men with screening; chance of having a prostate biopsy as a result of screening for 0 out of 1000 men with no screening, vs 240 out of 1000 men with screening; chance of becoming impotent or incontinent as a result of screening for 0 out of 1000 men with no screening, vs 20 out of 1000 men with screening.

— PSA, prostate-specific antigen; RRR, relative risk reduction.

but not all, studies reported that many men among the general population were willing to accept considerable risk of harm such as unnecessary biopsies, risk of impotence and risk of incontinence, in order to achieve a small

reduction in their risk of prostate cancer mortality. It is unclear, however, how much of the variability in preferences was due to the differences in study methodology and reporting.

**Table 4** Results of the studies that examined the effect of a decision aid on the men's motivation for undergoing PSA screening

Study	Patient-important outcomes presented in the decision aid	Results (men who got randomised to the decision-aid arm, unless otherwise stated)
Gattellari <i>et al</i> <sup>30</sup>	Prostate cancer diagnosis: 10% up to age 75 years. Prostate cancer mortality: 1 out of 100 men will die from prostate cancer.	Interest in having PSA test in the upcoming 12 months: ▶ Definitely: 26% (95% CI 18 to 35) ▶ Quite a lot: 11% (95% CI 6 to 11) ▶ Somewhat: 19% (95% CI 12 to 27) ▶ A little: 25% (95% CI 16 to 33) ▶ Definitely not interested 23% (95% CI 15 to 31)
Petrova <i>et al</i> <sup>31</sup>	Prostate cancer mortality: 7 of 1000 men who participated in screening and 7 of 1000 men who did NOT participate in screening. Unnecessary treatment: 20 of 1000 men who participated in screening and 0 of 1000 men who did NOT participate in screening.	▶ Intended to participate in screening: 44%. ▶ Intended to not participate in screening: 37%.
Sheridan <i>et al</i> <sup>32</sup>	Prostate cancer diagnosis: 5 out of every 100 men who are aged 50 years have prostate cancer, whereas 25 out of every 100 men aged 70 years have prostate cancer. Prostate cancer mortality: 3 of every 100 men die from prostate cancer.	▶ Interested in screening: 78%*
Sheridan <i>et al</i> <sup>33</sup>	Prostate cancer mortality: ▶ Without screening over 10 years: 4 out of 1000 men. ▶ With screening over 10 years: 3 out of 1000 men. ▶ Benefits of screening over 10 years: fewer death in 1 out of 1000 men. Unnecessary biopsies: moderate-to-serious infection or bleeding due to biopsies in 300 out of 1000 men. Unnecessary treatment: sex and urine problems due to treatment: 300 out of 1000 men.	Intent to accept screening, presented as a range of 1–5 (high scores indicate stronger intention to accept screening): ▶ Decision aid with a focus on the number presentation: 3.63 (SD: 1.15). ▶ Decision aid with a focus on the narrative presentation: 3.53 (SD: 1.24). ▶ Decision aid with a focus on the numbers and frame: 3.88 (SD: 1.06).
Taylor <i>et al</i> <sup>34</sup>	Prostate cancer diagnosis: about 1 of every 6 (16%) men will be diagnosed with prostate cancer. Prostate cancer mortality: about 1 out of every 33 (3%) men will die from prostate cancer.	Self-reported screening at 13 months: ▶ PSA screening: 45.3%. ▶ DRE screening: 46.8%. ▶ Combined PSA+DRE screening: 59.5%.
Wilt <i>et al</i> <sup>35</sup>	Prostate cancer diagnosis: 10% of the men get prostate cancer. Prostate cancer mortality: 70%–80% who have prostate cancer do not die from it.	▶ 31% received a PSA test in the year after.

\*All study participants (not randomised trial).

DRE, digital rectal examination; PSA, prostate-specific antigen.

### Context in relation to previous research

Patients' values and preferences encompass perspectives, priorities, beliefs, expectations, values and goals for health and life when considering the potential benefits, harms, costs and inconveniences of management options available.<sup>36</sup> To inform the RapidRecs guideline,<sup>2</sup> we limited our scope to quantitative data on thresholds related to benefits and harms, which was deemed the most important information for the panel's decision making. There is currently no formal guidance for conducting systematic reviews of patients' values and preferences to inform decision makers.<sup>37 38</sup> Clinical practice guidelines have used values and preferences studies to inform outcome importance, such as measures of health state utilities as well as non-utilities (eg, questionnaires, qualitative studies).<sup>20 39</sup>

In addition, qualitative research on values and preferences in particular have been used for contextualising guidelines with regard to feasibility and acceptability of interventions, and identifying barriers and facilitators to implementation of recommendations.<sup>40</sup>

A recent qualitative review on men's perspectives of prostate cancer screening identified five themes that influence men's choices about screening: social prompting, gaining decisional confidence, preserving masculinity, avoiding the unknown and uncertainties and prohibitive costs.<sup>41</sup> The review did not discuss the degree of benefits and harms considered important nor report on heterogeneity across individuals' perceptions; however, the authors highlighted the 'complex decisional matrix' of deciding whether to be screened. Another systematic



review summarised studies eliciting preferences about screening test attributes and healthcare delivery attributes regarding various cancer screening (prostate, colon, breast).<sup>42</sup> Efficacy, process and cost were significant determinants of choice, whereas healthcare delivery attributes had mixed effects. The magnitude of effects deemed important, however, was not reported.

### Unanswered questions and future research

The RapidRecs guideline panel identified several subgroups of men who might express different distribution values and preferences regarding prostate cancer screening. These included men with family history, men of African descent, men with a lower socioeconomic status and men that previously had screening or biopsies.<sup>1 2</sup> However, none of the studies that met our eligibility criteria investigated whether the men's values and preferences differed across subgroups. Identifying whether there are differences among men in these subgroups regarding their judgements of benefits and harms would be important to assess the need for specific recommendations.

There is considerable variability in the design and reporting of values and preferences studies, which are often not amenable for producing absolute estimates of effect regarding benefits and harms that would be helpful for decision making. More standardised reporting would ensure that decision makers are able to use data from values and preferences research. Additionally, in this systematic review we focused on the values and preferences that can be used to inform the magnitude of effect in terms of patient-important outcomes that men would consider important to undergo screening. Potentially other values and preferences outcomes, including those derived from utilities and qualitative studies, could provide additional insights.

Many factors probably play a role in what shapes individual decisions, and some of these factors could relate to incentives from others: family members, coworkers, media as well as recommendations from healthcare providers. A challenge of the research in this field is to disentangle men's true values and preferences from responses to such incentives. Potential avenues of research may include the mapping of screening rates, and their evolution in parallel to recommendation of screening campaigns across countries. Such research may, however, be limited in its conclusion because of the paucity of reliable data, and the multiple outside factors that may be at play.

### Strengths and weaknesses

Our systematic review has several strengths. First, we followed the MOOSE guidelines and prospectively registered our protocol. Second, we followed rigorous systematic review methodology, including a systematic comprehensive search using a validated filter for the identification of patient's values and preferences, and assessment of study quality.

There are also limitations to our systematic review. First, the results reported are intrinsically limited by the specific design of the included studies, and the information that men were exposed to. For example, most studies included several characteristics of the screening options (eg, cost, intervals of screening), which may have influenced some men's willingness to screen more than the potential benefits and harms. Second, none of the studies explicitly asked participants what thresholds of benefit and harm would be important to them. Due to suboptimal reporting or heterogeneous study design across the included studies, we were not able to meta-analyse any data, and were limited to narratively summarising the included studies. Third, willingness or intention to screen may not reflect individuals' future behaviour,<sup>34</sup> thus our inferences about acceptability are uncertain.

### CONCLUSIONS

The variability of men's values and preferences, particular to the degree that their information needs are met, reflect that the decision to screen is highly preference sensitive. As a consequence, men considering screening should be assisted through shared decision making to ensure that they are reaching a decision in line with their values.

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## REFERENCES

- Ilic D, Djulbegovic M, Jung JH, *et al.* Prostate-specific antigen-based screening for prostate cancer: a systematic review and meta-analysis. *BMJ* 2018;362:k3519.
- Tikkinen KA, Dahm P, Lytvyn L, *et al.* Prostate cancer screening with prostate-specific antigen (PSA) test: a clinical practice guideline. *BMJ* 2018;362:k3581.
- Bell N, Connor Gorber S, Shane A, *et al.* Recommendations on screening for prostate cancer with the prostate-specific antigen test. *CMAJ* 2014;186:1225–34.
- Grossman DC, Curry SJ, Owens DK, *et al.* Screening for prostate cancer: US preventive services task force recommendation statement. *JAMA* 2018;319:1901–13.
- Carroll PR, Parsons JK, Andriole G, *et al.* Prostate cancer early detection, version 1.2014. Featured updates to the NCCN Guidelines. *J Natl Compr Canc Netw* 2014;12:1211–9.
- Carter HB, Albertsen PC, Barry MJ, *et al.* Early detection of prostate cancer: AUA Guideline. *J Urol* 2013;190:419–26.
- EAU Guidelines. Edn. presented at the EAU Annual Congress Copenhagen 2018. Copenhagen.
- Jemal A, Fedewa SA, Ma J, *et al.* Prostate Cancer Incidence and PSA testing patterns in relation to uspstf screening recommendations. *JAMA* 2015;314:2054–61.
- Drazer MW, Huo D, Eggener SE. National prostate cancer screening rates after the 2012 US preventive services task force recommendation discouraging prostate-specific antigen-based screening. *J Clin Oncol* 2015;33:2416–23.
- Nordström T, Bratt O, Örtengren J, *et al.* A population-based study on the association between educational length, prostate-specific antigen testing and use of prostate biopsies. *Scand J Urol* 2016;50:104–9.
- Young GJ, Harrison S, Turner EL, *et al.* Prostate-specific antigen (PSA) testing of men in UK general practice: a 10-year longitudinal cohort study. *BMJ Open* 2017;7:e017729.
- Drazer MW, Prasad SM, Huo D, *et al.* National trends in prostate cancer screening among older American men with limited 9-year life expectancies: evidence of an increased need for shared decision making. *Cancer* 2014;120:1491–8.
- Misra-Hebert AD, Hu B, Klein EA, *et al.* Prostate cancer screening practices in a large, integrated health system: 2007–2014. *BJU Int* 2017;120:257–64.
- Van der Meer S, Kollen BJ, Hirdes WH, *et al.* Impact of the European Randomized Study of Screening for Prostate Cancer (ERSPC) on prostate-specific antigen (PSA) testing by Dutch general practitioners. *BJU Int* 2013;112:26–31.
- Stacey D, Taljaard M, Smylie J, *et al.* Implementation of a patient decision aid for men with localized prostate cancer: evaluation of patient outcomes and practice variation. *Implement Sci* 2016;11:87.
- Agoritsas T, Heen AF, Brandt L, *et al.* Decision aids that really promote shared decision making: the pace quickens. *BMJ* 2015;350:g7624.
- Martin RM, Donovan JL, Turner EL, *et al.* Effect of a Low-Intensity PSA-Based Screening Intervention on Prostate Cancer Mortality: The CAP Randomized Clinical Trial. *JAMA* 2018;319:883–95.
- Siemieniuk RA, Agoritsas T, Macdonald H, *et al.* Introduction to BMJ Rapid Recommendations. *BMJ* 2016;354:i5191.
- Selva A, Solà I, Zhang Y, *et al.* Development and use of a content search strategy for retrieving studies on patients' views and preferences. *Health Qual Life Outcomes* 2017;15:126.
- Zhang Y, Alonso-Coello P, Guyatt GH, *et al.* GRADE Guidelines: 19. Assessing the certainty of evidence in the importance of outcomes or values and preferences-Risk of bias and indirectness. *J Clin Epidemiol* 2018;4356:31036–3. S0895.
- Violette PD, Agoritsas T, Alexander P, *et al.* Decision aids for localized prostate cancer treatment choice: Systematic review and meta-analysis. *CA Cancer J Clin* 2015;65:239–51.
- Elwyn G, O'Connor AM, Bennett C, *et al.* Assessing the quality of decision support technologies using the International Patient Decision Aid Standards instrument (IPDASi). *PLoS One* 2009;4:e4705.
- Guyatt GH, Oxman AD, Vist GE, *et al.* GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. *BMJ* 2008;336:924–6.
- Cantor SB, Volk RJ, Krahn MD, *et al.* Concordance of couples' prostate cancer screening recommendations from a decision analysis. *Patient* 2008;1:11–19.
- de Bekker-Grob EW, Rose JM, Donkers B, *et al.* Men's preferences for prostate cancer screening: a discrete choice experiment. *Br J Cancer* 2013;108:533–41.
- Howard K, Brenner AT, Lewis C, *et al.* A comparison of US and Australian men's values and preferences for PSA screening. *BMC Health Serv Res* 2013;13:388.
- Howard K, Salkeld GP, Patel MI, *et al.* Men's preferences and trade-offs for prostate cancer screening: a discrete choice experiment. *Health Expect* 2015;18:3123–35.
- van den Bruel A, Jones C, Yang Y, *et al.* People's willingness to accept overdiagnosis in cancer screening: population survey. *BMJ* 2015;350:h980.
- Pignone MP, Howard K, Brenner AT, *et al.* Comparing 3 techniques for eliciting patient values for decision making about prostate-specific antigen screening: a randomized controlled trial. *JAMA Intern Med* 2013;173:362–8.
- Gattellari M, Ward JE. Does evidence-based information about screening for prostate cancer enhance consumer decision-making? A randomised controlled trial. *J Med Screen* 2003;10:27–39.
- Petrova D, Garcia-Retamero R, Cokely ET. Understanding the harms and benefits of cancer screening: a model of factors that shape informed decision making. *Med Decis Making* 2015;35:847–58.
- Sheridan SL, Felix K, Pignone MP, *et al.* Information needs of men regarding prostate cancer screening and the effect of a brief decision aid. *Patient Educ Couns* 2004;54:345–51.
- Sheridan SL, Sutkowi-Hemstreet A, Barclay C, *et al.* A comparative effectiveness trial of alternate formats for presenting benefits and harms information for low-value screening services: a randomized clinical trial. *JAMA Intern Med* 2016;176:31–41.
- Taylor KL, Williams RM, Davis K, *et al.* Decision making in prostate cancer screening using decision aids vs usual care: a randomized clinical trial. *JAMA Intern Med* 2013;173:1704–12.
- Wilt TJ, Paul J, Murdoch M, *et al.* Educating men about prostate cancer screening. a randomized trial of a mailed pamphlet. *Eff Clin Pract* 2001;4:112–20.
- Montori VM, Elwyn G, Devereaux PJ, *et al.* Chapter 27: Decision Making and the Patient. *JAMA User's guide: Users' guides to the medical literature: a manual for evidence-based clinical practice*. 3rd edn.
- Yu T, Enkh-Amgalan N, Zorrig G. Methods to perform systematic reviews of patient preferences: a literature survey. *BMC Med Res Methodol* 2017;17:166.
- Schünemann HJ, Oxman AD, Fretheim A. Improving the use of research evidence in guideline development: 6. Determining which outcomes are important. *Health Res Policy Syst* 2006;4:18.
- Zhang Y, Alonso-Coello P, Guyatt G, *et al.* GRADE Guidelines: 20. Assessing the certainty of evidence in the importance of outcomes or values and preferences - Inconsistency, Imprecision, and other Domains. *J Clin Epidemiol* 2018;4356:31061.2.
- Lewin S, Booth A, Glenton C, *et al.* Applying GRADE-CERQual to qualitative evidence synthesis findings: introduction to the series. *Implement Sci* 2018;13(Suppl 1):2.
- James LJ, Wong G, Craig JC, *et al.* Men's perspectives of prostate cancer screening: a systematic review of qualitative studies. *PLoS One* 2017;12:e0188258.
- Mansfield C, Tangka FK, Ekwueme DU, *et al.* stated preference for cancer screening: a systematic review of the literature, 1990–2013. *Prev Chronic Dis* 2016;13:E27.