

BMJ Open Doctors' approaches to PSA testing and overdiagnosis in primary healthcare: a qualitative study

Kristen Pickles,¹ Stacy M Carter,¹ Lucie Rychetnik^{1,2}

To cite: Pickles K, Carter SM, Rychetnik L. Doctors' approaches to PSA testing and overdiagnosis in primary healthcare: a qualitative study. *BMJ Open* 2015;5:e006367. doi:10.1136/bmjopen-2014-006367

► Prepublication history for this paper is available online. To view these files please visit the journal online (<http://dx.doi.org/10.1136/bmjopen-2014-006367>).

Received 12 August 2014
Revised 16 February 2015
Accepted 17 February 2015



CrossMark

¹Centre for Values, Ethics and the Law in Medicine, Sydney School of Public Health, University of Sydney, Sydney, New South Wales, Australia
²School of Medicine, University of Notre Dame, Sydney, New South Wales, Australia

Correspondence to

K Pickles;
kristen.pickles@sydney.edu.au

ABSTRACT

Objectives: (1) To explain general practitioners' (GPs') approaches to prostate-specific antigen (PSA) testing and overdiagnosis; (2) to explain how GPs reason about their PSA testing routines and (3) to explain how these routines influence GPs' personal experience as clinicians.

Setting: Primary care practices in Australia including men's health clinics and rural practices with variable access to urology services.

Participants: 32 urban and rural GPs within Australia. We included GPs of varying ages, gender (11 female), clinical experience and patient populations. All GPs interested in participating in the study were included.

Primary and secondary outcome measure(s): Data were analysed using grounded theory methods to determine how and why GPs provide (or do not provide) PSA testing to their asymptomatic male patients.

Results: We observed patterned variation in GP practice, and identified four heuristics to describe GP preference for, and approaches to, PSA testing and overdiagnosis: (1) GPs who prioritised avoiding underdiagnosis, (2) GPs who weighed underdiagnosis and overdiagnosis case by case, (3) GPs who prioritised avoiding overdiagnosis and (4) GPs who did not engage with overdiagnosis at all. The heuristics guided GPs' *Routine Practice* (usual testing, communication and responses to patient request). The heuristics also reflected GPs' different *Practice Rationales* (drawing on experience, medicolegal obligations, guidelines and evidence) and produced different *Practice Outcomes* (GPs' experiences of the consequences of their PSA testing decisions). Some of these heuristics were more responsive to patient preferences than others.

Conclusions: Variation in GPs' PSA testing practices is strongly related to their approach to overdiagnosis and underdiagnosis of prostate cancer. Men receive very different care depending on their GP's reasoning and practice preferences. Future policy to address overdiagnosis will be more likely to succeed if it responds to these patterned variations.

INTRODUCTION

Prostate-specific antigen (PSA) testing for prostate cancer in healthy men is an emotive, controversial¹ and hotly debated

Strengths and limitations of this study

- Most previous research has examined which general practitioner (GP) characteristics are associated with frequent or infrequent testing, and has been predominantly quantitative. This in-depth qualitative study offers a unique examination of GPs' approaches to prostate cancer overdiagnosis, from the GP perspective. It is the first study to systematically map prostate-specific antigen (PSA) testing with GPs' reasoning and understanding of prostate cancer screening and overdiagnosis.
- We identified and interviewed highly informative participants (GPs) and have developed valuable detailed insights into how the PSA testing process works in everyday practice.
- There may be value in knowing the prevalence of the four heuristics we have discovered across the population: a next step could be a population-based survey to ascertain the prevalence of these heuristics at a population level.
- Since physicians with strong opinions may have been more likely to volunteer, some selection bias is possible. However, diverse opinions and approaches were reported, suggesting that strong selection bias is unlikely.

issue. Evidence suggests that harms of PSA testing for prostate cancer in asymptomatic men can outweigh benefits.^{2–4} Most guidelines recommend against population screening,^{3 5–7} however, some professional societies do recommend selective PSA testing^{8–10} (table 1). In Australia, and internationally, many men continue to be tested despite guidelines advising not to screen.^{16–18} This article presents an empirical qualitative study of how Australian general practitioners (GPs) reason about PSA testing of asymptomatic men for prostate cancer, who they test and why, with a particular focus on how GPs manage the risk of overdiagnosis.

Overdiagnosis and/or overtreatment are considered the main potential harms of PSA testing. Overdiagnosis occurs when people without symptoms are correctly diagnosed

Table 1 The US, UK and Australian recommendations for prostate-specific antigen (PSA) testing of asymptomatic men for prostate cancer

	Professional body	Advice for health practitioners (see original documents for exact phrasing)
Population	US Preventive Services Task Force (USPSTF) ³	<ul style="list-style-type: none"> ► Discuss PSA screening thoroughly with men who raise the issue or if the man's individual circumstances warrant consideration of PSA testing. Do not feel obligated to offer PSA testing if a patient does not raise the issue or request the test ► The decision to start or continue PSA screening should reflect the patient's understanding of the possible benefits and expected harms and should respect his preferences
	National Health and Medical Research Council (NHMRC) ¹¹ National Health Service (NHS) ¹²	<ul style="list-style-type: none"> ► Before ordering a PSA test, health practitioners should talk to men about the potential benefits and harms of PSA testing ► Screening not recommended. An informed choice programme, Prostate Cancer Risk Management aims to provide high-quality information about the risks and benefits to men who ask about screening in order to enable them to decide whether to have the test
National	American Cancer Society (ACS) ¹⁰	<ul style="list-style-type: none"> ► Provide men the opportunity to make an informed decision; for men who are unable to decide, the screening decision can be left to the discretion of the healthcare provider ► Men at average risk and expected to live at least 10 more years should receive this information beginning at age 50 years. Men in higher risk groups should receive this information at age 40–45 years
Specialist	Cancer Council Australia (CCA) and Australian Health Ministers' Advisory Council (AHMAC), 2010 ¹³	<ul style="list-style-type: none"> ► Speak to men about the benefits and harms of testing and treatment so that they can make an informed choice
	American Urological Association (AUA) ⁸	<ul style="list-style-type: none"> ► Shared decision-making for men aged 55–69 years based on a man's values and preferences ► Routine screening is not recommended in men aged 40–54 years at average risk, or in men over 70 years or with less than a 10–15-year life expectancy; decisions should be individualised for men younger than 55 years at higher risk
Primary Care	Urological Society of Australia and New Zealand (USANZ) ¹⁴	<ul style="list-style-type: none"> ► PSA and digital rectal examination (DRE) should be offered to men 55–69 years, after providing information about the risks and benefits of such testing ► Interested men in younger age groups (under 55 years) could have a single PSA test and DRE performed at or beyond age 40 to provide an estimate of their prostate cancer risk over the next 10–20 years, with the intensity of subsequent monitoring being individualised accordingly
	American College of Physicians (ACP) ¹⁵	<ul style="list-style-type: none"> ► Inform men 50–69 years about the limited potential benefits and substantial harms of screening for prostate cancer ► Base the decision on the man's risk for prostate cancer, a discussion of the benefits and harms of screening, the patient's general health and life expectancy and patient preferences ► Advised not to screen patients who do not express a clear preference for screening ► Advised not to screen average-risk men under 50 years, over 69 years, or with a life expectancy of less than 10 to 15 years
	Royal Australian College of General Practitioners (RACGP) ⁶	<ul style="list-style-type: none"> ► Not recommended unless the man specifically asks for it, and he is fully counselled on the pros and cons ► General practitioners need not raise this issue, but if men ask about prostate screening they need to be fully informed of the potential benefits, risks and uncertainties of prostate cancer testing ► When a patient chooses screening, both PSA and DRE should be performed ► Responding to the patient's concerns and fulfilling medicolegal responsibilities are considerations in discussion with patients

with a disease that would not cause them to experience symptoms or early death.¹⁹ It is hard to understand and explain,²⁰ and difficult to quantify; estimates range from 15% to more than 84% of screen-detected prostate cancers.^{21–26} Overdiagnosis may lead to overtreatment:²⁷ treatment a person did not need. PSA testing often triggers a cascade of diagnostic tests and active treatment,^{28–29} potentially compromising a well person's quality of life.^{30–31} Advocates of testing argue that PSA testing may, in some cases, lower the stage and grade of cancer at diagnosis, and reduce the risk of being diagnosed with metastatic prostate cancer, for which there is no cure.^{32–34} However, across the population of asymptomatic men, PSA testing does not decrease all-cause mortality, and some men will progress and develop metastatic disease even if they are screened (despite earlier diagnosis).³⁵

Responsibility for guiding men's decisions about whether or not to be screened for prostate cancer has largely been placed in the hands of individual physicians. In Australia, GPs are the primary point of contact to access a PSA test. There is no organised screening programme; PSA testing is opportunistic but prevalent.¹⁸

Empirical work exploring prostate cancer screening in general practice has primarily focused on: (1) the reasons GPs give for ordering PSA tests; (2) the characteristics of GPs (such as age, gender, location) associated with more or less frequent testing and (3) how GPs communicate with patients about the PSA test.^{36–44} The predominantly quantitative evidence provides insights into the patterns and potential drivers of PSA testing in general practice but does not illuminate the dilemmas of PSA testing from the GP's perspective, and in particular how GPs reason about overdiagnosis. To fill this gap, we conducted a qualitative study to explore how and why GPs provide (or do not provide) PSA testing to their asymptomatic male patients. We report on the significance and impact of overdiagnosis in GPs' clinical reasoning about PSA testing.

METHODS

Design

We used the well-established, systematic qualitative research methodology of grounded theory⁴⁵ to guide our sampling and analysis. We collected data via in-depth interviews. GPs had an opportunity to discuss the study, and gave consent prior to participation.

Participants and setting

We recruited 32 urban and rural GPs throughout Australia (11 female). Our initial purposive sample was of GPs working in men's health clinics in Sydney (n=2). We advertised via the newsletters and email lists of regional GP organisations (Medicare Locals) in Sydney (n=8). GPs were invited to contact KP if they were interested and willing to participate in the research. We then

broadened our sampling by advertising in mass and social media, and in medical journals (*Medical Observer*, the Australian Medical Association's *GP Network News*, and the 6 min newsletter). As analysis and sampling evolved, we invited additional rural and interstate GPs to answer specific analytical questions (n=11). Rural GPs were accessed by phoning practice managers, through colleagues, and advertising with rural Medicare Locals, adding eight further GPs. When we encountered GPs whose routine care was divergent from previously interviewed GP norms, we invited more GPs from that practice to attempt to distinguish between personal and institutional influences on their practice. An additional three GPs were recruited in this final phase of theoretical sampling. GPs of varying ages, clinical experience, gender and patient populations were all included. All GPs interested in participating in the study were included. GPs were compensated for their time.

Interviews/data collection

A semistructured interview schedule was developed with a focus on GPs' current approaches to, and reasoning about, PSA testing. The schedule covered a broad range of topics, including GPs' recent clinical encounters involving PSA testing decisions; communicating information; screening pathways; and the central theme of this paper, overdiagnosis. The interview schedule was modified between interviews, informed by the developing analysis. Interviews took place between March and September 2013. They were conducted by KP, mostly by telephone, and ranged in duration from 18 min to 1 h and 10 min. All interviews were audio-recorded, de-identified and transcribed verbatim.

Examples of questions GPs were asked about overdiagnosis included the following:

- ▶ Are you familiar with the term 'overdiagnosis'?
- ▶ Do you think about the issue of overdiagnosis in your practice?
- ▶ How do you manage overdiagnosis in your practice?
- ▶ Overdiagnosis must be a challenging concept to talk about with your patients; how do you manage that challenge?

Data coding and analysis

The analysis was led by KP, who coded the transcripts and wrote detailed memos which were reviewed and discussed by the authors in analytical meetings. A subset of transcripts was read and coded by all three authors independently; this coding was compared and discussed to inform the development of the central concepts in the study. This paper focuses on how GPs dealt with the concept of overdiagnosis.

RESULTS

Most GPs felt uncertain and/or conflicted regarding what to do about PSA testing of asymptomatic men.

In the following section, we will explain overall patterns and then outline four heuristics used in practice.

GPs considered underdiagnosis as well as overdiagnosis

GPs discussed the harms of underdiagnosis (the missed opportunity to intervene in potentially preventable deaths) as much as those of overdiagnosis (the psychological and physical harms and financial costs of unnecessary diagnosis and treatment). Since both harms are salient and serious, PSA testing decisions were described as a “balancing act” (GP21) or gamble. GPs reported the difficulties of needing to choose between potential harms (eg, incontinence and impotence) and the chance of saving lives.

Testing decisions were described as a personal burden

Uncertainty about PSA testing created a ‘personal burden’ for some GPs; they felt personally responsible for the consequences of their PSA testing approach, and experienced guilt and self-blame as a result.

Many GPs used personal or professional experiences with the PSA test, both positive and negative, as powerful anchors for their current practice: these experiences often explained GPs’ perception of personal burden. We will return to the personal burden of PSA testing throughout the following sections.

GPs’ communication practices varied

GPs varied in the conversations they had with men specifically about overdiagnosis. Some deliberately avoided raising the issue, or talked men into or out of having a PSA test. GPs described several important contextualising factors.

1. Cancer is widely feared and difficult to talk about.
2. Overdiagnosis is hard to understand for GPs and for the public—and it is contradictory to many people’s existing health beliefs.
3. Both doctors and patients often have a strong belief that cancer screening is, in general, a worthwhile and important strategy to combat the risk of getting cancer.

GPs employed four heuristics to manage PSA testing

GPs’ responses to this difficult situation depended on how they viewed an implicit continuum between overdiagnosis and underdiagnosis. They considered which end of the spectrum would cause the greatest harm to each patient and/or their patients in general.

Four broad patterns (‘heuristics’) were employed.

1. Some GPs preferred to offer PSA testing to avoid underdiagnosis.
2. Some GPs were strongly oriented to avoiding overdiagnosis, and so tried to test as little as possible.
3. Some GPs made case-by-case individualised decisions.
4. Some GPs did not think about underdiagnosis or overdiagnosis at all.

These four heuristics represent observed patterns of GPs’ preferred or dominant practice orientations; that is, each

GP seemed to prefer one of these four heuristics as their overall approach to PSA testing. Some of these heuristics were more responsive to patient preferences than others (table 2).

The GPs’ *Dominant Practice Orientation* guided their *Routine Practice* (usual testing, communication and responses to patient requests). GPs also described their *Practice Rationale* (drawing on experience, medicolegal obligations, guidelines and evidence) which influenced testing decisions and justified why they adopted their particular practice orientation. Their orientation produced a *Practice Outcome*: GPs’ experiences of the consequences of their PSA testing decisions. The four dominant practice orientations (heuristics) are summarised in table 2 and described below.

Heuristic 1: GP preference to offer PSA testing to avoid underdiagnosis

GPs employing heuristic 1 thought testing was necessary because there was a *possibility* it might prevent a man’s death. Overdiagnosis was perceived as (1) a natural consequence of PSA testing; (2) better than dying and (3) a justifiable source of harm (harms being a regrettable but necessary price of ‘cure’).

These GPs focused on cancer as life-threatening, and prostate cancer as a terrible death. They saw preventing death as the primary duty of the GP. This heightened their responsibility to do anything that may diagnose cancer early: “Because if you don’t overdiagnose, the alternative is to underdiagnose” (GP28). Underdiagnosis was perceived to be a medicolegal risk, and for some GPs, legal risk was uppermost in their minds during the decision-making process. GPs concerned with missing diagnosing cancers practised more defensively; “I’m often a bit defensive...I guess that’s partly that legal thing” (GP5).

GPs with this practice orientation advised men to have a PSA, emphasising benefits of early detection, and did not discuss overdiagnosis.

Some of these GPs thought decisions about postdiagnosis management (eg, active surveillance) could limit the harms of potential overdiagnosis. This allowed them to define testing without invasive procedures as inconsequential: “it’s not terribly onerous to have a blood test every six months” (GP3). Although many of these GPs accepted that the PSA test was not perfect, they preferred to test because “clearly, people’s lives are saved” (GP8).

These GPs anchored their practice orientation to personal experiences. Their approach was supported by stories of men still being alive following active testing and treatment.

Another anchor for this heuristic was having experienced caring for patients with metastatic cancers, “I’ve had two recently where their GP refused to actually test the PSA level over the last ten years and both presented with metastatic prostate cancer” (GP24), and witnessing the horrors of prostate cancer deaths: “dying from prostate cancer would probably rank amongst one of the

Table 2 Practice, conditions and consequences of the four general practitioner (GP) heuristics for dealing with prostate-specific antigen (PSA) testing

Dominant practice orientation				
GPs engaging with overdiagnosis			GPs not engaging with overdiagnosis	
GP prioritises avoiding underdiagnosis			GP prioritises avoiding overdiagnosis	GP avoids thinking about overdiagnosis or underdiagnosis
Routine Practice	How did GPs approach communication?	<p>GPs inclined not to talk about overdiagnosis. The information they provide is "next to none" (GP9). Communication style characterised by advising men to have a PSA with emphasis on benefits of early detection</p>	<p>GPs inclined to talk about overdiagnosis and underdiagnosis, tailored specifically to the personal circumstances of each patient and what they are perceived as being capable of understanding. GPs agreed that it is never a particularly easy discussion to have, because the information is complex and "the figures are so—are quite hard to explain" (GP16), with the discussion described by some as becoming "more complicated depending on how interested the person is" (GP4)</p>	<p>GPs do not talk about overdiagnosis or underdiagnosis; general information about the PSA test as a screening tool sometimes provided. GPs happy to leave discussion up to the specialists; "I wouldn't go ahead, two steps ahead and discuss that they might find a cancer that they—that wouldn't have killed them; I don't go and—I don't go there. I think, I mean, that's sort of a urologist can do that" (GP7). For some, it was easiest to just do the PSA test with no explanation at all</p>
	How did GPs approach PSA testing?	<p>Mostly test. Testing is perceived to be an absolute obligation. These GPs feel their primary duty is to prevent prostate cancer death, and save men's lives wherever possible. "To not screen somebody, I don't know, it seems cruel, it's cruel and irresponsible... to not at least make an attempt to avoid the misery of a person getting prostate cancer, to me, seems unbelievably cruel" (GP29). "We have to diagnose them if they have a problem. What if it couldn't wait? How would you know it won't affect them?" (GP11)</p>	<p>Variable testing practice. Testing decisions and 'rules' shifted according to the patient, and factored in such things as the patient's risk profile (eg, age, family history), life expectancy, interest in and reason for wanting a PSA test, motivation to have the test, anxiety around cancer, understanding, and intention and ability to follow up any abnormal test results. For some GPs, <i>it's/it's</i> "really one of those tests in medicine that you order with the hope that it will be low or negative, and the sort of dread that it will be positive because you know that, it being positive creates a whole lot of problems for you and the patient" (GP17)</p>	<p>Mostly test. GPs seemed disengaged from the overdiagnosis debate and tended to default to testing, doing what they had always done without any further consideration</p>
	How did GPs respond to patient requests for a PSA test?	<p>GPs will test if requested. These GPs valued the knowledge produced by the test which can reassure patients and the GP. "I believe there is no case for saying you shouldn't take PSAs...how can knowledge not be a good thing?" (GP29)</p>	<p>GPs will test if requested. These GPs particularly emphasised being responsive to patient preferences</p>	<p>GP will test if requested</p>

continued

Table 2 Continued

Dominant practice orientation				
GPs engaging with overdiagnosis				
	GP prioritises avoiding underdiagnosis	GP thinks about underdiagnosis and overdiagnosis case by case	GP prioritises avoiding overdiagnosis	GPs not engaging with overdiagnosis GP avoids thinking about overdiagnosis or underdiagnosis
Practice rationale	Did GPs draw on first-hand experiences to reason about PSA testing?	No	Yes. It is a difficult balance for these GPs to practise according to the evidence while not being influenced by personal and professional experiences; "it's certainly a—hard to be, treating dying people who are young and not to worry about all of this and I, but I try not to change my practice based on my own personal experience of one or two people dying of prostate cancer. I have to still have confidence in the advice I get from, the population screening advice I get from bigger experts than me" (GP8)	No
	Did GPs express medicolegal concerns about PSA testing?	No. Either GPs believed their patients had made an informed choice following discussion or they felt they practised from a defensible position	No. Perceived themselves to be covered by the guidelines of their medical college. They engaged patients in detailed discussions about potential harms and resisted medicolegal fears. "If I did that...I think I would be a more paternalistic doctor who ordered a lot more tests. And I don't see that would be good medicine. I think it would do more harm to more people for practicing defensively like that" (GP30)	Varied. "It's very unclear for GPs, what it is [why there is an onus to discuss testing]. And, I mean, on one hand we are being told to, you know, to try to, you know, basically discuss the—the downside of PSA screening and things with patients...But then pretty much, they all go on and have the test anyway...and part of that is probably fuelled by my anxiety about missing something. Ah, and I guess part of that anxiety comes from medico-legal anxiety" (GP3)
	Did GPs draw on practice guidelines, recommendations or their interpretation of the evidence?	These GPs were likely to agree that population statistics do not, or cannot, apply to individuals, and sometimes had difficulty translating population-based information; "applying knowledge from an	GPs trusted the evidence to guide their decisions and practised according to population-level statistics and the guidance of most professional recommendations (particularly their medical college);	No

continued

continued

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

Table 2 Continued

Dominant practice orientation				
GPs engaging with overdiagnosis				
GP prioritises avoiding underdiagnosis	GP thinks about underdiagnosis and overdiagnosis case by case	GP prioritises avoiding overdiagnosis	GPs not engaging with overdiagnosis GP avoids thinking about overdiagnosis or underdiagnosis	
fine for the people in their... universities and stuff like that—to give us figures and say, you know, we are only going to lose this number of individuals if we do all this testing...but those individuals, some of them are young men, with lots of productivity and stuff” (GP24)	epidemiological study to one person is not easy...it’s so hard to apply” (GP28). “I don’t think, a doctor should ever be guided by mathematics, you know, humans aren’t machines” (GP29)	“we must stick to the epidemiological rigor behind screening” (GP23); “I worry that there are men, young men who probably will get prostate cancer and die of it because I’m not doing enough screening, but I’m not prepared to, to not follow the evidence and I think that the evidence says you don’t do it” (GP8). However, it was extremely challenging for GPs to balance guidelines against anecdotal experiences; “even though you know the statistics, you are influenced by what you are dealing with at the time...if you hear the story instead of just the statistics, it makes a lot more powerful a case” (GP27)	Personal struggles about what is the right approach to PSA testing were not a significant feature. GPs did not have to grapple with the ‘what ifs’ because they weren’t engaging with issues of overdiagnosis. For some it was about performing according to ‘good’ GP ideals. For example, one GP’s understanding was that a large majority of people would think he was neglectful if they were 45 years and above and he wasn’t offering PSA testing. This GP believed patients would compare him with other GPs who were screening and think they were much better than him. Satisfying patient expectations meant no burden on the GP	
Burden moderated by belief in the PSA test as life-saving. Some GPs were so convinced that testing to save lives was the right thing to do that they did not feel burdened. Other GPs were somewhat burdened by the experience of the patient’s side effects but rationalised this using their belief in preventing prostate cancer death. “Oh, well, it happens. I mean unfortunately no matter how good a doctor, now and then this is going to happen” (GP19). “We all live with that fear of, kind of, missing a cancer in somebody that is clinically significant” (GP3)	Burden shared with patients. “It’s a difficult area for GPs because there is this debate...about what should be done. You’re trying to do the best for your patients, you’re trying to avoid, you know, being sued for missing something” (GP5)	Heavy personal burden reported. Many GPs carried the burden of hoping they had protected their patient from the harms of overdiagnosis while witnessing prostate cancer death. “I’m fully aware of the fact that prostate cancer kills my patients and that by not testing for it, I won’t find it...it’s an incredibly difficult situation” (GP8). GPs recalled cases of patients who had suffered with aggressive/metastatic cancers and spoke of how hard it is to see men suffering (from potentially missed cancers) but to continue to practise according to their own values, the evidence and recommendations. “But I did what you were meant to do and that’s what’s going to happen sometimes, so it’s just hard to take” (GP27)		
Practice outcome	GP experience of personal burden			

worst ways to die...pain that is almost not able to be alleviated by narcotics" (GP29).

Despite their convictions, GPs experienced *some* personal struggle when they witnessed side effects of prostate cancer treatment. Such cases were often recalled in detail. For example, one GP describes this as "a heavy burden if a person is left with side effects" but accepted that "that's just part of being a GP, you have to walk around with this" (GP29). They tried not to take it personally, "oh, well, it happens. I mean, unfortunately, no matter how good a doctor [I am], now and then this is going to happen" (GP19). Overall, though, the personal burden felt by this group was relatively small and did not challenge the GP's belief in PSA testing, which they said fulfilled their role as a clinician to save lives. Many also regarded testing as consistent with specialists' advice, which allowed them to reduce their personal burden; that is, the responsibility of decisions about PSA testing was shared with these specialists (but not with their patients).

Heuristic 2: GP preference to not offer PSA testing to avoid overdiagnosis

GPs employing heuristic 2 preferred not to conduct PSA testing. Their primary justification was preventing harms caused by overdiagnosis. However, while they would try to talk patients out of having the test, they would never refuse a PSA test. These GPs also recognised that PSA testing has saved lives; "we know that happens. The problem is, it just doesn't happen often enough to balance out...all the damage that we do" (GP17).

This group of GPs emphasised the harms of PSA testing (including overdiagnosis) when advising their patients; and said many patients chose not to be tested following discussion. These GPs, who fully explain overdiagnosis, described themselves as "taking the risk of doing the hard work, hard yards" (GP23). They resisted medicolegal fears by engaging in detailed discussions of benefits and harms, and felt covered from legal prosecution by the Royal Australian College of General Practitioners (RACGP) guidelines.

GPs committed to avoiding overdiagnosis particularly drew on and trusted the research evidence to guide and inform their testing decisions. However, practising accordingly could be compromised by situational factors, such as a patient who had not been tested dying of prostate cancer. GPs said it was incredibly challenging to ignore personal (anecdotal) experiences, yet some were adamant that their practice would not be influenced by these experiences.

GPs found it hard knowing some cancers would be missed because of their decision not to test: for example, one described this as "a burden that I carry" (GP8). GPs most concerned about overdiagnosis experienced the highest levels of personal burden because, although relatively rare, death as the potential consequence of not testing was seen as the worst possible outcome. Some suspected that overdiagnosis and

overtreatment were not as much of a burden for the patient as they were for the doctor.

Heuristic 3: GP thinks of each patient as an individual and makes case-by-case decisions

GPs employing heuristic 3 had no preconceived attitude towards avoiding underdiagnosis or overdiagnosis. They tailored PSA testing decisions specifically for the personal circumstances of *each* patient, according to the patient's risk profile (age, family history), life expectancy, interest, motivation, reason for wanting a PSA test, cancer anxiety, or intention and ability to act on abnormal test results. These GPs were particularly responsive to patients' individual preferences, so the outcome of the consultation was largely unpredictable: "You have to try and work out what's best for the—that one particular patient that you are talking to at the time" (GP18). Testing 'rules' shifted according to the patient and the GP; "it's so easy to just learn what you do from a book but once you are actually faced with someone you know you can't—it's difficult to apply the same rule" (GP6).

These GPs approached communication in several different ways. Some made their own decision about the 'right' approach for each particular patient, and advised that patient accordingly. This could include not discussing overdiagnosis at all, on the grounds that it was irresponsible to expect patients to understand complex information; "if you start going down that road and—and to what end?" (GP7). Other GPs tailored their discussion about overdiagnosis to the needs of the individual patient, their perceived level of understanding and time pressures: "it gets more complicated depending on how interested the person is" (GP4). Thus, the GP's communication depended entirely on the individual patient in front of them.

GPs who approached PSA testing case by case generally agreed that overdiagnosis statistics do not, or cannot, apply to individuals; "those like statistical issues don't apply to the individual...because...they make their decisions on a set of complex, but perhaps irrational basis, you know, anxiety and..." (GP7). Accordingly, they tailored their testing and patient communication but expressed some difficulties in translating population-based information to individuals.

The personal burden experienced by these GPs was minimal as in most consultations the burden of decision-making was shared with their patients. GPs sought to reach a mutual understanding of PSA testing if they thought the patient was able to understand the information required, and shared the responsibility of decisions and outcomes of the consultation with the individual man. They tended to consider decisions about PSA testing as neither right nor wrong and so could be swayed either way depending on the patient and their needs. These GPs had minimal legal concern because they perceived patients to have made informed decisions based on their individual needs.

Heuristic 4: GP preference to avoid thinking about underdiagnosis or overdiagnosis

GPs not thinking about underdiagnosis or overdiagnosis did not have a preference or priority for avoiding one harm over another. For these GPs, the PSA test was considered just another form of routine screening and underdiagnosis or overdiagnosis was not an issue of concern.

The majority of GPs in this group did not engage with considering the implications of underdiagnosis or overdiagnosis and what that meant for their patients. Some of these GPs felt explaining overdiagnosis was the responsibility of urologists, and preferred to simply inform men that a PSA test may lead to them having a biopsy. These GPs also said they preferred to be guided by urologists on what to do about PSA testing overall.

Personal burden associated with underdiagnosis or overdiagnosis was therefore not a significant feature for this group of GPs. For some, their priority was being regarded as a 'good' GP by their patients: they focused on how their testing decisions might influence their reputation and rapport with their patient. They reported that a 'good' GP was in many cases deemed to be someone who actively tested.

DISCUSSION

Overdiagnosis of indolent cancers in cancer screening is now recognised as a significant problem, but solutions to this problem (eg, communication, public awareness) are as yet uncertain, including in primary care. Most previous research has examined associations between GP characteristics and frequency of PSA testing. Fewer studies have sought to explain variation in GPs' PSA testing practice. Ilic and colleagues⁴⁶ differentiated 'reactive screeners' (GPs who screened only at the patient's request) from 'proactive screeners' (GPs motivated to test, believed screening was beneficial, and feared missing cancer, including for medicolegal reasons). Our study provides a more nuanced analysis of how and why GPs test the way they do, and offers a unique examination of GPs' approaches to prostate cancer underdiagnosis and overdiagnosis. It is the first study to systematically examine the relationship between GPs' reasoning and behaviour in relation to PSA testing. We identified four distinct approaches, each associated with different practices, rationales and outcomes. Our findings explain why men so often receive different advice and clinical care: this depends on their GP's PSA testing practice orientation.

There is value in understanding the reasoning behind actual practice. GPs' reasoning makes sense of variation in practice: it explains why different GPs are making different testing decisions in similar cases. GPs' experiences with PSA testing (positive and negative), values, perceptions (of the GP role, the patient role, of the PSA test and overdiagnosis), considerations of evidence and guidelines, and their sense of personal burden

(anticipated or experienced) all uniquely contribute to PSA testing patterns. Variation in practice has ethical implications, as men are experiencing unequal access to information and consent to PSA testing. Yet these GPs were not acting arbitrarily; most were simply doing the best they could in an almost impossible situation. The difficult position GPs are in should be recognised in future efforts to address the problem of prostate cancer overdiagnosis.

Policy implications

Guidance used by Australian GPs about PSA testing varies widely (see [table 1](#)). This also contributes to the diversity of practice revealed in this study. Although it would be unrealistic to expect the mere existence of a guideline to change practice,³⁹ it does seem reasonable for GPs to expect that expert bodies will provide clear guidance wherever possible. A community jury on PSA testing reported men's experiences of variable and inconsistent advice from GPs, and recommended programmes to support GPs to provide patients with better quality and consistent information about PSA screening.⁴⁷ The Australian Medical Health and Research Council (NHMRC) has recently produced an authoritative summary of PSA testing benefits and harms for GPs to discuss with their patients.

The findings of this study offer important guidance for the implementation of such recommendations in practice. We recommend that agencies seeking to promote the uptake of guidance for practitioners must take account of the different motivations of GPs and recognise the significant diversity in the approaches that GPs are taking towards PSA testing of asymptomatic men. GPs who employ heuristic 2, for example, were already attentive to the epidemiological evidence, and so are likely to be receptive to recent NHMRC guidance. However, GPs who are employing heuristic 1 may need very active knowledge translation strategies if they are to change their practice. These GPs were deeply concerned that by their failure to screen they might allow a man to die of prostate cancer. It seems unlikely that they will change their practice unless this concern is recognised and responded to. Communications, workshops and new incentives therefore need to consider variation in GP perspectives and the range of drivers of current practice as identified in this research (address legal concerns, the need for consent due to potential harms and acknowledge burden).

Limitations

Since physicians with strong opinions may have been more likely to volunteer, some selection bias is possible. However, diverse opinions and approaches were reported, suggesting that strong selection bias is unlikely.

Conclusions

Future strategies for addressing the problem of prostate cancer overdiagnosis in general practice should be

underpinned by empirical evidence about how GPs approach PSA testing, and the reasons they give for their actions. Explicit consideration in practice guidelines of the challenges faced by GPs when balancing underdiagnosis and overdiagnosis, including GPs experiences of personal burden, medicolegal concerns and communication strategies, will better support GPs to inform and guide men's decisions on whether or not to have a PSA test. Further public deliberation on how the inevitable trade-offs could and should be managed in primary care could also inform such discussions between clinicians and their patients.⁴⁸

Twitter Follow Kristen Pickles at @PicklesKristen

Acknowledgements The authors thank the general practitioners for their participation in this research.

Contributors KP, SMC and LR conceived the study and were involved in designing the study, developing the methods and drafting of the manuscript. SMC and LR obtained funding and are CIs on the NHMRC funded project grant. KP conducted the interviews, had full access to all data in the study, and takes responsibility for the integrity of the data and the accuracy of the data analysis. All authors contributed to the interpretation of the analysis and critically revised the manuscript.

Funding The project was funded by NHMRC grant 1023197. Stacy Carter is supported by NHMRC Career Development Fellowship 1032963. The funders had no role in the design or conduct of the study; in the collection, analysis and interpretation of the data; or in the preparation or approval of the manuscript.

Competing interests SC is supported by NHMRC Career Development Fellowship 1032963.

Ethics approval All study procedures were approved by the Cancer Institute NSW and the University of Sydney Human Research Ethics Committee [#15245].

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement No additional data are available.

Open Access This is an Open Access article distributed in accordance with the Creative Commons Attribution Non Commercial (CC BY-NC 4.0) license, which permits others to distribute, remix, adapt, build upon this work non-commercially, and license their derivative works on different terms, provided the original work is properly cited and the use is non-commercial. See: <http://creativecommons.org/licenses/by-nc/4.0/>

REFERENCES

1. Stark JR, Mucci L, Rothman KJ, *et al.* Screening for prostate cancer remains controversial. *BMJ* 2009;339:b3601.
2. Ilic D, Neuberger MM, Djulbegovic M, *et al.* Screening for prostate cancer. *Cochrane Database Syst Rev* 2013;1–76.
3. Moyer VA. Screening for prostate cancer: US preventive services task force recommendation statement. *Ann Intern Med* 2012;157:120–34.
4. Djulbegovic M, Beyth RJ, Neuberger MM, *et al.* Screening for prostate cancer: systematic review and meta-analysis of randomised controlled trials. *BMJ* 2010;341:c4543.
5. Mackie A. *Screening for Prostate Cancer Review against programme appraisal criteria for the UK National Screening Committee (UK NSC)*. London: National Health Service, 2010.
6. Royal Australian College of GPs (RACGP). *Guidelines for preventive activities in general practice* 2012. 8th edn. <http://www.racgp.org.au/your-practice/guidelines/redbook/early-detection-of-cancers/prostate-cancer/>
7. Wilt TJ, Ahmed HU. Prostate cancer screening and the management of clinically localized disease. *BMJ* 2013;346:f325.
8. Carter HB, Albertsen PC, Barry MJ, *et al.* Early detection of prostate cancer: AUA guideline. *J Urol* 2013;190:419–26.
9. Mitka M. Group now advises against routine PSA screening. *JAMA* 2013;309:2316.
10. American Cancer Society (ACS). American Cancer Society recommendations for the early detection of prostate cancer 2014. <http://www.cancer.org/cancer/prostatecancer/moreinformation/prostatecancerearlydetection/prostate-cancer-early-detection-acs-recommendations>
11. National Health and Medical Research Council (NHMRC). Australia. PSA testing for prostate cancer in asymptomatic men: Information for health practitioners. 2014; <https://www.nhmrc.gov.au/guidelines-publications/men4>, 2014.
12. National Health Service (NHS) Choice, United Kingdom. Prostate cancer – PSA screening. 2015; <http://www.nhs.uk/Conditions/Cancer-of-the-prostate/Pages/prevention.aspx>
13. Cancer Council Australia, Australian Health Ministers' Advisory Council (AHMAC), Australia. Position statement. Prostate cancer screening in Australia: joint key messages. 2010; http://www.cancer.org.au/content/pdf/CancerControlPolicy/PositionStatements/PS-Prostate_Cancer_Screening_Joint_key_messages_%20published_May2010.pdf.
14. Urological Society of Australia and New Zealand (USANZ). Urological Society of Australia and New Zealand PSA testing policy. 2009; <http://www.usanz.org.au/uploads/65337/ufiles/PDF/psa-testing.pdf>.
15. Qaseem A, Barry MJ, Denberg TD, *et al.* Screening for prostate cancer: a guidance statement from the Clinical Guidelines Committee of the American College of Physicians. *Ann Intern Med* 2013;158:761–9.
16. Ross LE, Coates RJ, Breen N, *et al.* Prostate-specific antigen test use reported in the 2000 National Health Interview Survey. *Prev Med* 2004;38:732–44.
17. Sirovich BE, Schwartz LM, Woloshin S. Screening men for prostate and colorectal cancer in the United States: does practice reflect the evidence? *JAMA* 2003;289:1414–20.
18. Australian Institute of Health and Welfare (AIHW). Prostate cancer in Australia. 2013; <http://www.aihw.gov.au/WorkArea/DownloadAsset.aspx?id=60129545133>
19. Welch G, Schwartz L, Woloshin S. *Overdiagnosed: making people sick in the pursuit of health*. Beacon Press, 2011.
20. Hersch J, Jansen J, Irwig L, *et al.* How do we achieve informed choice for women considering breast screening? *Prev Med* 2011;53:144–6.
21. Etzioni R, Penson DF, Legler JM, *et al.* Overdiagnosis due to prostate-specific antigen screening: lessons from U.S. prostate cancer incidence trends. *J Natl Cancer Inst* 2002;94:981–90.
22. Draisma G, Boer R, Otto SJ, *et al.* Lead times and overdiagnosis due to prostate-specific antigen screening: estimates from the European Randomized Study of Screening for Prostate Cancer. *J Natl Cancer Inst* 2003;95:868–78.
23. McGregor M, Hanley J, Boivin J, *et al.* Screening for prostate cancer: estimating the magnitude of overdiagnosis. *CMAJ* 1998;159:1368–72.
24. Telesca D, Etzioni R, Gulati R. Estimating lead time and overdiagnosis associated with PSA screening from prostate cancer incidence trends. *Biometrics* 2008;64:10–19.
25. Gulati R, Wever EM, Tsodikov A, *et al.* What if I don't treat my PSA-detected prostate cancer? Answers from three natural history models. *Cancer Epidemiol Biomarkers Prev* 2011;20:740–50.
26. Wever EM, Draisma G, Heijnsdijk EA, *et al.* Prostate-specific antigen screening in the United States vs in the European Randomized Study of Screening for Prostate Cancer–Rotterdam. *J Natl Cancer Inst* 2010;102:352–5.
27. Moynihan R, Doust J, Henry D. Preventing overdiagnosis: how to stop harming the healthy. *BMJ* 2012;344:e3502.
28. Cooperberg MR, Broering JM, Kantoff PW, *et al.* Contemporary trends in low risk prostate cancer: risk assessment and treatment. *J Urol* 2007;178:S14–19.
29. Welch HG, Black WC. Overdiagnosis in cancer. *J Natl Cancer Inst* 2010;102:605–13.
30. Sanda MG, Dunn RL, Michalski J, *et al.* Quality of life and satisfaction with outcome among prostate-cancer survivors. *N Engl J Med* 2008;358:1250–61.
31. Hayes JH, Ollendorf DA, Pearson SD, *et al.* Active surveillance compared with initial treatment for men with low-risk prostate cancer: a decision analysis. *JAMA* 2010;304:2373–80.
32. Loeb S, Catalona WJ. What to do with an abnormal PSA test. *Oncologist* 2008;13:299–305.
33. Aus G, Bergdahl S, Lodding P, *et al.* Prostate cancer screening decreases the absolute risk of being diagnosed with advanced

- prostate cancer—results from a prospective, population-based randomized controlled trial. *Eur Urol* 2007;51:659–64.
34. Grubb RL, Pinsky PF, Greenlee RT, *et al.* Prostate cancer screening in the Prostate, Lung, Colorectal and Ovarian cancer screening trial: update on findings from the initial four rounds of screening in a randomized trial. *BJU Int* 2008;102:1524–30.
 35. Schröder FH, Hugosson J, Carlsson S, *et al.* Screening for prostate cancer decreases the risk of developing metastatic disease: findings from the European Randomized Study of Screening for Prostate Cancer (ERSPC). *Eur Urol* 2012;62:745–52.
 36. Cooper CP, Merritt TL, Ross LE, *et al.* To screen or not to screen, when clinical guidelines disagree: primary care physicians' use of the PSA test. *Prev Med* 2004;38:182–91.
 37. Brett J, Watson E, Hewitson P, *et al.* PSA testing for prostate cancer: an online survey of the views and reported practice of general practitioners in the UK. *BMC Fam Pract* 2005;6:24.
 38. Gormley GJ, Catney D, McCall JR, *et al.* Prostate-specific antigen testing: uncovering primary care influences. *BJU Int* 2006;98:996–1000.
 39. Girgis S. General practitioners' perceptions of medicolegal risk—using case scenarios to assess the potential impact of prostate cancer. *Med J Aust* 1999;171:362–6.
 40. Pollack CE, Platz EA, Bhavsar NA, *et al.* Primary care providers' perspectives on discontinuing prostate cancer screening. *Cancer* 2012;118:5518–24.
 41. Drummond FJ, Carsin A, Sharp L, *et al.* Factors prompting PSA-testing of asymptomatic men in a country with no guidelines: a national survey of general practitioners. *BMC Fam Pract* 2009;10:3.
 42. Bell DS, Hays RD, Hoffman JR, *et al.* A test of knowledge about prostate cancer screening. *J Gen Intern Med* 2006;21:310–14.
 43. Clements A, Watson E, Rai T, *et al.* The PSA testing dilemma: GP's reports of consultations with asymptomatic men: a qualitative study. *BMC Fam Pract* 2007;8:35.
 44. Bowen DJ, Hannon PA, Harris JR, *et al.* Prostate cancer screening and informed decision-making: provider and patient perspectives. *Prostate Cancer Prostatic Dis* 2011;14:155–61.
 45. Charmaz K. *Constructing grounded theory: a practical guide through qualitative analysis*. London: SAGE Publications, 2006.
 46. Ilic D, Murphy K, Green S. What do general practitioners think and do about prostate cancer screening in Australia? *Aus Fam Phys* 2013;42:904–8.
 47. Rychetnik L, Doust J, Thomas R, *et al.* A Community Jury on PSA screening: what do well-informed men want the government to do about prostate cancer screening—a qualitative analysis. *BMJ Open* 2014;4:e004682.
 48. Rychetnik L, Carter SM, Abelson J, *et al.* Enhancing citizen engagement in cancer screening through deliberative democracy. *J Natl Canc Inst* 2013;105:380–6.