Perception of abnormal serum prostate-specific antigen (PSA) test results amongst family practitioners

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ABSTRACT

INTRODUCTION With increased use of serum prostate-specific antigen (PSA) testing, prostate cancers are diagnosed at an earlier stage in younger men, when radical curative treatments are appropriate. Modifications of the PSA test such as PSA velocity and age-adjusted values are available to aid in the selection of patients for biopsy. However, it is not clear whether these data are used in general practice.

PATIENTS AND METHODS A self-administered questionnaire was mailed to all primary care practices within one region in the UK. A series of visual analogue questions designed to identify referral thresholds for age-adjusted PSA levels and PSA velocity were used to identify patterns in referral behaviour.

RESULTS Individual family practitioners see only small numbers of patients requesting PSA tests or with newly diagnosed prostate cancer each year. The median (range) thresholds considered for referral at ages 45, 55, 65, 75 and 85 years were 4.5 ng/ml (2.5–15.5 ng/ml), 5.5 ng/ml (3.0–15.5 ng/ml), 6.5 ng/ml (3.5–15.5 ng/ml), 6.5 ng/ml (3.5–25.5 ng/ml), and 7.5 ng/ml (3.5–25.5 ng/ml), respectively. Only 5% of practitioners correctly identified the age-specific PSA threshold for referral of a 45-year-old man.

CONCLUSIONS It is important to remember that younger men (even those in their forties and fifties) may be at risk of prostate cancer even if asymptomatic. It is important in a climate of increasing demand for PSA testing that those who initiate the process understand the implications and limitations of testing, including appropriate triggers for referral to secondary care. The exact approach required for the successful dissemination of this information to primary care is not clear, but our data suggest that a better understanding is required.

KEYWORDS

Prostate cancer – PSA testing – Primary care practice – Referral

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Prostate cancer is now the most commonly diagnosed cancer amongst men in the UK.¹ The incidence has risen in recent years, reflecting, in part, a wider utilisation of serum prostate-specific antigen (PSA) as a diagnostic tool.² Prior to the introduction of PSA testing in the UK in the early 1990s, there was no readily accessible diagnostic indicator, no treatment programmes for early stage disease and no reliable monitor of disease during follow-up following therapy. Prostate cancer was frequently diagnosed at an advanced stage and in the older man.³ Since its introduction, there has been a stage migration towards localised disease at diagnosis and to detection in younger patients,⁴ for whom a plethora of treatment options are potentially available.

Age-adjusted PSA values were introduced in 1993⁵ to improve the clinical impact of PSA. The aim was both to highlight those younger men at risk of cancer (who would previously been overlooked) and to reduce unnecessary investigation of older patients. Calculated 'PSA velocity' over a 3-year period has been used to identify men at increased risk of prostate cancer, with a threshold of 0.75 ng/ml suggested as a clinically useful index.⁶

Currently, neither the NHS Executive nor the National Screening Committee recommend PSA screening, but policy permits testing in men who have been counselled and understand evidence-based information on PSA testing.⁷ This has led to an *ad hoc* arrangement for PSA testing. Information on factors influencing these referral patterns of

family practitioners is limited; in this study, we used a questionnaire to assess variations in application of the PSA test and referral triggers across the areas feeding two acute general hospital based urology units serving 650,000 patients. The particular focus was on the perception of 'abnormal' PSA values, age-adjusted values and calculations of PSA velocity.

Patients and Methods

Two urology departments based at the West Suffolk and Ipswich Hospital developed a self-administered questionnaire. This was mailed to all primary care practices within their combined catchment area. Demographic data requested included number of years in clinical practice and number of patients estimated per year with either newly diagnosed prostate cancer or requesting a PSA test. A series of visual analogue questions designed to identify referral thresholds for age-adjusted PSA levels and PSA velocity were used to identify patterns in referral behaviour (Fig. 1). Questionnaires were anonymous to ensure confidentiality.

Data relating to the age of newly diagnosed men with prostate cancer over the period 2001–2006 were obtained from urology units' databases.

Results

A total of 502 questionnaires were distributed. Of these, 208 (41%) were returned, of which 192 (38%) contained

Table 1 Traditional age-adjusted thresholds for PSA and recently proposed UK age-adjusted PSA thresholds for comparison

Age (years)	PSA threshold (ng/ml) (Oesterling <i>et al.</i> ⁵)	New suggested UK threshold (ng/ml) (Winkler <i>et al.</i> ¹¹)
40–49	2.5	–
50–59	3.5	2.4
60–69	4.5	5.7
70+	6.5	10.1

complete data. Anonymous returns precluded the sending of further reminders. Of practitioners, 140 (73%) had been qualified for more than 15 years. The median number of estimated new prostate cancer patients seen per year were 2 (range, 0–10). The median estimated number of patients investigated by PSA per month was 2 (range, 0–12).

The median (range) PSA threshold for referral to urology for men aged 45, 55, 65, 75 and 85 years is shown in Figure 2A–E. The median (range) thresholds for referral at these ages were 4.5 ng/ml (2.5–15.5 ng/ml), 5.5 ng/ml (3.0–15.5 ng/ml), 6.5 ng/ml (3.5–15.5 ng/ml), 6.5 ng/ml (3.5–25.5 ng/ml), and 7.5 ng/ml (3.5–25.5 ng/ml), respectively. Family practitioners under-estimated the risk for a 55-year-old man with a PSA of 4.5 ng/ml of having carcinoma, with a median risk of 10% (range, 0–90%). By contrast, the risk in a 75-year-old man was over-estimated, with a median risk estimation of 10% (range, 0–90%). For a man of 70 years with a PSA value of 9.5 ng/ml, the median risk estimation was correct, although the spread of estimated values was wide (Fig. 3).

With regard to PSA velocity, only 15% of those questioned would refer such a patient aged 65 years with a baseline PSA of 3.8 ng/ml, whereas 73% would refer a man whose PSA rose from 9.8 ng/ml to 11.2 ng/ml in the same period. Practitioners who saw more patients for PSA-related

Table 2 Percentage of practitioners correctly identifying age-specific thresholds for referral

	Age (years)			
	45	55	65	75
PSA threshold correct (%)	5	10	21	22
PSA threshold incorrect – low (%)	0	0	3	31
PSA threshold incorrect – high (%)	95	90	75	47

Figure 2 Spread of PSA referral thresholds.

issues did not perform better in using age-specific thresholds of PSA velocities which indicated higher risk patients. Nine practitioners saw more than 10 patients per month for a PSA test. This group had a significantly higher mean threshold for referring a 65-year-old man to an urologist (7.8 ng/ml versus 6.3 ng/ml; $P = 0.01$, Student's *t*-test), and for referring an 85-year-old man (12.4 ng/ml versus 8.7 ng/ml; $P = 0.007$, Student's *t*-test). For the other age groups, there was no significant difference in referral threshold.

Age distribution at diagnosis is shown in Figure 4.

Only 5% of practitioners correctly identified the age-specific PSA threshold for referral of a 45-year-old man (Table 2) and 95% overestimated this threshold. The proportion

using the correct threshold increased with increasing patient age, but the majority continued to overestimate the PSA value to trigger referral.

Discussion

PSA testing of asymptomatic men is a common occurrence across the UK.⁸ This study illustrates that individual family practitioners see only small numbers of patients requesting PSA tests or with newly diagnosed prostate cancer per annum. These data show that risk perception and referral are good in the older patient age group. However, in patients below 70 years, who are the population potentially

Figure 3 Estimated risk of cancer for four hypothetical patients with age (years) and PSA (ng/ml) indicated.

more likely to benefit from an earlier diagnosis of localised prostate cancer, risk perception appeared less accurate. It is important to remember that younger men (even those in their forties and fifties) may be at risk, even if asymptomatic. Indeed, in our unit, 10% of newly diagnosed men with prostate cancer are under 60 years of age at diagnosis (Fig. 4). However, it must be noted that while it is possible to detect prostate cancer in the younger man, it has been shown that screening appears to detect a greater number of 'incidental' or lower risk carcinomas which may never have required treatment,¹⁵ and the outcomes of large screening studies on disease mortality are eagerly awaited.

PSA testing in primary care has increased over the last decade. However, reports suggest that awareness of national guidelines on PSA testing amongst family practitioners remains low.⁹ Our study confirms this view. In the absence of a nationally agreed screening programme for prostate cancer, patients should only be offered a PSA test after appropriate counselling. Men should understand why the test is performed and its limitations, a situation which is may not always be the case in the UK.¹⁰ For example, it is now clear that there is a significant risk of a positive biopsy even in patients with 'normal' PSA levels. Thompson *et al.*¹⁶ showed, in the control arm of the prostate cancer prevention trial, that 10% of men with PSA of 0.6–1.0 ng/ml were found to have cancer following the end-of-study biopsy and 10% of these were high-grade tumours. Such data make informed discussion of PSA testing complex. Understanding the limitations is, therefore, the key to appropriate referral to secondary care. Clearly, a PSA threshold of 4 ng/ml, as traditionally used, will miss a large proportion of cancers, but wide-spread adoption of lower thresholds to increase sensitivity would expose many men to an unnecessary biopsy with its attendant morbidity without any current evidence that such screening prevents death from prostate cancer.

As a compromise, age-adjusted PSA values, traditionally based upon the US population (Table 1),⁵ have been widely adopted by UK urologists. Recent adjustments allowing for a UK-based population may further add to their application (Table 1).¹¹ Our data show that the majority of family practitioners do not use these values as thresholds for referral. Indeed, 95% felt that a higher PSA in younger men was appropriate.

Figure 4 Age distribution of new prostate cancer diagnoses.

Policy implications

Targeted information on age-adjusted values and PSA velocity, which should trigger a referral to secondary care, should be provided to those who initiate testing to enhance the chance of prompt diagnosis in the younger patient who may have potentially more to gain from early diagnosis.

Communicating this message to our colleagues in primary care will facilitate better care for this increasing group of men. One randomised trial of educational outreach visits has demonstrated improved short-term understanding of PSA testing and a change in clinical practise, with fewer PSA tests in the group of practitioners who received educational visits. This improvement was not sustained at 12 months, however, suggesting that on-going education is required.¹² Future work should aim to improve on-going dissemination of information to primary care and re-assess understanding of PSA testing thereafter.

Study limitations

The response rate in this study was low (41%). There is the potential for selection bias. One important limitation of the study is the use of clinical vignettes to seek practitioner's reported behaviour. These vignettes only provide minimal information about the patient, sometimes making expected behaviour difficult to predict. There is the potential for difference between reported and actual behaviour in that participants may be more likely to report what they perceive as 'correct textbook' practice rather than actual practice.

Conclusions

PSA testing rates in the UK are rising.¹⁵ The rate of asymptomatic testing in general practice is at least 1.6% per annum.¹⁴ With the increasing media profile of prostate cancer, these rates will continue to rise. It is important, therefore, in a climate of increasing demand for PSA testing, that those who initiate the process understand the implications and limitations of testing to optimise the diagnosis of cancer for those patients who will benefit from radical treatment. The exact approach required for the successful dissemination of this information to primary care is not clear, but our data suggest that a better understanding is required.

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