Singapore Med J 1998; Vol 39(5):193-195

Role of PSA Testing in Multiphasic Health Screening

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ABSTRACT

Background: Although mass screening for prostate cancer does not meet the criteriae for an effective screening programme, multiphasic screening which includes PSA testing is still being carried out.

Aim: We decided to study and evaluate the usefulness of PSA testing in multiphasic health screening and at the same time establish age-specific ranges of normal PSA values in our local population.

Results: Six hundred and ninety five male patients who had their PSA levels tested during a multiphasic health screening from October 1992 to August 1995 were evaluated. Abnormal PSA levels were repeated and subjected to a DRE and TRUS biopsy if they were persistently high using age-specific PSA ranges. Our results showed 14 (4.1%) out of 695 patients who had an abnormal PSA of > 4 ng/mL. compared to 19 who had abnormal PSA levels using the age-specific PSA ranges. Of the patients who were < 40 yrs of age, no further investigations were done. Amongst those 80 years and older, none had abnormal age-specific PSA rates. No prostate cancers were picked up amongst all the patients investigated. Median age specific PSA values at the 95th percentile was calculated for each age group. A rise in the median PSA values with age was also noted.

Conclusion: We recommend that in patients less than 40 years of age, PSA should not be carried out as the probability of prostate cancer is almost zero. Similarly, in patients who are 80 years and above and asymptomatic, such screening may not be indicated given the limited options available. Age-specific rates are a better way to reduce the negative biopsy rates in the age-groups that are amenable to curative treatment. With a local set of age-specific PSA ranges, we hope to increase the positive predictive value of PSA for prostate cancers in our local population until more specific and equally sensitive tests are made available.

Keywords: age-specific rates, prostate cancer, local, normal, biopsy

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INTRODUCTION

It is now generally accepted that mass screening for prostate cancer using prostate specific antigen (PSA) levels in the general population does not meet the criteriae for an effective screening programme[1-5]. There is also no paper that has linked the increase in detection rate with a decrease in the cancer specific mortality[6]. As such, screening using PSA in a general population is discouraged. However in a multiphasic screening where a diagnosis of the absence of cancer is important, PSA will still be done for pre-employment checkups, for insurance purposes and on patient's own request. Although we cannot change the socioeconomic nor personal reasons for doing multiphasic screening, we decided to study and evaluate the usefulness of PSA testing in multiphasic health screening in terms of cancer pickup and consequently provide some guidelines for its use. At the same time we hope to establish age-specific ranges of PSA values in normal, healthy males in our local population, which in turn will reduce the false positive rates and consequently the morbidity that accompanies the prostate biopsies that will have to be carried out as a result of PSA testing.

METHODS AND MATERIALS

Six hundred and ninety-five male patients who had their PSA's tested during a multiphasic health screening from October 1992 to August 1995 were evaluated. All patients had a full medical examination, chest X-rays, alkaline phosphatase and were followed up for a year if abnormal. Abnormal PSA levels were repeated and subjected to a DRE and TRUS biopsy if they were persistently high using age-specific PSA ranges as follows based on Oesterling's study[7]: < 50 years of age: 0 – 2.5; 50 – 59 yrs of age: 0 – 3.5; 60 – 69 yrs of age: 0 – 4.5; 70 or more years: 0 – 6.5. The results were analysed and evaluated in terms of pickup for prostatic carcinoma. Age-specific PSA values for our local population were also obtained.

Of the 695 males screened, the median age group is 40 – 49 years (Table I). There were 623 Chinese (89.6%), 28 Indians (4%), 19 Malays (2.7%), 17 Indonesians (2.4%) and 8 Caucasians (1.2%) in the study population.

RESULTS

There were 14 (4.1%) out of 695 patients who had an abnormal PSA of > 4 ng/mL. Using the age-specific PSA ranges, 19 had abnormal PSA levels.

In the 40 – 49 years age group, only 2 had a PSA of > 4 ng/mL. Using the age-specific PSA rates,

Table I – Number of abnormal PSA values by age groups using a PSA value of 4 ng/mL and age-specific PSA ranges

Age groups/yrs	< 30	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 89	≥ 90
No. of patients	46	187	228	159	55	12	3	1
Present normal age-specific rates	< 2.5	< 2.5	< 2.5	< 3.5	< 4.5	< 6.5	< 6.5	< 6.5
No. greater than age-specific ranges	3 (6.5%)	2 (10.7%)	7 (30.7%)	5 (31.4%)	1 (18.2%)	1 (8.3%)	0	0
No. with PSA > 4 ng/mL	2 (5.3, 7.2)	1 (15.2)	2 (4.2, 5.6)	3 (10.4, 5, 4.1)	3 (4.4, 4.5, 4.8)	2 (5.9, 9.7)	0	0
No. with normal age-specific rates after repeat PSA testing	not retested	not retested	4 and 3 lost to follow-up	1 and 2 lost to follow-up				
Pathology	Dengue fever	flu and UTI	None	2 BPH (trus & bx)	1 BPH after TURP	1 BPH (trus & bx)		

7 would have required a transrectal ultrasound and biopsy. Of these seven, 3 were lost to follow-up and the remaining 4 had PSA values that normalised with repeat testing. For the 50 – 59 years age group, 3 had a PSA of > 4 ng/mL. Using the age-specific PSA rates, 5 patients required a transrectal ultrasound and biopsy. Of these, one had his PSA value return to normal and 2 were lost to follow-up. Two showed prostatic hyperplasia on biopsy.

For the 60 – 69 years age group, 3 had a PSA of > 4 ng/mL. Using the age-specific PSA rates, only 1 patient required a transrectal ultrasound and biopsy. He subsequently had a transurethral resection of the prostate for outlet obstruction. This showed prostatic hyperplasia on histology.

Of the patients who were < 40 yrs of age, no further investigations were done. Two patients less than 30 years of age had high PSA levels of 15.2 and 25.5 ng/mL. It is interesting to note that one was recovering from dengue fever and the other from influenza at the time of testing. Amongst those 80 years and older, none had abnormal age-specific PSA rates. No prostate cancers were picked up amongst all the patients investigated.

Median age-specific PSA values were also calculated for each age group. An upper limit using the 95th percentile PSA value in each age group was established as is used in the Oesterling study[7]. There is a rise in the median PSA values with increasing age as is widely known. The rise increases sharply between the 50 – 59 and 60-69 years age groups. The number of patients above 79 years of age were too small to make any useful conclusions.

DISCUSSION

With the heightened awareness of prostate cancer and an aging population, more and more male patients are getting their PSA's tested as part of a multiphasic health screen, either as a member of a company or as an individual seeking insurance or mental comfort. As such, more specific methods for pickup of prostate cancers are required. Age-specific rates is one such tool that is shown to be useful in picking up more organ-confined disease in the younger age-groups and decreasing the number of negative biopsies in the older ones[7,8]. We evaluated the role of PSA in multiphasic health screening for normal healthy males. Using 4 ng/mL as the upper limit, we found that 14 (2.0%) had abnormal PSA values. Using the age-specific PSA ranges, the number with abnormal PSA increased to 19 (2.7%). This increase reflects the increase in abnormal values in the 40 – 49 and 50 – 59 years age-groups. However, there is a decrease in abnormal values in the 60 – 69 and 70 – 79 years age groups. Hence, age-specific PSA ranges brings about a greater sensitivity in the pickup of abnormal PSA values in the 40 – 59 years age group, where most of the prostate cancers picked up are early and have a higher chance for curative intervention. At the same time, the same age-specific PSA ranges allow for greater specificity in those 60 – 79 years age group, thereby decreasing the numbers with negative prostate biopsies, a point noted by Dr Oesterling in his landmark study[7]. In our study, patients < 40 years of age were also screened. The probability of a prostatic cancer in this age group is remote and unlikely. It is thus not necessary to do PSA's for anyone less than 40 years of age for whatever purposes. Two hundred and thirty-three patients would have been spared a PSA test in this study if the age of a patient was taken into account.

It is also note worthy that there is an increase in PSA values with age, with the rise starting in the 50 – 59 years age group and doubling to the 70 – 79 years age group. This increase is similar to Oesterling's study in predominantly white populations and forms the basis for using age-specific rates[7].

As the patients who were screened are healthy male individuals with no known prostate cancers, we used the PSA values to obtain a set of normal age-specific PSA values for each particular age group. The increase in PSA levels with age can be seen clearly in Table II. As most if not all of the age-specific PSA ranges were derived from white

Table II – Mean and standard deviations of PSA values by age groups

Age groups/yrs	< 30	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79	80 – 89	≥ 90
No. of patients	46	187	228	159	55	12	3	1
Median PSA value	0.625	0.82	0.765	0.92	1.0	2.0	1.7	1.2
Mean PSA value	1.155	0.974	1.001	1.163	1.570	2.743	1.833	1.2
Std dev of PSA values	1.330	1.136	0.727	1.067	1.388	2.851	1.106	0

based communities which have a higher incidence of prostatic cancers, this multiphasic screening provides us with an opportunity to obtain a set of age-specific PSA ranges for our own Asian and predominantly Chinese population . Using the 95th percentile as in Oesterling's initial study, we obtained an upper limit of PSA ranges as shown in Table III. The levels obtained were fairly similar except that the upper limit for PSA in the 50 – 59 years age group of patients was 2.6 ng/mL instead of 3.5 ng/mL based on Oesterling's study. This might be a reflection of the lesser numbers of BPH and smaller glands that we see in our society compared to the West as benign prostatic hyperplasia begins to surface in that age group. If that is the case, using a value of 3.5 ng/mL may cause us to underdiagnose early prostate cancers which is the situation now where the majority of our patients are seen at a much latter stage. The upper limit for males 70 – 79 years of age is 7.6 which is much higher than the limit proposed by Oesterling. A larger number in this cohort may help us to obtain a more definitive upper limit of PSA.

Table III – Upper limit of PSA ranges in our population using the 95th percentile values

Age groups/yrs	30 – 39	40 – 49	50 – 59	60 – 69	70 – 79
95th percentile	1.8	2.4	2.61	4.43	7.61

CONCLUSION

In conclusion, multiphasic screening is done for reasons where the negative diagnosis of prostate cancer is important. As such, it will always be done with PSA included. We would like to recommend that in patients less than 40 years of age, PSA should not be carried out as the probability of prostate cancer is almost zero. Similarly, in patients who are 80 and above and asymptomatic, such screening may not be indicated given the limited options available and the potential physical and psychological harm that a positive result might bring. If PSA needs to be done, age-specific rates are a better way to increase the pickup of early cancers in the age groups that are amenable to curative treatment and at the same time reduce the numbers of negative prostate biopsies in the older age groups where life expectancy is not likely to extend beyond twenty years. We also hope that with a local set of age-specific PSA ranges, we might increase the positive predictive value of PSA for prostate cancers in our local population until more specific and equally sensitive tests are made available.

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