**Prostate cancer**

The prostate is a walnut-sized gland below the bladder present in men only. It makes the fluid that carries and nourishes sperm. The prostate sits in front of the rectum ('back passage'), which is why the prostate can be felt by putting a finger into the rectum. Urine flows from the bladder through the prostate to the urethra and then to the outside world. The prostate is like a ring doughnut or polo mint with a hole in the middle.

There are three main problems that affect the prostate, prostate enlargement (benign prostatic hyperplasia – BPH or benign prostatic enlargement - BPE), prostate cancer and prostatitis.

If the channel through the prostate gets small as the prostate enlarges, urinary symptoms can develop such as getting up at night, passing urine frequently, or a poor urinary stream. However, the prostate is not the only cause for urinary symptoms. Investigations and treatments for these problems can be found in the operations section for benign prostate enlargement.

In general, prostate cancer does not cause urinary symptoms unless it is very advanced. Therefore, the majority of men with urinary symptoms do NOT have prostate cancer.

Prostate cancer is a growing problem in this country as men live longer. When it starts there are no symptoms, but it is now the second commonest cause of death from cancer in men after lung cancer (see graphs below). Prostate cancer can be detected early using the PSA and an MRI scan; subsequent targeted prostate biopsies and then deciding what treatment options are best for you including observation. PSA testing is controversial and so it is important to understand the advantages, risks and alternatives to PSA testing. Multiple new treatments have arisen for prostate cancer including HIFU (high intensity focused ultrasound), Cryotherapy, laparoscopic and robotic radical prostatectomy.

Urinary symptoms can be due to a variety of different causes. When due to the prostate, these symptoms include getting up a night, passing urine frequently by day, and taking a long time to pass urine when in the toilet.

See the frequently asked questions (FAQ) regarding the enlarged prostate, operations for benign prostate enlargement including Urolift, Steam ablation (Rezum), bipolar TURP and laser prostatectomy.

*What increases the risk of prostate cancer?*

•Age: the older men get, the more likely a cancer might develop in the prostate.

•Race: Afro-Caribbean men are at higher risk than Caucasians and men from the Far East have a lower risk for cancer.

•Family history: If a father, brother or uncle has prostate cancer, the risk is also increased.

•Obesity: increases the risk of lethal prostate cancer.

•'metabolic syndrome'

•Tall stature: increases the risk of advanced prostate cancer

•Occupation: Farmers, firemen, workers in electrical capacitor plants, pesticide workers and rotating shifts workers

•Diet (https://prostatecanceruk.org/prostate-information/living-with-prostate-cancer/your-diet-and-physical-activity)

*Is diet important in prostate cancer?*

It is not absolutely proven, but certain types of diet may increase the risk of prostate cancer including:

•red meat

•saturated fat

•low intake of fruit and vegetables

•omega 6 fatty acids (corn, safflower oils and red meats).

•high calorie diet

•high calcium and milk consumption

The following diet appears to be associated with either a lower incidence of prostate cancer or lower chance that prostate cancer will spread or be more serious:

•selenium - seafood, poultry, brazil nuts and especially broccoli florets

•vitamin E (wheat germ, nuts, soybeans, organ meats and vegetable oils)

•beans -- black, pinto, small red and kidney beans are high in fiber, which helps the body rid itself of excess testosterone. Beans are also rich in inositol pentakisphosphate, a known cancer-fighter

•soy and soya products (e.g. 62.5 mg Soy isoflavone aglycones (ADM Novasoy)

•folate supplementation

•lycopenes - found in concentrated tomato sauces (e.g. pizza), watermelon and pink grapefruit. These work when eaten with broccoli simultaneously

•cruciferous vegetables (cabbage, broccoli, brussel sprouts, cauliflower, bok choy and kale)

•omega 3 fatty acids found in oily fish (e.g. tuna, sardines, salmon), linseed, walnuts or food supplements

•sweet potatoes, carrots and cantaloupe are rich in beta-carotene, which gives them their orange color and helps the immune system keep cancer at bay

•pomegranate juice (8 oz/day)

•zinc

•milk thistle

•turmeric (curcumin): a chemical found in curry especially in combination with watercress, cabbage, winter cress, broccoli, brussels sprouts, kale, cauliflower, kohlrabi and turnips.

•green tea (the evidence for this is less strong than it was a few years ago)

•quercetin: possibly helpful

•A low glycaemic index (GI) diet may also be helpful as this reduces the amount of circulating insulin which is known to reduce stimulus for growth.

Some drugs can also reduce the risk of prostate cancer including 5a-reductase inhibitors (e.g. finasteride, dutasteride). Statins are used to reduce cholesterol and seem to reduce the probability that prostate cancer will spread outside the prostate if develops at all.

*Reasons for prebiopsy multiparametric MRI (http://www.ctu.mrc.ac.uk/12602/13009/PROMIS\_briefing\_paper\_jan\_2017)*

What if an MRI is performed before prostate biopsy? There are several advantages to such an approach.

Firstly, some men may be so reassured by a negative MRI that they decide not to have a biopsy at all. We know that a very high quality MRI is, if negative, more reassuring about the absence of tumour than a negative biopsy, and some men decide to go no further, and to have their PSA checked regularly, and perhaps another MRI at an interval. If they decide on biopsy, and that is negative too, they are very unlikely indeed to have a cancer that will harm them.

Secondly, we can detect most significant tumours on MRI, so that the biopsies can be targeted to the suspicious area. This stops us missing tumours that lie in difficult to reach places (around 10% of significant cancers are completely missed by standard biopsy because of where they lie, but picked up by MRI) and it also helps us to be sure that the sample is representative: sometimes random biopsies just shave the edge of a large tumour, leading us to underestimate how much there is.

This leads on to the third advantage of MRI before biopsy. If a small amount of tumour is detected, MRI can check that this is not the edge of a large amount, or that there is a larger tumour in the front of the prostate. Active surveillance is unsuccessful in some men precisely because of such undetected tumours, most of which can be seen with MRI.

Finally, the finding of a significant cancer usually means that staging is required to detect spread outside the prostate. Radiologists who have looked at MRI images both before and after biopsy have no doubt that they are degraded for several months by the effects of bleeding from the biopsy: the best quality staging scan is undoubtedly one done before any of this has occurred - before the biopsy.

In all three cases then: whether no disease is found, a small amount, or a significant amount, MRI is likely to be useful. This is why we would see it as the optimal first step in a man presenting with a raised PSA.

*Why have a prostate biopsy?*

Biopsies are taken to find the cause for:

•a high PSA

•because the prostate feels abnormal

•abnormal findings on MRI

Traditionally biopsies are carried out under local anaesthetic through the back passage (rectum) (https://www.baus.org.uk/\_userfiles/pages/files/Patients/Leaflets/TRUSP%20biopsies.pdf). This is uncomfortable, inaccurate and has a high risk of infections. We recommend using the MRI images as a map for a targeted biopsy through the perineum (the skin between the scrotum and the back passage) (https://www.baus.org.uk/\_userfiles/pages/files/Patients/Leaflets/Transperineal%20biopsies.pdf). The transperineal targeted prostate biopsy is less painful, safer and much more accurate.

Once biopsies are taken, it may be possible to determine the severity of cancer, if it is found. This enables a decision on how to treat prostate cancer if it is present.

*How do I work out how serious my cancer is?*

There are several considerations:

•the underlying risk of the cancer affecting your quality of life

•your general health and age

The underlying risk of the cancer is determined principally by:

•Gleason Score:

This is a measure of how aggressive the cancer is. The two commonest patterns of cancer are each graded from 1 to 5. The two grades are summed and the total is known as the Gleason score. Therefore, this ranges from 6 to 10. Most cancers have a Gleason Score of 7: the most serious are 8 - 10 .

•Cancer Stage:

This refers to how far the cancer has spread and can be determined partially by prostate examination with a finger, and an MRI scan, or a bone scan. If the cancer is confined to the prostate, the stage is 'T1' or 'T2', if it is outside the prostate it is 'T3' or 'T4'. Bone scans indicate whether there is cancer in the bones. Sometimes, the lymph nodes in the pelvis are sampled with an operation to determine if cancer is present there.

•PSA: the higher the PSA, the more likely the cancer is outside the prostate; the faster the rate of change, the more likely serious cancer is present.

•Other bits of information can be used and relate often to the information gained from the prostate biopsies: the proportion of positive biopsies or the length of cancer in the biopsies.

It is important to know how the cancer was detected i.e. by screening with a PSA test or because of symptoms. Most of our knowledge is based on prostate cancer detected in patients with urinary symptoms. If the cancer was detected early because of PSA testing, the time between diagnosis and the development of symptoms from the cancer is likely to be much longer than if the cancer was detected because of urinary symptoms.

*What additional tests or scans are necessary now I have prostate cancer?*

These tests relate mostly to determining if the cancer is confined to the prostate and what chance there is that treatment will fail after a few years. It is possible to combine the information to calculate whether the cancer has spread outside or the chance that the cancer will return after treatment. The information required is:

•PSA

•Gleason Score

•Clinical stage determined by examination of the prostate by a finger or MRI scan

•the proportion of positive biopsies

The following web sites contain 'calculators' enabling you estimate your risk. This information should be interpreted with a doctor who understands prostate cancer.

• The Sloane Kettering Nomogram https://www.mskcc.org/nomograms/prostate

• The Prostate Calculator http://www.prostatecancer-riskcalculator.com

While magnetic resonance imaging (MRI) is increasingly used to detect prostate cancer it can also tell if the cancer is has spread outside the prostate and give information about your anatomy relevant to treatment and side-effects. For this test, you enter a scanning machine, which makes a lot of noise, and produces high quality images of the prostate. It may help determine if the lymph nodes ('lymph glands') contain cancer or not.

**What are my treatment choices?**

Depending on your individual situation you might choose

* Monitoring
	+ active monitoring with the intention to cure if and when necessary
	+ watchful waiting with the intention to maintain quality of life when elderly
* Focal therapy (treating half the prostate or just the cancer)
	+ High intensity focused ultrasound (HIFU)
	+ Cryotherpay
	+ Prostate electroporation
* Whole gland radical treatments
	+ radical radiotherapy (external beam)
	+ radical prostatectomy (either open, laparoscopic or robotic) brachytherapy
* Palliation
	+ Hormone treatment

The situation is often difficult and experts may disagree. A careful decision needs to be made usually in conjunction with consultants in radiotherapy and urology.

Part of the problem is that early prostate cancer grows slowly and so treatments are for problems that will often not present for several years. Having said that, the opportunity for curative treatment is available only when cancer is confined to the prostate and has not spread elsewhere.

**What is active monitoring? http://www.baus.org.uk/\_userfiles/pages/files/Patients/Leaflets/Active%20surveillance.pdf**

The prostate cancer is monitored to determine whether it is progressing or not. The implication is that if the prostate appears to be growing and is at risk of causing problems, then a treatment option will be undertaken. To do this, the tumour should be of low risk of progression anyway. There are no universally accepted criteria for this and a discussion is necessary with an experienced prostate cancer doctor. In most patients, doctors would recommend active monitoring for most Gleason score 6 cancers. If the cancer was of larger volume, the Gleason score was 7 or more, or if the PSA was 15 ng/ml or more, or if both sides of the prostate contained cancer (stage T2b or higher) curative options such as focal or whole gland radical treatments are highly recommended. If these conditions do not apply, then active monitoring may be appropriate.

Active monitoring involves regularly measuring the PSA and seeing how it changes. Some people perform prostate examinations regularly and recently MRI scan are increasingly used at least every two years before a repeat prostate biopsies is advised. The idea is to look for evidence that the disease is advancing. Provided it does not advance too far, curative treatment might still be possible or not be necessary! This is becoming a more acceptable way to manage people with prostate cancer. Probably the best strategy is to incorporate all pieces of information regarding the disease and your overall health.

## What is HIFU? https://prostatecanceruk.org/media/2492025/hifu-ifm.pdf

High Intensity Focused Ultrasound (HIFU) is the name for a technique to treat prostate cancer. Like a magnifying glass focuses light rays to a focal point, HIFU concentrates sound waves on a precisely targeted, small area of diseased tissue. HIFU heats the tissue to about 100°C degrees and destroys it.

The advantage of visually directed HIFU is that the surgeon uses real-time feedback to adjust the amount of energy needed to ensure eradication of the diseased tissue whilst protecting healthy tissues. The active involvement of the surgeon in the planning and treatment achieves a high rate of success.

HIFU is a relatively new treatment that has become popular, as it is minimally invasive with fewer side effects than whole gland radical treatments. It is generally only used if the tumor is contained on one side of the prostate and is not considered high risk (Gleason score >7).

**What is a radical prostatectomy? http://www.baus.org.uk/\_userfiles/pages/files/Patients/Leaflets/Rad%20prost%20lap.pdf**

A radical prostatectomy is the operation to remove the entire prostate gland. At the same time the seminal vesicles, which are attached to the prostate, are removed occasionally with the lymph nodes, which are specialised tissue to which the prostate drains. This procedure can be performed by an incision through the lower belly or by key hole techniques ('laparoscopic' or 'endoscopic' or 'robotic'). The advantages are:

•the prostate gland with its cancer and surrounding tissue is removed offering what many doctors believe to be the best chance of removing all cancer. This is believed to be most accurate when the cancer is detected because of 'prostate' (urinary) symptoms, the cancer can be felt with a finger, or the cancer is Gleason score 7 or more.

•the prostate can be examined completely and an accurate prediction made of the likley outcome

•the PSA should fall to almost undetectable values making it much easier to determine if the disease has unfortunately recurred

•additional treatment such as radiotherapy can be given with fewer side-effects

•a short hospital stay (1 to 2 days) is necessary rather than regular attendance

•urinary symptoms (weak or slow flow etc) due to the prostate are usually eliminated completely

*The disadvantages are*

•it is a major-complex operation

•a blood transfusion may occasionally be necessary (<1%)

•control of urine is less good in some after surgery and pads may be required for some time. About 1 in 30 men have problems with intermittent leakage which may require another small intervention to stop it. This is more common in men over 70 years of age About 1 in 6 patients have minor incontinence which is generally socially acceptable and can be managed well.

•erections may be weaker or non existent although good sexual activity can be had with Viagra, Cialis or Levitra. Nerve-sparing operations have a 70% success to preserve erections.

•additional treatments may be required if the prostate cancer returns

There is strong evidence that radical prostatectomy reduces the chance of dying from prostate cancer by about 50% compared to watchful waiting and deferred androgen deprivation. The evidence comes from a randomised study published in one of the world's most prestigious medical journals. However, the results are most applicable to men with cancer detected because of symptoms, with a PSA around 12 ng/ml, prostate cancer that can be felt with a finger when examined, and Gleason score 7 or above. Nowadays, many men have few urinary symptoms, PSA values around 5 to 8, Gleason score 6 and impalpable cancer ie the cancers are detected earlier in their history. This is not to say that surgery is not effective just that to benefit one has to wait longer.

The procedure can be performed through a traditional incision in the lower abdomen or through 5 very small incisions ie endoscopic, laparoscopic or robotic surgery. The advantages of laparoscopic surgery include improved view allowing more precise surgery, shorter hospital stay (1 -2 days) and earlier return to leisure activities and work. It is technically difficult to and specialised training is required.

**What is radiotherapy? https://prostatecanceruk.org/media/11602/external\_beam\_radiotherapy-ifm.pdf**

The prostate is treated by radiotherapy given whilst lying in a machine at a special hospital. Usually, one attends on week-days for 6 to 7 weeks for a short time for the treatment. Commonly, this treatment is accompanied by hormonal therapy to block the effects of testosterone, which is the male hormone that drives prostate growth. The advantages are:

•the prostate cancer is treated and is less likely to recur or cause symptoms

•there is a lower chance of incontinence compared to radical prostatectomy or brachytherapy, but frequency or urgency may be worse

•radiotherapy can be given to the side walls of the pelvis which may be important if the cancer has spread outside to lymph glands.

•Salvage cryotherapy or surgery can be used if radiotherapy fails

•surgery with the well known risks is avoided

*There are disadvantages too:*

•many doctors believe that radiotherapy is probably a less effective treatment than surgery when compared to surgery 10 to 15 years of follow up. Hence patients under 70 benefit primarily from surgery

•side-effects include diarrhoea, and blood in the stools or urine

•erections become weaker over time which is compounded by lack of testosterone from the hormone treatment

•it is more difficult to use the PSA to determine if the treatment has been successful or not

•if treatment fails, cryotherapy or surgery is associated with more side-effects such as worse incontinence

**What is brachytherapy? https://www.baus.org.uk/\_userfiles/pages/files/Patients/Leaflets/Brachy%20treatment.pdf**

Seeds with radiotherapy energy are placed systematically in the prostate under a general anaesthetic. Patients may not stay in hospital overnight. This is done either in one or two stages depending on the set up.

The advantages are:

•this can be a day case procedure so patients can often leave the same day

•it is possible to have additional therapy, usually external beam therapy, if there is disease recurrence

•incontinence of urine is less likely

*The disadvantages include*

•urinary symptoms often become significantly worse after the procedure and sometimes a catheter is required for a period to empty the bladder

•the treatment is probably less effective than surgery regarding cancer cure

•weakness of erections occurs, although possibly less commonly than after surgery or external beam radiotherapy

**What is cryotherapy? https://prostatecanceruk.org/prostate-information/treatments/cryotherapy**

The prostate and its cancer can be killed by freezing the cells. To give this therapy, a general anaesthetic is necessary and a catheter needs to be placed for several days.

The main advantage is that it can be given focally to just treat the tumor and not the remainder of normal prostate tissue or after radiotherapy if it is not effective. It can also be repeated. If given focally is rarely causes erectile dysfunction.

**What is hormonal therapy? https://prostatecanceruk.org/media/2494413/hormone\_therapy\_ifm.pdf**

This usually refers to reducing testosterone levels in the body and is usually known as androgen deprivation, androgen suppression or castration. Testosterone with its derivative dihydrotestosterone is the male hormone that drives prostate growth. Rather than reduce the levels of testosterone, its action can be blocked by drugs and this is known as androgen blockade.

This form of therapy is usually used with or without radical radiotherapy, and sometimes after radical surgery. The prostate cancer tends to be more advanced than early.

The side effects of this include hot flushes, tiredness, anaemia, and in the long term osteoporosis.

*How do I decide what to do?*

You have to trade-off the advantages over the disadvantages of each option. It depends on the relative values of each. This is best done by discussing the issues with a doctor and close family. In general, if the thought of having cancer and not doing the most possible to get rid of it dominates your thinking, then you should choose an interventional treatment. There is no caste iron evidence to indicate one treatment is better than another. It becomes more important to maximally remove the cancer surgically if it is high risk or there are many years of life possibly ahead. Focal therapy offers the best chance of preservation of quality of life. It can only be used for smaller tumours with a Gleason score <8 located to one side of the prostate.

On the other hand, active monitoring may be the best option for low risk tumours and if quality of life is most important especially if there is uncertainty over the benefit of treatment. A second opinion is often helpful

Several websites offer details and on-line help in making decisions including:

• American Cancer Society

• National Cancer Institute

• Michigan Cancer Consortium

• The Prostate Cancer Charity