Gateway Ref: 7385

Advice on the Development of

Low Dose Rate (Permanent Seed Implant)

Brachytherapy Services for

Localised Prostate Cancer

in England

Department of Health
November 2006

DH INFORMATION READER BOX

Policy		Estates	
HR / Workforce		Performance	
Management		IM & T	
Planning		Finance	
Clinical		Partnership Working	

Document Purpose	Best Practice Guidance		
ROCR Ref:		**Gateway Ref:**	7385
Title	Advice on the Development of Low Dose Rate Brachytherapy Services for Localised Prostate Cancer for England		
Author	DH		
Publication Date	November 2006		
Target Audience	Cancer Networks & SHA Cancer Leads		
Circulation List	PCT CEs, NHS Trust CEs, SHA CEs, Foundation Trust CEs		
Description	The prostate brachytherapy framework aims to provide advice to strategic health authorities (SHAs), cancer networks, primary care trusts (PCTs) and NHS Trusts in England that are developing, providing or commissioning low dose rate prostate brachytherapy services.		
Cross Ref	N/A		
Superseded Docs	N/A		
Action Required	N/A		
Timing	**N/A**		
Contact Details	Cheryl Cavanagh Cancer Policy Team, DH Rm 411 Wellington House 133-155 Waterloo Road, London SE1 8UG 020-7972-1312		
For Recipient's Use			

CONTENTS

Executive Summary

1. Low dose rate (LDR) brachytherapy is one of several treatments available for men with localised prostate cancer. These also include:

    a. active monitoring;
    b. radical prostatectomy;
    c. radical external beam radiotherapy [EBRT].

2. Brachytherapy involves the insertion of radioactive needles under ultrasound guidance. The evidence for the efficacy of this treatment is based on large case series rather than randomised controlled trials. Based on these case series, brachytherapy seems to be as effective as radical prostatectomy or EBRT in terms of biochemical freedom from treatment failure, when it is given to patients with low and intermediate risk disease (T1 or 2, Gleason score 6 or less). Brachytherapy is not suitable for patients with T3 disease.

3. Short term effects of brachytherapy are common. These relate predominantly to urinary frequency and urinary retention. In the long term erectile impotence affects approximately 40% of men.

4. The role of brachytherapy is expected to increase as a result of earlier diagnosis and patient choice. NICE has published Interventional Procedure Guidance on low dose rate brachytherapy for localised prostate cancer and on high dose rate (HDR) brachytherapy in combination with external-beam radiotherapy for localised prostate cancer. It has recommended that for both procedures current evidence on safety and efficacy appears adequate to support their use in the NHS. NICE has also been commissioned to develop a clinical guideline on the diagnosis and treatment of prostate cancer. However, this guideline is not expected to be published until November 2007 at the earliest.

5. In the meantime, demand from patients is increasing and there is a danger of unplanned growth and inequalities in access to brachytherapy. The Department of Health's Prostate Cancer Advisory Group (PCAG) and its Prostate Cancer Treatment Working Group (PCTWG) therefore advised that the Department should issue interim advice (in advance of the NICE clinical guideline) to the NHS. This framework is the resulting advice. It has been based on professional consensus and has the support of the Royal College of Radiologists.

6. This framework relates solely to low dose rate [LDR] - permanent seed implant - brachytherapy for localised prostate cancer, which accounts for over 90% of all prostate brachytherapy in England. It does not cover LDR brachytherapy for other conditions or HDR brachytherapy.

7. The advice in this framework is not mandatory. However, networks are encouraged to ensure that existing LDR brachytherapy facilities/services in their boundaries are in line with this framework and that any plans to develop such facilities/services are developed in consultation with the relevant specialist commissioning group and strategic health authority taking into account the advice in this document.

8. The framework notes that brachytherapy can only be performed in a suitable area at a centre licensed to handle radioactive material and to carry out brachytherapy. Within the NHS in England, this means in practice it should take place at one of the 51 radiotherapy centres. The framework also sets out the facilities required and endorses NICE's recommendation that LDR brachytherapy should be planned and performed by a multidisciplinary team.

9. The capital costs are likely to be in the region of £85.5k to £95.5k. Disposable (consumable) costs per patient amount to around £3200. If one quarter of patients with localised disease were to undergo LDR brachytherapy, the consumable cost would be around £15m per year across England.

10. Local audits are essential to assess the quality of care delivered. A national clinical audit is also desirable and it is recommended that the British Association of Urological Surgeons (BAUS) and DH liaise with the Healthcare Commission about the possible introduction of a national clinical audit on urological cancers including brachytherapy.

11. In the USA, the proportion of patients receiving brachytherapy for localised prostate cancer is estimated to be between 30% and 50%. In England it is probably around 5%. Demand is therefore likely to increase, though availability of other treatments (e.g. laparoscopic prostatectomy) will affect patients' choices.

12. In relation to workload and throughput, the following recommendations are made:

    a. an individual clinician should, as an absolute minimum, carry out more than 5 cases per year and should transfer work immediately to other colleagues if performing less than this level;

    b. the minimum number of patients treated by a prostate brachytherapy service should be 25 per year within three years of establishment;

    c. a workload of 50-60 cases per year will be needed for long term economic viability.

13. To ensure sufficient throughput of cases to maintain expertise it is recommended that:

    a. larger networks (>1.5 million population) should have one centre only providing LDR brachytherapy;

    b. smaller networks (<1.5 million population) should work in conjunction with neighbouring networks to ensure acceptable demand.

14. As at January 2006, LDR brachytherapy was provided in 19 NHS centres and 2 independent centres in England. 15 networks did not appear to be providing LDR brachytherapy within their boundaries although they may have had referral protocols in place to facilities outside their boundaries. Some of these networks may already have plans to establish a service and they should do so in consultation with their specialist commissioning group and strategic health authority taking account of the advice in this document.

15. Further research into the effectiveness of brachytherapy is needed. Plans are in progress for a feasibility study of brachytherapy versus radical prostatectomy.

16. The recommendations set out in this framework are summarised at pages 28-30 and the NHS is strongly advised to take these into account as it develops, provides or commissions LDR brachytherapy services.

Purpose of Framework

17. This framework aims to provide strategic health authorities (SHAs), cancer networks, primary care trusts (PCTs) and NHS Trusts in England considering the introduction, or continuation, of low dose rate (LDR) - permanent seed implant - brachytherapy for the treatment of localised prostate cancer with advice on:

    a. patient numbers/optimum activity; and,

    b. expectations in terms of:
        i. staff (including workforce and training issues);
        ii. facilities & equipment;
        iii. quality assurance & audit of outcomes.

18. This document is not intended to be a patient information leaflet. It also assumes that good practice has been followed in terms of providing patients diagnosed with prostate cancer with appropriate information to make an informed choice about treatment options in line with the guidance issued by the National Institute for Health & Clinical Excellence on "Improving Outcomes in Urological Cancers" in September 2002.

19. The uptake of the advice in this framework is not mandatory. However, the NHS is encouraged to take it into account as it develops, provides or commissions LDR brachytherapy services.

20. This document should be read in conjunction with NICE Interventional Procedure Guidance 132: Low dose brachytherapy for localised prostate cancer, which was issued on 27th July 2005.

Background

Prostate Cancer & its treatment

21. Prostate cancer is one of the most common cancers in men accounting for nearly 29,500 new cancer cases diagnosed in England in 2004. It is also the second commonest cause of male cancer death, with around 8,500 deaths annually in England.

22. It tends to affect older men, with the risk rising with age. It is not a single disease entity but comprises a number of different forms, ranging from a small incidental tumour found on biopsy, which may or may not cause any symptoms or shorten life, right through to life-threatening metastatic prostate cancer.

23. The prognosis from prostate cancer is variable and depends on the grade and stage of the tumour. The American Cancer Society estimate that 98% of men survive at least 5 years, 84% survive at least 10 years, and 56% survive at least 15 years. Comparative figures from Cancer Research UK estimate survival to be 80%, 61%, and 49% at these times respectively.

Treatment options for men with localised, early disease

24. Treatment options depend on the stage of the cancer. Current treatments for early, localised prostate cancer (T1 to T2 tumours) include active monitoring (AM or watchful waiting), radical prostatectomy, radiotherapy (external beam or brachytherapy). Metastatic prostate cancer is usually treated with hormone therapy.

Active monitoring/active surveillance

25. The intention of active monitoring, otherwise known as active surveillance, is to target curative treatment only to those men who stand to benefit. Men with early prostate cancer are closely monitored with frequent Prostate Specific Antigen (PSA) tests with or without repeat prostate biopsies. Those with early signs of progression in terms of the rate of rise of PSA, or adverse features on repeat biopsy, receive curative treatment (surgery or radiotherapy). The remainder, in whom the PSA does not rise significantly, and who do not have adverse features on repeat biopsy, continue to be observed, and so avoid the risk of treatment-related adverse effects. The main advantage of active monitoring is that there are no immediate side effects, and many men never need treatment. On the other hand, it is too early to say whether active monitoring with selective curative treatment will be as effective as immediate treatment for all.

Surgery (radical prostatectomy)

26. Radical prostatectomy is an operation which involves removal of the prostate and some, or all, of the seminal vesicals. The intention of the operation is to remove the cancer completely whilst preserving urinary continence. Where possible, erectile function is preserved using a nerve sparing approach. The operation is usually undertaken through an open lower abdominal incision, although there is gathering expertise in the use of laparoscopic prostatectomy using standard laparoscopic methods and robot assisted approaches. The true outcome, including data on morbidity and cost of laparoscopic techniques has not been tested in randomised trials.

27. Level 1 evidence for the effectiveness of radical prostatectomy as a means of cure is limited and most of the existing published data is from case series. A single large long term randomised controlled trial from Scandinavia has shown that radical prostatectomy improves life expectancy compared with monitoring in an unscreened population. Data from randomised trials of screening and treatment of screened populations with radical surgery (and radiotherapy) are awaited.

28. The operation is safe, but there are small risks of complications, such as bleeding and infection. Death from radical prostatectomy is an uncommon event (< 1 in 1000). The rate of post-operative urinary incontinence is approximately 10% although this takes the form of minor stress leakage during coughing or straining in most men. Major incontinence occurs in < 1% overall.

29. The risk of erectile dysfunction post operatively depends on whether or not nerve sparing is possible and / or appropriate during surgery. Where nerve sparing is not possible, erectile dysfunction is usually inevitable. Where one of the two nerve bundles is spared, erectile function is present post-operatively in 20 – 35% and where bilateral nerve preservation is possible, 60 – 80% of men will have preserved erectile function. If erectile dysfunction is present pre-operatively, it will usually be exacerbated by surgery.

30. Microscopic analysis of the margins of the tumour following removal show that a proportion of men will have microscopic evidence of tumour at the margin (margin positivity). Approximately 50 – 60% of men with positive margins will ultimately show evidence of biochemical and / or clinical disease progression and may require additional treatment. The rate of margin positivity varies considerably in reported series and databases. Interpretation of these data is difficult because of case selection and reporting bias but the overall figure from general large population databases is in the region of 40%. For those men who have persistently raised PSA following surgery or who subsequently develop biochemical failure, there is uncertainty as to the best form of treatment. Many will be treated using radiotherapy to the prostate bed.

This treatment is to be evaluated in a large scale National Cancer Research Institute (NCRI) Trial, The Radicals study, comparing early and delayed radiotherapy with and without hormonal treatment.

Radiotherapy (radical external beam conformal radiotherapy)

31. Radical external beam conformal radiotherapy is a treatment that involves focussing high energy radiation on to the prostate and seminal vesicals. The treatment is administered on an out-patient basis and involves the use of multiple treatments (fractions). The treatment is planned by taking CAT Scan pictures of the prostate and thereafter, treatment is continued for between 3 and 8 weeks depending on the centre and the number and rate of "fractions" that the centre uses in its treatment schedule. Machines administering the treatment, shape the radiation field to the prostate (conformal radiotherapy) in a way which avoids radiation affecting associated structures such as the rectum and bladder. Each individual fraction of treatment takes approximately 10-15 minutes to administer and this usually takes place five times a week for the duration of the therapy. In some circumstances, radiotherapy is preceded by hormonal therapy for a period of three months and for a period of 12 to 24 months thereafter.

32. The main aim of radiotherapy is to destroy the cancer, leave the prostate remaining in place and preserve urinary and sexual function. The treatment has complications, which can be classified as short term and long term. The short term symptoms occur in most men but they usually settle down in the first 3 to 6 months after treatment. They include temporary inflammation / irritation of the bladder or bowel during the treatment. This will usually manifest as an increase in urinary and faecal urgency and frequency. Rectal bleeding may occur and there is a small risk of urinary retention.

33. The risk of major late side effects is 2-3%. These include urinary incontinence, bladder contracture and rectal damage. The incidence of the latter 2 complications is < 1%. The long term risk of impotence following radiotherapy is about 40 to 50%. This effect tends not to occur immediately but becomes manifest between 6 and 24 months after initial radiotherapy. If hormone therapy is used as a therapy adjunct to radiation, erectile dysfunction and loss of libido will usually ensue. This will usually return in the months following cessation of the treatment but some men will experience a permanent loss of erectile function. There is a small increase in the risk of developing cancer in the rectum following radiotherapy.

Brachytherapy

34. Brachytherapy is a form of radiotherapy which involves the insertion of radioactive sources in to the prostate under ultrasound guidance. The rationale for this approach is that: the prostate is left in situ whilst the cancer cells are destroyed; that the local dose of radiation to the prostate is higher than for external beam radiotherapy whilst avoiding higher radiation doses (and thus toxicity) to the adjoining structures; and that the therapy can be administered in a much shorter time scale than conventional external beam radiotherapy. The treatment is described in more detail in paragraphs 51-53.

35. The evidence for efficacy of this treatment is based on large case series, mainly from North America. There is no level one evidence from randomised trials to show the true outcomes although case series report that in low and intermediate risk patients (T1 / 2 Gleason scores 6 or less) this treatment seems to be as effective as radical prostatectomy and external beam radiotherapy in terms of biochemical freedom from treatment failure. Unlike external beam radiotherapy, seed brachytherapy is not appropriate for T3 disease although high dose rate (HDR) brachytherapy is under investigation alone or with external beam treatment in this stage.

36. The main complications are, like external beam radiotherapy, bracketed as short and long term. Because of the relatively short history of this therapy, long term complication data are limited. Short term effects relate predominantly to irritative urinary and rectal symptoms and to retention of urine. Irritative urinary symptoms manifest as urinary frequency as a consequence of the high dose of radiation to the urethra by comparison with that from external beam radiotherapy. Data from the UK national brachytherapy database shows that this occurs in the majority of men within the first three months, settling down in most men within 6 months. A small proportion of men have a persistent increase in their urinary frequency and in irritative sensation in relation to micturition (emptying the bladder).

37. Urinary retention post treatment is a significant problem in men with pre-existing Lower Urinary Tract Symptoms (LUTS). For this reason, men with large prostate volumes (> 50mls on TRUSS – trans-rectal ultrasound scan) and those with high urinary symptom scores are usually excluded from this form of treatment, although sometimes hormone manipulation is used as an adjunctive therapy to decrease the size of the prostate prior to needle implantation. Avoidance of these high risk cases reduces the risk of urinary retention. With these caveats, the incidence of post brachytherapy implant urinary retention is between 4 and 8%. This is usually managed by indwelling urethral catheterisation or intermittent self catheterisation for a period of up to 3 months, by which time, voiding (excretory) function is usually restored. A small number of men will require catheterisation for a longer period. TURP

(trans-urethral resection of the prostate) in this group of men is usually contra-indicated because of the high rate of post trans-urethral resection incontinence. The incidence of urethral / bladder neck stricturing (abnormal narrowing) is <1% in experienced centres.

38. Erectile impotence is also a complication of this therapy. This occurs in approximately 40% of men but it is not usually seen in the early stages. Its onset, like that in external beam radiotherapy, tends to occur from 6 to 24 months following treatment.

Reason for Framework

39. With an ageing population, an increased public awareness of symptoms and increased use of the Prostate Specific Antigen (PSA) blood test it is likely that there will be more cases of prostate cancer picked up at an early stage (localised). Choice of treatment is influenced by a number of factors including the stage of the disease, general health status and co-morbidity of the patient, as well as patient choice. However, as the NICE guidance on Improving Outcomes in Urological Cancers noted, there is no consensus on the optimum form of management for patients with early prostate cancer – some of the treatment options are discussed earlier (see pages 8-12).

40. The role of brachytherapy is expected to increase as a result of earlier diagnosis and patient choice. This form of treatment is likely to be particularly attractive to patients as it removes the need for major surgery and is thought to result in similar, and possibly lower, levels of unwanted side effects such as incontinence and impotence. In addition, early indications are that long term results are as good as for surgery.

41. NICE has been commissioned to produce a clinical guideline on the diagnosis and treatment of prostate cancer. This will address the main treatment modalities for prostate cancer, including brachytherapy, and consider its use in relation to other treatment options for prostate cancer. This should provide some clarity about the optimum form of management for prostate cancer patients. However, these guidelines are not expected to be published until at least November 2007.

42. In the meantime, the reported speed, convenience, favourable toxicity and effectiveness of brachytherapy is leading to increased demand from patients for this form of treatment in advance of the clinical guideline being available. In addition, on 27th July 2005 NICE published Interventional Procedure Guidance on low dose rate brachytherapy for localised prostate cancer, recommending that it is safe enough for routine use in the NHS. More recently, on 24th May 2006 NICE published Interventional Procedure Guidance on high dose rate brachytherapy in combination with external-beam radiotherapy for localised prostate cancer also noting that current evidence on safety and efficacy appeared adequate to support its use in the NHS.

43. NICE's interventional procedure recommendations are likely to lead to even more demand for this procedure from patients. There is therefore a danger of unplanned growth in service provision to meet this demand that might result in:

    a. service development in areas where the caseload is not sufficient to build up the expertise for the team or individuals needed to ensure optimal outcomes for patients (ie relatively small departments in relatively close proximity to each other all planning to offer this service but unable to

maintain expertise with the resulting risk of morbidity and treatment failure and implications for education and training);

b. inequalities in access to this treatment (ie. it is more likely to be introduced in areas with high patient demand – these are likely to be more affluent areas with a more informed patient base).

44. The Department of Health's Prostate Cancer Advisory Group (PCAG), chaired by the National Cancer Director, and its associated Prostate Cancer Treatment Working Group (PCTWG) therefore advised that the Department should issue advice to the NHS about the introduction of this technique in the interim period before clinical guidelines from NICE are available. This idea has been supported by the Department's National Radiotherapy Advisory Group (NRAG).

45. This framework is the resulting advice. It has been based on professional consensus and is supported by the Royal College of Radiologists.

46. Sources of funding for brachytherapy are not addressed in this document.

What the Framework covers

47. Brachytherapy is a method of delivering radiation to cancers by placing radioactive seeds either into the cancer or very close to it. It is used for the treatment of a number of tumours including prostate, lung, breast, cervical and head & neck cancers. It can be used either as radical local treatment or as a boost after radical external beam radiation or sometimes for salvage after failure of external beam radiation.

48. This framework focuses exclusively on the use of brachytherapy for the treatment of localised prostate cancer.

49. There are two types of brachytherapy for the treatment of localised prostate cancer:

    a. ***Low dose rate (LDR) brachytherapy*** –this is permanent seed implant brachytherapy involving the injection of approximately 100 radioactive seeds into the prostate gland with the guidance of transrectal ultrasound. These seeds give off their radiation gradually at a low dose rate over several months and remain in the prostate permanently;

    b. ***High dose rate (HDR) brachytherapy*** – the implantation of thin, plastic catheters into the prostate gland and the insertion of an Iridium 192 source into each catheter in turn for a short period of time using a remote afterloading system. The total dose is usually given in two or three separate fractions over a two day period. These implants are then removed at the end of treatment.

50. As noted at paragraph 42, NICE has published Interventional Procedure Guidance on low dose rate brachytherapy for localised prostate cancer and on high dose rate brachytherapy in combination with external-beam radiotherapy for localised prostate cancer. It has recommended that for both procedures current evidence on safety and efficacy appears adequate to support their use in the NHS. However, as it is estimated that over 90% of prostate brachytherapy in England is performed using LDR brachytherapy, ***this framework concentrates on LDR brachytherapy for localised prostate cancer only.***

Low Dose Rate (LDR) - Permanent Seed Implant - Brachytherapy

The process

51. LDR brachytherapy can be carried out as a single or a two stage process. The two stage process involves:

    a. ***prostate volume study*** – this is performed about 3 to 6 weeks before the implant to assess the size and shape of the prostate gland and determine whether or not this treatment is technically possible. A transrectal ultrasound unit is used to take several images of the prostate gland - these images provide a 3 dimensional model of the prostate gland which is used to determine the number of iodine seeds needed to treat the prostate and exactly where they should be placed. It is usually carried out under general anaesthetic. Bowel cleansing is required prior to the prostate volume study for adequate imaging. If the gland is too large to implant, it may be necessary for a patient to receive hormone therapy for 3 to 6 months to reduce the size of the gland – a repeat prostate volume study would then be performed after 3 months to check if the gland had shrunk sufficiently to be implanted;

    b. ***prostate implant*** – the patient is usually admitted to hospital the day before, or on, the morning of the prostate implant. Bowel preparation is given and the implant is performed in the operating theatre under general or spinal anaesthetic. It usually takes 1 to 2 hours. Seeds can be preloaded into needles which are inserted into the prostate gland through the skin between the scrotum and anus (perineum) – the needles are imaged with ultrasound and guided to their final position. Alternatively, a radiotherapy after-loading system may be used which does not require preloading of seeds – empty needles or catheters are inserted into the prostate gland under ultrasound; when they are in the final position they are connected to a device which loads them with seeds then withdraws the needle, leaving the seeds in place. After the implant, antibiotics are prescribed to prevent infection. Most patients go home the day after the procedure but some leave hospital as soon as they have recovered from the anaesthetic.

52. Provided the prostate volume is known, planning and implantation can be done in a single stage with the plan produced whilst the patient is under general anaesthetic. This eliminates the requirement for repositioning the patient between the two stages. However, it may initially take longer in the theatre and require more interaction and workforce when a team moves from the two stage to the single stage process.

53. Follow up usually starts 4 to 6 weeks after the implant with a routine CT scan to monitor the quality of the positioning of the implants and is followed by an

appointment every 3 months for the first year followed by 6 monthly visits for the next four years to check treatment progress – largely by means of monitoring of the PSA level. After five years progress is then assessed annually by PSA test.

Facilities/equipment needed to provide brachytherapy

54. Brachytherapy can only be performed in a suitable area at a centre licensed to handle radioactive material and to carry out brachytherapy. The room in which the radioactive material is handled has to be specially designated for this purpose. Oncologists responsible for the treatment, along with the supporting facilities are regulated under the Medicines (Administration of Radioactive Substances) Regulations Act 1978. In practice this means that brachytherapy can only take place at one of the 51 radiotherapy centres in England or in private centres specifically licensed for this purpose.

55. To achieve high quality implants, image guided placement of the implants is key. The minimum requirements are:

    a. interactive transrectal ultrasound with template software;
    b. a stepping unit;
    c. seed planning/dosimetry software;
    d. shielded needle holder and templates (if two stage process is used);
    e. disposables such as seeds and stabilisation & implant needles.

56. In addition it is useful to have in the operating theatre:

    a. an x-ray image intensifier - to verify the correct placement of the seeds;
    b. cystoscopy equipment - to ensure that no seeds are left within the urinary tract.

57. The surgical team should also have access to anaesthesia and sterilisation facilities.

Workforce needed to deliver a brachytherapy service incl. training needs

58. NICE's interventional overview on LDR brachytherapy recommends that brachytherapy should be planned and performed by a multidisciplinary team. It is strongly advised that these teams are part of the prostate specialist multi-disciplinary team(s) (SMDTs) being set up to implement the NICE guidance on Improving Outcomes in Urological Cancers.

59. Such a team will need a number of skills and competencies to achieve satisfactory brachytherapy including:

    a. expertise in prostate ultrasound for planning and treatment;

b. brachytherapy dosimetry and treatment planning;
c. implantation skills and knowledge and experience in delivery of radiation;
d. communication skills, including the input of specialist nurses, to ensure appropriate support for patients and their families.

60. It is recommended that members of a team carrying out prostate brachytherapy should include:

a. clinical oncologists trained in brachytherapy for prostate cancer (at least two - for holiday cover etc);
b. a urologist and/or radiologist (at least two - for holiday cover etc, ie. 2 urologists or 2 radiologists or a urologist and a radiologist);
c. physicists (at least two - for holiday cover etc);
d. anaesthetist.

61. Either the urologist, clinical oncologist or radiologist should have been trained in prostate ultrasound.

62. Nurses, physicists, technicians (depending on local circumstances) and radiographers are also important to the team and need to become involved in planning the services. This should include ensuring that men receive appropriate support eg. from the specialist nurses, radiographers etc.

63. Outcomes may be highly operator dependent and training in the technique will be required for the team along with a programme of continuing professional development. For example, the team:

a. should participate in a prostate brachytherapy training course and attend at least one implantation procedure before starting their own programme;

b. have one or more mentors (people experienced in the different disciplines of prostate brachytherapy) present during the first one or two procedures;

c. should be offered continuing medical education (CME) in prostate brachytherapy.

In addition, clinical oncologists, radiographers and physicists with a designated interest in prostate brachytherapy should be encouraged and adequately resourced to attend educational courses and meetings on brachytherapy as part of a co-ordinated programme of continuing professional development.

Estimated cost of introducing and running a brachytherapy service (at 2005 prices)

64. The capital costs of setting up a seed implant programme are likely to be around £85,500-95,500. This would include:

    a. Transrectal ultrasound machine with probe suitable for brachytherapy (not all machines are suitable): £45 – 50,000;
    b. Software programme for seed planning/dosimetry: £25,000. Fully integrated commercial systems can be purchased for more, and are likely to include maintenance agreements;
    c. Stepping Unit: £15 – 20,000;
    d. Shielded needle holder and templates: £5 – 600 (for two stage process).

65. The overall price assumes that there is an image intensifier available in the operating theatre.

66. The revenue costs of setting up a seed implant programme include:

    a. Disposable (consumable) costs – these may vary a little but are essentially fixed per patient. They are estimated at around:
        i. Iodine Seeds: £3,000 per patient;
        ii. Implant needles: £200 per patient.
    b. Service contracts on equipment;
    c. Staff costs.

67. It is difficult to work out the national costs of this treatment, but on the assumption that 65% of new prostate cases (19,175) have localised disease and 25% of those (4,794) undergo brachytherapy – the cost of disposables would be around £15.3 million for England per annum.

68. The unit cost (calculated from capital and revenue) will depend on the number of patients per year and the amortisation of the equipment.

69. It is important to note that if a patient were not receiving LDR brachytherapy they would almost certainly be receiving another form of radical treatment probably prostatectomy or radical radiotherapy of equivalent cost. Active surveillance for patients with low risk disease represents a real alternative but is unlikely to be chosen by patients seeking a radical intervention.

70. It should also be noted that provision of brachytherapy may provide some scope to free up linear accelerator time for use on other cancer patients. It might also provide some cost savings in terms of a reduction in hospital and operating costs and possibly reduced complications compared to standard external beam radiation treatment, but this has not been proven.

Quality assurance (including audit of outcomes)

71. It is important to measure implant quality and post implant dosimetry (which requires access to CT scanning) from the outset so that the team can learn quickly from experience how to achieve consistent implant quality. To do this, teams would need to ensure that they collected relevant information on patients' cases including:

    a. volume implanted;
    b. number of seeds;
    c. number of needles used;
    d. total activity implanted;
    e. prescribed dose;
    f. D90 (dose that covers 90% of the prostate volume as defined from post implant imaging);
    g. V100 (percentage of the prostate volume that has received the prescribed dose);
    h. V150 (volume that has received 50% more than the prescribed dose);
    i. Indication of rectal and urethal doses.

72. This information should be used to carry out local audits on:

    a. patient selection;
    b. radiotherapy planning parameters;
    c. cancer control;
    d. outcomes including urinary, sexual and bowel functions; and, where appropriate,
    e. quality of life issues.

73. If all centres collected this information it would also be possible to have a national clinical audit looking at comparisons such as:

    a. patient selection and treatment outcomes in existing and new centres in England;
    b. patient selection with agreed European and American guidelines;
    c. UK implant quality based on defined planning parameters for prostate brachytherapy with European and American guidelines;
    d. initial morbidity (in terms of urinary, sexual and bowel functions) in an England population with those quoted in the literature;
    e. biochemical outcome in an England population with those quoted in the literature.

74. Centres whose results were outwith the majority would be easily identified and the information would allow them to examine their performance in detail and instigate appropriate action thus improving patient care.

75. A voluntary brachytherapy audit for England was started a few years ago, co-ordinated by the Christie Hospital in Manchester. It was estimated that this captured data on around 40% of prostate brachytherapy given and included data from 3 of the larger brachytherapy centres in England (Manchester, Leeds and Mount Vernon). However, it is unclear whether this audit will continue. It is therefore suggested that a national clinical audit for urological cancers (along the same lines as LUCADA and DAHNO audits that have been established for lung and head & neck cancers respectively) including brachytherapy is set up. BAUS and DH should pursue this with the Healthcare Commission which has responsibility for the national clinical audits programme. If and when such an audit is available all teams that carry out, or are planning to carry out, brachytherapy, should submit data to it.

Frequency of provision and future demand

76. There are no figures collected centrally from which to calculate the frequency of current provision of brachytherapy but it is estimated that around 5% of current treatment for localised prostate cancer is brachytherapy.

77. Over the last ten years in the USA the proportion of patients having brachytherapy or surgery for localised prostate cancer have changed from about 10% brachytherapy to between 30-50% brachytherapy. It is likely that a similar shift will be seen in England given NICE's interventional procedure guidance and patient choice, although other factors such as the availability of robotic or laparoscopic prostatectomy, or IMRT radiotherapy techniques will also affect patient choices. The popularity (or otherwise) of active surveillance will also be a factor influencing future demand for brachytherapy.

Optimum activity to serve identified populations

78. This will be an evolving situation. A prostate brachytherapy workload in the region of 50-60 cases per annum will be needed for long term economic viability. However, in the interim, to maintain expertise and experience the minimum number of patients treated by a LDR brachytherapy team should be at least 25 per annum after the first three years of establishment of a service.

79. It is recommended that, in line with the NICE Improving Outcomes Guidance for Urological Cancers for radical prostatectomies, any individual clinician implanting LDR seeds should carry out more than 5 cases per annum and that any individual carrying out 5 or less should make immediate arrangements within their network to pass this work on to more specialised colleagues. Individual caseload review will be needed in centres to ensure this. Procedures carried out as part of private practice can count towards the workload figure although it is strongly recommended that the private service is in line with this framework. *It should be noted that the workload level suggested for*

individuals in this paragraph is an absolute minimum level - it is hoped that individuals will carry out more than the minimum suggested to ensure expertise is maintained.

80. To ensure a sufficient number of cases to maintain expertise it will be necessary for larger networks (around 1.5 million or more) to ensure there is only one centre providing LDR prostate brachytherapy for their population and that smaller networks (less than 1.5 million) work in conjunction with neighbouring networks to ensure acceptable demand.

81. The prostate brachytherapy service might best be placed at the host Trust of the SMDT if this is a radiotherapy centre. However, there may be circumstances where networks might want to place it at another centre for historic, geographic or logistical reasons, for example if the service is already being offered at an alternative centre.

Where LDR Brachytherapy is currently carried out

82. Around January 2006, it was understood that LDR Brachytherapy for localised prostate cancer was provided in about 19 NHS and 2 independent centres in England. There were also 2 centres in Edinburgh and Glasgow but no centres in either Wales or Northern Ireland. The centres in England were:

Centre	***Location***	***Cancer Network***	***Date Set up***	***No. of patients treated (1 Apr 04 - 31 Mar 05)***
Cookridge Hospital	Leeds	Yorkshire	1995	177
Mount Vernon Cancer Centre	Middlesex	Mount Vernon	1998	50
Royal Free Hospital	London	North London	1998	22
St. Luke's Cancer Centre	Guildford	Surrey, West Sussex and Hampshire	1999	145
St Mary's*	London	Independent	1999	12
Northern Centre for Cancer Treatment	Newcastle	Northern	2000	15
Christie Hospital	Manchester	Greater Manchester and Cheshire	2000	108
Northampton General Hospital	Northampton	Leicestershire, Northampton and Rutland	2002	25
Southend Hospital	Westcliff-on-Sea	South Essex	2002	30
Guy's & St.Thomas' Hospital	London	South East London	2003	50
Royal Berkshire & Battles Hospital NHS Trust	Reading	Thames Valley	2003	50
Gloucestershire Hospitals NHS Trust	Cheltenham	Three Counties	2003	13
Royal United Hospitals	Bath	Avon, Somerset & Wiltshire	2004	5
Addenbrookes	Cambridge	West Anglia	2004	1
Clatterbridge	Wirral	Merseyside & Cheshire	2005	0
Mid Kent Oncology Centre	Kent	Kent & Medway	2005	Not requested
St Mary's	Portsmouth	Central South Coast	2006	Not requested
Queen Elizabeth,	Birmingham	North West Midland/ Black Country	2006	Not requested
Royal Marsden	London	South West London	2006	Not requested

* St Mary's, London originally provided a private service but is now understood to treat NHS patients.

83. In addition, there were at least 2 independent centres offering this service:

Centre	***Location***	***Cancer Network***	***Date Set up***	***No. of patients treated (1 Apr 04 - 31 Mar 05)***
Princess Grace Hospital	London	N/A (independent provider)	unknown	Unknown
Leeds Nuffield	Leeds	Independent	2001	49

84. The following map sets out the known locations of NHS and independent LDR brachytherapy centres in the UK at December 2005/January 2006:


NHS
UK Brachytherapy Centres (2005)
Providing Permanent Seed Service for Prostate Cancer
NORTH SEA
IRISH SEA
ENGLISH CHANNEL

85. In January 2006 there appeared to be 15 cancer networks without an LDR prostate brachytherapy provider within their boundary although they may have had referral protocols to other networks providing this service. These were:

    a. Lancashire & South Cumbria
    b. Teesside,South Durham and North Yorkshire
    c. Humber and Yorkshire Coast
    d. North Trent
    e. Pan Birmingham
    f. Arden
    g. Mid Trent
    h. Derby/Burton
    i. Norfolk and Waveney
    j. Mid Anglia
    k. West London
    l. North East London
    m. Peninsula
    n. Dorset
    o. Sussex

86. Some of these networks may now have established LDR prostate brachytherapy centres or have plans to do so. Either way, they are encouraged to develop any plans in consultation with their Specialist Commissioning Group and SHA taking the advice in this document into account. Those networks with existing centres are also encouraged to ensure that their services are in line with this framework.

87. Those networks with no current plans need to consider how to ensure that LDR prostate brachytherapy is available as an option for appropriate patients. Networks with populations of less than 1.5 million should consider this with their neighbouring networks. When considering provision, networks should take the following into account:

    a. current and likely future demand for the service in the network and the availability of, or demand for, a similar service in adjacent network(s);
    b. the number of patients needed to maintain expertise (25 p.a within 3 years of a service being established);
    c. cost-effectiveness;
    d. the place of such a service in the research and development of brachytherapy;
    e. patient representatives have indicated that patients with prostate cancer would prefer to travel further to receive treatments from centres of excellence.

Research & Development

88. No randomised control trial (RCT) has to date been conducted to assess the use of brachytherapy compared to other treatments such as conventional radiotherapy, conformal radiotherapy or radical prostatectomy. NICE guidance on Improving Outcomes in Urological Cancers recommended that a large scale national or internationally co-ordinated research project was needed to assess the effectiveness of brachytherapy for localised prostate cancer. As a result, DH provided around £900k funding for men to take part in the *SPIRIT* trial – an international RCT comparing brachytherapy with radical surgery.

89. Unfortunately, this trial folded in April 2004 because of poor recruitment to the American arm. There is currently no RCT for brachytherapy for men in the UK and there is unlikely to be anything similar established in the near future in which to enrol UK patients. However, DH is considering how best to use the funding previously earmarked for the SPIRIT trial to further the knowledge and clinical application of brachytherapy. Plans are in progress for a feasibility study of brachytherapy versus radical prostatectomy (SABRE – Surgery Against Brachytherapy Randomised Evaluation). If it is possible to establish a clinical trial involving brachytherapy then networks would be encouraged to enrol all appropriate patients in it.

Summary of Recommendations

90. The Prostate Cancer Advisory Group, supported by the National Radiotherapy Advisory Group recommends that:

    a. Each cancer network has procedures in place to refer appropriate patients with localised prostate cancer to facilities offering LDR prostate brachytherapy either within or outside their network.

    b. Networks ensure that existing LDR brachytherapy facilities/services in their boundaries are in line with this framework.

    c. Networks planning to establish an LDR prostate brachytherapy facility develop these plans in consultation with their Specialist Commissioning Group (SCG) and SHA taking into account the advice in this document.

Location

    d. Networks need to consider in collaboration with their SCG and SHA (and with their neighbouring networks where their population is less than 1.5 million) how to ensure that prostate brachytherapy is available as an option for appropriate patients if it is not already.

    e. Brachytherapy should only be carried out in centres licensed to handle radioactive material. In practice this means that brachytherapy should take place at one of the 51 radiotherapy centres in England or in private centres specifically licensed for this purpose.

Multi-disciplinary teams

    f. LDR prostate brachytherapy within the network should be planned and managed by a team that is part of a prostate specialist multi-disciplinary team being set up to implement the NICE guidance on Improving Outcomes in Urological Cancers.

Optimum activity to serve identified populations

    g. No individual urologist/clinical oncologist should carry out five or less LDR prostate brachytherapy procedures per annum. Any individual carrying out 5 or less should make immediate arrangements within their network to pass this work on to more specialised colleagues.

    h. To maintain expertise and experience the absolute minimum number of patients treated by a LDR brachytherapy team should be 25 per annum within the first three years of establishment of a service – in the longer term teams should be aiming for a workload of 50-60 cases per annum.

Facilities/equipment

i. The minimum requirements to provide an LDR brachytherapy service are:

   i. interactive transrectal ultrasound with template software;
   ii. a stepping unit;
   iii. seed planning/dosimetry software;
   iv. shielded needle holder and templates (for 2 stage process);
   v. disposables such as seeds and stabilisation & implant needles.

Workforce

j. Members of a team carrying out prostate brachytherapy should include:

   i. clinical oncologists trained in brachytherapy for prostate cancer (at least 2 - to cover holidays etc);
   ii. urologist and/or radiologist (at least 2 – to cover holidays etc, ie. 2 urologists or 2 radiologists or a urologist and a radiologist);
   iii. physicists (at least 2 - for holiday cover etc);
   iv. anaesthetist.

k. Either the urologist, clinical oncologist or radiologist should have ultrasound skills.

l. Nurses, physicists, technicians (depending on local circumstances) and radiographers are important to the team and need to be involved in planning the service.

Training & Development

m. The team:

   i. should participate in a prostate brachytherapy training course and attend at least one implantation procedure before starting their own programme;
   ii. have one or more mentors (people experienced in the different disciplines of prostate brachytherapy) present during the first one or two procedures;
   iii. should be offered continuing medical education (CME) in prostate brachytherapy.

n. Clinical oncologists, radiographers and physicists with a designated interest in prostate brachytherapy should be encouraged and adequately resourced to attend educational courses and meetings on brachytherapy as

part of a co-ordinated programme of continuing professional development.

Audit

o. Providers should measure post implant dosimetry so that the surgical team can learn from experience and achieve consistent implant quality.

p. All providers of the technique (both new and existing) should audit outcomes.

q. DH and BAUS should liaise with the Healthcare Commission to encourage a national clinical audit for urological cancers including brachytherapy.

r. If and when a national audit is available all teams that carry out, or are planning to carry out, brachytherapy, should submit data to it.

Research & Development

s. Networks are encouraged to enrol all appropriate patients in a national clinical trial involving brachytherapy if one is established in the future.

Maintaining quality

t. The Cancer Action Team should work with the NHS to produce measures on brachytherapy in general (ie. not prostate specific) for inclusion in the Manual for Cancer Services against which cancer networks can self assess or can be peer reviewed.