Economic analysis of care pathways for Prostate Cancer follow up services

A report for Prostate Cancer UK and Transforming Cancer Services Team for London

05 February 2016

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A report submitted by ICF Consulting Services

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Job Number 8999

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Executive summary

Prostate Cancer UK (PCUK) and Transforming Cancer Services Team for London (TCST) commissioned ICF to carry out a short piece of research to analyse the cost of care pathways for prostate cancer. This research examines the costs associated with how support services were provided in South London prior to the introduction of a new care pathway (in February 2015) using funding provided by PCUK's Health and Social Care Professionals programme, and the costs associated with the newly introduced care pathway. Specifically, the aims of the research were to:

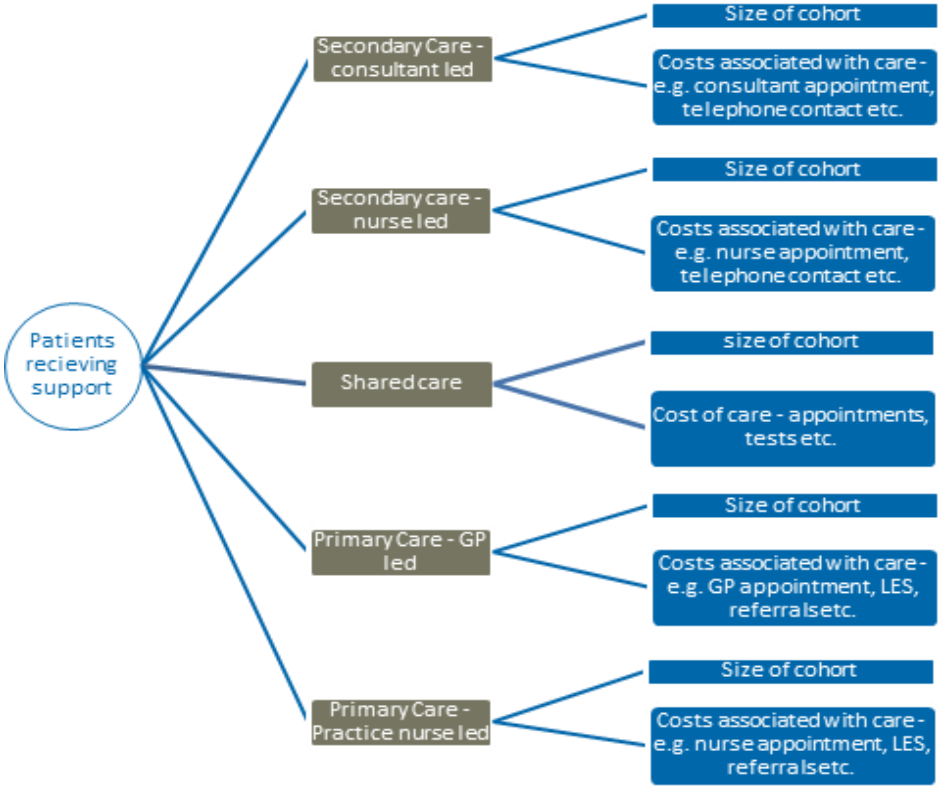
- Undertake financial modelling of existing models of care; and
- Undertake financial modelling of new pathways and models of care.

The analysis focussed on patients with prostate cancer within Croydon registered at GP practices taking part in the Local Incentive Scheme (LIS) for prostate cancer.[1] It examined the costs of providing prostate cancer support over a five year period, as examining costs over a longer period reduces the certainty of the estimates. The resources used to provide the support to prostate cancer patients has been analysed but the outcomes for patients were outside the scope of the study. More details of the approach taken and the results from the analysis are provided in the main body of the report.

Description of the care pathway

Initially this research aimed to estimate the cost of five different care pathways that were in place prior to the introduction of the new LIS (see Figure ES1.1).

Figure ES1.1 Initial outline for research



[1] A Local Incentive Scheme (LIS) is a financial arrangement where GPs are paid a set amount to provide a specific service instead of standard tariff payments.

However, following the research carried out by TCST for London, it became apparent that patients were not receiving their support through five separate care pathways prior to the introduction of the new LIS. There were only two care pathways prior to the introduction of the new LIS. These two care pathways were for patients on 'watchful waiting' and those who are stable for two years after treatment to be supported in either a primary care or secondary care setting. Both pathways involved a combination of nurse and consultant / GP involvement. The basic components of the care pathway were:

- The patient had a PSA test on average twice a year for the first three years of their support programme.[2] This involves attending a phlebotomy clinic or their GP practice to have their blood taken for the test. The patient would then see either their GP in surgery or consultant in secondary care to receive the results of the test.
- After three years of receiving the PSA test on average every six months, patients had a PSA test on average every 12 months, assuming that there were no causes for concern. This test was conducted in the same way as described above.
- If patients were on the primary care pathway and there was a concern about a PSA rise or reoccurrence the primary care clinicians would either request for the patient to be transferred back for secondary care opinion or advice would be sought about management from the secondary care consultant.

The new primary care pathway, introduced with the new LIS, has some similarities to the previous primary care pathway. Patients receiving watchful waiting and those who are stable two years after treatment would still receive the PSA test on average twice a year for the first three years. Again, barring any causes for concern, the frequency of PSA test will revert to once every 12 months after three years of support. The differences between the old and new primary care pathway are:

- Patients receive all their follow up support in primary care. This can either come from the GP or a practice nurse. Therefore when moving from the 'old' to the 'new' primary care pathway there is some substitution of labour from consultant to GP or practice nurse.
- A tailored information pack is sent by the GP practice to patients transferred to the primary care-led pathway from secondary care. The pack outlines what the patient should expect as part of their follow up and reassurance that they will be referred back to acute care as a result from any abnormal tests. The pack also lists red-flag symptoms with a prompt of where to go to get advice as well as a directory of local support services.
- A holistic needs assessment and care plan is carried out in a welcome appointment. This happens when the patient begins receiving support in a primary care setting following discharge from secondary care. This includes referring patients on to other services (both health service and voluntary sector services) which may help them with the problems they have identified. It is hoped that this will help the patients to self-manage both their prostate cancer and any other long term conditions they have. It also aims to reduce the number of primary care and secondary care appointments required for each patient as they have been given information with how to manage conditions. Therefore the 'new' care pathway could improve the quality of care for patients, though this is outside the scope of this study. A separate evaluation study (carried out by TCST) will collect evidence of the impact of the new care pathway on quality of care as well as patient and clinician experience.
- The final element of the new pathway is the maintenance of a prostate cancer register in each GP practice as a requirement of the new LIS helps mitigate against the risk of patients becoming lost to follow up.

[2] This description is based on the average number of appointments each patient receives during their follow up schedule. In practice, care pathways are individualised depending on the patients' treatment and level of risk.

Headline costs of the care pathways

It is early in the implementation of the revised pathway. This limits economic analysis to modelling costs 'as they are likely to be', rather than 'as they are'. Lack of evidence on benefits also restricts analysis. More research is needed to verify these results and to generate further information on the patient benefits.

The headline costs of the different care pathways analysed are presented in Table ES1.2. This shows that the direct healthcare cost per patient is estimated to be over £870 for the secondary care pathway compared to £380 on the new primary care pathway, a saving of 57%. The opportunity cost to patients, carers and employers is also lower on the new primary care pathway (£160) than on the secondary care pathway, a saving of 45%.

The cost of the new primary care pathway per patient is estimated to be £330 per patient, higher than the previous primary care pathway by 25%. This is due to a change in the value of the LIS paid for primary care follow-up of prostate cancer.

All patients who qualified for the new care pathway (to receive watchful waiting support, or have had surgery at least two years ago and have not had any relapse) as of 10 December 2015 have been included in the analysis.

At the time of writing this report, a total of 594 patients with the characteristics to be included on the new primary care pathway were identified by the TCST. Table ES1.1 shows the number of patients receiving support on each care pathway at the start and the end of the project.

Table ES1.1 Number of patients who are eligible for the new care pathway

	Patients receiving secondary care follow-up	Patients receiving primary care follow-up
Start of project	155	439
End of project (as of 10/12/2015)	88	506

TCST data, 10 December 2015

This data was used to estimate the total cost for the entire cohort of the follow up care with and without the introduction of the new primary care pathway. This showed that the total direct cost following the introduction of the new pathway was £244,600, an increase in the direct healthcare costs for the cohort of 3%. However, the opportunity cost to individuals, carers and employers was £122,000 following the introduction of the new primary care pathway, a decrease in cost of 8%. The overall cost of for the cohort following the introduction of the new primary care pathways (£366,600) was estimated to be less than the cost under the old care pathways (£369,400, a 1% decrease).

Table ES1.3 compares the difference in cost between the secondary care pathway, the old primary care pathway and the new primary care pathway. This table includes the opportunity cost to GP practices from the change in labour arrangements under the new care pathway. This cost is not included in the total costs presented in Table ES1.3 to avoid double counting. When the opportunity cost to GP practices is included in the analysis, it is estimated that the new primary care pathway costs less than the secondary care pathway (26% decrease in cost) and the old primary care pathway (12% decrease in cost). This means that the saving across the entire cohort is estimated to be £68,300 (a 12% decrease in cost).

These estimated costs were calculated using the information that 67 patients had been discharged from secondary care onto the new primary care pathway. However, there are a further 88 patients who were identified as being eligible to be discharged from secondary care onto the new primary care pathway. Once these patients are discharged, the cost saving will be much higher.

Table ES1.2 Headline cost of care pathways, five year time period

Pathway	Direct healthcare cost	Opportunity cost to patients, carers and employers	Total cost
Secondary care pathway per patient	£870	£280	£1,150
New primary care pathway for patients discharged from secondary care per patient	£380	£160	£530
Old primary care pathway per patient	£230	£140	£370
New primary care pathway for patients previously receiving support in primary care per patient	£330	£140	£460
Total cohort costs old pathways	*£237,200*	*£132,200*	*£369,400*
Total cohort costs new pathways	*£244,600*	*£122,000*	*£366,600*

ICF calculations. Costs rounded to the nearest £10 per patient, £100 for cohort. This is a summary table with information taken from the more detailed Table 4.1, Table 4.2 and Table 4.3 in the main report.

Table ES1.3 Difference in cost of care pathways, five year period

Pathway	Direct healthcare cost	Opportunity cost to patients, carers and employers	Opportunity cost to GP practices	Total cost
Secondary care pathway to new primary care pathway per patient	£490	£130	(-£320)	£300
Old primary care pathway to new primary care pathway per patient	(-£90)	£0	£200	£110
Total cohort difference in costs	*(-£7,300)*	*£10,200*	*£65,400*	*£68,300*

ICF calculations. Costs rounded to the nearest £10 per patient, £100 for cohort. This is a summary table with information taken from the more detailed Table 4.1, Table 4.2 and Table 4.3 in the main report.

1 Introduction

Prostate Cancer UK (PCUK) and Transforming Cancer Services Team for London (TCST) commissioned ICF to carry out a short piece of research to analyse the cost of care pathways for prostate cancer. This research examines the costs associated with how support services were provided in South London prior to the introduction of a new care pathway (in February 2015) using funding provided by PCUK's Health and Social Care Professionals programme, and the costs associated with the newly introduced care pathway.

1.1 Aims of the research

This research was carried out in parallel to a separate research project which will assess the quality of the care provided to patients on the new care pathway. Therefore the aims of this research were limited to examining the costs of the support provided to prostate cancer patients prior to the introduction of the new Local Incentive Scheme (LIS) and the costs of support provided to prostate cancer patients following the introduction of the new LIS.[3] Specifically, the aims of the research were to:

- Undertake financial modelling of existing models of care; and
- Undertake financial modelling of new pathways and models of care.

The modelling of costs is needed for services provided to patients who are stable. These patients are characterised by having stable Prostate Specific Antigen (PSA) levels, and who have had radical surgery at least two years ago. This follows the approach described in the National Institute of Clinical Excellence (NICE) guidance for Prostate Cancer, which states:

"After at least 2 years (of stable PSA levels after having radical surgery), offer follow-up outside hospital (for example, in primary care)"[4]

These patients are termed as undergoing 'watchful waiting' or 'follow up post treatment'.

In order to achieve the aims of the study, several steps have been taken:

- Identifying the size of the cohort undergoing 'watchful waiting' and 'follow up post treatment' for all current and future care pathways;
- Identifying the costs associated with each of the current 'watchful waiting' and 'follow up post treatment' pathways, and for the future care pathway which will be introduced;
- Undertaking a sensitivity analysis of the costs associated with current pathways of 'watchful waiting' and 'follow up post treatment', the new pathways and models of care; and
- Comparing the costs associated with the current models of care and the new pathway and models of care.

In order to carry out the cost comparison exercise, the following research has taken place:

- Consultations with the TCST to establish the scope of the old and new care pathways and the number of patients;
- A short literature review to find evidence of impacts and cost information; and
- A modelling exercise to estimate the cost of the old and new care pathways.

[3] A Local Incentive Scheme (LIS) is a financial arrangement where GPs are paid a set amount to provide a specific service instead of standard tariff payments.

[4] NICE (2014) NICE Guidelines (CG175) Prostate Cancer: diagnosis and management. Available at: https://www.nice.org.uk/guidance/cg175/chapter/recommendations

1.2 Structure of the report

The rest of the report is structured as follows:

- Section 2 describes the care pathways which will be examined;
- Section 3 describes the methodology and assumptions used to estimate the cost of the care pathways;
- Section 4 presents the results of the estimated cost of the care pathways;
- Section 5 shows the results of the sensitivity carried out on the results; and
- Section 6 discusses the findings and discusses the resources which were required to introduce the new care pathway.

2 Care pathways examined

This section provides a description of the care pathways which are considered in the research. It underpins the methodology and modelling results which follow in the subsequent sections. The care pathways outlined present the activities for which costs are estimated.

2.1 Type of follow up care examined

2.1.1 Watchful waiting

Watchful waiting is a way of monitoring prostate cancer that is not causing any symptoms or problems. The aim of watchful waiting is to monitor the cancer over the long term and avoid treatment in the absence of symptoms. Many men on watchful waiting may never receive any treatment for their prostate cancer.[5]

Prostate cancer is often slow growing and may not cause any problems or symptoms for long periods. Many treatments for prostate cancer can cause significant side effects which can impact on an individual's daily life. Therefore monitoring rather than treatment is appropriate for many patients. Watchful waiting is targeted at patients with other long term conditions, where treatment may cause significant harm to the patient. Therefore the patient will be continuously monitored.

2.1.2 Follow up post treatment

Patients who have had treatment for prostate cancer (for example surgery, radiotherapy or brachytherapy) require regular check-ups after their treatment has been completed. These appointments are referred to as follow up post treatment.[6] The aim is to:

- Check how a patient's cancer has responded to treatment;
- Address any side effects of treatment; and
- Provide an opportunity for the patient to raise any concerns or ask any questions.

Patients who have been monitored for at least two years post treatment and have been identified as stable (their test results show no increased risk of prostate cancer) can access the new care pathway. Therefore these patients have been included in the analysis.

2.2 Care pathway prior to the introduction of the new LIS

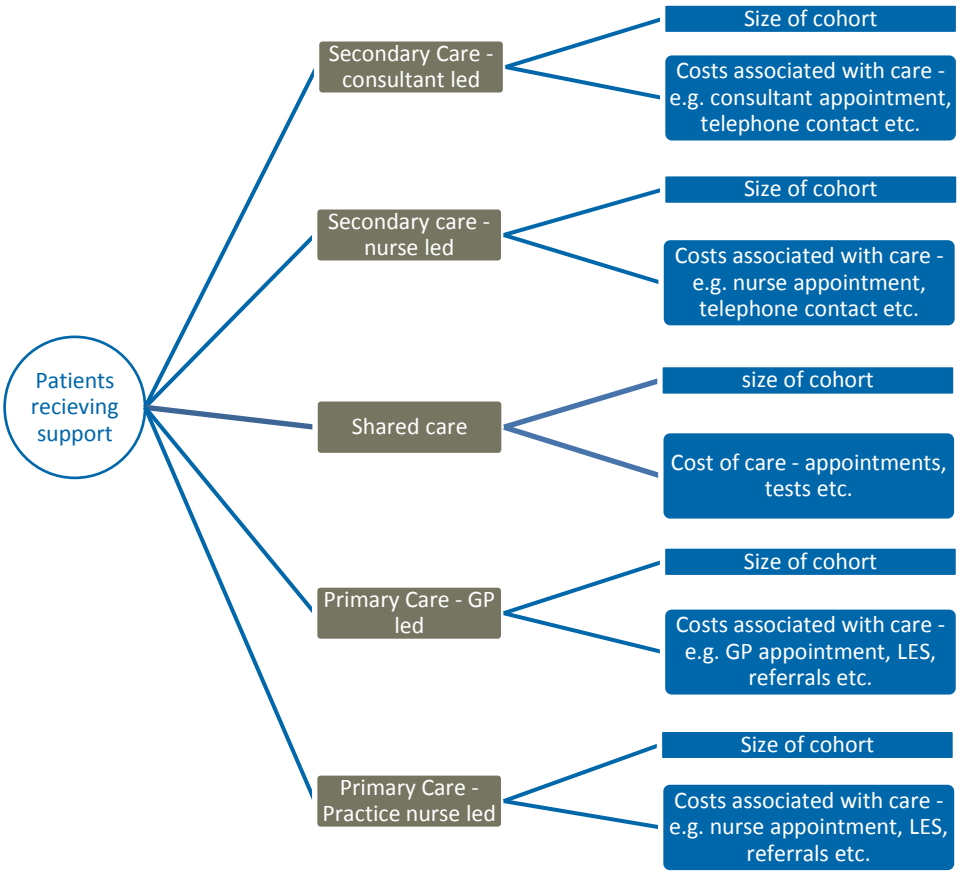
Initially this research aimed to estimate the cost of five different care pathways that were in place prior to the introduction of the new Local Incentive Scheme (LIS).[7] These care pathways are presented in Figure 2.1.

[5] Prostate Cancer UK website, http://prostatecanceruk.org/prostate-information/choosing-a-treatment/

[6] Prostate Cancer UK website, http://prostatecanceruk.org/prostate-information/treatments/follow up-after-treatment

[7] These were: secondary care – consultant led; secondary care – nurse led; shared care; primary care – GP led; and primary care – nurse led.

Figure 2.1 Initial outline for research



However following the research carried out by TCST for London, it became apparent that patients were not receiving their support through five separate care pathways prior to the introduction of the new LIS. There were only two care pathways prior to the introduction of the new LIS. These two care pathways were for patients to receive their support in either a primary care or secondary care setting. The basic components of the care pathway were:[8]

- The patient had a PSA test on average twice a year for the first three years of their support programme. This involves attending a phlebotomy clinic or their GP practice to have their blood taken for the test. The patient would then see either their GP in surgery or consultant in secondary care to receive the results of the test.
- After three years of receiving the PSA test on average every six months, patients had a PSA test on average every 12 months, assuming that there were no causes for concern. This test was conducted in the same way as described above.
- If patients were on the primary care pathway and there was a concern about a PSA rise or reoccurrence the primary care clinicians would either request for the patient to be transferred back for secondary care opinion or advice would be sought about management from the secondary care consultant.

Under the old primary care pathway there was an existing LIS in place. This was paid to primary care providers who were providing support for prostate cancer patients. The LIS was £50 per patient per year. This was to encourage GPs to provide prostate cancer support to patients so that the patient did not have to attend secondary care.

[8] This description is based on the average number of appointments each patient receives during their follow up schedule. In practice, care pathways are individualised depending on the patients' treatment and level of risk.

Prior to the introduction of the new primary care pathway and LIS, patients, GPs and practice nurses who were responsible for providing follow up care reported that they did not fully understand the care pathway.[9] Within the primary care setting there was no robust guidance about how to provide support to patients with prostate cancer issued to GPs, other than what was outlined in the previous Local Incentive Scheme document. This meant that the appointments were not always carried out at the correct intervals (every six months) and additional services were not always recommended to patients.

For each patient receiving support for prostate cancer, there were additional costs to those incurred from the support appointments. There are further primary care appointments for conditions which may be linked to prostate cancer, and costs to the individual, employers and informal carers from attending the support appointments.

2.3 Care pathway following the introduction of the new LIS

The new care pathway, introduced with the new LIS, has some similarities to the previous primary care pathway. The frequency of the PSA test is the same. There may also be additional costs associated with patients attending primary care for conditions linked to prostate cancer and costs to employers and individuals for the time spent attending the appointments. The differences between the old and new care pathway are:

- Patients receive all their follow up support in primary care. This can either come from the GP or a practice nurse. Therefore when moving from the 'old' to the 'new' primary care pathway there is some substitution of labour from consultant to GP or practice nurse.
- A holistic needs assessment and care plan is carried out in a welcome appointment. This happens when the patient begins receiving support in a primary care setting having previously received support in secondary care.

When the patient is discharged from secondary care and begins receiving support in primary care, the secondary care practitioner will provide patient specific information to the primary care practitioner. A letter including information on the patient's treatment and how frequently to carry out the PSA test is sent to the patient's GP practice.

Each primary care practice receives a guidance pack on how to provide support for patients receiving watchful waiting and follow up post treatment support. The guidance pack was produced by TCST. This includes a clinical template to follow to ensure all relevant information is covered in the consultation and training for practice nurses so that they can carry out the welcome appointment and the prostate cancer consultation (following the template).

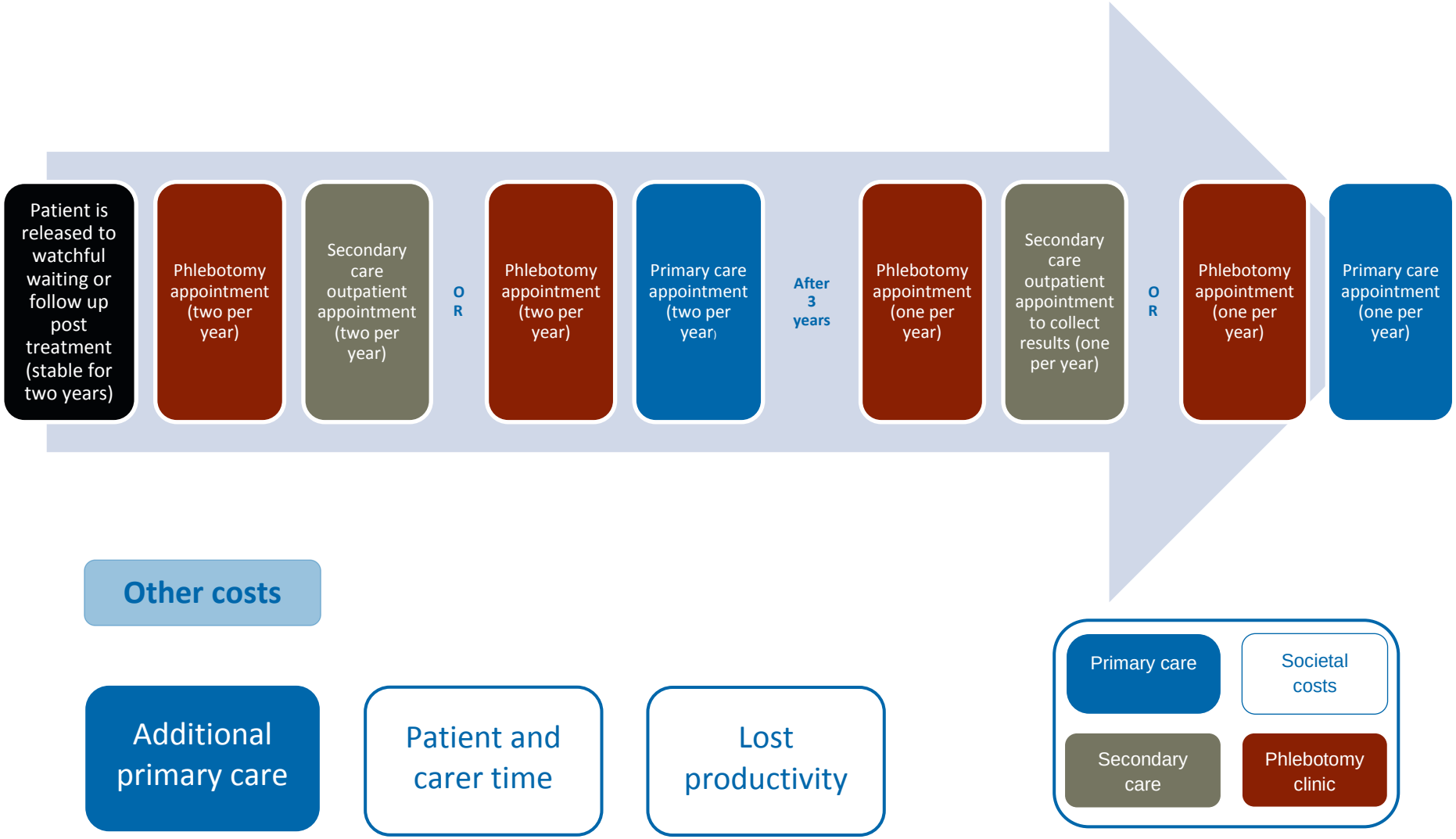
The holistic needs assessment and care plan involves the patient receiving a holistic needs assessment form prior to attending their appointment at the practice. This covers any physical, practical or relationship concerns they have. The patient either completes this form prior to, or at the start of, the welcome appointment. The practice nurse then uses this form to provide information and guidance to the patient. This includes referring patients on to other services (both health service and voluntary sector services) which may help them with the problems they have identified. It is hoped that this will help the patients to self-manage both their prostate cancer and any other long term conditions they have. It also aims to reduce the number of primary care and secondary care appointments required for each patient as they have been given information with how to manage conditions.

The final element of the new pathway is the maintenance of a prostate cancer register in each GP practice as a requirement of the new LIS helps mitigate against the risk of patients becoming lost to follow up.

A simplified version of the two care pathways is provided in Figure 2.2 and Figure 2.3 below.

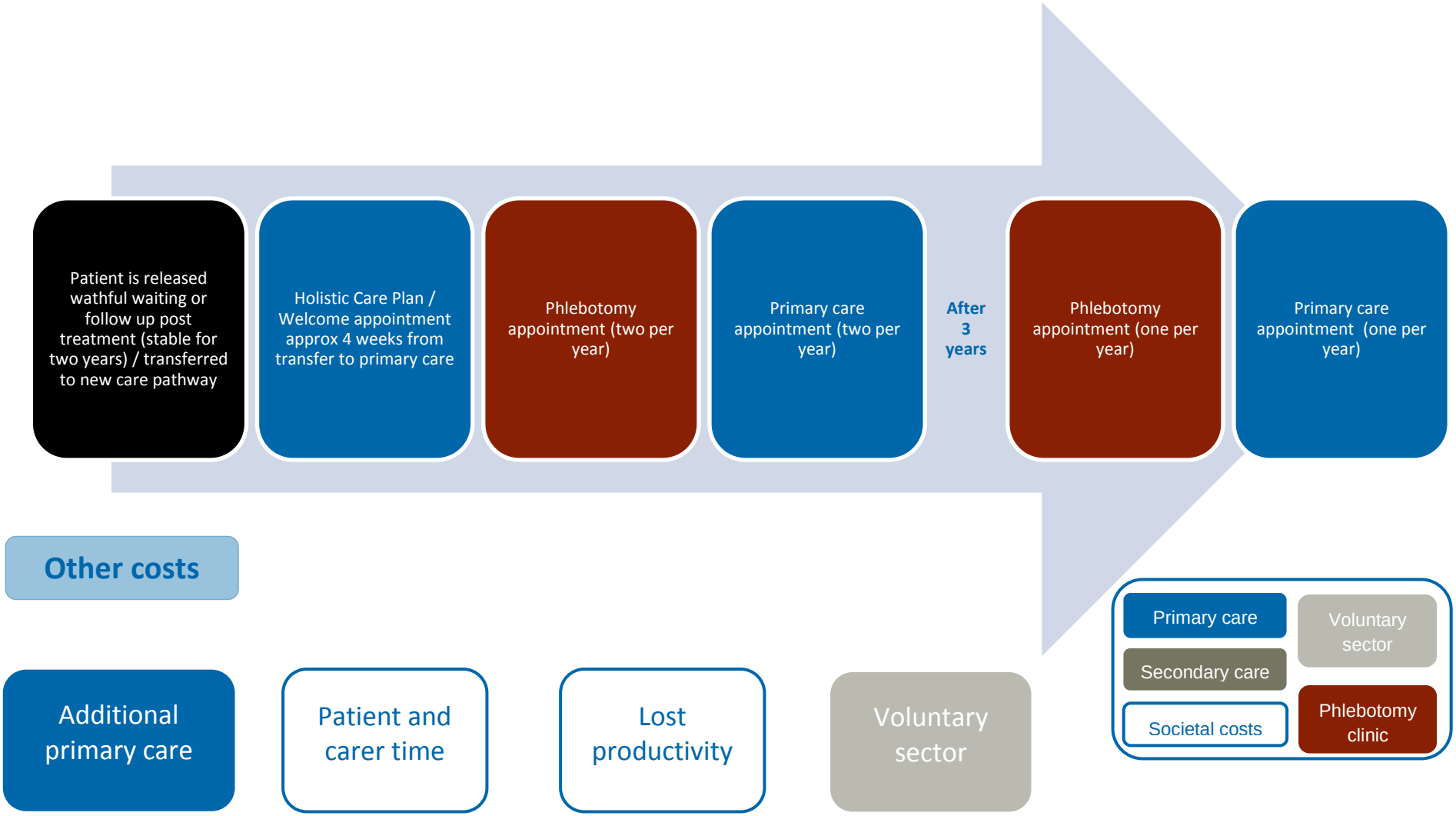
[9] Findings from discussions with TCST staff.

Figure 2.2 Previous care pathway for watchful waiting and follow up post treatment[10]



[10] This diagram depicts the average number of appointments each patient receives during their follow up schedule. In practice, care pathways are individualised depending on the patients' treatment and level of risk.

Figure 2.3 New care pathway for watchful waiting and follow up post treatment[11]



[11] This diagram depicts the average number of appointments each patient receives during their follow up schedule. In practice, care pathways are individualised depending on the patients' treatment and level of risk.

3 Methodology for the cost comparison

This section sets out the methodology which has been used to estimate the cost of the care pathways for prostate cancer support which have been analysed. It is important to note that this is a cost comparison of providing the care pathways. It does not include an assessment of the cost of moving between the care pathways (for example the designing of the care pathway, the employment of staff using PCUK funds, the identification of patients who are eligible for the new pathway and the training provided to primary care staff). These costs have been significant.

It is still early in the implementation of the revised pathway. This limits economic analysis to modelling costs 'as they are likely to be', rather than 'as they are'. More research is needed to verify these results and to generate further information on the patient benefits resulting.

3.1 Scope of the analysis

The scope of the analysis is as follows:

Geography: Patients with prostate cancer within Croydon have been included in the analysis. Additionally, only patients from the GP practices who have signed up to the new LIS have been included. This is because the data for the number of patients receiving support for prostate cancer is only available for those practices participating in the LIS.

Time: All patients who qualified for the new care pathway (to receive watchful waiting support, or have had surgery at least two years ago and have not had any relapse) as of 10 December 2015 have been included in the analysis. The analysis has been extended over a five year period. This timeframe has been chosen as after five years the frequency of patient follow up is reviewed, therefore examining costs over a longer period reduces the certainty of the estimates.

Costs: The analysis includes the costs to the health service, the costs to patients and carers and to employers. However as stated above, the cost of moving between care pathways is not included in the analysis.

The review of literature on the impact of having follow up support in primary care on additional primary care appointments was inconclusive. Some studies suggested a decrease in other primary care appointments; others suggested an increase in awareness of other issues led to an increase in other primary care appointments (for example Ahmad et al., 2014).[12] As the evidence was inconclusive, the additional primary care costs have been excluded from the analysis. There is also not enough evidence to estimate the effect of the new care pathway on voluntary services, which has also been excluded from the analysis. Therefore, the healthcare costs included are the costs associated with providing the support in a primary and secondary care setting.

The opportunity costs of the care pathways are the value of an alternative that must be given up in order to follow an action. The opportunity costs included are patient and carer travel and waiting time (and the cost to employers of this time for employed patients and carers), and opportunity costs to GP practices due to the substitution of labour from GP to practice nurse.

Both direct and opportunity costs are included in the analysis. Direct costs are those which have to be paid for by commissioning services (for example paying for appointments). Opportunity costs are costs incurred which are not directly paid for but are incurred on the care pathway.

[12] Ahmad, N., Ellins, J., Krelle, H. et al (2014) Person-centred care: from ideas to action, *Health Foundation*

3.2 Approach to measuring direct healthcare costs

This section presents the methodology and assumptions used for the different types of primary and secondary care appointments. These unit costs are multiplied by the number of appointments per year and discounted over time to estimate the total direct healthcare costs associated with each of the pathways. Section 4 presents more details on the results of the estimations.

3.2.1 Size of cohort

Data presenting the size of the cohort being analysed was collected by the TCST staff. The data were collected by the staff visiting the GP practices which are participating in the new LIS and accessing their patient records. The staff examined the records to identify patients who were receiving follow up support either in primary care or secondary care. A total of 1,797 patients with prostate cancer were identified, of which 594 were eligible for the new primary care pathway.[13] Table 3.1 shows the number of patients receiving support on each care pathway at the start and the end of the project.

Table 3.1 Number of patients who are eligible for the new primary care pathway

	Patients receiving secondary care follow-up	Patients receiving primary care follow-up
Start of project	155	439
End of project (as of 10/12/2015)	88	506

TCST data, 10 December 2015

3.2.2 Secondary care costs

Direct healthcare costs for secondary care result from the resources spent on follow up hospital appointments.

The management information provided by TCST and Croydon CCG gives the cost of a hospital follow up appointment as £85.[14] This unit cost is multiplied by the number of appointments for support to estimate the total secondary care cost.

3.2.2.1 Cost of hospital transportation for secondary care follow up

For patients that cannot travel to these appointments on their own, a hospital transportation cost has been calculated. This was calculated in the following way:

1. It is assumed that the proportion of patients requiring hospital transportation is half of all patients receiving their support in secondary care. This is based on the Unit Cost of Health and Social Care (2006)[15] which estimates that approximately a half of all eligible patients are likely to require this service;

[13] Data collected on 10/12/2015.

[14] This is the cost for a "Follow Up Attendance – Single Professional" (WF01A) in Urology, taken from NHS tariff information. The value of the follow up attendance includes an adjustment for Market Factor Forces (MFF) for the three secondary care providers (Croydon University Hospital, St. Georges and Royal Marsden) which provide follow up care to patients in Croydon. The mean of these three values has been used as the cost of a hospital follow up appointment.

[15] PSSRU (2006) The Unit Cost of Health and Social Care 2006; available at: http://www.pssru.ac.uk/pdf/uc/uc2006/uc2006.pdf

2. The cost of hospital transportation was identified from the same source. The PSSRU report estimates the unit cost of hospital transportation to be approximately £60;[16]
3. The proportion of patients requiring hospital transportation was multiplied by its unit cost, which resulted into a hospital transport cost of about £30 per appointment.

The formula below shows the total cost to secondary care per appointment, including the appointment cost and transportation cost:

$$Unit\ cost\ of\ secondary\ care\ appointment = UC_H + (P_{HT} * UC_{HT})$$

$$UC_H - unit\ cost\ per\ hospital\ appointment$$

$$P_{HT} - proportion\ of\ patients\ requiring\ hospital\ transportation$$

$$UC_{HT} - unit\ cost\ per\ hospital\ transportation$$

The total unit cost of a secondary care appointment according to this formula equals £115.

3.2.3 Primary care costs

The primary care costs are made up of two parts. The first part is the cost paying for the primary care appointments, which is the cost of paying for the LIS (under both the old and new care pathways) which is described here. The second aspect is the opportunity cost of providing the service, which is described in section 3.3.2 below.

3.2.3.1 Cost of paying the LIS

Each appointment has a LIS cost attached. The values of the LIS were provided in information from the TCST, and are listed below:

- The LIS for the welcome appointment, including the holistic needs assessment and care plan (new care pathway) is £50 per appointment (30 minutes).
- The LIS for GP appointments (new primary care pathway) is £43 (20 minute appointment) per patient.
- The LIS for GP appointments (old primary care pathway) is £50 per patient per year. This is the equivalent of £25 per appointment for the first three years followed by £50 per appointment for subsequent years.

3.2.4 Cost of blood tests for patients

Patients have their blood taken prior to any appointment in a primary or secondary care setting. This is in order for the PSA test to be completed. A patient can have their blood taken in different settings regardless of whether they are receiving their follow up support through primary or secondary care. For example, the taking of blood could happen at a GP practice, a hospital or a local blood test clinic. A patient does not have to provide blood samples in the same setting for each appointment.

The cost of providing phlebotomy services in secondary care in Croydon is £4 per test.[17] The cost of providing a blood test in a primary care setting is covered by a separate LIS in Croydon. The cost of phlebotomy services under the LIS in Croydon is estimated to be £1.90 per appointment.[18]

[16] The PSSRU report the Unit Cost of Health and Social Care (2006) estimates the cost of hospital transportation as £50. This has been converted to 2014 prices using GDP deflators.

[17] This is taken from NHS Reference Cost information. The value of phlebotomy attendance includes an adjustment for Market Factor Forces (MFF) for the three secondary care providers (Croydon University Hospital, St. Georges and Royal Marsden) which provide follow up care to patients in Croydon. The mean of these three values has been used as the cost.

[18] NHS South East Commissioning Support Unit (2015) Croydon CCG Integrated Report; Available at: http://www.croydonccg.nhs.uk/about-us/Governing%20body/Governing%20Boday%20Papers/Croydon%20CCG%20M4%202015-09-11%2011-32-06%20-%20Contracting%20Sections%20Only%20amended%2030%2009%202015.pdf

It is unclear what setting a patient attends to give blood for the PSA test for patients receiving follow up care for any of the care pathways analysed. The setting for taking blood can change for any patient during the care pathway. For these reasons of uncertainty the cost of blood tests has not been included in the analysis. It is assumed patients attend the phlebotomy service which was most convenient for their needs on all care pathways, and this will not alter if the patient changes which care pathway they receive their support on. Therefore the cost of blood tests for patients is the same on both care pathways.

3.3 Approach to measuring opportunity costs of the care pathway

The opportunity cost is the value of an alternative that must be given up in order to follow an action. The opportunity costs of the care pathways are the amount of time spent traveling to, waiting for and attending appointments multiplied by its value to individuals and employers, and the opportunity cost of providing the service to GP practices. This subsection describes the calculation of opportunity costs per appointment, which are aggregated to present total opportunity costs for each pathway in section 4.

3.3.1 Cost of time

The amount of time patients spend per appointment depends on some of the following factors, according to the type of appointment and employment status of patients:

- Average travel time to and from a GP appointment in Croydon (nearly seven minutes each way, assuming half of patients travel by car and half by public transport);[19]
- Average travel time to and from hospital appointment in Croydon (16 minutes each way assuming half of patients travel by car and half by public transport);[20]
- For employed patients, the average travel time from work to home before attending a GP or hospital appointment (42 minutes[21]) – it is assumed that on average, each employed individual drives from work to home (or vice-versa) once per appointment;
- The duration of a GP appointment is assumed to be 20 minutes;[22]
- The duration of the welcome appointment, including the holistic needs assessment and care plan is assumed to be 30 minutes;[23]
- The duration of a secondary care consultation is assumed to be 30 minutes;[24] and
- The waiting times in the GP surgery or hospital are assumed to be:
  - 1 hour for hospital appointment;[25] and
  - 16 minutes for GP or practice nurse appointment.[26]

The value of time spent per appointment depends on employment status of patients. The average employment rate for males aged over 65 in Croydon (12%) has been used to estimate the proportion of patients in employment.[27] The age group 65+ was used because the incidence of prostate cancer is low for younger males.

[19] Accessibility statistics 2011-2012, https://www.gov.uk/government/statistics/accessibility-statistics-2012
[20] Ibid.
[21] Department of Transport statistics, average commuting journey time for London.
[22] Consultations with TCST staff
[23] Ibid.
[24] Based on NHS England advice to allow two hours per outpatient appointment in secondary care
[25] Ibid.
[26] GP patient survey. Available at: https://gp-patient.co.uk/surveys-and-reports#july-2014
[27] Annual Population Survey (2014) https://www.nomisweb.co.uk/

A cost has also been estimated for unemployed or inactive patients. Although there is no loss of productivity from these patients attending appointments, it is assumed that they value their time and would prefer to be carrying out other activities instead of attending the appointments. An hour of leisure time is valued at approximately £10 (Wardman and Wheat, 2013).[28] For employed individuals, the value of time is assumed equal to lost productivity at work as expressed by average hourly gross value added (GVA) per worker. The average hourly GVA per worker in Croydon is approximately £30.[29]

The calculation of opportunity costs is presented in the equation below.

$$Primary\ care\ appt.cost = (2 * T_{GP} + W_{GP} + D_{GP}) * (1 - E_P) * V_{LT} + \\ + (2 * T_{GP} + W_{GP} + D_{GP} + T_{WR}) * E_P * GVA$$

$$Secondary\ care\ appt.cost = (2 * T_H + W_H + D_H) * (1 - E_P) * V_{LT} + \\ + (2 * T_H + W_H + D_H + T_{WR}) * E_P * GVA$$

$$T_{GP} - average\ drivetime\ to\ GP\ in\ croydon$$
$$W_{GP} - waiting\ time\ for\ GP\ appointment$$
$$D_{GP} - duration\ of\ GP\ appointment$$
$$T_H - average\ drivetime\ to\ hospital\ in\ croydon$$
$$W_H - waiting\ time\ for\ hospital\ appointment$$
$$D_H - duration\ of\ hospital\ appointment$$
$$E_P - patient\ employment\ rate\ in\ Croydon$$
$$V_{LT} - value\ of\ an\ hour\ of\ leisure\ time$$
$$GVA - average\ hourly\ GVA\ per\ worker\ in\ Croydon$$

Some patients will require the support of a carer (either formal or informal) to attend appointments. Research carried out by Macmillan estimated that there were over one million carers for people with cancer in the UK. This figure has been divided by the total number of people with cancer to estimate the proportion of cancer patients with a carer. This works out to be around 40%. However, the number of carers for individuals with prostate cancer is estimated to be lower than for other cancers.[30] Therefore, a more conservative estimate of the percentage of patients requiring a carer has been used in these calculations (30%).

The opportunity costs for carers were calculated in exactly the same way as for patients. The only difference was that general employment rate for people aged between 16 and 64 was used (73%) in estimating the proportion of carers in employment (since a carer could be anyone from the working age group population).[31]

There are additional indirect costs to patients and carers of attending the follow up care appointments. These include the cost of transportation (paying for taxis, the cost of public transport, petrol and insurance costs for drivers and parking etc.). However, no evidence on the proportion of patients using different types of transport and cost estimates was found during the literature review. Therefore, the estimates focus on opportunity costs of time and the cost of health services providing transport to patients rather than including other indirect costs.

[28] Wardman & Wheat (2013) Meta-Analysis of Post-1994 Values of Non-Work Travel Time Savings. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/252088/meta-analysis-vtts-dft-011.pdf

[29] Sub regional Productivity - February 2015. Available at: http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-393200

[30] Macmillan Cancer Support, 2011, Understanding the UK's carers of people with cancer.

[31] Annual Population Survey, 2014

3.3.2 Change in opportunity cost of primary care staff providing services

The second aspect of the primary care cost is the change in the opportunity cost associated with GPs and practice nurses providing the services for prostate cancer follow up between the two care pathways. The opportunity cost is value of an alternative that must be given up in order to follow an action. In this case, it is the value of the service that GPs and practice nurses could provide instead of providing the support to prostate cancer patients – providing appointments to patients with different ailments.

The appointments received in primary care for patients using the LIS is the activity for which the opportunity cost is estimated under the old primary care pathway. These are the appointments for patients receiving care through primary care to collect their results. The value of this activity was calculated using the value of time GP staff spent with patients. The value of time spent with patients is taken from the Unit Cost of Health and Social Care (2014).[32]

For the old care pathway, the cost per appointment is assumed to be £66 per GP appointment (a twenty minute appointment). This value is multiplied by the number of GP appointments to estimate the total primary care cost.

The opportunity cost of primary care for the new primary care pathway is slightly different to that of the old care pathway. The same sources have been used to calculate the values, but the values are assumed to be:

- The welcome appointment (including the holistic needs assessment and care plan) is assumed to take 30 minutes and is carried out by a practice nurse.[33] The primary care cost of this is £20; and
- The appointment for collecting the test results can now be carried out by either a GP or a practice nurse. This means there are different primary care costs depending on the approach taken in each GP practice. These costs are assumed to be:
  - £66 per GP appointment; and
  - £14 per practice nurse appointment.

  It has been assumed that half of the appointments are carried out by GPs and half by practice nurses. Therefore, the cost of appointment to collect test results is as described in the formula below:

$$Unit\ cost\ of\ GP\ follow\ up\ support = \frac{0.5 * UC_{GP} + 0.5 * UC_{GPN}}{4}$$

  Where UC_{GP} is the hourly cost of GP time and UC_{GPN} is the hourly cost of practice nurse time.

The unit cost of this type of appointment is approximately £40.

The results of the opportunity cost for primary care staff are presented as a change in the opportunity cost between the two care pathways of GPs and practice nurses providing prostate cancer follow up. This opportunity cost is not included in the total cost of the care pathways, in order to avoid any issues regarding double counting of the value of primary care appointments (the cost of the LIS and the opportunity cost). However, the opportunity cost needs to be accounted for. This is because the change in staffing arrangements for follow up appointments changes the resources available for alternative tasks (more GP time is available for other tasks in the new care pathway, which is more costly than GP practice nurse time).

[32] PSSRU (2014) The Unit Cost of Health and Social Care 2014; available at: http://www.pssru.ac.uk/project-pages/unit-costs/2014/

[33] Consultations with TCST staff.

4 Results

This section provides the results from the estimation of the costs associated with providing follow up support to prostate cancer patients. It presents the estimated costs for the different care pathways at an individual and cohort level. The costs are broken down by direct healthcare costs and opportunity costs of patients attending appointments.

4.1 Headline costs of old and new care pathways

4.1.1 Secondary care pathway and new primary care pathway

The cost per patient of receiving follow up care in a secondary setting and on the new primary care pathway is presented in Table 4.1. This shows that the total discounted direct healthcare cost for a patient receiving follow up in a secondary care setting is nearly £900 over five years. This includes secondary care appointments and hospital transportation. On the new care pathway, the direct healthcare costs are under £400 per patient. This represents a reduction in cost of £490, or 57%.

The opportunity costs of the new primary care pathway are lower than for the secondary care pathway as well. The opportunity cost per patient for the new primary care pathway is £160, compared to £280 on the secondary care pathway. This represents a reduction of £130, or 45% in the opportunity cost. A patient being discharged from a secondary care to the new primary care pathway does incur an opportunity cost to GP practices, as GP's and nurses have additional patients to treat. This is estimated at £320 per patient over five years. The total difference in cost between the secondary care and new primary care pathways is estimated to be £300.

Table 4.1 Cost of secondary care and new primary care pathways per patient, five year period

Type of cost	Secondary care pathway	New primary care pathway	Difference in cost
Direct healthcare costs			
Primary care cost (LIS)	£0	£380	*(-£380)*
Blood test cost	-	-	-
Secondary care	£640	£0	£640
Hospital transportation	£230	£0	£230
Total direct healthcare costs	*£870*	*£380*	*£490*
Opportunity cost to patients, carers and employers			
Opportunity cost to patient	£130	£60	£70
Opportunity cost to informal carer	£10	£10	£10
Opportunity cost to employer	£140	£90	£50
Total opportunity cost to patients, carers and employers	*£280*	*£160*	*£130*
Change in opportunity cost to GP practices			
Changes due to staffing arrangements	-	-	*(-£320)*
Total cost	**£1,150**	**£530**	**£300**

ICF calculations

4.1.2 Old primary care pathway and new primary care pathway

The cost per patient receiving primary care follow up on the old and new primary care pathways is presented in Table 4.2. This shows that due to the increase in the value of the LIS for the new care pathway, the direct healthcare cost per patient increased by £90, or 39% over five years. This is the only direct healthcare cost.

The opportunity cost to individuals, carers and employers is the same on the old and new primary care pathways, as patients attend the same number of appointments at the same location on both care pathways. However, the change in care pathways in primary care does create an opportunity cost saving for GP practices. As practice nurses are able to carry out the follow-up appointments, more GP time is made available to treat other patients. The value of the changes in staffing arrangements is valued at £200 per patient over five years. This means that the total estimated difference in cost between the old and new primary care pathways is estimated to be £110.

Table 4.2 Cost of old primary care and new primary care pathways per patient, five year period

Type of cost	Old primary care pathway	New primary care pathway	Difference in cost
Direct healthcare costs			
Primary care cost (LIS)	£230	£330	*(-£90)*
Blood test cost	-	-	-
Secondary care	0	0	0
Hospital transportation	0	0	0
Total direct healthcare costs	£230	£330	*(-£90)*
Opportunity cost to patients, carers and employers			
Opportunity cost to patient	£50	£50	£0
Opportunity cost to informal carer	£10	£10	£0
Opportunity cost to employer	£80	£80	£0
Total opportunity cost to patients, carers and employers	*£140*	*£140*	*£0*
Change in opportunity cost to GP practices			
Changes due to staffing arrangements	-	-	£200
Total cost	**£370**	**£460**	**£110**

ICF calculations

4.1.3 Comparison of the cohort

All patients who qualified for the new care pathway (to receive watchful waiting support, or have had surgery at least two years ago and have not had any relapse) as of 10 December 2015 have been included in the analysis.

At the time of writing this report, a total of 594 patients with the characteristics to be included on the new care pathway were identified by the TCST. Of the 594 patients identified:

- 155 were previously receiving their follow up support in secondary care;
  - 67 of these were discharged from secondary care onto the new primary care pathway;
  - 88 patients were continuing to receive their follow up support in secondary care as of 15/12/2015; and

- 439 were previously receiving support in primary care and had moved onto the new primary care pathway.

These cohort sizes were used to compare the total cohort cost with and without the introduction of the new primary care pathway. These results are presented in Table 4.3. This shows that the total direct healthcare cost is higher following the introduction of the new primary care pathway than would be the case without its introduction. This additional cost is estimated to be £7,300, or 3% of the original direct healthcare costs. This is because the additional cost of the new (higher value) LIS for the 439 patient's previously receiving follow up support in primary care more than offsets the savings from the 67 patients who have been discharged from secondary care support onto the new primary care pathway.

The opportunity cost to individuals, carers and employers is lower following the introduction of the new primary care pathway than would be the case without its introduction. This opportunity cost saving is estimated to be £10,200, or 8% of the original opportunity cost. The total savings from the opportunity cost to individuals, carers and employers for the cohort is higher than the additional direct healthcare cost. Finally, if the opportunity cost to GP practices is considered, the savings of the new care pathway are much larger than the additional costs (£68,300).

Table 4.3 Comparison of cohort costs with and without the introduction of the new primary care pathway, five year period

Type of cost	Without the introduction of the new primary care pathway		With the introduction of the new primary care pathway		Difference in cost
	Number of patients	Cost	Number of patients	Cost	
Direct healthcare cost					
Primary care cost (LIS)	439	£102,600	506	£168,100	*(-£65,500)*
Blood test cost	-	-	-	-	-
Secondary care	155	£99,500	88	£56,500	£43,000
Hospital transportation	155	£35,200	88	£20,000	£15,200
Total direct healthcare costs		£237,200		£244,600	*(-£7,300)*
Opportunity cost to patients, carers and employers					
Opportunity cost to patient	594	£43,800	594	£39,200	£4,700
Opportunity cost to informal carer	594	£4,000	594	£3,600	£400
Opportunity cost to employer	594	£84,400	594	£79,200	£5,100
Total opportunity cost to patients, carers and employers		*£132,200*		*£122,000*	*£10,200*
Change in opportunity cost to GP practices					
Changes due to staffing arrangements	-	-	-	-	£65,400
Total cost		**£369,400**		**£366,600**	**£68,300**

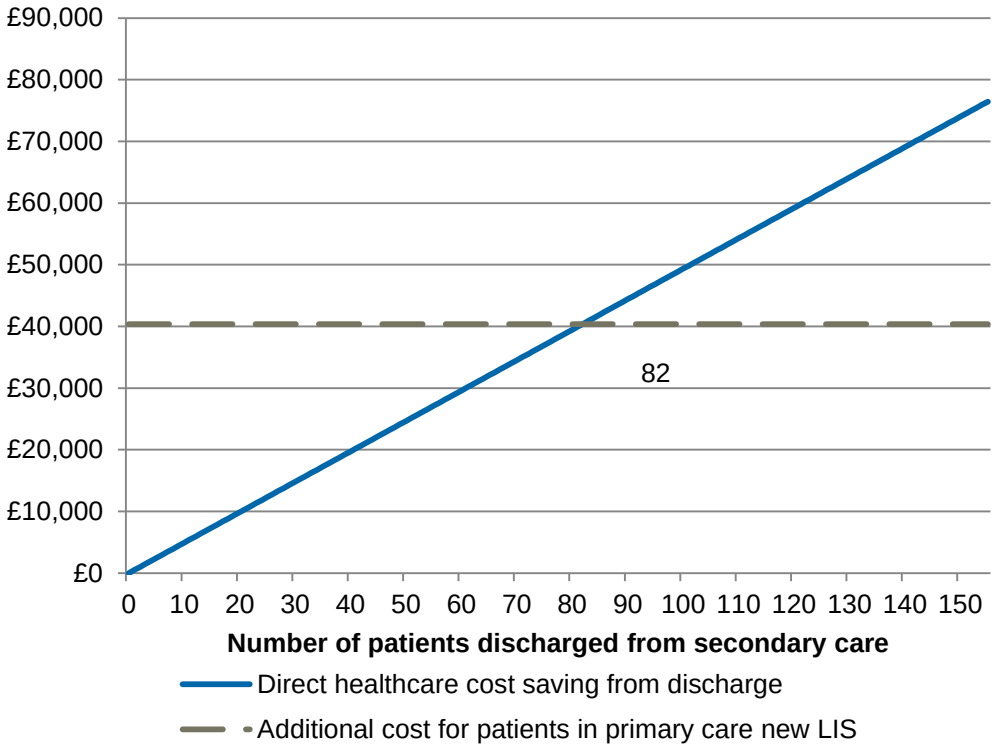
ICF calculations

Figure 4.1 presents an analysis of the number of patients required to be discharged from secondary care to the new primary care pathway to offset the additional direct healthcare

cost of the LIS for the 439 patients who were on the old primary care pathway. This additional cost is estimated to be just over £41,000.

A total of 155 patients were identified as receiving follow up care in secondary care and being suitable for discharge. Presently, 67 patients have been discharged. The analysis shows that for the direct healthcare cost savings from discharges to equal the additional cost of the LIS 82 secondary care patients would need to be discharged. If all 155 suitable patients were discharged from primary care, the direct healthcare savings would exceed the additional healthcare costs by 89% (healthcare savings of over £76,000 compared to additional costs of over £41,000).

Figure 4.1 Number of discharges from secondary care needed to offset additional direct healthcare cost of LIS



ICF analysis

4.2 Detailed cost of previous care pathways

4.2.1 Direct healthcare costs

Using the assumptions and methodology outlined in section 3, an average cost per person receiving their support from secondary care was calculated. The cost per year for each individual receiving their support on the secondary care pathway is:

- £60 for hospital transportation for the first three years and £30 after three years; and
- £169 for the secondary care appointments for the first three years and £85 for subsequent years.

This gives an annual cost per individual receiving their support through secondary care of £229 for the first three years and £115 in subsequent years.

The average cost for each individual receiving support through the old primary care pathway was calculated in a similar way. The annual cost per individual is the £50 LIS payment. This

is the only direct healthcare payment for the care pathway, meaning the annual cost is £50 for all years.

4.2.2 Opportunity costs

Again, using the methodology set out in section 3 the average opportunity cost of each individual receiving support through secondary care was estimated. The annual opportunity cost for each individual receiving their support through secondary care is:

- £35 for individual patients for the first three years and £17 in subsequent years;
- £3 for informal carers for the first three years and £2 in subsequent years; and
- £37 for employers for the first three years and £18 in subsequent years.

This gives an average annual opportunity cost per individual receiving their support through secondary care of £75 for the first three years, £37 for subsequent years.

The same methodology was applied for patients receiving their support through primary care. The average annual opportunity cost per individual is:

- £15 for individual patients for the first three years, and £7 in subsequent years;
- £1 for informal carers for all years; and
- £21 for employers for the first three years, £10 in subsequent years...

This gives an average annual opportunity cost per individual receiving their support through primary care of £36 for time costs for the first three years and £18 in subsequent years.

The opportunity cost to GP practices is not presented as a cost per patient in the results table to avoid double counting of the total cost of the care pathways. However, in order to calculate the difference in opportunity cost to GP practices of staffing the prostate cancer follow up support the annual opportunity costs is:

- £0 for patients receiving their support in secondary care; and
- £132 per patient receiving their support in a primary care setting in the first three years, and £66 in subsequent years.

4.3 Detailed cost of new care pathway

Under the new primary care pathway, there is an additional activity (the welcome appointment that encompasses a holistic needs review) which attracts a cost. This cost is only for patient who are discharged from secondary care to the new primary care pathway – it does not apply to patients who were supported on the old primary care pathway. Additionally, the value of the LIS is higher under the new care pathway, but practice nurses can carry out the prostate cancer follow up appointment.

4.3.1 Direct healthcare costs

Again, using the assumptions and methodology outlined in section 3, an average annual cost per patient receiving support under the new care pathway was calculated. The annual cost for each individual who has been discharged from secondary care is £136 for the first year (the HNA appointment and two appointments for PSA results), £86 per year for the second and third years, and £43 for subsequent years. The LIS payment is the only direct healthcare cost.

For patients who received their support on the old primary care pathway, i.e. patients that were already being followed up in primary care, the cost of the new primary care pathway is £86 per year for the first three years, and £43 for subsequent years.

4.3.2 Opportunity costs

Again, using the methodology set out in section 3 the average opportunity costs of each individual receiving support on the new care pathway was calculated. The opportunity cost is different for those who have been discharged from secondary care and those who previously received care on the old primary care pathway, due to the HNA appointment. The annual opportunity cost for each individual receiving their support through secondary care is:

- £23 for individual patients discharged from secondary care in the first year; £14 in the second and third years and £7 in subsequent years;
- £14 for patients who previously received their care in a primary care setting for the first three years and £7 in subsequent years;
- £2 for informal carers per patient discharged from secondary care in the first year, and £1 per year in subsequent years.
- For patients previously receiving support in a primary care setting, the cost is £1 per patient per year;
- £32 for employers per patient discharged from secondary care in the first year; £21 in the second and third year and £10 in subsequent years; and
- £21 for employers per patient who previously received support in a primary care setting for the first three years, and £10 in subsequent years.

This gives an average annual opportunity time cost per individual of:

- £57 for the first year for a patient discharged from secondary care; £36 in the second and third year and £18 in subsequent years; and
- £36 for the first three years for patients who previously received support in a primary care setting, and £18 in subsequent years.

The opportunity cost to GP practices is again not included in the total cost of the care pathway to avoid double counting, but has been calculated to estimate the change in opportunity cost to GP practices from changing staffing arrangements to provide follow up care to prostate cancer patients. The annual opportunity costs per patient are:

- £100 per patient discharged from secondary care in the first year, £80 in the second and third year and £40 in subsequent years;
- £80 per patient who previously received their support on the old primary care pathway for the first three years, and £40 in subsequent years.

4.4 Summary

The total healthcare costs over the five year period are presented in section 4.1. This includes a comparison of the cost of the secondary care pathway and the new primary care pathway and an analysis of the cost for the total cohort under the old care pathway and the new care pathway. The costs presented in this section are the discounted sum of the annual costs discussed in section 4.3.[34]

This analysis shows that the cost of the new primary care pathway is lower than the cost of the secondary care pathway by 54% including only direct healthcare costs and opportunity costs to individuals, carers and employers.

[34] Discounting is a technique used to compare costs and benefits that occur in different time periods. This is based on the assumption that society as a whole, also prefers to receive goods and services sooner rather than later, and to defer costs to future generations (HM Treasury, 2011; The Green Book). A discount rate of 3.5% has been used throughout this analysis.

However, the cost of the new primary care pathway is higher than old primary care pathway by 25%, including only direct healthcare costs and opportunity costs to individuals, carers and employers. The total healthcare cost and opportunity cost to patients, carers and employers has decreased slightly for the cohort (£3,000, or 1%). If more patients were discharged from secondary care the savings would increase significantly.

If the opportunity cost to GP practices from changes in the staff who provide the follow up support is included in the analysis, the cost for the cohort is significantly lower with the introduction of the new primary care pathway than without its introduction (a decrease in cost of £68,000, 12%).

5 Sensitivity analysis

The calculations which have been used to estimate the cost of the old and new care pathways involve assumptions. Therefore the best estimates presented in section 4 include a degree of uncertainty. In this section, the results of a sensitivity analysis are presented. The sensitivity analysis presents a range of values (a high and a low estimate) which we can be confident that the true value of the cost of the care pathways lies between.

The assumptions and data source variations which have been altered for the sensitivity analysis are presented in Table 5.1. All the information and assumptions have been varied except for those provided by the TCST (the value of a secondary care consultation appointment, the value of the LIS, the duration of appointments and the number of patients).

The variation in the assumptions which required calculations are explained below:

- The average travel times have been varied by using the average travel time by car and by public transport. In the low estimate, the average travel time by car has been applied to all appointments; in the high estimate the journey time by public transport has been applied to all estimates.
- The value of GP time and practice nurse time (for the GP appointment, blood test and welcome appointment) time has been varied using values including qualification and direct staff costs and without qualification or direct staff costs. All values are taken from the same source. This has been used to vary the opportunity cost to GP practices.
- The employment rates have been adjusted using the Confidence Interval values provided from the Annual Population Survey;
- The percentage of patients has been varied using a high and low estimates based on the fact that, on average, 40% of cancer patients require a carer. High and low estimates around this value have been applied;
- The unit cost of hospital transport has been varied based on the average number of patients in the vehicle for each journey. The central estimate is based on five people in the vehicle, whereas four and six people have been used for the low and high estimates respectively;
- The waiting time for a hospital appointment has been varied by adding and subtracting half an hour to the central estimate of one hour. At the highest estimate, the total length of time required for the appointment is two hours, which is the length of time patients are recommended to allow by NHS England guidance;
- The GVA per hour has been adjusted using percentiles, with the higher estimate using an approximation of the 60th percentile and the low estimate using an approximation of the 40th percentile.[35]
- The travel to work time has been varied by using the England average for the low estimate and the London business journey estimate for the higher estimate.

Table 5.1 Assumptions and data sources which have been varied in the sensitivity analysis

Cost item	Low estimate	Best Estimate	High estimate	Source

[35] These percentiles of the GVA value have been calculated using the percentile scales from the ASHE, as no percentile or confidence interval values were available for the GVA estimates. The percentage change from the median value to the 40th and 60th percentile from the ASHE has been applied to the average GVA figure. ASHE was chosen to make this adjustment as there is a strong relationship between earnings and productivity.

Average travel time to the hospitals in Croydon	0.16 hour	0.27 hour	0.38 hour	Accessibility statistics, 2011 -2012[36]
Average travel time to GP in Croydon	0.08 hour	0.11 hour	0.14 hour	Accessibility statistics, 2011 -2012[37]
Value of a GP appointment	£58	£66	£78	Unit Costs of Health & Social Care 2014, PSSRU – estimates for a 20 minute appointment with GP
Value of a practice nurse appointment	£11	£14	£15	Unit Costs of Health & Social Care 2014, PSSRU
Value of HNA standard payment	£17	£21	£22	Unit Costs of Health & Social Care 2014, PSSRU
Proportion of new appointments with practice nurse	25%	50%	75%	Qualitative interviews
Proportion of new appointments with GP	75%	50%	25%	Qualitative interviews
Value of leisure time (hour)	£5.2	£9.7	£14.1	Department of Transport[38]
Employment rate (general)	69.2%	73.1%	77%	Annual Population Survey
Employment rate (treatment group)	7%	11.8%	16.6%	Annual Population Survey
Proportion of patients requiring carers	20%	30%	50%	Macmillan[39]
Proportion of patients requiring hospital transport	30%	50%	60%	Unit Costs of Health & Social Care 2006, PSSRU
Unit cost of hospital transport	£48	£60	£72	Unit Costs of Health & Social Care 2006, PSSRU
Time waiting for appointment (hospital)	0.5 hours	1 hour	1.5 hours	NHS guidance
Time waiting for appointment (GP)	0.13 hour	0.27 hour	0.41 hour	GP patient survey[40]
GVA per hour	£26	£30.2	£35.4	ONS[41]
Travel-to-work time	0.5	0.7	0.75	Department for Transport[42]

[36] Accessibility statistics 2012. Available at: https://www.gov.uk/government/statistics/accessibility-statistics-2012

[37] Ibid.

[38] Department of Transport, Meta-analysis of post-1994 values of non-work travel time savings, https://www.gov.uk/government/publications/values-of-travel-time-savings-analysis-of-non-work-values-since-1994

[39] Macmillan Cancer Support, 2011, Understanding the UK's carers of people with cancer.

[40] GP patient survey. Available at: https://gp-patient.co.uk/surveys-and-reports#july-2014

[41] Office for National Statistics, Sub regional Productivity - February 2015, http://www.ons.gov.uk/ons/publications/re-reference-tables.html?edition=tcm%3A77-393200

[42] Department of Transport, Average trip time by purpose, 2014

5.2 Results of sensitivity analysis

The results from the sensitivity analysis are presented below. Table 5.2 presents the difference in costs per patient between the secondary care and new primary care pathways. This shows that the change in direct healthcare costs ranges between £380 and £590 per patient over five years. The opportunity cost to individuals and employers is lower on the new care pathway than in secondary care for all estimates, ranging between £40 and £320. The opportunity cost to GP practices of providing staff for the prostate cancer follow up ranges from £250 to £370, which means the total difference in cost between the two care pathways is between £40 and £670 per patient.

Table 5.2 Difference between secondary care and new primary care pathways per patient, five year period

Type of cost	Low estimate	Best estimate	High estimate
Direct healthcare costs			
Primary care cost (LIS)	*(-£380)*	*(-£380)*	*(-£380)*
Blood test cost	-	-	-
Secondary care	£640	£640	£640
Hospital transportation	£110	£230	£330
Total direct healthcare costs	£380	£490	£590
Opportunity cost to patients, carers and employers			
Opportunity cost to patient	£20	£70	£140
Opportunity cost to informal carer	£0	£10	£10
Opportunity cost to employer	£10	£50	£160
Total opportunity cost to patients, carers and employers	*£40*	*£130*	*£320*
Change in opportunity cost to GP practices			
Changes due to staffing arrangements	(-£370)	(-£320)	(-£250)
Total cost	**£40**	**£300**	**£670**

ICF calculations

Table 5.3 shows the difference between the old and new primary care pathways. The only variation in the difference in the care pathways estimates is in the opportunity cost to GP practices, where the difference ranges from £90 to £360, meaning the total difference in cost of the care pathways ranges from £0 to £270.

Table 5.3 Difference between old and new primary care pathways per patient, five year period

Type of cost	Low estimate	Best estimate	High estimate
Direct healthcare costs			
Primary care cost (LIS)	*(-£90)*	*(-£90)*	*(-£90)*
Blood test cost	-	-	-
Secondary care	£0	£0	£0
Hospital transportation	£0	£0	£0
Total direct healthcare costs	*(-£90)*	*(-£90)*	*(-£90)*
Opportunity cost to patients, carers and employers			
Opportunity cost to patient	£0	£0	£0
Opportunity cost to informal carer	£0	£0	£0
Opportunity cost to employer	£0	£0	£0
Total opportunity cost to individuals and employers	£0	£0	£0
Change in opportunity cost to GP practices			
Changes due to staffing arrangements	£90	£200	£360
Total cost	**£0**	**£110**	**£270**

ICF calculations

Table 5.4 presents the total cohort cost with and without the introduction of the new primary care pathway. This shows that under each of the assumptions used in the sensitivity analysis, the direct healthcare costs are higher on the new care pathway than on the old care pathways. The difference in costs is estimated to be between £600 and £15,200 more expensive on the new care pathway. This is due to the higher LIS payment for those patients who were previously receiving their support in a primary care setting.

The opportunity costs to individuals, carers and employers is lower on the new care pathways than the old care pathway for all the estimates. The difference between the care pathways is estimated to be between £2,900 and £25,500. The opportunity cost to GP practices is also estimated to be less on the new care pathway than on the old care pathway, generating a benefit to GP practices. This benefit is estimated to be between £14,100 and £141,000.

Overall, it is estimated that there is a cost saving for the entire cohort following the introduction of the new care pathway. This cost saving is estimated to be between £1,800 and £165,800.

Table 5.4 Comparison of difference in cohort costs with and without the introduction of the new primary care pathway, five year period

Type of cost	Low estimate	Best estimate	High estimate
Direct healthcare costs			
Primary care cost (LIS)	*(-£65,500)*	*(-£65,500)*	*(-£65,500)*
Blood test cost	-	-	-
Secondary care	£43,000	£43,000	£43,000
Hospital transportation	£7,300	£15,200	£22,000
Total direct healthcare costs	*(-£15,200)*	*(-£7,300)*	*(-£600)*
Opportunity cost to patients, carers and employers			
Opportunity cost to patient	£1,400	£4,700	£9,500
Opportunity cost to informal carer	£100	£400	£1,300
Opportunity cost to employer	£1,400	£5,100	£14,700
Total opportunity cost to patients, carers and employers	£2,900	£10,200	£25,500
Change in opportunity cost to GP practices			
Changes due to staffing arrangements	£14,100	£65,400	£141,000
Total cost	**£1,800**	**£68,300**	**£165,800**

ICF calculations

Table 5.5 presents the estimated cost of each care pathway in the sensitivity analysis. These figures do not include the opportunity cost to GP practices, to avoid double counting of the cost of each care pathway. This shows that under all of the assumptions used in the sensitivity analysis, the cost of the new primary care pathway (£440 - £710) is lower than the cost of the secondary care pathway (£850 - £1,620).

The cost of the new primary care pathway for patients who formerly received care in a primary care setting (£380 - £610) is estimated to be higher than the old primary care pathway (£290 - £520). This is due to the higher value of the LIS. When the total cohort cost is analysed, the cost of the old care pathway is estimated to be between £269,400 and £536,600, and the total cost of the new care pathway lies between £281,700 and £511,600.

Table 5.5 Headline costs of care pathways from sensitivity analysis, five year period

Sector	Low estimate	Best estimate	High estimate
Secondary care pathway per patient	£850	£1,150	£1,620
New primary care pathway per patient discharged from secondary care	£440	£530	£710
Old primary care pathway per patient	£290	£370	£520
New primary care pathway per patient previously receiving care in primary care	£380	£460	£610
Total cohort cost old pathway	£269,400	£369,400	£536,600
Total cohort cost new pathway	£281,700	£366,700	£511,800

ICF calculations

6 Conclusion

This section presents the conclusions of this analysis, and how the findings answer the research aims of the study.

6.1 Initial research aims

The research aims for this study were:

- Undertake a financial modelling of existing models of care; and
- Undertake financial modelling of new pathways and models of care.

The initial aims of the project were to discover how many patients were receiving support for prostate cancer in five different care pathways and the costs associated with these pathways. However following the research carried out by TCST, it became apparent that patients were not receiving their support through five separate care pathways prior to the introduction of the new LIS. Instead, there were two main care pathways – support provided in secondary care; and GP led primary care support, where the consultations would be carried out by GPs. Therefore, the research estimates the costs associated with the two previous care pathways and compares them to cost of the new care pathway.

The new care pathway, introduced alongside the new LIS, allows support to be in a primary care setting and led by practice nurses, although if the patient or practice prefer, GPs can provide the consultation where the results are given to the patient. The costs of this new care pathway have been compared with the costs associated with the two previous care pathways.

6.2 Cost comparison of care pathways

The results of the analysis suggest that the new primary care pathway and LIS is significantly cheaper than the secondary care pathway. It provides a direct healthcare cost saving of 57% per patient over a five year period. This is due to the decrease in both the use of more expensive consultant appointments and requirements for hospital transportation in the secondary care pathway.

The direct healthcare costs of the new primary care pathway are 39% more expensive than the previous primary care pathway. This is due to the increased value of the LIS on the new primary care pathway. Therefore, the cost to primary care increases, however the cost per patient is still lower than the cost in secondary care pathway.

The opportunity costs for patients, carers and employers on the new primary care pathway are 45% lower than the costs for the secondary care pathway. This is because travel times and waiting times are much lower for primary care than secondary care, therefore the length of time patients and carers spend travelling to or waiting for appointments decreases.

The opportunity cost to GP practices is also lower on the new care pathway than on the old primary care pathway. This is because the value of the time GPs and practice nurses spend supporting prostate cancer patients will actually decrease despite the time spent with the patient remaining constant. The decrease in the value of time to GP practices is due to some primary care follow up-appointments being carried out by practice nurses who are properly trained in dealing with prostate cancer patients. Previously these appointments were carried out by GPs, whose time is more expensive.

The results from the sensitivity analysis show that the change in total costs for the cohort (including direct healthcare costs, opportunity costs to individuals, carers and employers and opportunity costs to GP practices) ranges between a saving of nearly £2,000 and £168,000 between the old and new care pathways. In all estimates, the total cohort costs are less expensive with the introduction of the new care pathway than without it. This means that

even when using the most pessimistic set of assumptions, the result that there is a cost saving following the introduction of the new care pathway. This gives a high degree of certainty that the cost of the new care pathway is lower than the cost of the old care pathway.

Additionally, not all patients who were identified as fulfilling the criteria for discharge from secondary care had moved onto the new care pathway. If all 155 eligible patients had been discharged from secondary care to the new primary care pathway the cost of the new care pathway would be significantly lower than the cost of the old care pathway.

Even though this analysis shows that there is a cost saving from introducing the new primary care pathway compared to the secondary care pathway, this was not the sole aim. The new pathway is also aiming to improve the quality of support provided to prostate cancer patients by providing tailored patient information packs, training modules for GPs and practice nurses, templates to seek specialist advice and providing more rounded support which includes referring and or signposting patients to support services. This should be taken into consideration when analysing the value of the new care pathway.

6.3 Further research

This analysis provides evidence of the costs associated with the secondary care, old and new primary care pathways. However, the evidence is limited to the activities delivered by the health service in these particular care pathways. It does not include the effect of the care pathways on:

- The number of primary care appointments for anything other than the monitoring of prostate cancer. Patients may also attend primary care appointments for related conditions (for example leaking urine, erectile dysfunction and bowel problems) which are not captured in this analysis due to lack of evidence. Future research into the number of patients who attend appointments for these conditions under different care pathways would be useful. This research would contribute to understanding the impact of the holistic needs assessment and care plan.
- The proportion of prostate cancer appointments (where patients receive their results) are undertaken by practice nurses on the new primary care pathway. As the new primary care pathway has only just started, it was not possible to say with certainty what proportion of appointments would be undertaken by practice nurses. Once the care pathway has been in place for a number of years, it would be useful to analyse how many appointments are carried out by practice nurses.
- The number of voluntary sector appointments that prostate cancer patients use, and whether this has increased or decreased following the introduction of the new care pathway. As the new primary care pathway refers patients to voluntary services, it would be interesting to see the effect of this on voluntary service provision.
- The introduction of the new primary care pathway could have an impact on the quality of care patients receive. Parallel evaluation to this study is being carried out by the TCST and is assessing the quality of care to patients. However, the holistic nature of the care will lead to better self-management of health conditions. This could lead to better outcomes for the patients, including the management of long term diseases, healthy living and psychological impacts. This would then have an impact on health service costs in the longer term. It would be interesting if the longer term impacts on health service resources of the holistic approach taken in the new care pathway were investigated further.