Assessment of response rates and yields for Two opportunistic Tools for Early detection of Non-diabetic hyperglycaemia and Diabetes (ATTEND). A randomised controlled trial and cost-effectiveness analysis

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Abstract

Aims: To assess the opportunistic use in primary care of a computer risk score versus a self-assessment risk score for undiagnosed type 2 diabetes.

Methods: We conducted a randomised controlled trial in 11 primary care practices in the UK. 577 patients aged 40-75 years with no current diagnosis of type 2 diabetes were recruited to a computer based risk score (Leicester Practice Computer Risk Score (LPCRS)) or a patient self-assessment score (Leicester Self-Assessment Score (LSAS)).

Results: The rate of self-referral blood tests was significantly higher for the LPCRS compared to the LSAS, 118.98 (95% CI: 102.85, 137.64) per 1000 high-risk patient years of follow-up compared to 92.14 (95% CI: 78.25, 108.49), $p=0.022$. Combined rate of diagnosis of type 2 diabetes and those at risk of developing the disease (i.e. impaired glucose tolerance (IGT) or impaired fasting glucose (IFG)) was similar between the two arms, 15.12 (95% CI: 9.11, 25.08) per 1000 high-risk patient years for LPCRS compared to 14.72 (95% CI: 9.59, 22.57) for the LSAS, $p=0.699$. For the base case scenario the cost per new case of type 2 diabetes diagnosed was lower for the LPCRS compared to the LSAS, £168 (95% Credible Interval (CrI): 76, 364), and £352 (95% CrI: 109, 1,148), respectively.

Conclusions: Compared to a self-assessment risk score, a computer based risk score resulted in greater attendance to an initial blood test and is potentially more cost-effective.

Keywords: type 2 diabetes, risk scores, early detection.

1. Introduction

The prevalence of type 2 diabetes has risen dramatically in recent decades and is now acknowledged as a global epidemic.[1, 2] Type 2 diabetes decreases length of life by up to ten years and also reduces quality of life.[3] It has been estimated that in the year 2000 excess global mortality attributable to diabetes equated to 2.9 million deaths, corresponding to 5.2% of all deaths, with this rising to over 8% for the U.S., Canada, and the Middle East.[4] The global health expenditure on diabetes was estimated as at least \$376 billion USD for 2010, approximately 12% of total global expenditure,[5] and treatment costs associated with managing potentially preventable complications of diabetes accounts for approximately 10% of the National Health Service (NHS) budget in the UK.[6, 7]

The increasing prevalence and associated cost of managing type 2 diabetes has prompted a recent shift in interest and investment towards early detection and efforts to prevent complications, with studies reporting early detection and treatment as a potential cost-effective strategy.[8] A recent modelling study has shown major benefits are likely from the early diagnosis and treatment of type 2 diabetes and cardiovascular risk factors.[9] Many health care systems advocate regular health checks to assess risk of developing chronic conditions such as cardiovascular disease (CVD), and type 2 diabetes. Such a scheme was introduced in the UK in 2009, but unfortunately uptake to the scheme has been poor with less than half of those invited for a test attending.[10]

Opportunistic risk identification methods provide a possibility to engage with populations who do not respond to invitation-based screening, and has previously

been associated with a higher yield for identifying individuals with hypertension.[11]

The UK National Institute for Health and Care Excellence (NICE) guidance for risk identification for type 2 diabetes recommends the use of evidence based opportunistic methods using low cost, simple, risk assessment tools to identify those at highest risk and hence likely to benefit from a confirmatory blood test.[12] A recent study that modelled different risk identification strategies for identifying undiagnosed type 2 diabetes supported this advice, and concluded using a non-invasive risk stratification tool followed by a confirmatory blood test was the most cost-effective method of identifying undiagnosed diabetes and abnormal glucose tolerance.[13]

Many countries now have patient computer records, making both a computer risk score or a self-assessment score relevant methods for identifying high risk individuals, but to date there has been no direct comparison of the two approaches.

Both the Leicester Practice Computer Risk Score (LPCRS) and the Leicester Self-Assessment Score (LSAS) have been developed and validated in large datasets and are accepted assessment tools for identifying individuals who currently have undiagnosed type 2 diabetes or are at high risk of developing diabetes, defined as impaired glucose tolerance (IGT) and/or impaired fasting glucose (IFG).[14, 15] The LSAS score is a self-completed questionnaire completed without intervention from a health care professional (HCP), or the need for results of medical tests such as those for cholesterol. The score is calculated using a number of risk factors; including age, sex, ethnicity, BMI, waist circumference, hypertension and family history of diabetes. The LPCRS is similar but is a calculation based on electronic data held within the primary care practice, therefore this score does not include waist circumference as this is not

routinely collected and/or recorded. The LPCRS involves the HCP communicating directly to the patient that they are at high risk of type 2 diabetes, whereas the LSAS is filled out independently by the patient, consequently, uptake of diagnostic blood tests may differ between the two scoring tools. Evidence on the use of such risk assessment tools in a pragmatic setting is lacking, in particular in terms of the subsequent self-referral rates to a blood test. .

This study, **ATTEND: Assessment of response rates, yields and cost-effectiveness for Two opportunistic Tools for Early detection of Non-diabetic hyperglycaemia and Diabetes**, aims to evaluate risk identification for type 2 diabetes using a computer based and a self-assessment tool within primary care, with the objective of improving uptake to confirmatory testing.

2. Materials and Methods

2.1 Study population

This study was a parallel arm randomised controlled trial assessing two alternative risk assessment methods for type 2 diabetes; the LSAS and the LPCRS. It was carried out across 11 primary care practices in Leicestershire (n=7) and Northamptonshire (n=4), in the United Kingdom. The study recruited between July 2011 and October 2013, with data collection completed six months later. All patients aged 40-75 years old were considered eligible for the trial, except for those with known diabetes, the terminally ill or those perceived by their health care practitioner to be unsuitable for inclusion.

2.2 Randomisation and recruitment

Trial participant identification and randomisation was conducted using a MIQUEST search within each of the 11 primary care practices. MIQUEST enables queries to be executed that extract data from medical records held in primary care computer systems. The LPCRS was then used to rank all eligible patients according to their level of diabetes risk, with a threshold of ≥ 5 indicating a 'high risk'[15] which corresponds to roughly the top 50% of the population in terms of diabetes risk. A random sample of patients identified as potentially at high risk by the LPCRS were then flagged within each practice for this arm of the trial, with an average of 288 records flagged per practice (ranging from 200 to 417). For the LSAS arm a random sample of all eligible patients on the practice list were flagged. As the LSAS arm included both high and low risk individuals roughly twice as many records were flagged in this arm (an average of 526 per practice, ranging from 200 to 1558) and recruitment continued for longer,

until the required sample size was achieved. This allowed for similar numbers of individuals rated as potentially at high risk by either tool to be recruited into the trial (n=241 for LPCRS and n=191 for LSAS).

When a flagged patient attended their practice an onscreen prompt appeared advising the HCP what action to take based on the randomisation group, and informed consent from the patient was obtained. Once consented, those in the LSAS group were asked to complete the tool, calculate their risk score and book an appointment for a blood test if they were above the target score as described in the tool. Patients in the LPCRS arm were informed that they were at high risk by the HCP and advised to book an appointment for a blood test following their consultation. All patients were asked to complete a questionnaire which included the Risk Perception Score for Developing Diabetes (RPS-DD), the EQ-5D and the Hospital Anxiety and Depression Score (HADS).[16-18] These were completed after the LSAS score, or after the patient had been informed of their LPCRS score, depending on the arm of the trial.

Participants who scored positive on either risk assessment tool and who booked in for a blood test were asked to choose between a glycated haemoglobin (HbA1c) or a fasting plasma glucose (FPG) test. As recommended by UK and WHO guidelines which state diagnosis should not be based on a single glucose determination, participants with a result of ≥ 42 mmol/mol (6%) for HbA1c or ≥ 6 mmol/l for fasting blood glucose were invited for a second confirmatory test, and asked to choose between HbA1c and an oral glucose tolerance test (OGTT). Final diagnosis was based on the results of the second test. Blood test results identified individuals with currently undiagnosed type 2 diabetes as well as individuals who were at high risk of developing the disease, i.e.

individuals with IGT and/or IFG. Criteria for diagnosing type 2 diabetes, IGT and IFG were as specified by the World Health Organisation,[19] with HbA1c cut-offs used as specified by NICE.[20] Participants diagnosed with type 2 diabetes over the course of the study were informed of their diagnosis and went on to receive standard care from their general practice. The HCP was informed of any patients found to have IFG or IGT.

2.3 Outcomes

The primary aim of this study was to compare two opportunistic risk assessment methods (a computer based and a self-assessment risk tool) to evaluate identification for type 2 diabetes within primary care, with the objective of improving uptake to confirmatory testing in a primary care setting. The primary outcome for comparison of the two methods was rate of attendance to first stage blood test. Secondary outcomes included the yield in diagnosis of positive results for type 2 diabetes and individuals at risk of developing type 2 diabetes (that is presence of IGT or IFG) at final assessment.

To aid our understanding and interpretation of the results three patient reported outcome measures were also recorded at baseline, and were used to compare intervention arms, and those who proceeded to a confirmatory blood tests with those who did not. These were the RPS-DD,[17] HADS,[16] and the EQ-5D quality of life questionnaire. [18] The RPS-DD assesses personal risk perception of developing diabetes and its complications, it has six sub-scales; i) comparative disease risk, ii) environmental risk, iii) personal control, iv) worry, v) optimistic bias and diabetes risk knowledge. The subscales can be combined into a composite risk scale, where a higher value indicates a greater perceived risk of type 2 diabetes and its complications. HADS

has 14 items, seven relating to anxiety and seven to depression. A score of greater than seven for either anxiety or depression equates to the presence of mild or moderate symptoms. The EQ-5D has five dimensions; mobility, self-care, usual activities, pain/discomfort and anxiety/depression, and individuals report problems within each dimension over three levels.

2.4 Sample size and statistical analysis

The sample size calculation determined that 366 participants were required (183 per group), in order to find a statistically significant difference of 0.5 compared to 0.65 in attendance to the first blood test between the two groups (i.e. 50% for the LSAS and 65% for the LPCRS) with 80% power and an alpha of 5%.

Recruitment of high risk individuals to the LPCRS arm was faster than to the LSAS arm, as all patients recruited to the LPCRS arm were already determined to be at high risk, hence the LSAS arm recruited for longer to achieve the required sample size. Consequently event rates (uptake of initial blood test, uptake to confirmatory blood test, diagnosis of type 2 diabetes and identification of individuals at high risk of developing type 2 diabetes (IGT and IFG)) were compared between the two arms, rather than absolute numbers. Follow-up time was recorded from the time the records were flagged on the database at the start of the study, to the end of the trial. As the LSAS arm contained individuals who went on to be scored as either high risk or low risk by the screening tool, whereas the LPCRS arm only contained individuals who had already scored positive on the tool, rates for both arms are reported for years of high-risk follow-up within the arm only, to allow both groups to have comparable

denominators. Therefore all individuals in the LPCRS arm contributed to the follow-up time, but in the LSAS arm it was only the individuals who scored positive on the screening tool. Rates are therefore reported per 1000 high-risk person years for both arms, with high risk being defined as a positive score on the screening tool utilised for that arm. When comparing two groups (i.e. the two risk assessment methods or individuals attending for a confirmatory blood test and those who did not) t-tests were used for normally distributed continuous outcomes and chi-squared tests for categorical outcomes. All analyses were carried out in STATA 13.1.

2.5 Cost-effectiveness analysis

To model the cost-effectiveness of the two strategies a decision tree was developed using the software package WinBUGS 14. As the short-term cost-effectiveness of the two strategies was of interest for this study, a health care perspective was taken and the time horizon was limited to the screening process. A diagram of the decision tree has been provided as a supplementary figure (figure S1). Costs were included to cover the implementation of the two risk assessment strategies, any consequent blood tests, and salary costs where the involvement of HCPs or administrators were required.[21,22] To assess patients using the LPCRS a computer programme has to be run through practice records, taking roughly one hour of an administrator's time per practice. For patients randomised to the LSAS a paper copy of the questionnaire was provided to patients (2-sides of A4). Time to complete tasks by health care practitioners and administrators was estimated and consequently was modelled with uncertainty within the decision tree by estimating them with distributions rather than as point estimates. All costs are for 2014 and are itemised in table 3.

Uptake to blood tests, and identification of type 2 diabetes and those at risk were modelled as incidence rates. The base case scenario assumes a practice size of 6891 patients, as this is the current average practice list size in the UK.[23] The model also assumed that 60% of the practice list would be aged between 40-75 years and eligible for the risk assessment tool. For the base case model it is assumed that the risk assessment tools have been implemented separately in an average sized primary care practice (N=6891), where 60% of individuals are aged between 40-75 years and eligible for the risk assessment tool. Scenarios were also considered whereby the risk assessment tools were implemented in both a small (N=1000) and a large (N=20,000) primary care practice, and in an average sized practice for five years. The LPCRS requires some initial set up costs whilst the LSAS does not, but the LSAS has greater continuing costs. Scenarios were considered whereby the intervention was implemented for both one year and five years. Sensitivity analyses were carried out on practice size and costs.

3. Results

From July 2011 to October 2013 577 patients consented to participate in this study, with collection of follow-up data completed 6 months later. 241 individuals were consented to the LPCRS group and 336 to the LSAS group of which 191 were found to be potentially at 'high risk', as determined by the LSAS. Baseline characteristics of the two arms are summarised in table 1. Age, BMI, ethnicity and gender were similar between the two trial arms, especially when comparing those found to be potentially at high risk by the LSAS (n=191) with the LPCRS (all high risk).

The two high risk groups achieved comparable scores on the RPS-DD, HADS and EQ-5D questionnaires (results outlined fully in supplemental table S1). The only significant difference between the two high risk groups was found for personal estimation of percentage chance of developing type 2 diabetes over their lifetime. This was significantly higher in the LSAS group compared to the LPCRS, mean (SD) of 41.08 (20.86) compared to 35.98 (20.89), $p=0.032$. Although this result should be interpreted with caution due to the number of tests that were undertaken.

Of those individuals who consented to the trial and were subsequently revealed to be at high risk of type 2 diabetes, either via the LSAS or the LPCRS, 75% of each group attended for a blood test. A comparison of those who attended for a blood test with those who did not attend is summarised in supplementary table S2. Participant flow through the trial and subsequent diagnosis is presented in figure 1.

The rate of confirmatory blood tests undertaken was significantly higher in the LPCRS arm compared to the LSAS arm, 118.98 (95% CI: 102.85, 137.64) per 1000 high risk

patient years of flagged records compared to 92.14 (95% CI: 78.25, 108.49), $p=0.022$ (table 2). Rate of diagnosis of type 2 diabetes was also higher, 5.26 (95% CI: 2.62, 10.51) per 1000 high risk patient years compared to 1.92 (95% CI: 0.62, 5.95), although this was not a significant difference ($p=0.134$). Rates of identification of individuals at high risk (IGT or IFG) or with undiagnosed type 2 diabetes were similar between the two risk assessment tools, 15.12 (95% CI: 9.11, 25.08) per 1000 high-risk patient years for the LPCRS and 14.72 (95% CI: 9.59, 22.57) for the LSAS, $p=0.699$.

The results of the economic analysis are summarised in table 4. The results show that overall the LPCRS is more costly to implement than the LSAS, and this was consistent for all scenarios considered. For the baseline scenario (practice size of $N=6891$, for one year follow-up) the cost was £436 (95% CrI: 108, 876) higher for the LPCRS than the LSAS. Although the LPCRS has slightly higher set-up costs than the LSAS, the cost per person attending for a blood test was extremely similar between the two methods; therefore the difference in costs was mainly driven by the higher uptake of blood tests using the LPCRS risk assessment tool. Even though the LPCRS was more costly to put into place, as the rate of identification of type 2 diabetes was higher using this risk assessment method the cost per case of type 2 diabetes identified was lower than for the LSAS, (£170 (95% CrI: 77, 368)) and £352 (95% CrI: 109, 1,148) respectively (USD: LPCRS \$263 (95% CrI: 119, 570) and LSAS \$545 (95% CrI: 169, 1,777)), but this was not a significant difference. The cost per high risk or type 2 diabetes case identified combined was similar between the two arms, although slightly higher in the LPCRS arm, £59 (95% CrI: 34, 101) and £46 (95% CrI: 26, 81) for the LPCRS and LSAS arms respectively (USD: LPCRS \$91 (95% CrI: 52, 156) and LSAS \$71 (95% CrI: 40, 125)). As

the LPCRS has some initial set up costs, whilst the LSAS does not, the costs per case identified are reduced if the LPCRS is run for a longer time period or a larger cohort, whereas the costs per case for the LSAS remain relatively constant.

4. Conclusions

The rate of uptake to blood test was significantly higher when the computer based tool was used compared to a self-assessment tool. This is possibly because the risk of diabetes is communicated by the HCP with the LPCRS, whereas with the self-assessment tool the patient completes the questionnaire and interprets the score themselves. Where the HCP communicates the score the patient may be better informed of the risks of undiagnosed type 2 diabetes, and hence be more motivated to arrange a blood test. Rate of diagnosis of type 2 diabetes was also higher in the LPCRS arm. This was essentially due to the higher number of blood tests that were undertaken. Both the LPCRS and the LSAS identified a population of high risk patients with similar characteristics, which is to be expected as many of the items within each tool are the same (e.g. both contain BMI, ethnicity, gender, age and family history of type 2 diabetes). The only significant difference between the two intervention arms was for personal estimation of percentage chance of developing type 2 diabetes over their lifetime, which was higher in the LSAS arm compared to the LPCRS (41.1% compared to 36.0%). This may be because the process of filling out the self-assessment tool makes an individual more aware of the risk factors linked to type 2 diabetes, and how the risk factors are linked to their own medical history.

In terms of cost-effectiveness both opportunistic risk assessment tools were relatively cheap to implement in practice, with the majority of costs being incurred from the blood tests. The cost per case of type 2 diabetes identified ranged from £168 to £352 depending on the scenario modelled. These reflect relatively low costs compared to the results of a simulation study which considered a number of different approaches

to screening for type 2 diabetes; including blood tests, and different risk scores.[13]

For this study The estimated costs per case of type 2 diabetes identified varied from £457 to £1639. Considering the large costs that can be incurred from late diagnosis of diabetes[8,9] the results of this study present a strong case for the implementation of such opportunistic strategies.

This study is the first direct comparison of a computer based risk score and a self-assessment score in a real-world setting, and has implications for practice worldwide. An RCT design of moderate size was utilised, ensuring comparable intervention arms for both known and unknown confounders, as well as high quality of evidence collated. The population assessed was of mixed ethnicities, with over 15% of the study population being non-Caucasian. Limitations of the study are that an RCT of risk assessment tools will never completely replicate uptake of the risk scores if implemented in primary care. Additionally, due to the study design, the number of individuals who refused to consent could not be monitored, which would have informed acceptability and uptake of the risk assessment tools in practice. HCPs involved with the trial reported informally that a high proportion of approached individuals agreed to participate.

The results presented here are also limited in that only the cost-effectiveness of the screening process itself has been considered. In practice any screening programme which enables individuals with T2DM or those at risk of developing the disease to be identified early, will lead to long-term cost-savings as cardiovascular complications and morbidity will be reduced.[9]

Previous studies have advocated the benefits of both early diagnosis of type 2 diabetes and identification of individuals at risk of the disease [8,9] and this study indicates that the use of opportunistic risk assessment tools would be a cost-effective approach for implementing this. A recent study by Herman et al [9] carried out a simulation study to assess the impact of early detection and treatment of type 2 diabetes on long-term risk of cardiovascular morbidity and mortality, and concluded major benefits are likely to accrue from early diagnosis and treatment.

This study provides an important comparison of a computer risk score and a self-assessment risk score for opportunistic screening of type 2 diabetes and those at high risk of developing this chronic condition, in a primary care setting. As uptake to invitation based health check programmes is often poor, opportunistic risk assessment methods provide an avenue to engage with individuals currently not being reached. Computer based tools have the advantage in that they can be tailored to identify only high risk individuals to be targeted by primary care, whereas for the self-assessment tools, the primary care staff need to have a discussion with every individual who they believe the risk assessment score is appropriate for.

In conclusion both computer and self-assessment risk assessment tools are relatively inexpensive to implement and successfully identify new cases of type 2 diabetes and those at risk of developing the disease. Use of computer based risk tool has a higher rate of participants progressing to a blood test and appears to be cheaper in terms cost per case of type 2 diabetes diagnosed.

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Contributors

KK, EB, GK, HD, AW, LG, AZ and MJD designed, set-up and conducted the study. EB, GK and HD were involved with data collection and input. CG analysed the data and ran the cost-effectiveness analysis. CG and KK wrote the first draft of the manuscript, to which all authors then contributed. All authors were involved with the interpretation of the results. We confirm that the manuscript has been read and approved by all named authors and that there are no other persons who satisfied the criteria for authorship but are not listed. We further confirm that the order of authors listed in the manuscript has been approved by all of us.

Conflict of Interests

KK (chair) and MJD would like to declare they are members of the NICE Guidelines on Prevention of Diabetes, as well as both advising on the Department of Health's National Screening Committee on Vascular Risk. KK is also a member of the National Diabetes Prevention Programme - Expert Reference Group. CG, HD, EB, LG, AW, GK, AZ have no competing interests to declare.

We confirm that we have given due consideration to the protection of intellectual property associated with this work and that there are no impediments to publication, including the timing of publication, with respect to intellectual property. In so doing we confirm that we have followed the regulations of our institutions concerning intellectual property.

We understand that the Corresponding Author is the sole contact for the Editorial process (including Editorial Manager and direct communications with the office). He is responsible for communicating with the other authors about progress, submissions of revisions and final approval of proofs.

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Table 1: Baseline characteristics of consented participants

	LPCRS (n=241)	LSAS All (n=336)	High risk (n=191)	Low risk (n=145)	p-value*
Age (mean (SD))	61.1 (8.95)	57.4 (9.43)	60.9 (8.62)	52.9 (8.48)	0.780
BMI (mean (SD))	30.8 (5.83)	28.9 (6.04)	31.0 (6.03)	26.3 (4.91)	0.735
Gender (n,%)					
Males	141 (59.0)	150 (44.9)	101 (53.2)	49 (34.0)	0.226
Females	98 (41.0)	184 (55.1)	89 (46.8)	95 (66.0)	
Ethnicity (n,%)					
White European	203 (84.2)	278 (83.2)	149 (78.0)	129 (90.2)	0.098
Other	38 (15.8)	56 (16.8)	42 (22.0)	14 (9.8)	

*p-values represent the comparison between those who scored as high-risk on the LSAS (n=191) and those scored as high-risk on the LPCRS (n=241)

Table 2: Uptake and results of blood tests for each risk assessment tool

	LPCRS	LSAS	p-value
<i>Rates per 1,000 high risk patient years (95% CI)*</i>			
Rate of first blood test	118.98 (102.85, 137.64)	92.14 (78.25, 108.49)	0.022
Rate of high risk and type 2 diabetes diagnosis combined	15.12 (9.11, 25.08)	14.72 (9.59, 22.57)	0.699
Rate of type 2 diabetes diagnosis	5.26 (2.62, 10.51)	1.92 (0.62, 5.95)	0.134
<i>First blood test</i>			
Identified as high risk and invited for a blood test (N)	241	191	
Attended	181 (75.0)	144 (75.0)	0.945
Choice of test			
FPG	72 (39.8)	48 (33.3)	
HbA1c	109 (60.2)	96 (66.7)	0.232
Result (mean (SD))			
FPG (mmol/l)	5.16 (1.64)	4.93 (0.52)	0.361
HbA1c (mmol/mol)	39.22 (7.27)	38.94 (5.26)	0.753
<i>Second blood test</i>			
Attended if invited	10 (100.0)	6 (100.0)	-
Choice of test			
HbA1c	3 (30.0)	3 (60.0)	0.267
OGTT	7 (70.0)	2 (40.0)	

*For example if a GP practice with 1000 high risk patients (LPCRS $\geq$ 5) implemented the intervention strategy for one year, these are the expected number of events

Table 3: Costs included in the decision tree

Test	Unit costs and required resources
Self-assessment risk score	7p per printed questionnaire (2 sides of A4)
Practice risk score	1 hour of administrator time per practice to load the risk score onto the practice database
OGTT	2 minutes of administrator time to arrange appointment for blood test 30 minutes of HCA time to perform blood test £0.68 for laboratory test 2 minutes of nurse time to review test
FPG	2 minutes of administrator time to arrange appointment for blood test 10 minutes of HCA time to perform blood test £0.34 for laboratory test 2 minutes of nurse time to review test
HbA1c	2 minutes of administrator time to arrange appointment for blood test 10 minutes of HCA time to perform blood test £2.37 for laboratory test 2 minutes of nurse time to review test
Administrator	£26 per hour
Healthcare assistant	£20 per hour
Nurse (GP practice)	£34 per hour

All costs are for 2014. Salary costs were taken from Curtis (2014) and the cost of laboratory tests were provided by the Leicester Pathology Service. Time to undertake tasks was modelled with uncertainty in the analysis.

Table 4: Costs of the two opportunistic risk assessment methods if implemented under different scenarios

	LPCRS	LSAS	Incremental cost-effectiveness ratios
<i>Opportunistic risk assessment strategies run in an average size practice (N=6891) for 1 year</i>			
Number attending for a blood test	247 (214, 285)	190 (161, 224)	-
Total cost	1,836 (1,332, 2,642)	1,399 (1,005, 2,007)	436 (108, 876) [†]
Cost per person attending for blood test	7.47 (5.56, 10.43)	7.36 (5.48, 10.23)	8.01 (5.28, 13.45)
Cost per type 2 diabetes case diagnosed	170 (77, 368)	352 (109, 1,148)	57 (-369, 547)
Cost per high risk or type 2 diabetes case identified	59 (34, 101)	46 (26, 81)	17 (-772, 697)
<i>Opportunistic risk assessment strategies run in an average size practice (N=6891) for 5 years</i>			
Number attending for a blood test	1233 (1068, 1425)	953 (807, 1122)	-
Total cost	9,079 (6,556, 13,120)	6,999 (5,028, 10,040)	2,076 (442, 4,277) [†]
Cost per person attending for blood test	7.39 (5.48, 10.35)	7.36 (5.48, 10.23)	7.60 (4.96, 12.34)
Cost per type 2 diabetes case diagnosed	168 (76, 364)	352 (109, 1,148)	55 (-353, 526)
Cost per high risk or type 2 diabetes case identified	58 (34, 100)	46 (26, 81)	16 (-735, 670)
<i>Opportunistic risk assessment strategies run in a small practice (N=1000) for 5 years</i>			
Number attending for a blood test	179 (155, 207)	138 (117, 163)	-
Total cost	1,340 (973, 1925)	1,015 (729, 1456)	324 (86, 643) [†]
Cost per person attending for blood test	7.51 (5.60, 10.47)	7.36 (5.48, 10.23)	8.20 (5.45, 14.05)
Cost per type 2 diabetes case diagnosed	171 (78, 370)	352 (109, 1,148)	59 (-376, 563)
Cost per high risk or type 2 diabetes case identified	59 (35, 102)	46 (26, 81)	19 (-793, 860)
<i>Opportunistic risk assessment strategies run in a large practice (N=20,000) for 5 years</i>			
Number attending for a blood test	3,577 (3,099, 4,136)	2,764 (2,343, 3,255)	-
Total cost	26,290 (18,970, 38,000)	20,390 (14,610, 29,610)	5,975 (1,232, 12,360) [†]
Cost per person attending for blood test	7.37 (5.46, 10.34)	7.36 (5.48, 10.23)	7.52 (4.88, 12.16)
Cost per type 2 diabetes case diagnosed	168 (76, 365)	352 (109, 1,148)	54 (-349, 523)
Cost per high risk or type 2 diabetes case identified	58 (34, 101)	46 (26, 81)	16 (-731, 665)

Figures are given in GBP and values in parenthesis are 95% Credible Intervals (CrI). It is assumed 60% of the practice list will be aged between 40-75 years and therefore eligible for the risk assessment tool.

†Represent incremental costs. For other outcomes the incremental cost-effectiveness ratios represent the additional cost per each additional person attending/case identified.