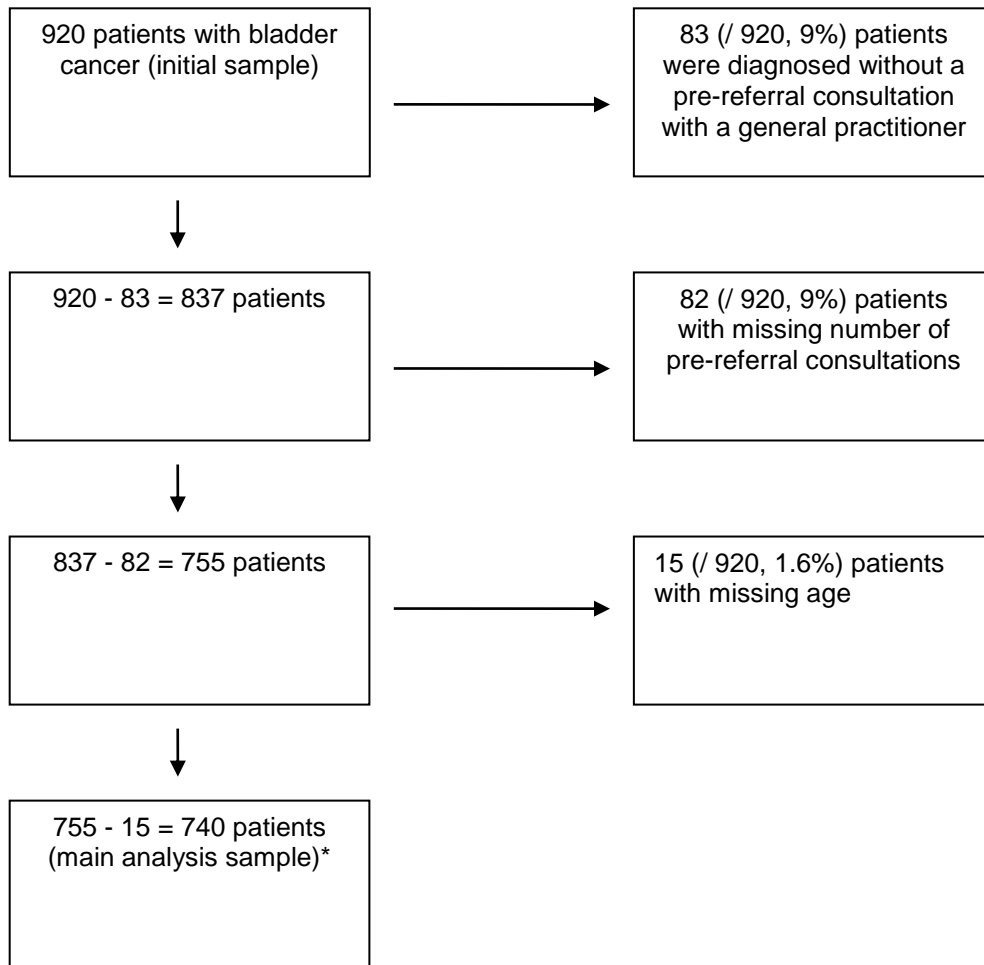


Appendix 1. Sample characteristics

		Bladder		Renal		
		n=920	%	n=398	%	
Gender	Men	667	72.50	231	58.04	
	Women	252	27.39	165	41.46	
	Unknown gender	1	0.11	2	0.5	
Age group	16 to 24	0	0	2	0.5	
	25-34	3	0.33	2	0.5	
	35-44	17	1.85	17	4.27	
	45-54	56	6.09	38	9.55	
	55-64	137	14.89	95	23.87	
	65-74	288	31.3	116	29.15	
	75-84	271	29.46	83	20.85	
	85+	127	13.8	35	8.79	
	Unknown age group	21	2.28	10	2.51	
Tests	Blood test	No	652	70.87	275	69.1
		Yes	268	29.13	123	30.9
	Endoscopy	No	914	99.35	394	98.99
		Yes	6	0.65	4	1.01
	US Scan	No	836	90.87	307	77.14
		Yes	84	9.13	91	22.86
	MR Scan	No	920	100	392	98.49
		Yes	0	0	6	1.51
	CT Scan	No	919	99.89	381	95.73
		Yes	1	0.11	17	4.27
	Chest X-ray	No	915	99.46	356	89.45
		Yes	5	0.54	42	10.55

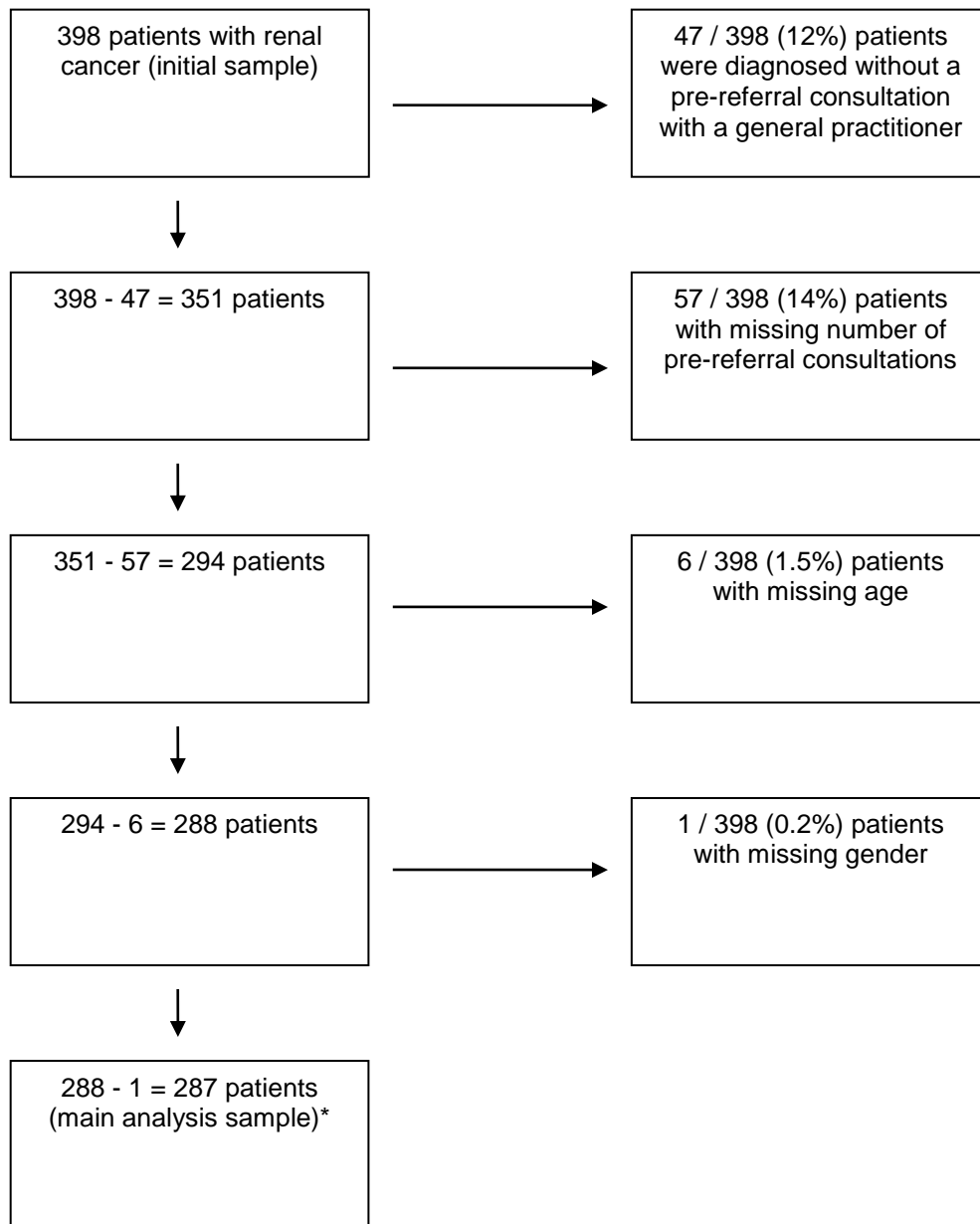
Appendix 2. Flow diagram: Derivation of the main analysis sample

a. Bladder cancer



*Gender, haematuria status, ultrasound scan use status, and 'blood test' status were completely observed in this sample.

b. Renal cancer



*Haematuria status, ultrasound scan use status, and 'blood test' status were completely observed in this sample.

Appendix 3. Comparative evidence on reported frequency of haematuria among patients with bladder, renal, or bladder-renal (urinary tract) cancers. These comparisons indicate that the proportion of patients with recorded haematuria in the national audit dataset used in the present study is comparable to the respective proportions reported in other primary care studies

Study	Data	% frequency of haematuria
<i>Bladder or renal (urinary tract)</i>		
<i>Present study</i>	<i>RCGP audit including data on 1,316 cases of urinary tract cancer</i>	<i>Men: 58.6 (55.3 to 61.8) Women: 48.7 (43.8 to 53.6) Persons: 55.4 (52.7 to 58.1)</i>
Jones R et al., BMJ 2007	General Practice Research Database (GPRD) (317 cases in analysis samples 1999-2000)	Men: 58.7 (52.8 to 64.4) Women: 51.2 (42.1 to 60.2)
Bruyninckx et al., BJGP 2003	Belgian primary care (sentinel network), 1993-1994 (126 patients with urinary tract cancer)	Men: 63.8 (53.2 to 73.3) Women: 46.9 (29.5–65.0)
<i>Bladder</i>		
<i>Present study</i>	<i>RCGP audit including data on 920 cases of bladder cancer</i>	<i>Persons: 68.8 (65.7 to 71.8)</i>
Shepherd EA et al, BJGP 2012	General Practice Research Database (GPRD) (4,935 cases of bladder cancer)	Persons: 52.8 (51.5 to 54.2)
Bruyninckx et al., BJGP 2003	Belgian primary care, 1993-1994 (87 patients with bladder cancer)	Persons: 70.1 (59.2 to 79.2)
<i>Renal</i>		
<i>Present study</i>	<i>RCGP audit including data on 396 cases of renal cancer</i>	<i>Persons: 24.4 (20.2 to 28.9)</i>
Bruyninckx et al., BJGP 2003	Belgian primary care, 1993-1994 (39 patients with urinary cancer other than bladder cancer)	Persons: 35.9 (21.7 to 52.8)
Shepherd E et al., BJGP 2013.	General Practice Research Database (GPRD) (3183 cases and 15,707 controls).	Persons: 17.7 (16.4 to 19.1)

;

Appendix 4. Different logistic regression models, used to explore degree of potential confounding of gender differences by other variables

	Gender only (as per Table 3 – crude)			Gender and age			Gender and haematuria			Gender, age and haematuria			Gender and use of ultrasound scan			Gender and blood test use			Full model (as per Table 3 - adjusted)		
	Odds ratio	95% CI		Odds ratio	95% CI		Odds ratio	95% CI		Odds ratio	95% CI		Odds ratio	95% CI		Odds ratio	95% CI		Odds ratio	95% CI	
BLADDER (n=740)																					
Men	Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
Women	2.91	1.93	4.39	2.82	1.87	4.27	3.00	1.96	4.60	2.88	1.88	4.43	2.68	1.77	4.08	3.56	2.31	5.50	3.29	2.06	5.25
16-54				1.54	0.75	3.17				1.34	0.63	2.86							1.20	0.53	2.72
55-64				0.71	0.35	1.45				0.66	0.32	1.37							0.59	0.29	1.21
65-74				Ref.						Ref.									Ref.		
75-84				1.25	0.75	2.10				1.25	0.73	2.13							1.18	0.69	2.03
85+				1.28	0.67	2.43				1.43	0.73	2.77							1.27	0.65	2.49
No haematuria							Ref.			Ref.									Ref.		
Haematuria							0.27	0.18	0.41	0.27	0.17	0.41							0.29	0.19	0.46
No blood test																Ref.			Ref.		
Blood test																2.67	1.74	4.11	2.47	1.58	3.86
No US scan													Ref.						Ref.		
US scan													2.10	1.20	3.68				1.55	0.82	2.93
RENAL (n=287)																					
Men	Ref.			Ref.			Ref.			Ref.			Ref.			Ref.			Ref.		
Women	1.88	1.08	3.27	1.88	1.08	3.29	1.72	0.98	3.03	1.73	0.98	3.04	1.85	1.06	3.24	2.02	1.14	3.58	1.90	1.06	3.42
16-54				1.17	0.49	2.79				1.06	0.44	2.55							1.05	0.41	2.74
55-64				1.11	0.52	2.38				0.99	0.46	2.15							0.85	0.39	1.85
65-74				Ref.						Ref.									Ref.		
75-84				0.95	0.42	2.14				0.88	0.39	2.00							0.95	0.38	2.38
85+				1.19	0.43	3.29				1.09	0.39	3.05							0.97	0.34	2.77
No haematuria							Ref.			Ref.									Ref.		
Haematuria							0.48	0.24	0.98	0.48	0.24	0.99							0.64	0.30	1.37
No blood test																Ref.			Ref.		
Blood test																2.84	1.60	5.04	2.99	1.64	5.46
No US scan													Ref.						Ref.		
US scan													2.03	1.13	3.65				2.17	1.11	4.24

Appendix 5. Sensitivity analysis using different binary categories of number of pre-referral consultations (two or more vs. one, and four or more vs. one, two or three; three or more vs. one or two used in main analysis)

	Main analysis (three or more vs. one or two consultations)*			Two or more vs. one consultation			Four or more vs. one, two or three consultations		
BLADDER (n=740)	Odds ratio	95% UCL	95% LCL	Odds ratio	95% UCL	95% LCL	Odds ratio	95% UCL	95% LCL
Men	Ref.			Ref.			Ref.		
Women	3.29	2.06	5.25	1.64	1.16	2.34	5.69	2.88	11.26
16-54	1.20	0.53	2.72	1.12	0.62	2.04	0.79	0.25	2.51
55-64	0.59	0.29	1.21	0.94	0.59	1.50	0.52	0.18	1.50
65-74	Ref.			Ref.			Ref.		
75-84	1.18	0.69	2.03	0.97	0.66	1.44	1.49	0.70	3.18
85+	1.27	0.65	2.49	0.93	0.56	1.53	0.47	0.15	1.47
No haematuria	Ref.			Ref.			Ref.		
Haematuria	0.29	0.19	0.46	0.35	0.25	0.50	0.16	0.09	0.31
No blood test	Ref.			Ref.			Ref.		
Blood test	2.47	1.58	3.86	2.26	1.63	3.13	2.43	1.28	4.59
No US scan	Ref.			Ref.			Ref.		
US scan	1.55	0.82	2.93	1.10	0.65	1.85	1.12	0.44	2.83
RENAL (n=287)									
Men	Ref.			Ref.			Ref.		
Women	1.90	1.06	3.42	1.88	1.12	3.15	2.01	0.94	4.32
16-54	1.05	0.41	2.74	0.85	0.38	1.88	1.25	0.39	4.00
55-64	0.85	0.39	1.85	0.74	0.37	1.46	1.05	0.38	2.95
65-74	Ref.			Ref.			Ref.		
75-84	0.95	0.38	2.38	0.89	0.44	1.79	0.94	0.29	3.02
85+	0.97	0.34	2.77	0.46	0.18	1.18	1.34	0.35	5.11
No haematuria	Ref.			Ref.			Ref.		
Haematuria	0.64	0.30	1.37	0.83	0.46	1.47	0.44	0.14	1.36
No blood test	Ref.			Ref.			Ref.		
Blood test	2.99	1.64	5.46	2.91	1.71	4.93	1.92	0.88	4.20
No US scan	Ref.			Ref.			Ref.		
US scan	2.17	1.11	4.24	2.14	1.20	3.80	1.73	0.72	4.15

*As per Table 3 – adjusted model, in main text

Ref.: Reference, US: Ultrasound, UCL: Upper Confidence Limit, LCL: Lower Confidence Limit

Appendix 6. A. Sensitivity analysis using multiple imputation. (Multiple imputation was conducted using chained equations which created 20 imputed datasets)

	Complete case analysis (as Table 3)	Results from multiply imputed complete dataset
Bladder [n=740 (complete) min 797 (multiple imputation)]	Odds ratio	Odds ratio
Men	Reference	Reference
Women	3.29	3.31
16-54	1.20	1.20
55-64	0.59	0.58
65-74	Reference	Reference
75-84	1.18	1.20
85+	1.27	1.32
No haematuria	Reference	Reference
Haematuria	0.29	0.29
No blood test	Reference	Reference
Blood test	2.47	2.42
No ultrasound scan	Reference	Reference
Ultrasound scan	1.55	1.53
Renal [n=287 (complete), min 324 (multiple imputation)]	Odds ratio	Odds ratio
Men	Reference	Reference
Women	1.90	1.86
16-54	1.05	0.99
55-64	0.85	0.88
65-74	Reference	Reference
75-84	0.95	0.93
85+	0.97	0.95
No haematuria	Reference	Reference
Haematuria	0.64	0.60
No blood test	Reference	Reference
Blood test	2.99	2.74
No ultrasound scan	Reference	Reference
Ultrasound scan	2.17	1.92

B. Proportion of patients with missing information by data item (n=920 for bladder and n=398 for renal cancer). Information on haematuria status, investigation by ultrasound scan and investigation by 'blood test' was complete)

	Complete	Missing	% missing
Bladder	Number of pre-referral consultations	838	82 8.9%
	Primary Care Interval	785	135 14.7%
	Gender	919	1 0.1%
	Age group	899	21 2.3%
Renal	Number of pre-referral	341	57 14.3%

consultations			
Primary Care Interval	298	100	25.1%
Gender	396	2	0.5%
Age group	388	10	2.5%

Appendix 7. Population health impact illustration

In the UK each year about 2,900 and 3,000 women are diagnosed with bladder and renal cancer, respectively. We use the values of 2,929 and 2,992 women with bladder and renal cancer, respectively, as the basis of subsequent calculations. These figures represent the three-year annual average of incident diagnoses of either cancer in women during 2007-9.

Using data from the national audit, it can be expected that of those women approximately 2,639 women with bladder cancer (or 90%) and 2,580 women with renal cancer (or 86%) will have at least one pre-referral consultation with a general practitioner.

We further estimate that each year in the UK:

- Approximately 435 women with bladder cancer* are currently diagnosed non-promptly because of gender inequalities in GP decision-making (166 presenting with haematuria, and 270 presenting without haematuria).
- Approximately 258 women with renal cancer** are currently diagnosed non-promptly because of gender inequalities in GP decision-making (32 presenting with haematuria, and 258 presenting without haematuria)

Considering both urinary tract cancers together, about 693 women every year are experiencing a non-prompt diagnosis because of gender inequalities. More than a quarter of those women presents with haematuria (197 women, or 28.5%) whereas the remaining women (496, or 71.5%) present without haematuria.

*Or 13% (378 / 2,929) of all women with bladder cancer.

**Or 9% (269 / 2,992) of all women with renal cancer.

Appendix 8. Supplementary analysis comparing the characteristics of a sub-sample of participating and non-participating practices

		Participating practices		Non-participating practices		p
		n	Mean	n	Mean	
General practice patient survey – patient experience measures (0-100)	Ability to book within 2 days	534	83.0	2345	83.5	0.27
	Ability to book 2 days ahead	534	75.5	2345	75.7	0.75
	Ability to see preferred doctor	534	74.3	2345	75.7	0.0020
	Doctor communication	534	83.9	2345	83.5	0.055
	Confidence and trust in the doctor	534	84.4	2345	83.8	0.013
	Nurse communication	534	84.8	2345	85.2	0.015
	Overall satisfaction with practice	534	85.8	2345	85.7	0.56
Quality Outcomes Framework practice scores (0-100)	Cancer indicators composite score	533	93.0	2284	92.7	0.33
	All clinical indicators composite score	533	80.8	2307	80.1	<0.001
Practice population deprivation index (0-100)		534	20.9	2312	22.2	0.015
Practice list size (patients)		534	7544	2308	6900	0.0012
Number of practice general practitioners		532	5.2	2315	4.5	<0.001

Methods used to produce the data in the above table: The (English) National Audit of Cancer Diagnosis in Primary Care was co-ordinated at the level of Cancer Networks. Of the 28 cancer networks in England, 20 networks contained general practices which took part in the audit. Of these cancer networks, eleven provided the identity of participating practices, although this was not linked to the audit data at the patient level. Practice comparisons (participating vs. non-participating) were restricted to cancer networks that identified participating practices so as to ensure a like-for-like comparison. Not doing so would have led to potential differences being identified which were due to differences between networks rather than within networks which is our prime focus.

We compared practices using data from the General Practice Patient Survey (GPPS),^{a,b} the Quality Outcomes Framework (QOF, <http://www.qof.ic.nhs.uk/>) and publicly available data on practice level socio-economic deprivation. For General Practice Patient Survey questions, we first linearly re-scaled items on a 0 to 100 scale. We then calculated shrunken estimates of practice scores from mixed effects models; case-mix adjusted for age, sex, ethnicity, deprivation and self-rated health. For Quality and Outcomes Framework practice scores, we calculated an overall average clinical summary score for each practice using a shrunken estimate of the proportion of patients for whom each measure was met, weighted by the point score for that indicator in the Quality and Outcomes Framework. A summary score was also calculated restricting indicators to those in the cancer domain. Further details of the calculation of these scores and the motivation for the techniques used are given elsewhere.^c We also compared the practice's list size (number of registered patients) (published as part of the Quality and Outcomes Framework) and the number of full-time equivalent doctors working at each practice (provided by the NHS information Centre). Finally we compared practice level socio-economic deprivation scores (calculated by applying the 2007 Lower Super Output Area Index of Multiple Deprivation proportionately to the practice population and made available by the Association of Public Health Observatories, www.apho.org.uk/resource/item.aspx?RID=95729). Formal comparisons between participating practices and non-participating practices were made using a t-test.

Results regarding Appendix 8 analysis (see Table).

- For about half of the patient experience measures considered there was evidence that the participating practices perform, on average, differently to the non-participating practices (Table). However, the differences are of very small magnitude and can be considered trivial. For example, participating practices scored lower on experience of relational continuity of care (i.e. seeing their preferred doctor) with a score of 74.3 out of 100 compared to 75.7 in non-participating practices.
- Regarding cancer domains of clinical quality measures, there was no evidence of differences between those practices who participated and those who did.
- Regarding overall clinical quality indicators, there was strong evidence of a small difference (80.7 out of 100 compared to 80.0).
- There are some more tangible differences in the other practice characteristics with participating practices being somewhat larger on average (by over 600 patients and around 1 full time doctor), and serving slightly less deprived patients. However, such differences are still small compared to the overall distribution seen in England.

References for Appendix 8

a. Campbell J, Smith P, Nissen S, Bower P, Elliott M, Roland M. The GP Patient Survey for use in primary care in the National Health Service in the UK – development and psychometric characteristics. *BMC Fam Pract.* 2009; 10:57.

b. Roland M, Elliott M, Lyratzopoulos G, Barbieri J, Parker R, Smith P, Bower P, Campbell J. Reliability of patient responses in pay for performance schemes: analysis of national General Practitioner Patient Survey data in England. *BMJ.* 2009; 339:b3851

c. Llanwarne NR, Abel GA, Elliott MN, Paddison CAM, Lyratzopoulos G, Campbell J, Roland M. Relationship between clinical quality and patient experience: analysis of data from the English Quality and Outcomes Framework and the national GP Patient Survey. *Ann. Fam. Med.* 2013. In Press