NKCA
National Kidney Cancer Audit

NATCAN
National Cancer Audit Collaborating Centre

National Kidney Cancer Audit State of the Nation Report: Methodology Supplement

An audit of care received by people diagnosed with kidney cancer between 1 January 2018 to 31 December 2022 in England and 1 January 2022 to 31 December 2023 in Wales. National time trends in kidney cancer diagnoses and treatments between 1 January 2019 to 30 September 2024 in England and 1 January 2022 to 31 December 2023 in Wales.

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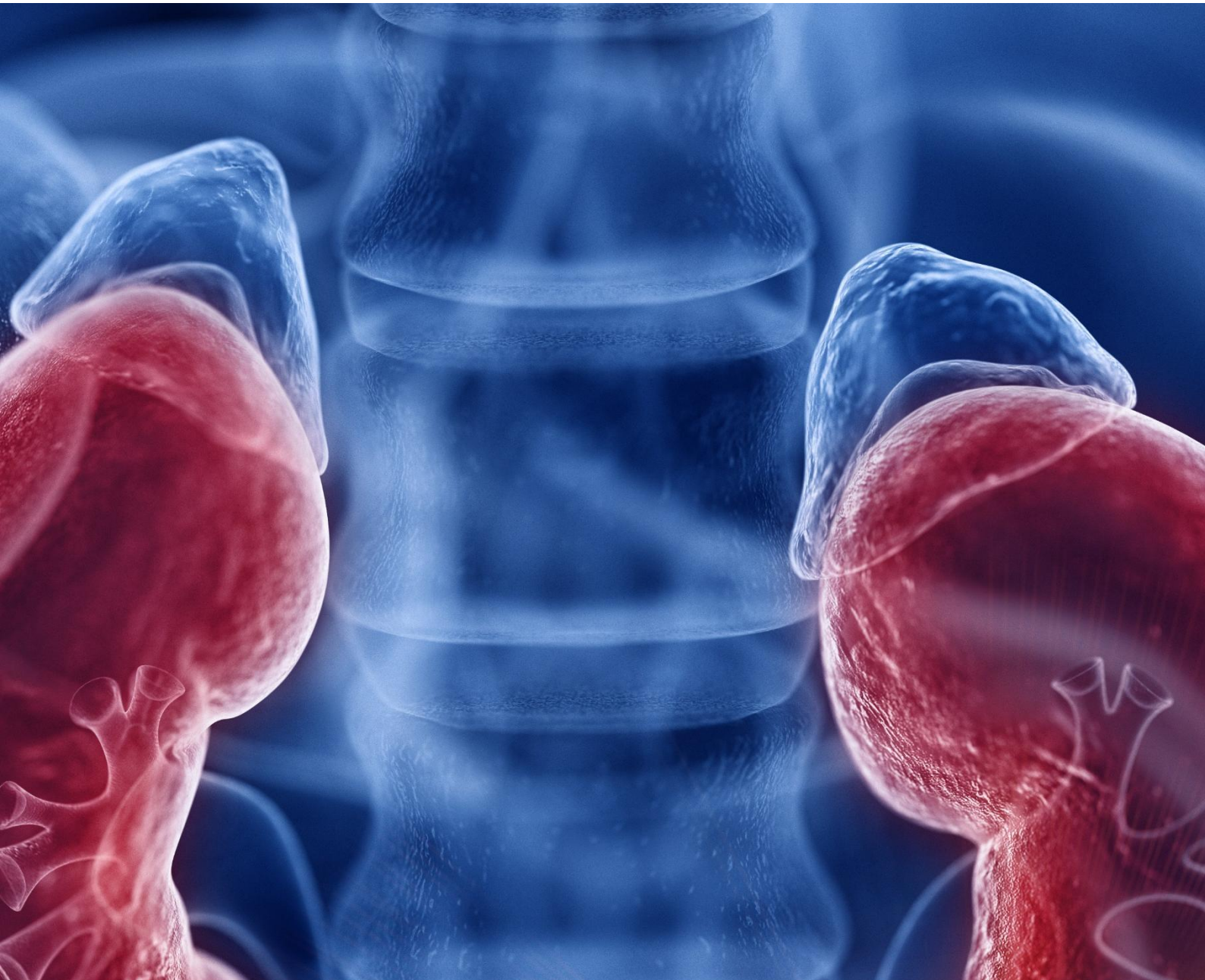

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This document was prepared by members of the NKCA project team:
Amit Bahl (BUG), Clinical Lead Oncology
Grant Stewart (BAUS), Clinical Lead Surgery
Raghav Varma, Clinical Fellow
Thomas Cowling, Senior Methodologist
Emily Mayne, Data Scientist
Marina Parry, Senior Project Manager
Aurelia Chen, Project Coordinator
Adrian Cook, Senior Statistician
Jan van der Meulen, Senior Methodologist

With review and input from:
NKCA Clinical Reference Group
NATCAN Executive Team

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The National Cancer Audit Collaborating Centre (NATCAN) is commissioned by the Healthcare Quality Improvement Partnership (HQIP) and funded by NHS England and the Welsh Government as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). NATCAN delivers national audits in bowel, breast (primary and metastatic), kidney, lung, non-Hodgkin lymphoma, oesophago-gastric, ovarian, pancreatic and prostate cancers.

The British Association of Urological Surgeons (BAUS) was founded in 1945 and exists to promote the highest standards of practice in urology, for the benefit of patients, by fostering education, research and clinical excellence. BAUS is a registered charity and qualified medical practitioners practising in the field of urological surgery are eligible to apply for membership. Registered Charity no: 1127044

The British Uro-oncology Group (BUG) was formed in 2004 to meet the needs of clinical and medical oncologists specialising in the field of urology. As the only dedicated professional association for uro-oncologists, its overriding aim is to provide a networking and support forum for discussion and exchange of research and policy ideas. Registered Charity no: 1116828

This work uses data that has been provided by patients and collected by the NHS as part of their care and support. For patients diagnosed in England, the data is collated, maintained and quality assured by the National Disease Registration Service (NDRS), which is part of NHS England. Access to the data was facilitated by the NHS England Data Access Request Service.

NHS Wales is implementing a new cancer informatics system. As a result, the quality and completeness of data from Wales is likely to have been impacted due to implementation of this new system across multiple NHS organisations (health boards), which has resulted in data being supplied by both old and new systems. Additionally, and reflecting the uncertainty of data quality, the data submitted to the audit may not have undergone routine clinical validation prior to submission to the Wales Cancer Network (WCN), Public Health Wales.

Contents

1. Introduction

This document provides supporting material to the 2025 State of the Nation (SotN) Report for the National Audit of Kidney Cancer (NKCA) and its data tables and data viewer. The document describes the data used in the report with details on sources of data, criteria for inclusion and how data completeness, patient characteristics and performance indicators are derived and reported.

2. Sources of Data

The audit uses information from routine national health care datasets in England and Wales. These datasets capture details on the diagnosis, management, treatment and outcome of every patient newly diagnosed with cancer in the NHS in England and Wales.

For England, the audit received information from the National Disease Registration Service (NDRS) at a tumour level for this State of the Nation report. The information held in the National Cancer Registration Dataset (NCRD) and the Rapid Cancer Registration Dataset (RCRD) is compiled from a variety of sources including the Cancer Outcomes and Services Dataset (COSD), Hospital Episode Statistics admitted patient care (HES APC) records, the Systemic Anti-Cancer Therapy dataset (SACT), Radiotherapy Dataset (RTDS) and data submitted by pathology laboratories. The audit also received linked information from COSD (linked at tumour level), HES APC, HES Outpatients data (HES OP), SACT and RTDS (all linked at patient level). Appendix 1 provides more detail on the data sources listed below and the information they contain.

The English data received by the National Cancer Audit Collaborating Centre (NATCAN) included data on patients registered with cancer up to 31st October 2024. For information on the timeliness of NCRD and RCRD, please see the NATCAN website.

As with cancer registries in other countries, cancer registrations in England can take up to 5 years after the end of a given calendar year to reach *approximately* 100% completeness and stability. NDRS uses an active system of gathering information on cancer diagnoses from multiple sources across the patient pathway. Completeness varies by tumour type because different patient pathways provide different opportunities for data flows into NDRS. The 'Gold standard' cancer registration dataset that is used in cancer statistics bulletins and available for analysis outside of NDRS contains over 98% of all the people that will eventually be found by the registration process, and the completeness for a calendar year of data increases over time. More information about the cancer registration process can be found here.

For Wales, the audit was provided with a registration dataset at patient level for patients diagnosed with kidney cancer in 2023. Welsh cancer registration data is captured through a national system, Cancer Information System for Wales (CaNISC) and the new Welsh Clinical Portal. The audit also received linked datasets of records from the Patient Episode Database for Wales (PEDW) containing information on inpatient and day case activity, and mortality data from the Office for National Statistics (ONS).

Due to the different periods covered, and differences in the construction of some indicators, England and Wales data were managed and analysed separately. In addition, results for England and Wales are presented separately.

3. Inclusion and Exclusion Criteria

The data submitted by NDRS and WCN is checked and filtered for eligible participants, tables 3.1 and 3.2 explains the process in defining the final cohort to be used in the audit.

People were included for analysis within the SotN Report if they met the following inclusion and not the exclusion criteria:

Table 3.1: Audit Inclusion Criteria

Inclusion Criteria	**Details**
Type of cancer	C64 (Malignant neoplasm of kidney)
Adults	Age >=18
Valid Diagnosis Date	England: 1 January 2018 to 30 September 2024 Wales: 1 January 2022 to 31 December 2023
First Diagnosis	1. Earliest diagnosis (diagnosisdatebest) was included in the cohort if dates of diagnosis differed. 2. If dates of diagnosis were the same then inclusion based on selecting in order: a. The tumour with complete TNM (t_best, n_best, m_best) b. The tumour with the most advanced stage based on TNM was analysed (t_best, n_best, m_best)

Table 3.2: Audit Exclusion Criteria	
Exclusion Criteria	**Details**
Reported by death certificate only or date of diagnosis corresponds to date of death	**For English data:** Using NCRD or RCRD: final_route = DCO (Death Certificate Only) and/or basisofdiagnosis = 0 (Death certificate) and/or dco = Y (tumour registered from a death certificate only) and/or diagnosisdatebest = deathdatebest **For Welsh data:** DIAGNOSIS_DATE (Cohort data) = date of death
Diagnosed and treated outside of an NHS organisation in England or Wales.	**For English data:** Organisation of diagnosis was a Welsh health board (code starting with 7) Organisation of diagnosis was a private healthcare organisation **For Welsh data:** Organisation of diagnosis was an English trust (code starting with R) Organisation of diagnosis was a private healthcare organisation

4. Key Data Items

Details of the variables and datasets used to compile the data completeness are shown below in Table 4.1.

Table 4.1: Data Completeness Variables				
Data Item	**Source**			
	England		**Wales**	
	Data field	**Dataset**	**Data field**	**Dataset**
T stage	t_best	NCRD	TNMStageT	Can reg dataset
N stage	n_best	NCRD	TNMStageN	Can reg dataset
M stage	m_best	NCRD	TNMStageM	Can reg dataset
Performance status	performancestatus	COSD	PerformanceStatus	Can reg dataset
Tumour size	tumoursize	NCRD	*Not available*	*NA*
Ethnicity	ethnicity	NCRD	EthnicGroup	PEDW

Details of the variables and datasets used to compile the patient and tumour characteristics are shown below in Table 4.2.

Table 4.2: Patient and Tumour Characteristics Variables				
Data Item	**Source**			
	England		**Wales**	
	Data field	**Dataset**	**Data field**	**Dataset**
Age at diagnosis	*age* categorised into 6 groups: <45, 45-54, 55-64, 65-74, 75-84, >85	NCRD	*AgeAtDiag* categorised into 6 groups: <45, 45-54, 55-64, 65-74, 75-84, >85	Can reg dataset
Gender / sex	*gender*	NCRD	*sex*	PEDW

Performance status	*Performancestatus* categorised into 3 groups: 0, 1-2, ≥3	COSD	*PerformanceStatus* categorised into 3 groups: 0, 1-2, ≥3	Can reg dataset
Number of co-morbidities (Charlson score)	See appendix 2 for details Categorised into 3 groups: 0, 1, ≥2	HES APC	See appendix 2 for details Categorised into 3 groups: 0, 1, ≥2	PEDW
Stage	*Stage_best*	NCRD	*StageOther*	Can reg dataset
T stage	*T_best*	NCRD	*TNMStageT*	Can reg dataset
N stage	*N_best*	NCRD	*TNMStageN*	Can reg dataset
M stage	*M_best*	NCRD	*TNMStageM*	Can reg dataset
Ethnicity	*Ethnicity* categorised into 5 groups	NCRD	*ethnicgroupcategory*	PEDW
Index of multiple deprivation	*imd19_quintile_lsoas*	NCRD	*deprivationquintile*	PEDW

Details of the variables and datasets of additional data items needed for performance indicator development in Table 4.3.

Table 4.3: Additional data items needed for performance indicator development

Data Item	**Source**			
	England		**Wales**	
	Data field	**Dataset**	**Data field**	**Dataset**
Date of multidisciplinary team (MDT) meeting	*firstmdtmeetingdate*	COSD	*PlanDiscussedDate* *CancerCarePlanMDTDate*	Can reg dataset
Has cancer care plan been discussed by MDT?	*Not available*	*NA*	*PlanDiscussed*	Can reg dataset
Was the patient consented for a clinical trial?	*clin_trial*	CWT	*Not available*	*NA*
Date of decision to treat	*treat_period_start*	CWT	*Not available*	*NA*
Date of diagnosis	*diagnosisdatebest*	NCRD	*DiagnosisDate*	Can reg dataset
Date of death	*deathdatebest*	NCRD	*DeathDate*	Can reg dataset

5. Indicator Definitions

The audit uses key indicators to monitor progress against its healthcare improvement goals. These indicators align with national guidelines and standards. Definitions of how the indicators included in the SotN report were derived from data for England and Wales are described below.

Some indicators are further focused on subgroups of patients as defined by sex and stage of the disease, as these factors are important determinants of whether particular treatments are suitable for patients.

5.1 Performance Indicator 1: Recorded MDT meeting date

Percentage of people who had a record of being discussed at a multidisciplinary team (MDT) meeting.

Table 5.1: Percentage of people who had a record of being discussed at an MDT meeting		
	England	**Wales**
Dates of diagnosis:	1/1/2020 to 31/12/2022	1/1/2022 to 31/12/2023
Numerator: Number of people who had a record of being discussed at an MDT meeting	Number of people with kidney cancer with date of first MDT meeting recorded (*firstmdtmeetingdate*) in NCRD.	Number of people with kidney cancer with a record that treatment plan was discussed by the MDT (*PlanDiscussed* = "Yes") or an MDT meeting date recorded (*PlanDiscussedDate* / *CancerCarePlanMDTDate*) in the registration extract.
Denominator: Number of people with a new diagnosis of kidney cancer	Final cohort as described in patient inclusion / exclusion.	Final cohort as described in patient inclusion / exclusion.
Construction notes		
Country reporting:	England & Wales separate	
Organisational Reporting level: Trust / Health Board	Reported at the level of diagnosing Trust.	Reported at the level of diagnosing Health Board.
Subgroup Reporting :	None	None
Risk adjusted:	No	
Outlier reporting:	No	

5.2 Performance Indicator 2: Consented for a clinical trial

Percentage of people with kidney cancer who are consented for a clinical trial.

Table 5.2: Percentage of people with kidney cancer who are consented for a clinical trial		
	England	**Wales**
Dates of diagnosis:	1/1/2020 to 31/12/2022	N/A
Numerator: Number of people with kidney cancer who are consented for a clinical trial	Number of people with kidney cancer who have been consented for a clinical trial (*clin_trial* = 1) in CWT.	N/A
Denominator: Number of people with a new diagnosis of kidney cancer and whether they participated in a clinical trial recorded	Initial cohort as described in patient inclusion / exclusion. Only included people with kidney cancer who had whether they participated in a clinical trial recorded (*clin_trial* = 1 or 2).	N/A
Construction notes	• Exclusions: People who didn't have whether they participated in a clinical trial recorded.	N/A
Country reporting:	England only (Wales was excluded as there was no equivalent data item about whether a person was consented to a clinical trial)	
Organisational Reporting level: Trust	Reported at the level of diagnosing Trust.	N/A
Subgroup Reporting :	None	N/A
Risk adjusted:	No	

Outlier reporting:	No

5.3 Performance Indicator 3: Small kidney cancer (≤4cm) biopsies

Percentage of people with a small kidney cancer (≤4cm) who have a biopsy.

Table 5.3: Percentage of people with a small kidney cancer (≤4cm) who have a biopsy		
	England	**Wales**
Dates of diagnosis:	1/1/2020 to 31/12/2022	N/A
Numerator: Number of people who have ≤4cm or T1aN0M0 kidney cancer who have a biopsy	Number of people who have ≤4cm (*tumoursize* <=40 mm) or T1aN0M0 (*t_best* = 1a & *n_best* = N0 & *m_best* = M0) kidney cancer who have a biopsy recorded. Biopsy is identified by the following OPCS-4 procedure codes in HES APC: M131, M081 (see *Table A3.1 for more detail*).	N/A
Denominator: Number of people who have ≤4cm or T1aN0M0 kidney cancer	Number of people who have ≤4cm kidney cancer (*tumoursize* <=40 mm) or T1aN0M0 (*t_best* = 1a & *n_best* = N0 & *m_best* = M0) kidney cancer.	N/A
Construction notes	• Exclusions: People with N1 RCC, people with M1 RCC, people with tumour size > 4cm, people with ≥ T1b RCC. • We included people with T1a RCC who were missing N and/or M stage as it is our clinical assumption that these patients are N0 and M0.	N/A
Country reporting:	England only (Wales was excluded from this indicator as only 25% of patients have either T1a/T1b specified or tumour size available)	
Organisational Reporting level: Trust	Reported at the level of diagnosing Trust.	N/A
Subgroup Reporting :	None	N/A
Risk adjusted:	Yes: age, gender, ethnicity, co-morbidity and deprivation	
Outlier reporting:	No	

5.4 Performance Indicator 4: Radical nephrectomy within 31 days of decision to treat

Percentage of people with a T3+ and/or 10cm+ and/or N1 and M0 renal cell carcinoma (RCC) whose radical nephrectomy is within 31 days of decision to treat.

Table 5.4: Percentage of people with a T3+ and/or 10cm+ and/or N1 and M0 renal cell carcinoma (RCC) whose radical nephrectomy is within 31 days of decision to treat		
	England	**Wales**
Dates of diagnosis:	1/1/2020 to 31/12/2022	N/A
Numerator:	Number of people with T3+ (*t_best* = 3 or *t_best* = 4) and/or	N/A

Number of people with T3+ and/or 10cm+ and/or N1 and/or stage 3 who have a radical nephrectomy within 31 days of decision to treat	10cm+ (*tumoursize* >=100 mm) and/or N1 (*n_best* = 1) and/or stage 3 (*stage_best* = 3) who have a radical nephrectomy within 31 days of decision to treat (*treat_period_start*).	
Denominator: Number of people with T3+ and/or 10cm+ and/or N1 and/or stage 3 renal cell carcinoma (RCC) who have a radical nephrectomy	Number of people with T3+ (*t_best* = 3 or *t_best* = 4) and/or 10cm+ (*tumoursize* >=100 mm) and/or N1 (n_best = 1) and/or stage 3 (stage_best = 3) renal cell carcinoma (RCC) who have a radical nephrectomy.	N/A
Construction notes	• Exclusions: People with M1 RCC and people with stage 1 RCC. • Radical nephrectomy is identified via HES APC using the OPCS-4 procedure codes listed in Table A3.2. • We are unable to use diagnosis date, as for most patients it is the same as the surgery date. • Instead, we used Cancer Waiting Time 'treatment period start' date which represents the decision to treat date. • We decided to include those missing M stage as it is a fair clinical assumption that if they are receiving surgery they are M0	N/A
Country reporting:	England only (Wales was excluded from this indicator as only 15% of patients have decision to treat date recorded)	
Organisational Reporting level: Trust	Reported at the level of diagnosing Trust.	N/A
Subgroup Reporting :	None	N/A
Risk adjusted:	Yes: age, gender, ethnicity, co-morbidity and deprivation	
Outlier reporting:	No	

5.5 Performance Indicator 5: T1b-3NXM0 RCC (T2-3NXM0 RCC for Wales) who have surgery

Percentage of people with T1b-3NXM0 RCC (T2-3NXM0 RCC for Wales) who have surgery.

Table 5.5: Percentage of people with T1b-3NXM0 RCC (T2-3NXM0 RCC for Wales) who have surgery		
	England	**Wales**
Dates of diagnosis:	1/1/2020 to 31/12/2022	1/1/2022 to 31/12/2023
Numerator: Number of people with T1b-3NXM0 or stage 2 or 3 RCC or tumour size > 4 cm who undergo surgery between 31 days prior to diagnosis and 365 days following diagnosis	Number of people with T1b-3NXM0 (*t_best* = 1b-3, *n_best* = X, *m_best* = 0) or stage 2 (*stage_best* = 2) or 3 (*stage_best* = 3) RCC or tumour size > 4 cm (*tumoursize* >40 mm) who undergo surgery between 31 days prior to diagnosis and 365 days following diagnosis	Number of people with T2-3NXM0 (*TNMStageT* = 2-3, TNMStageN = X, *TNMStageM* = 0) or stage 2 (*StageGroup* = "Stage II") or 3 (*StageGroup* = "Stage III") RCC who undergo surgery between 31 days prior to diagnosis and 365 days following

	(*diagnosisdatebest*). Surgery is identified via HES APC using the OPCS-4 procedure codes listed in *Table A3.2* and *Table A3.3*.	diagnosis (*DiagnosisDate*). Surgery is identified via PEDW using the OPCS-4 procedure codes listed in *Table A3.2* and *Table A3.3*.
Denominator: Number of people with T1b-3NXM0 or stage 2 or 3 RCC or tumour size > 4 cm	Number of people with T1b-3NXM0 (*t_best* = 1b-3, *n_best* = X, *m_best* = 0) or stage 2 (*stage_best* = 2) or 3 (*stage_best* = 3) RCC or tumour size > 4 cm (*tumoursize* >40 mm)	Number of people with T2-3NXM0 (*TNMStageT* = 2-3, TNMStageN = X, *TNMStageM* = 0) or stage 2 (*StageGroup* = "Stage II") or 3 (*StageGroup* = "Stage III") RCC
Construction notes	• T1b-3 includes: T1b, T2, T2a, T2b, T3, T3a, T3b, T3c • NX includes: N0, N1, N missing • Exclusions: People with M1 RCC, people with missing M stage, people with stage 4 disease, people with T4 RCC, people with T1a RCC, people with tumour size ≤ 4cm • This excludes stage 1 patients who have a tumour size of equal to or less than 4 cm	• T2-3 includes: T2, T2a, T2b, T3, T3a, T3b, T3c • NX includes: N0, N1, N missing • Exclusions: People with M1 RCC, people with missing M stage, people with stage 4 disease, people with T4 RCC, people with T1 RCC, people with stage 1 RCC
Country reporting:	England and Wales separate (We used T2-3NXM0 RCC for Wales (same as England except excluding T1b and tumour size > 4 cm as only 25% of patients have either T1a/T1b specified or tumour size available))	
Organisational Reporting level: Trust	Reported at the level of diagnosing Trust.	Reported at the level of diagnosing Health Board.
Subgroup Reporting :	None	None
Risk adjusted:	Yes: age, gender, ethnicity, co-morbidity and deprivation	
Outlier reporting:	No	

5.6 Performance Indicator 6: Nephron sparing treatment

Percentage of people with T1aN0M0 RCC who undergo nephron sparing treatment.

Table 5.6: Percentage of people with T1aN0M0 RCC who undergo nephron sparing treatment

	England	**Wales**
Dates of diagnosis:	1/1/2020 to 31/12/2022	N/A
Numerator: Number of people with T1aN0M0 RCC or tumour size ≤ 4cm who undergo nephron sparing treatment (NSS or ablation) between 31 days prior and 365 days following diagnosis	Number of people with T1aN0M0 RCC (*t_best* = 1a & *n_best* = N0 & *m_best* = M0) or tumour size ≤ 4cm (*tumoursize* <=40 mm) who undergo nephron sparing treatment (NSS or ablation) between 31 days prior and 365 days following diagnosis (*diagnosisdatebest*). Nephron sparing treatment is identified via HES APC using the OPCS-4 procedure codes listed in *Table A3.3* and *Table A3.4*.	N/A
Denominator: Number of people with T1aN0M0 RCC or tumour size ≤ 4cm who undergo surgery (RN or NSS) or ablation	Number of people with T1aN0M0 RCC (*t_best* = 1a & *n_best* = N0 & *m_best* = M0) or tumour size ≤ 4cm (*tumoursize* <=40 mm) who undergo surgery (RN or NSS) or ablation	N/A

between 31 days prior and 365 days following diagnosis	between 31 days prior and 365 days following diagnosis (*diagnosisdatebest*). Surgery and ablation are identified via HES APC using the OPCS-4 procedure codes listed in *Table A3.2, Table A3.3* and *Table A3.4*.	
Construction notes	• Exclusions: People with M1 RCC, people with N1 RCC, people with tumour size > 4cm, people with ≥ T1b RCC • We included people with missing N status and/or M status as N1 and M1 will be rare in people with T1a RCC	N/A
Country reporting:	England only (Wales was excluded from this indicator as only 25% of patients have either T1a/T1b specified or tumour size available)	
Organisational Reporting level: Trust	Reported at the level of diagnosing Trust.	N/A
Subgroup Reporting :	None	N/A
Risk adjusted:	Yes: age, gender, ethnicity, co-morbidity and deprivation	
Outlier reporting:	No	

5.7 Performance Indicator 7: SACT within 12 months of diagnosis

Percentage of people presenting with M1 RCC who have initial SACT within 12 months of diagnosis.

Table 5.7: Percentage of people presenting with M1 RCC who have initial SACT within 12 months of diagnosis

	England	**Wales**
Dates of diagnosis:	1/1/2018 to 31/12/2022	1/1/2022 to 31/12/2023
Numerator: Number of people presenting with metastatic RCC who have initial SACT within 12 months of diagnosis	Number of people presenting with metastatic RCC (*m_best* = 1) who have initial SACT within 12 months of diagnosis (*diagnosisdatebest*). SACT is identified through SACT dataset. It is also identified via HES APC using the OPCS-4 procedure codes listed in *Table A4.1* and using the ICD-10 codes listed in *Table A4.2*.	Number of people presenting with metastatic RCC (*TNMStageM* = 1) who have initial SACT within 12 months of diagnosis (*DiagnosisDate*). SACT is identified via PEDW using the OPCS-4 procedure codes listed in *Table A4.1* and using the ICD-10 codes listed in *Table A4.2*.
Denominator: Number of people presenting with metastatic RCC	Number of people presenting with metastatic RCC (*m_best* = 1).	Number of people presenting with metastatic RCC (*TNMStageM* = 1)
Construction notes	Exclusions: People with M0 RCC, people whose M status is missing	Exclusions: People with M0 RCC, people whose M status is missing
Country reporting:	England and Wales separate	
Organisational Reporting level: Trust	Reported at the level of diagnosing Trust.	Reported at the level of diagnosing Health Board.
Subgroup Reporting :	None	None
Risk adjusted:	Yes: age, gender, ethnicity, co-morbidity and deprivation	
Outlier reporting:	No	

5.8 Performance Indicator 8: Death within 30 days of starting SACT treatment

Percentage of people with kidney cancer who die within 30 days of starting SACT treatment.

Table 5.8: Percentage of people with kidney cancer who die within 30 days of starting SACT treatment		
	England	**Wales**
Dates of diagnosis:	1/1/2018 to 31/12/2022	1/1/2022 to 31/12/2023
Numerator: Number of people diagnosed with metastatic RCC who die within 30 days of starting SACT treatment	Number of people diagnosed with metastatic RCC (*m_best* = 1) who die (*deathdatebest*) within 30 days of starting SACT treatment. SACT is identified through SACT dataset. It is also identified via HES APC using the OPCS-4 procedure codes listed in *Table A4.1* and using the ICD-10 codes listed in *Table A4.2*.	Number of people diagnosed with metastatic RCC (*TNMStageM* = 1) who die (*DeathDate*) within 30 days of starting SACT treatment. SACT is identified via PEDW using the OPCS-4 procedure codes listed in *Table A4.1* and using the ICD-10 codes listed in *Table A4.2*.
Denominator: Number of people diagnosed with metastatic RCC who underwent SACT treatment	Number of people diagnosed with metastatic RCC (*m_best* = 1) who underwent SACT treatment. SACT is identified through SACT dataset. It is also identified via HES APC using the OPCS-4 procedure codes listed in *Table A4.1* and using the ICD-10 codes listed in *Table A4.2*.	Number of people diagnosed with metastatic RCC (*TNMStageM* = 1) who underwent SACT treatment. SACT is identified through SACT dataset. It is also identified via HES APC using the OPCS-4 procedure codes listed in *Table A4.1* and using the ICD-10 codes listed in *Table A4.2*.
Construction notes	• Exclusions: People with M0 RCC • We included people with missing M stage as our clinical assumption is that they are M1 if they received SACT in this time period	• Exclusions: People with M0 RCC • We included people with missing M stage as our clinical assumption is that they are M1 if they received SACT in this time period
Country reporting:	England and Wales separate	
Organisational Reporting level: Trust	Presented at the level of treating Trust.	Presented at the level of diagnosing Health Board (For Wales, we were unable to identify treating Health Board for the patients with SACT only recorded in CaNISC so results were reported at the level of diagnosing Health Board instead).
Subgroup Reporting :	None	None
Risk adjusted:	Yes: age, gender, ethnicity, co-morbidity and deprivation	
Outlier reporting:	No	

6. NHS Organisations

The audit presents organisation-level findings by the NHS organisation of diagnosis or treatment, as appropriate for the specific indicator:

- Organisation of treatment: for indicators concerned with treatment outcomes (Performance Indicator 8: Death within 30 days of starting SACT treatment)
- Organisation of diagnosis: for all other indicators

Details on allocation to NHS Trust in England:

- Trust of diagnosis is identified using the trust of diagnosis variable in the NCRD.

- Cases in the English data where the organisation of diagnosis is an NHS Wales organisation are excluded from the England analyses, unless the case had SACT in England.

For Wales, the local health board of diagnosis was identified using the trust of diagnosis variable in the cancer registration dataset.

A minimum of 10 diagnoses in the audit period were required for reporting at trust or health board level. This was to ensure only trusts providing cancer services were included and also to avoid very small numbers which can lead to unreliable estimates and increase the risk of potential data disclosure.

7. Statistical Analysis

All statistical analyses were conducted using *Stata version 17.*

Most results in the SotN Report are descriptive. The results of categorical data items are reported as percentages (%). Results are typically provided as an overall figure and broken down by NHS organisation of diagnosis (see NHS organisations section). Note that within tables in the SotN Report, the total percentage may not equal 100%, due to rounding.

7.1 Suppression

- Data quality and completeness results have not been supressed.
- Organisations with indicator denominator values less than 10 have been suppressed.

7.2 Risk-adjustment of indicators

The provider level results for some indicators were risk adjusted. The tables of performance indicators state whether risk adjustment has been performed. Multivariable logistic regression was carried out to produce the risk adjusted results. This was used to estimate the probability of a patient having an event, at trust level the individual probabilities were summed to give the expected number of events, and the number of events was then divided by the expected.

Table 7.1 below provides details on the datasets and variables used to compile the variable used for risk adjustment.

Table 7: Risk Adjustment Variables

Data Item	**Additional detail**	
	England	**Wales**
Age at diagnosis	Age (NCRD) categorised into 6 groups: <45, 45-54, 55-64, 65-74, 75-84, >85	Age (Cohort data) categorised into 6 groups: <45, 45-54, 55-64, 65-74, 75-84, >85
Gender	Gender (NCRD) analyse as male and female	Gender (Cohort data) analyse as male, female and missing
Ethnicity	Ethnicity (NCRD (England) and Cohort data (Wales)) categorised into 6 groups: White, Mixed, Asian/Asian British, Black/Black British, Other, missing	
Deprivation	The Index of Multiple Deprivation (IMD) was used to categorise patients into five socioeconomic groups (1=least deprived; 5=most deprived) based on the small areas in which they lived (LSOAs, containing ~1500 people). The 5 categories were fifths of the national IMD ranking of these areas. Deprivation categorised into 6 groups: 1- least deprived, 2, 3, 4, 5 – most deprived, missing	

Charlson comorbidity index	The CCI is a commonly used scoring system for medical comorbidities, consisting of a grouped score calculated based on the absence (0) and presence (≥1) of 14 pre-specified medical conditions (**Appendix 2**). The CCI was calculated using information on secondary diagnoses (ICD-10 codes) recorded in HES APC (England) / PEDW (Wales) within the 24-month period prior to a patient's diagnosis. For the purpose of analysis, the CCI is grouped into three categories: • **0** none of the 14 pre-specified comorbidities. • **1** only 1 of the 14 pre-specified comorbidities. • **2+** 2 or more of the 14 pre-specified comorbidities

7.3 Handling of missing data

For the risk-adjustment, missing values for age, gender, ethnicity and deprivation were classified as a separate "missing" category to ensure all included people contributed to the statistical models.

8. Outlier Process

The outlier process can be found in the separate NKCA outlier policy.

Appendix 1: Routine data sources

Overview of the data sources used for the SotN Report.

Country	Data source	Content
England	Cancer registry (NCRD and RCRD)	Data on all aspects of the cancer registration including information from hospital pathology systems.
England	COSD	Cancer Outcomes and Servives dataset (COSD) items, are submitted routinely by service providers via multidisciplinary team (MDT) electronic data collection systems to the National Cancer Data Repository (NCDR) on a monthly basis.
England	SACT	Systemic Anti-Cancer Therapy (SACT) data contains information on chemotherapy dates, regimen(s) and dose(s).
England	RTDS	Radiotherapy dataset (RTDS) contains information on radiotherapy treatment including dates, prescription region and dose.
England	HES	Hospital Episode Statistics (HES) is the administrative database of all NHS hospital admissions in England; records were supplied by NHS Digital to NCRAS.
England	CWT	Cancer Waiting Times (CWT) dataset provides information on the waiting times of people referred with suspected cancer or symptoms and subsequently told the outcome of their diagnosis, and treated for cancer by the NHS in England.
England	PCPD	Primary Care Prescription Database (PCPD) contains information on the use of endocrine therapy.
Wales	CaNISC	Cancer Network Information System Cymru (Canisc) contains data on all aspects of the cancer registration including investigations. (OLD SYSTEM)
Wales	CDF	Clinical Dataset Form (CDF) contains data on all aspects of the cancer registration including investigations (NEW SYSTEM)
Wales	PEDW	Patient Episode Database for Wales (PEDW) is the administrative database of all NHS hospital admissions in Wales.
Wales	RTH	Radiotherapy data (RTH) contains information on radiotherapy treatment.
England & Wales	ONS	Office for National Statistics (ONS) death data including date of death and cause of death.

Appendix 2: Charlson Comorbidity Index

Reference:

Armitage JN, van der Meulen JH. Identifying co-morbidity in surgical patients using administrative data with the Royal College of Surgeons Charlson Score. Br J Surg 2010;97:772-81. doi https://doi.org/10.1002/bjs.6930

Pre-specified conditions included in the assignment of Charlson Comorbidity Index (CCI).

CCI Conditions
Myocardial infarction
Dementia
Diabetes mellitus
Metastatic solid tumour
Congestive cardiac failure
Chronic pulmonary disease
Hemiplegia or paraplegia
AIDS/HIV infection
Peripheral vascular disease
Rheumatological disease
Renal disease
Cerebrovascular disease
Liver disease
Any malignancy

Note:

AIDS/HIV diagnoses cannot be identified in HES APC data because of legal requirements for NHS trusts to remove patient identifiers from legally restricted records, including those containing diagnoses of HIV/AIDS. These diagnoses are also not found in linked PEDW data.

Appendix 3: Lists of Surgical Codes

Table A3.1. Renal biopsy OPCS-4 codes

OPCS-4	Description
M08.1	Open biopsy of lesion of kidney
M13.1	Percutaneous needle biopsy of lesion of kidney

Table A3.2. Radical nephrectomy OPCS-4 codes

OPCS-4	Description
M02.1	Nephrectomy and excision of perirenal tissue
M02.2	Nephroureterectomy NEC
M02.3	Bilateral nephrectomy
M02.5	Nephrectomy NEC
M02.7	Excision of transplanted kidney NEC
M02.8	Other specified total excision of kidney
M02.9	Unspecified total excision of kidney

Table A3.3. Nephron sparing surgery OPCS-4 codes

OPCS-4	Description
M02.4	Excision of half of horseshoe kidney
M03.1	Heminephrectomy of duplex kidney
M03.8	Other specified partial excision of kidney
M03.9	Unspecified partial excision of kidney
M04.2	Open excision of lesion of kidney NEC
M04.3	Open destruction of lesion of kidney

Table A3.4. Ablation OPCS-4 codes

OPCS-4	Description
M10.4	Endoscopic cryoablation of lesion of kidney
M13.7	Percutaneous radio frequency ablation of lesion of kidney
M13.8	Percutaneous puncture of kidney – Other Specified

Y11.2	Cryotherapy to organ NOC
Y13.7	Microwave destruction of lesion of organ NOC

Table A3.5. Surgery approach OPCS-4 codes – secondary codes

OPCS-4	**Description**
Laparoscopic	
Y75.1	Approach Abdominal Cavity Laparoscopically Assisted
Y75.2	Approach Abdominal Cavity Laparoscopic NEC
Y75.4	Approach Abdominal Cavity Hand Assisted Minimal Access
Robotic	
Y75.3	Approach Abdominal Cavity Robotic Assisted Minimal Access & Approach Abdominal Cavity Robotic Minimal Access

* Surgeries which were not accompanied by a code which suggested that they had a laparoscopic or robotic approach (Table C5) were assumed to be open procedures.

Appendix 4: Lists of Systemic Therapy Codes

Table A4.1. Systemic therapy OPCS-4 codes

OPCS-4	Description
X29.2	Continuous intravenous infusion of therapeutic substance NEC
X35.2	Intravenous chemotherapy
X37.3	Intramuscular chemotherapy
X38.4	Subcutaneous chemotherapy
X39.1	Oral administration of therapeutic substance
X70.1	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 1
X70.2	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 2
X70.3	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 3
X70.4	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 4
X70.5	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 5
X70.8	Other specified procurement of drugs for chemotherapy for neoplasm in Bands 1-5
X70.9	Unspecified procurement of drugs for chemotherapy for neoplasm in Bands 1-5
X71.1	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 6
X71.2	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 7
X71.3	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 8
X71.4	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 9
X71.5	Procurement of drugs for chemotherapy for neoplasm for regimens in Band 10
X71.8	Other specified procurement of drugs for chemotherapy for neoplasm in Bands 6-10
X71.9	Unspecified procurement of drugs for chemotherapy for neoplasm in Bands 6-10
X72.1	Delivery of complex chemotherapy for neoplasm including prolonged infusional treatment at first attendance
X72.2	Delivery of complex parenteral chemotherapy for neoplasm at first attendance
X72.3	Delivery of simple parenteral chemotherapy for neoplasm at first attendance
X72.4	Delivery of subsequent element of cycle of chemotherapy for neoplasm
X72.8	Other specified delivery of chemotherapy for neoplasm
X72.9	Unspecified delivery of chemotherapy for neoplasm
X73.1	Delivery of exclusively oral chemotherapy for neoplasm

X73.8	Other specified delivery of oral chemotherapy for neoplasm
X73.9	Unspecified delivery of oral chemotherapy for neoplasm
X74.8	Other specified other chemotherapy drugs
X74.9	Unspecified other chemotherapy drugs

Table A4.2. Systemic therapy ICD-10 codes

ICD-10	**Description**
Z08.2	Follow-up examination after chemotherapy for malignant neoplasm
Z29.2	Other prophylactic chemotherapy
Z51.1	Chemotherapy session for neoplasm
Z51.2	Other chemotherapy
Z54.2	Convalescence following chemotherapy