NKCA
National Kidney Cancer Audit

NATCAN
National Cancer Audit Collaborating Centre

National Kidney Cancer Audit

State of the Nation Report 2024

Methodological Supplement

NKCA State of the Nation Report 2024 - Methodological Supplement

Contents

Abbreviations

Acronym	Description
CaNISC	Cancer Information System for Wales
CCI	Charlson Comorbidity Index
COSD	Cancer Outcomes and Services Dataset
ECOG	Eastern Cooperative Oncology Group
HES APC	Hospital Episode Statistics Admitted Patient Care
ICD-10	International classification of diseases and related health problems,10th revision
IMD	Index of Multiple Deprivation
LSOA	Lower Super Output Areas
MDT	Multidisciplinary Team
NCDR	National Cancer Data Repository
NCRD	National Cancer Registration Dataset
NDRS	National Disease Registration Service
NKCA	National Kidney Cancer Audit
NSS	Nephron sparing surgery
ONS	Office for National Statistics
PEDW	Patient Episode Database for Wales
PI	Performance indicator
PS	Performance status
RCC	Renal cell carcinoma
RCRD	Rapid cancer registry data
RCS	Royal College of Surgeons of England
RN	Radical nephrectomy
RTDS	Radiotherapy dataset
SACT	Systemic anti-cancer dataset
WCN	Wales Cancer Network

Introduction

The purpose of this document is to share the methodology of the NKCA State of the Nation (SotN) report 2024.

In this report, we make use of the 'gold-standard' National Cancer Registration Dataset (NCRD) and the Rapid Cancer Registration Dataset (RCRD) for England as well as the NKCA dataset from Wales (described below) to describe process and outcome measures from selected aspects of the care pathway for people with kidney cancer.

Overview of audit design

Inclusion / exclusion criteria

Patients are eligible for inclusion in the prospective audit if they have newly diagnosed kidney cancer using the ICD10 diagnostic code of "C64" (malignant neoplasm of kidney, except renal pelvis).

A patient is included in the prospective audit in England if they have a record of newly diagnosed kidney cancer in the National Cancer Registration Dataset (or Rapid Cancer Registration Dataset). A patient is included in the prospective audit in Wales if a completed NKCA record was submitted and the Wales Cancer Network (WCN) can assign that record to a diagnosing Health Board.

Inclusion criteria:

- Tumour group listed as "Kidney" and site ICD-10 code listed as "C64"

Exclusion criteria:

- Younger than 18 years old when diagnosed
- Diagnosed via death certificate only
- Date of diagnosis is the same as Office of National Statistics (ONS) date of death
- Diagnosed and treated outside of an NHS organisation in England or Wales
- Provider (e.g. Trust or Health Board) of diagnosis is not provided

Multiple kidney cancer tumours

Where someone had more than one kidney cancer tumour record, only one tumour record was analysed. This record was prioritised by:

1) Tumour with earliest diagnosis date was analysed
    a. Note: Tumours with earlier diagnosis date were prioritised to avoid picking up any recurrences
2) (If tumours had the same diagnosis date) Tumour with complete TNM was analysed
3) (If tumours had same diagnosis date and all had TNM complete/incomplete) The tumour with the most advanced stage based on TNM was analysed

Indicator definitions

Table 1. Cancer registration dataset and time period that define the population for each performance indicator

Performance indicators	England	Wales
PI1: Percentage of people with kidney cancer with the data completeness measure recorded for MDT meeting	National Cancer Registration Dataset (NCRD) People with kidney cancer diagnosed between 01/2019 – 12/2021	Cancer Network Information System Cymru (CaNISC) People with kidney cancer diagnosed between 01/2022 – 12/2022
PI2: Percentage of people with kidney cancer who are consented for a clinical trial (England only) *		
PI3: Percentage of people with a small renal mass (≤4cm) who have a biopsy (England only) *		
PI4: Percentage of people with a T3+ and/or 10cm+ and/or N1 and M0 renal cell carcinoma (RCC) who have a radical		

Performance indicators	England	Wales
nephrectomy within 31 days of decision to treat (England only) *		
PI5: Percentage of people with T1b-3NxM0 RCC (T2-3NxM0 RCC for Wales) who have surgery		
PI6: Percentage of people with T1aN0M0 RCC who undergo nephron sparing treatment		
PI7: Percentage of people presenting with M1 RCC who have initial SACT within 12 months of diagnosis	NCRD People with kidney cancer diagnosed between 01/2017 – 12/2021	
PI8: Percentage of people with kidney cancer who die within 30 days of starting SACT treatment		

*Measured in England only due to the availability of relevant data for Wales. MDT: Multi-disciplinary team; SACT: systemic anti-cancer therapy.

More detail on how the indicators were calculated can be found in the indicator definitions section below.

Outlier process

Further information about the outlier process can be found in the FAQs for NATCAN (point 17).

Sources of data

English datasets

In England, the National Kidney Cancer Audit (NKCA) works with the National Disease Registration Service (NDRS), NHS England, as a data collection partner. NDRS collects patient-level data from all NHS acute providers using a range of national data-feeds. This includes the Cancer Outcomes and Services Dataset (COSD), which specifies the data items that need to be submitted. Data are submitted to the National Cancer Data Repository (NCDR) on a monthly basis via MDT (Multidisciplinary Team) electronic data collection systems. Clinical sign-off of data submitted to NDRS is not mandated in England. For this State of the Nation report NCRAS provided data from the 'gold-standard' National Cancer Registration Dataset (NCRD) and the Rapid Cancer Registration Dataset (RCRD).

National Cancer Registration Dataset (NCRD) and Rapid Cancer Registration Dataset (RCRD)

This year, we choose to use the NCRD to report on our performance indicators and use the RCRD for the national picture sections of the report. The NCRD undergoes more processing to improve its data completeness compared to the RCRD and also contains a broader range of variables. On the other hand, the RCRD has the advantage that it is available to us much more quickly after a patient is diagnosed so we can conduct more timely analyses. The

National Prostate Cancer Audit (NPCA) has found that RCRD captures approximately 90% of prostate cancer diagnoses that are seen in the NCRD dataset, with consistent completeness of data collection across trusts.

Completeness of Cancer Registrations

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 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 (NCRD) 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.

In future years the NKCA will work to align the reporting periods in England and Wales, and to provide more timely reporting. In England this will require the use of Rapid Cancer Registration Data (RCRD) as well as 'gold standard' National Cancer Registration Data (NCRD)[1], and development work is needed to ensure the RCRD is of sufficient data quality.

Welsh datasets

The NKCA's data collection partner in Wales is the Wales Cancer Network (WCN), Public Health Wales. The NKCA dataset is captured through a national system, Cancer Information System Cymru (CaNISC), after identification by hospital cancer services and uploaded via electronic MDT data collection systems. Prior to submission of NKCA data to the WCN, each patient record is validated (frequently by an MDT coordinator) and signed off by a designated clinician. Patient records are signed off when all key data items have been completed. For this annual report, WCN have provided, as usual, Cancer Network Information System Cymru (CaNISC), Patient Episode Database for Wales (PEDW) and Office for National Statistics (ONS) data in Wales.

We urge centres to work with their data collection leads to ensure kidney cancer data is collected as completely as possible as the audit is only as accurate as the data we receive.

This report presents results from the prospective audit for men diagnosed with, or treated for, kidney cancer between January 2019 and September 2023 in England and between January 2022 and December 2022 in Wales. For England, diagnoses were linked to data from Hospital Episode Statistics (HES), the Radiotherapy Dataset (RTDS) and the Systemic Anti-Cancer Therapy dataset (SACT). For Wales, data are captured through Cancer Network

[1] The audits in NATCAN do not 'collect' clinical data. The cancer audits utilise the nationally mandated flows of data from hospitals to the National Disease Registration Service (NDRS) in NHSE and the Wales Cancer Network in Public Health Wales, thereby minimising the burden of data collection on provider teams. Further information about the timeliness of National Cancer Registration Dataset (NCRD) can be found on the NATCAN website https://www.natcan.org.uk/resources/timeliness-of-the-national-cancer-registration-dataset-ncrd/

Information System Cymru (CaNISC) and linked to additional data items from the Patient Episode Database for Wales (PEDW), Office for National Statistics (ONS) and CaNISC.

Data definitions

Coding of key data items

Table 2. Data sources and identification methods for different kidney cancer procedure types

Procedure	Data Source	Identification Method
Biopsy	England: HES APC Wales: CaNISC, PEDW	**Table C4.** Renal Biopsy OPCS-4 codes
Surgery	England: HES APC Wales: CaNISC, PEDW	**Table C1.** Radical nephrectomy OPCS-4 codes, **Table C2.** Nephron sparing surgery OPCS-4 codes
Ablation	England: HES APC Wales: PEDW	Identified by all the codes in **Table C3.** Ablation OPCS-4 codes
SACT	England: SACT	For patients without a record of another type of cancer, all records in SACT were counted. For patients with a record of another type of cancer, only records in SACT where the primary diagnosis was C64 were counted
	England: HES APC Wales: PEDW	SACT was identified by all the codes in **Table C6.** Systemic therapy OPCS-4 codes and **Table C7.** Systemic therapy ICD-10 codes as long as they were accompanied by C64 in diag1 or a metastasis code in diag1 (C77/C78/C79) with C64 in diag2

Lists of surgical codes used

Table C1. Radical nephrectomy OPCS-4 codes

OPCS-4	Description
M02.1	Nephrectomy and excision of perirenal tissue
M02.5	Nephrectomy NEC
M02.8	Other specified total excision of kidney
M02.9	Unspecified total excision of kidney

Table C2. Nephron sparing surgery OPCS-4 codes

OPCS-4	Description
M03.8	Other specified partial excision of kidney
M03.9	Unspecified partial excision of kidney
M04.2	Open excision of lesion of kidney NEC

Table C3. 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
Y11.2	Cryotherapy to organ NOC
Y13.7	Microwave destruction of lesion of organ NOC

Table C4. Renal biopsy OPCS-4 code

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

Table C5. 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.

Lists of systemic therapy codes used

Table C6. 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 C7. 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

Completeness of key data items

The completeness of five key data items (performance status, T, N, M stage and ethnicity) in England and Wales is reported below.

Table 3. Data completeness for selected data items for people newly diagnosed with kidney cancer in England between 1st January 2019 and 31st December 2021 and in Wales between 1st January 2022 and 31st December 2022.

Data variable	**England**		**Wales**	
	N	**% complete**	**N**	**% complete**
Time period covered	1 Jan 2019 – 31 Dec 2021		1 Jan 2022 – 31 Dec 2022	
No. of people with a new diagnosis of kidney cancer	28,229 [NCRD]		490 [CaNISC]	
Performance status	11,217 [NCRD]	40%	344 [CaNISC]	70%
T stage	22,360	79%	364	74%

	[NCRD]		[CaNISC]	
N stage	20,214 [NCRD]	72%	330 [CaNISC]	67%
M stage	21,614 [NCRD]	77%	314 [CaNISC]	64%
Ethnicity	26,650 [NCRD]	94%	285 [PEDW]	58%

Patient characteristics / important clinical variables

Comorbidity status

The NKCA team used the Royal College of Surgeons of England (RCS) modified Charlson Comorbidity Index (CCI) to measure the comorbidity burden of patients (see Armitage et al.[1] for details).

The CCI is a commonly used scoring system for medical comorbidities. It consists of a grouped score that is calculated based on the absence (0) or presence (≥1) of the pre-specified medical conditions listed in Table 4. The CCI was calculated using information on secondary diagnoses (ICD-10 codes) in the hospital admission data (HES/PEDW) recorded within the 12-month period prior to a patient's diagnosis. The CCI score was used to perform risk-adjustment for certain performance indicators. Indicators for which risk adjustment was performed are outlined in Table 6.

Table 4. Pre-specified conditions included in the assignment of Charlson Comorbidity Index score

Medical condition	**ICD-10 diagnostic code(s)**
AIDS/HIV infection	B20; B21; B22; B23; B24
Cerebrovascular disease	G45; G46; I6
Chronic pulmonary disease	Chronic: I26; I27; J40; J41; J42; J43; J44; J45; J47; J60; J61; J62; J63; J64; J65; J66; J67; J684; J701; J703 Acute: J46**
Congestive cardiac failure	I11; I13; I42; I43; I50; I255; I517
Dementia	A810; F00; F01; F02; F03; F051; G30; G31
Diabetes mellitus	E10; E11; E12; E13; E14
Hemiplegia or paraplegia	G114; G81; G82; G83
Liver disease	B18; I85; I864; I982; K70; K71; K721; K729; K76; R162; Z944
Metastatic solid tumour	C77; C78; C79
Myocardial infarction (MI)	Acute MI: I21**; I22**; I23** History of MI: I252
Peripheral vascular disease	I70; I71; I72; I73; I770; I771; K551; K558; K559; R02; Z958;

	Z959
Renal disease (RD)	Chronic: I12; I13; N01; N03; N05; N07; N08; N18; N25; Z49; Z940; Z992 Acute: N171**; N172**; N19**
Rheumatological disease	M05; M06; M09; M120; M315; M32; M33; M34; M35; M36

** Code associated with an acute episode, only counted in admissions prior to the index admission.

Deprivation / socioeconomic status

In England and Wales, small regional areas are assigned a measure of social deprivation, called the Index of Multiple Deprivation (IMD). The Index is constructed from various individual deprivation scales and a score is derived for each area (Lower Super Output Areas [LSOA]), which contain approximately 1500 people) in England and Wales. Separate IMD scores are derived from England and Wales. In the analyses, patients were categorised into one of five socioeconomic groups (1=least deprived; 5=most deprived) based on the IMD score of the area in which they lived. The five categories were based on the quintiles of the ranked IMD scores.

Performance status

Performance status is used by clinicians to classify a patient's functional impairment. It is used to group patients when comparing treatment effectiveness and assessing prognosis to help remove differences in patient case-mix. This is important for the audit because the distribution of patient performance status can vary between organisations, and case mix adjustment is required for some indicators. Details of the indicators for which case mix adjustment was performed can be found in Table 6.

Various scoring systems exist for evaluating performance status. The World Health Organisation classification is collected by the cancer registration services. Table 5 outlines the World Health Organisation classification. Clinicians use standard criteria to assign patient's a performance status score, and each category describes the extent to which a person can perform activities of daily living.

Table 5. Performance status classification, as defined by the World Health Organisation classification

Grade	Description
0	Able to carry out all normal activity without restriction
1	Restricted in strenuous activity but ambulatory and able to carry out light work
2	Ambulatory and capable of all self-care but unable to carry out any work activities; up and about more than 50% of waking hours
3	Symptomatic and in a chair or in bed for greater than 50% of the day but not bedridden
4	Completely disabled; cannot carry out any self-care; totally confined to bed or chair

TNM/staging

The anatomical extent of a cancer. This indicates whether a cancer is only present in the kidney/primary site (localised disease) or whether it has spread to other areas of the body (metastatic spread). It is usually denoted by the TNM staging process where “T” represents the local stage, “N” the presence of lymph node involvement and “M” represents the presence of metastatic disease.

T1 is divided into T1a and T1b depending on how big the cancer is:

- T1a means the cancer measures 4cm or less
- T1b means the cancer measures between 4cm and 7cm

T2 is divided into T2a and T2b depending on size:

- T2a means the cancer measures between 7cm and 10cm
- T2b means the cancer measures more than 10cm but completely inside the kidney

T3 is divided into T3a, T3b and T3c depending on whether the cancer has grown into surrounding tissues or main blood vessels:

- T3a means the cancer has grown into the nearby tissues or the renal vein
- T3b means the cancer has grown into the vena cava, but hasn't spread above the diaphragm (sheet of muscle that separates chest and abdominal cavity, which helps us breathe)
- T3c means the cancer has grown into the vena cava and spread above the diaphragm. Or has grown into the wall of the vena cava

T4 means the cancer has spread beyond the layer of tissue around the kidney (fascia). It might have spread into the adrenal gland above the kidney

N0 means that the nearby lymph nodes do not contain cancer cells

N1 means there are cancer cells in lymph nodes near the kidney

M0 means the cancer has not spread to other parts of the body

M1 means the cancer has spread to other parts of the body such as the lungs

For Wales, any TNM stages recorded as X e.g. MX were regarded as M stage was not known.

Indicator definitions

PI1: Percentage of people with kidney cancer with the data completeness measure recorded for MDT meeting

Indicator	**Percentage of people with kidney cancer with the data completeness measure recorded for MDT meeting**	**Notes**
Denominator	Number of people with a new diagnosis of kidney cancer	
Numerator	Number of people with kidney cancer with MDT meeting recorded	
Exclusions	None	
Country	England and Wales	England: MDT meeting was classified as recorded if date of first MDT meeting was recorded Wales: MDT meeting was classified as recorded if it was recorded that treatment plan was discussed by the MDT
Time Periods	England: People with kidney cancer diagnosed between Jan 2019 – Dec 2021 Wales: People with kidney cancer diagnosed between Jan 2022 – Dec 2022	
Reporting level	England: Presented at the level of diagnosing Trust Wales: Presented at the level of diagnosing Health Board	

PI2: Percentage of people with kidney cancer who are consented for a clinical trial

Indicator	Percentage of people with kidney cancer who are consented for a clinical trial	Notes
Denominator	Number of people with a new diagnosis of kidney cancer and whether they participated in a clinical trial recorded	
Numerator	Number of people with kidney cancer who are consented for a clinical trial	
Exclusions	People who didn't have whether they participated in a clinical trial recorded	
Country	England only	Wales was excluded as there was no equivalent data item about whether a person was consented to a clinical trial
Time Periods	People with kidney cancer diagnosed between Jan 2019 – Jan 2021	
Reporting level	Presented at the level of the diagnosing Trust	

PI3: Percentage of people with a small renal mass (≤4cm) who have a biopsy

Indicator	Percentage of people with a small renal mass (≤4cm) who have a biopsy	Notes
Denominator	Number of people who have ≤4cm or T1aN0M0 renal mass	
Numerator	Number of people who have ≤4cm or T1aN0M0 renal mass who have a biopsy	
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
Country	England only	Wales was excluded from this indicator as only 5% of the T1 RCC was differentiated into T1a or T1b and there was no tumour/lesion size available in the Welsh data
Time periods	People with kidney cancer diagnosed between Jan 2019 – Dec 2021	
Reporting level	Presented at the level of diagnosing Trust	
Codes used	**Table C4.** Renal Biopsy OPCS-4 codes	

PI4: Percentage of people with a T3+ and/or 10cm+ and/or N1 and M0 renal cell carcinoma (RCC) who have a radical nephrectomy within 31 days of decision to treat

Indicator	**Percentage of people with a T3+ and/or 10cm+ and/or N1 and M0 renal cell carcinoma (RCC) who have a radical nephrectomy within 31 days of decision to treat**	**Notes**
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	
Numerator	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	For England, 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
Exclusions	People with M1 RCC, people with stage 1 RCC, people whose surgery is earlier or on the same date as decision to treat date (treatment_period_start), people missing a decision to treat date (treat_period_start)	We decided to include those missing M stage as it is a fair clinical assumption that if they are receiving surgery they are M0
Country	England only	Wales was excluded due to lack of appropriate decision to treat date
Time periods	People with kidney cancer diagnosed between Jan 2019 – Dec 2021	
Reporting level	England: Presented at the level of diagnosing Trust	
Codes used	**Table C1.** Radical nephrectomy OPCS-4 codes **Table C2.** Nephron sparing surgery OPCS-4 codes	
Clinical definition	**T3+ and/or 10cm+ and/or N1 and M0 RCC:** Tumour extends into major veins or perinephric tissues or invades beyond Gerota fascia and/or tumour more than 10cm in size and/or metastasis in regional lymph node(s) with no distant metastasis	

PI5: Percentage of people with T1b-3NxM0 RCC (T2-3NxM0 RCC for Wales) who have surgery

Indicator	Percentage of people with T1b-3NxM0 RCC (T2-3NxM0 RCC for Wales) who have surgery	Notes
Denominator	Number of people with T1b-3NxM0 or stage 2 or 3 RCC or tumour size > 4 cm	T1b-3 includes: T1b, T2, T2a, T2b, T3, T3a, T3b, T3c Nx includes: N0, N1, N missing
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	
Exclusions	Both: People with M1 RCC, people with missing M stage, people with stage 4 disease, people with T4 RCC England only: People with T1a RCC, people with tumour size ≤ 4cm Wales only: People with T1 RCC, people with stage 1 RCC	This excludes stage 1 patients who have a tumour size of equal to or less than 4 cm
Country	England and Wales	We used T2-3NxM0 RCC for Wales (same as England except excluding T1b and tumour size > 4 cm as both unavailable)
Time periods	England: People diagnosed with kidney cancer between Jan 2019 – Dec 2021 Wales: People diagnosed with kidney cancer between Jan – Dec 2022	
Reporting level	England: Presented at the level of diagnosing Trust Wales: Presented at the level of diagnosing Health Board	
Codes used	**Table C1.** Radical nephrectomy OPCS-4 codes **Table C2.** Nephron sparing surgery OPCS-4 codes	
Clinical definition	**T1b-3NxM0 RCC:** Tumour is more than 4cm in size or tumour extends into major veins or perinephric tissues with no distant metastasis **T2-3NxM0 RCC:** Tumour is more than 7cm in size or tumour extends into major veins or perinephric tissues with no distant metastasis	

PI6: Percentage of people with T1aN0M0 RCC who undergo nephron sparing treatment

Indicator	Percentage of people with T1aN0M0 RCC who undergo nephron sparing treatment	Notes
Denominator	Number of people with T1aN0M0 RCC or tumour size ≤ 4cm who undergo surgery (RN or NSS) or ablation between 31 days prior and 365 days following diagnosis	
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	
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
Country	England only	Wales was excluded from this indicator as only 5% of the T1 RCC was differentiated into T1a or T1b and there was no tumour/lesion size available in the Welsh data
Time periods	People with kidney cancer diagnosed between Jan 2019 – Dec 2021	
Reporting level	Presented at the level of diagnosing Trust	
Codes used	**Table C1.** Radical nephrectomy OPCS-4 codes **Table C2.** Nephron sparing surgery OPCS-4 codes **Table C3.** Ablation OPCS-4 codes	
Clinical definition	**T1aN0M0 RCC:** Tumour is less than or equal to 4cm in size with no regional lymph node metastasis and no distant metastasis	

PI7: Percentage of people presenting with M1 RCC who have initial SACT within 12 months of diagnosis

Indicator	Percentage of people presenting with M1 RCC who have initial SACT within 12 months of diagnosis	Notes
Denominator	Number of people presenting with metastatic RCC	
Numerator	Number of people presenting with metastatic RCC who have initial SACT within 12 months of diagnosis	
Exclusions	People with M0 RCC, people whose M status is missing	
Country	England and Wales	
Time Periods	England: People with kidney cancer diagnosed between Jan 2017 – Dec 2021 Wales: People with kidney cancer diagnosed between Jan – Dec 2022	
Reporting level	England: Presented at the level of diagnosing Trust Wales: Presented at the level of diagnosing Health Board	
Codes used	**Table C6.** Systemic therapy OPCS-4 codes **Table C7.** Systemic therapy ICD-10 codes	

PI8: Percentage of people with kidney cancer who die within 30 days of starting SACT treatment

Indicator	Percentage of people with kidney cancer who die within 30 days of starting SACT treatment	Notes
Denominator	Number of people diagnosed with metastatic RCC who underwent SACT treatment	
Numerator	Number of people diagnosed with metastatic RCC who die within 30 days of starting SACT treatment	
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	England and Wales	
Time Periods	England: People with kidney cancer diagnosed between Jan 2017 – Dec 2021 Wales: People with kidney cancer diagnosed between Jan – Dec 2022	
Reporting level	England: Presented at the level of treating Trust Wales: 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.
Codes used	**Table C6.** Systemic therapy OPCS-4 codes **Table C7.** Systemic therapy ICD-10 codes	

Statistical analysis

All statistical analyses were performed using Stata version 17.0.

Variation between providers

To more appropriately assess variation between English providers for the performance indicators, we excluded Trusts within less than 10 patients in the denominator.

NHS organisations

In this report (except for the results of PI8: Percentage of people with kidney cancer who die within 30 days of starting SACT treatment), English patients were allocated to NHS

organisations based on the "Trust of diagnosis" recorded within the dataset. Welsh patients were allocated to NHS organisations based on the "Health Board of diagnosis" recorded within the dataset.

Risk adjustment of indicators

The provider level results for some indicators were risk adjusted. Please see below which indicator's provider-level results were risk adjusted and which data items were involved in the risk adjustment. Multivariable logistic regression was carried out to produce the risk adjusted results.

Table 6. Risk adjustment strategy for performance indicators

Indicator	Risk Adjusted	Notes
PI1: Percentage of people with kidney cancer with MDT meeting recorded	No	
PI2: Percentage of people with kidney cancer who are consented for a clinical trial (England only)	No	
PI3: Percentage of people with a small renal mass (<4cm) who have a biopsy (England only)	No	
PI4: Percentage of people with a T3+ and/or 10cm+ and/or N1 renal cell carcinoma (RCC) who have a radical nephrectomy within 31 days of diagnosis (England only)	Yes: age, gender, ethnicity, co-morbidity and deprivation	Risk adjusting this indicator as patient characteristics may impact the time to treatment
PI5: Percentage of people with T1b-3NxM0 RCC (T2-3NxM0 RCC for Wales) who have surgery	Yes: age, gender, ethnicity, co-morbidity and deprivation	Risk adjusting this indicator as patient characteristics may impact treatment decisions
PI6: Percentage of people with T1aN0M0 RCC who undergo nephron sparing treatment**	Yes: age, gender, ethnicity, co-morbidity and deprivation.	Risk adjusting this indicator as patient characteristics may impact treatment decisions
PI7: Percentage of people presenting with M1 RCC who have initial SACT within 12 months of diagnosis	Yes: age, gender, ethnicity, co-morbidity and deprivation	Risk adjusting this indicator as patient characteristics may impact treatment decisions
PI8: Percentage of people with kidney cancer who die	Yes: age, gender, ethnicity, co-morbidity and deprivation	Risk adjusting this indicator as patient characteristics may impact treatment decisions

within 30 days of starting SACT treatment		

Please see below the format and categories of the risk adjustment variables.

Table 7. Format of risk adjustment variables

Risk Adjustment Variable	**Format**
Age	Categorical – 6 categories: <45, 45-54, 55-64, 65-74, 75-84, >85
Gender	Categorical – 3 categories: male, female, missing
Ethnicity	Categorical – 6 categories: White, Mixed, Asian/Asian British, Black/Black British, Other, missing
Deprivation	Categorical – 6 categories: 1- least deprived, 2, 3, 4, 5 – most deprived, missing
Co-morbidity	Categorical – 3 categories: 0, 1, ≥2 co-morbidities

References

1. Armitage, J. N., van der Meulen, J. H. & Royal College of Surgeons Comorbidity Consensus Group. Identifying co-morbidity in surgical patients using administrative data with the Royal College of Surgeons Charlson Score. Br J Surg 97, 772–81 (2010).