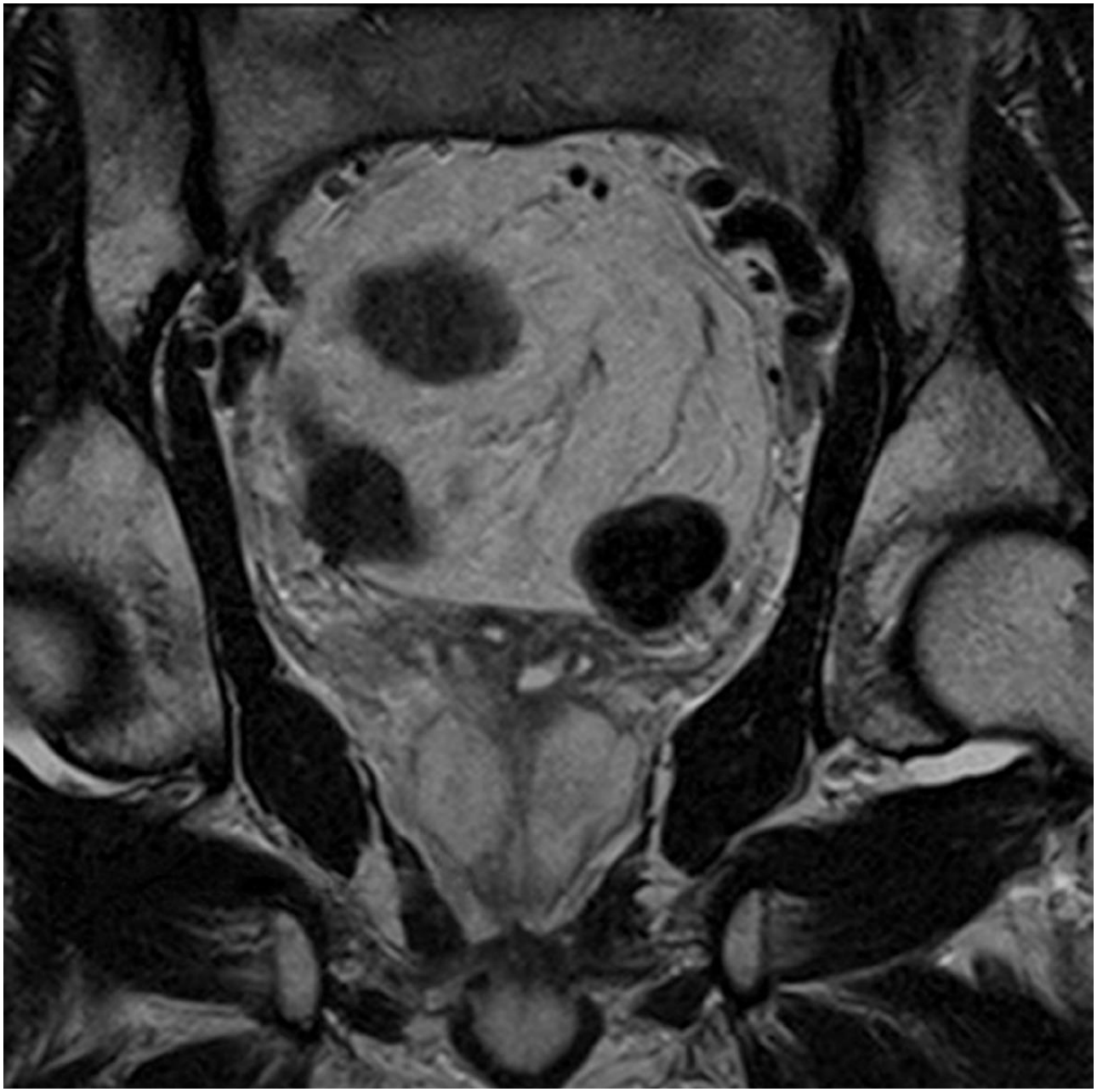
NPCA
National Prostate Cancer Audit

Annual Report 2021

Methodology supplement



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NPCA Annual Report 2021 – Methodology Supplement

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Data receipt and processing

Routine data collection

In England, the National Prostate Cancer Audit (NPCA) works with the National Cancer Registration and Analysis Service (NCRAS), Public Health England, as a data collection partner. NCRAS 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 NCRAS is not mandated in England.

The NPCA's data collection partner in Wales is the Wales Cancer Network (WCN), Public Health Wales. The NPCA dataset (see below) is captured through a national system, Cancer Information System for Wales (CaNISC), after identification by hospital cancer services and uploaded via electronic MDT data collection systems. Prior to submission of NPCA 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.

NPCA dataset and Rapid Cancer Registration Dataset

The National Prostate Cancer Audit utilises existing information from routine datasets on the diagnosis, management and treatment of every patient newly diagnosed with prostate cancer in England and Wales.

Only COSD data items are collected for men newly diagnosed with prostate cancer since 1st April 2019 in England in the following categories of the NPCA Minimum dataset (MDS):

1. **All men newly diagnosed with prostate cancer** during the initial phase of management.
2. All patients who have **undergone radical prostatectomy**.

A summary of the COSD data items in the NPCA dataset previously collected for patients can be found on the NPCA website.[1] For this annual report, the NCRAS provided data from the Rapid Cancer Registration Dataset (RCRD), which is sourced mainly from COSD but contains proxy tumour registrations, as the standard Cancer Registration data were unavailable. This dataset has been provided more quickly than has been possible in the past and includes men diagnosed up to December 2020. However, the speed of production and the pandemic has meant that several of the standard data items are unavailable or too incomplete for use.

The RCRD and Welsh data are linked to other national datasets to provide extra information. In England, these supplementary datasets are Hospital Episode Statistics (HES) data, the Office for National Statistics (ONS) dataset, the National Radiotherapy Dataset (RTDS) and the Systemic Anti-Cancer Dataset (SACT).

In Wales, the NPCA MDS is captured through CaNISC and linked to additional data items from the Patient Episode Database for Wales (PEDW), ONS and CaNISC. RTDS data are currently unavailable so the following additional category in the NPCA MDS dataset is collected:

3. **All men for whom external beam radiation therapy or brachytherapy is planned, with or without androgen deprivation therapy.**

CaNISC provides information regarding radiotherapy intent, site and dosing. The radiotherapy centres in Wales are currently implementing the collection of the RTDS, which will be available to the NPCA in the near future.

[1] https://www.npca.org.uk/resources/npca-minimum-dataset/

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Patient inclusion

Patients are eligible for inclusion in the prospective audit if they have newly diagnosed prostate cancer using the ICD-10 diagnostic code of "C61" (malignant neoplasm of the prostate). The data collection period reported includes men diagnosed between 1 April 2019 and the 31 March 2020 in England and Wales. This duration of follow-up allows an assessment of our shorter-term indicators of disease presentation, readmission and treatment allocation (indicators 1-2 and 5-6: see Table 2).

Medium-term indicators of complications following treatment (indicators 3 and 4) require longer follow-up (up to two years' post-treatment) so the diagnostic period is earlier. The reporting time period is therefore over a whole calendar year (1 January 2018 to 31 December 2018).

A patient is included in the prospective audit in England if he has a record of newly diagnosed prostate cancer in the Rapid Cancer Registration Dataset. A patient is included in the prospective audit in Wales if a completed NPCA record was submitted and the Wales Cancer Network (WCN) can assign that record to a diagnosing Health Board.

Additionally, men who were diagnosed in England up to 31 December 2020 were included in a dedicated study of the impact of COVID-19 on prostate cancer services. These data were used to compare diagnoses and rates of treatment during 2020 to the same calendar periods in 2019.

Suitability of the RCRD in England for use by the NPCA

A report comparing the 'standard' NCRAS dataset to the new RCRD can be found here. In brief, the two datasets were compared for the period of 1 January 2018 to 31 March 2019 for which data were available from both sources.

The RCRD was found to be very complete with regards to the capture of number of men diagnosed: 90% of those found in the NCRAS dataset were present in the RCRD. This did not vary substantially across specialist multi-disciplinary teams (SMDTs). There are also no data available in the RCRD on Gleason score and PSA which means that the NPCA risk group cannot be assigned as in previous years. In its place, an overall disease stage variable (stage I – IV) is included in the RCRD. Individual TNM components from the RCRD were also provided. However, over a third of data on T (tumour, 35% missing), N (node, 39%) and M (metastases, 42%) stage variables were missing in the RCRD (compared to between 12% (T, M) and 17% (N) in the NCRAS data).

The stage variable also did not map well to the previous risk groups which meant that some of the usual NPCA indicators could not be included in this year's report (see below). For example, the risk group of men with primary metastatic disease did not map to stage IV, which also included N1 (node positive) patients. The locally advanced risk group comprised men with T3/4, N1, Gleason≥8 or PSA>20mg/dl, while stage III included only men with T3/4. The low-risk group included only T1 patients, while stage I included T2a.

The timeliness of the data (including men diagnosed up until 31 December 2020) makes it a valuable resource, but these disadvantages that will need to be overcome in future.

Data quality

The completeness of four key data items (PSA, Gleason score, TNM and performance status in Wales and additionally stage in England) provides a marker of data quality (Table 1).

Table 1. Data completeness for selected data items for men newly diagnosed with prostate cancer in England and Wales over the period of 1 April 2019 and 31 March 2020.

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Data variable	England		Wales	
	N	%	N	%
Diagnostic and staging variables				
No. of men with new diagnosis of prostate cancer	43,330[a] [RCRD]	100%	2,561 [NPCA]	100%
Performance status completed	26,301 [RCRD]	61%	2,561 [NPCA]	100%
Biopsy performed	34,379 [HES]	79%	1,269 [PEDW]	50%
PSA completed [b]			2,208 [NPCA]	86%
Gleason score completed [b]			2,208 [NPCA]	86%
TNM completed	24,641 [RCRD]	57%	2,026 [NPCA]	79%
Stage variable assigned [c]	31,934 [RCRD]	74%	N/A	
Risk group assigned [c]	N/A		2405 [NPCA]	94%

Acronyms: RCRD = Rapid Cancer Registration dataset; NPCA = National Prostate Cancer Audit dataset; HES = Hospital Episode Statistics; PEDW = Patient Episode Database for Wales; PSA = Prostate Specific Antigen; TNM = Tumour, Nodes, Metastases Classification of Malignant Tumours.

[a] including 6 men who could not be assigned a provider

[b] unavailable in the RCRD for England.

[c] Stage variable only available for England from RCRD; PSA and Gleason score unavailable in RCRD therefore unable to assign a risk group for English men

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Preparation for analysis

The NPCA Project Team, based at the Clinical Effectiveness Unit (CEU)[2] receives the national data from the NCRAS and WCN starting in May each year, with the aim of receiving final datasets by the end of June in the year of publication of the annual report (final datasets were received mid-August in 2021). A series of steps are performed to prepare the complex and large datasets for analysis.

Specifically, using specialised statistical software[3], the project team:

- Clean the datasets received
- Check the datasets for discrepancies
- Perform data augmentation (combining multiple sources of information)

↓

Merge the relevant datasets.

This involves restructuring the English and Welsh datasets so that they have the same format and can be analysed simultaneously.

↓

Where necessary, derive new information (data items) by combining different data items.

For example, the risk group and the Charlson comorbidity index are calculated using patient diagnosis information in HES and PEDW.

↓

Conduct analyses and present audit results.

In aggregated tables and graphs for annual reports and other outputs (such as peer reviewed articles and papers).

Definition of variables

Comorbidity and socioeconomic status

The presence of comorbidities is not captured within a single data item by the national registration services but is available as a data item in the RCRD. The NPCA team uses the Royal College of Surgeons of England (RCS) modified Charlson Comorbidity Index (CCI)[4] to describe these where they are not otherwise available.

[2] The CEU is an academic collaboration between The Royal College of Surgeons of England and the London School of Hygiene and Tropical Medicine, and undertakes national clinical audits and research. Since its inception in 1998, the CEU has become a national centre of expertise in methods, organisation, and logistics of large-scale studies of the quality of surgical care.

[3] Stata® is a statistical package for data analysis, data management, and graphics (https://www.stata.com/)

[4] Armitage JN, van der Meulen JH, Royal College of Surgeons Co-morbidity Consensus G. Identifying co-morbidity in surgical patients using administrative data with the Royal College of Surgeons Charlson Score. *Br J Surg.* 2010;97(5):772-81.

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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) and presence (≥1) of 14 pre-specified medical conditions (Analysis of the impact of COVID-19

The COVID impact section of the report covers:

Diagnoses

- overall, and broken down by RCRD disease stage
- type of biopsy: trans-rectal and trans-perineal

Radical prostatectomy procedures

- all types: laparosopic, robotic and open

Radiotherapy treatments initiated

- overall, and broken down into conventional (or standard fractionated) therapy and hypofractionated regimens. This was defined based on the doses documented in the Radiotherapy Dataset (RTDS).

Systemic treatments

- use of docetaxel and enzalutamide, given to men with newly-presenting hormone-sensitive metastatic prostate cancer, as per the change in guidance referred to above.

Methods

For England, data from the RCRD were used to identify prostate cancer diagnoses between 1 January 2019 and 31 December 2020. These were linked to data from Hospital Episode Statistics (HES), the Radiotherapy Dataset (RTDS) and the Systemic Anti-Cancer Therapy dataset (SACT). As noted above, the RCRD captures approximately 90% of cancer diagnoses that are seen in the full NCRAS dataset, with relatively consistent completeness across trusts. A full comparison of the two datasets can be found here.

We identified all patients in England newly diagnosed with prostate cancer between 1 January 2019 and 31 December 2020 according to the RCRD. We also used a number of *procedure-based cohorts* including patients with prostate cancer who had a radical prostatectomy (RP), radiotherapy (RT), androgen deprivation therapy (ADT) or chemotherapy between 1 January 2019 and 31 December 2020.

The RCRD also provided information on age at diagnosis, ethnicity, tumour stage ranging from stage I (cancer contained within prostate) to stage IV (cancer spread to lymph nodes or other parts of the body), Charlson Comorbidity Index, and the Index of Deprivation (IMD). Information on receipt of androgen-deprivation therapy (ADT) as a first treatment was derived from the cancer treatment modality data item in the Cancer Waiting Times dataset.

In addition to the variables described above, the M70.2 code was used to identify patients who had a transperineal (TP) biopsy and the M70.3 to identify patients who had a transrectal (TR) biopsy using both inpatient and outpatient HES. For each patient, the biopsy with a date closest to the date of diagnosis was taken.

The RTDS provided information on the fractionation regimen (standard, hypofractionation, or ultra-hypofractionation on the basis of United Kingdom RT dose fractionation guidance).

The SACT dataset was used to identify men who received systemic treatment with docetaxel, enzalutamide, or abiraterone. Linkage of SACT to the rCRD identified men with hormone-sensitive metastatic PCa who had treatment within 16 weeks of diagnosis.

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Data are presented at NHS region level for the seven English regions and for the 21 cancer alliances (Appendix 5).

Each quarter of the 2020 calendar year is compared to the same quarter of 2019 (Q1: January-March, Q2: April-June, Q3: July-September and Q4: October-December). 2020 data are presented as a percentage of 2019 for the seven English regions, except for systemic treatments where low numbers of patients given enzalutamide in 2019 made comparison of absolute numbers more meaningful. At the level of the cancer alliance, data are presented as patient numbers in 2019 and in 2020, and shown in overlapping bar charts.

Age, Charlson score, biopsy type and stage were used to check that the distributions of patient characteristics were similar in 2019 and 2020 (

Table 3).

Table 3. Patient and diagnostic characteristics for men newly diagnosed with prostate cancer in England over the period of 1 January - 31 December in 2019 and 2020

Data variable	**2019**		**2020**	
	N	**%**	**N**	**%**
No. of men with new diagnosis of prostate cancer	42,591		33,045	
Age				
<60	5,486	13%	3,945	12%
60-69	13,480	32%	10,332	31%
70-79	16,924	40%	13,454	41%
≥80	6,701	16%	5,314	16%
Total	42,591	100%	33,045	100%
Missing	0		0	
Charlson score				
0	34,206	80%	26,846	81%
1	3,926	9%	3,002	9%
≥2	4,459	11%	3,197	10%
Total	42,591	100%	33,045	100%
Missing	0		0	
Biopsy performed				
Trans-rectal biopsy	21,757	63%	10,779	43%
Trans-perineal biopsy	12,634	37%	14,496	57%
Total	34,391	100%	25,275	100%
Missing	8,200		7,770	
Stage				
I	11,358	36%	8,599	37%
II	5,078	16%	3,500	15%
III	9,545	30%	6,739	29%
IV	5,408	17%	4,518	19%
Total	31,389	100%	23,356	100%
Missing	11,202		9,689	

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Appendix 1). 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 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 five categories were fifths of the national IMD ranking of these areas.

Disease status and risk stratification

In Wales, cancer stage was defined using "T category (pre-treatment)", "N category (pre-treatment)" and "M category (pre- treatment)". Where pre-treatment information was missing for T or N, the corresponding pathological staging items were used if available. Men were assigned to a prostate cancer risk according to a modified D'Amico classification, which is a three-tiered disease status category, assigned according to their TNM stage, Gleason score and PSA, using an algorithm previously developed by the NPCA.[5] All data items were collected as part of the NPCA dataset in Wales.

In England, the RCRD did not contain information on Gleason grade or PSA which precluded using our risk-stratification algorithm to assign a risk group, however it did contain individual T, N and M variables. Disease staging (stage I-IV) was derived by NCRAS from TNM status.

Treatment allocation

A patient was considered to have undergone radical prostate cancer therapy if he was identified as having received a radical prostatectomy, radical external beam radiotherapy or brachytherapy within 12 months of his diagnosis date.

Radical prostatectomy

HES and PEDW records, for England and Wales respectively, were used to identify patients who had undergone a radical prostatectomy using the OPCS-4 procedure code "M61". Where information on radical prostatectomy was missing in the PEDW data for Wales, this information was added from the NPCA dataset.

It should be noted that for Wales all men who received an RP in 2018 were included in these indicators even if diagnosed before the start of the year, in order to maximise numbers of RPs included, while for England, we include men who are both diagnosed and treated within 2018 as we did not have access to earlier data in the RCRD.

Radical radiotherapy

For England, the RTDS data-item "treatment modality" was used to identify men who received external beam radiotherapy and/or brachytherapy. Men receiving radiotherapy for metastases or radiotherapy with palliative intent were excluded.

For Wales, CaNISC was used in a similar way to the RTDS to identify men receiving curative radiotherapy and to exclude those receiving palliative radiotherapy.

Chemotherapy

SACT was used to identify the men receiving docetaxel and enzalutamide and was only available for men in England. Linkage of SACT to the RCRD identified men with hormone-sensitive metastatic PCa who had treatment within 16 weeks of diagnosis. Docetaxel is a chemotherapeutic treatment which was new to the NICE 2019 prostate cancer guidelines[6] and according to those guidelines, should be 'offered' to men with metastatic disease who are fit enough

[5] NPCA Annual Report 2016. Download from: https://www.npca.org.uk/reports/npca-annual-report-2016/

[6] NICE, 2019. Prostate Cancer: diagnosis and management. NICE Guideline [NG131], 2019.

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to receive chemotherapy. The use of these drugs changed dramatically in April 2020 when new national rapid guidance was published in the UK on systemic anticancer therapy, recommending swapping docetaxel for enzalutamide or abiraterone in men with newly-presenting hormone-sensitive disease, given that these treatments are less immunosuppressive and can be administered at home.[7]

NPCA performance indicators

The 2021 Annual Report focuses on four performance indicators in England and Wales, and a further two in Wales, which are described in

[7] NICE, 2020. NICE Guideline [NG161], 2020. NHS England interim treatment changes during the COVID-19 pandemic

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Table 2.

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Table 2. NPCA Performance Indicators.

Performance indicator		Description
For England and Wales		
Disease presentation		
1	Proportion of men diagnosed with metastatic disease (presented at the level of the SMDT).	This *process* indicator provides information on the variation of the proportion of men diagnosed with metastatic prostate cancer, at a point at which they are normally beyond curative treatment. This could potentially indicate a late diagnosis. The numerator is the number of men diagnosed with metastatic disease between 1 April 2019 and 31 March 2020; the denominator is the number of men whose disease status has been determined. It is an unadjusted measure.
Outcomes of treatment: short-term		
2	Proportion of patients who had an emergency readmission within 90 days of radical prostate cancer surgery (presented at the level of the surgery centre).	This *outcome* indicator may reflect that patients experienced a complication related to radical prostate cancer surgery after discharge from hospital. This indicator was derived from linkage with HES/PEDW admissions for men undergoing radical prostatectomy between 1 April 2019 and 31 March 2020. To create a variable for those patients who had an emergency readmission within 90 days of a radical prostatectomy: we identify those patients who had a radical prostatectomy, calculate the difference in days between the given discharge date after prostatectomy and any readmission date, and find those patients with a code indicating an emergency readmission (see Appendix 2) which is recorded within 90 days of discharge. An emergency readmission code indicates that "admission was unpredictable and at short notice because of clinical need" (from the HES data dictionary[8]). An overnight stay is not required for a patient to fall into this category.
Outcomes of treatment: medium-term		
3	Proportion of patients experiencing at least one genitourinary (GU) complication requiring a procedural/surgical intervention within 2 years of radical prostatectomy (presented at the level of the surgical centre).	This outcome indicator may reflect the quality of the surgical procedure received. This indicator includes men undergoing a radical prostatectomy between 1 January 2018 and 31 December 2018. It was derived using a coding-framework based on OPCS-4 procedure codes to capture genitourinary complications that required an intervention (see Appendix 3).[9] These included complications of the urinary tract as opposed to those related to sexual dysfunction. Men with an associated diagnosis of bladder cancer (ICD-10 "C67" code) or who received post-operative radiotherapy were excluded. Men who are both diagnosed and treated in 2018 are included in this indicator for England, and all those treated in 2018 are included for Wales.

[8] http://content.digital.nhs.uk/media/23711/Admitted-Patient-Care/pdf/Admitted_Patient_Care_.pdf

[9] More detail about the development of this indicator can be found here: Sujenthiran A, Charman S, Parry M et al. Quantifying severe urinary complications after radical prostatectomy: the development and validation of a surgical performance indicator using hospital administrative data. *BJU int* (2017); 120:219-225

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4	Proportion of patients receiving a procedure of the large bowel and a diagnosis indicating radiation toxicity (gastrointestinal (GI) complication) up to 2 years following radical prostate radiotherapy (presented at the level of the radiotherapy centre).	This *outcome* indicator may reflect the quality of the radiotherapy interventions received. This indicator includes men undergoing radical radiotherapy between 1 January 2017 and 31 December 2017 and assesses the percentage of men at each radiotherapy centre who experienced at least one gastro-intestinal (GI) complication within 2 years of their radiotherapy, using procedure (OPCS-4) and diagnostic codes (ICD-10) derived from patient-level linked administrative hospital data (see Appendix 4). A toxicity event requires evidence of both a diagnostic endoscopic procedure (e.g. colonoscopy or sigmoidoscopy) in addition to a diagnostic code consistent with radiation toxicity equivalent to Grade 2 toxicity or above according to the National Cancer Institute Common Toxicity Criteria for Adverse Events (CTCAE). These indicators have been validated and used to compare the effectiveness of different treatment modalities and processes of care in prostate cancer radiotherapy.[10] Men with an associated diagnosis of bladder cancer, those who received additional brachytherapy and those who had received a radical prostatectomy prior to radiotherapy were excluded. Men who are both diagnosed and treated in 2018 are included in this indicator for England, and all those treated in 2018 are included for Wales.
For Wales only		
Treatment allocation		
5	Proportion of men with low-risk localised prostate cancer undergoing radical prostate cancer therapy (presented at the level of the SMDT).	This *process* indicator provides information about the potential "over-treatment" of men with low-risk prostate cancer. This indicator was derived from linkage with PEDW data for men undergoing radical treatment between 1 April 2019 and 31 March 2020 within 12 months of their diagnosis. The denominator is the number of men with low-risk localised prostate cancer, the numerator is the number of these having radical prostatectomy, radiotherapy or brachytherapy within 12 months of diagnosis.
6	Proportion of men with high-risk/locally advanced disease receiving radical prostate cancer therapy (presented at the level of the SMDT).	This *process* indicator provides information about potential "under-treatment" of men with high-risk/locally advanced disease. This indicator was derived from linkage with PEDW data for men undergoing radical treatment between 1 April 2019 and 31 March 2020. The denominator is the number of men with high-risk/locally advanced disease, the numerator is the number of these having radical prostatectomy, radiotherapy, or brachytherapy within 12 months of diagnosis.

[10] More detail about this indicator can be found here: Sujenthiran A, Parry M, Nossiter J et al. Comparison of Treatment-Related Toxicity With Hypofractionated or Conventionally Fractionated Radiation Therapy for Prostate Cancer: A National Population-Based Study. *Clin Oncol.* (2020); 32(8): 501-508; Parry M, Nossiter J, Sujenthiran A et al. Impact of high-dose rate and low-dose rate brachytherapy boost on toxicity, functional and cancer outcomes in patients receiving external beam radiation therapy for prostate cancer: a national population-based study. *Int J Radiat Oncol Biol Phys* (2020); S0360-3016(20)34545-4

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Statistical analyses

All statistical analyses were performed using Stata version 15.1.

Most results in the Annual Report are descriptive. The results of categorical data items are reported as percentages (%). The denominator of these proportions is, in most cases, the number of patients for whom the value of the data item was not missing. Results are typically grouped by Trust/Health Board (for Wales) or by specialist MDT (SMDT).

Centres which performed fewer than 10 procedures per year were excluded, however there were none of these this year.

Adjusted outcomes

Multivariable logistic regression was carried out for performance indicators 2-6. 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.

Indicators 2, 3 and 4 were adjusted for patient age, comorbidity, socio-economic status (for all) and disease stage (for English patients). The analyses for indicators 5 and 6 were adjusted for patient age and comorbidity.

Funnel plots

Funnel plots are used to make comparisons, and graphically display variation, between Trusts/Health Boards or between specialist MDTs. The plots are generated by plotting the rate for each Trust/Health Board/SMDT against the total number of patients used to estimate the rate. The 'target' is specified as the average rate across all Trusts/Health Boards/SMDTs.

The funnel plots generated for the performance indicators use control limits defining differences corresponding to two standard deviations (inner limits) and three standard deviations (outer limits) from the national average. These limits get wider where hospitals have a lower volume of patients and narrower where there is higher volume, reflecting the increased variability in results when there are fewer patients per hospital.

Funnel plots are displayed in the Annual Report for process measures across England and Wales (performance indicators 2-4).

Due to the unusual circumstances underpinning data collection and collation, resulting in the unavailability of standard cancer registration data[11], the NPCA has not carried out a formal outlier process in this report. Individual provider results can still be accessed and assessed on our website.

Analysis of the impact of COVID-19

The COVID impact section of the report covers:

Diagnoses

- overall, and broken down by RCRD disease stage
- type of biopsy: trans-rectal and trans-perineal

[11] Standard cancer registration data for diagnoses in England from 1st January 2019 were unavailable during the preparation of this report. For updates regarding future availability please refer to the monthly National Disease Registration Service newsletters

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Radical prostatectomy procedures

- all types: laparosopic, robotic and open

Radiotherapy treatments initiated

- overall, and broken down into conventional (or standard fractionated) therapy and hypofractionated regimens. This was defined based on the doses documented in the Radiotherapy Dataset (RTDS).

Systemic treatments

- use of docetaxel and enzalutamide, given to men with newly-presenting hormone-sensitive metastatic prostate cancer, as per the change in guidance referred to above.

Methods

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In addition to the variables described above, the M70.2 code was used to identify patients who had a transperineal (TP) biopsy and the M70.3 to identify patients who had a transrectal (TR) biopsy using both inpatient and outpatient HES. For each patient, the biopsy with a date closest to the date of diagnosis was taken.

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Data are presented at NHS region level for the seven English regions and for the 21 cancer alliances (Appendix 5).

[12] Prostate cancer stages. American Cancer Society. https://www.cancer.org/cancer/prostate-cancer/detection-diagnosis-staging/staging.html

[13] The Royal College of Radiologists. Radiology dose fractionation, third edition. London: The Royal College of Radiologist, 2019. brfo193_radiotherapy_dose_fractionation_third-edition.pdf (rcr.ac.uk)

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Each quarter of the 2020 calendar year is compared to the same quarter of 2019 (Q1: January-March, Q2: April-June, Q3: July-September and Q4: October-December). 2020 data are presented as a percentage of 2019 for the seven English regions, except for systemic treatments where low numbers of patients given enzalutamide in 2019 made comparison of absolute numbers more meaningful. At the level of the cancer alliance, data are presented as patient numbers in 2019 and in 2020, and shown in overlapping bar charts.

Age, Charlson score, biopsy type and stage were used to check that the distributions of patient characteristics were similar in 2019 and 2020 (

Table 3).

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<60	5,486	13%	3,945	12%
60-69	13,480	32%	10,332	31%
70-79	16,924	40%	13,454	41%
≥80	6,701	16%	5,314	16%
Total	42,591	100%	33,045	100%
Missing	0		0	
Charlson score				
0	34,206	80%	26,846	81%
1	3,926	9%	3,002	9%
≥2	4,459	11%	3,197	10%
Total	42,591	100%	33,045	100%
Missing	0		0	
Biopsy performed				
Trans-rectal biopsy	21,757	63%	10,779	43%
Trans-perineal biopsy	12,634	37%	14,496	57%
Total	34,391	100%	25,275	100%
Missing	8,200		7,770	
Stage				
I	11,358	36%	8,599	37%
II	5,078	16%	3,500	15%
III	9,545	30%	6,739	29%
IV	5,408	17%	4,518	19%
Total	31,389	100%	23,356	100%
Missing	11,202		9,689	

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Appendix 1: Charlson Comorbidity Index

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

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	

Appendix 2: Coding for emergency readmissions

Performance indicator 2: *Proportion of patients who had an emergency readmission within 90 days of radical prostate cancer surgery (presented at the level of the surgery centre).*

Patients are coded as having an emergency readmission if:

- they were readmitted between 1 and 90 days since discharge following radical prostatectomy
- they have an "admimeth" code starting with a “2” indicating emergency admission, as shown below (from the HES data dictionary[14])
- an overnight stay is not required to qualify as readmission

Emergency Admission, when admission is unpredictable and at short notice because of clinical need:
21 = Accident and emergency or dental casualty department of the Health Care Provider
22 = General Practitioner: after a request for immediate admission has been made direct to a Hospital Provider, i.e. not through a Bed bureau, by a General Practitioner: or deputy
23 = Bed bureau
24 = Consultant Clinic, of this or another Health Care Provider
25 = Admission via Mental Health Crisis Resolution Team (available from 2013/14)
2A = Accident and Emergency Department of another provider where the patient had not been admitted (available from 2013/14)
2B = Transfer of an admitted patient from another Hospital Provider in an emergency (available from 2013/14)
2C = Baby born at home as intended (available from 2013/14)
2D = Other emergency admission (available from 2013/14)
28 = Other means, examples are: - Admitted from the Accident and Emergency Department of another provider where they had not been admitted - Transfer of an admitted patient from another Hospital Provider in an emergency

[14] http://content.digital.nhs.uk/media/23711/Admitted-Patient-Care/pdf/Admitted_Patient_Care_.pdf

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Appendix 3: Coding for genitourinary complications

Performance indicator 3: *Proportion of patients experiencing at least one genitourinary (GU) complication requiring a procedural/surgical intervention within 2 years of radical prostatectomy (presented at the level of the surgical centre).*

Patients are coded as having a genitourinary complication if:

- they had a radical prostatectomy between 1 January 2018 and 31 December 2018
- they had not had radical radiotherapy
- they do not have a record of bladder cancer
- they have a record of one of the following OPCS-4 procedure codes

Men who are both diagnosed and treated in 2018 are included in this indicator for England, and all those treated in 2018 are included for Wales.

OPCS-4 Procedure Code and Definition	
M444	Endoscopic removal of blood clot from bladder
M448-9	Other specified/unspecified other therapeutic endoscopic operations on bladder
M455	Diagnostic endoscopic examination of bladder using rigid cystoscope
M458-9	Other specified/unspecified diagnostic endoscopic examination of bladder
M471	Urethral irrigation of bladder
M478-9	Other specified/unspecified urethral catheterisation of bladder
M481	Suprapubic aspiration of bladder
M512	Endoscopic suspension of neck of bladder
M642	Implantation of artificial urinary sphincter into outlet of male bladder
M643	Insertion of prosthetic collar around outlet of male bladder
M646	Reconstruction of neck of male bladder NEC
M648-9	Other specified/unspecified other open operations on outlet of male bladder
M651-5,8-9	Endoscopic resection of prostate/outlet of male bladder
M662	Endoscopic incision of outlet of male bladder NEC
M668-9	Other specified/unspecified other therapeutic endoscopic operations on outlet of male bladder
M679	Unspecified other therapeutic endoscopic operations on prostate
M763	Optical urethrotomy
M764	Endoscopic dilation of urethra
M768-9	Other specified/unspecified therapeutic endoscopic operations on urethra
M792	Dilation of urethra NEC
M793	Calibration of urethra
M794	Internal urethrotomy NEC

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Appendix 4: Coding for gastrointestinal complications

Performance indicator 4: *Proportion of patients receiving a procedure of the large bowel and a diagnosis indicating radiation toxicity (gastrointestinal (GI) complication) up to 2 years following radical prostate radiotherapy (presented at the level of the radiotherapy centre).*

Patients are coded as having a gastrointestinal complication if:

- they had a radical radiotherapy between 1 January 2018 and 31 December 2018
- they had not had radical prostatectomy
- they had not had additional brachytherapy
- they do not have a record of bladder cancer
- they have a record of one of the following OPCS-4 procedure or OCD-10 diagnosis codes

Men who are both diagnosed and treated in 2018 are included in this indicator for England, and all those treated in 2018 are included for Wales.

OPCS-4 Procedure Code and Definition	
H201-4,H206,H208-9,H212,H221, H228-9	Endoscopy of colon
H231-6,H238-9,H242,H248-9,H251,H258-9	Sigmoidoscopy of lower bowel
H261-9,H271,H279,H281,H288-9	Sigmoidoscopy of sigmoid colon
H541	Anorectal stretch
H564	Excision of anal fissure
H626	Proctoscopy
M372	Repair of vesicocolic fistula
M375	Repair of fistula of bladder NEC
ICD-10 Diagnosis Code and Definition	
K520	Gastroenteritis and colitis due to radiation
K528-9	Other specified/unspecified noninfective gastroenteritis and colitis
K603-4	Anal/rectal fistula
K624-6	Stenosis/haemorrhage/ulcer of anus and rectum
K627	Radiation proctitis
K628-9	Other specified/unspecified disease of rectum and anus
K632	Intestinal fistula
N321	Vesicointestinal fistula

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Appendix 5: Regions and Cancer Alliances in England

Region	Cancer Alliance
East of England	East of England - North
	East of England - South
London	North Central London
	North East London
	RM Partners
	South East London
Midlands	East Midlands
	West Midlands
North East & Yorkshire	Humber, Coast and Vale
	Northern
	South Yorkshire and Bassetlaw
	West Yorkshire and Harrogate
North West	Cheshire and Merseyside
	Greater Manchester
	Lancashire and South Cumbria
South East	Kent and Medway
	Surrey and Sussex
	Thames Valley
	Wessex
South West	Peninsula
	Somerset, Wiltshire, Avon & Gloucestershire

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