Utilization patterns of oral therapies in prostate cancer in Tuscany: a retrospective observational study based on regional administrative databases

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Last updated: 09/07/2026

Study Ongoing

Administrative details

EU PAS number

EUPAS1000001049

Study ID

1000001049

DARWIN EU® study

No

Study countries

Italy

Study description

Background: Prostate cancer is one of the most common cancers among men worldwide. The introduction of second-generation androgen receptor inhibitors (ARIs) has substantially changed the treatment of prostate cancer across different disease settings. Given their increasing use in clinical practice and the limited availability of real-world evidence on utilization patterns and clinically relevant outcomes, further evaluations based on administrative healthcare data are warranted.
Objectives: The primary objective of this study is to describe the utilization patterns of oral therapies for prostate cancer in Tuscany, with particular focus on abiraterone, apalutamide, enzalutamide, and darolutamide. Secondary objectives are to characterize the demographic and clinical profile of treated patients, describe treatment discontinuation and switching patterns, and evaluate the occurrence of major cardiovascular and other clinically relevant adverse events associated with these therapies.
Methods: This is a retrospective descriptive observational cohort study based on the regional administrative healthcare databases of Tuscany. All residents of Tuscany aged ≥18 years with at least one dispensing of abiraterone, apalutamide, enzalutamide, or darolutamide between 2016 and 2025 will be included. Patients will be classified as first-line users, new users beyond first-line therapy, or prevalent users. Drug utilization patterns will be described according to calendar year and Regional Healthcare Area. Demographic and clinical characteristics, including comorbidities and concomitant medications, will be evaluated among first-line users and new users beyond first-line therapy. Treatment discontinuation, treatment switching, and clinically relevant adverse events resulting in hospitalization or emergency department visits, including cardiovascular events, acute kidney injury, acute liver injury, and fractures, will be evaluated during follow-up using validated algorithms.

Study status

Ongoing

Research institutions and networks

Institutions

University of Pisa

First published: 01/02/2024

Last updated: 01/02/2024

Institution

Unit of adverse drug reactions monitoring (UADRM), University Hospital of Pisa

Italy

First published: 08/01/2014

Last updated: 07/07/2026

Institution | Educational Institution | Hospital/Clinic/Other health care facility | ENCePP partner

Agenzia regionale di sanità della Toscana (ARS Toscana)

Italy

First published: 01/02/2024

Last updated: 23/03/2026

Institution | EU Institution/Body/Agency | ENCePP partner

University of Siena

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Institution

Department of Statistics, Informatics and Applications 'Giuseppe Parenti', University of Florence.

Italy

First published: 03/07/2026

Last updated: 22/07/2026

Institution | Educational Institution

Networks

Centro Regionale di Farmacovigilanza della Toscana (CRFVT)

Italy

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Network | ENCePP partner

Contact details

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Study timelines

Date when funding contract was signed

Actual: 01/04/2026

Study start date

Planned: 06/07/2026

Actual: 01/01/2016

Data analysis start date

Planned: 06/07/2026

Date of final study report

Planned: 30/09/2026

Sources of funding

- No external funding

Study protocol

Protocol_ cancer study_ 02-07..2026 .pdf (1008.2 KB)

Regulatory

Was the study required by a regulatory body?

No

Is the study required by a Risk Management Plan (RMP)?

Not applicable

Methodological aspects

Study type

Study type list

Study topic:

Human medicinal product

Study type:

Non-interventional study

Scope of the study:

Drug utilisation

Other

If ‘other’, further details on the scope of the study

descriptive safety study

Data collection methods:

Secondary use of data

Study design:

This study will be a retrospective, descriptive observational study based on the identification of a cohort of patients treated with abiraterone, apalutamide, enzalutamide, or darolutamide in each year of the study period, using data extracted from the Tuscan administrative healthcare databases

Main study objective:

to describe the use of the main oral therapies for prostate cancer in the region, with particular focus on the introduction of second-generation androgen receptor inhibitors compared with abiraterone. In particular, the descriptive comparison between abiraterone and second-generation androgen receptor inhibitors may provide useful insights into how the introduction of new therapeutic options has changed the management of prostate cancer in Tuscany and whether this has occurred uniformly or differently across the various regional areas.

Study Design

Non-interventional study design

Cohort

Study drug and medical condition

Study drug International non-proprietary name (INN) or common name

DAROLUTAMIDE

ENZALUTAMIDE

APALUTAMIDE

ABIRATERONE ACETATE

Anatomical Therapeutic Chemical (ATC) code

(L02BX03) abiraterone

abiraterone

(L02BB05) apalutamide

apalutamide

(L02BB04) enzalutamide

enzalutamide

(L02BB06) darolutamide

darolutamide

Medical condition to be studied

Prostate cancer

Population studied

Short description of the study population

All individuals residing in Tuscany, registered with the Regional Healthcare Service, aged ≥18 years, and with at least one dispensing of one of the drugs of interest (Table A) between 1 January 2016 and 31 December 2025 (i.e., the index drug) will be included. The cohort entry date (index date) will correspond to the dispensing date of the index drug. Individuals aged <18 years at the index date will be excluded to avoid including patients who received these treatments for indications other than prostate cancer. In addition, individuals

with less than 24 months of available observation in the regional healthcare registry before the index date will be excluded. Three categories of users will be identified:
1) First-line users: patients with a dispensing of the index drug and no dispensing of any other drug of interest during the 24 months preceding the index date;
2) New users beyond first-line therapy: patients with at least one dispensing of the index drug and at least one previous dispensing of another drug of interest, excluding the index drug, during the 24 months preceding the index date;
3) Prevalent users: patients with at least one dispensing of one of the drugs of interest and at least one dispensing of the same drug during the 24 months preceding the index date.
Patients will be identified based on the first dispensing of the study drugs recorded in the regional administrative FED and SPF databases using Anatomical Therapeutic Chemical (ATC) codes (Table A). Follow-up for each patient will begin on the index date and will end on 31 December 2025, or on the date of death, transfer outside the Tuscany Region, loss to follow-up, discontinuation of the index drug, or switching to another antineoplastic drug other than the index drug, whichever occurs first. Treatment discontinuation and treatment switching will be defined according to the criteria described in the "Variables" section. Treatment discontinuation and switching events will be assessed during the 12 months following the index date.
Among patients receiving one of the drugs of interest, selected clinically relevant events (cardiovascular events, renal impairment, hepatic impairment, and fractures) will also be identified according to diagnoses recorded in the Hospital Discharge Records (HDR) and Emergency Department (ED) databases during the 12 months following the index date (Table B)

Study design details

Setting

The study will exclusively use the regional administrative healthcare databases of Tuscany, whose data are routinely collected for administrative purposes and allow the identification of healthcare services provided to individuals covered by the Tuscan Regional Healthcare Service.

Comparators

Previously most widely used therapy (abiraterone)

Outcomes

Primary endpoints:

● Description of the use of the main oral therapies for prostate cancer in routine clinical practice in Tuscany, with particular focus on the use of abiraterone, apalutamide, enzalutamide, and darolutamide during the study period (2016–2025).

● Description of the distribution of patient categories (first-line users, new users beyond first-line therapy, and prevalent users) for each study drug by calendar year and Regional Healthcare Area (Area Vasta) of Tuscany.

● Description of the demographic (age, sex, and area of residence) and clinical (comorbidities and concomitant treatments) characteristics of patients treated with the oral therapies of interest for prostate cancer during the study period (2016–2025).

● Description of the frequency of treatment discontinuation and treatment switching among patients treated with abiraterone, apalutamide, enzalutamide, and darolutamide.

Secondary endpoint

• Description of the occurrence of major cardiovascular events and other clinically relevant events during the follow-up period

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Data analysis plan

The analyses will be primarily descriptive. Categorical variables will be summarized as absolute frequencies and percentages, while continuous variables will be described using the mean and standard deviation or the median and interquartile range, according to the distribution of the data.
The following will be described:
A. The percentage of first-line users, new users beyond first-line therapy, and prevalent users among all users of each drug of interest, by calendar year (2016–2025) and Local Health Authority of residence (Figures 1a–d);
B. The percentage of first-line users receiving each of the four drugs of interest among all first-line users, by Local Health Authority of residence and calendar year (2016–2025) (Figure 2);
C. The demographic and clinical profile (comorbidities and concomitant pharmacological treatments) of first-line users and new users beyond first-line therapy during the periods 2016-2019, 2020-2022, 2023-2025, on the basis of the patients' cohort entry, by drug of interest and Local Health Authority of residence (Tables 1a–d);
D. The frequency of treatment discontinuation and switching from the index drug to one of the other drugs of interest among first-line users and new users beyond first-line therapy during the 12 months following the index date, by drug of interest and Local Health Authority of residence (Tables 1a–d)
E. The frequency of safety events of interest across the different treatment groups classified according to treatment line (first-line users and new users beyond first-line therapy) (Table 2). Specifically, the adverse events listed in Table 2 will be evaluated among patients receiving the drug of interest, who will be followed for up to 12 months from the dispensing date of the index drug or until death, treatment discontinuation, treatment switching, or loss to follow-up (removal from the regional healthcare registry), whichever occurs first.
Sensitivity analysis
- Treatment discontinuation and switching from the index

Data management

ENCePP Seal

The use of the ENCePP Seal has been discontinued since February 2025. The ENCePP Seal fields are retained in the display mode for transparency but are no longer maintained.

Data sources

Data source(s)

ARS Toscana

Data sources (types)

Administrative healthcare records (e.g., claims)

Use of a Common Data Model (CDM)

CDM mapping

No

Data quality specifications

Check conformance

Unknown

Check completeness

Unknown

Check stability

Unknown

Check logical consistency

Unknown

Data characterisation

Data characterisation conducted

No

Data characterisation moment

after extract-transform-load to a common data model

Data characterisation details

The data analysis workflow will be conceptually divided into a series of intermediate steps, starting from the original administrative healthcare data in TheShinISS format through to the final tables and figures. Each intermediate step will be documented in a codebook. For each step, simulated datasets will be developed to allow the analytical procedures to be implemented and tested. At the end of this process, a complete simulated dataset in TheShinISS format will be generated, and the entire analytical workflow will be executed to verify its correct implementation. The analytical procedures, together with the simulated datasets, will remain publicly available to ensure transparency and reproducibility in accordance with the principles of Open Science.
A simple set of data extraction criteria will be defined for the identification of the study population in the ARS Oracle database. This dataset will be stored on the ARS file server and converted into the TheShinISS data model.