Modelling cost determinants for treating metastatic castration-resistant prostate cancer: an Italian national healthcare system's perspective cost analysis

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OBJECTIVES

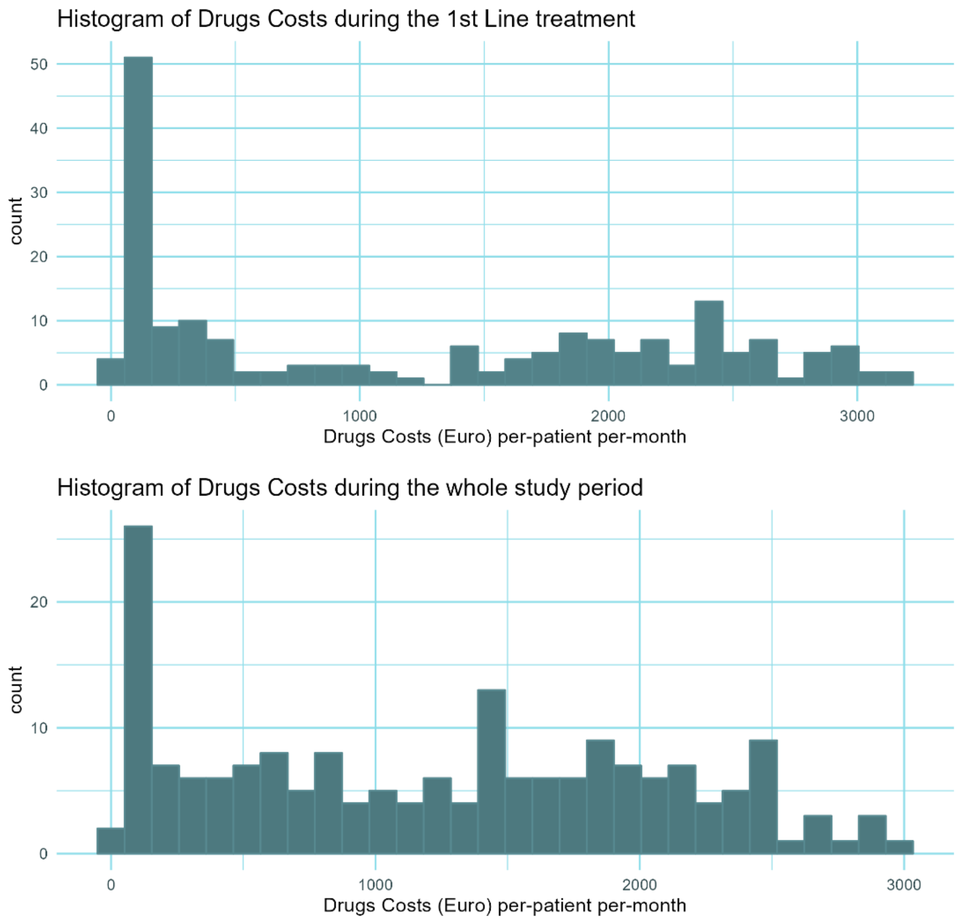
This study aimed at estimating the healthcare costs and identifying potential drivers associated with metastatic castration-resistant prostate cancer (mCRPC).

METHODS

Adult mCRPC patients receiving as first line (1L) treatment abiraterone, enzalutamide or docetaxel associated with LH-RH analogue between 2014-2018 were selected from electronic medical records. Clinical information was deterministically linked with multiple administrative databases to retrieve economic data. Costs were separately summarised for medication, inpatient and outpatient and expressed per-patient per-month (PPPM) for the 1L alone and for the whole study period. For identifying possible cost-drivers, GLM-Gamma models were developed for outpatient and medication costs. Whereas, accounting for the high frequency of zero inpatient costs, Zero-Inflated Gamma models were developed. The study adopted a National Healthcare perspective.

RESULTS

185 patients were selected for the study. Medication cost was around 1,000 €/PPPM during the 1L and 1,242 €/PPPM considering the whole study period.



Age, comorbidity and the presence of bone metastases were evaluated as statistical significant predictors of medical costs (p<0.05). A 2% increase in costs was observed for the 1 year age increase; a 25% per unit of Charlson's comorbidity index; and a doubling of costs due to the presence of bone metastases.

Gamma model, hospital pharmacies distribution (FED) component

Parameter	Coefficient (exp)	95% CI Lower limit	95% CI Upper limit	p-value
Intercept	709,51	471,01	1.096,62	<0,0001
Age (1 yr. Increase, after 50)	1,019	1,003	1,036	0,0231

Gamma model, local pharmacies distribution (AFT) component

Parameter	Coefficient (exp)	95% CI Lower limit	95% CI Upper limit	p-value
Intercept	25,41	17,27	39,15	<0,0001
CCI (age-unadjusted)	1,2503	1,0408	1,5373	0,0146
Bone metastases	2,0957	1,3156	3,2346	0,0012

The median inpatient and outpatient costs were 245 and 304 €/PPPM respectively during 1L; comparable values were observed when considering the whole study period.

Costs during the first line treatment, per-patient per-month (€)

	5%	25%	50%	75%	95%	Mean	SD	min-max
Inpatient	0,00	0,00	245,12	629,84	3.181,2	626,65	1.139,6	0,00 – 8.339,5

Costs during the first line treatment, per-patient per-month (€)

	5%	25%	50%	75%	95%	Mean	SD	min-max
Outatient	62,29	187,92	300,30	454,98	689,50	331,58	191,68	15,82 – 90,60

The presence of bone and visceral metastases were associated with significantly higher costs (p<0.05) increasing 1L inpatient total costs by 48% and 119%, respectively. The presence of bone metastases increased by 22% (p<0.05) the 1L outpatient costs, respectively. Similar predictors were observed when analyzing the whole study period.

Inpatient costs determinants during the 1L*Zero-inflated Gamma model*

Fixed Effects model component

Parameter	Coefficient (exp)	95% CI Lower limit	95% CI Upper limit	p-value
Intercept	1.269,29	667,62	2.413,22	<0,0001
Age (1 yr. Increase, after 50)	0,970	0,949	0,991	0,0057
Limphnodes metastases	1,484	1,033	2,133	0,0329
Visceral metastases	2,195	1,229	3,921	0,0079

Zero-inflated model component

Parameter	OR	95% CI Lower limit	95% CI Upper limit	p-value
(Intercept)	0,430	0,296	0,624	<0,0001
CCI - age unadjusted	0,744	0,498	1,112	0,1496
Any liver disease	8,777	0,658	117,137	0,1004

Outpatient costs determinants during the first line treatment: *Gamma model*

Gamma model

Parameter	Coefficient (exp)	95% CI Lower limit	95% CI Upper limit	p-value
Intercept	281,97	241,47	332,06	<0,0001
Hemiplegia	2,050	1,014	5,098	0,0762
Bone metastases	1,220	1,010	1,466	0,0358

DISCUSSION AND CONCLUSIONS

As expected, the main cost-drivers are associated with the presence of metastasis and chronic conditions. Data show that mCRCP patients do not frequently require acute management, likely because of the increasing chronicity of this disease.