Cost-Effectiveness analysis of nivolumab for the treatment of second-line advanced squamous non-small cell lung cancer (NSCLC) in Spain

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Introduction

- Squamous non-small cell lung cancer (NSCLC) is a very aggressive disease that originates in epithelial cells surrounding respiratory tree from the trachea to the terminal bronchiole[1].
- NSCLC (also known as non-small cell), accounts for 85-90% of lung cancer, representing squamous histology approximately 25-30% of all lung neoplasms[1,2,3].
- Currently treatments for NSCLC are limited and little effective. Docetaxel is the standard treatment in actual clinical practice for 2L NSCLC in Spain.

Objective

To assess the efficiency of nivolumab vs docetaxel for advanced squamous NSCLC patient´s treatment in 2L, from the Spanish National Health System (NHS) perspective.

Methods

- A partitioned survival model was used to simulate the evolution of a NSCLC patient population (1,7m^2,70kg) during a 20-year horizon (lifetime). The model had three distinct health states: progression-free (PF), progressed disease (PD), and death. Weekly cycle-length was used in the model.
- Progression-free-survival and overall-survival patient-level data from CA209-017[4] study were used to fit parametric survival curves (spline-2 and log-logistic, respectively), in order to extrapolate survival beyond the study time horizon.
- Live years gained (LYG) and quality adjusted life years (QALY) were used as outcome measure.
- Total cost estimation included: drug acquisition for 2L and subsequent therapies (3L), administration, management of 2L treatment adverse events (AE), and disease management in PF and PD (€962.99 every 4 weeks). Best supportive care as treatment option was considered for 2L and 3L. Cost associated with terminal care in the days before dead was applied (€ 2,738.51 one-off cost).
- A 3% annual discount rate was applied to both, costs and outcomes[5].
- An oncologists' board provided detailed health care resource consumption for disease and AE (grade 3-4 with incidence ≥5%) management.
- Utilities (0.781 PF and 0.620 PD state) derived from EQ-5D data collected in the CA209-017[4] with Spanish tariff.
- Drug cost estimation (Table 1) considered the notified ex-factory price[6] with mandatory deduction[7], according to the dosages indicated on summaries of product characteristics (SPC)[8,9] and the average treatments duration from CA209-017[4].
- Unitary costs (€,2016) for health resources were obtained from a national database[10].
- One way deterministic and probabilistic sensitivity analyses (SA) were performed.

Table 1. Drug costs drugs considered for 2L and subsequent treatment (3L)

Active substance	Brand name drug	Unit Cost (€, 2016) (ex-factory Price)	Cost per dose (€)
Docetaxel	Docetaxel Accord EFG (20mg/ml 1 VIAL concentrate for solution for infusion 1 ml)	€43.97	€280.31
Erlotinib	Tarceva (150mg 30 covered tablets)	€2,045.40 (*€1,891.98)	€441.46
Gemcitabine	Gemcitabina Accord (1g 1 VIAL concentrate for solution for infusion 15ml)	€43.70	€92.86
Nivolumab	Opdivo (40mg 1 Vial 4ml)	€570.00 (*527.25)	€2,768.06
	Opdivo (100mg 1 Vial 10ml)	€1,425.00 (*1,318.13)	
Vinorelbine	Vinorelbina Actavis EFG (10mg/ml 1 Vial 1ml)	€6.30	€32.13
Best Supportive Care (BSC)	Morphine (patches) Durogesic MATRIX		€233.56
	Morphine ABSTRAL (100mcg 10 sublingual tablets)		
	Corticosteroids (Prednisone Alonga (50mg 30 tablets)		
	Shakes (RESOURCE 2.0 - (200ml 24 Apricot)		
	Oxygen (domiciliary oxygen therapy)		

* Mandatory deductions (RDL8/2010) of 7.5% was applied for calculations.

Results

- Nivolumab showed higher effectiveness, with 1.11 incremental LYG and 0.81 incremental QALY compared to docetaxel.
- Lifetime total cost per patient resulted €67,550 with nivolumab and €26,990 with docetaxel (Table 2).
- Incremental cost-effectiveness ratio (ICER) and incremental cost-utility ratio (ICUR) were €36,792/LYG and €49,867/QALY, respectively.
- In deterministic SA, ICUR values ranged between €43,028/QALY and €67,405/QALY (Figure 1). In addition, in probabilistic SA, 75.4% of the 1,000 MonteCarlo simulations performed were below €65,000/QALY (Figure 2).

Table 2. Base case results

Concept	Nivolumab	Docetaxel	Diference
Drug acquisition costs	€36,257	€1,770	€34,487
Administration costs	€1,951	€940	€1,010
Monitoring costs	€27,795	€14,121	€13,675
Adverse events costs	€5	€610	€-605
Subsequent treatment 3L:			
Acquisition costs	€1,231	€9,095	€-7,864
Administration costs	€311	€454	€-144
Total costs	€67.550	€26.990	€40,559
LYG	€2.02	€0.91	€1.10
QALY	€1.38	€0.57	€0.81
ICER (€/LYG)	€36,792/LYG (nivolumab vs docetaxel)		
ICUR (€/QALY)	€49,867/QALY (nivolumab vs docetaxel)		

Figure 1. One way sensitivity analyses results: Tornado diagram

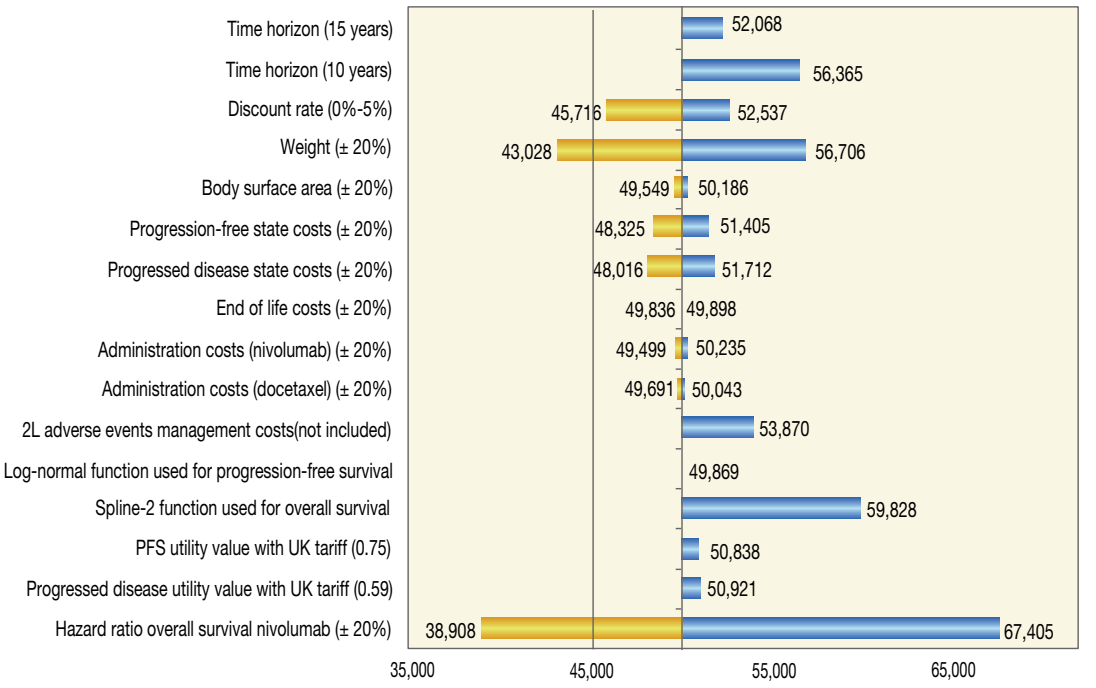
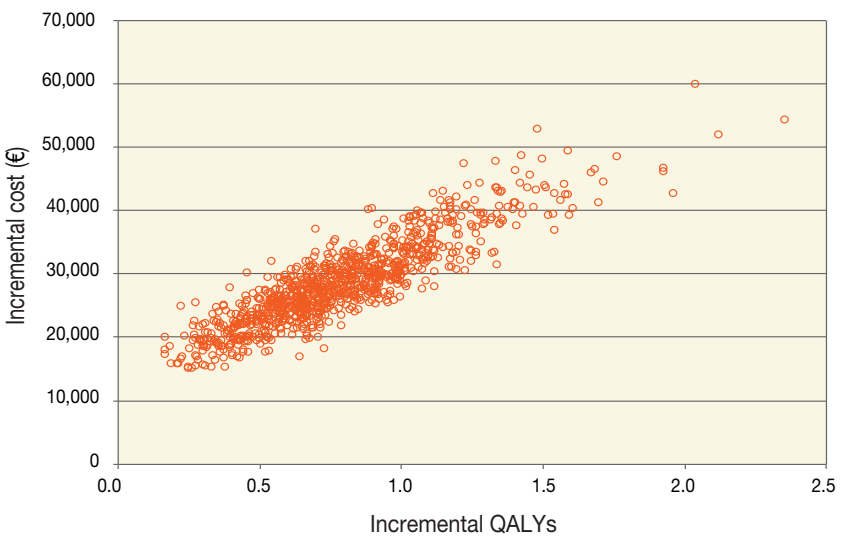


Figure 2. Cost-effectiveness plane: nivolumab vs docetaxel



Conclusions

Nivolumab could be considered a cost-effective strategy compared to docetaxel for the 2L treatment of advanced squamous NSCLC, considering the National Institute for Health and Care Excellence (NICE) recommendations for treatments which meet end of life criteria[11].

References

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