Cost-effectiveness of umeclidinium/vilanterol (UMEC/VI) versus aclidinium/formoterol (ACL/FOR) in patients with COPD in the United Kingdom

Digital poster

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Introduction

- Patients with COPD often require high healthcare resource utilisation and treatment costs as a result of substantial disease morbidity and mortality.[1]
- The UK NICE guidelines recommend dual long-acting bronchodilator maintenance therapy for patients with COPD with persistent symptoms or exacerbations;[2] however, currently more evidence is needed to evaluate their cost-effectiveness.
- A recent NMA compared use of dual therapy treatments in COPD, including UMEC/VI versus ACL/FOR. The NMA performed a frequentist regression-based analysis, with networks stratified by observation time horizon (12 and 24 weeks).[3]
  - To be included, RCTs were required to observe patients with COPD indexed on a dual therapy (LAMA/LABA), report lung function, health-related quality of life, breathlessness, RMU, and exacerbations and have a duration of at least 8 weeks.[3]
  - The NMA found that at 24 weeks, UMEC/VI provided significantly greater improvements in trough FEV_1, RMU and exacerbation rates versus ACL/FOR. There was no statistically significant difference between the treatments in TDI focal score or SGRQ score.[3]

Objective

This analysis assessed the cost-effectiveness of UMEC/VI versus ACL/FOR for the treatment of COPD, from a UK NHS perspective, using data from this recent NMA.

Methods

- The GALAXY model[4] is a validated and extensively published economic model employing a linked risk-equation approach to model COPD disease progression and outcomes and evaluate cost-effectiveness.
- The GALAXY model was populated with pooled patient baseline characteristics (**Table 1**) and treatment effects (**Table 2**) for this analysis.
  - The population parameters were obtained from an 8-week, multicentre, crossover clinical trial in symptomatic patients with COPD, that compared once-daily UMEC/VI 62.5/25 mcg with once-daily TIO/OLO 5/5 mcg (Study 204990; NCT02799784).[5]
  - The analysis was conducted in accordance with NICE health technology evaluations guidelines.[6]

Table 1: **Pooled baseline characteristics**

Characteristic	Study 204990 (pooled data)	SPARK (pooled data)	Notes
Female, %	39.8	23.7	
Age, years, mean (SE)	64.4 (0.55)	63.1 (8.10)	
BMI, %			
Low (<21)	10.0	10.0	Data unavailable in SPARK, obtained from Study 204990
Medium (21–30)	50.0	50.0	Data unavailable in SPARK, obtained from Study 204990
High (>30)	40.0	40.0	Data unavailable in SPARK, obtained from Study 204990
Any CV comorbidity, %	27.0	27.0	Data unavailable in SPARK, obtained from Study 204990
Any other comorbidity, %	78.4	78.4	Data unavailable in SPARK, obtained from Study 204990
History of ≥1 exacerbation, %	19.0	98.0	
mMRC score ≥2, %	100.0	100.0	Data unavailable in SPARK, obtained from Study 204990
Current smokers, %	53.0	38.0	
Height, cm, mean (SE)	169.9 (0.60)	169.9 (0.60)	Data unavailable in SPARK, obtained from Study 204990
Fibrinogen, µg/dL, mean (SE)	453.2 (2.4)	488.5 (2.4)	Derived from a risk equation
6MWT, m, mean (SE)	349.9 (2.7)	308.2 (2.7)	Derived from a risk equation
Number of exacerbations in previous year, mean (SE)	0.18 (0.03)	0.18 (0.03)	Data unavailable in SPARK, obtained from Study 204990
Moderate exacerbations	0.16	0.16	Data unavailable in SPARK, obtained from Study 204990
Severe exacerbations	0.02	0.02	Data unavailable in SPARK, obtained from Study 204990
Starting FEV_1 % predicted, mean (SE)	59.6 (5.6)	37.0 (0.3)	
Starting SGRQ total score, mean (SE)	43.1 (1.00)	53.0 (0.67)	

Table 2: **Treatment effects***

Parameter	UMEC/VI vs ACL/FOR mean difference (95% CI)
FEV_1, change from baseline, mL	97.50 (72.89, 122.11)
SGRQ score, change from baseline	−0.42 (−2.06, 1.22)
Moderate/severe exacerbations, relative risk	0.43 (0.22, 0.84)
Rescue medication use, change from baseline in puffs/day	−0.46 (−0.66, −0.25)

**Data obtained from the NMA. Only 12 weeks analysis available.[3]*

- **Table 3** shows the UK healthcare resource unit and drug costs used, with costs (GBP, 2022) and QALYs discounted at 3.5% annually.
- Base-case settings and assumptions are shown in **Table 4**.

Table 3: **Cost inputs***

Parameter	Base-case input value (N=1,104)		Source
	UMEC/VI	ACL/FOR	
Drug costs per day, £	1.08	1.08	BNF 2022[9]
Healthcare costs per year or per exacerbation, £			**Source**
Disease management, COPD severity (FEV_1 % predicted)			
Moderate to severe (50–80%)		128	NICE 2018[10]
Severe (30–<50%)		850	NICE 2018[10]
Very severe (<30%)		1,578	NICE 2018[10]
Exacerbation			
Moderate		88	NICE 2018[10]
Severe		2,379	NICE 2018[10]
Moderate exacerbation event outpatient costs, £			**Source**
Oral corticosteroid: prednisolone		1.04	NICE 2019[2]
Antibiotics			
Amoxicillin		0.06	NICE 2018[10]
Doxycycline		0.14	NICE 2018[10]
Clarithromycin		0.28	NICE 2018[10]

**Unit costs were inflated to 2022 values using the Consumer Price Index data obtained from the Office of National Statistics.[11]*

Table 4: **Base-case model settings and assumptions used in this study**

Base-case model settings	Assumptions
• UK NHS perspective • Study 204990 population • Lifetime horizon (probabilistic analysis) • 1-year cycle length • 3.5% discount rate for costs and benefits • Treatment discontinuation and patient productivity costs excluded	• Treatment effect was assumed to be persistent at a constant rate for all patients • Treatment discontinuation was assumed to be zero in the first and subsequent years • UMEC/VI treatment effects for FEV_1 were assumed to begin at the onset of the analysis (zero months)

Assessment of impact of uncertainty

- Base-case analysis was probabilistic (with a deterministic analysis for comparison), to address the uncertainty in parameter estimation, using input parameters with distributions that randomly sampled over 5,000 Monte Carlo simulations.
- One-way sensitivity and scenario analyses were conducted to test robustness of the model results.
  - Scenario analyses used patient baseline demographics from the SPARK study (a parallel-group study comparing treatment with IND/GLY versus GLY and TIO monotherapies over 64 weeks)[7] to evaluate the effects of starting with a population with more severe COPD.
    - Scenario analyses also evaluated the impact of time horizon, discount rates, treatment effects, treatment discontinuation (using data from Study 204990 and the AERISTO trial[8] in separate analyses) and subsequent treatment, rescue medication cost exclusion and patient productivity cost inclusion.
  - Sensitivity analyses were performed on baseline covariate values not available from Study 204990, and UMEC/VI treatment effects on exacerbation, SGRQ and FEV_1.

Conclusion

- Based on this analysis, UMEC/VI was the dominant treatment from a UK NHS perspective, predicted to give lower costs and improved health outcomes compared with ACL/FOR.
- These findings suggest that UMEC/VI should be considered as a preferred treatment option for COPD versus ACL/FOR by physicians in the UK.
- Limitations of this study include:
  - No data were available for treatment discontinuation in subsequent years, only 12-week discontinuation rate data were collected; however, discontinuation rates did not substantially influence the cost-effectiveness of UMEC/VI, as evidenced by the results of the scenario analyses.
  - While data on baseline fibrinogen and 6MWT at baseline were unavailable, the incremental benefit for QALYs and costs did not change substantially compared with the deterministic results in the sensitivity analyses performed for these factors.

Results

Deterministic analysis

- Over a lifetime horizon (25 years), UMEC/VI was predicted to result in 0.385 fewer total exacerbations PPPY and provided an additional 0.615 LYs and 0.295 QALYs with cost savings of £3,255 compared with ACL/FOR.
- Lower drug and non-drug costs and fewer moderate and severe exacerbations were also predicted for UMEC/VI compared with ACL/FOR.

Probabilistic base-case analysis

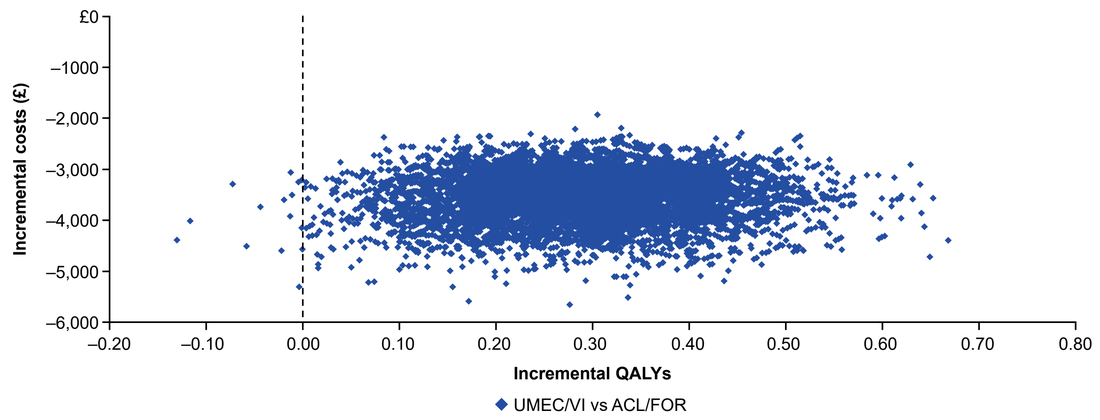
- Over a lifetime horizon (25 years), UMEC/VI was predicted to result in 0.385 fewer total exacerbations PPPY and provided an additional 0.608 LYs (95% range: 0.283, 0.942) and 0.291 QALYs (0.088, 0.503), with cost savings of £3,555 (£2,682, £4,585) compared with ACL/FOR (**Table 5**).

Table 5: **Cost-effectiveness analyses for UMEC/VI versus ACL/FOR over a lifetime horizon**

Probabilistic (25 years)	UMEC/VI	ACL/FOR	Incremental
Cumulative number of exacerbations			
Moderate	2.553	5.604	−3.051
Severe	0.675	1.453	−0.777
Total	3.228	7.057	−3.828
Severe exacerbations PPPY	0.061	0.140	−0.078
Total exacerbations PPPY	0.293	0.678	−0.385
Outcomes at end of timeframe			
Survival at end of time horizon, %	1.5	0.9	0.65
Accumulated LYs (undiscounted)	11.012	10.404	0.608
Accumulated QALYs	6.081	5.790	0.291
Costs at end of timeframe, £			
Total accumulated costs	12,917	16,471	−3,555
Drug costs	8,836	9,994	−1,158
Total non-drug costs	4,081	6,477	−2,397
Incremental results			
Incremental cost, £ (95% range)			−3,555 (−4,585, −2,682)
Incremental LYs, undiscounted (95% range)			0.608 (0.283, 0.942)
Incremental QALYs (95% range)			0.291 (0.088, 0.503)
ICER/QALY (vs ACL/FOR)			Dominant (Dominant, Dominant)

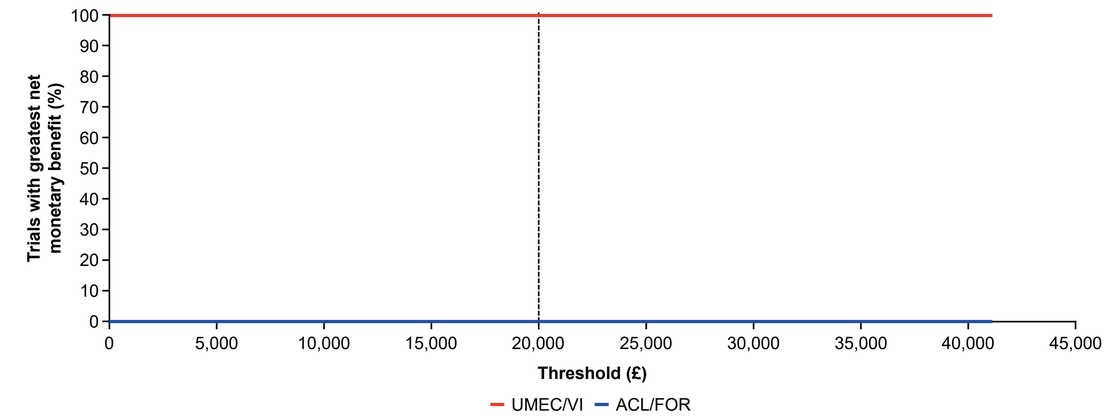
- UMEC/VI was less costly and showed higher QALYs compared with ACL/FOR across most simulations and remained the more favourable treatment option compared with ACL/FOR for 99.8% of 5,000 simulations (**Figure 1**).

Figure 1: **Base-case incremental cost-effectiveness plane**



- At a willingness-to-pay threshold of £20,000 per QALY, the probability that UMEC/VI was cost-effective was 100% compared with ACL/FOR (**Figure 2**).

Figure 2: **Base-case net-benefit acceptability curve**



Scenario and sensitivity analyses

- UMEC/VI was the dominant (lower predicted costs and improved health outcomes) treatment for all scenarios and sensitivity analyses compared with ACL/FOR.
- Cost savings for UMEC/VI compared with ACL/FOR were highest in the scenario where patient productivity costs were included. Cost savings were lowest for the scenario in which treatment discontinuation data from the AERISTO trial were applied for the first and subsequent years.

Abbreviations

6MWT, 6-minute walk test; ACL, aclidinium; BMI, body mass index; BNF, British National Formulary; CI, confidence interval; COPD, chronic obstructive pulmonary disease; CV, cardiovascular; FEV_1, forced expiratory volume in one second; FOR, formoterol fumarate; GBP, British pound sterling; GLY, glycopyrronium; ICER, incremental cost-effectiveness ratio; LABA, long-acting β_2-agonist; LAMA, long-acting muscarinic antagonist; LY, life-year; mMRC, modified Medical Research Council dyspnoea scale; NHS, National Health Service; NICE, National Institute of Health and Care Excellence; NMA, network meta-analysis; OLO, olodaterol; PPPY, per patient per year; QALY, quality-adjusted life year; RCT, randomised controlled trial; RMU, rescue medication use; SE, standard error; SGRQ, St George's Respiratory Questionnaire; TDI, transition dyspnoea index; TIO, tiotropium; UK, United Kingdom; UMEC, umeclidinium; VI, vilanterol.

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On behalf of all authors, this poster is presented by **AM**, an employee of GSK.

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