Artificial intelligence-aided colonoscopy for adenoma detection and characterization
A cost-effectiveness analysis in the Spanish setting

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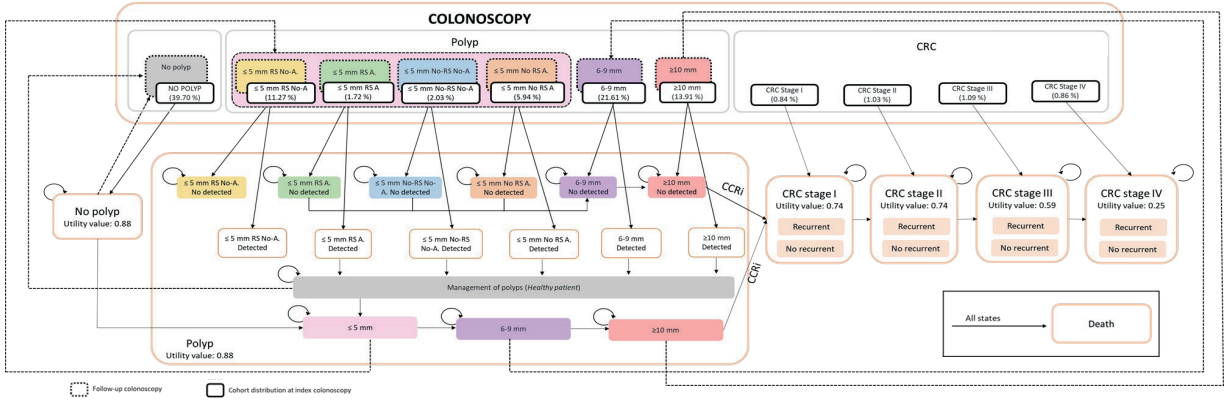
Objective

To assess the cost-effectiveness of GI Genius™, an Intelligent Endoscopy Module for real-time polyp detection and characterization, compared to standard practice, from a Spanish National Health System perspective.

Methods

- A Markov model representing the clinical pathway of patients eligible for colonoscopy was designed to estimate, over a lifetime horizon, the total cumulative costs and health outcomes, life years gained (LYG) and quality-adjusted life years (QALY).
- Based on screening programmes data[1-6], a hypothetical population (1,000 patients with mean age of 61.32 years) was initially distributed between 8 health states and substates (Figure 1).
- The efficacy of GI Genius™ was captured considering the adenoma miss rate (AMR)[7] (Table 1) and annual transition probabilities were used to simulate natural disease evolution[8-10]. Polyps' management followed European and American guidelines[11] (Table 1).

Figure 1. Markov model diagram



- All-cause mortality data[12], and specific CRC-related mortality[8] were applied.
- Utility values derived from EQ-5D were used for QALY estimation[9,13].
- Unitary costs (€,2023)[14], applied to resource consumption were: colonoscopy, €319.36; GI Genius™, €7.59/per colonoscopy; polypectomy, €130.44; histopathology, €148.54. Annual CRC management costs[2] were €4,162.88 (stage I), €4,645.66 (stage II), €4,659.62 (stage III) and €7,743.30 (stage IV).
- A 3% annual discount rate was applied to costs and health outcomes[15].
- Model´s structure and inputs were validated by an expert panel and sensitivity analyses (SA) were performed to assess the model's robustness.

Table 1. Clinical data

	Adenoma Miss Rate[7]		Detected polyp management[11]	
	GI Genius™	Standard practice	GI Genius™	Standard practice
≤5 mm RS No-A polyps	15.85%	35.75%	Leave-in-situ	Polipectomy + Histopathology
≤5 mm RS A polyps	15.85%	35.75%	Resect and discard	
≤5 mm No-RS No-A polyps	15.85%	35.75%		
≤5 mm No-RS A polyps	15.85%	35.75%		
6-9 mm polyps	20.69%	22.86%	Polipectomy + Histopathology	
≥10 mm polyps	6.06%	15.79%		

A, adenoma; No-A, no adenoma; No-RS, no rectosigmoid; RS, rectosigmoid

Results

- For a hypothetical cohort of 1,000 patients, the use of GI Genius™ in colonoscopy against the standard practice avoided 145 polypectomies, 314 histopathologies, and 7 cases of CRC.
- Over a lifetime horizon, GI Genius™ yielded more LYG and QALY, and resulted less costly compared to standard practice (Table 2).

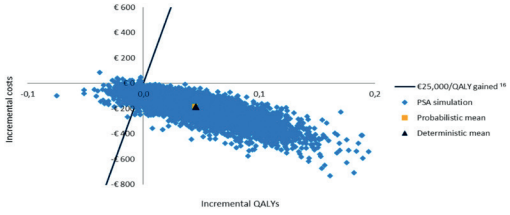
Table 2. Base case results

	GI Genius™	Standard practice	Incremental
Total LYG /QALY	16.37 / 14.32	16.33 / 14.27	0.04 /0.05
Total costs	€2,194.78	€2,381.88	€-187.10
Diagnostic cost	€687.43	€667.61	€19.82
Disease management cost	€1,507.35	€1,714.27	€-206.92
ICER (€/LYG) / ICUR (€/QALY)	GI Genius™ resulted a dominant option		

ICER, incremental cost-effectiveness ratio; ICUR, incremental cost-utility ratio; QALY, quality-adjusted life year; LYG, life-year gained

- GI Genius™ remained a dominant strategy in all one-way SA, and in 94.6% of 10,000 MonteCarlo simulations of the probabilistic SA (Figure 2).

Figure 2. Probabilistic sensitivity analysis. Cost-effectiveness plane



PSA, probabilistic sensitivity análisis; QALY, quality-adjusted life year

Conclusions

The use of GI Genius™ would result a dominant strategy (more effective and less costly) vs standard practice in patients undergoing colonoscopies in Spain.

References

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