

Does current reimbursement drive the adoption of computer-aided applications to increase the adenoma detection in colonoscopies – a provider-based impact model for Germany, France, and Italy



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Objective

- This impact model aims to assess the relationship between Computer-aided detection (CAD) use in colonoscopies and provider reimbursement in Germany, France, and Italy.

Background

- Colorectal cancer (CRC) is a major public health challenge worldwide. In Europe it is one of the top three malignancies in terms of incidence and mortality for both sexes. <sup>(1)</sup>
- Colonoscopy is considered as gold standard for the early detection of colorectal neoplasia, due to highest sensitivity and specificity of all early-detection methods. By removing adenomas during the screening colonoscopy, the development of cancer can effectively be prevented, and CRC-associated mortality can be reduced. <sup>(2,3,4)</sup>
- One of the most relevant quality indicators for colonoscopy is adenoma detection rate (ADR). Research shows an inverse relationship between adenoma detection rate and colorectal cancer incidence. <sup>(5)</sup>
- CAD systems show great potential in improving ADR, a large prospective study illustrates the impact of new equipment on the detection of adenoma. <sup>(6)</sup>
- An increase in ADR and therefore an improvement in the prevention of colorectal cancer (CRC) is supported when using CAdE during coloscopy procedures.
- Health care providers (HCPs) receive higher reimbursement when also conducting a polypectomy compared to colonoscopy only. Thus, while an HCP needs to invest in AI technology, potentially, a higher adenoma detection rate and conducting more polypectomies, could recoup part of the costs.
- However, the financial implications on the provider when implementing CAD is not fully evaluated and depends not only on the ratio of colonoscopies and polypectomies but also on the number of detected lesions within the same patient.

Results

- Colonoscopies with detection increased from 53% to 63% in the standard colonoscopy group versus CAD assisted, i.e., colonoscopies without detection decrease from 47% to 37% (Table 3).
- The calculated detected carcinoma cases increased by 100% from 2 to 4 cases in the CAD assisted versus standard colonoscopy.
- Considering hospitals referrals for the detected carcinomatous lesions the total case volume increased by 1.5%.
- Calculated economic impact:
  - Reimbursement for office-based Healthcare Providers (HCPs) saw an increase of 1.2%, 1.9%, and 2.4% for Germany, France, and Italy, respectively, attributed to enhanced adenoma detection and increased colonoscopies with polypectomies compared to standard colonoscopy (Figure C).
  - Factoring in the additional hospital cases resulting from increased carcinoma detections, the total reimbursement surged by 12.7%, 11.4%, and 13.0% for Germany, France, and Italy, respectively.

Conclusions

- Improvements in ADR through adoption of a CAD application results in minor changes in reimbursement for the healthcare provider within the initial colonoscopy case.
- It is likely that reduced reimbursement hurdles for adopting innovative technologies might improve uptake of CAD.

Limitations

- The results of this impact calculation model are mainly based on the change in ADR and PDR referenced by papers and the assumed inputs to distribute the cases alongside the decision-tree.
- Differences in the detection rate of CAD per polyp type is not taken into consideration.
- A change in the number of detected lesions per colonoscopy is not considered in this impact calculation model.

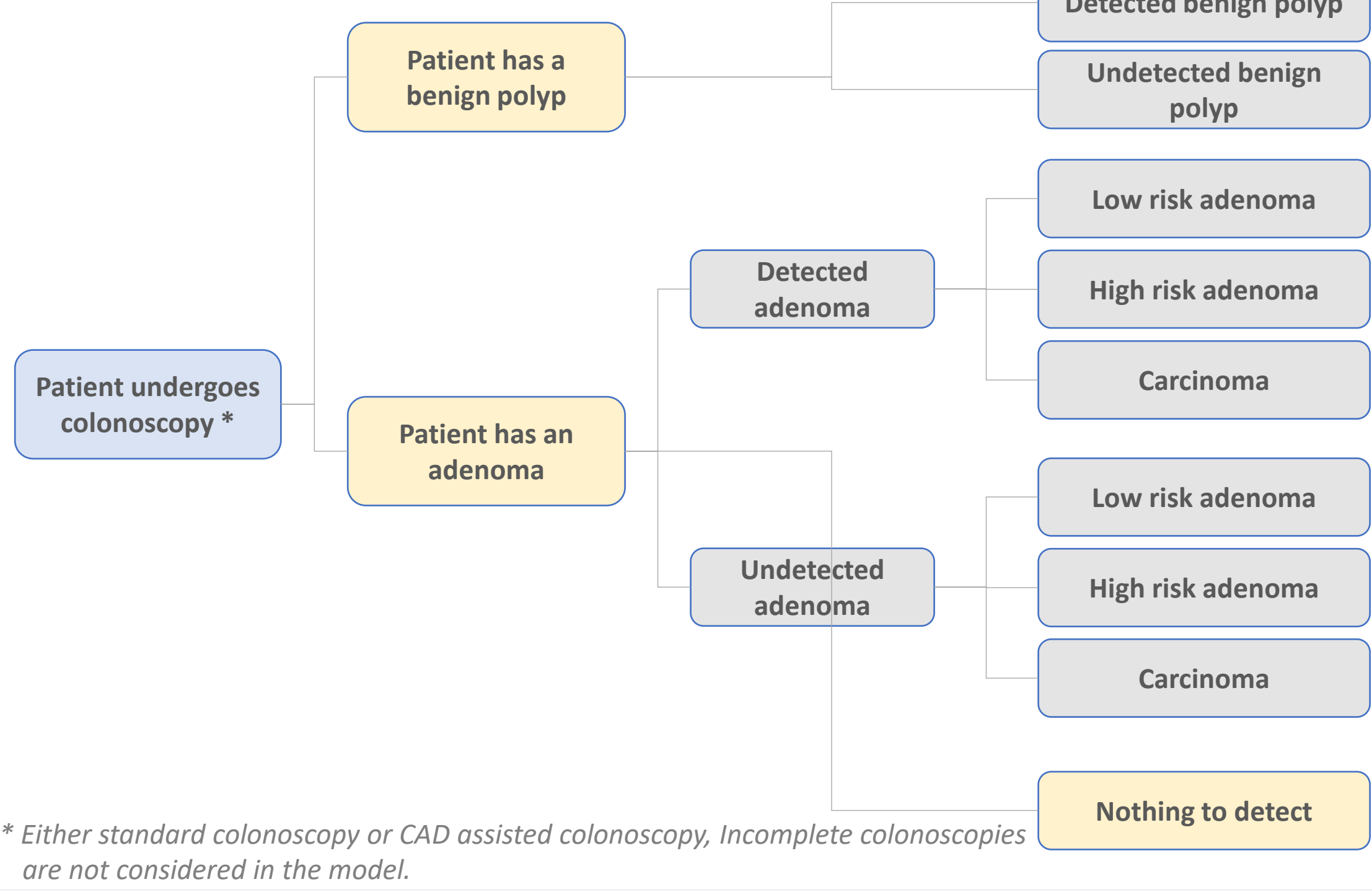
Disclosure

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- Conflict of interest: All authors are employees of Olympus Europe SE & Co. KG
- Authorship contributions: Drafting the work and designed content - JB, DK, GP, SG; Collected the data - JB, DK; Performed analysis, paper writing - JB, JCM; Final approval of the version to be published - JB, DK, SG, JCM, GP

Methods

- The analysis is based on a decision-tree mapping out the patient pathways following colonoscopy (Figure A) using CAD (ENDO-AID CAdE, Olympus Medical Systems Corporation, Tokyo, Japan) or standard colonoscopy.
- During colonoscopy, a patient may have a benign polyp, an adenoma, or nothing to detect.
- In the model, benign polyps and adenoma are discrete, such that, if a patient has both a benign polyp and an adenoma they would be classified as having an adenoma only.
- By subtracting the ADR from the polyp detection rate (PDR) the benign PDR is calculated. In the model it is assumed the relative change in benign PDR is not negative and the maximum of benign PDR from standard colonoscopy or CAD-assisted colonoscopy is used for calculation.
- Benign polyps and adenomas may be detected during the colonoscopy, or they may go undetected. The model examines the volume of cases that are detected versus those that remain undetected.
- For standard colonoscopy, an ADR of 35% is assumed <sup>(7)</sup>. The CAD-assisted ADR of 45% and PDR of 61%, as well PDR of 53% for standard colonoscopy are calculated based on a weighted average relative increase from published literature <sup>(8,9,10)</sup> comparing standard colonoscopy with CAdE assisted colonoscopy (Figure B).
- Adenomas are categorized into high risk, low risk, or carcinoma. Their percentages are based on findings from published research (Table 1). <sup>(11,12)</sup>
- During a colonoscopy, it is assumed that benign polyps, low- and high-risk adenomas are removed through polypectomy. Carcinomas, however, are not removed during the colonoscopy; instead, patients are referred to a hospital for the necessary carcinoma removal.
- Provider case volume is quantified as the total number of colonoscopies, categorized into either diagnostic-only colonoscopies or colonoscopies involving polypectomy.
- The main outcome measure, total reimbursement for the provider, received is calculated by multiplying the diagnostic-only colonoscopies, colonoscopies with polypectomy and additional hospital cases for removal of the carcinoma with the reimbursement fee for the procedure (Table 2).
- For simplification, a possible add-on fee for the medical devices needed to perform the polypectomy or removal of the carcinoma is not considered
- In calculating the economic impact, we assume that patients are distributed between public (90%) and private (10%) insurance.

A Decision tree of the model

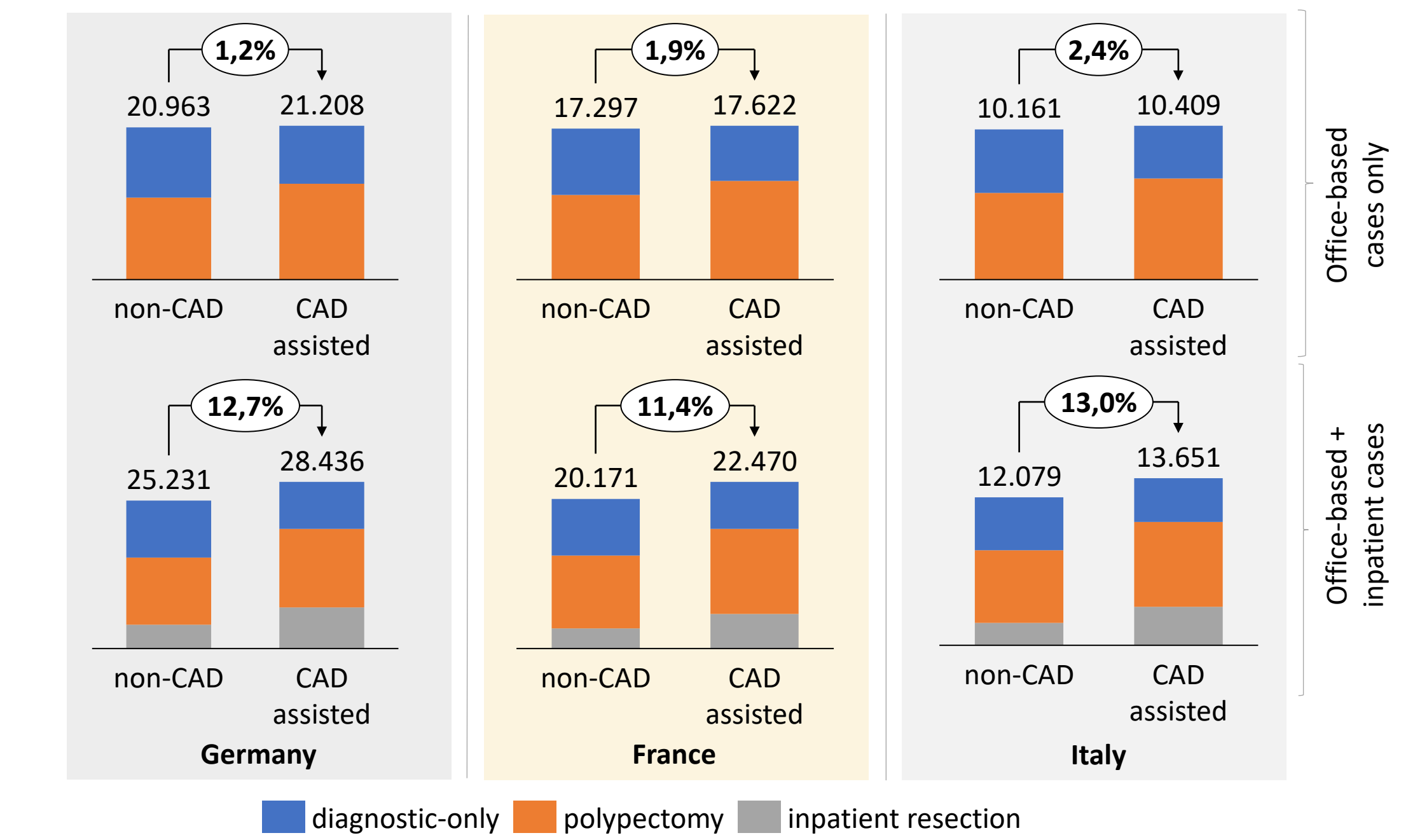


\* Either standard colonoscopy or CAD assisted colonoscopy, Incomplete colonoscopies are not considered in the model.

3 Distribution of cases following colonoscopy

Colonoscopy result	CAD assisted colonoscopy		Standard colonoscopy	
	abs.	%	abs.	%
Total colonoscopy cases	100	100.0%	100	100.0%
Detected polyps	18	17.6%	18	17.6%
Undetected polyps	0	0.0%	0	0.0%
High risk detected adenoma	19	19.1%	16	15.6%
Low risk detected adenoma	22	22.2%	17	17.3%
Detected carcinoma	4	3.7%	2	2.1%
High risk undetected adenoma	0	0.0%	4	4.5%
Low risk undetected adenoma	0	0.0%	5	4.9%
Undetected carcinoma	0	0.0%	1	0.6%
Nothing to detect	37	37.4%	37	37.4%
Colonoscopy with no detection	37	37.4%	47	47.4%
Colonoscopy with detection	63	62.6%	53	52.6%

C Calculated reimbursement impact for the provider



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