

Cost Effectiveness Analysis of the Prevention of Colorectal Cancer by Aspirin and Colonoscopic Surveillance

Réseau d'Evaluation en Economie de la Santé (REES France)
28, rue d'Assas – 75006 Paris – http://www.rees-france.com

Context: The risk of colorectal cancer (CRC) is only prevented by the identification and the resection of the colic polyps during a colonoscopy. Two American studies showed the protective effect of aspirin in particular in addition with an endoscopic surveillance. Nevertheless this treatment is very expensive. In this context, a cost-effectiveness analysis was carried out in order to know the consequences of the reduction of endoscopic procedures related to the effectiveness of Aspirin.

Objective: To evaluate the clinical and economic advantages of a chemoprevention by aspirin and/or an endoscopic surveillance by a cost-effectiveness analysis.

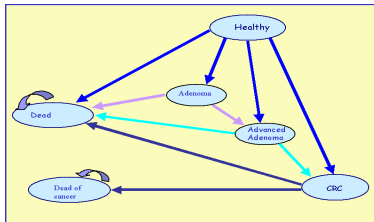
Methods

4 Strategies:

- 1/ Without surveillance nor treatment (reference)(Ø)
- 2/ Prevention treatment by Aspirin (A): 325 mg per day
- 3/ Periodic surveillance without treatment (S)
- 4/ Periodic surveillance and prevention treatment by Aspirin (S+A)

Markov model :

- Cycle duration : 1 year
- Follow –up period : 12 years
- 6 Clinical states : Healthy, Adenoma, Advanced Adenoma, Colorectal Cancer (CRC), Dead, Dead of cancer



- adenoma (average data resulting from Rickert 1979 and Vatn 1982⁷⁻⁸)
- advanced adenoma (results from Betés 2003⁹ and Stevens 2003¹⁰)

ages brackets	50-59ans	60-69ans	70-79ans
probability of adenoma	0,00151	0,001207	0,004386
probability of advanced adenoma	0,00151	0,001207	0,004386

- colorectal cancer, Eide 1986¹¹ (weighted average of the annual conversion rate of three types of advanced adenomas)

	probability of CRC
strategy Ø	0,01411
strategy S	0,07056

- dead of CRC in 5 years : 50% (Ladabaum 2001¹²); mortality rate for an age (Insee 2003¹³)

Safety:

- SAE: 1/10000 (Bond 1993,1995,2000⁴⁻⁵⁻⁶)

Costs :

- Colonoscopy diagnosis (Lejeune 2003¹⁴, weighted average public/private cost in 1996 : 525€) / therapeutic (weighted average public/private cost in 1996 : 658€)
- Chemotherapy 12 weeks plan in treatment of metastatic CRC (weighted average cost of 3 protocols¹⁵ : 7344€, weighted median cost: 6803€)(Gautié 2002)
- GHM the most frequent and prices

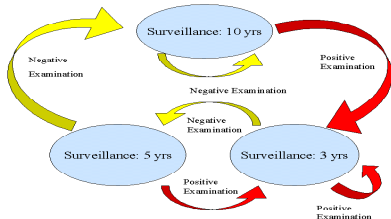
GHS	Wording	GHS cost in €
Cancer Diagnosis		
2107	Malignant tumour of the digestive tract, age < 70 yrs and/or CMA	2464.0
2108	Malignant tumour of the digestive tract, age > 69 yrs and/or CMA	4908.6
Complications due to the Colonoscopy		
2105	Digestive haemorrhage, age < 70 yrs without CMA	2107.50
2106	Digestive haemorrhage, age > 69 yrs without CMA	4042.81

- Annual cost of prevention treatment by Aspirin in January 2002: treatment 19.9€ and treatment + complication 190.4€ [22.1-221.4] (Suleiman 2002⁶)

Assumptions :

- Annual probabilities of transition (actuarial method and DEALE)
- Annual treatment cost (diagnosis + cost of CRC treatment + Aspirin)

Protocol of follow-up in the case of strategy with surveillance (strategies S and S+A)



Efficacy :

- compliance : 82.6% go to the colonoscopy to 1 year et 78.2% to 3 years (Winawer 1993²)
- sensibility : 92% for optic colonoscopy (Pickhardt 2003³)

compliance	probability
to 3 yrs	90%
to 5 yrs	85%
to 10 yrs	80%

sensibility	probability
adenoma	90%
advanced adenoma	95%

Results

Cost-Effectiveness Analysis :

- Criteria: -incidence of CRC during 30 years for a 100 000 people cohort
- number of years of life ≥50 years for 100 000 people

Strategy	Expected cancer /100000 people	Avoided cancer /100000 people	Life expectancy in the model (years)	Gained years of life	cost per avoided cancer	ICER (/ year of life)
Ø	5090	Ref	16,22	Ref	11 288 €	696 €
A	3710	1380	16,38	0,16	8 920 €	546 €
S	1860	3230	16,59	0,37	6 693 €	403 €
S+A	1290	3800	16,63	0,41	6 177 €	371 €

⇒ Strong predominance of strategy S+A « surveillance and Aspirin »: strategy S+A is the most effective (3800 cancers avoided per 100 000 people) and the least expensive (ICER 371€) of all

Sensitive Analysis :

- Influence of the probability to develop/ of developping adenomas for a person without surveillance: variation between 0.0105 and 0.0271
- Influence of the improvement of clinical parameters related to the surveillance (extreme cases).
 - ⇒ Effectiveness improvement of 50% due to a regular colonoscopic surveillance
 - ⇒ total cost of strategy A « only Aspirin » cheaper than the two others
 - ⇒ strategy A more efficient than strategy S but strategy S+A « Surveillance+Aspirin » more effective than the two others
- Effectiveness improvement of 95% due to a regular colonoscopic surveillance
 - ⇒ strategies S and S+A with colonoscopic prevention more effective and less expensive than strategies without colonoscopic prevention
 - ⇒ strategies S: the least expensive (4 157 € / person)
 - ⇒ strategies S+A: the most effective (4770 cancers avoided / 100 000 people)

Conclusion : The chemoprevention is efficient : there is no existing process which makes possible to obtain results more effective at lower cost.

References : 2: Winawer et al., Randomised comparison of surveillance intervals after colonoscopic removal of newly diagnosed adenomatous polyps, NEJM 1993, vol 328: 901-905; 3: Pickhardt PJ, Computed tomographic virtual colonoscopy to screen for colorectal neoplasia in asymptomatic adults, NEJM 2003; vol. 349:2191-2200; 4: Bond JH, Follow-up after polypectomy: consensus?, EJC 1995, vol. 31A: 1141-1144; 5: Bond JH, Polyp guideline: diagnosis, treatment, and surveillance for patients with nonfamilial colorectal polyps, Annals of Internal Medicine 1993, vol. 119:836-842; 6: Bond JH, Polyp guidelines, treatment and surveillance for patients with colorectal polyps, AJG 2000, vol. 95: 3053-3063; 7: Rickert R et al., Adenomatous lesions of the large bowel, Cancer 1979, vol. 43:1847-1857; 8: Vatn M et al., The prevalence of polyps of the large intestine in Oslo: an autopsy study, Cancer 1982, vol. 49:819-825; 9: Betés M et al., Use of colonoscopy as a primary screening test for colorectal cancer in average risk people, AJG 2003, vol. 98:2648-2654; 10: Stevens T et al., Colonoscopy screening in the elderly: when to stop?, AJG 2003, vol. 98:1881-1885; 11: Eide JJ, Risk of colorectal cancer in adenoma-bearing individuals within a defined population, IJC 1986, vol. 38:173-176; 12: Ladabaum U, Aspirin as an adjunct to screening for prevention of sporadic colorectal cancer, Annals of internal medicine 2001, Vol. 35: 769-781; 13: Beaumel C, Doisneau L, Vatn M, La situation démographique en 2001, Mouvements de la population, INSEE Résultats, Société N°18, Août 2003; 14: Lejeune C, Analyse coût-efficacité du dépistage de masse du cancer colorectal en France: utilisation d'un modèle de simulation; 15: Gautié L et al., Coûts des traitements chimiothérapeutiques palliatifs des cancers colorectaux métastatiques. Etude rétrospective réalisée à l'Institut Claudius Regaud, Journal d'Economie Médicale 2002, Vol. 20, N°7-8, 401-408; 16: Suleiman S et al., Chemoprevention of colorectal cancer by aspirin: a cost-effectiveness analysis, Gastroenterology 2002;122:78-84.