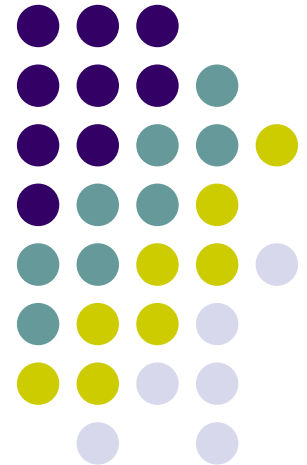


Systematic review of CT colonography versus colonoscopy

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Evidence Review Group Meeting
October 9, 2007

Institute for Clinical and Economic Review
Boston, Massachusetts



Objectives of clinical review



- To compare the sensitivity and specificity of computed tomography (CT) colonography with that of optical colonoscopy for detection of polyps and colorectal neoplasia
- To assess harms associated with CT colonography
- To assess patient acceptance of CT as a screening tool



Inclusion Criteria

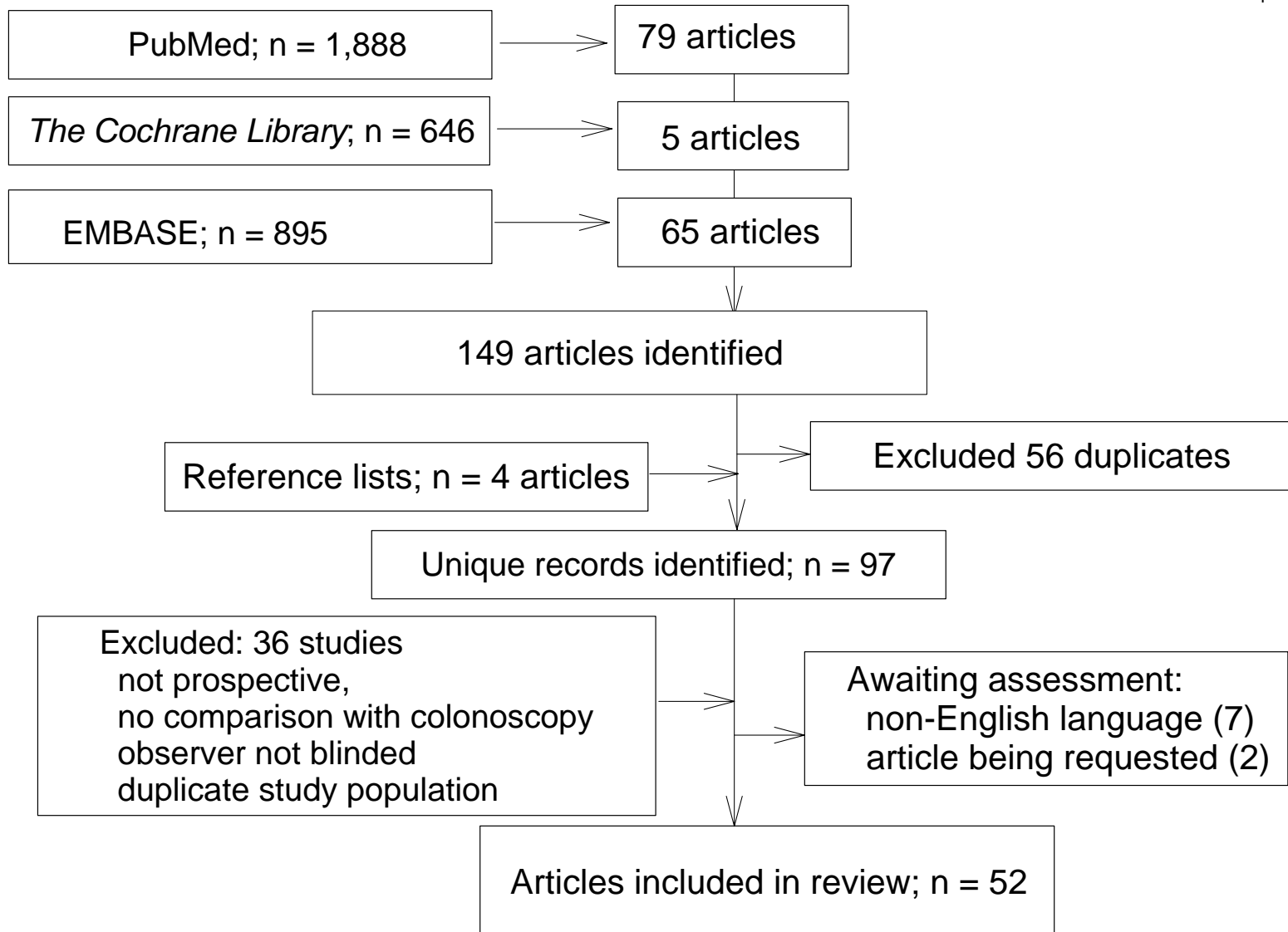
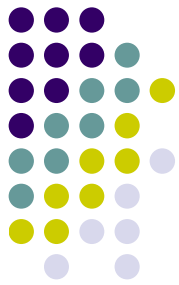
- Prospective diagnostic accuracy studies of CT colonography
- Colonoscopy used as reference standard
- Endoscopists unaware of index test results; CT readers unaware of reference test results
- Study participants:
 - Adults who have undergone CT colonography and colonoscopy
 - No active bowel disease (e.g., Crohn's disease, irritable bowel syndrome, etc.)

Outcomes



- Outcomes:
 - Sensitivity & specificity to detect a lesion ≥ 10 mm, ≥ 6 mm, and 6 to 9 mm by patient
 - Sensitivity & specificity to detect a lesion ≥ 10 mm, ≥ 6 mm, and 6 to 9 mm by lesion
 - Harms associated with CT colonography
 - Perforation or other adverse event
 - Radiation
 - Extracolonic findings with CT colonography
 - Patient acceptance of CT colonography

Search Results



Criteria used to select studies



- Multi-detector CT scanners with collimation < 5 mm;
- Scan acquired within a single breath hold of ≤ 30 seconds;
- Reference standard of combined CT colonoscopy and colonoscopy results (segmental unblinded colonoscopy or second look colonoscopy)
- Observers had read at least 30 CT scans or receiving CTC training before study start.

Included studies



Author	Scanner	Time	Training
Ginnerup 2003	Marconi M x 8000, Marconi Medical Systems	2 x 17 s	approximately 100
Hoppe 2004	Asterion 4- channel multi-detector	30 s	30-60
Iannaccone 2004	Somatom Plus 4 Volume Zoom, Siemens Medical Solutions.	12-18 s	> 300, 200, 100
Iannaccone 2005	Somatom Plus 4 Volume Zoom, Siemens Medical Solutions	14-20 s	> 400, 200, 100
Johnson 2007	Lightspeed Ultra, GE Healthcare	28 s	> 1,000
Pickhardt 2003	GE Lightspeed or LightSpeed Ultra, GE Medical Systems	NR	> 25 for training or > 1,000 scans
Rockey 2005	4- or 8-slice multi-detector CT scanners	NR	> 50 or training module
Taylor 2003	Lightspeed Plus, GE Medical Systems	NR	NR
Van Gelder 2004	Mx8000, Philips	22 s	> 50

Study Quality



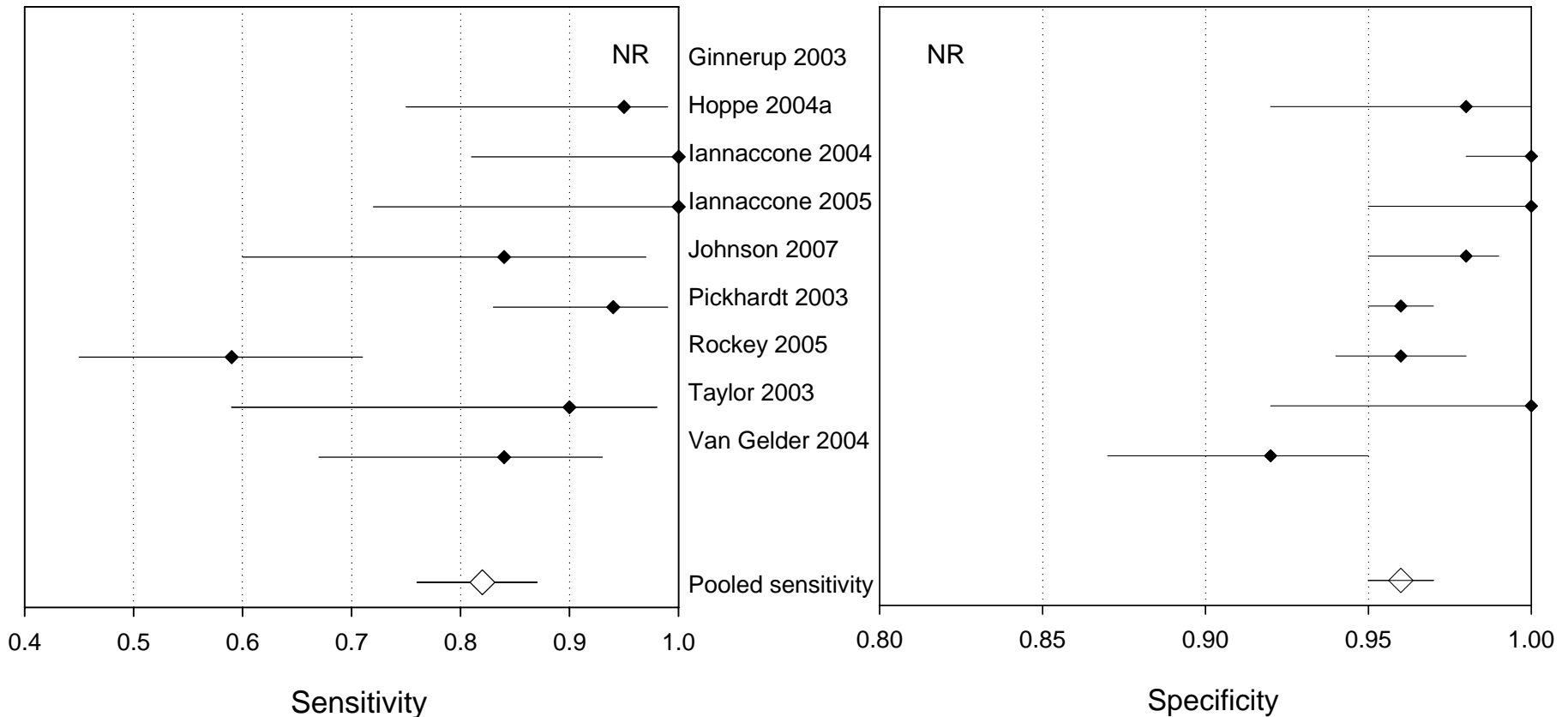
- QUADAS Tool
 - Used to assess diagnostic accuracy studies
 - 14 items assessing internal validity
- 5 “high” quality studies
 - Ginnerup 2003; Iannaccone 2004 & 2005; Pickhardt 2003, Taylor 2003
- 4 “fair” quality studies
 - Hoppe 2004, Johnson 2007, Rockey 2005, Van Gelder 2004



Description of Studies

- Population
 - N = 3,141
 - Age range (56-69 years)
 - Men: women = 1,924:1,234
 - Asymptomatic, symptomatic, mixed
- Bowel cleansing methods fairly uniform
- Routine use of contrast media in 3 studies
- Image reconstruction
 - 2-D for initial review and 3-D for problem solving
 - 3-D for initial review and 2-D for problem solving

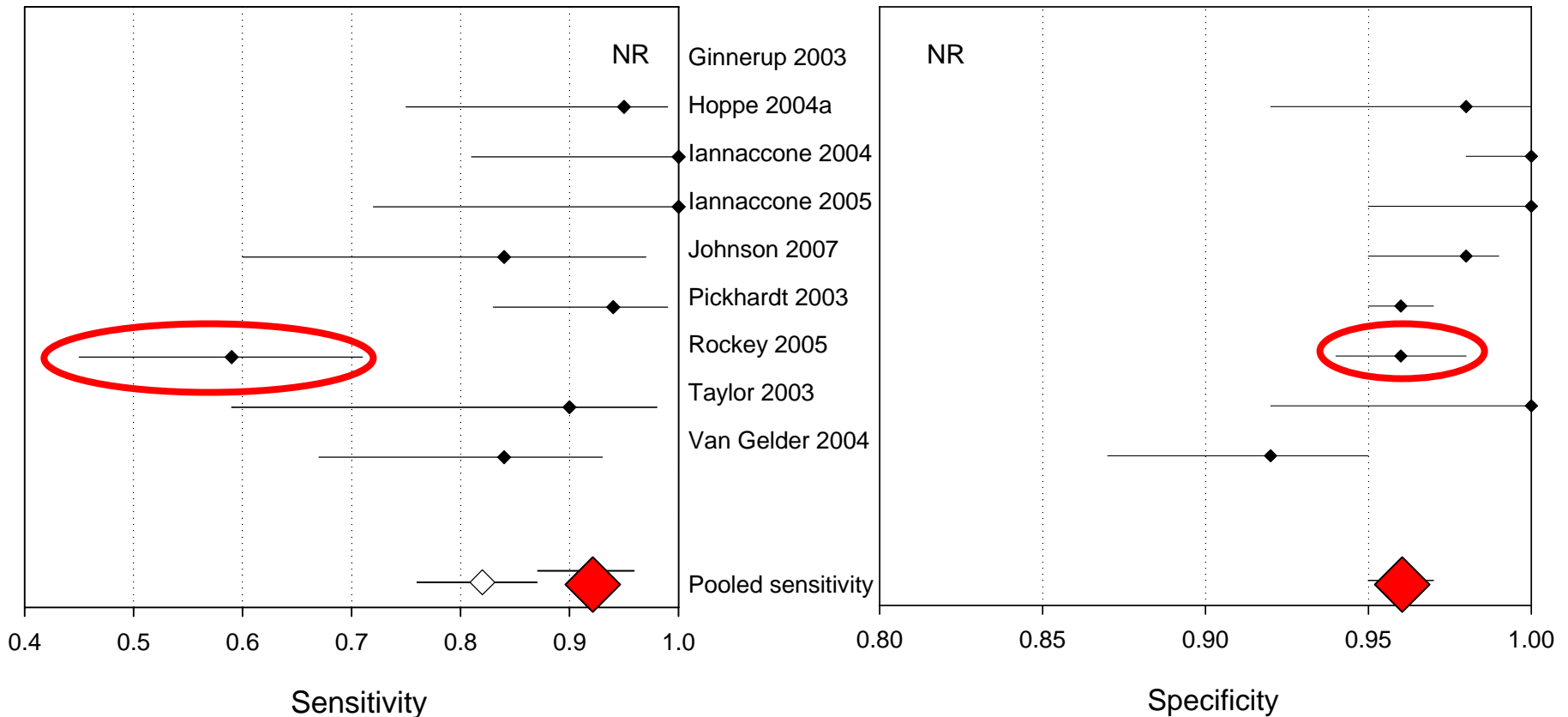
Sensitivity & specificity for lesions ≥ 10 mm per patient



82%, (95% CI, 76-87%)

96%, (95% CI, 95-97%)

Sensitivity & specificity for lesions ≥ 10 mm per patient



82%, (95% CI, 76-87%)

92%, (95% CI, 86-95%)

96%, (95% CI, 95-97%)

96%, (95% CI, 95-97%)

Predictive values in *asymptomatic* populations



- For lesions ≥ 10 mm per patient
- Pickhardt reported:
 - **Positive Predictive Value = 49% (45/92)**
 - **Negative Predictive Value = 99.7% (1138/1141)**
- Johnson reported:
 - **Positive Predictive Value = 76% (16/21)**
 - **Negative Predictive Value = 98.6% (205/208)**

CT colonography sensitivity



- By patient:
 - Lesions \geq 6 mm : **77%** (73-80%)
- By lesion:
 - Lesions \geq 10 mm : **83%** (77-87%)
 - Lesions 6 to 9 mm: **73%** (68-77%)

Extracolonic findings



Author	Population	Any	Important
Cotton 2004	asymptomatic	--	1.3%
Dachman 1998	symptomatic	70%	--
Iannaccone 2004	mixed	13%	5.4%
Kalra 2006	symptomatic	57%	--
Laghi 2002	symptomatic	68%	--
Miao 2000	symptomatic	12%	--
Pickhardt 2003	asymptomatic	--	1.3%
Rockey 2005	symptomatic	57%	4.6%
<i>Xiong *</i>	<i>Review; 17 studies</i>	<i>55%</i>	<i>2.7%</i>



Harms

- None observed in 8 studies that reported on harms
- Rate of perforation in a survey of 50 institutions = 0.08% (9 in 17,067 CT exams) (Burling et al, 2006)
- Rate of perforation in a survey of 11 institutions = 0.06% (7 in 11,870 CT exams) (Sosna et al, 2006)
- Rate of perforation in colonoscopy = 0.13% (Burling et al, 2006)

Radiation



- Radiation dose reported in 11 of included studies ranged from 0.7 to 12 mSv
- Current radiation risk of CT colonoscopy is between 1.2 to 11.7 mSv, with a median of 5.1 mSv (Jensch et al, 2006)
- Lower radiation doses (about 0.5 mSv) appear to detect lesions as well as standard radiation doses (Van Gelder 2004, Iannaccone 2003b)



Patient Acceptance

- After having experienced both CT colonography and colonoscopy, of 1883 patients in 4 included studies:
 - 48.7% preferred CT colonography
 - 41.3% preferred colonoscopy
 - 9.9% had no preference
- But, it is not known if unscreened patients who refuse colonoscopy would accept CT colonography as a screening option



Implications and Summary

- CT colonography appears equivalent to colonoscopy as a screening option, given:
 - Use of current best technology
 - Adequate training of readers
 - That lesions ≥ 10 mm are the ones that are clinically important
- CT colonography appears to be safe