

Appraisal of CT Colonography

The Institute for Clinical and
Economic Review
(ICER)

Structure of the Day

- Introduction to ICER and purpose of today
- Introduction to CTC
- Comparative Clinical Effectiveness
- Comparative Value
- Evidence Ratings
- Close

ICER

- Diverse Funding
- Collaborative academic model
- First cycle of appraisals
 - IMRT for localized prostate cancer
 - Virtual colonoscopy
 - Pegfilgrastim

Goals of ICER

- Stimulate broader national policy to integrate value considerations into comparative effectiveness initiatives
- Test new methods for making technology assessments more accessible and actionable
- Support public dialogue

ICER Appraisal Process

- Topic selection
- Scoping committee
- Technology assessment
 - Clinical effectiveness
 - Comparative value
- Presentation to Evidence Review Group (ERG)
- Final Report with Integrated Evidence Rating

Integrated Evidence Rating

Comparative Clinical Effectiveness

Superior A

Incremental B

Comparable C

Pot/Unprov P/U

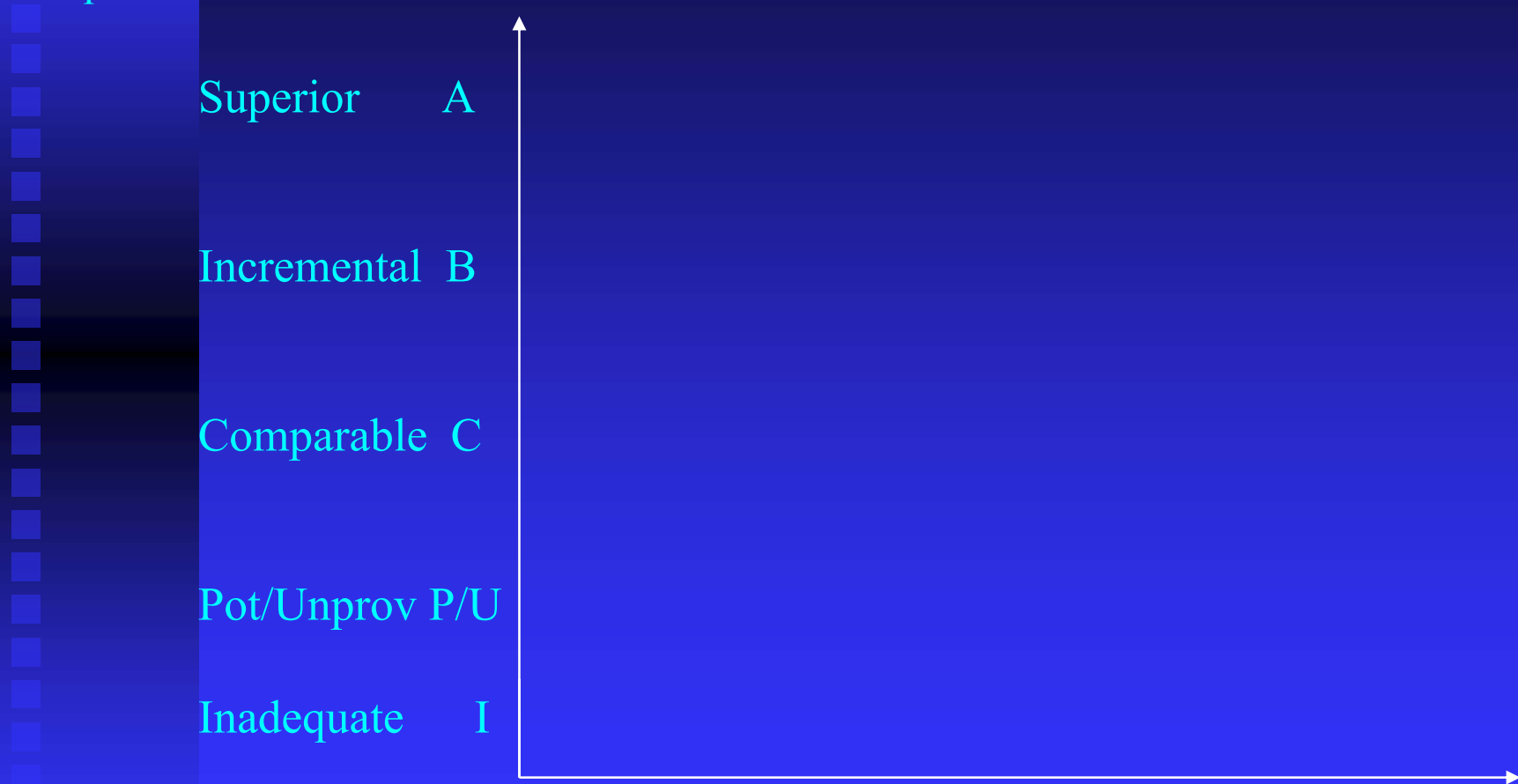
Inadequate I

Comparative Value

a
High

b
Reasonable/
Comparable

c
Low



Comparative Clinical Effectiveness

Comparative Clinical Effectiveness

Comparing tech ____ vs. ____

High Confidence	D	C	B	A
Limited Confidence	I	I	P/U	P/U
Low Confidence	I ←————→ I			
	Inferior Net Benefit	Comparable Net Benefit	Small Net Benefit	Mod-Large Net Benefit

Integrated Evidence Rating

Comparative Clinical Effectiveness

Superior A

Incremental B

Comparable C

Pot/Unprov P/U

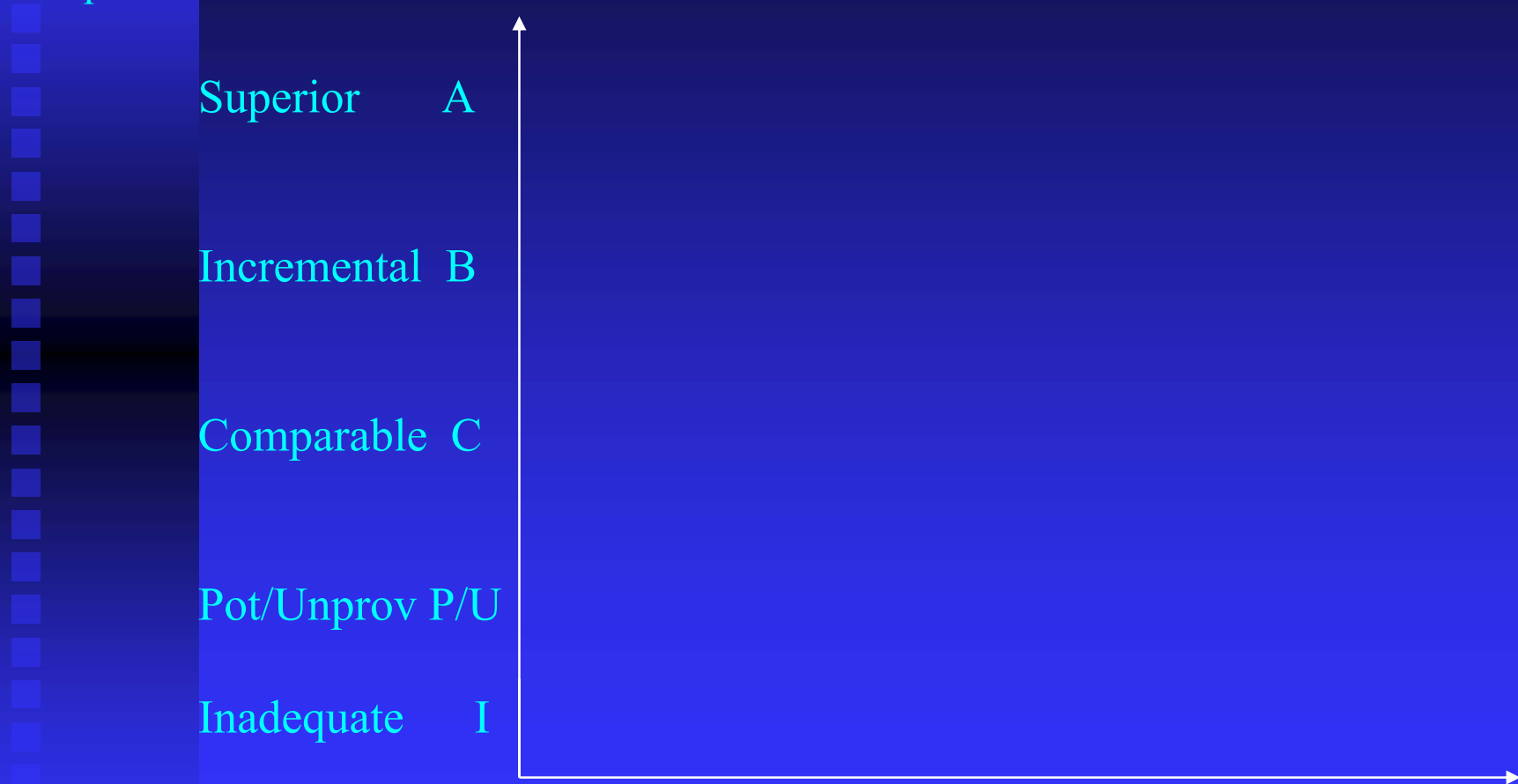
Inadequate I

Comparative Value

a
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Low



Comparative Value Rating



Other considerations:

- Cost per key outcome(s)
- Relative cost to similar treatments/situations

Integrated Evidence Rating

Comparative Clinical Effectiveness

Superior	A	Aa	Ab	Ac
Incremental	B	Ba	Bb	Bc
Comparable	C	Ca	Cb	Cc
Pot/Unprov P/U		Pa	Pb	Pc
Inadequate	I	I	I	I

Comparative Value

a
High

b
Reasonable/
Comparable

c
Low

Radiation treatments for prostate cancer

Comparative Clinical Effectiveness

Superior	A	Aa	Ab	Ac
Incremental	B	Brachytherapy	Bb	IMRT
Comparable	C	Ca	Cb	Cc
Pot/Unprov P/U		Pa	Pb	Pc
Inadequate	I	Proton Beam Therapy		

Comparative Value

a	b	c
High	Reasonable/ Comparable	Low

Purpose of the Day

- What is the structure and role of the Evidence Review Group?
 - Independent
 - Composition
 - Review of Draft Assessment
 - Recommend ratings of comparative clinical effectiveness and value

Introduction to CT Colonography

Mike Zalis, M.D.

Appraisal of CT Colonography

Background

Scope

- Patient population
- Comparator(s)
- Key questions
 - ◆ Technical issues
 - ◆ Sensitivity and specificity vs. OC
 - ◆ Safety
 - ◆ Patient acceptance
 - ◆ Extracolonic findings
 - ◆ Impact on population screening
 - ◆ Cost-effectiveness vs. no screening and vs. alternatives

Background

- Colorectal cancer screening
 - ~50% of eligible get screened
 - Non-invasive methods
 - Invasive methods: screening = prevention
 - Polyps
 - ◆ ≥ 10 mm
 - ◆ 6-9 mm
 - ◆ ≤ 5 mm

CT Colonography

- Potential benefits
 - Minimally invasive = fewer complications, no sedation
 - Availability and acceptance = More patients screened overall
 - ? Less costly overall
- Potential harms
 - False negatives
 - False positives
 - Hassle for patients of dual-phase testing
 - Loss to follow-up between positive CTC and OC
 - ? More costly overall

Assessing a diagnostic technology

- Evolution of data on devices/procedures
 - Technical effectiveness in selected patients and best hands
 - Generalizability to community patients and practice

Previous HTA on CTC

- MSAC (2006)
- ICSI (2006)
- NICE (2005)*
- BCBSA TEC (2004)
- CTAF (2004)

* Found evidence adequate to support its use

Clinical Guidelines

- NCCN (2007)
- ACR (2006)
 - CTC = 6 on appropriateness scale of 1-9
- ACS (2003)
- USPSTF (2002)
- ACG (2002)

Systematic Review of the Literature

Roberta Scherer, Ph.D

Draft Integrated Evidence Rating

Interpretation of Key Findings

- Safe, well accepted
- Test characteristics compare favorably to alternative screening methods other than OC
- Comparable to OC for large polyps
- Less sensitive for medium polyps but with q 5y strategy unlikely to miss many significant lesions
- Cost per LYS vs. no screening = \$1,500
- Cost/LYS vs. OC
 - \$630,000 if cost of CTC = colonoscopy
 - \$100,000 if cost of CTC half price of colonoscopy
 - <\$50,000 if cost of CTC one third of colonoscopy

Draft Integrated Evidence Ratings

CT Colonography vs. no screening and OC

Comparative Clinical Effectiveness

Superior	A	CTC	Ab	Ac
Incremental	B	Ba	Bb	Bc
Comparable	C	CTC 1/3-price	CTC half-price	CTC full-price
Pot/Unprov P/U		Pa	Pb	Pc
Inadequate	I	I	I	I
Comparative Value		a High	b Reasonable/ Comparable	c Low

ERG Feedback

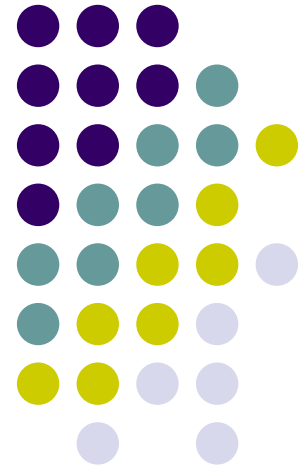
- ICER format: useful?
- What information would you have liked?
 - Draft ratings before the meeting?
- What information did you not find useful?
- Process: a vote, consensus, or some blend for rating determination?
- Best role for patients, clinical experts, and manufacturers?
- Other?

Thank you!

Systematic review of CT colonography versus colonoscopy

Roberta W. Scherer, PhD
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

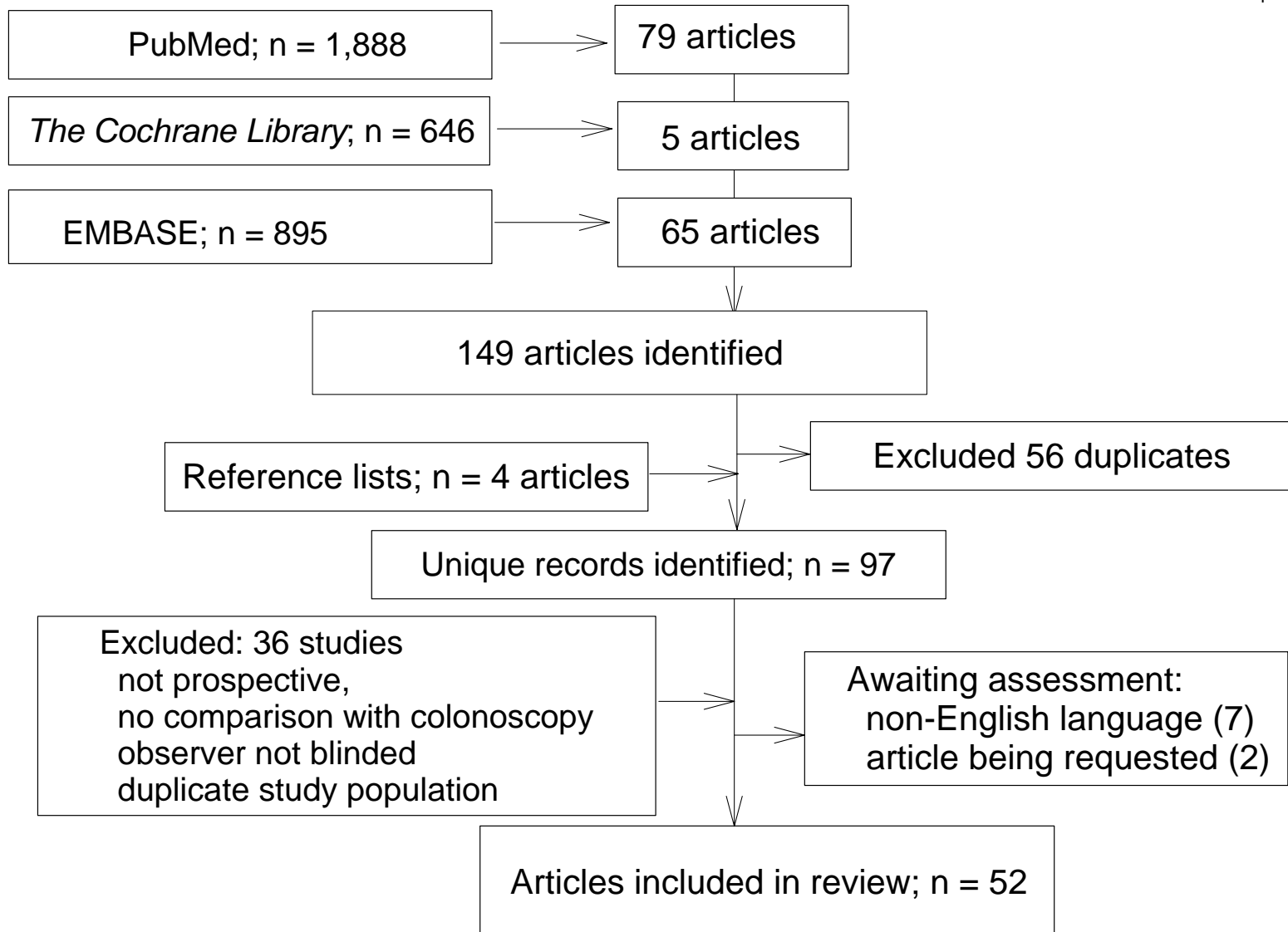
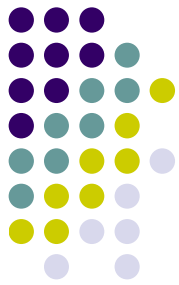
- Prospective diagnostic accuracy studies of CT colonography
- Colonoscopy used as reference standard
- Endoscopists unaware of index test results; CT readers unaware of reference test results
- Study participants:
 - Adults who have undergone CT colonography and colonoscopy
 - No active bowel disease (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



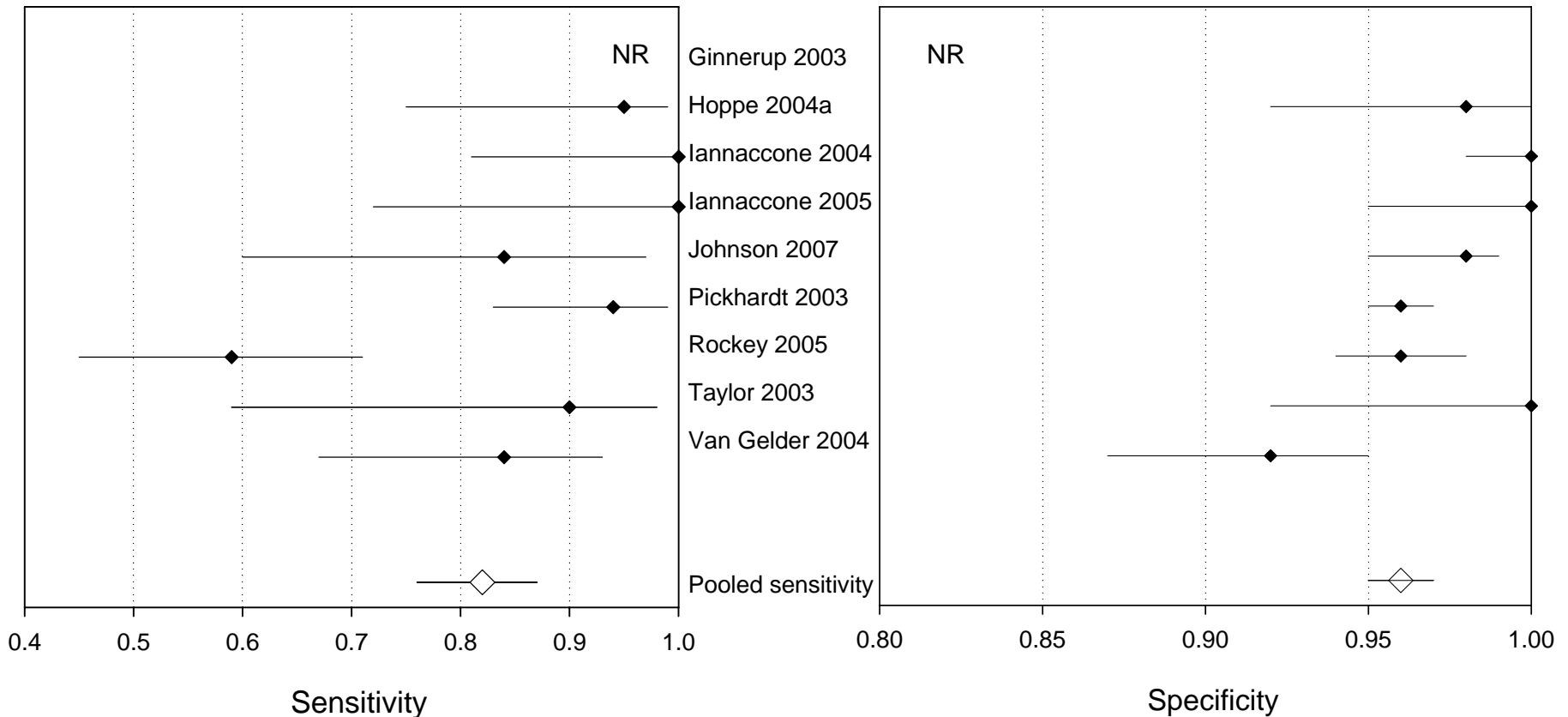
- QUADAS Tool
 - Used to assess diagnostic accuracy studies
 - 14 items assessing internal validity
- 5 “high” quality studies
 - Ginnerup 2003; Iannaccone 2004 & 2005; Pickhardt 2003, Taylor 2003
- 4 “fair” quality studies
 - Hoppe 2004, Johnson 2007, Rockey 2005, Van Gelder 2004



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

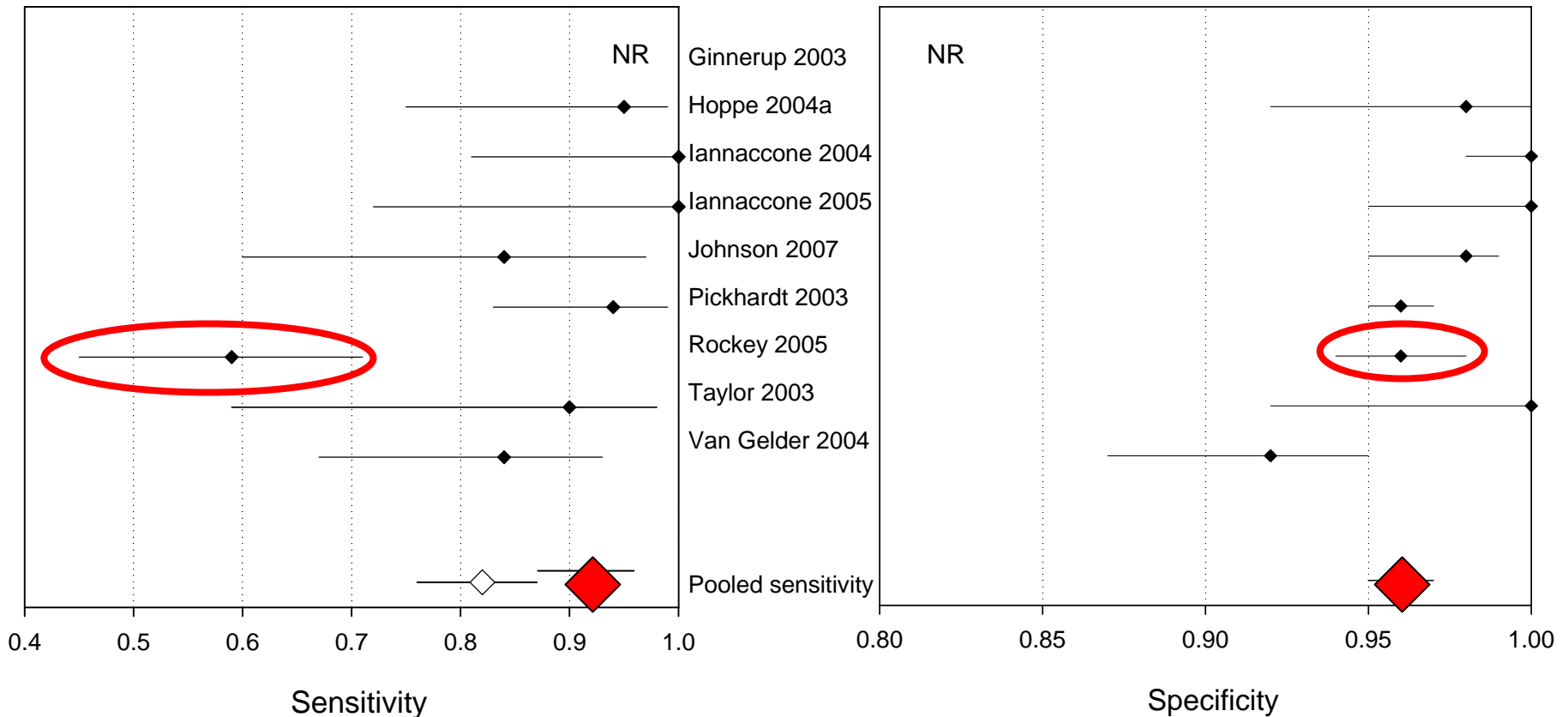
Sensitivity & specificity for lesions ≥ 10 mm per patient



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