

Rapid Technological Advances: Treatments for Stable Ischemic Heart Disease

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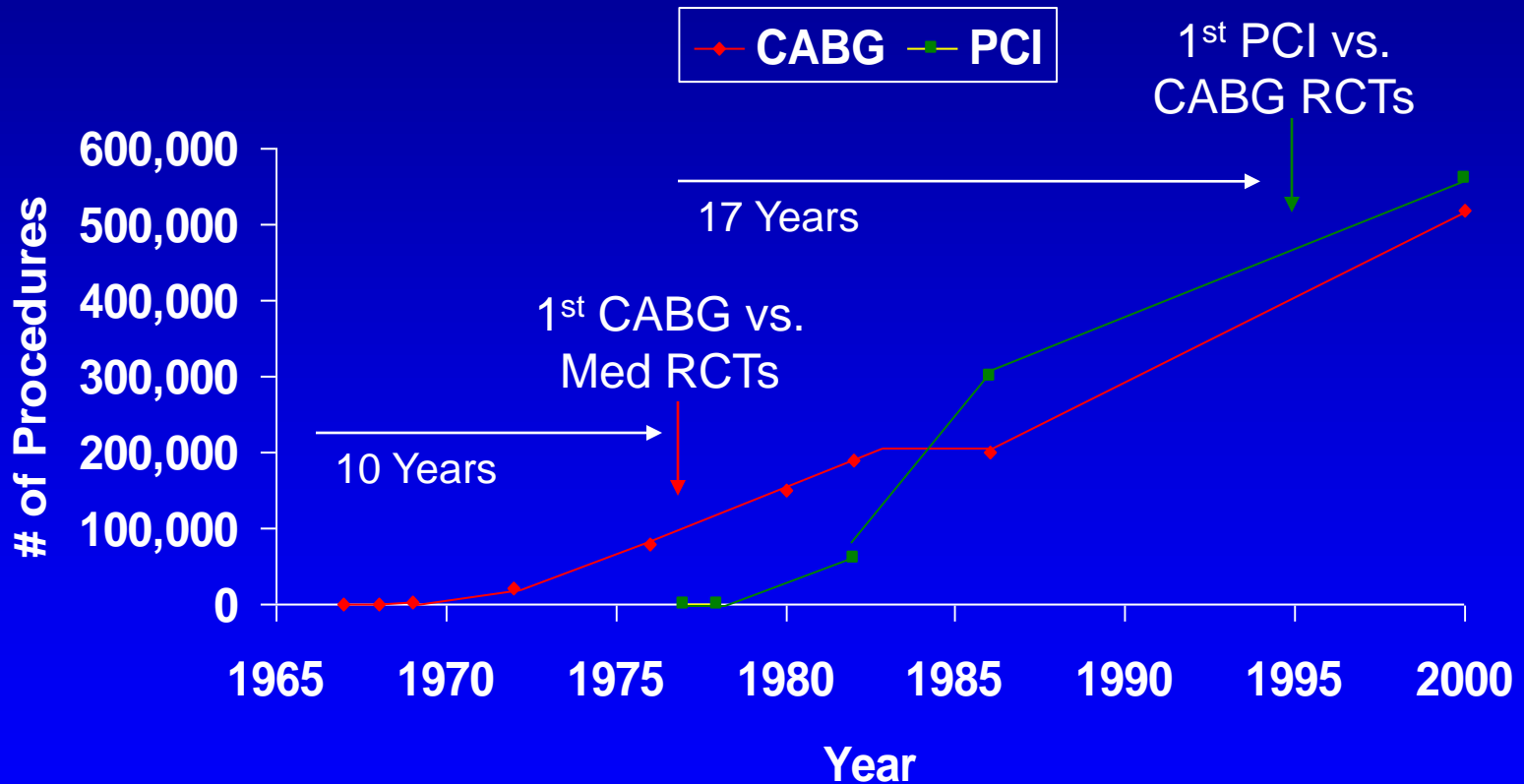
Methodological Challenges in
Comparative Effectiveness Research

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Goals

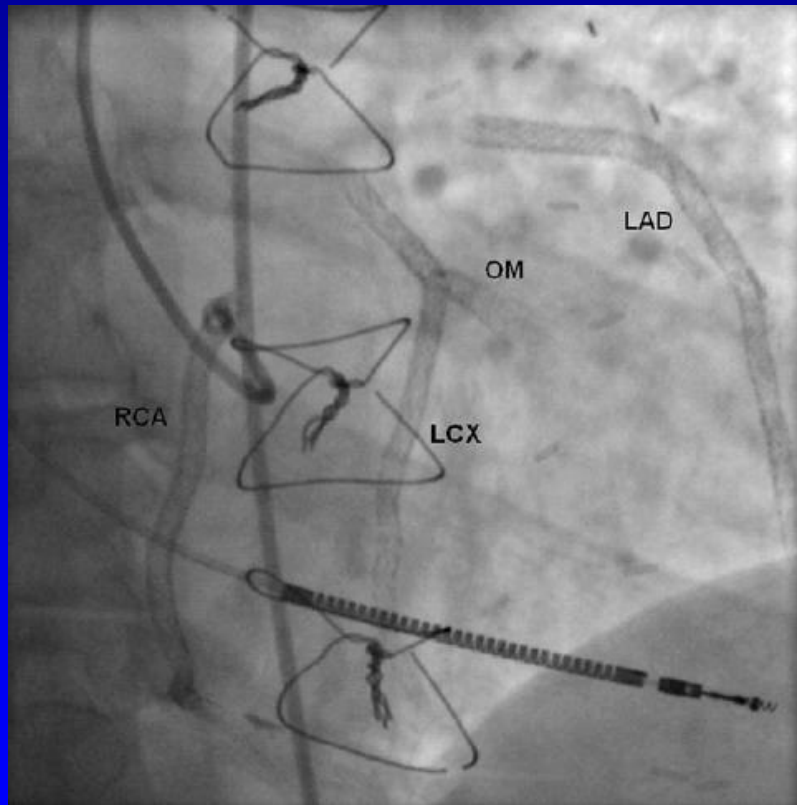
- Feasibly and reasonably evaluate or simulate treatment effects that are evolving rapidly
 - Network meta-analysis
 - Hierarchical Bayesian meta-analysis
 - Registries
 - Computer simulation models

Technological Advances



1980: 150,000 CABG's \$15-20,000 → \$2 billion or 1% of health expenditure

A Heart with 67 Stents

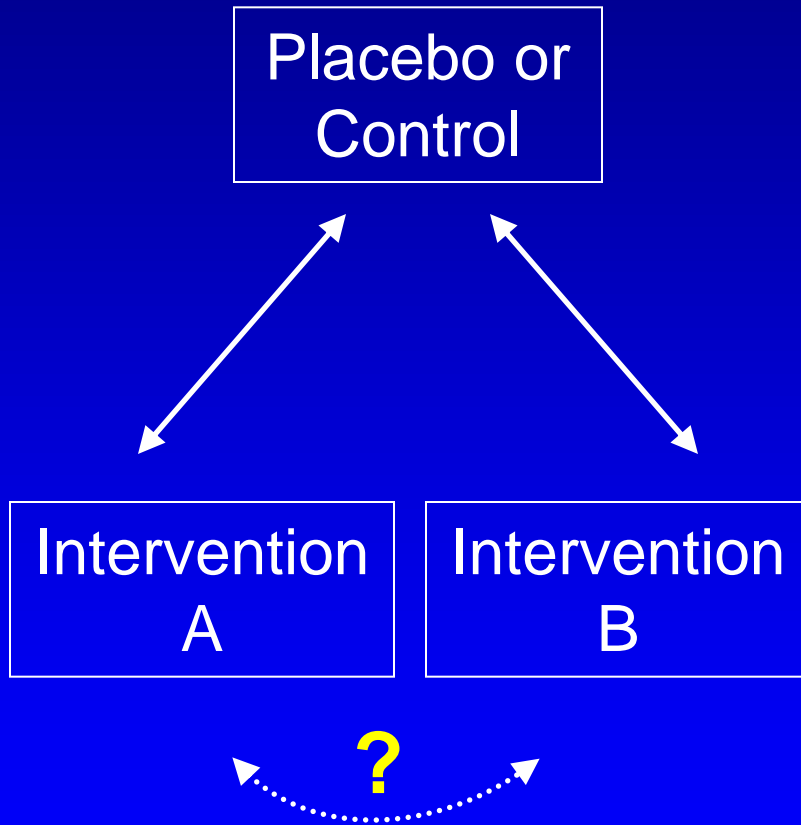


- Plain Old Balloon Angioplasty 1977
- Bare Metal Stent 1986
- Drug Eluting Stent (steel) 1999
- 2nd generation DES (cobalt) 2005

Network Meta-analysis to Assess Technological Advances

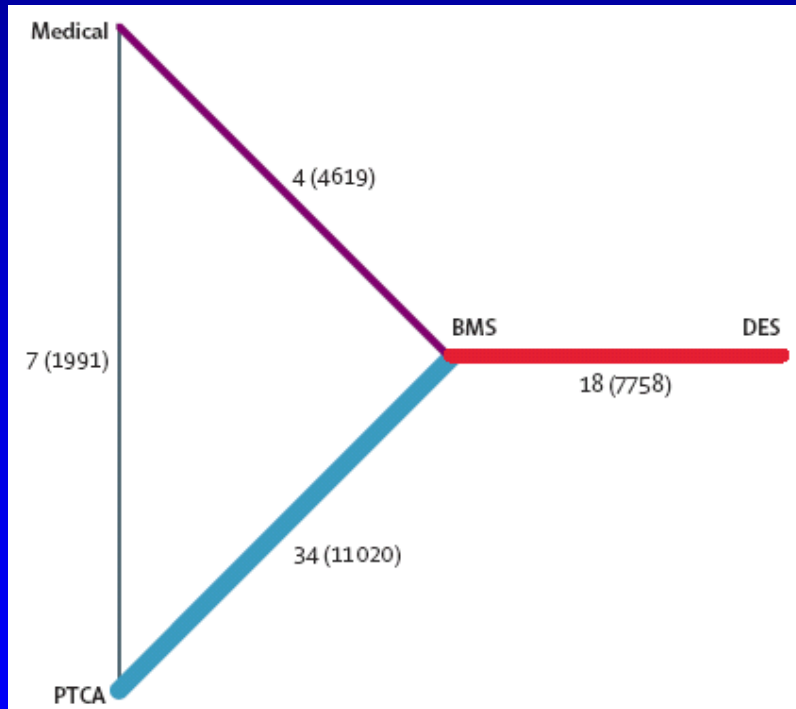
- For non-acute CAD, 20-year synopsis of PTCA, BMS, DES, and medical therapy
- Random effects meta-analyses summarized head-to-head (direct) comparisons
- Network meta-analyses integrated direct and indirect evidence

Indirect Meta-analysis for Comparative Efficacy



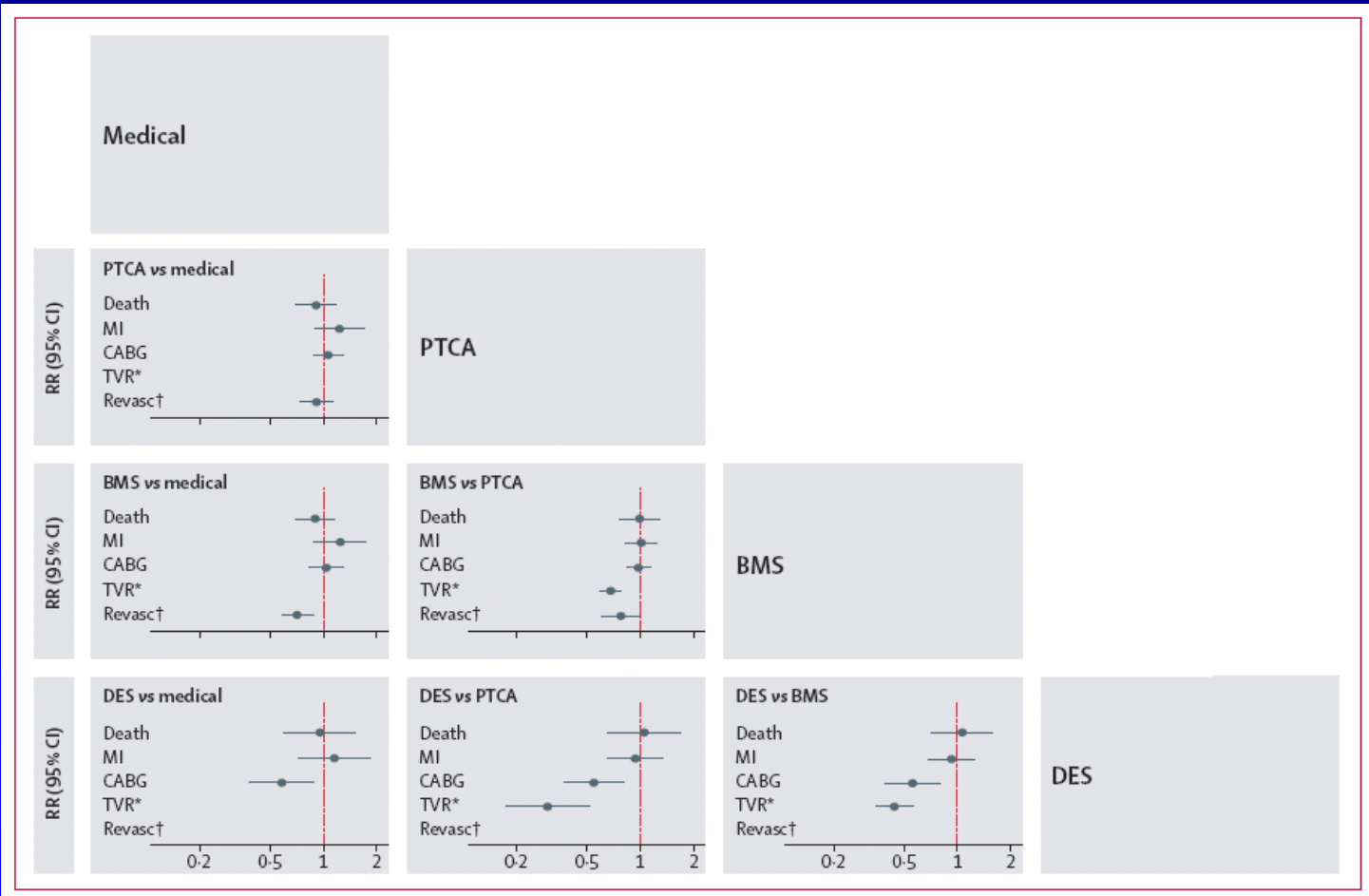
- Compare 2 active interventions thru a common comparator
- In 41/44 meta-analyses, indirect comparisons not significantly different from those of direct comparisons
- 3/44 significant discrepancy ($P < 0.05$)

Network Meta-analysis for Comparative Efficacy



- Indirect comparison between DES & MED
- Assumes transitivity
- Disagreement between direct and indirect assessed by incoherence of the network

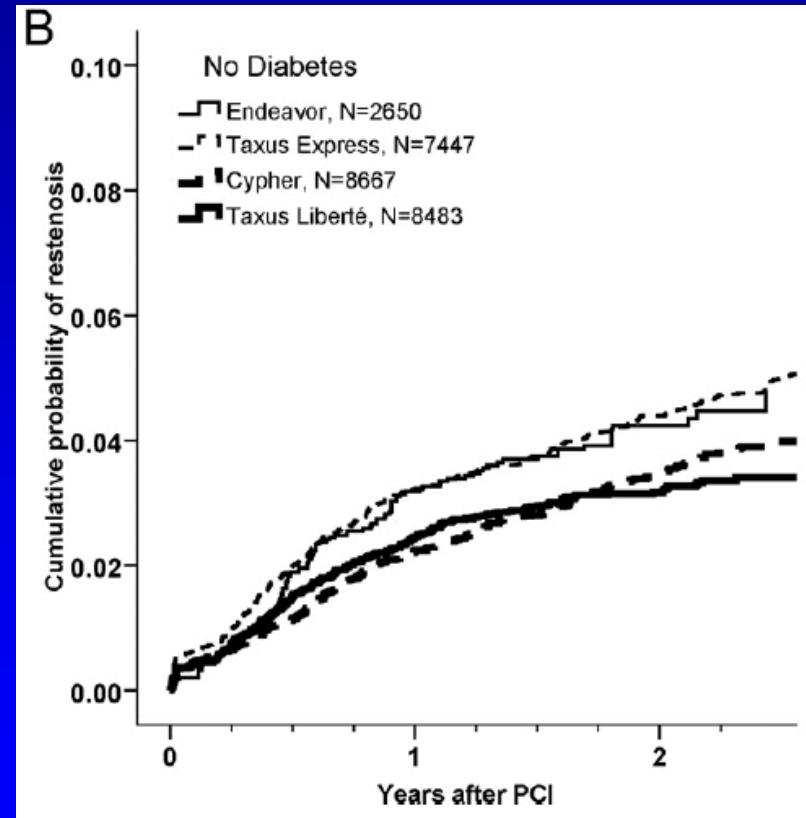
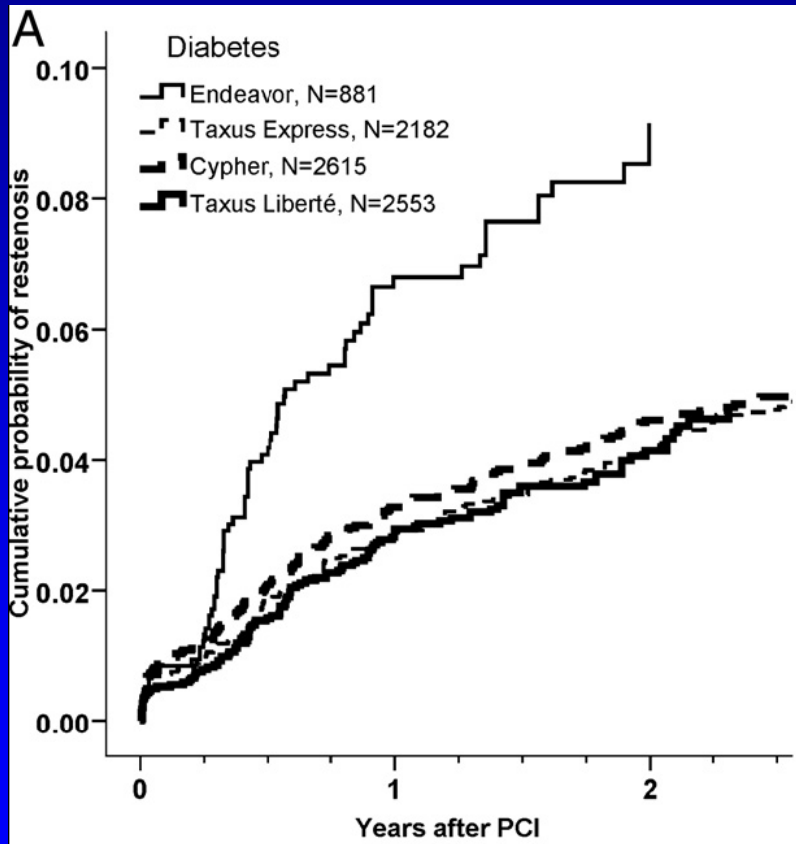
Network Meta-analysis for Comparative Efficacy



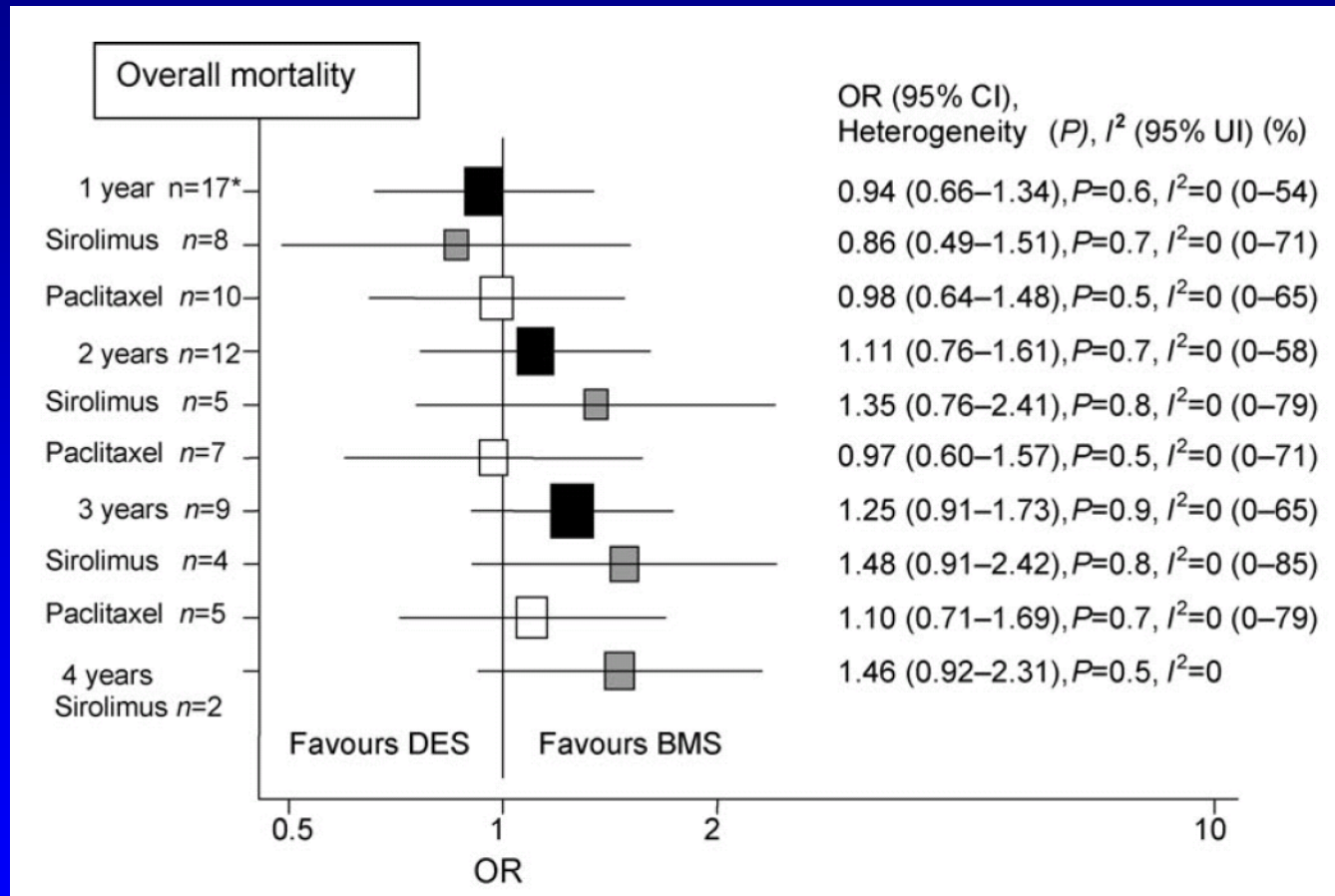
Efficacy and Bias and Effectiveness

- Hierarchical Bayesian meta-analysis of BMS vs. PCTA
- If restenosis, repeat intervention 78% of PTCA vs. 69% of BMS
- Difference in repeat angioplasty falls from 6.8% (CI 5.1-8.4%) to 2.1% (CI -1.6 to 6.0)
- Efficacy: mandatory repeat angiogram

Comparative Safety Registries: SCAAR

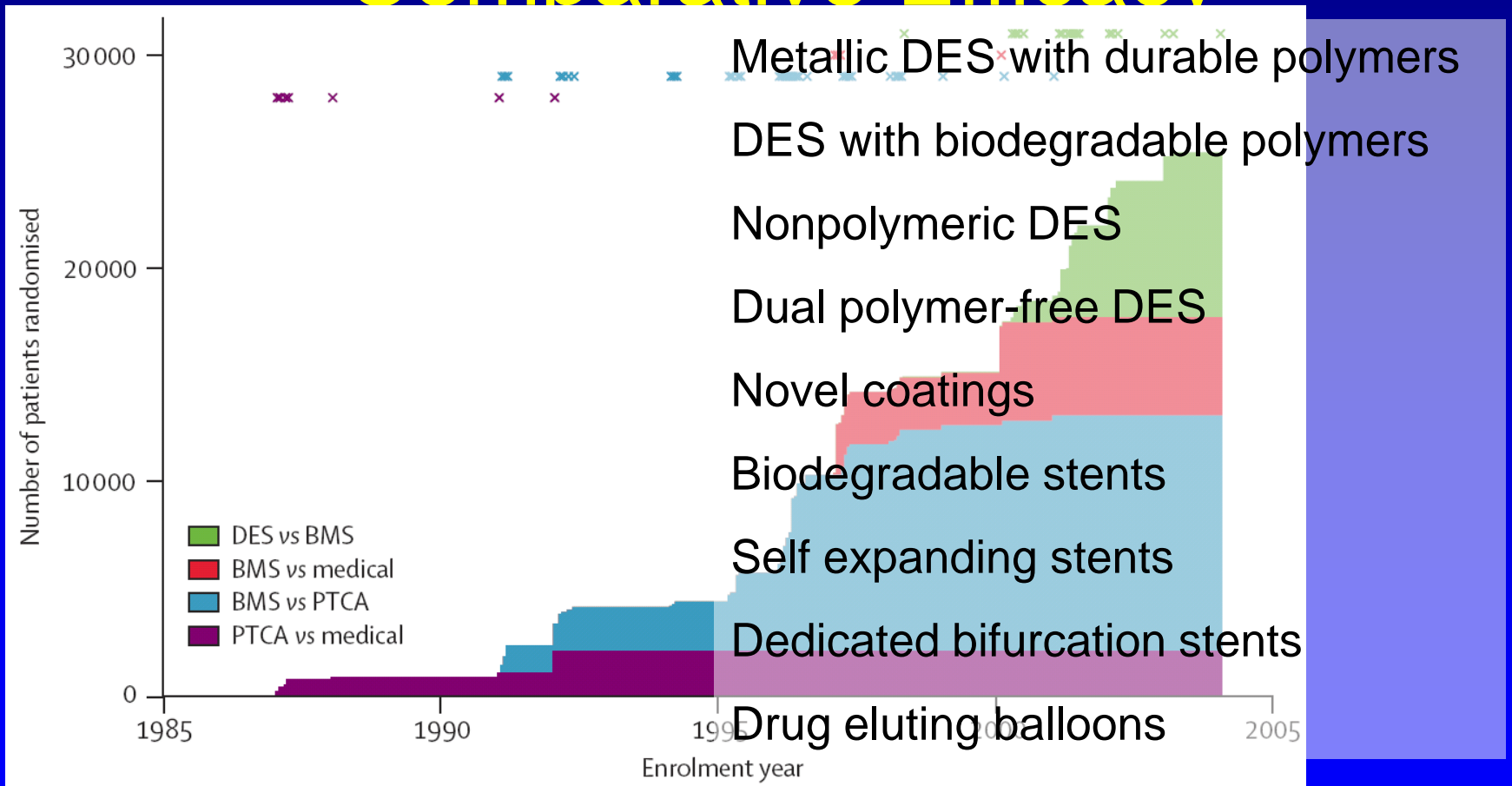


Comparative Safety Meta-analysis: DES vs BMS Mortality



“When changing one word can save a life: bare instead of eluting”

Network Meta-analysis for Comparative Efficacy



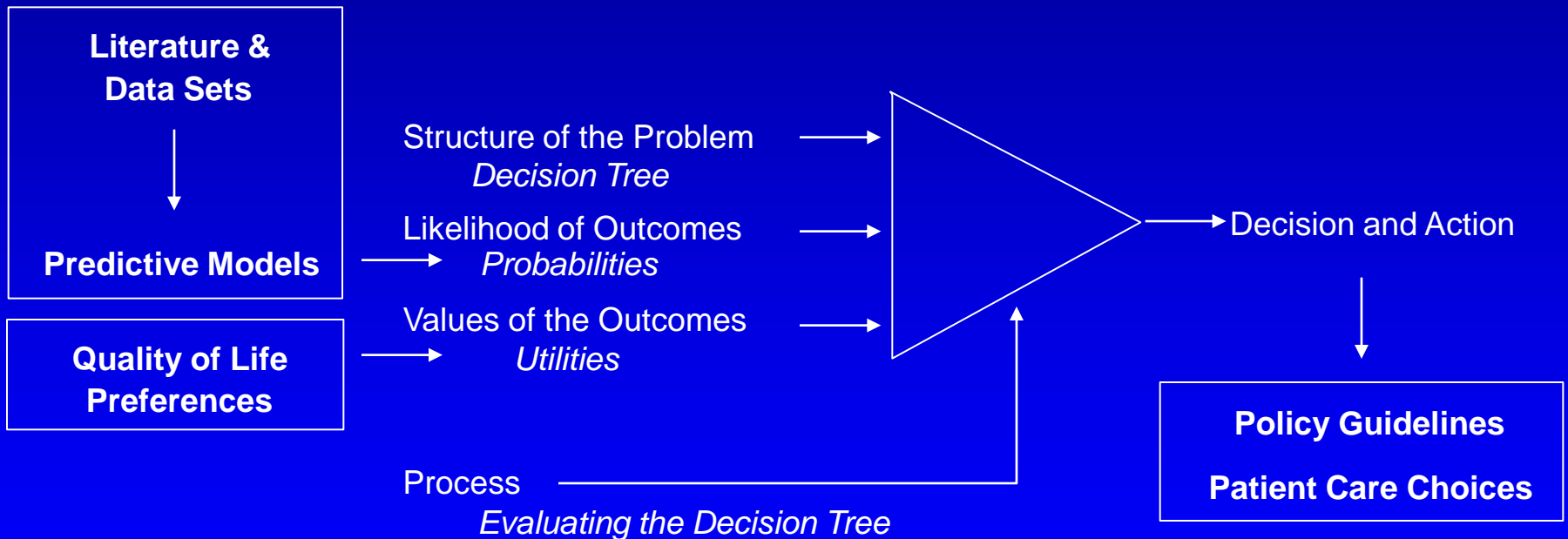
“Essentially, all models are wrong, but some are useful.”

-George EP Box

“Our advice: Beware of geeks bearing formulas,

-Warren Buffet

Clinical Decision Making Models



Model Validation

NY STM PTCA
and CABG

Minnesota LTM
CABG

Dartmouth LTM
PTCA and CABG

Dartmouth STM
PTCA and CABG

Duke LTM
Medicine, PTCA
and CABG

Manitoba, CA, NY
and Regional
Variability in STM
PTCA and CABG

**NEMC
Decision
Model**

Medicare Cost

Anginal States

Dartmouth
Utilities

Literature
Estimates

MET Level

Duke DASI

Dissemination

MGH SDP

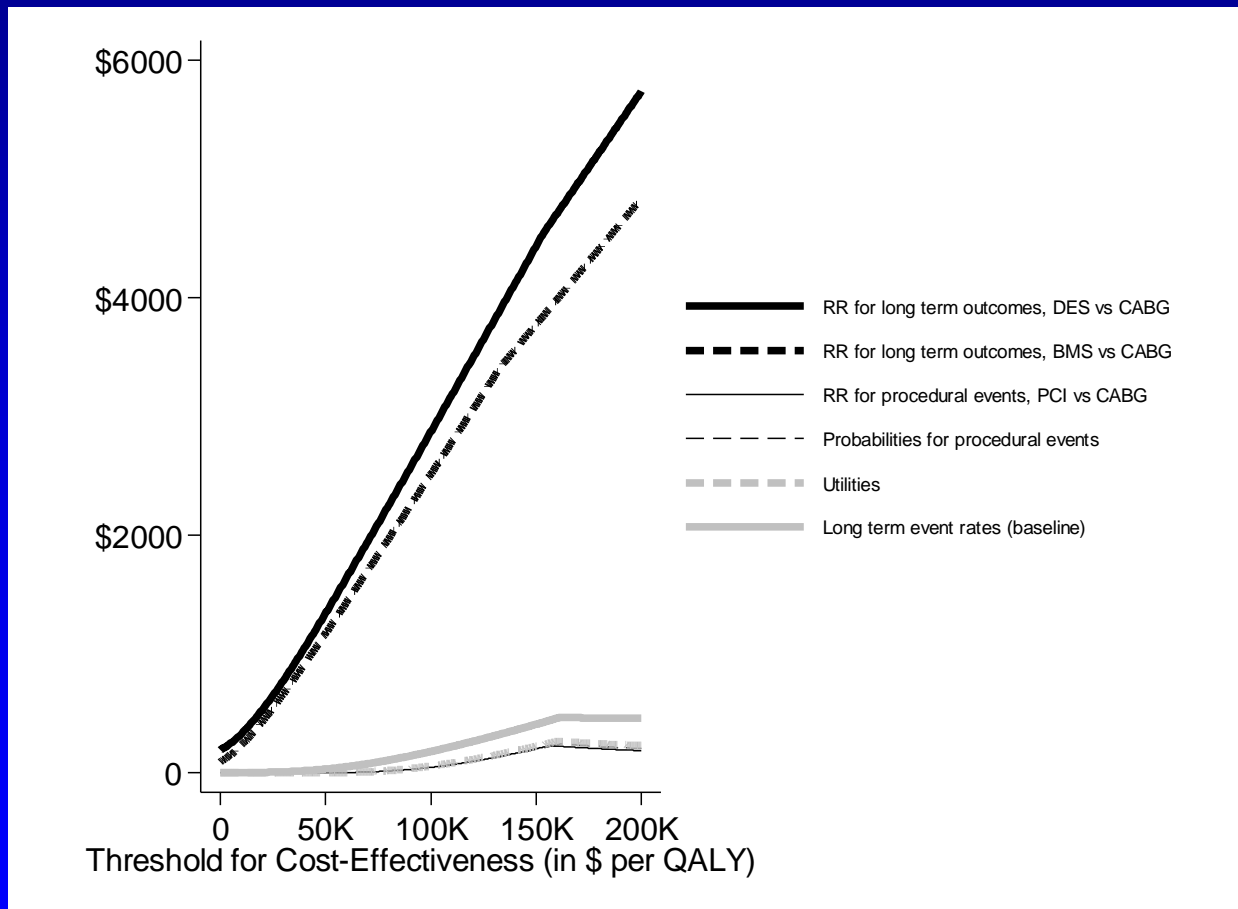
Dartmouth ESO

Duke

Minnesota
Demonstration
Projects

NNE

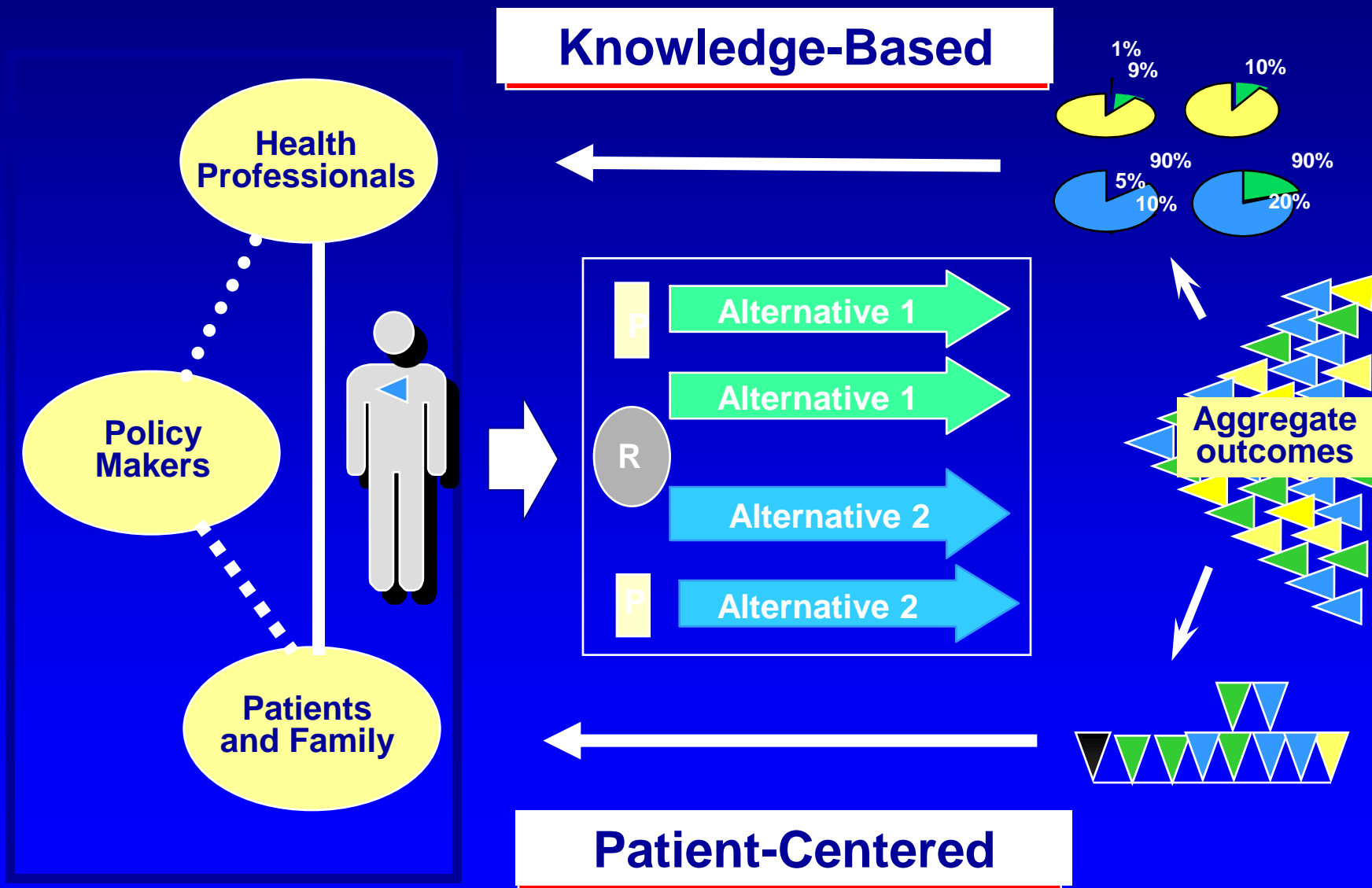
Value of Information



Incidentalome: A Threat to Genetic Medicine

- Suppose a genetic test has a sensitivity and specificity of 99.9%
- Probability of disease = 1 in 1000 if family hx and 1 in 100,000 if no family hx
- Screen 1000 Fam Hx → 1 True+ and 1 False+
- Screen 10 million No Fam hx → 100 True+ and 10,000 False+
- Screen for 10,000 genes and Specificity = 99.99% → 63% will have a False Positive

Learning System, Value of Information, Patient Preferences

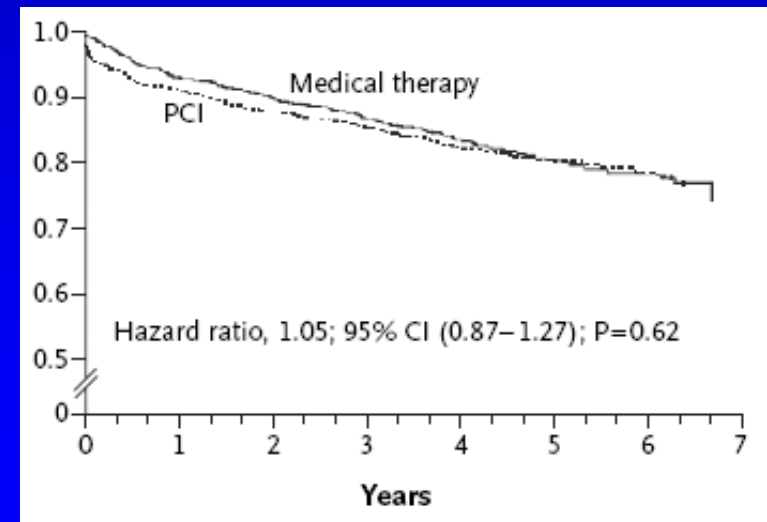


Conclusions

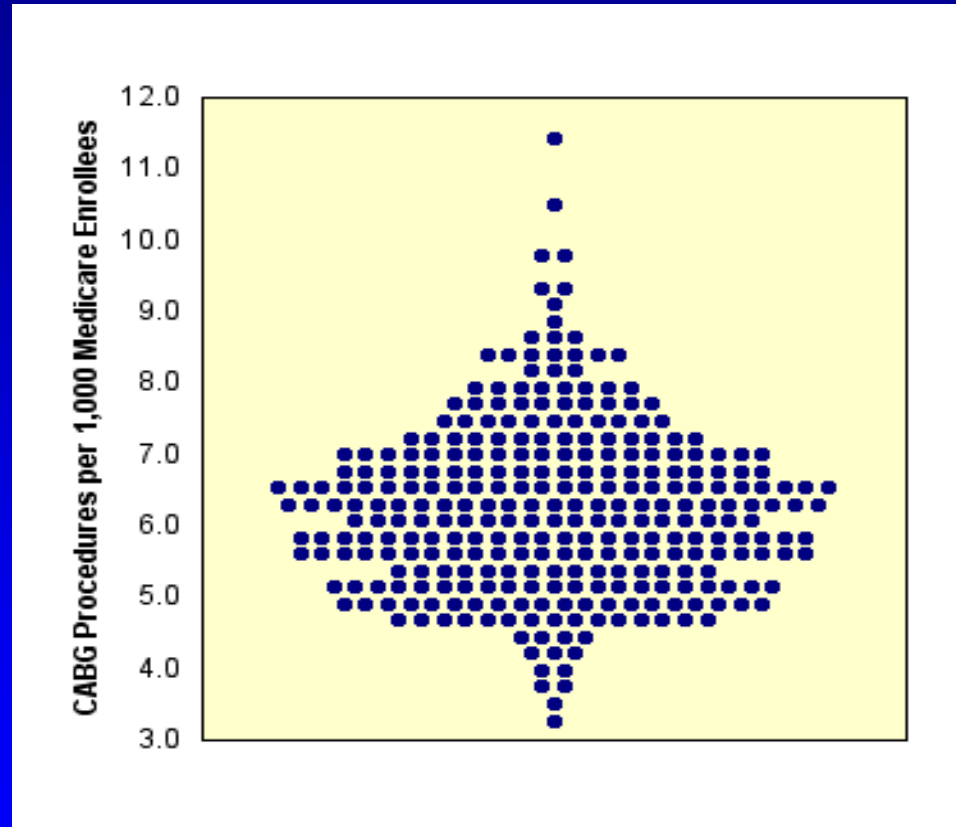
- Rapidly evolving medical technology will accelerate
- Available methodologies include network meta-analysis, Hierarchical Bayesian meta-analysis, registries computer simulation models
- Developing a learning healthcare system to address uncertainty, uniqueness and value conflict

PCI vs. Medical Therapy

- Improved medical therapy (beta blocker, statin, ACEI, anti-platelet)
- No difference in deaths or MI
- PCI
 - Angina benefit for 6 to 24 mos but not 36 mos
 - Fewer subsequent PCI or CABG



Should where you live affect your likelihood of CABG?



4-fold variation in likelihood of CABG

What Do PCI/CABG Patients Believe?

- 88% substantially or greatly ↓ risks
 - 75% prevent MI & 71-83% prolong life
 - Expect 10 year increase in life expectancy
- But CABG vs. Medical therapy actually suggest
 - 19 months gain for left main disease
 - 6 months for 3-vessel disease
 - 2 months for 1- or 2-vessel disease

What do Patients Know?

- MD & patient agreement regarding survival benefit no better than chance
- Poor agreement regarding likelihood of symptom improvement
- Patients 4-times more likely to believe PCI would prevent MI or MI fatality
- 52% correctly answered only ≤ 1 out of 5 knowledge questions (29% mean)