Abdominal Aortic Aneurysm (AAA)

- An abdominal aortic aneurysm (AAA) is an abnormal expansion of the abdominal portion of the aorta, the largest artery in the body.
- AAAs usually develop slowly and most often do not cause symptoms.
- The eventual endpoint of AAA expansion is rupture, a catastrophic situation in which the artery bursts, causing severe internal bleeding.
- AAA is largely undetected and untreated.
- A common condition, particularly among men over 60.

AAA is a Candidate for Screening

- A common condition
  - 5% of men over 60 have AAA
- Long asymptomatic period of development
- Detection of AAA through ultrasound is both sensitive and specific
- If an AAA ruptures, death is likely
  - Kills 9000-15,000 in US every year
- Surgery prior to rupture prevents a rupture
  - Complications from surgery kill 4%

Policy Question

- On February 1 this year the United States Preventive Services Task Force recommended screening for Abdominal Aortic Aneurysm (AAA) for Men aged 65-75 who smoked (2/1/05).
- On February 15 Senators Chris Dodd (D-CT) and Jim Bunning (R-KY) introduced the Screening Abdominal Aortic Aneurysms Very Efficiently (SAAAVE) Act:
  - Medicare will pay for screening for anyone over 65 with family history of AAA, risk factors for cardiovascular disease (such as smoking or hypertension), or arteriosclerotic vascular disease.

What information is needed for a cost-effectiveness analysis

- Screening costs $400
- Operation costs $20,000
  - Costs of surgery complications
- How many screens and how many AAAs detected?
- How many would need the operation and how many would be watched for AAA growth?
- What are the costs of not screening?
- How many deaths avoided from screening?

Cost-effectiveness Analysis

- Brings all of this information together to describe the tradeoff between costs and effectiveness of screening compared to usual care
  - Decision model (Frame, 1993)
  - Markov Decision model (Lee, 2002)
  - Economic evaluation within a clinical trial (MASS, 2002)
Frame (1993)
Comparison
- Intervention: One-time screen with elective repair of AAA $\geq 4$ cm
- Alternative: Elective repair of incidentally discovered AAA and emergency repair of ruptured AAA
- Hypothetical Population: men aged 60-79
- Time horizon: 20 years

Frame (1993)
Decision Model
- Follows cohort over time in different states with probabilities of transitioning between states
  - States: (noAAA, smallAAA-undetected, largeAAA-undetected, smallAAA-detected, largeAAA-detected, dead)
  - Transition probabilities come from literature
  - Different probabilities with and without screening

Frame (1993)
Measures and Result
- Effectiveness: Life years saved
- Unit Costs: From Canadian Health system (perspective)
- Sensitivity analysis: compared results between pessimistic and optimistic range of estimate
- Discount rate: 5%
- Result: $41,550 per life-year for one-time screen with ultrasound vs. regular care

Frame (1993)
Questions
- Was the effectiveness well established?
- What is the bias from not considering complications from surgery?
- Are results generalizable to other populations?
  - Women? Smokers?
  - Aneurisms $\geq 5.5$ cm

Lee (2002)
Comparison
- Intervention: One-time screen with elective repair of AAA $\geq 5$ cm plus surveillance if between 3 and 5 cm.
  - A “quick screen” also evaluated
- Alternative: Elective repair of incidentally discovered AAA and emergency repair of ruptured AAA
- Hypothetical Population: men aged 70
- Time horizon: lifetime

Lee (2002)
Markov Decision Model
Lee (2002)

Measures and Result

• Effectiveness: QALYs saved
• Unit Costs: Hospital study and lit review
• Considers complications in costs and QALYs
• Discount rate: 3% used
• Result: $11,215 per QALY for one-time screen with ultrasound vs. regular care

Lee (2002)

Sensitivity Analysis

MASS (2002)

Comparison

• Intervention: One-time screen with elective repair of AAA >= 5.5 cm plus surveillance if between 3 and 5.5 cm
• Alternative: Elective repair of incidentally discovered AAA and emergency repair of ruptured AAA
• Population: men aged 65-74 in UK
• Time horizon: 4 years

MASS (2002)

Economic Evaluation in MASS Clinical Trial

• 67,000 patients randomized to screen or no screen and followed for 4 years
• Censored those lost to follow-up prior to 4 years and those who died of other causes
• Medical resources for costs were not measured for everyone in the trial.
  – A sample of subjects was used

MASS (2002)

Measures and Results

• Effectiveness: Life years saved based on AAA-related mortality
• Unit Costs: From Hospitals in 4 UK centers
• Discount rate: 1.5% for effects and 6% for costs
• Result: $57,000 per life-year for one-time screen with ultrasound vs. regular care (€28,389 per LY)
• Estimated sampling uncertainty of estimate
  – (95% CI: £15,000 to £145,000 per LY)
MASS (2002) Sensitivity Analysis

- Cost effectiveness improves over 10 year horizon
- Using 3% discount rate for both costs and effects does not change conclusion
- Cost effectiveness improves with all cause mortality
  - But clinical difference in all cause mortality was not statistically significant in the trial
- QALY measures did not show a disutility from screening surveillance or surgery, but QALY adjusted LYs makes results less cost effective

MASS (2002) Questions

- What are the advantages and disadvantages of trial based analysis over model based analysis?
  - Is high degree of sample uncertainty a disadvantage?
  - Why was uncertainty of the trial considered for all cause result and not AAA related result?
- What is the generalizability to other populations and other centers?

General Questions for 3 studies

- Is the perspective and setting relevant for our policy question?
- What is the right prevalence rate for screening to be cost-effective?
  - Could screening be used only for high risk groups?
- How should the uncertainty around the estimates be factored in to decision making?
- Is compliance an issue?
- Should medical costs unrelated to AAA be considered?
- If this is such a good idea, why is no one paying for this screening out-of-pocket?

Should the bill be passed?