# Physician Agency and Incentive Alignment

Evidence from Afendulis and Kessler (2007)

# Overview

- Question: What are the effects of integration of diagnosis and treatment?

- Contribution: Quantify the impact of integration on both financial and health outcomes and make welfare conclusions.

# Environment

- Three types of cardiac doctors:
  - Noninterventional cardiologists- diagnose patients and offer nonsurgical treatment
  - Cardiac surgeons- do not diagnose patients and offer bypass surgery
  - Interventional (integrated) cardiologists- both diagnose patients and offer angioplasty

# Models

$$\Pr(A_j=1)=\frac{e^{\alpha+\beta_A I_j+\delta_A X_j+\gamma_A Z_j}}{1+\sum_{\tau=A,B,C} e^{\alpha+\beta_\tau I_j+\delta_\tau X_j+\gamma_\tau Z_j}},$$

$$\Pr(B_j=1)=\frac{e^{\alpha+\beta_B I_j+\delta_B X_j+\gamma_B Z_j}}{1+\sum_{\tau=A,B,C} e^{\alpha+\beta_\tau I_j+\delta_\tau X_j+\gamma_\tau Z_j}},$$

$$\text{and } \Pr(C_j=1)=\frac{1}{1+\sum_{\tau=A,B,C} e^{\alpha+\beta_\tau I_j+\delta_\tau X_j+\gamma_\tau Z_j}}.$$

- $X_j$ = patient characteristics
- $Z_j$ = hospital and diagnosing cardiologist characteristics
- $I_j$ = indicator for diagnosed by interventional cardiologist

- Treatment recommendation indicators:
  - $A_j$: angioplasty
  - $B_j$: bypass surgery
  - $C_j$: nonsurgical care

# Models

$$Y_j=\varphi+\theta X_j+\lambda I_j+\pi Z_j+\sigma^A A_j+\sigma^B B_j+\sigma^C C_j+\omega^A A_j*I_j+\omega^B B_j*I_j+\omega^C C_j*I_j+\zeta^A A_j*Z_j+\zeta^B B_j*Z_j+\zeta^C C_j*Z_j+\varepsilon_j,$$

- $Y_j$ = total spending or health outcome in year after diagnosis

# Data

- 20 percent random sample of all patients who received a diagnostic catheterization in 1998

- Link doctors to patient catheterization with physician claims data
- Doctor classifications:
  - Interventional – billed for any angioplasties in 1998 or 1999
  - Noninterventional – billed for neither angioplasty nor bypass in 1998 or 1999

# Validation of Identifying Assumption

**Table 2**

Diagnosing Cardiologist, Health Status at diagnosis, and Subsequent Spending of Patients in Areas with High and Low Numbers of Interventional Cardiologists

| | Patients from areas with … | | |
|---|---|---|---|
| | **Above-median density of interventional cardiologists** | **Below-median density of interventional cardiologists** | **Difference (standard errors in parentheses)** |
| Probability of diagnosis by interventional cardiologist | 0.872 | 0.655 | 0.217** (0.003) |
| Number of days in hospital in year before diagnosis | 2.94 | 2.98 | −0.04 (0.04) |
| Hospital spending in year before diagnosis | $3,926 | $3,987 | −$61 (52) |
| Total spending in year after diagnosis | $28,264 | $28,842 | −$578** (171) |
| Number of patients | 53113 | 53103 | |

** Significant at the 5 percent level.

## Table 3

Effect of Diagnosis by Interventional Versus Noninterventional Cardiologist on Health Spending and Health Outcomes in the Year after Diagnosis (*Standard errors in parentheses*)

| Raw differences between patients diagnosed by interventional versus noninterventional cardiologists | | | | Differences controlling for patient, doctor, hospital, and selection | | | |
|---|---|---|---|---|---|---|---|
| **Spending** | **AMI readmit** | **HF readmit** | **Mortality** | **Spending** | **AMI readmit** | **HF readmit** | **Mortality** |
| *Total effect* | | | | | | | |
| 1. $E(Y\|I=1) - E(Y\|I=0)$ | | | | | | | |
| $216 | 0.166% | 0.219% | 0.910% | $2,847 ($747) | 0.393% (0.428%) | 0.584% (0.840%) | −0.463% (0.861%) |
| *Portion due to type of treatment* | | | | | | | |
| 2. Portion due to the redirection of bypass patients to angioplasty | | | | | | | |
| $[Pr(B\|I=0) - Pr(B\|I=1)] * [E(Y\|I=1, A) - E(Y\|I=1, B)]$ | | | | | | | |
| −$445 | 0.041% | −0.032% | −0.052% | −$1,024 ($172) | 0.175% (0.069%) | 0.060% (0.115%) | −0.057% (0.118%) |
| 3. Portion due to the redirection of non-surgical patients to angioplasty | | | | | | | |
| $[Pr(C\|I=0) - Pr(C\|I=1)] * [E(Y\|I=1, A) - E(Y\|I=1, C)]$ | | | | | | | |
| $577 | 0.107% | −0.032% | −0.112% | $ 535 ($173) | 0.123% (0.049%) | 0.018% (0.043%) | −0.040% (0.045%) |
| *Portion conditional on type of treatment* | | | | | | | |
| 4. Angioplasty | | | | | | | |
| $Pr(A\|I=0) * [(E(Y\|I=1, A) - E(Y\|I=0, A)]$ | | | | | | | |
| −$398 | 0.035% | −0.040% | 0.371% | $1,179 ($327) | 0.259% (0.255%) | −0.173% (0.392%) | −0.059% (0.392%) |
| 5. Bypass surgery | | | | | | | |
| $Pr(B\|I=0) * [(E(Y\|I=1, B) - E(Y\|I=0, B)]$ | | | | | | | |
| −$27 | 0.000% | −0.046% | 0.009% | $1,744 ($461) | −0.047% (0.232%) | 0.600% (0.500%) | −1.195% (0.517%) |
| 6. Nonsurgical treatment | | | | | | | |
| $Pr(C\|I=0) * [(E(Y\|I=1, C) - E(Y\|I=0, C)]$ | | | | | | | |
| $510 | −0.017% | 0.369% | 0.694% | $ 414 ($415) | −0.116% (0.269%) | 0.079% (0.527%) | 0.889% (0.560%) |

# Conclusions

- Diagnosis by an interventional cardiologist leads to increases in spending, but no improvements in health outcomes.
- Integration can have the same effects on incentives and behavior as banned “kickback” payments from treating to diagnosing doctors.

- Suggested solution:
  - Paying integrated doctors differently or allowing doctors more freedom to make and receive payments for referrals, could reduce costs and improve quality.

# Discussion

- In what ways could the pay structure of integrated doctors be changed to address this issue?

- What might be causing the difference in effects of diagnosis by an interventional cardiologist on mortality for bypass patients versus nonsurgical patients?
  - How might one test these mechanisms?