

Urgent revascularization with PCI was more cost-effective than CABG in medically refractory, high-risk myocardial ischemia

Stroupe KT, Morrison DA, Hlatky MA, et al. Cost-effectiveness of coronary artery bypass grafts versus percutaneous coronary intervention for revascularization of high-risk patients. *Circulation*. 2006;114:1251-7.

Clinical impact ratings: Emergency Med ★★★★★☆☆ Hospitalists ★★★★★☆☆ Cardiology ★★★★★☆☆

QUESTION

In patients with medically refractory myocardial ischemia who are at high risk for adverse events, what is the cost-effectiveness of urgent revascularization with percutaneous coronary intervention (PCI) compared with coronary artery bypass grafting (CABG)?

METHODS

Design: Cost-effectiveness analysis from a randomized controlled trial (Angina With Extremely Serious Operative Mortality Evaluation [AWESOME]) with 5-year follow-up.

Setting: 16 Veterans Affairs medical centers.

Patients: 445 patients (mean age 67 y, 99% men) who had medically refractory myocardial ischemia and were at high risk for adverse events (age > 70 y, previous CABG, left ventricular ejection fraction < 0.35, myocardial infarction [MI] within 7 d, and requirement of intraaortic balloon pump). Exclusion criteria were single-vessel circumflex disease, no vessels suitable for revascularization, unprotected (ungrafted) > 50% left-main stenosis, comorbid disease with life

expectancy < 1 year, or angioplasty in the previous 6 months.

Intervention: Urgent revascularization with PCI ($n = 218$) or CABG ($n = 227$).

Outcomes: Life-years of survival and total cost of care (inpatient care, including revascularizations, hospital cost, outpatient costs, rehabilitation, mental health care, and long-term care) (adjusted to 2004 US dollars).

MAIN RESULTS

The PCI group incurred less total cost than did the CABG group initially and at 3 and 5 years (Table). Groups did not differ for probability of survival at 3 (0.82 vs 0.79, $P = 0.34$) or 5 years (0.75 vs 0.70, $P = 0.21$) or for life expectancy at 5 years (3.97 vs 3.78

life-y, $P = 0.18$). PCI was the dominant treatment in 92.6% (at 3 y) and 89.4% (at 5 y) of bootstrap replications.

CONCLUSION

In patients with medically refractory myocardial ischemia who are at high risk for adverse events, urgent revascularization with percutaneous coronary intervention was more cost-effective than coronary artery bypass grafting.

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For correspondence: Dr. K.T. Stroupe, VA Hospital, Hines, IL, USA. E-mail Kevin.stroupe@va.gov. ■

Cost-effectiveness of urgent revascularization with percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) in medically refractory, high-risk myocardial ischemia*

Outcomes	Follow-up (y)	PCI	CABG	Difference (95% CI)
Initial cost (US \$)	Baseline	17 231	41 091	-23 860 (-21 964 to -25 582)
Total cost (US \$)	3	63 896	84 364	-20 468 (-27 569 to -13 918)
	5	81 790	100 522	-18 732 (-27 831 to -9873)

*CI defined in Glossary.

COMMENTARY

The optimal use of revascularization remains a challenging clinical decision. The AWESOME trial by Stroupe and colleagues is indicative of a gradually shifting paradigm in which PCI is supplanting CABG across many subsets of patients.

Revascularization relieves ischemia or improves survival relative to medical therapy. In patients in whom it does not confer a survival benefit, stenting is appropriate to relieve ischemia refractory to medical therapy. In contrast, CABG has been the preferred strategy in higher-risk patients in whom revascularization may confer a survival benefit (left-main disease, 3-vessel disease, proximal left anterior descending disease, significant left ventricular dysfunction, and particularly diabetes). Evidence now challenges the dominance of CABG in higher-risk patients. The Arterial Revascularization Therapies Study (ARTS) (1) and meta-analysis (2) of multivessel bare metal stenting compared with CABG showed equivalence in mortality, MI, or stroke, and less angina and repeat revascularization with CABG. In ARTS2, patients with multivessel disease treated with drug-eluting stents (DESs) had outcomes superior to those in the CABG group in ARTS (3).

In patients with left-main disease, evidence suggests better outcomes with DESs than with CABG. The largest reported study showed a nonsignificant 43% lower 1-year risk for major adverse cardiac and cerebrovascular events with DESs than with CABG (4). In patients with severe refractory angina at high risk for poor outcome after CABG, the AWESOME trial and cost-effectiveness analysis showed that PCI was the dominant strategy with equivalent or superior clinical outcomes and lower cost than CABG. This finding suggests that when

technically feasible, PCI can substitute for CABG in high-, low-, and medium-risk patients.

Ongoing trials will help elucidate the relative roles of PCI with DESs compared with CABG. The incremental cost-effectiveness of initial PCI compared with modern aggressive medical therapy is being further tested in the Clinical Outcomes Utilizing percutaneous coronary Revascularization and Aggressive Guideline-driven drug Evaluation (COURAGE) (5) and Bypass Angioplasty Revascularization Investigation 2 Diabetes (6) trials. As medical therapy, CABG, and PCI continue to improve, frequent reexamination of the optimal use and cost-effectiveness of each approach across subsets of patients will be required.

William B. Hillegass, MD, MPH
Brigitta C. Brott, MD
University of Alabama at Birmingham
Birmingham, Alabama, USA

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