

Outcomes of Percutaneous Coronary Intervention Performed at Offsite Versus Onsite Surgical Centers in the United Kingdom



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ABSTRACT

BACKGROUND Percutaneous coronary intervention (PCI) is increasingly being performed at centers with offsite surgical support. Strong guideline endorsement of this practice has been lacking, in part because outcome data are limited to modest-size populations with short-term follow-up.

OBJECTIVES The aim of this study was to compare the outcomes of PCI performed at centers with and without surgical support in the United Kingdom between 2006 and 2012.

METHODS A retrospective analysis was performed of centrally tracked outcomes from index PCI procedures entered in the British Cardiovascular Intervention Society database between 2006 and 2012, stratified according to whether procedures were performed at centers with onsite or offsite surgical support. The primary endpoint was 30-day all-cause mortality, with secondary endpoints of mortality at 1 and 5 years.

RESULTS Outcomes at a median of 3.4 years follow-up were available for 384,013 patients, of whom 31% (n = 119,096) were treated at offsite surgical centers. In an unadjusted analysis, crude mortality rates were lower in patients treated at centers with offsite versus onsite surgical coverage (2.0% vs. 2.2%; p < 0.001). On multivariate adjustment, there were no between-group differences in survival between the naive and imputed populations at 30 days (naive population hazard ratio [HR]: 0.87; 95% confidence interval [CI]: 0.71 to 1.06; p = 0.16; imputed population HR: 0.99; 95% CI: 0.89 to 1.09; p = 0.82), 1 year (naive population HR: 0.92; 95% CI: 0.79 to 1.07; p = 0.26; imputed population HR: 0.99; 95% CI: 0.92 to 1.06; p = 0.78), or 5 years (naive population HR: 0.92; 95% CI: 0.84 to 1.01; p = 0.10; imputed population HR: 0.97; 95% CI: 0.92 to 1.03; p = 0.29). Results were consistent irrespective of procedural indication. No differences in mortality were seen in sensitivity analyses performed using a propensity-matched population of 74,001 patients.

CONCLUSIONS PCI performed at centers without onsite surgical backup is not associated with any mortality hazard. (J Am Coll Cardiol 2015;66:363-72) © 2015 by the American College of Cardiology Foundation.

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**ABBREVIATIONS
AND ACRONYMS****BCIS** = British Cardiovascular Intervention Society**CABG** = coronary artery bypass grafting**MI** = myocardial infarction**NSTEMI** = non-ST-segment elevation myocardial infarction**PCI** = percutaneous coronary intervention**STEMI** = ST-segment elevation myocardial infarction

The site of delivery of percutaneous coronary intervention (PCI) has evolved from provision by interventional cardiology departments with onsite cardiothoracic support to a more geographically widespread service, including centers without onsite cardiothoracic surgery backup. This change has evolved partly through the improved safety of PCI, such that emergency coronary artery bypass grafting (CABG) is required only for rare catastrophic situations. Other potentially influential factors include the geographic expansion of cardiological services, economic factors, and the popularity of local cardiology services.

SEE PAGE 373

The acceptance of this mode of delivery of PCI has not been universal, and consequently the volume of PCI performed at offsite surgical centers varies worldwide. Data from the U.S. National Cardiovascular Data Registry show that in 2009, only 13% of all PCI centers were offsite surgical centers, accounting for a mere 3% of the total U.S. PCI volume (1). This in part stems from the American College of Cardiology and American Heart Association PCI guidelines, which gave elective PCI at offsite surgical centers a Class III recommendation in 2005 (2) and only a Class IIb (Level of Evidence: B) recommendation in 2011 (3). Primary PCI has had a marginally stronger recommendation (Class IIa). In contrast, the United Kingdom has embraced the use of offsite surgical centers to deliver PCI, with these centers accounting for 63% of PCI institutions and 39% of the total annual PCI volume in 2012 (4). Additional factors driving the uptake in the United Kingdom include the high rates of cardiovascular disease and a national directive to improve revascularization rates after many years of inequitable distribution of service provision, particularly for patients living outside major cities.

Historically, there were concerns that PCI performed without onsite surgical support would lead to inferior outcomes (5) because of staff inexperience, low institutional volume, and the delay in emergency CABG when needed. Data from registries (1), randomized studies (6,7), and meta-analyses (8) have not substantiated these concerns; however, important

qualifications within these studies (e.g., small sample size) limit the strength of the conclusions and subsequent guideline recommendations (9).

Since 2005, outcomes from all PCI procedures in the United Kingdom have been recorded in the British Cardiovascular Intervention Society (BCIS) database, and this now includes data from >700,000 patients. Between 2006 and 2012, the number of patients undergoing PCI at offsite surgical centers more than doubled, from approximately 15,000 to >36,000 (4). The aim of this study was to report and compare the outcomes of PCI performed at centers with and without surgical support in the United Kingdom between 2006 and 2012.

METHODS

PATIENT POPULATION. This study is based on a retrospective analysis of data collected in the BCIS database under the auspices of the National Institute for Cardiovascular Outcomes Research. From January to December 2012, a total of 92,445 PCIs were performed, representing a rate of 1,452 per million population at 118 PCI centers. One hundred thirteen variables are recorded for each patient, covering demographics, indications for PCI, procedural details, and outcome data. During the upload of data to the central servers, some range and internal consistency checks are applied. The Medical Research Information Service uses data collected by the Office of National Statistics to undertake mortality tracking. This is facilitated by the use of National Health Service numbers, which provide a unique identifier for any person registered with the National Health Service in England and Wales. Tracked mortality data are not available for the small minority of patients who underwent their procedures in the devolved countries of the United Kingdom (Scotland and Northern Ireland).

The study population comprised all index (first or primary attendance) PCI procedures entered into the BCIS database between January 1, 2006, and December 31, 2012. Patients <20 and >105 years of age were excluded, along with procedures performed outside England or Wales, in view of the absence of tracked mortality data. Records containing missing data regarding the presence or absence of onsite surgical backup were also excluded.

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