Defining operative mortality: Impact on outcome reporting

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ABSTRACT

Objective: Death is an important outcome of procedural interventions. The death rate, or mortality rate, is subject to variability by definition. The Society of Thoracic Surgeons Adult Cardiac Surgery Database definition of ''operative'' mortality originally included all in-hospital deaths and deaths occurring within 30 days of the procedure. In recent versions of the Society of Thoracic Surgeons Adult Cardiac Surgery Database, ''in-hospital'' has been modified to include ''patients transferred to other acute care facilities,'' and ''deaths within 30 days unless clearly unrelated to the procedure'' has been changed to ''deaths within 30 days regardless of cause.'' This study addresses the impact of these redefinitions on outcome reporting.

Methods: The California Office of Statewide Health Planning and Development hospitalized patient discharge database was queried for the year 2009, the most recent year that data files could be linked to the vital statistics death files to include all-cause mortality. Isolated coronary artery bypass grafting, isolated valve, coronary artery bypass grafting valve, and percutaneous coronary intervention procedures were identified by International Classification of Diseases, Ninth Edition, Clinical Modification procedure codes. Percutaneous coronary intervention procedures were further divided into acute coronary syndrome (percutaneous coronary intervention acute coronary syndrome) and all other percutaneous coronary intervention (percutaneous coronary intervention no acute coronary syndrome). Deaths were counted by 5 methods depending on the time and place of occurrence: (1) in-hospital or during the index hospitalization; (2) in-hospital + connected hospitalization, defined as a transfer to another acute care facility on the same day or within 24 hours of discharge; (3) in-hospital + 30 day, death during index hospitalization or within 30 days after the procedure; (4) in-hospital + connected + 30 day readmission, death during index hospitalization, transfer to acute care facility, or deaths during readmission within 30 days; and (5) in-hospital + connected + 30 day. To study the impact of these operative mortality definitions, we examined 5 different methods to track mortality and performed 2 separate analyses. The first analysis did not exclude any patients, and the second analysis excluded any patient who could not be accurately tracked after hospital discharge.

Results: In the first analysis with no patients excluded, a total of 17% (117/697) of surgical deaths and 31% (409/1324) of percutaneous coronary intervention deaths were counted after the original hospitalization. The highest percentage of posthospital deaths occurred after elective percutaneous coronary intervention: 45% (135/301). In surgical patients, the highest percentage of posthospital deaths occurred in coronary artery bypass grafting procedures: 20% (57/284). In the

Procedure	Method 1		Method 2		Method 3		Method 4		Method 5	
	N	Deaths N (%)	N	Deaths N (%)	N	Deaths N (%)	N	Deaths N (%)	N	Deaths N (%)
Isolated CABG	13,312	227 (1.71)	13,244	241 (1.82)	12,275	258 (2.07)	12,243	248 (2.03)	12,243	263 (2.15)
CABG/ Valve	3,134	152 (4.85)	3,110	163 (5.24)	2,957	164 (5.45)	2,948	166 (5.63)	2,948	169 (5.73)
Isolated Valve	5,794	201 (3.25)	5,765	214 (3.71)	5,372	211 (3.84)	5,358	203 (3.79)	5,358	212 (3.96)
PCI with ACS	23,057	749 (3.25)	22,727	789 (3.47)	20,414	923 (4.42)	20,293	806 (3.97)	20,293	916 (4.51)
PCI without ACS	30,886	166 (0.54)	30,812	172 (0.56)	29,121	290 (0.98)	29,063	242 (0.83)	29,063	287 (0.99)

Operative mortality using 5 methods.

Central Message

Mortality rates for the same procedure can be variable and depend on the definition chosen.

Perspective

Depending on the definition of mortality used, the mortality rate for any procedure can vary, and these definitions and rankings may not be accurate.

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Abbreviations and Acronyms

ACC-NCDR = American College of Cardiology National Cardiovascular Data Registry
ACS = acute coronary syndrome
CABG = coronary artery bypass grafting
OSHPD = Office of Statewide Health Planning and Development
PCI = percutaneous coronary intervention
STS-NDB = Society of Thoracic Surgeons National Database

second analysis, with untrackable patients excluded, hospital deaths included 12% (161/1324) for percutaneous coronary intervention compared with 4% (30/697) for surgical procedures.

Conclusions: A significant percentage of procedural deaths occur after transfer or discharge from the index hospital. This is especially evident in the percutaneous coronary intervention group. These findings illustrate the importance of the definition of ''operative'' mortality and the need to ensure accuracy in the reporting of data to voluntary clinical registries, such as the Society of Thoracic Surgeons Adult Cardiac Surgery Database and National Cardiovascular Data Registry. (J Thorac Cardiovasc Surg 2016;151:1101-10)

Evaluating the care delivered by hospitals has been the goal of quality reporting programs, with accurate reporting being imperative for analysis and comparisons of outcomes. This is particularly emphasized when outcomes for procedural interventions are analyzed and compared. Although postoperative death is an important measurable outcome, operative morality does not have a universal definition.[1,2] Several definitions of operative morality have been used in various quality programs, with some defining postoperative mortality as a death that occurs during the same admission, and others defining postoperative death within a standardized time interval after surgery,[2] with 30-day follow-up most common. However, it is difficult for some hospitals to track 30-day mortality, because patients may be referred from remote locations and some centers may not have the resources to track all mortality after discharge.[1]

The Society of Thoracic Surgeons National Database (STS-NDB) separately collects both in-hospital and 30-day mortality status, and has revised its definition of operative mortality to ensure more accurate and consistent measurement of outcomes. The original definition of operative mortality included (1) all deaths occurring during the hospitalization in which the operation was performed, even if after 30 days; and (2) those deaths occurring after discharge from the hospital but within 30 days of the procedure unless the cause of death is clearly unrelated to the operation. This definition was further updated in 2011 to address the issue of patients transferred to other acute care facilities. The most recent iteration of operative mortality appeared in 2014, which defined operative mortality as (1) all deaths, regardless of cause, occurring during the hospitalization in which the operation was performed, even if after 30 days (including patients transferred to other acute care facilities); and (2) all deaths, regardless of cause, occurring after discharge from the hospital but before the end of the 30th postoperative day.[3] To study the impact of these changes to the STS-NDB operative mortality definitions, we examined 5 different methods to track mortality and performed 2 separate analyses. The first analysis did not exclude any patients, and the second analysis excluded any patient who could not be accurately tracked after hospital discharge. The aim of this study was to demonstrate the effect of differences in mortality definition methodology and the impact of the definition on morality rates.

MATERIALS AND METHODS

The California Office of Statewide Health Planning and Development (OSHPD) hospitalized Patient Discharge Database was queried for the year 2009, the most recent year that data files could be linked to the vital statistics death files to include all-cause mortality. The OSHPD collects inpatient discharge data from all licensed inpatient hospitals in California. Each record in the dataset corresponds to an individual inpatient hospital discharge.

The California Cardiac Surgery and Intervention Project, a project of the California Society of Thoracic Surgeons, collects data from the OSHPD Patient Discharge Database on all cardiac surgery and percutaneous coronary intervention (PCI) procedures performed in the state. The data files have patient-level data and include information on patient demographics, diagnosis and procedure codes, payment source, admission source, and all-cause mortality. Because California requires licensed hospitals to submit data on all discharged patients biannually, a 100% collection rate is ensured for patients undergoing cardiac surgery or PCI. The OSHPD includes confidential information about health care outcomes to qualified California Society of Thoracic Surgeons investigators who are faculty members of the University of California. The California Cardiac Surgery and Intervention Project reports volume and outcomes on all cardiac surgery and interventions on its Web site to provide quality improvement data for health care givers and other stakeholders.

We queried the database from January 1, 2009, to December 31, 2009, for all patients undergoing a primary procedure of isolated coronary artery bypass grafting (CABG), isolated valve, CABG valve, and PCI procedures. These patients were identified by International Classification of Diseases, 9th Revision, Clinical Modification procedure codes. PCI procedures were further divided into acute coronary syndrome (ACS) (PCI with ACS) and all other PCI (PCI without ACS) on the basis of the presence of an admission diagnosis code for acute myocardial infarction code (410.xx).

The OSHPD inpatient discharge record also includes patient disposition. Patients transferred to another facility can be tracked through connected hospitalizations on the basis of a record linkage number that uniquely identifies the patient. We included in our mortality outcome