

**RESEARCH BRIEF**

# GAPS IN USE OF THE INTERNAL MAMMARY ARTERY IN BYPASS SURGERY DECREASE

JANET YOUNG, MD, MHSA  
RESEARCH SCIENTIST  
CENTER FOR HEALTHCARE ANALYTICS

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# BACKGROUND

Coronary artery bypass graft (CABG) surgery uses patient veins or arteries to bypass narrowed areas of the coronary arteries to increase blood flow to the heart. Vessels commonly used for this purpose include the saphenous vein from the leg, the internal mammary artery (IMA) from the chest, or the radial artery from the arm. The IMA's use in cardiac bypass began several decades ago. In 1970, Green<sup>1</sup> described a series of patients undergoing anastomosis of the internal mammary artery to left anterior descending coronary artery. Studies as early as 1985 showed superior patency of the IMA compared with the saphenous graft<sup>2</sup> as well as better long-term outcomes.<sup>3</sup> More recent studies have also shown improved short-term outcomes.<sup>4</sup> Despite these findings, a number of studies have noted variability in the use of the IMA. This study reviews trends in IMA use by winners and nonwinners of the *Thomson Reuters 100 Top Hospitals*<sup>®</sup> cardiovascular studies and in the use of the IMA in the Medicare population in general from 2000 through 2010. We found that:

- Both winners and nonwinners of the *100 Top Hospitals* cardiovascular award have increased IMA use — from 83 to 93 percent in nonwinner hospitals and from 88 to 96 percent in winner hospitals between study years 2002 and 2011.
- The IMA usage gap between men and women has decreased, but IMA use in women still lags behind men — 89 versus 93 percent.
- The usage gap between younger and older patients is also decreasing. IMA use increased for all over-65 age groups, but the increase was greatest for patients 85 and older. For them, IMA use increased 27 percentage points between 2000 and 2010 — rising from 58 to 86 percent.
- IMA utilization is highest in the Northeast, followed by the Midwest and West, and lowest in the South. Although this order remained constant between 2000 and 2010, the South had the greatest increase, thus narrowing the gap. In 2000, only 75 percent of Medicare patients in the South received an IMA graft, compared with 83 percent in the Northeast. By 2010, the gap decreased to just 3 percentage points — with 90 percent in the South and 93 percent in the Northeast.

# METHODOLOGY

We analyzed trends in IMA use by the *100 Top Hospitals* cardiovascular study award winners and nonwinners. We based this trending analysis on results from study years 2002 through 2011. This trend is based on the IMA utilization for the median hospital within each category (winners and nonwinners) in isolated CABGs — a surgical procedure in which CABG is the only major cardiac procedure performed. Patients with ICD-9-CM codes indicating a prior CABG were excluded because one or both internal mammary arteries may have been used in the previous CABG. Additionally, patients below age 65 were excluded from this calculation.

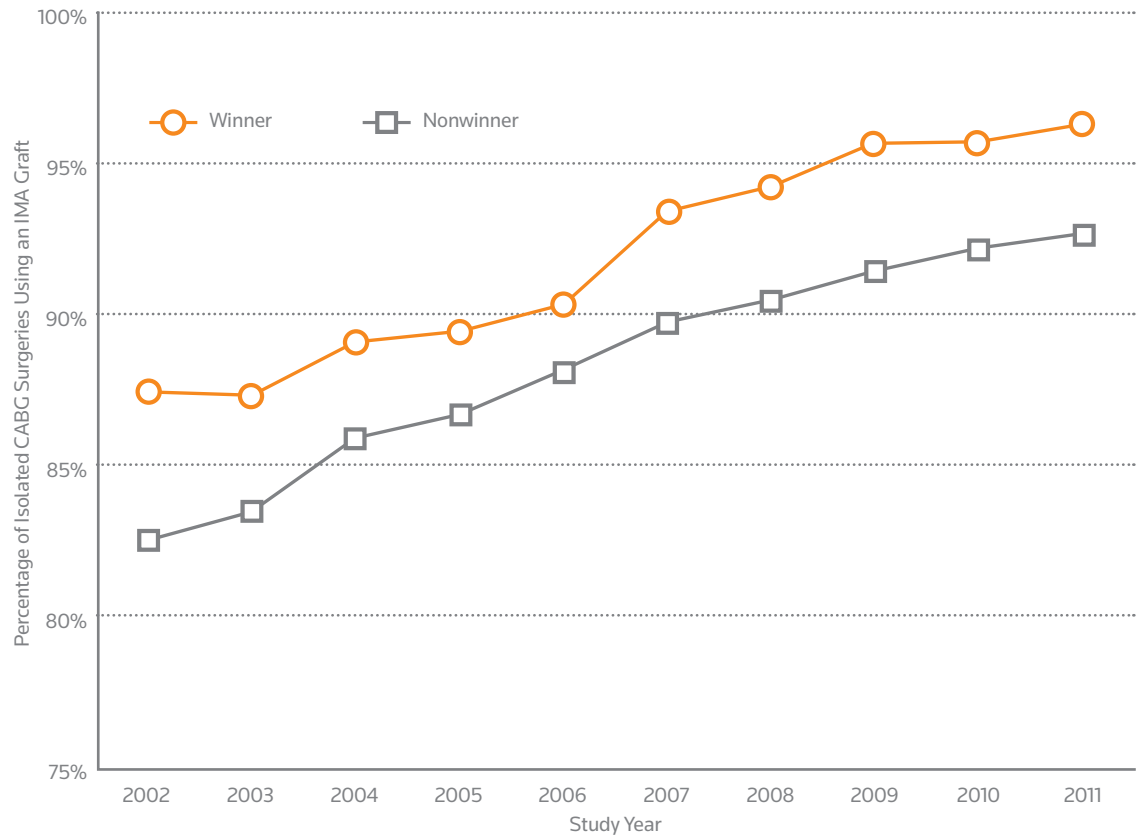
We also performed a trend analysis of IMA utilization in isolated CABG procedures by age group, geographic region, and sex using Medicare Provider Analysis and Review (MedPAR) datasets from federal fiscal years 2000 through 2010. Patients with a previous CABG or those younger than age 65 were excluded. Percentages represent results from all hospitals performing CABGs, including hospitals that were not eligible for the *100 Top Hospitals* cardiovascular studies.

# FINDINGS

Between study years 2002 and 2011, both *100 Top Hospitals* cardiovascular study winners and nonwinners increased their utilization of IMA in isolated CABG patients. Although it's not surprising that the study winners would have higher utilization than nonwinners (IMA utilization is a performance measure used in ranking), it's notable that the bar continues to be raised. That is, to perform at benchmark levels in a study, hospitals must outperform the benchmark level set in the previous year's study.

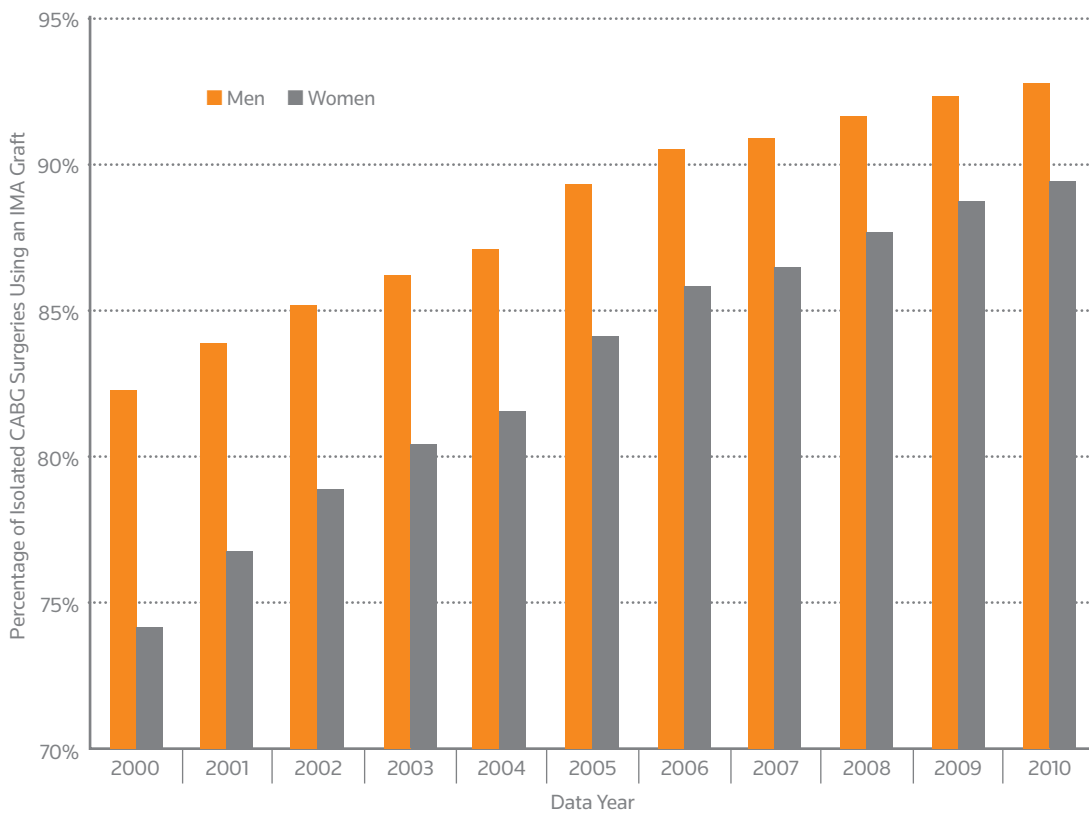
Nonwinner IMA utilization steadily increased from 82.7 to 92.7 percent during the 10 years studied, while winner utilization increased from 87.5 to 96.3 percent during the same time (Figure 1).

**Figure 1: CABG IMA Utilization by 100 Top Hospitals Program Cardiovascular Winners and Nonwinners, by Study Year**



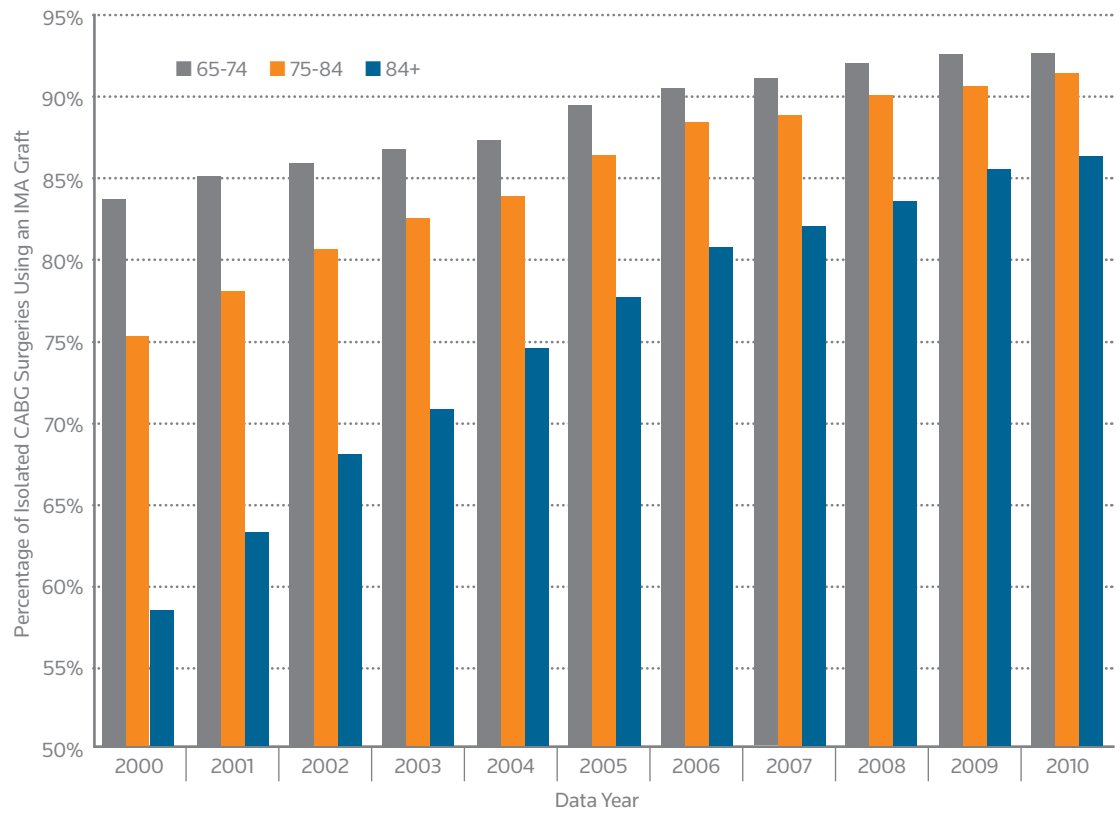
Utilization of the IMA in women, the elderly, and the South has previously been shown to be lower than their corresponding counterparts.<sup>5</sup> Between 2000 and 2010, the IMA usage gap between men and women decreased, although the use in women still lagged behind men in this population — 89.4 versus 92.8 percent (Figure 2).

Figure 2: IMA Utilization Trend by Sex



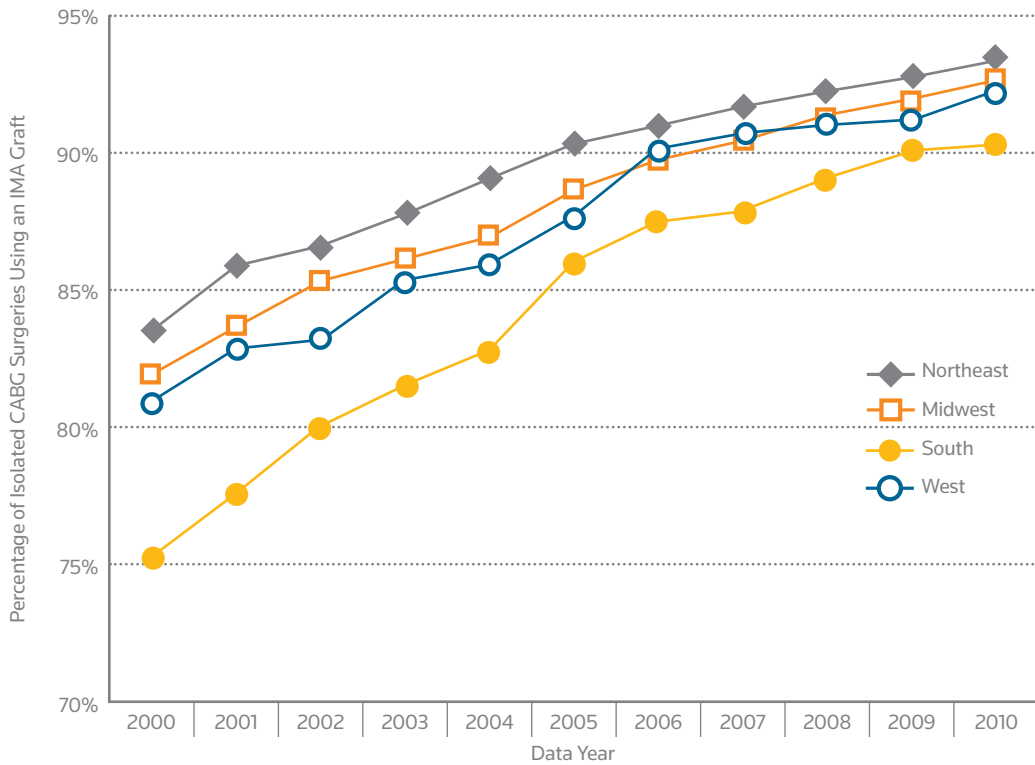
We examined three age groups: 65–74, 75–84, and 85 and older. Between 2000 and 2010, there was an increase in utilization of the IMA in all age groups, but the increase was greater in the older (75–84 and 85+) than the younger (65–74) age groups, and was most dramatic in the oldest age group (85+), where IMA usage jumped from 58.4 percent in 2000 to 86.3 percent in 2010 (Figure 3).

**Figure 3: IMA Utilization Trend by Age Group**



There are regional differences in IMA utilization. Using census regions to stratify hospitals, we found that IMA utilization is highest in the Northeast, followed by the Midwest and West, with the lowest rates in the South. Although this order remained constant over the 10 years we studied, the South had the greatest increase in use. In 2000, only 75.3 percent of Medicare patients in the South received an IMA graft, compared with 83.4 percent in the Northeast. Although all groups increased their use in subsequent years, the gap between them decreased. In 2010, the South used the IMA in 90.3 percent of their isolated CABG patients, compared with 93.4 percent in the Northeast (Figure 4).

**Figure 4: IMA Utilization Trend by Census Region**



# DISCUSSION

As early as 1985, information in published peer-reviewed literature showed improved long-term outcomes for CABGs when an IMA graft was used. Performing CABG with an IMA graft is generally more technically difficult than using the saphenous vein and usually takes longer. Concern that the increased operative time might have adverse effects, particularly on groups such as elderly patients or those with an acute coronary event, contributed to their being relative contraindications. Other perceived and relative contraindications included chronic obstructive pulmonary disease, poor left ventricular function, and female sex.<sup>6,7,8</sup> However, evidence for a rationale to consider female sex as a contraindication appears to be lacking.<sup>9</sup>

There has been evidence since the 1990s that both women and the elderly benefit from use of the IMA.<sup>10</sup>

<sup>11</sup> Additionally, the last decade has seen a number of quality measures and initiatives targeting IMA utilization in CABG. The Society of Thoracic Surgeons (STS) lists IMA use as the only quality measure related to operative care of CABG patients. In selecting this measure, the STS states, “There may be no other single surgical measure that so positively impacts the long-term survival of CABG patients, and it is for this reason that use of at least one IMA was chosen as the operative process measure.”<sup>12</sup> The Physician Quality Reporting System (formerly known as the Physician Quality Reporting Initiative) includes utilization of the IMA as a measure. The National Quality Forum (NQF) has also endorsed IMA utilization as a measure for cardiac surgery. Finally, there have been statewide initiatives — in Michigan, Alabama, and northern New England — to increase use of the IMA.<sup>13</sup>

There are still differences in use of the IMA by sex, age, and census region. But it is encouraging that although IMA utilization is still increasing in groups that already had high rates, usage in the previously lower groups is increasing more quickly, thus causing the gaps between the groups to narrow.

# CONCLUSION

Utilization of internal mammary artery in isolated CABG procedures has increased for *100 Top Hospitals* cardiovascular study winners and nonwinners in the last decade. It has also increased dramatically for women and the elderly, as well as patients treated in the South. With literature supporting the better long-term outcomes for patients receiving an IMA graft as well as quality initiatives and measures aimed at increasing its use, patient groups previously considered by some to be ineligible for IMA grafting are now receiving this procedure.

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Thomson Reuters  
777 E. Eisenhower Parkway  
Ann Arbor, MI 48108 USA  
Phone +1 734 913 3000

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