Coronary Revascularization in the Community

A Population-Based Study, 1990 to 2004

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Objectives
We sought to examine temporal trends in the utilization of coronary revascularization in a geographically defined population.

Background
Earlier reports on revascularization utilization focused on inpatient settings and did not distinguish incident from recurrent procedures. Furthermore, little is known on age- and gender-specific trends. Finally, longitudinal data on the utilization and results of coronary angiography as explanatory factors for the changing revascularization practice are lacking.

Methods
Data integrating diagnostic and therapeutic coronary procedures performed in Olmsted County (Minnesota) between 1990 and 2004 were analyzed. Standardized rates were calculated applying the direct method and temporal trends compared using Poisson regression models.

Results
Revascularization utilization increased by 24% during the study (95% confidence interval [CI] 5% to 46%), but the trends diverged by procedure type, with a sustained increase (69%, 95% CI 43% to 101%) for percutaneous coronary interventions (PCI) contrasting with a stabilization, then decline (−33%, 95% CI −16% to −47%) for coronary artery bypass grafting (CABG). For PCI, although the use increased in all categories, greater increases were noted in the elderly, in women, and for recurrent procedures. No such patterns were detected for CABG. Angiography use remained stable, and the rate of 3-vessel and/or left main disease declined (−22%, 95% CI −8% to −33%).

Conclusions
Over the 15-year period, revascularization increased in the community with a large increase in PCI partially offset by a decrease in CABG. More PCIs are performed in women and the elderly and for recurrent disease. These changes occurred within the context of a decline in multivessel disease and thus likely reflect the natural history of coronary artery disease. (J Am Coll Cardiol 2007;50:1223–9) © 2007 by the American College of Cardiology Foundation

Diverging trends in utilization of coronary revascularization procedures have been documented in the U.S. and abroad throughout the 1990s, where an increase in percutaneous coronary interventions (PCI) has accompanied a stabilization and then decline in coronary artery bypass grafting (CABG) (1–10). Because previous studies were limited to inpatient data, the reported trends may not fully capture the changes in revascularization practice, such as outpatient PCI (11–13).

Moreover, although earlier studies have documented age and gender differences in utilization of revascularization procedures (14–18), conflicting evidence has been reported regarding age- and gender-specific trends (2,4,8,19–21), which might be related to the selected nature of the populations studied (e.g., Medicare beneficiaries or patients with acute myocardial infarction). Furthermore, because the ability to distinguish between incident (i.e., first-ever) and recurrent procedures, which generally requires person-based data, was lacking in most studies, it is uncertain whether the proportion of incident versus recurrent procedures has changed over time (7,21).

Finally, because the selection between CABG and PCI is largely influenced by anatomic coronary artery disease (CAD) (5,22–24), it is important to interpret revascularization trends in light of temporal changes in the extent and severity of angiographic CAD.

To address these gaps in knowledge, we studied trends in revascularization utilization in Olmsted County, Minnesota, between 1990 and 2004. Specifically, we assessed variations according to procedure type, age, gender, and incident status and evaluated trends in the use and results of coronary
coronary angiography as contributing factors to the variations seen in coronary revascularization.

Methods

Study setting. The population of Olmsted County is served by a largely unified medical care system that has accumulated comprehensive clinical records over an extensive period (25,26). Olmsted County (2000 census population 124,277) is 144 km southeast of Minneapolis and St. Paul, with approximately 70% of its population residing in Rochester, the centrally located county seat. In 2000, about 90% of all residents were white and 11% were aged 65 years or more (27). The Olmsted County population is largely middle class, with 91% of adults having graduated from high school and only 2.4% uninsured. With the exception of a higher proportion being employed in the health care industry, the population characteristics are similar to those of white Americans nationally.

Epidemiologic research in Olmsted County is feasible because the city and county are relatively isolated from other urban centers, and nearly all medical care is delivered to local residents by a handful of providers. The Mayo Medical Center and the Olmsted Medical Group and its affiliated Olmsted Community Hospital provide comprehensive care for the region in every clinical discipline. The epidemiologic potential of this situation is enhanced by the fact that each provider uses a unit medical record system, whereby all data collected for an individual are assembled in 1 place. The unit records of each provider in the county are available for use. These medical records are easily retrievable because the Mayo Clinic has maintained since the early 1900s extensive indexes based on clinical and histologic diagnoses and surgical and billable procedures. The Rochester Epidemiology Project (25,26) has developed a similar index for the records of other providers of medical care to local residents. This indexing system includes death certificates for Olmsted County residents. The result is the linkage of medical records from essentially all sources of medical care available to and used by the Olmsted County population. All aspects of the present study were approved by the appropriate institutional review boards.

Coronary procedures. Since 1955, the Mayo Clinic has maintained an index of surgical procedures, which can be queried electronically. This allowed identifying all patients who underwent CABG between 1990 and 2004. Similarly, registries of all coronary angiography procedures, diagnostic and therapeutic, have been maintained since 1979. Because the Mayo Clinic is the sole provider of coronary angiography, PCI, and CABG surgery in Olmsted County, this case finding approach resulted in the complete ascertainment of all revascularization procedures performed in the county.

We defined revascularization as CABG or PCI, with or without stent insertion. Incident status was defined as revascularization with no prior CABG or PCI.

Significant angiographic CAD was defined as 75% stenosis or greater of the left anterior descending, left circumflex, or right coronary artery or 50% stenosis or greater of the left main (LM) coronary artery (28). Three mutually exclusive disease categories were created for analytic purposes: 1) negative (no significant stenosis); 2) positive (1- or 2-vessel disease not involving the LM artery); and 3) severe (3-vessel or LM CAD). Sensitivity analyses were conducted using the Coronary Artery Surgery Study extent and severity scores, which evaluate the global burden of CAD in the entire coronary tree (29).

Statistical analyses. Age-, gender-, and year-specific utilization rates were calculated for each procedure. The denominators were determined by Olmsted County population census data for 1990 and 2000, with linear interpolation for the intercensal years and extrapolation after 2000 (30). These rates were directly standardized to the age and gender distributions of the 2000 U.S. population using a lower cutoff for age of 25 years.

Poisson regression models were used to assess temporal trends in procedure utilization overall and by selected categories using the SAS procedure GENMOD (SAS Institute Inc., Cary, North Carolina). Specific counts for each calendar year, age (using midpoints of 10-year intervals), gender, and incident/recurrent category were used as the unit of observation. Rate ratios (RR) and 95% confidence intervals (CI) of procedure utilization in different time periods (using tertiles defined as 1990 to 1994 [reference], 1995 to 1999, and 2000 to 2004) were estimated. Percentage change for the entire study period was also estimated. Comparisons of temporal trends across specific groups and categories were performed by including the 2-way interaction term of each variable with year-after-year adjustment for all main effects. Then 3-way interactions were assessed in models that included the corresponding main effects and 2-way interactions.

Model goodness-of-fit was assessed by examining the deviance statistic, and corrections for overdispersion were performed (SAS dscale option). A p value of 0.05 was selected for the threshold of statistical significance except when testing for interactions, where p values up to 0.10 were accepted.

Results

Over the 15 years of the study, 4,681 coronary revascularizations were performed in 3,525 individuals. This includes 3,139 PCIs (31% in women) and 1,542 CABGs (26% in women). One-fourth of both PCIs and CABGs were performed in individuals age 75 years or more.

Use of CABG versus PCI. There was an upward trend in the use of revascularization, with a rapid increase throughout the 1990s followed by a relative stabilization in the initial years of the new millennium (Fig. 1). Accordingly, the overall utilization rates (per 100,000 persons) were 343 in 1990 to 1994, 420 in 1995 to 1999, and 453 in 2000 to
2004. Compared with the reference period (1990 to 1994), the age- and gender-adjusted RR in the years 1995 to 1999 and 2000 to 2004 were 1.15 (95% CI 1.01 to 1.31) and 1.21 (95% CI 1.07 to 1.37), respectively (Table 1). This equates to a total increase of 24% (95% CI 5% to 46%) in coronary revascularization between 1990 and 2004.

Trends varied markedly between CABG and PCI (p < 0.0001 for the year-by-type interaction). A sizable monotonic increase was shown in PCI, whereas CABG rates were relatively stable until the late 1990s and then declined substantially. The PCI rates (per 100,000 persons) increased from 204 in 1990 to 1994, to 271 in 1995 to 1999, and to 334 in 2000 to 2004. This corresponds to a 5% adjusted increase (95% CI 1.07 to 1.23) in PCI use per year (per 100,000 persons). It should be noted, however, that PCI use was not universally increasing across all demographic groups, as substantial variations in the trends were noticed, because the magnitude of the increase was greater in the elderly (p < 0.0001 for the year-by-age interaction) and in women (p = 0.07 for the year-by-gender interaction).

Accordingly, the RR in the final versus initial 5 years of the study was 2.67 (95% CI 2.01 to 3.55) in persons age 75 years or more compared with 1.40 (95% CI 0.98 to 2.01) in persons <75 years old and 1.71 (95% CI 1.38 to 2.11) in women compared with 1.43 (95% CI 1.21 to 1.69) in men (age-adjusted). However, in absolute terms, the respective increase in rate (per 100,000 persons) was larger in men (from 298 to 470) than in women (from 117 to 211). For CABG, no significant age or gender interactions were detected. Yet, unlike younger individuals for whom a steep decline in CABG use was noted, no decrease over time was shown in persons aged 75 years or more.

Trends by age and gender. Age- and gender-specific trends, by procedure type, are shown in Table 1. For PCI, although increases occurred in all demographic groups, substantial variations in the trends were noticed, because the magnitude of the increase was greater in the elderly (p < 0.0001 for the year-by-age interaction) and in women (p = 0.07 for the year-by-gender interaction). Accordingly, the RR in the final versus initial 5 years of the study was 2.67 (95% CI 2.01 to 3.55) in persons age 75 years or more compared with 1.40 (95% CI 0.98 to 2.01) in persons <75 years old and 1.71 (95% CI 1.38 to 2.11) in women compared with 1.43 (95% CI 1.21 to 1.69) in men (age-adjusted). However, in absolute terms, the respective increase in rate (per 100,000 persons) was larger in men (from 298 to 470) than in women (from 117 to 211). For CABG, no significant age or gender interactions were detected. Yet, unlike younger individuals for whom a steep decline in CABG use was noted, no decrease over time was shown in persons aged 75 years or more.

Trends by incident status. As shown in Fig 2, trends in incident versus recurrent revascularization rates differed between PCI and CABG (p < 0.0001 for the year-by-type-by-incident status interaction). For PCI, the age- and gender-adjusted rates of recurrent procedures rose steeply, whereas a more modest increase occurred in incident procedures. Indeed, the rates (per 100,000 persons) increased from 74 in 1990 to 1994 to 147 in 2000 to 2004 for recurrent PCI, and from 164 to 215, respectively, for incident PCI. Accordingly, the RR in 2000 to 2004 versus 1990 to 1994 was 1.93 (95% CI 1.59 to 2.34) for recurrent procedures compared with 1.31 (95% CI 1.15 to 1.50) for incident procedures (p = 0.001 for the interaction). In contrast, no year-by-incident status interaction was detected for CABG (respective RR 0.67 [95% CI 0.54 to 0.84] and 0.81 [95% CI 0.69 to 0.96]; p = 0.32 for the interaction).

Among all patients undergoing at least 1 revascularization as an Olmsted County resident between 1990 and 2004 (n = 3,525) during their lifetime, 1,862 (53%) had only PCI (74% with 1 PCI, 18% with 2, and 8% with 3 or more), 1,079 (31%) had only CABG (94% with 1 CABG and 6% with 2 or more), and 584 (17%) had both (58% with 1 PCI and 1 CABG, 20% with 2 PCI and 1 CABG, and 22% with different combinations) (Table 2). After an initial PCI, a second PCI was performed in 265 patients (59%) for disease progression, 135 (30%) for restenosis, and 51 (11%) for both.

Use and results of coronary angiography. The use of angiography remained relatively stable during the study period, where the standardized rates per 100,000 persons were 868 in 1990 to 1994, 909 in 1995 to 1999, and 897 in 2000 to 2004. This corresponds to a 5% adjusted increase (95% CI −1% to 9%) from 1990 to 2004. However, diverging trends in the categories defining angiographic results were noted, with increasing rates of negative angiography (from 223 in 1990 to 1994 to 334 in 2000 to 2004 [per 100,000 persons]) contrasting with respective declines in results meeting criteria for positive (447 to 396) and severe (198 to 167) CAD (Fig 3). For the total duration of
the study, a 22% decrease in 3-vessel and/or LM CAD (95% CI −8% to −33%) and a 16% decrease in otherwise positive CAD (95% CI −4% to −26%) were estimated along with a 76% increase in negative angiography (95% CI 54% to 101%) after adjustment for age, gender, and prior CABG (p < 0.0001 for the year-by-angiographic results interaction). Likewise, when the analysis was restricted to incident angiograms only, over the 15 years studied there was a 36% decrease in 3-vessel and/or LM CAD (95% CI 18% to −49%), a 21% decrease in otherwise positive CAD (95% CI −8% to −32%), and a 71% increase in negative angiography (95% CI 44% to 102%) after adjustment for age and gender.

Sensitivity analyses were carried out comparing the extent and severity of angiographic CAD as measured by the Coronary Artery Surgery Study scores across 5-year tertiles. For the extent score, the respective means (SD) for the years 1990 to 1994, 1995 to 1999, and 2000 to 2004 were 2.9 (2.5), 2.6 (2.5), and 2.3 (2.3) (p < 0.001 after adjustment for age and gender), respectively, and for the severity score 59.7 (36.8), 56.0 (36.4), and 51.7 (34.4) (p < 0.001 after adjustment for age and gender), respectively. These data confirm a decline in the burden of CAD over time.

**Discussion**

**Summary of findings.** In Olmsted County from 1990 to 2004, a 69% increase in PCI accompanied by a 33% decrease in CABG resulted in an increase of 24% in total revascularization. For PCI, although increases were noted in all categories examined, variations in the magnitude of the increase were detected. Utilization among the elderly increased more steeply than among younger persons; a greater increase was noted in women compared with men; and repeat procedures rather than incident ones contributed mostly to the overall trend. Trends in CABG were less heterogeneous, yet, unlike other groups or categories, no decrease was shown in the elderly. Although the use of coronary angiography did not change significantly over the study period, the rate of severe disease declined by 22%.

**Trends by revascularization type.** Although an increase in the use of PCI and a decrease in CABG have been widely reported (1–10), some, but not all, of these reports have further noticed a stabilization in PCI and total revascularization in the most recent years (3,5,6,8,10). However, those studies were carried out in inpatient settings and their results should be interpreted with caution, because they may not encompass all revascularization practices (1,11–13).

**Table 1** Temporal Trends in Coronary Revascularization, by Type, in Olmsted County, 1990 to 2004

<table>
<thead>
<tr>
<th>Rates Per 100,000* / Rate Ratios (95% CI)†</th>
<th>p Value (Linear Trend)‡</th>
<th>p Value (Interaction)</th>
<th>1990 to 1994</th>
<th>1995 to 1999</th>
<th>2000 to 2004</th>
</tr>
</thead>
<tbody>
<tr>
<td>Any coronary revascularization</td>
<td></td>
<td></td>
<td>342.9</td>
<td>419.5</td>
<td>452.7</td>
</tr>
<tr>
<td>(1 (reference)</td>
<td>1.15 (1.01-1.31)</td>
<td>1.21 (1.07-1.37)</td>
<td>—</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Percutaneous coronary interventions</td>
<td></td>
<td></td>
<td>203.5</td>
<td>270.7</td>
<td>335.4</td>
</tr>
<tr>
<td>Overall</td>
<td>1 (reference)</td>
<td>1.25 (1.09-1.44)</td>
<td>1.50 (1.31-1.72)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Age group</td>
<td></td>
<td></td>
<td>184.7</td>
<td>221.0</td>
<td>259.7</td>
</tr>
<tr>
<td>25–74 yrs</td>
<td>1 (reference)</td>
<td>1.19 (0.82-1.77)</td>
<td>1.40 (0.98-2.01)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>≥75 yrs</td>
<td>430.5</td>
<td>836.1</td>
<td>1.17 (1.00-1.37)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>298.3</td>
<td>390.7</td>
<td>469.5</td>
</tr>
<tr>
<td>Men</td>
<td>1 (reference)</td>
<td>1.23 (1.03-1.46)</td>
<td>1.43 (1.21-1.69)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Women</td>
<td>117.2</td>
<td>160.1</td>
<td>211.1</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Coronary artery bypass grafting</td>
<td></td>
<td></td>
<td>139.3</td>
<td>148.8</td>
<td>117.3</td>
</tr>
<tr>
<td>Overall</td>
<td>1 (reference)</td>
<td>1.01 (0.85-1.19)</td>
<td>0.77 (0.65-0.92)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Age group</td>
<td>117.7</td>
<td>122.9</td>
<td>89.6</td>
<td>0.1461</td>
<td>0.1739§</td>
</tr>
<tr>
<td>25–74 yrs</td>
<td>1 (reference)</td>
<td>1.04 (0.68-1.59)</td>
<td>0.76 (0.49-1.19)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>≥75 yrs</td>
<td>400.6</td>
<td>444.0</td>
<td>422.4</td>
<td>0.9357</td>
<td>—</td>
</tr>
<tr>
<td>Gender</td>
<td>1 (reference)</td>
<td>1.08 (0.73-1.60)</td>
<td>1.02 (0.69-1.50)</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Men</td>
<td>220.1</td>
<td>227.3</td>
<td>181.3</td>
<td>0.0037</td>
<td>0.9555</td>
</tr>
<tr>
<td>1 (reference)</td>
<td>0.97 (0.79-1.19)</td>
<td>0.75 (0.61-0.93)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
<tr>
<td>Women</td>
<td>65.7</td>
<td>76.5</td>
<td>57.9</td>
<td>0.0715</td>
<td>—</td>
</tr>
<tr>
<td>1 (reference)</td>
<td>1.14 (0.84-1.55)</td>
<td>0.85 (0.62-1.17)</td>
<td>—</td>
<td>—</td>
<td></td>
</tr>
</tbody>
</table>

*Unadjusted rates per 100,000 persons. †The rate ratios (RRs) are adjusted for age and gender; the age-specific RRs are adjusted for gender; the gender-specific RR are adjusted for age. ‡The p values for linear trend refer to the adjusted RR. §For the assessment of the age by year interaction, age was defined using 10-year intervals. CI = confidence interval.
The present study incorporates data from a geographically defined community over a long period of time, including recent years, thereby addressing this gap in knowledge. The use of PCI increased steadily over time along with a decline in CABG, resulting in a net moderate increase in total revascularization. Although the driving forces of these diverging trends remain to be defined, several key factors have been the focus of this study, as detailed subsequently.

**Age and gender effect.** Because the burden of cardiovascular disease has shifted toward elderly persons and women (31–33), age and gender are likely to play a crucial role in any current cardiovascular procedural trend. Moreover, because disparities in the use of coronary revascularization for women and elderly persons have been documented in earlier studies (14–18), it is essential to monitor temporal trends in these specific groups.

Several studies have found a progressive increase in utilization among the elderly of both CABG (2,7–10,21) and PCI (1–3), whereas trends by gender have been less consistent with some (2,19), but not all (3,4,8,21), studies reporting a greater increase in women relative to men. However, many of the studies were carried out in selected populations, such as Medicare beneficiaries, patients from a single institution or persons after myocardial infarction.

The present study thus provides important new knowledge on this topic by demonstrating that, in the community, an increasing proportion of PCI, more than of CABG, is performed in elderly persons and women. These findings are likely due to a combination of several factors, including demographic changes occurring in the population (31,33), gender differences in CAD manifestation (34,35), greater tendency and awareness among health care providers of the preexisting treatment differences by age and gender (19,36), and perception of the upper age limit for CABG (7). Note that the latter perception may differ by type of CABG, because promising results have been reported for elderly patients undergoing off-pump CABG (37).

### Incident and recurrent procedures.

Trends in incident and recurrent procedures are likely driven by different mechanisms. Incident procedures are affected by trends in incidence and prevalence of CAD, changing clinical indications for revascularization, and the effectiveness of alternative treatments. Recurrent procedures are determined by the prevalence and type of previous revascularization and by technical innovations that reduce the likelihood of restenosis (3).

Little is known about trends according to incident status. Although some studies have suggested a decreasing rate of recurrent procedures (3,21), others have reported the opposite (7,38). However, none of those studies was conducted in a defined community, so the reported trends are challenging to interpret in terms of their implications in the practice of cardiology.

The present study indicates that the sizable increase in recurrent procedures was the dominant force for the upward trend in PCI use, whereas incident procedures have increased to a lesser extent. In contrast, a comparable decrease in CABG rates was shown between incident and recurrent procedures.

### Angiography use and results.

Although CABG and PCI are alternative methods of coronary revascularization,
CABG surgery is traditionally seen as an approach indicated mainly for extensive CAD. However, as experience and technology have evolved, through simple balloon angioplasty, to bare metal coronary stents, and then drug-eluting stents, PCI has been increasingly used for coronary anatomy of increasing complexity (24). Therefore, the use and results of angiography are key elements to consider in interpreting revascularization trends.

Two recent studies, one from the U.S. and the other from Canada, have reported an increasing use over time of cardiac catheterization (2,4). However, in the present study, no change in the use of angiography was noted. A possible explanation for these conflicting results might be the differences between the study populations. Whereas Lucas et al. (4) studied Medicare patients (usually age 65 years or more), Alter et al. (2) examined trends among Ontario residents (with no age limit). Because the age-specific procedure rates in the Canadian study lagged far behind those of the American study, and the latter was limited to elderly persons, the applicability of these findings to U.S. practice is unclear. These considerations notwithstanding, the stable rates of coronary angiography noted in Olmsted County during the study period facilitate the interpretation of angiographic findings and ensuing revascularization practice.

A single study suggested an increase in single-vessel disease and a decrease in 3-vessel disease (21). The present study extends those findings by indicating that a decrease in severe CAD, defined as LM and/or 3-vessel disease, occurred along with a substantial increase in angiographic findings not meeting criteria for significant disease, suggesting a decreasing threshold for undertaking coronary angiography. However, the temporal decline in CAD severity observed in our study need not be influenced by the more liberal approach to angiography, because each of the angiographic categories was assessed individually (i.e., not only proportionally to other categories).

Although CABG is still indicated chiefly for multivessel and/or LM disease (5,39), our findings on revascularization trends likely reflect, at least in part, changes in the severity of angiographic CAD. Temporal changes in the use of PCI for more complex disease and a decreasing threshold for performing revascularization may play complementary roles.

**Study limitations.** Our findings pertain to a single community, and the extent to which they represent other populations, given regional variation across the U.S. (40) and the limited ethnic diversity of this community (27), may be questioned. In addition, different staffing patterns could have altered the results. Still, utilization rates among Medicare beneficiaries in Rochester do not exceed the national average in any of the procedures studied (41), and mortality rates from cardiovascular diseases in Olmsted County are commensurate with national rates (31). Because these data are restricted to local residents, the study is not subject to referral bias (42). Finally, because the main objective of this study was to evaluate specific trends in the practice of coronary revascularization by procedure type, demographic groups, and incident status, there is no plausible reason to believe that the observed patterns differ materially from other settings. This is particularly true because this study focuses on well established widely available techniques.

Although no study could be generalizable to the entire U.S. population, the value of Olmsted County studies lies in the ability to measure in 1 population the comprehensive utilization of revascularizations and interpret the large changes observed in light of the presence and severity of angiographic CAD, which were lacking up to this point. It is noteworthy that our data do not include referral indications or clinical indicators such as ejection fraction or diabetes status; therefore, inferences about appropriateness of care cannot be made from this study.

**Conclusions**

In Olmsted County over the 15-year period, a moderate increase in coronary revascularization was observed. This was primarily related to a rapid increase in PCI incompletely offset by a concomitant decline in CABG. Trends in PCI varied between demographic groups, with greater increases in elderly persons and women. Furthermore, recurrent procedures rather than incident procedures were the major driver of the increase in PCI. A decrease in the extent and severity of CAD occurred during this period and likely played a key role in the changing face of coronary revascularization.

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REFERENCES