Endovascular Aortic Aneurysm Repair in Patients With the Highest Risk and In-Hospital Mortality in the United States

Carlos H. Timaran, MD; Frank J. Veith, MD; Eric B. Rosero, MD; J. Gregory Modrall, MD; Frank R. Arko, MD; G. Patrick Clagett, MD; R. James Valentine, MD

Background: A randomized clinical trial from the United Kingdom (EVAR trial 2) comparing endovascular aortic aneurysm repair (EVAR) with no intervention found no advantage for EVAR in patients with high risk. This finding was predominantly caused by the substantial in-hospital mortality after EVAR (9%).

Hypothesis: The nationwide in-hospital mortality for patients with the highest risk undergoing EVAR in the United States is lower than that reported in EVAR trial 2.

Design: Population-based, cross-sectional study.

Setting: The 2001-2004 Nationwide Inpatient Sample.

Patients and Methods: The Nationwide Inpatient Sample identified EVAR procedures for nonruptured abdominal aortic aneurysms. Risk stratification was based on comorbidities and the Charlson comorbidity index, a validated predictor of in-hospital mortality after abdominal aortic aneurysm repairs. Weighted univariate and logistic regression analyses were used to determine the association between comorbidity measures and risk-adjusted in-hospital mortality.

Results: During the 4-year period, 65,502 EVARs were performed with an in-hospital mortality of 2.2%. Risk-adjusted in-hospital mortality rates ranged from 1.2% to 3.7%. Stratified analyses, including only elective EVAR procedures, revealed that in-hospital mortality was significantly higher in patients with the most severe comorbidities (1.7%) vs those with lower comorbidity (0.4%; \( P < .001 \)). Patients with high risk had only a 1.6-fold increased risk of adjusted in-hospital mortality (odds ratio, 1.6; 95% confidence interval, 1.2-2.2) compared with patients with low risk.

Conclusions: The EVAR procedure is currently being performed in the United States with low in-hospital mortality, even in patients with the highest risk. Therefore, EVAR should not be denied to high-risk patients with abdominal aortic aneurysms in the United States on the basis of the level I evidence from the United Kingdom study.

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The recent evidence report and technology assessment prepared for the Agency for Healthcare Research and Quality comparing endovascular and open surgical repairs for nonruptured abdominal aortic aneurysms (AAAs) revealed that endovascular aortic aneurysm repair (EVAR) is associated with improved perioperative outcomes, but it does not improve long-term survival or quality of life. \(^1\) Despite these data, EVAR has been rapidly replacing open repair for the treatment of infrarenal AAAs. According to national hospital databases, there has been a 600% increase in the annual number of EVAR procedures performed in the United States since 2000. \(^2\) Although EVAR is associated with higher in-hospital costs compared with open repair, EVAR now accounts for nearly half of all AAA repairs.

Endovascular aortic aneurysm repair is associated with lower 30-day morbidity and mortality rates compared with open repair. \(^3,4\) Endovascular aortic aneurysm repair is therefore widely used to treat patients with the highest risk in the United States, as recommended by the joint council of the vascular surgery societies. \(^4\) However, a recent United Kingdom (UK) randomized clinical trial (EVAR trial 2) \(^5\) that compares EVAR with no intervention found no advantage for EVAR in patients deemed medically unfit for open repair. This finding was to a great extent due to the substantial in-hospital (9%) and pre-procedural (8%) mortality in the group randomized to undergo EVAR. Despite being a methodologically high-quality randomized clinical trial, EVAR trial 2 was critically limited by long delays between randomization and treatment for those patients assigned to EVAR. Because no ran...
domized clinical trials comparing EVAR with open repair and/or no intervention have been completed in the United States, it is unclear how the results of EVAR trial 2 and other European trials\(^6,7\) should influence the treatment of patients with AAAs in this country, particularly of those considered to be medically unfit for open repair. Moreover, the level I evidence from the UK trial may prompt US health care organizations and funding agencies to deny reimbursement for EVAR in patients with the highest risk, resulting in improper denial of treatment in this population. It is therefore imperative to establish the outcomes of patients with the highest risk already undergoing EVAR in the United States.

The purpose of this study was to determine the nationwide, risk-adjusted procedural mortality for patients undergoing EVAR in the United States and to evaluate whether the in-hospital EVAR mortality among patients with the highest surgical risk were comparable with those reported in EVAR trial 2.\(^2\)

### METHODS

The Nationwide Inpatient Sample from the Healthcare Cost and Utilization Project was used to identify all EVAR procedures performed from 2001 to 2004. The Nationwide Inpatient Sample is the largest all-payer inpatient database in the United States.\(^8\) It represents a 20% stratified sample of inpatient admissions to US academic, community, and acute care hospitals nationwide (about 1000 hospitals in 35 states, excluding federal and prison hospitals). Typical discharge data collected include demographics, primary and 14 different secondary diagnoses, primary and 14 different secondary procedures per patient as identified by International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) codes, length of stay, charges, and outcomes. Sampling weights are provided for accurate calculations based on the complex survey design. The Nationwide Inpatient Sample core inpatient files were used for data extraction and analysis for the most recent years available (2001-2004). Because Nationwide Inpatient Sample data are publicly available and contain no personal identifying information, this study was exempt from institutional review board approval.

The ICD-9-CM coding system has had a specific code for EVAR since October 2000. All EVAR procedures since 2001 were therefore included in this analysis, as this was the first year during which endovascular repairs were properly coded in this database. For the purpose of this study, patients undergoing EVAR were identified by primary diagnostic code (ICD-9-CM 441.4; intact, nonruptured AAA) and the specific procedure code (ICD-9-CM 39.71). Patients younger than 50 years and those with primary or secondary diagnostic codes for ruptured AAA; aortic dissection; thoracic or thoracoabdominal aortic aneurysm; Marfan syndrome and other congenital anomalies; coartation of the aorta; Turner syndrome; and polyarteritis nodosa were excluded from the analysis. Based on 15 diagnosis codes (ICD-9-CM) and the clinical classification software (Agency for Healthcare Research and Quality, Rockville, Md) coding system included in the data, which limits and prevents overcoding,\(^9\) we calculated a comorbidity index using a modified Charlson comorbidity index (CCI),\(^10\) a validated measure for use with administrative data that correlates with inhospital morbidity and mortality after surgical procedures, including elective AAA repairs.\(^11\) Each of the indicated diagnoses is assigned a weight and summed to provide a patient's total score. The ability of the CCI to predict in-hospital mortality was initially assessed. Once validated, the CCI was further used to define 4 surgical risk–based groups according to their comorbidities (score interquartile range, 0-3; 0 indicating low-risk vs ≥3 indicating greatest comorbidity) for analyses.

The primary outcome endpoint was in-hospital mortality, ie, deaths that occur during the same hospitalization as EVAR. Mortality data were available directly from the data set, which are entered as died during hospitalization and is coded from the disposition of the patient. Healthcare Cost and Utilization Project quality control procedures are routinely performed to confirm that data values are valid, consistent, and reliable.\(^12\)

There were an estimated 65,502 EVAR procedures performed for nonruptured AAAs during the 4-year period. Of these, 85.5% were elective procedures. The estimated number of EVARs significantly increased, from 13,980 in 2001 to 19,890 in 2004 (\(P<.001\)). Patient characteristics and comorbidities are listed in Table 1. The crude in-hospital mortality was 2.2%. Older age, female sex, a high CCI, an emergent or urgent EVAR, and admissions on weekends were identified as independent predictors for in-hospital mortality using multivariate logistic regression analyses (Table 2). Risk stratification was further performed using the CCI, which was validated as an independent predictor of EVAR in-hospital mortality (per point increase in CCI, OR, 1.12; 95% CI, 1.06-1.20) after adjusting for age and sex. Risk-adjusted in-hospital mortality revealed that a higher CCI score was associated with early death (1.8%, 2.0%, 2.2%, and 3.7% for a CCI score of 0, 1, 2, and ≥3, respectively; \(P<.001\)).

Patients undergoing elective EVAR had significantly lower in-hospital mortality than those undergoing urgent or emergent EVAR procedures (0.9% vs 8.4%, respectively; \(P<.001\)). Of note, nonelective EVAR was associated with an 8-fold increased risk of periprocedural-adjusted mortality (OR, 8.2; 95% CI, 7.1-9.4). We found that patients admitted on weekends who underwent EVAR (3%) also had significantly higher in-hospital mortality (12.3%) after adjusting for possible interactions with the type of admission (elective vs nonelective) using logistic regression (OR, 2.1; 95% CI, 1.7-4.9; \(P<.001\)). As expected, most EVAR procedures in patients admitted on weekends were con-
The results of this study indicate that EVAR is currently being performed in the United States with low in-hospital mortality despite its frequent use in patients with severe comorbidities that conceivably may render them unfit for open repair (11%; 7132 of 65502 procedures), according to recent reports. US nationwide statistics also specifically demonstrate that patients with the highest risk and associated comorbidities have significantly lower in-hospital mortality than their medically unfit counterparts, as reported by EVAR trial 2. On the basis of these mortality figures, we conclude that EVAR should not be denied to high-risk patients with AAA in the United States. Our findings also indicate that EVAR should be offered as an elective procedure, because nonelective EVAR presumably performed in patients with symptomatic AAAs was associated with an 8-fold increased risk of in-hospital mortality.

Several observational studies have assessed perioperative outcomes of EVAR in patients with the highest risk. Most series have consistently reported excellent technical success and low rates of morbidity and mortality after EVAR in patients with significant comorbidities. Similar favorable perioperative outcomes have been recently reported in large population-based studies. Anderson et al reported the outcomes of EVAR vs open repair from 2000 to 2002 using the New York Statewide Planning and Research Cooperative System. During the 3-year study period, a significant increase in the number of EVARs occurred (137 in 2000 vs 871 in 2002), which coincided with approval of endografts by the US Food and Drug Administration and reimbursement for the procedures. Despite being preferentially used in elderly patients with high-risk medical comorbidities, EVAR was associated with fewer postoperative complications and significantly lower mortality compared with open repair. In fact, in-hospital mortality for EVAR decreased from 1.14% in 2001 to 0.80% in 2002. More recently, Lee at al compared the perioperative outcomes of EVAR and open surgical AAA repair, analyzing the 2001 National Inpatient Sample database. That year, 4607 patients underwent open repair, whereas 2565 underwent EVAR. Despite the fact that patients undergoing EVAR had substantially more comorbid cardiovascular conditions than those undergoing open repair, perioperative mortality was significantly lower following EVAR than after open repair (1.3% vs 3.8%; P<.001). Although perioperative outcomes were

### Table 1. Study Population (N = 65502)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Value, No. (%)</th>
</tr>
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<tbody>
<tr>
<td>Sex</td>
<td></td>
</tr>
<tr>
<td>M</td>
<td>54,300 (82.9)</td>
</tr>
<tr>
<td>F</td>
<td>11,202 (17.1)</td>
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<tr>
<td>Age, y</td>
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<tr>
<td>50-59</td>
<td>2,994 (4.57)</td>
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<tr>
<td>60-69</td>
<td>16,269 (24.84)</td>
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<tr>
<td>70-79</td>
<td>30,094 (45.94)</td>
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<tr>
<td>≥80</td>
<td>16,145 (24.65)</td>
</tr>
<tr>
<td>No. of cases performed per year</td>
<td></td>
</tr>
<tr>
<td>2001</td>
<td>13,980 (21.34)</td>
</tr>
<tr>
<td>2002</td>
<td>14,076 (21.49)</td>
</tr>
<tr>
<td>2003</td>
<td>17,556 (26.80)</td>
</tr>
<tr>
<td>2004</td>
<td>19,690 (30.37)</td>
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<tr>
<td>Charlson comorbidity index score</td>
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<tr>
<td>0</td>
<td>20,181 (30.81)</td>
</tr>
<tr>
<td>1</td>
<td>24,739 (37.77)</td>
</tr>
<tr>
<td>2</td>
<td>13,450 (20.53)</td>
</tr>
<tr>
<td>&gt;3</td>
<td>7,132 (10.89)</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
</tr>
<tr>
<td>Coronary artery disease</td>
<td>11,963 (18.26)</td>
</tr>
<tr>
<td>Heart failure</td>
<td>5,795 (8.71)</td>
</tr>
<tr>
<td>Cardiac valvular disease</td>
<td>75 (0.12)</td>
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<tr>
<td>Chronic obstructive pulmonary disease</td>
<td>20,147 (30.76)</td>
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<tr>
<td>Renal insufficiency</td>
<td>2,254 (3.44)</td>
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<tr>
<td>Diabetes mellitus</td>
<td>8,489 (12.96)</td>
</tr>
<tr>
<td>Hypertension</td>
<td>40,891 (62.43)</td>
</tr>
</tbody>
</table>

### Table 2. Independent Predictors of In-Hospital Mortality After Endovascular Abdominal Aortic Aneurysm Repair*

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Coefficient</th>
<th>Odds Ratio (95% Confidence Interval)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>0.037</td>
<td>1.04 (1.03-1.04)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Female sex</td>
<td>0.377</td>
<td>1.46 (1.26-1.68)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Charlson comorbidity index score</td>
<td>0.120</td>
<td>1.12 (1.06-1.20)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Emergent or urgent EVAR</td>
<td>2.110</td>
<td>8.25 (7.21-9.44)</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Admission during the weekend</td>
<td>0.719</td>
<td>2.05 (1.70-2.47)</td>
<td>&lt;.001</td>
</tr>
</tbody>
</table>

*Variables entered into the multivariate regression models were selected by stepwise selection if P<.05.
†Odds ratio of in-hospital mortality.

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not specifically adjusted according to surgical risk in these large state and national administrative databases, overall, perioperative outcomes clearly favor EVAR over open repair in community hospitals in the United States.

A recent evidence-based report prepared under the auspices of the Agency for Healthcare Research and Quality assessed the treatment options for intact AAAs. The recommendations and reported results were primarily based on randomized clinical trials (conducted outside the United States) that frequently included endografts that are not approved for use in the United States. Among patients fit for open repair and with an AAA of 5.5 cm or larger, EVAR was found to be associated with lower perioperative morbidity and mortality and decreased 4-year aneurysm-related mortality. For patients medically unfit for open repair because of comorbidities, the report concluded that EVAR does not improve survival compared with no intervention. These results were based on the UK EVAR trial 2, a methodologically high-quality study and the only randomized clinical trial that has evaluated EVAR vs no intervention for patients with large AAAs (≥5.5 cm) who were deemed medically unfit for open repair because of cardiac, pulmonary, or renal comorbidities (338 of 1741 patients with AAA suitable for EVAR who had a fitness assessment). The lack of benefit of EVAR was in part due to the unexpectedly high in-hospital mortality (9%) and the 8% preprocedural mortality in the group randomized to undergo EVAR. This perioperative mortality was significantly higher in the sicker patients in EVAR trial 2 than those receiving EVAR who were judged medically fit for surgery in EVAR trial 1 (9% vs 2%; P<.001). When urgent or emergent EVAR cases were excluded from the analyses in EVAR trial 2, the 30-day EVAR mortality was still 7%. Several criticisms have been raised about the EVAR trial 2 results that limit their applicability in the United States. First, 9 ruptures and 14 deaths occurred in the EVAR group prior to elective repair probably because of long delays in treatment (median time from randomization to EVAR, 57 days). Second, multiple patient crossovers from the no-intervention group occurred (47 of 172 patients) without explanation in the majority of cases (28 of 47 patients). Surprisingly, 12 of these patients underwent open repair, raising concern that these patients may not have truly been medically unfit. Finally, the inclusion criteria used in this study were subjective and affected by individual interpretation. Eligibility for EVAR trial 2 was determined locally according to cardiac, respiratory, and renal comorbid conditions; a pragmatic approach was used to determine fitness. This nonrigorous subjective method of determining fitness status critically limits the utility and applicability of the results of this trial to other settings, particularly to the United States. Other confounding variables—such as intensive treatment of comorbidities, provider experience with EVAR, and the lack of treatment delays—may lead to different outcomes in the United States than in the UK with EVAR trial 2.

Because the evidence report prepared for the Agency for Healthcare Research and Quality could have implications for reimbursement of EVAR in patients with high risk by health care organizations and funding agencies in the United States, the Society for Vascular Surgery Outcomes Committee recently published risk-adjusted outcomes of EVAR using data of 5 nonrandomized investigational device exemption studies leading to US approval of endografts by the Food and Drug Administration. High-risk criteria included being aged 60 years or older and having at least 1 cardiac, pulmonary, or renal comorbid condition. The 30-day operative mortality for EVAR was 2.9% in this high-risk group. The results of this study, which were included in the evidence report for the Agency for Healthcare Research and Quality, have been criticized, because the inclusion criteria for the investigational device exemption studies usually required that patients were candidates for open repair; 75% of patients with high risk had only 1 comorbidity, whereas less than 1% had all 3 comorbidity conditions. Therefore, the evidence report concluded that the outcomes of the high-risk group in this study are not comparable with those reported for the patients who were considered medically unfit for open repair in EVAR trial 2.

Although the present study is large, recent, and based on the entire spectrum of EVAR experience in the United States, several important limitations should be acknowledged. First, risk-adjusted in-hospital mortality was based on the CCI, which limits assessment of the severity of the different morbidities and therefore precludes any direct comparison with EVAR trial 2. The CCI, however, proved to be an independent predictor of in-hospital mortality and adequately discriminated risk-adjusted early deaths. Moreover, the importance of reporting nationwide statistics of in-hospital mortality is that this large cohort necessarily has to include the equivalent EVAR trial 2 patients considered medically unfit for open repair, as EVAR has certainly been offered to such patients since its introduction in the United States. Our risk-adjustment strategy categorized only 11% of all patients as those with the highest surgical risk, which, as defined in this study, clearly do not reside within the population of the EVAR trial 1 and very likely were medically unfit for open repair. In fact, the distribution of comorbidities revealed that among the highest-risk group (CCI ≥3), 13% had at least 1 major comorbidity, 62% had 2, and 25% had 3 comorbidities. By comparison, among 1741 eligible patients with AAA anatomically suitable for EVAR who had fitness assessed and were initially considered for enrollment into EVAR trial 1 and EVAR trial 2, 399 (23%) were deemed unfit for open repair. These data suggest that our proportionally smaller group of patients with the highest operative risk may include patients who may be as sick as or even sicker than the proportionately larger group of patients in EVAR trial 2, who were considered medically unfit for open repair.

A second limitation of this study is that we were unable to evaluate unfit patients with large AAAs who were not offered EVAR. We acknowledge that exclusion of these patients may have led to a lower mortality rate in the study population, but our data suggest that relatively few patients will be too ill for EVAR. The subgroup with CCI scores greater than 5 had a mortality rate approaching those of the EVAR trial 2, but these subjects represented less than 0.5% of the study population. At the very least, the low overall mortality rate for unfit patients in this study
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Carlos H. Timaran, MD, University
Correspondence: the level I evidence from EVAR trial 2.

hospital mortality, even in patients with the highest risk.

It may result in improved long-term mortality, such hy-
pothesis can only be tested with prospective studies.

In conclusion, this study demonstrates that EVAR is cur-
rently being performed in the United States with low in-
hospital mortality, even in patients with the highest risk.
US nationwide mortality rates indicate that EVAR should
not be denied to high-risk AAA patients in the United States
because of their alleged high perioperative mortality from
the level I evidence from EVAR trial 2.

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Rosero. Analysis and interpretation of data: Timaran, Veith,
Rosero, Modrall, Arko, Clagett, and Valentine. Drafting
of the manuscript: Timaran, Veith, and Valentine. Criti-
cal revision of the manuscript for important intellectual con-
tent: Timaran, Veith, Rosero, Modrall, Arko, Clagett, and
Valentine. Statistical analysis: Timaran and Rosero.
Administrative, technical, and material support: Timaran,
Modrall, Clagett, and Valentine. Study supervision:
Timaran, Veith, Modrall, Clagett, and Valentine.
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The discussions that follow this article are based on the
originally submitted manuscript and not the revised
manuscript.

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Endovascular Aneurysm Repair (EVAR) trials: design, methodology and progress.

DISCUSSION

Bruce L. Gewertz, MD, Los Angeles, Calif: This is an interesting
report, well analyzed and well presented. The data clearly
show that endovascular aneurysm repairs are increasing and
that they are quite safe in properly selected patients.

The authors contrast the excellent results presented here
with the higher mortality in the randomized EVAR-2 study
from the UK. They properly point out the high preprocedural
death and rupture rate and the untoward procedural mortal-
ity in the British study. These are important and relevant points
but mostly demonstrate the differences between a randomized
trial and a retrospective one. I have one question and one
comment.

In this day and age, what really is high risk, and what hap-
ens when it is assessed retrospectively? Given the types of pa-
tients that we now treat routinely, advanced age and the mere
presence of moderate chronic obstructive pulmonary disease
(COPD) and coronary disease may no longer represent the haz-
ard they used to be. If high risk was more specifically and rig-
orously defined by markers like dependence on home oxygen
and marked reduction in ventilricular ejection fraction, we might
have a better sense of the real risk of EVAR in the patients who
are not suitable candidates for open repair. This small group,
after all, is the key demographic for this treatment.

Finally, as our experience grows, as the devices get smaller
and better, and as the complications of insertion of the devices
decrease, the real challenge for vascular surgeons is determi-
ning who are the proper candidates for EVAR based on the du-
rability of repair, not the safety of repair. Is it really a better
procedure in the long run for the patient with marginal anatomy
and angulated neck or juxtarenal location, or the fit 70-year-
old? I would submit that irrespective of the safety of the initial
endovascular procedure, which is well delineated here by the
Southwestern Group, that open repair with its definitive out-
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Endovascular Aneurysm Repair (EVAR) trials: design, methodology and progress.
comes and equivalent risks may still be preferred in many patients.

**Dr Valentine:** You ask, what is high risk? As you know, there are many indices and other tools that have been used to predict operative mortality. In this cross-sectional, population-based study, we used the Charlson comorbidity index, which is a validated measure that has been used to assess operative risk in many other surgical procedures, including bariatric surgery, open aneurysm repair, and coronary bypass.

Instead of looking at isolated comorbidities, patients are stratified according to a scoring system that is a compendium of all weighted morbidity that you saw on the slide presented by Dr Timaran. An index score of 3 or greater indicates the highest surgical risk and represented 11% of the patients in the entire cohort of 65,000. Based on the present data, we can say that patients in this group have a relatively low mortality after endovascular aneurysm repair, approximately one seventh of that reported in the British study.

We did a further analysis within this group and found that a patient had to reach a score of 5 or 6 in order to have an increased operative mortality. However, this represented only 300 patients out of the 65,000 in this study, or less than 0.5%. At the very least, the low operative mortality in this study indicates that we are choosing the patients properly, and our data suggest that very few patients should be denied EVAR in elective circumstances.

Regarding your question about long-term applicability of this technology, we obviously did not look at late mortality or the need for reintervention in this study. I would speculate that there would be a significant decrease in aneurysm-related mortality in the EVAR patients. Considering the EVAR-2 data, we might expect a 4-year mortality rate of 7%, compared to 20% in patients who did not receive any type of repair at all. I cannot comment on the open repairs.

Now, this might translate into improved all-cause mortality, but, of course, most patients will die of nonaneurysm-related cause. Taking the data from EVAR-2 and other trials, we can speculate that there would be about a 25% reintervention rate. Routine surveillance is clearly needed in these patients.

**Walter J. McCarthy, MD, Chicago, Ill:** This paper supports the use of EVAR for the sometimes very high-risk patients that we are treating in the United States. My question is about the odds ratio change for patients with nonelective procedures and particularly those admitted on the weekend. Is this because of increased difficulty in getting these patients to treatment? Could it be because of insufficient industry support on the weekends?

**Dr Valentine:** That is a good question. Since most of our hospitals do not stock a full complement of endovascular grafts that will fit every patient, we all rely on the availability of pharmaceutical representatives to bring additional equipment to the hospital when needed. I do not know whether that had an effect on patients admitted over the weekend, when the pharmaceutical representatives might not be available. On the other hand, weekend admission is probably a marker for a symptomatic aneurysm, or at least for the need to perform an urgent operation. It is pretty clear that an emergent or urgent operation was associated with a significantly increased risk of death in these patients. And, of all of the things that we looked at, that was the most important predictor of operation, not the risk-related morbidity and mortality on our index.

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