30-Day Mortality and Major Complications after Radical Prostatectomy: Influence of Age and Comorbidity

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Background: Radical prostatectomy is associated with excellent long-term disease control for localized prostate cancer. Prior studies have suggested an increased risk of short-term complications among older men who underwent radical prostatectomy, but these studies did not adjust for comorbidity.

Methods: We examined mortality and complications occurring within 30 days following radical prostatectomy among all 11,010 men who underwent this surgery in Ontario, Canada, between 1990 and 1999 using multivariable logistic regression modeling. We adjusted for comorbidity using two common comorbidity indices. Statistical tests were two-sided.

Results: Overall, 53 men (0.5%) died, and 2,246 (20.4%) had one or more complications within 30 days of radical prostatectomy. In models adjusted for comorbidity and year of surgery, age was associated with an increased risk of 30-day mortality (odds ratio = 2.04 per decade of age; 95% confidence interval [CI] = 1.23 to 3.39). However, the absolute 30-day mortality risk was low, even in older men, at 0.66% (95% CI = 0.2 to 1.1%) for men aged 70–79 years. In adjusted models, age was associated with an increased risk of cardiac (P_trend < .001), respiratory (P_trend = .01), and miscellaneous medical (P_trend = .058) complications. Similarly, increasing comorbidity was associated with a higher risk of all categories of complications. Conclusions: Increasing comorbidity is a stronger predictor than age of almost all categories of early complications after radical prostatectomy. The risk of postoperative mortality after radical prostatectomy is relatively low for otherwise healthy older men up to age 79. [J Natl Cancer Inst 2005;97:1525–32]

Prostate cancer is the most commonly diagnosed cancer in men and the third most common cause of cancer death in men (1). Most patients have localized disease at the time of diagnosis that is potentially curable with radical prostatectomy or radiation therapy. In comparison with conservative management, where the cancer is followed without local therapy (i.e., surgery or radiation), radical prostatectomy is associated with lower disease-specific mortality, lower rates of local progression and development of metastases, and higher overall survival (2).

Despite the impressive long-term outcomes with radical prostatectomy, less than 5% of men over age 70 with prostate cancer receive this treatment modality in Canada (3). In one American study of men with clinically localized disease, those under age 60 years were 25 times more likely to receive radical prostatectomy than those aged 70 years or older (4). In a recent survey, 69% of Canadian urologists and 53% of American urologists agreed with the statement that age 70 should be the upper age limit for radical prostatectomy (5).

Two possible explanations for these differences in the rate of radical prostatectomy by age have been proposed. First, clinicians may believe that older men with prostate cancer are less likely to live as long as younger men and, therefore, are less likely to benefit from aggressive treatment (6). Second, radical prostatectomy is associated with substantial potential morbidity and mortality, and many clinicians consider older men to be at higher risk of surgery-associated short- and long-term complications (7). Major long-term complications associated with radical prostatectomy include urinary and sexual dysfunction (8). Short-term, perioperative morbidities include cardiovascular complications (e.g., myocardial infarction, congestive heart failure, and arrhythmias), venous thromboembolism, rectal injury, and wound infection (9). Several studies have demonstrated higher radical prostatectomy complication rates with increasing age (9,10). Begg et al. studied complication rates among 11,522 men who underwent radical prostatectomy in the United States and reported that at least one postoperative complication was experienced by 28%, 31%, and 35% of men aged 65–69 years, 70–74 years, and 75 years or older, respectively (10). Major postoperative complications included cardiac (5.5% of patients), respiratory (11%), vascular (4.7%), wound-related or bleeding (2.6%), genitourinary (2.8%), miscellaneous medical (7.6%), and miscellaneous surgical (6.6%) complications (10).

Published studies on complications following radical prostatectomy are limited by a lack of information on the interaction among age, comorbid conditions, and complication rates. However, increasing comorbidity has been shown to increase the risk of a variety of adverse postoperative outcomes of a variety of surgical procedures (11,12). Indeed, in one of the few studies examining the impact of comorbidity on short-term complications, Begg et al. (10) demonstrated increasing 30-day mortality and postoperative complication rates with increasing comorbidity. However, the interaction between age and comorbidity was not examined.

As patients age, chronic comorbid illnesses become more common (13). However, association between age and comorbidity is imperfect, and many older adults have few or no comorbid conditions. Knowing the independent contribution of age and comorbidity to major short-term complications of radical prostatectomy is important for at least two reasons.
First, it will better inform discussions between patients and their surgeons about the treatment of localized prostate cancer (14). In particular, given the low utilization rates of radical prostatectomy in older men, it is important to obtain information about the relative safety or tolerability of radical prostatectomy in older men. Second, there is limited and sometimes conflicting information about which types of complications (e.g., cardiac, pulmonary) increase with age. Identification of specific complications that increase with advanced age may suggest approaches to decreasing these complications, such as increasing the use of preoperative beta-blockers and anticoagulants to prevent cardiac (15) and thromboembolic (16) complications, respectively.

The objectives of this study were to examine the rates of mortality and major complications occurring within 30 days following radical prostatectomy among all men who underwent this surgery in Ontario, Canada, between 1990 and 1999. We used a large administrative database from the Ontario Cancer Registry (OCR) to derive complication rates adjusted for both age and comorbidity. In particular, we investigated whether the low use of radical prostatectomy in men aged 70 or older is justified by the complication and/or mortality rates.

**Patients and Methods**

**Study Design**

This study was a retrospective cohort study of all patients diagnosed with incident prostate cancer between April 1, 1990, and March 31, 1999, in Ontario, Canada, who underwent radical prostatectomy. The data on the cohort were obtained from the OCR. Study approval was obtained from the research ethics board at the University Health Network. Given the anonymized nature of the data, the requirement for informed consent was waived.

The OCR is a comprehensive province-wide cancer database with case ascertainment rates in excess of 95% (17,18). This passive cancer registry combines information from four major sources. First, discharge information is obtained from all hospital separations in every acute care hospital in Ontario for patients diagnosed with cancer. The discharge data include up to 16 diagnostic codes and eight procedure codes, and these served as our primary source of information on comorbidities and complications. Second, information on cancer diagnosis and treatment is obtained from the nine Regional Cancer Centers in Ontario (including the Princess Margaret Hospital). All cancer patients undergoing radiation therapy and many of those receiving surgery or chemotherapy are seen at a Regional Cancer Center. Third, vital status information is obtained from both hospital discharge abstracts (in cases of in-hospital mortality) and from death certificate information from the Registrar General’s office (for any death in Ontario). Fourth, pathology reports are received from about 85% of acute care hospitals for cancer cases. We previously demonstrated 98% agreement between OCR data and detailed chart review for receipt of radical prostatectomy (19). Vital status information in the OCR has been shown to be over 99% accurate (20,21).

**Complications**

The major outcomes of interest were mortality and any complication that occurred within 30 days of radical prostatectomy. We included complications that occurred during either the index hospital admission or in any other hospital admission within 30 days of the date of radical prostatectomy. To develop a comprehensive list of possible complications, we began with published complication lists compiled by Lu-Yao (22) and by Begg (10). We used International Classification of Disease 9th revision (ICD-9) diagnostic codes identical to those used by investigators in those prior studies. Procedure codes were matched to corresponding codes in the Canadian Classification of Diagnostic, Therapeutic, and Surgical Procedures (23).

The initial list of complications was supplemented by a comprehensive literature search to identify all studies examining short-term complications after radical prostatectomy. We used combinations of the following search terms: prostatic neoplasms, radical prostatectomy, intraoperative/in-hospital/perioperative/postoperative complications, and mortality. We also searched surgical textbooks and published radical prostatectomy case series for potential complications. In addition, we reviewed the list of complications with three expert surgical oncologists to ensure that no possible complications had been missed. All complications were grouped into seven mutually exclusive categories (22)—cardiac, respiratory, vascular, wound/bleeding, genitourinary, miscellaneous medical, and miscellaneous surgical (lists of complications in each category are available at: http://jncicancer.spectrum.oxfordjournals.org/jnci/content/vol97/issue20/.

**Comorbidity**

Comorbidity was measured with two different approaches. First, we measured overall comorbidity using two different comorbidity indices commonly used in health services research, the Charlson Index (24) and the Diagnosis Count (25). [We used the Deyo modification of the Charlson Index (11)]. Second, we adjusted for the presence of specific medical illnesses that can affect short-term mortality (e.g., coronary artery disease, diabetes), as has been suggested by others (26). The following comorbid conditions were considered, based on a literature review of studies of postoperative complications after major surgical procedures: AIDS, anemia, cardiac disease (including prior myocardial infarction, other coronary artery disease, atrial fibrillation, and congestive heart failure), chronic obstructive pulmonary disease, connective tissue disease, dementia, diabetes, hypercholesterolemia, hypertension, liver disease, obesity, other malignancy, peptic ulcer disease, peripheral vascular disease, renal failure, and stroke (including transient ischemic attack).

**Statistical Analyses**

We first generated unadjusted mortality and complication rates by age group (<60 years, 60–69 years, and 70–79 years). These age groups were chosen to ensure an adequate number of patients in each group as well as to facilitate comparison with published studies.

We examined 30-day mortality using logistic regression. Because there were few deaths within 30 days of radical prostatectomy, we designed our model-building strategy to examine predictors of mortality so as to avoid overfitting (27). We began with univariate logistic regression analyses of mortality (dependent variable) with comorbidity (defined by the Charlson Index, the Diagnosis Count, or the presence of individual comorbid conditions), year of surgery (1995–1999 vs. 1990–1994), and age
as predictor variables. Age was modeled as a continuous variable using both single-order and higher-order polynomials. A multivariable model was created by including all predictor variables that were statistically significant \((P<.10)\) in univariate regression models.

Our model-building strategy for complications was slightly different from that for mortality because the larger number of outcomes allowed the use of more complex multivariable models. Each category of complications was modeled separately using logistic regression. For each set of models, patients who did not have a complication in that category (e.g., cardiac) were grouped together, whether they had a complication in another category. To minimize biases associated with stepwise selection strategies \((28)\), we included all predictor variables that were of interest in our initial models. Predictor variables were removed from the models only if there were too few observations to allow an estimate of the odds ratio (OR) for that variable, as was the case with several of the rarer comorbid conditions. To minimize assumptions about relationships (e.g., linear) between outcome and predictor variables, age, both comorbidity indices and year of surgery were modeled as categorical variables. We compared models containing the Charlson Index with models containing either the Diagnosis Index or individual comorbidity diagnoses to avoid double-counting of conditions contained within the Charlson Index. Because the models were not nested, those with the best discriminatory ability were identified using the c-statistic, which is equivalent to the area under the receiver operating characteristic curve \((29)\).

To examine the relationship between increasing age and probability of complications, we used the multivariable regression models with the best discriminatory ability for each complication to generate graphs of the predicted probability of each complication as a function of age among subjects with no comorbidity. Similar graphs were generated for comorbidity–complication relationships for subjects aged 60–69 years. Finally, to examine the interactions among age, comorbidity, and complications, we generated graphs for any complication for subjects in all possible age and comorbidity groups.

Goodness-of-fit testing for all logistic models was performed using the Hosmer-Lemeshow statistic \((30)\). Model discrimination was assessed using the c-statistic. Interaction terms were included for key predictor variables (i.e., age and comorbidity index). Because of sample size restrictions, tests for interaction were not performed for mortality models. \(P\) values of .05 were considered statistically significant. All analyses were performed using SAS version 8.12 (SAS Corporation, Cary, NC), and all statistical tests were two-sided.

**RESULTS**

Over the 10-year study period, 11,010 men (mean age = 62.6 years) underwent radical prostatectomy in the province of Ontario. Of these men, 2.6%, 26.5%, 59.8%, 10.2%, and 0.9% were less than 50 years, 50–59, 60–69, 70–74, and 75 years or older, respectively. Patients were generally healthy; the most common serious comorbid conditions were hypertension (13.3%), cardiac disease (6.7%), anemia (6.0%), diabetes (5.1%), and chronic obstructive pulmonary disease (4.5%). Only seven patients age 80 or older underwent radical prostatectomy, and these subjects were excluded from subsequent analyses.

**Thirty-Day Mortality**

Overall, 53 patients (0.48%) died within 30 days of radical prostatectomy. There was a monotonic increase in crude 30-day mortality with age, from 0.19% (95% confidence interval [CI] = 0.02% to 0.30%) for men under age 60 to 0.66% (95% CI = 0.2% to 1.1%) for men aged 70 to 79 years (Table 1). In univariate analyses, increasing age, Charlson score, Diagnosis Count, or the presence of cardiac disease, hypertension, or stroke was statistically significantly associated with higher 30-day mortality after surgery (Table 2). Having surgery in 1995–1999 was associated with a lower mortality risk than having surgery in 1990–1994. In multivariable analyses, the model with the best discriminatory ability included age, year of surgery, cardiovascular disease, and stroke (c-statistic = 0.69) (Table 2). Even after adjusting for comorbidity and year of surgery, increasing age continued to be associated with a statistically significant increase in 30-day mortality \((OR = 2.04\) per decade of age; 95% CI = 1.22 to 3.39). However, the absolute risk of 30-day mortality remained relatively low; for a 75-year-old man with no comorbidities, the predicted 30-day mortality was 0.74% (data not shown). There was no evidence for a nonlinear effect of age on 30-day mortality (data not shown). There was also no 5-year interval between ages 50 and 79 for which the risk of 30-day mortality did not rise with increasing age (data not shown).

**Complications**

Among the total cohort, 2246 men (20.4%) had at least one complication within 30 days of radical prostatectomy. Complication rates by category for all 11,010 men are shown in Table 1. In univariate analyses, increasing age was associated with increased risks of cardiac \((P_{\text{trend}} = .001)\), respiratory \((P_{\text{trend}} = .048)\), vascular

<table>
<thead>
<tr>
<th>Table 1. Complication and mortality outcomes (number and percentage) within 30 days among men who underwent radical prostatectomy by age group</th>
<th>All patients (N = 11010)</th>
<th>&lt;60 y of age (N = 3199)</th>
<th>60 to 69 y of age (N = 6587)</th>
<th>70 to 79 y of age (N = 1217)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Outcome</strong></td>
<td><strong>Mortality</strong></td>
<td>53 (0.48%)</td>
<td>6 (0.19%)</td>
<td>38 (0.58%)</td>
</tr>
<tr>
<td><strong>Complication</strong></td>
<td><strong>Any</strong></td>
<td>2246 (20.40%)</td>
<td>560 (17.51%)</td>
<td>1356 (20.59%)</td>
</tr>
<tr>
<td></td>
<td><strong>Cardiac</strong></td>
<td>309 (2.81%)</td>
<td>52 (1.63%)</td>
<td>187 (2.84%)</td>
</tr>
<tr>
<td></td>
<td><strong>Respiratory</strong></td>
<td>293 (2.66%)</td>
<td>76 (2.38%)</td>
<td>169 (2.57%)</td>
</tr>
<tr>
<td></td>
<td><strong>Vascular</strong></td>
<td>215 (1.95%)</td>
<td>41 (1.28%)</td>
<td>148 (2.25%)</td>
</tr>
<tr>
<td></td>
<td><strong>Wound</strong></td>
<td>555 (5.04%)</td>
<td>138 (4.31%)</td>
<td>342 (5.19%)</td>
</tr>
<tr>
<td></td>
<td><strong>Genitourinary</strong></td>
<td>829 (7.53%)</td>
<td>214 (6.69%)</td>
<td>502 (7.62%)</td>
</tr>
<tr>
<td></td>
<td><strong>Miscellaneous medical</strong></td>
<td>427 (3.88%)</td>
<td>112 (3.50%)</td>
<td>255 (3.87%)</td>
</tr>
<tr>
<td></td>
<td><strong>Miscellaneous surgical</strong></td>
<td>576 (5.23%)</td>
<td>154 (4.81%)</td>
<td>351 (5.33%)</td>
</tr>
</tbody>
</table>
D **ISCUSSION**

The overall trend was that as age increased, the risk of complications increased. This was true for both short-term and long-term outcomes after surgery, including radical prostatectomy (9, 10, 33, 34). In general, these studies have demonstrated an increasing 30-day mortality rate with increasing age. However, only two studies included men under age 65 (33, 34). One study reported an increasing 30-day mortality rate with increasing age (33), whereas the other study found no relationship between 30-day mortality and age (34).

Several previous studies have reported age-stratified 30-day mortality rates after radical prostatectomy (9, 10, 22, 31–33). In general, these studies have demonstrated an increasing 30-day mortality rate with increasing age. However, only two studies included men under age 65 (33, 34). One study reported an increasing 30-day mortality rate with increasing age (33), whereas the other study found no relationship between 30-day mortality and age (34). In the only study to examine the relationship between comorbidity and 30-day mortality, risk of mortality increased with increasing comorbidity (10).

Our study is the first, to our knowledge, to examine the relationship between age and 30-day mortality following radical prostatectomy after adjusting for comorbidity. The small increase in comorbidity-adjusted 30-day mortality with increasing age that we observed was equivalent to approximately a twofold increase in absolute risk per decade of age. How clinically important is this increase in risk? The 30-day mortality associated with radical prostatectomy has been decreasing over time (33, 34), and it remains low relative to that associated with other major surgeries in older adults (36, 37). In a decision analysis examining the optimal treatment of clinically localized prostate cancer, we found that radical prostatectomy was the preferred treatment option for otherwise healthy men up to age 75 with Gleason 5–7 or Gleason 8–10 tumors and that varying the probability of 30-day mortality after radical prostatectomy from 0.5% to 2% did not change the preferred treatment option (38). In other words, the range of probabilities of dying within 30 days observed in the current study (0.66% for men ages 70–79, 95% CI = 0.2% to 1.1%) would not alter the decision of whether to undergo surgery. Thus, for clinicians making recommendations about radical prostatectomy, the presence of specific comorbid medical conditions, particularly cardiovascular disease or stroke, both of which are associated with changes in both short- and long-term mortality, may be more important than age.

We found a 20% overall incidence of postoperative complications after radical prostatectomy, which is slightly lower than the range of 28%–30% reported in three large series (10, 22, 39). Several studies have also reported complication rates as a function of age (9, 10, 34, 40), and the three studies that examined the total rate of complications reported a positive relationship with age (9, 10, 40). By contrast, the relationship between age and specific categories of complications is less clear (9, 34). Lu-Yao et al. reported an increase in cardiopulmonary complications and in the need for surgical repairs of peri- or postoperative complications with increasing age but no relationship with vascular complications (9), whereas Wilt et al. found no relationship between age and the occurrence of cardiopulmonary complications, vascular complications, or colorectal injuries (34).

However, none of the above studies adjusted for the presence of comorbidity, even though comorbid medical illnesses have previously been shown to have a substantial impact on short-term outcomes after surgery, including radical prostatectomy (41).
Table 3. Multivariable models examining the risk of 30-day complication rates with age among men who underwent radical prostatectomy in Ontario, Canada, between 1990 and 1999

<table>
<thead>
<tr>
<th>Variable</th>
<th>Any complication</th>
<th>Cardiac</th>
<th>Respiratory</th>
<th>Vascular</th>
<th>Wound/bleeding</th>
<th>Genitourinary</th>
<th>Miscellaneous medical</th>
<th>Miscellaneous surgical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;60 y</td>
<td>1.00 (referent)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>60 to 69 y</td>
<td>1.08 (0.96 to 1.20)*</td>
<td>1.54</td>
<td>0.94</td>
<td>1.32</td>
<td>1.04</td>
<td>1.06</td>
<td>1.23</td>
<td>1.13</td>
</tr>
<tr>
<td>70 to 79 y</td>
<td>1.29 (1.09 to 1.52)</td>
<td>3.33</td>
<td>1.68</td>
<td>1.09</td>
<td>1.03</td>
<td>1.13</td>
<td>1.65</td>
<td>1.29</td>
</tr>
<tr>
<td>P trend</td>
<td>0.013</td>
<td>&lt;.001</td>
<td>.01</td>
<td>0.39</td>
<td>.089</td>
<td>.27</td>
<td>.058</td>
<td>.042</td>
</tr>
<tr>
<td>Diagnosis Count†</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1.00 (referent)</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>1</td>
<td>3.84 (3.31 to 4.46)</td>
<td>3.09</td>
<td>5.99</td>
<td>2.53</td>
<td>5.28</td>
<td>2.90</td>
<td>3.07</td>
<td>2.99</td>
</tr>
<tr>
<td>2</td>
<td>5.20 (4.44 to 6.09)</td>
<td>4.90</td>
<td>8.71</td>
<td>4.82</td>
<td>5.62</td>
<td>3.42</td>
<td>3.98</td>
<td>4.19</td>
</tr>
<tr>
<td>3</td>
<td>5.72 (4.78 to 6.84)</td>
<td>6.36</td>
<td>10.05</td>
<td>5.39</td>
<td>5.30</td>
<td>4.18</td>
<td>4.37</td>
<td>5.22</td>
</tr>
<tr>
<td>4 or more</td>
<td>8.03 (6.81 to 9.50)</td>
<td>9.97</td>
<td>12.62</td>
<td>5.66</td>
<td>9.74</td>
<td>4.21</td>
<td>6.18</td>
<td>6.84</td>
</tr>
<tr>
<td>P trend</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>c-statistic</td>
<td>0.70</td>
<td>0.74</td>
<td>0.73</td>
<td>0.71</td>
<td>0.72</td>
<td>0.67</td>
<td>0.68</td>
<td>0.76</td>
</tr>
</tbody>
</table>

*Numbers are odds ratios with 95% confidence intervals in parentheses. All models were adjusted for year of surgery.
†The Diagnosis Count (25) is a comorbidity index commonly used in health services research.
Indeed, we demonstrated statistically significant associations between number of comorbid conditions and each category of complications. Moreover, after adjustment for the presence of comorbidity, age was no longer statistically significantly associated with an increased risk in four of seven categories of complications. Because prior studies did not adjust for comorbidity, they may have overestimated the association of increasing age on the occurrence of certain complications.

Our findings have important clinical implications. Advancing age was primarily associated with an increased risk of cardiac complications and, to a lesser extent, with a higher risk of respiratory and miscellaneous medical complications. The strong association between increasing age and cardiac complications argues for both more careful preoperative evaluation of older men for the presence of subclinical cardiovascular disease and, for men who are selected for surgery, aggressive perioperative management in an effort to minimize cardiovascular complications. This management may include judicious use of perioperative beta-blockers, which have been associated with statistically significant reductions in cardiovascular morbidity and mortality in other surgical settings (15).

There are several limitations to our study. It is likely that men with serious comorbidities are underrepresented in our data set because these men are less likely to be offered and probably less willing to undergo radical prostatectomy than are healthier men. Thus, our results likely underestimate the risks of radical prostatectomy in men of any age with serious comorbidities. Additionally, the small number of observed deaths within 30 days of radical prostatectomy may have limited our ability to fully capture relationships among age, comorbidity, and mortality. As is the case for other administrative data sources, complications are probably underreported in the OCR, particularly those that are not life threatening, which may be more common in older adults than in younger adults. Better reporting of all complications may strengthen the relationship between age and some types of complications. In addition, for data privacy reasons, we did not have access to hospital and surgeon variables and were therefore unable to adjust for the number of surgeries performed in each hospital or by each surgeon. However, although several studies have demonstrated a relationship between number of surgeries performed and complication rates (including mortality) (10,35,40,42), adjusting for surgical volume did not negate the relationship between increasing age and complications in those studies, and such adjustment would probably not have affected the associations that we observed. Finally, our study did not address rates of long-term complications such as incontinence and erectile dysfunction, which may be affected by increasing age but are not accurately captured in administrative databases.

There are also several strengths to our study. The OCR includes men of all ages and data on patients treated at any of the acute care hospitals across Ontario who underwent radical prostatectomy, allowing a detailed assessment of the impact of age across the usual spectrum of patients who undergo surgery. By contrast, most prior series have examined Medicare claims and therefore have been restricted to examining men age 65 or older.

Fig. 1. Predicted rate of complications in seven categories within 30 days following radical prostatectomy among men who underwent this surgery in Ontario, Canada, between 1990 and 1999. A) Analysis by number of comorbid conditions (i.e., Diagnosis Count) for men aged 60–69 years. B) Analysis by age group in men without any comorbid conditions.

Fig. 2. Rate of any complication within 30 days following radical prostatectomy among men who underwent this surgery in Ontario, Canada, between 1990 and 1999 as a function of age group and number of comorbid conditions (i.e., Diagnosis Count).
In summary, increasing age was associated with an increased risk of mortality within 30 days of radical prostatectomy after adjusting for the presence of comorbidity. However, the absolute mortality risk remained fairly small, even in otherwise healthy men 70–79 years of age. Increasing age was also primarily associated with an increased risk of cardiac complications, whereas increasing comorbidity was associated with a higher risk of mortality and every category of complications. We conclude that increasing comorbidity was associated with a higher risk of mortality within 30 days of radical prostatectomy after adjusting for the presence of comorbidity. Further research should examine mortality and every category of complications. We conclude that increasing comorbidity was associated with a higher risk of mortality and every category of complications. We conclude that increasing comorbidity was associated with a higher risk of mortality within 30 days of radical prostatectomy after adjusting for the presence of comorbidity.

REFERENCES


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NOTES

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