



Kidney Cancer

Thirty-Day Mortality After Nephrectomy: Clinical Implications for Informed Consent

Vincent Cloutier^{a,b}, Umberto Capitanio^{a,c}, Laurent Zini^{a,d}, Paul Perrotte^b,
Claudio Jeldres^{a,b}, Shahrokh F. Shariat^a, Philippe Arjane^b, Jean-Jacques Patard^e,
Francesco Montorsi^c, Pierre I. Karakiewicz^{a,b,*}

^a Cancer Prognostics and Health Outcomes Unit, University of Montreal Health Centre, Montreal, Québec, Canada

^b Department of Urology, University of Montreal, Montreal, Québec, Canada

^c Department of Urology, Vita-Salute San Raffaele, Milan, Italy

^d Department of Urology, Lille University Hospital, Lille, France

^e Department of Urology, Rennes1 University Hospital, Rennes, France

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Abstract

Background: The existing literature suggests that the surgical mortality (SM) observed with nephrectomy for localised disease varies from 0.6% to 3.6%.

Objective: To examine age- and stage-specific 30-d mortality (TDM) rates after partial or radical nephrectomy.

Design, setting, and participants: We relied on 24 535 assessable patients from the National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) database.

Measurements: In 12 283 patients, logistic regression models were used to develop a tool for pretreatment prediction of the probability of TDM according to individual patient and tumour characteristics. External validation was performed on 12 252 patients.

Results and limitations: In the entire cohort of 24 535 patients, 219 deaths occurred during the initial 30 d after nephrectomy (0.9% TDM rate). TDM increased with age (≤ 49 yr: 0.5% vs 50–59 yr: 0.7% vs 60–69 yr: 0.9% vs 70–79 yr: 1.2% vs ≥ 80 yr: 2.0%; χ^2 trend $p < 0.001$) and stage (0.3% for T1–2N0M0 vs 1.3% for T3–4N0–2M0 vs 4.2% for T1–4N0–2M1; χ^2 trend $p = < 0.001$). TDM decreased in more recent years (1988–1993: 1.3% vs 1994–1998: 0.9% vs 1999–2002: 0.7% vs 2003–2004: 0.6%; χ^2 trend $p < 0.001$) and was lower after partial versus radical nephrectomy (RN) (0.4% vs 0.9%; $p = 0.008$). Only age ($p < 0.001$) and stage ($p < 0.001$) achieved independent predictor status. The look-up table that relied on the regression coefficients of age and stage reached 79.4% accuracy in the external validation cohort.

Conclusions: Age and stage are the foremost determinants of TDM after nephrectomy. Our model provides individual probabilities of TDM after nephrectomy, and its use should be highly encouraged during informed consent prior to planned nephrectomy.

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* Corresponding author. Cancer Prognostics and Health Outcomes Unit, University of Montreal Health Centre (CHUM), 1058, rue St-Denis, Montréal, Québec, Canada, H2X 3J4.
Tel. +1 514 890 8000 35336; Fax: +1 514 412 7363.
E-mail address: pierre.karakiewicz@umontreal.ca (P.I. Karakiewicz).

1. Introduction

Approximately 20 000 nephrectomies are performed annually in the United States [1]. Of those, 70% are performed for localised (T1–2N0M0) lesions and 20% and 10%, respectively, are performed for locally advanced (T3–4N0–2M0) or metastatic lesions (T1–4N0–2, M1) [1–4]. The existing literature suggests that the surgical mortality (SM) observed with nephrectomy for localised disease varies from 0.6% to 3.6% [1–5] and ranges from 4% to 12% [6,7] for patients with metastatic renal cell carcinoma (mRCC). Unfortunately, this wide variability of SM rates limits the usefulness of these estimates in individual informed consent considerations [8–10]. To date, no systematic classification of SM rates has been proposed. For example, there is no system that stratifies SM rates according to age, gender, or disease stage [11,12]. Moreover, there are no data examining the contemporary trends of SM after nephrectomy. It is likely that these have changed over time because of better patient selection, better disease staging, and improvement of peri- and postoperative management [1,13–17]. Finally, no tool exists to help clinicians predict SM rates after nephrectomy for specific patient subgroups, with the intent of preoperative risk stratification or informed consent.

We hypothesised that the year of surgery, age, stage, gender, and nephrectomy type (partial vs radical) affect the rate of SM, defined as 30-d mortality (TDM) after nephrectomy. We decided to address contemporary TDM rates after nephrectomy in a large population-based cohort from the United States. Specifically, we stratified the observed the TDM rates according to stage, age, gender, and year of surgery. Moreover, we developed a prediction tool to assist clinicians with the pretreatment prediction of the probability of individual TDM, according to patient and tumour characteristics [18].

2. Methods

2.1. Study population

Patients treated with nephrectomy from 1988 to 2004 were identified within nine registries of the National Cancer Institute (NCI) Surveillance, Epidemiology, and End Results (SEER) database. This cohort represents a 10% sample of the United States population [19]. The SEER registries include the Atlanta, Georgia; San Francisco–Oakland, California; Detroit, Michigan; and Seattle–Puget Sound, Washington, metropolitan areas as well as the states of Utah, Connecticut, New Mexico, Hawaii, and Iowa.

The kidney cancer diagnostic code (International Classification of Disease for Oncology, 2nd edition, [ICD-O-2] for renal lesions [C64.9]), combined with either partial or radical nephrectomy (RN) codes, was used as the main inclusion criterion. Upper-tract transitional cell carcinomas (TCC) or ureteral as well as noncortical renal tumours (ie, melanomas, sarcomas, and lymphomas) were not included. Exclusions also consisted of autopsy cases and all patients who underwent treatment modalities other than partial or radical nephrectomy. We also excluded patients with unavailable T, N, or M stages.

These exclusions resulted in 24 535 assessable patients with complete T, N, and M stage information, of whom 2276 (9.3%) had undergone partial nephrectomy (PN) and 22 259 (90.7%) had undergone

RN. For all patients, malignant histology was confirmed with the ICD-O-3 SEER histologic codes. Deaths that occurred within 30 d of nephrectomy were considered as events. No patients had follow-up of <30 d.

We used 1000 bootstrap resamples to better estimate the TDM rates and their 95% confidence intervals (CI). For the purpose of model development and its validation, the 24 535 assessable patients were divided into two similarly sized cohorts according to the SEER registry of origin. The development cohort originated from Seattle–Puget Sound metropolitan area as well as the states of Iowa, Connecticut, and New Mexico registries and consisted of 12 283 patients. The validation cohort originated from the Detroit, Atlanta, and San Francisco–Oakland metropolitan areas as well as the states of Hawaii and Utah and included 12 252 patients (Table 1).

2.2. Statistical analysis

We used χ^2 and *t* tests to assess the statistical significance of differences in means and proportions. We used the Statistical Package for the Social Sciences (SPSS, Chicago, IL) life table method to determine the TDM rates according to nephrectomy type (radical vs partial), patient age categories (≤ 49 yr vs 50–59 yr vs 60–69 yr vs 70–79 yr vs ≥ 80 yr), patient gender, disease stage (T1–2N0M0 vs T3–4N0–2M0 vs T1–4N0–2M1), and quartiles of the year of surgery (1988–1993 vs 1994–1998 vs 1999–2002 vs 2003–2004).

Because the proportion of patients dying within 30 d of nephrectomy is small, we applied 1000 bootstrap resamples to internally validate the TDM point estimates. Moreover, we bootstrapped the associated 95% CIs using 1000 repetitions to internally validate those. The bootstrapping process using 1000 repetitions simulates the TDM rates from 1000 cohorts of 24 535 patients (24 535 000 patients).

The development cohort of 12 283 patients was used to fit univariable and multivariable logistic regression models that addressed TDM after nephrectomy. The predictors consisted of patient age, gender, stage, nephrectomy type, and the year of surgery. Stepwise variable removal was then applied to the full multivariable model according to the Akaike's information criterion, with the intent of developing the most accurate and parsimonious model [20,21]. Subsequently, the multivariable logistic regression coefficients of the most accurate and parsimonious model were used to generate a look-up table predicting individual probabilities of TDM after PN or RN. The external validation cohort of 12 252 patients was used to assess the accuracy of the TDM predictions. Accuracy was quantified with the receiver operating characteristics–derived area under the curve (AUC), where 0.5 implies random predictions and 1.0 indicates perfect agreement.

All statistical tests were performed using S-PLUS Professional, version 1 (Mathsoft, Seattle, WA, USA) or SPSS version 15.0. Moreover, all tests were two-sided, with a significance level set at 0.05.

3. Results

According to the SEER database, 24 535 patients underwent either PN ($n = 2276$) or RN ($n = 22 259$) between 1988 and 2004 (Table 1). The median age was 62 yr (mean: 60.1 yr). Of those, 62.4% were male and 83.8% were Caucasian. Of all nephrectomies, 67.2% were performed for T1–2N0M0 versus 23.3% and 9.5% for T3–4N0–2M0 and T1–4N0–2M1 lesions, respectively (Table 1).

In the entire cohort of 24 535 patients, 219 deaths occurred during the initial 30 d after nephrectomy. This resulted in a 0.9% TDM rate (Table 2). TDM increased with age (≤ 49 yr: 0.5% vs 50–59 yr: 0.7% vs 60–69 yr: 0.9% vs 70–79 yr: 1.2% vs ≥ 80 yr: 2.0% [χ^2 trend $p < 0.001$]). Conversely,

Table 1 – Descriptive statistics for the cohort of 24 535 patients treated with either partial or radical nephrectomy of different stages between 1988 and 2004 within nine National Cancer Institute Surveillance, Epidemiology, and End Results registries. Data were also tabulated according to the characteristics recorded within the development and external validation cohorts.

Variables	Overall cohort (n = 24 535)	Development cohort (n = 12 283)	External validation cohort (n = 12 252)
SEER registries			
Seattle–Puget Sound, WA	3548	3548	–
Connecticut	3993	3993	–
Iowa	3024	3024	–
New Mexico	1718	1718	–
San Francisco–Oakland, CA	3381	–	3381
Metropolitan Detroit, MI	5011	–	5011
Metropolitan Atlanta, GA	1986	–	1986
Hawaii	1051	–	1051
Utah	823	–	823
Age (yr)			
Mean	60.1	60.8	59.4
Median	62	63	61
Race			
Caucasian (%)	20 556 (83.8)	11 424 (93.0)	9132 (74.5)
Other (%)	3979 (16.2)	859 (7.0)	3120 (25.5)
Gender			
Male (%)	15 299 (62.4)	7550 (61.5)	7749 (63.2)
Female (%)	9236 (37.6)	4733 (38.5)	4503 (36.8)
Stage			
T1–2N0M0 (%)	16 495 (67.2)	8200 (66.8)	8295 (67.7)
T3–4N0–2M0 (%)	5724 (23.3)	2911 (23.7)	2813 (22.9)
T1–4N0–2M1 (%)	2316 (9.5)	1172 (9.5)	1144 (9.4)
Treatment type			
PN (%)	2276 (9.3)	1111 (9.0)	1165 (9.5)
RN (%)	22 259 (90.7)	11 172 (91.0)	11 087 (90.5)

PN = partial nephrectomy; RN = radical nephrectomy.

increasing stage was associated with an increase in TDM rate (0.3% for T1–2N0M0 vs 1.3% for T3–4N0–2M0 vs 4.2% for T1–4N0–2M1 [χ^2 trend $p < 0.001$]). However, TDM decreased in more recent years of surgery (1988–1993: 1.3% vs 1994–1998: 0.9% vs 1999–2002: 0.7% vs 2003–2004: 0.6% [χ^2 trend $p < 0.001$]). PN was associated with 0.4% of TDM versus 0.9% for patients who underwent an RN ($p = 0.008$). Gender had no measurable effect ($p = 0.5$).

Table 3 lists the univariable and multivariable logistic models that were fitted in the development cohort. In univariable analyses, age ($p < 0.001$), stage ($p < 0.001$), nephrectomy type ($p = 0.046$), and year of surgery ($p = 0.004$) represented statistically significant predictors of TDM. In the full multivariable model, only age ($p < 0.001$) and stage ($p < 0.001$) achieved independent predictor status. In consequence, all other variables were removed from the multivariable analysis, according to the Akaike's information criterion [20].

Finally, a look-up table (Table 4) was defined using the regression coefficients of the variables included in the final model (age and stage). This look-up table predicts the individual probability of TDM after nephrectomy. The accuracy of the look-up table was 79.4% in the external validation cohort of 12 252 patients.

4. Discussion

The objective of the current analysis was to examine TDM after nephrectomy according to stage, age, gender, and

nephrectomy type. We confirmed our initial hypothesis that age, stage, year of surgery, and nephrectomy type have a profound effect on the overall TDM rates. Conversely, we recorded no effect for gender.

Because very small proportions of patients died within 30 d of nephrectomy, we used 1000 bootstrap resamples to internally validate the TDM rates and the associated 95% CIs (Table 2). The benefit of this approach resides in the use of 1000 simulated cohorts of 24 535 patients, from which the TDM rates can be obtained and recorded. Such practice results in better point estimates and in narrower 95% CIs.

In the subsequent step of the analysis, we developed a logistic regression model predicting TDM in the development cohort, which consisted of patients from four registries (Table 3). The model allowed us to identify the two most important predictors of TDM—namely, age and stage. These two predictors were then used to develop a look-up table for prediction of individual age- and stage-specific TDM rates after nephrectomy (Table 4). We finally applied these probabilities to the external validation cohort and found them to correctly predict TDM 79.4% of the time.

The resulting look-up table, which varies from 0.1% to 10.5%, can guide clinicians with respect to preoperative TDM risk (Table 4). For example, patients with T1–2N0M0 renal cell carcinoma (RCC) can expect virtually negligible mortality risk up to age 69 yr (0.1–0.2%, Table 4). Those aged ≥ 70 yr should be informed that their risks may double (0.4%, Table 4) or even triple (0.6%, Table 4). The risk profile of patients with T3–4N0–2M0 RCC is intermediate (0.6–

Table 2 – Thirty-day mortality rates after nephrectomy, with 95% confidence intervals, for the cohort of 24 535 patients within the nine National Cancer Institute Surveillance, Epidemiology, and End Results registries. Rates were stratified according to stage, patient age, gender, nephrectomy type, and year of surgery. *P* values denote χ^2 -based comparisons of 30-d mortality proportions. To increase the precision of the estimates, the rates and the 95% confidence intervals are bootstrapped with 1000 resamples.

Characteristics	All stages		T1–2N0M0		T3–4N0–2M0		T1–4N0–2M1	
	% (% CI) (<i>n</i> :overall)	<i>p</i> value	% (% CI) (<i>n</i> :overall)	<i>p</i> value	% (% CI) (<i>n</i> :overall)	<i>p</i> value	% (% CI) (<i>n</i> :overall)	<i>p</i> value
Overall	0.9 (0.8–1.0) (219:24 535)	<0.001 ^a	0.3 (0.2–0.4) (47:16 495)		1.3 (1.0–1.6) (74:5724)		4.2 (3.5–5.0) (98:2316)	
Age (yr)								
≤49	0.5 (0.3–0.7) (25:5060)	<0.001	0.1 (0–0.2) (3:3558)	<0.001	0.3 (0–0.7) (3:999)	<0.001	3.8 (2.1–5.6) (19:503)	0.2
50–59	0.7 (0.4–0.9) (36:5524)		0.2 (0.1–0.4) (8:3770)		0.8 (0.3–1.4) (10:1183)		3.2 (1.8–4.7) (18:571)	
60–69	0.9 (0.7–1.1) (57:6610)		0.1 (0–0.2) (5:4339)		1.3 (0.7–1.8) (20:1574)		4.6 (3.1–6.2) (32:697)	
70–79	1.2 (0.9–1.5) (67:5679)		0.6 (0.4–0.9) (23:3780)		1.6 (1.0–2.3) (23:1452)		4.7 (2.9–6.7) (21:447)	
≥80	2.0 (1.4–2.8) (34:1662)		0.8 (0.3–1.4) (8:1048)		3.5 (2.1–5.1) (18:516)		8.2 (3.1–14.1) (8:98)	
Gender								
Male	0.9 (0.8–1.1) (141:15 299)	0.5	0.3 (0.2–0.4) (31:9942)	0.4	1.2 (0.9–1.6) (46:3776)	0.5	4.1 (3.2–5.1) (64:1550)	0.7
Female	0.8 (0.7–1.0) (78:9236)		0.2 (0.1–0.4) (16:6522)		1.4 (0.9–2.0) (28:1948)		4.4 (3.0–6.0) (34:766)	
Nephrectomy type								
Partial	0.4 (0.2–0.7) (9:2276)	0.008	0.2 (0–0.4) (4:2055)	0.4	1.9 (0–4.2) (3:157)	0.5	3.1 (0–8.1) (2:64)	0.6
Radical	0.9 (0.8–1.1) (210:22 259)		0.3 (0.2–0.4) (43:14 440)		1.3 (1.0–1.6) (71:5567)		4.3 (3.5–5.1) (96:2252)	
Yr of nephrectomy								
1988–1993	1.3 (1.0–1.6) (83:6352)	<0.001	0.4 (0.2–0.6) (14:3858)	0.3	1.4 (0.9–2.0) (25:1781)	0.2	6.2 (4.5–7.9) (44:713)	0.02
1994–1998	0.9 (0.7–1.1) (56:6386)		0.4 (0.2–0.5) (15:4237)		1.6 (1.0–2.2) (25:1596)		2.9 (1.6–4.4) (16:553)	
1999–2002	0.7 (0.5–0.9) (51:7199)		0.2 (0.1–0.3) (10:5042)		1.3 (0.7–1.9) (19:1493)		3.4 (2.0–4.8) (22:654)	
2003–2004	0.6 (0.4–0.9) (29:4598)		0.2 (0.1–0.4) (8:3348)		0.6 (0.1–1.2) (5:854)		4.0 (2.4–6.0) (16:396)	

^a Denotes the *p* value for the χ^2 test across stage strata.

0.8%) up to age 69 yr. Similar to T1–2N0M0 RCC patients, individuals in the T3–4N0–2M0 category should be worried about substantially higher mortality rates if their age is situated between 70 and 79 yr (1.5%, Table 4) or is >80 yr (2.4%, Table 4). A similar scenario is apparent in patients with M1 RCC, where up to age 69 yr, the risk is 2.9–3.6% (Table 4). It doubles for ages 70–79 (7.0%) and triples for octogenarian patients (10.5%). Taken together, our findings demonstrate a virtual doubling in mortality for patients aged 70–79 and a tripling for those aged ≥80 relative to their younger counterparts and regardless of disease stage. The risk estimates are substantially more specific than using the average estimate of 0.9% TDM regardless of age and stage considerations. Moreover, our predictive look-up table excluded unimportant variables that may otherwise distract the clinician from the essential ones (age and stage).

Our results corroborate previous reports, which documented the effect of increasing age on TDM rates after nephrectomy [5,22,23]. However, the data used by previous investigators originated from substantially smaller samples (*n* = 575 [22], *n* = 656 [5], and *n* = 1885 [23]). The sample

size and event rate of these previous cohorts limit their robustness and generalisability. Our dataset provides higher confidence in the recorded TDM rates and confirms the validity and accuracy of our newly developed look-up table in an external validation cohort. To the best of our knowledge, no previous reports examined the effect of stage and surgery type on TDM rate within a large population-based cohort. Moreover, our data are the first to show an improvement in TDM rates according to the year of surgery [22].

Despite its strengths, our manuscript has limitations. First, the SEER 9 database is not linked to comorbidity information. Therefore, the effect of underlying comorbidities cannot be assessed [24]. Although age is a good proxy of comorbid conditions, it is not perfectly related to comorbidities. Therefore, consideration of comorbidities could further increase the accuracy of the current look-up table from 79.4% to a higher value. This said, all surgical candidates for nephrectomy should have an Eastern Cooperative Oncology Group (ECOG) performance status (PS) of 0 or 1. Therefore, our findings are most likely limited

Table 3 – Univariable and multivariable logistic regression models for predictions of 30-d mortality rates after partial or radical nephrectomy.

Variable	Univariable model		Full multivariable model		Reduced multivariable model	
	OR	<i>p</i>	OR	<i>p</i>	OR	<i>p</i>
Age (yr)	–	0.001	–	<0.001	–	<0.001
50–59 vs ≤49	1.095	0.816	1.054	0.893	1.019	0.962
60–69 vs ≤49	1.35	0.4	1.27	0.507	1.281	0.491
70–79 vs ≤49	2.363	0.01	2.485	0.007	2.536	0.006
≥80 vs ≤49	3.41	0.002	4.025	<0.001	3.988	<0.001
Gender						
Female vs male	1.064	0.762	1.143	0.522	–	–
Stage	–	<0.001	–	<0.001	–	<0.001
T3–4N0–2M0 vs T1–2N0M0	4.635	<0.001	4.036	<0.001	4.316	<0.001
T1–4N0–2M1 vs T1–2N0M0	19.188	<0.001	19.778	<0.001	20.91	<0.001
Tumour size	1.012	<0.001	1.005	0.104	–	–
Nephrectomy type						
Radical vs partial	3.235	0.046	1.249	0.711	–	–
Yr of surgery	–	0.004	–	0.074	–	–
1994–1998 vs 1988–1993	0.633	0.071	0.763	0.293	–	–
1999–2002 vs 1988–1993	0.536	0.015	0.65	0.099	–	–
2003–2004 vs 1988–1993	0.302	0.001	0.401	0.015	–	–

OR = odds ratio.

Table 4 – Look-up table for individual prediction of 30-d mortality after partial or radical nephrectomy according to age and stage strata. Point estimates were accompanied by their 95% confidence intervals. The look-up table was developed within the cohort of 12 283 patients. The predictions of the look-up table were 79.4% accurate in the external validation cohort of 12 252 patients.

	T1–2N0M0 % 30-d mortality (95% CI)	T3–4N0–2M0 % 30-d mortality (95% CI)	T1–4N0–2M1 % 30-d mortality (95% CI)
Age (yr)			
≤49	0.1 (0–0.4)	0.6 (0.1–1.9)	2.9 (1.2–5.9)
50–59	0.1 (0–0.5)	0.6 (0.2–1.8)	2.9 (1.4–5.6)
60–69	0.2 (0.05–0.5)	0.8 (0.3–1.6)	3.6 (2.0–6.3)
70–79	0.4 (0.1–0.7)	1.5 (0.7–2.6)	7.0 (4.0–11.0)
≥80	0.6 (0.1–1.5)	2.4 (0.8–4.9)	10.5 (4.3–23.0)

to good PS patients. In consequence, PS has little effect on the model predictions, as it is restricted to ECOG 0–1.

Second, our mortality end point consisted of TDM, which is considered a standard in the assessment of deaths related to surgical interventions [25–29]. Previous reports relied on in-hospital mortality [1,30]. Because this end point may include deaths that occurred after the 30-d period, such rates are not fully comparable with our results. Nonetheless, both definitions are valid. The nature of our dataset precluded the use of in-hospital mortality, as the dates of admission and discharge are not included in the SEER database.

Third, our model awaits an external validation within a population from outside North America. Finally, the model does not predict perfectly, and >25% of predictions may be incorrect.

5. Conclusion

Age and stage are the foremost determinants of TDM after nephrectomy. Our model provides individual probabilities of TDM after nephrectomy, and its use should be highly

encouraged during informed consent prior to planned nephrectomy.

Author contributions: Pierre I. Karakiewicz had full access to all the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis.

Study concept and design: Cloutier, Capitanio, Zini, Perrotte, Jeldres, Shariat, Arjane, Patard, Montorsi, Karakiewicz.

Acquisition of data: Cloutier, Capitanio, Zini, Jeldres, Shariat, Karakiewicz.
Analysis and interpretation of data: Cloutier, Capitanio, Zini, Perrotte, Jeldres, Shariat, Arjane, Patard, Montorsi, Karakiewicz.

Drafting of the manuscript: Cloutier, Capitanio, Zini, Jeldres, Karakiewicz.

Critical revision of the manuscript for important intellectual content: Cloutier, Capitanio, Zini, Perrotte, Jeldres, Shariat, Arjane, Patard, Montorsi, Karakiewicz.

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Editorial Comment on: Thirty-Day Mortality After Nephrectomy: Clinical Implications for Informed Consent

Amnon Zisman

Department of Urology, Assaf Harofeh Medical Center, Tel-Aviv University, Zerifin, Israel
zisman@asaf.health.gov.il

This survey by Cloutier et al is based on 24 535 nephrectomies [1]. It provides the clinician with a powerful tool for generally evaluating risk versus benefit of nephrectomy and should aid in patient education and selection. The authors presented a model based on Surveillance Epidemiology and End Results (SEER) with only 80% accuracy in predicting 30-d mortality following nephrectomy for renal tumors. They found that age ≥ 70 yr and more advanced disease stage are independently associated with increased mortality rate (Table 3 in Cloutier et al [1]). The risk is 0.1–0.2% for T1-2N0M0 patients age ≤ 69 , 0.6–0.8% for T3-4N0-2M0 patients age ≤ 69 , and 2.9–3.6% for patients age ≤ 69 undergoing cytoreductive nephrectomy for metastatic renal cell carcinoma. Taken together, one should expect a doubling in mortality rate within each stage group for patients aged 70–79 and tripling for those ≥ 80 , relative to their younger counterparts. These findings are even more intriguing considering the fact that approximately 20% of T1-2N0M0 cases will turn out to have a benign lesion but are still subjected to the above-mentioned case fatality risk.

Nevertheless, this model tends toward overgeneralization, underestimation, and smoothening of mortality rates in specific though not so rare situations. The SEER database is not linked to comorbidity information and, therefore, is insensitive to important covariants. A 30-d case fatality rate of 24%, for example, was reported following nephrectomy in patients with liver cirrhosis in Denmark [2]. Overall mortality for nephrectomy with inferior vena cava (IVC)

tumor thrombus is 6–7.5% [3,4]. High fatality rate is also reported for patients with locally extensive disease undergoing organ resection such as bowel, pancreas, liver, or spleen. One would expect that if taken into account, IVC tumor thrombus, massive local extension, or increase in anesthesia risk will result in even higher mortality rates than presented and, therefore, will make the model more predictive. Epidemiologically, these findings await external validation in a population from outside of the United States to test for more generalized differences such as genetic variation, general health of the population, and prevalence of comorbidities as well as for differences in health care policy, health care provider accessibility, and quality of surgical services.

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Editorial Comment on: Thirty-day Mortality After Nephrectomy: Clinical Implications for Informed Consent

T.R. Leyshon Griffiths

Department of Cancer Studies and Molecular Medicine, University of Leicester, Leicester, UK
trlg1@le.ac.uk

Recent publications relating to renal cell carcinoma (RCC) and to oncologic outcomes have facilitated pre-treatment counselling. A pretreatment model predicting RCC-specific mortality has been proposed which exceeded the accuracy of previous models [1]. We can now inform patients with clinical stage N0M0 RCC that complete lymphadenectomy in conjunction with radical nephrectomy confers no survival advantage [2]. In those with small renal tumours, we can relay the findings of a meta-analysis which showed similar metastatic progression

rates whether patients were managed with nephron-sparing surgery, with ablative techniques, or with surveillance, accepting selection bias [3]. For locally advanced RCC, a large retrospective study showed that nephrectomy improved cancer-specific survival [4]. A major limitation, though, has been our inability to accurately predict perioperative mortality.

In the current issue, Cloutier et al examine 30-day mortality (TDM) rates amongst 24 535 patients treated with partial or radical nephrectomy for RCC from 1988 to 2004 who were identified within the National Cancer Institute (NCI) Surveillance Epidemiology and End Results (SEER) database [5]. The key message relates to the importance of patient age when counselling patients for nephrectomy. The study has unsurprisingly shown that perioperative mortality is associated with increasing age and with extent of disease. Regardless of disease stage, however, the TDM rate approximately doubles for patients

aged 70–79 yr and triples for octogenarians compared with those aged up to 69 yr. Their prediction tool provides valuable age-related TDM rates according to whether preoperative clinical staging shows localised, locally advanced, or metastatic RCC. The accuracy of the tool was 79.4% in an external validation cohort. When counselling, we can now be more specific than merely quoting an overall TDM rate, which was 0.9% in this study. The model does, however, need validation outside North America.

This is a landmark study which should be included in preoperative counselling.

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