Self-Reported Quality of Life for Predicting Mortality in Renal Cell Carcinoma

Ridwan Alam, Hiten D. Patel, Michael A. Gorin, Michael H. Johnson, Mohamad E. Allaf, Phillip M. Pierorazio

The James Buchanan Brady Urological Institute and Department of Urology, Johns Hopkins University School of Medicine, Baltimore, MD

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Background

- With the rise of nephron-sparing management for renal cell carcinoma (RCC), QOL metrics may provide prognostic value above and beyond traditional demographic and disease parameters.
- <u>OBJECTIVE</u>: To evaluate the utility of self-reported QOL results in predicting mortality among RCC patients and test the findings in a prospectively-maintained external database.

Methods

Study Design

- Predictive variables were predefined and analyzed using the Surveillance, Epidemiology, and End Results – Medicare Health Outcomes Survey (SEER-MHOS) database.
- Mental component summary (MCS) and physical component summary (PCS) scores were classified as high (≥50; denoted as +) or low (<50; denoted as -) based on a population mean of 50 points.
- Patients were sorted into one of four discrete groups:
  1. MCS+, PCS+   2. MCS+, PCS-
  3. MCS-, PCS+   4. MCS-, PCS-

Statistical Analysis

- The Kaplan-Meier curve estimates the overall survival across time.
- Multivariable Cox proportional hazards regression evaluates associations between QOL metrics (as a continuous measure) and all-cause mortality.
- The Harrell's concordance statistic (C-index) estimates the predictive accuracy of the Cox regressions. The Akaike Information Criteria (AIC) measures the relative quality of the regression models – lower AIC values demonstrate a more parsimonious model.
- Multivariable Fine and Gray competing risks models estimates RCC-specific and non-RCC-specific mortality based on QOL metrics (as discrete groups).

External Database Testing

- The prospectively-maintained Delayed Intervention and Surveillance for Small Renal Masses (DISSRM) database was used to test the findings from the SEER-MHOS database.
- All patients in DISSRM are clinical stage T1a with no metastasis.

Results

Table 1. Vital Statistics

| Baseline Characteristics	SEER-MHOS	DISSRM
1) Study Size	1494	479
MCS+, PCS+	198 (13.3%)	154 (32.2%)
MCS+, PCS-	630 (42.2%)	146 (30.5%)
MCS-, PCS+	56 (3.8%)	73 (15.2%)
MCS-, PCS-	610 (40.8%)	106 (22.1%)
2) Median follow-up, years [IQR]	5.6 [4.0-8.3]	3.9 [2.0-6.0]
3) Median age at survey, years [IQR]	73.4 [68.8-79.3]	65.3 [57.1-73.6]
4) Male (%)	864 (57.8%)	282 (58.9%)
5) African-American (%)	147 (9.8%)	69 (14.4%)
6) Clinical stage (%)		
T1	1068 (71.5%)	479 (100%)
T2	199 (13.3%)	–
T3-T4	227 (15.2%)	–
7) Metastatic RCC (%)	51 (3.4%)	–
8) No surgery for RCC (%)	82 (5.5%)	223 (46.6%)
9) Modified cardiovascular index (%)		
0	976 (65.3%)	412 (86.0%)
1	313 (21.0%)	49 (10.2%)
2-4	205 (13.7%)	18 (3.8%)
10) History of other cancer (%)	362 (24.2%)	114 (23.9%)
11) Median MCS score, points [IQR]	52.2 [40.8-59.3]	53.7 [44.4-57.9]
12) Median PCS score, points [IQR]	36.2 [26.8-46.5]	49.3 [37.8-55.5]
13) Median time from RCC diagnosis to survey, years [IQR]	4.4 [1.8-8.3]	0.1 [0.0-0.2]

DISSRM Analysis
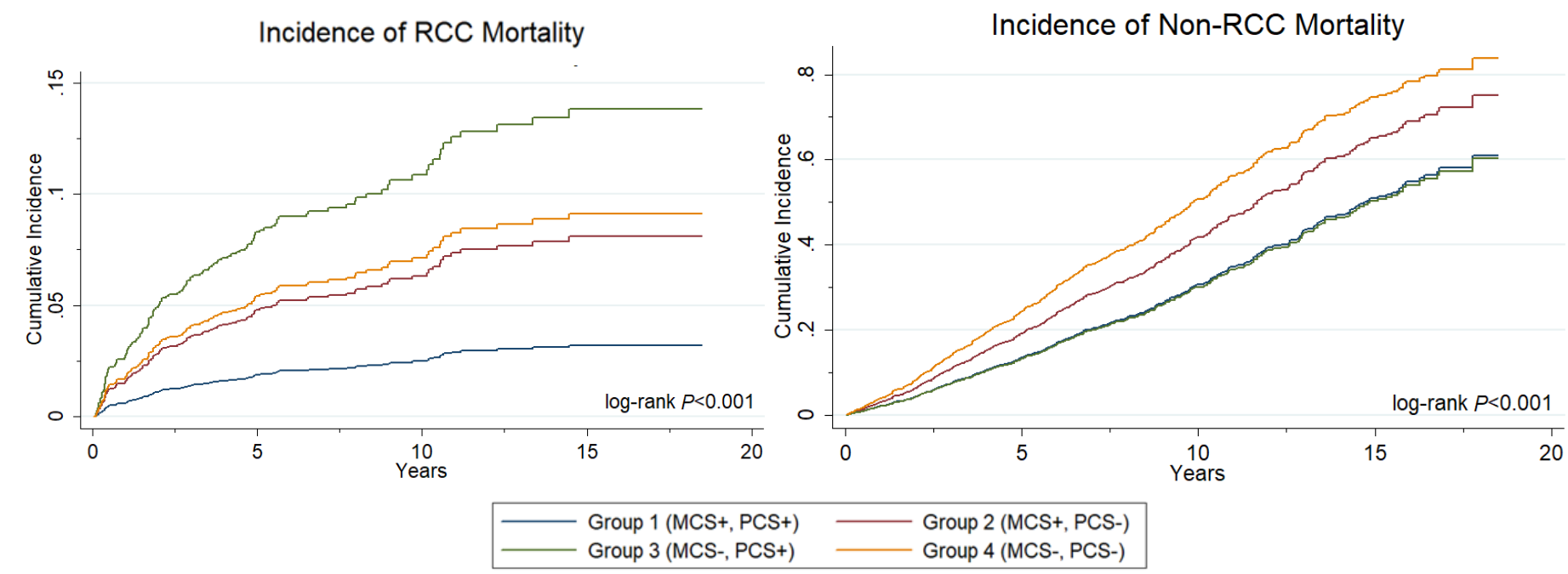
Figure 3. Kaplan-Meier Curve for Overall Survival
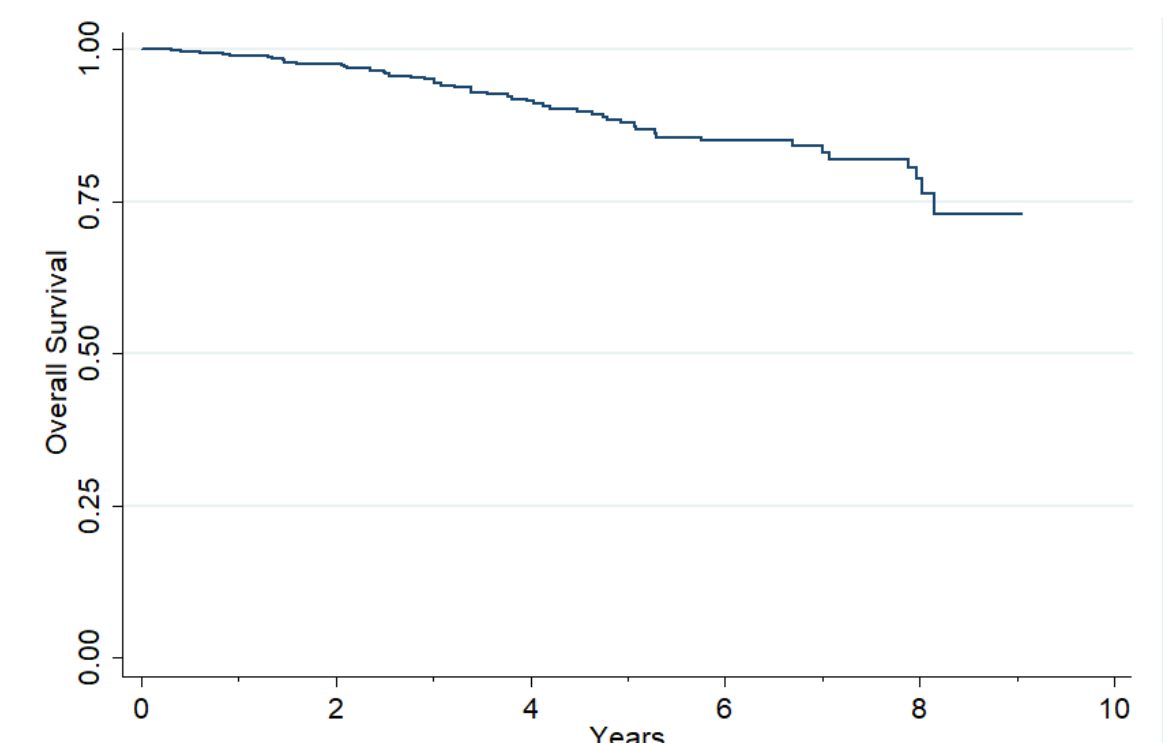
SEER-MHOS Analysis

Figure 1. Kaplan-Meier Curve for Overall Survival
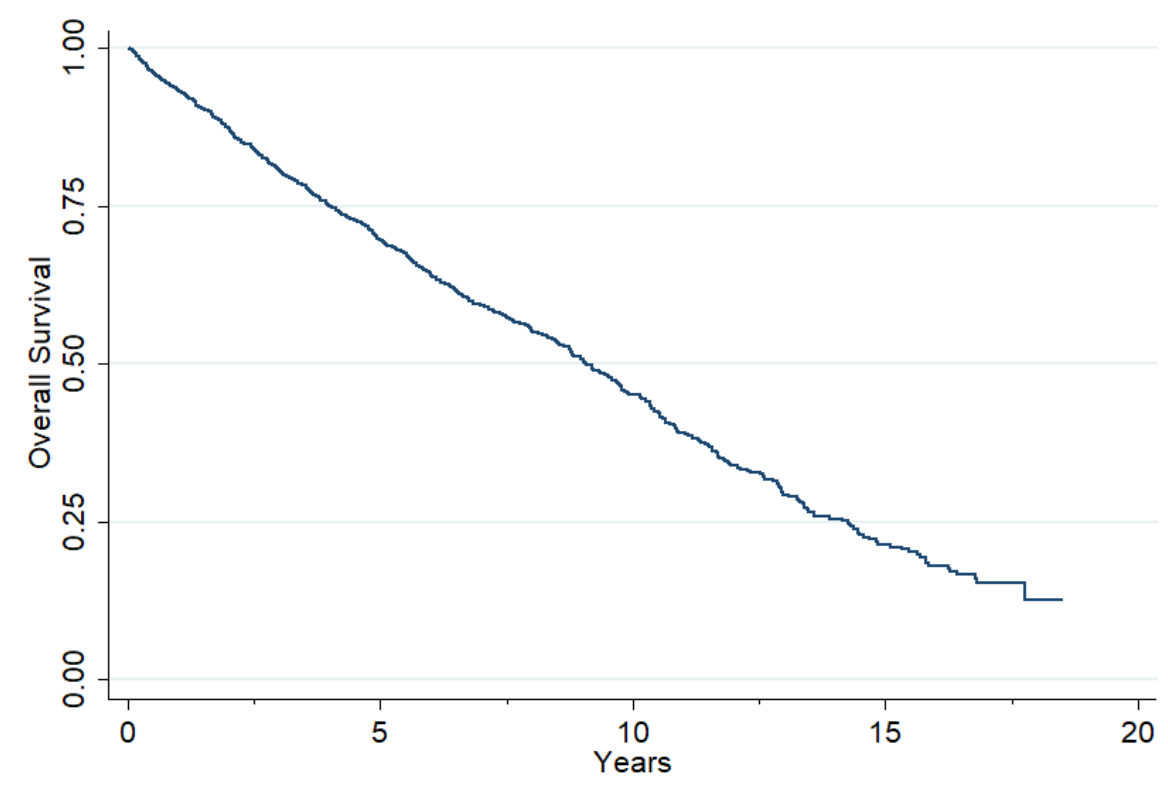
Figure 2. Fine and Gray Competing Risks Models

Table 3. External Testing of Cox Regression Models

Predictors Included in Model	C-index	AIC
Characteristics 3-10 (without QOL)	74.1%	496.4
Characteristics 3-13 (with QOL)	77.8%	494.9

- In agreement with the SEER-MHOS analysis, regression models including QOL metrics demonstrated maximum predictive ability and parsimony.
- Further testing demonstrated that the single best question producing maximum predictive ability (C-index = 76.9%) and parsimony (AIC = 335.2) was one of physical functioning limitations in the context of "moderate activities such as moving a table, pushing a vacuum cleaner, bowling, or playing golf."

Table 2A. Multivariable* Cox Regression for Overall Survival

Baseline Characteristics	Hazard Ratio [95% CI]	*P*-value
MCS score, per point	0.987 [0.981-0.993]	**<0.001**
PCS score, per point	0.977 [0.971-0.984]	**<0.001**

*adjusted for characteristics 3-10 & 13 listed in Table 1.

- Among 1494 patients, each additional MCS and PCS point reduced the hazard of all-cause mortality by 1.3% and 2.3%, respectively.

Table 2B. Performance Statistics of Cox Regression Models

Predictors Included in Model	C-index	AIC
Characteristics 3-10 (without QOL)	70.1%	9454.5
Characteristics 3-13 (with QOL – shown in Table 2A)	72.3%	9376.5

- Regression models including QOL metrics demonstrated maximum predictive ability and parsimony.

- With Group 1 as reference, all other groups demonstrated a higher incidence of RCC mortality; Groups 2 and 4 (low physical health) also demonstrated a higher incidence of non-RCC mortality.
- QOL metrics were independently predictive in both mortality scenarios, but disease parameters (clinical stage and metastasis) were more strongly associated with RCC-specific mortality, as expected.

Conclusions

- Models with self-reported QOL metrics predicted all-cause mortality in RCC patients with higher accuracy and parsimony than those without QOL metrics in two separate database tests.
- RCC-specific mortality was most strongly associated with disease parameters, although QOL metrics did demonstrate a small yet significant association.
- Non-RCC mortality was associated more with low physical health rather than low mental health.
- Development of a nomogram to predict mortality in this patient population should consider the inclusion of QOL metrics.