Oncologic Surveillance Following Surgical Resection for Renal Cell Carcinoma: A Novel Risk-based Approach

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Introduction

• **Effectiveness** of NCCN and AUA guidelines for RCC called into question\(^1\)
  
  • Both protocols missed approximately \(1/3\)\(^{rd}\) of all recurrences

• Reason recurrences missed \(\rightarrow\) **short duration of follow-up**
  
  • Follow-up method = *cumulative incidence of recurrence*\(^2-4\)

• This method *fails* to account for:
  
  • *Changes in recurrence risk* over time
  
  • *Influence of competing risks* from co-morbid conditions

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Objectives

Based on the need for effective RCC surveillance strategies:

• To propose a novel risk-based approach for determining individualized RCC surveillance regimens following surgical resection
Novel Approach—Weibull Modeling

- **Novel approach = competing risk models** to identify duration of surveillance
  - Statistical method= **Weibull modeling**
    - Alternative to Cox’s proportional hazard regression
    - Graphical *interaction between a patient’s*:
      - Risk of recurrence
      - Risk of non-RCC death

1 Carroll, KJ. Control Clin Trials 2003.
Methods

• Retrospective review of Mayo Clinic Renal Tumor Registry between 1990-2008
  • N = 2,511 M0 RCC radical/partial nephrectomy
    • Median postoperative follow-up 9 yrs (IQR 6.4, 12.7)
  • Disease recurrence = local recurrence or metastasis > 30 days from surgery
    • 676 recurred at median time of 1.6 yrs (IQR 0.5, 4.8)
  • Non-RCC death = mortality > 30 days from surgery
    • 615 died at median time of 6.1 years (IQR 3.0, 10.6)
Development of Individualized Surveillance Stopping Points

- **Graphical interaction** of Weibull models
  - Risk of *RCC recurrence*
    - Stratified by *stage and relapse site*
  - Risk of *non-RCC death*
    - Stratified by *age and Charlson Co-morbidity Index (CCI)*
- Identify the point in time when:
  
  Risk of non-RCC Death **exceeds** Risk of Recurrence =
  
  Stopping point for surveillance
Weibull Model Interactions:

Risk of Abdominal Recurrence (solid lines) vs. Non-RCC Death in CCI $\leq 1$ (circle on lines)
Weibull Model Interactions:

Risk of Abdominal Recurrence (solid lines) vs. Non-RCC Death in CCI ≥ 2 (circle on lines)
### Surveillance Stopping Points (years):
**Non-RCC Death Risk *Exceeds* Recurrence Risk**

<table>
<thead>
<tr>
<th>Stage Group</th>
<th>Relapse Site</th>
<th>Age (years) and CCI</th>
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<td>&gt;20 &gt;20 &gt;20 10.5 13 4.5</td>
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</table>
Conclusions

Limitations of NCCN and AUA → Need more effective RCC follow-up strategies

• **Modeling competing risks** may be a solution:
  • *Eliminates* over-simplified stopping points
  • *Better predicts* natural RCC disease course
    • Allows *interaction with overall health status*
• **Improvement** over current guidelines
  • May *balance* surveillance *benefit with medical resource allocation*
Comments and Questions

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