Disease management costs for patients with intermediate-high or high-risk renal cell carcinoma (RCC) following nephrectomy

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Background

- Renal cell carcinoma (RCC) is the ninth most common cancer worldwide and accounts for the vast majority of primary renal neoplasms, with over 270,000 new cases globally each year[1]
- Sixteen percent of patients with RCC have locoregional disease at diagnosis, and up to 40% of these patients will have a recurrence with metastasis, associated with a 5-year survival rate of 8%[2,3]
- Adjuvant pembrolizumab is approved globally in United States, Europe, Japan and many other regions for use after surgery with RCC. Before then, patients with RCC who undergo nephrectomy had no options for adjuvant therapy with high levels of supporting evidence to reduce the risk of recurrence
- Economic evaluation of the new adjuvant therapy plays an important role in understanding its economic impact on the healthcare system and payers
- However, disease management costs by health state, which are important in economic modeling, were not well studied in post-nephrectomy RCC

Objective

- To assess the disease management costs by RCC post-nephrectomy health states, including disease free (DF), locoregional recurrence (LR), distant metastasis (DM), and death
- To quantify the cost of nephrectomy procedure

Methods

Study design and population

- This is a retrospective cohort study using the SEER-Medicare linked data from 2007 to 2016. Patients who were 66 years or older with post-nephrectomy, non-metastatic, intermediate-high or high-risk RCC based on tumor-node-metastasis and Fuhrman grading status, and met the continuous enrollment criteria were included

Operational definitions

- Disease management costs were calculated as all-cause healthcare costs from Medicare claims, excluding RCC-specific drug and administration costs, as well as all Medicare Part D costs (i.e., prescription drug costs)
- The costs were classified into the following health states:
  - DF: Defined as time periods in which patients are with early-stage disease and are without any recurrence. Time-varying disease management costs were estimated following the breakdown of years 1-3, 4-5, and 6 and above after the initial nephrectomy until any recurrence or 30 days before death
  - LR: Defined as the time period from 1 month after the initial LR until the first DM or 30 days before death. Monthly average costs were calculated, excluding repeat surgery for LR
  - DM: Costs were separately estimated for DM pre-progression and DM post-progression. Pre-progression was defined as the time period between the initial DM and the disease progression after the initial DM. Disease progression after the initial DM was defined as the initiation of new metastatic RCC treatment after the initial DM. Time-varying costs were estimated for month 1 and months 2+. Post-progression was defined as the time period from the disease progression until 30 days before death
  - Death (terminal care): 30 days before death
- Costs of nephrectomy were calculated as per-patient costs specifically associated with partial or complete nephrectomy, including preoperative imaging
  - Initial nephrectomy: Defined as the first nephrectomy received by the patient after the initial diagnosis of early-stage RCC
  - Repeat nephrectomy: Defined as surgery received by the patient after LR

Statistical analysis

- Healthcare costs were assessed as mean monthly cost per patient (in 2019 USD) to account for different lengths of follow-up between patients and grouped into different health states
- For costs of nephrectomy, a one-time, lump-sum cost was estimated by adding up costs associated with nephrectomy
- A descriptive analysis was conducted, and no statistical comparisons of outcomes were undertaken

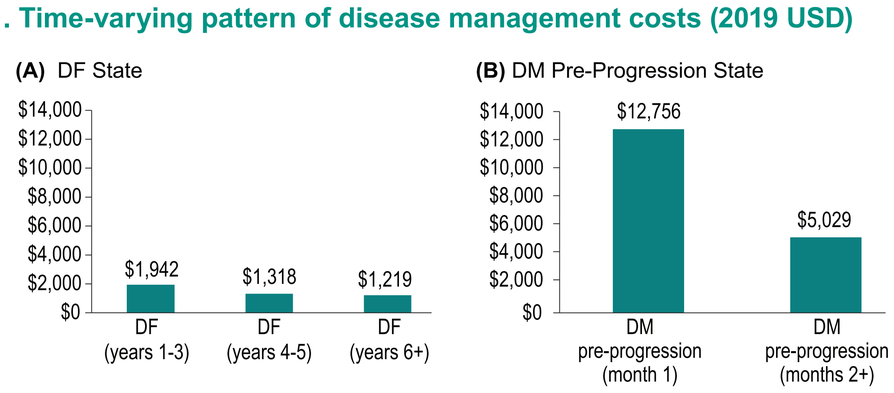
Outcome measures

- Disease management costs over time within DF, LR, DM, and death health states, separately
- Nephrectomy costs

Results

- Within the DF health state (**Figure 1A**), disease management costs were decreasing over time. Mean monthly costs per patient were $1,942, $1,318, and $1,219 in years 1-3, 4-5, and 6+, respectively
- Similar trends were observed in DM pre-progression (**Figure 1B**). Mean monthly costs per patient were $12,756 in month 1 and $5,029 for months 2+

Figure 1. Time-varying pattern of disease management costs (2019 USD)



- Disease management costs in other health states (**Figure 2**) included $3,071 for LR (excluding nephrectomy), $6,536 for DM post-progression, and $16,309 for terminal care
- Mean monthly costs per patient, standard deviations, and patient counts for each health state were reported in **Table 1**

Figure 2. Disease management costs by health state (2019 USD)

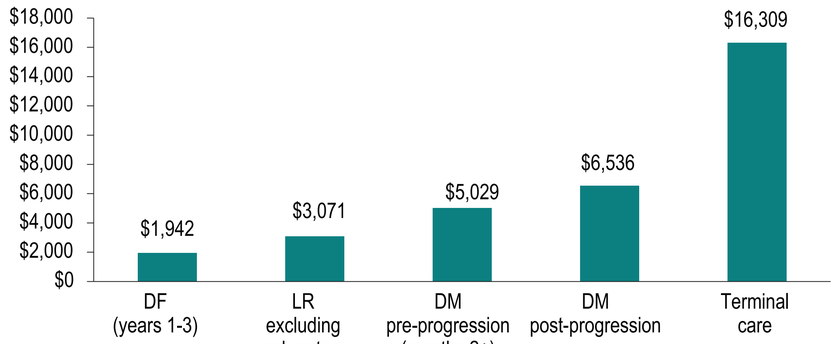


Table 1. Disease management cost statistics (2019 USD)

RCC health state	Costs	Standard deviation	Patient number
DF (years 1-3)	1,942	4,473	643
DF (years 4-5)	1,318	2,712	265
DF (years 6+)	1,219	1,832	139
LR excluding nephrectomy	3,071	4,824	29
DM pre-progression (month 1)	12,756	20,005	65
DM pre-progression (months 2+)	5,029	6,144	61
DM post-progression	6,536	6,452	21
Terminal care	16,309	19,697	181

- The costs of nephrectomy (**Table 2**) varied according to whether it was an initial or repeat procedure and whether it was a partial or complete nephrectomy. The cost ranged from $13,141 to $21,496, with a weighted average of $20,249

Table 2. Nephrectomy costs by type

Procedure[a]	Mean costs	Standard deviation	Patient number
Initial nephrectomy (partial)	21,496	12,884	42
Initial nephrectomy (complete)	20,264	12,692	597
Repeat nephrectomy (partial)	16,353	7,022	3
Repeat nephrectomy (complete)	13,141	16,547	7
Nephrectomy, weighted average	20,249	—	—

[a]Costs from imaging procedures (CT and MRI) within 30 days of nephrectomy were also included.

Limitations

- The patient population in the linked SEER-Medicare database includes Medicare patients who were aged 65 or above. Therefore, the results from this study may not be generalized to a younger patient population
- Sample size for some of the cost outcomes (eg, repeat surgery) is small, so the estimated costs may not be representative
- The study was descriptive and did not include statistical comparisons of outcomes in the different time periods

Conclusions

- Disease management costs decrease over time within the DF state, indicating that patients with prolonged disease-free survival may benefit from lower healthcare costs
- Post-nephrectomy RCC at later stages (LR, DM, death) has much higher disease management costs than at earlier stage (DF)
- Adjuvant therapies that could help maintain patients in the DF state may decrease disease management costs and repeat nephrectomy costs among this patient population
- In addition, the highest disease management costs in the DM state occur within the first month and remain high over time compared to disease management costs in the DF health state
- Future studies evaluating the economic impact of new treatments should account for the observed time-varying pattern of disease management costs within a health state

References

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Presented at ISPOR Europe 2022; Vienna, Austria; November 6-9, 2022.