Optimizing referral to a renal care management program through use of a predictive model for transition to dialysis in a Medicare Advantage population

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Background

Advanced chronic kidney disease (CKD) requires coordinated renal care management, particularly around the time of transition to dialysis. Individuals who are likely to progress to dialysis are typically identified by laboratory values reflecting kidney function, such as the estimated glomerular filtration rate (eGFR). However, timely selection of candidates for renal care management is hampered because of the frequent lack of relevant lab test results. Predictive analytics may provide a more efficient way of identifying individuals likely to transition to dialysis.1,2

Objective

To measure the clinical impact of using a predictive model to select individuals at high risk of transitioning to dialysis for referral to renal care management

Methods

Predictive Model Development:
- The model was created from administrative medical, pharmacy, and laboratory data, as well as matched consumer data who met the following criteria:
  - Medicare Advantage coverage
  - CKD diagnosis on ≥ 2 claims with eGFR < 30 mL/min/1.73 m² within the previous 12 months
  - Not currently in hospice care
  - No dialysis within the previous 12 months
- Over 1000 variables in 5 categories (demographic, clinical, behavioral, medication, and dialysis-specific) were considered as potential predictors of transition to dialysis in the next 12 months (see Figure 3).
- The final model includes 100 variables, with an area under the receiver operating characteristics curve (AUC-ROC) of 0.954.
- Neural Network was selected as the modeling methodology.

Inclusion Criteria:
- Individuals with Medicare Advantage coverage at time of referral
- Referred to the renal care management service between March and October 2014 (using dialysis predictive model risk scores (risk scores in the top 2%) or over 2.8 million Medicare Advantage members around the time of the study

Exclusion Criteria:
- Individuals with Medicare Advantage coverage at time of referral
- Referred to the renal care management service between March and October 2014 (using dialysis predictive model risk scores (risk scores in the top 2%) or standard criteria (e.g., eGFR <20mL/min/1.73 m² or nurse referral)

Results

Figure 1. Development of the Dialysis Predictive Model

Figure 2. Annualized Rate of Transition to Dialysis

Table 1. Characteristic Participants

Table 2. Enrollment and Retention

Figure 3. Time to Dialysis

Conclusions

By using a wide range of data sources and advanced modeling techniques, the dialysis predictive model was able to effectively identify members for referrals to renal care management.

The individuals identified by predictive model had a higher dialysis transition rate and longer interval to transition.

Similar enrollment and retention were observed in individuals referred by the predictive model and traditional means.

Implications

The predictive model may allow more time for intervention due to earlier identification.

The predictive model scores may also be used to prioritize referrals from various referral sources, enabling more focused intervention.

Limitations

- A longer term study may be needed to further evaluate the clinical outcomes of individuals referred by the dialysis predictive model
- Since individuals were not randomized to referral method, results might reflect unmeasured confounders that are related to transition to dialysis and differ between the two groups. However, the robustness of the results and the number of factors taken into account by the predictive model suggest this risk is small.
- This study is subject to limitations common to claims data (e.g., coding errors, missing data, fixed variables).

References

Figure 3. Time to Dialysis

Refrer1 using the predictive model was associated with a longer time until dialysis: 4 months (120 days) for Predictive Model versus 3 months (92 days, p<0.001) for Standard referral

Table 2. Enrollment and Retention

Outcome Predictive Model Standard P Value
Program enrollment 35% 37% 0.205
Continuation in program at study end 70% 68% 0.489

No differences in program enrollment or retention were observed.