Predictive Versus Retrospective Analytics: Identification of Patients Who Are Non-adherent to Medication

Brooke D. Hunter, MS; Kristin Brown-Gentry, MS; & Karim Prasla, PharmD, MS, BCPS

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Background

- Medication adherence is critical to the control of chronic conditions.[1] Non-adherence can lead to adverse medical outcomes and increased healthcare spend.[2,3] Predictive analytics can provide insight into patient behavior by trending medication adherence over time, thereby creating opportunity for earlier intervention relative to retrospective identification.

Objective

- To compare predictive identification to retrospective identification of patients who were non-adherent to their oral diabetic medication regimen to assess the added value of using predictive methods over retrospective methods alone.

Methods

- A sample of 1,009 Medicare members, who were 62% female, had a mean age of 64, had a mean of 5.7 chronic conditions, and were non-adherent to their oral diabetic medication in 2019 were analyzed.

- The observed cumulative, monthly adherence, measured as the Proportion of Days Covered (PDC) was calculated for January 2019 through June 2019, along with year non-adherence. Predicted cumulative, monthly PDC for January through June and predicted year-end PDC were estimated.

- Discrepancies of predicted PDC estimates and first month non-adherent (PDC < 80%) were assessed descriptively.

- Timing of predictive identification was compared to retrospective identification based on date of clinical outreach using a paired samples t-test.

Results

- Mean discrepancies between the observed and predicted PDC ranged from -10.99 to -3.96, with the largest discrepancy observed in January and the smallest discrepancy observed in June. Negative values indicate that the PDC estimates were larger than the observed values, and values closer to 0 indicate smaller discrepancies. Discrepancies between the observed first month non-adherent and the predicted first month non-adherent ranged from -0.31 to 0.63 months. Values closer to 0 indicate smaller discrepancies.

- Predictive identification identified non-adherent patients 4.4 to 3.4 months early, with the largest value observed in January and the smallest value observed in June. Retrospective identification identified patients between 4.4 and 1.8 months early. There was no difference between identification methods in January. Predictive identification identified non-adherent patients significantly earlier in February (t[71]=3.9, p<.001), March (t[92]=4.4, p<.001), April (t[122]=6.9, p<.001), May (t[168]=10.9, p<.001), and June (t[199]=11.5, p<.001).

Predictive identification provides added value over retrospective identification of patients at-risk of **medication non-adherence** through earlier identification.

Results

Accuracy of Predictions –
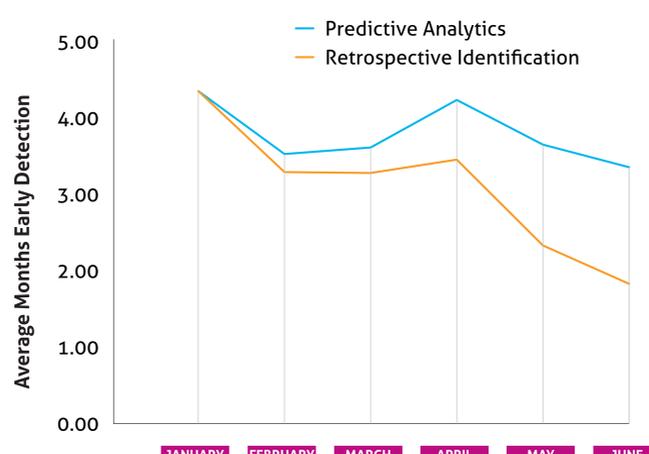discrepancy between predicted and observed adherence

Mean Value of Error in Predicted PDC
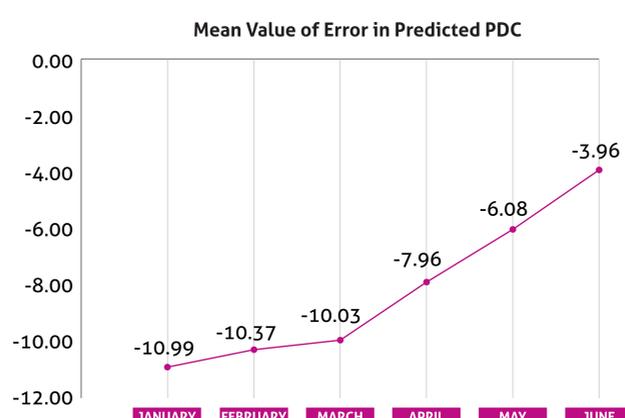
Notes. PDC Estimate[1] = Observed – Predicted

Predicted Non-adherent Month
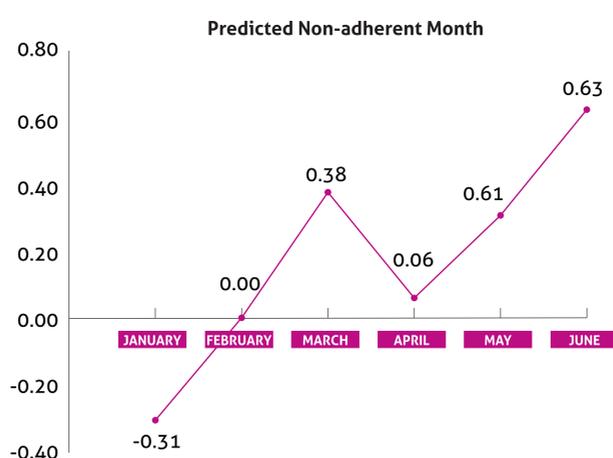
Notes. First Month Non-adherent[2] = Observed first month NA - Predicted first month NA

Early Identificaion –
How early are members identified prior to becoming non-adherent?

Discussion

- Each month the accuracy of the predicted PDC value becomes incrementally more accurate, which provides increasing insight into which patients are within reach of achieving a target of 80% adherence and able to reach or maintain an adherent status by the end of the year.

- On average, the model was able to predict the observed month a patient became non-adherent to their medication with less than a one-month error in timing. Knowing when a patient will become non-adherent can aid in resource allocation when it is not possible to outreach to all patients by prioritizing patients who have the greatest risk of medication non-adherence.

- On average, the predictive model was able to identify non-adherent patients 3.4 – 4.4 months earlier than when they became non-adherent. The earlier a patient is identified as being at risk of medication non-adherence, the greater the chance of getting the patient back on track through clinical intervention in a timely manner.

- Results support that predictive analytics identified patients who were non-adherent to their medication 4.4 -1.8 months earlier relative to retrospective identification. While retrospective identification is valuable to understanding a patient's history, predictive identification can provide the opportunity for outreach before a patient becomes non-adherent to their medication, and potentially prevent adverse medical outcomes or increased medical costs.

Limitations

- Retrospective identification was based on the timing of clinical outreach, and the number of patients who received clinical outreach may have been constrained by band width for outreach thereby introducing bias.

Conclusion

- Predictive analytics can be applied to patients to assess likelihood of medication non-adherence for chronic conditions. Predictive identification provides added value over retrospective identification of at-risk patients through earlier identification.

References

- World Health Organization (WHO). Adherence to Long-term Therapies: Evidence for Action. http://www.who.int/chp/knowledge/publications/adherence_report/en/
- Egede, L.E., Gebregziabher, M., Dismuke, C.E., Lynch, C.P., Axon, R.N., Zhao, Y., & Mauldin, P.D. (2012). Medication Nonadherence in Diabetes: Longitudinal effects on costs and potential cost savings from improvement. *Diabetes Care,* 35(12): 2533-2539.
- Roebuck, M.C., Liberman, J.N., Gemmill-Toyama, M., & Brennan, T.A. (2011). Medication adherence leads to lower health care use and costs despite increased drug spending. *Health Affairs,* 30(1): 91-99.

Brooke Hunter
BDHunter@magellanhealth.com

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