

PRODUCT

A machine learning model created to predict 0–180-day mortality risk for patients being transferred from acute care to a skilled nursing facility.

INDICATION

Transition Care Planning

VALUE PROPOSITION

Shared decision making based on informed key patient mortality risk prediction.

Guide appropriate transitions in care.

Increase the quality of end-of-life care for patients and their families.

Reduce the risk of cyclical transitions between the hospital and SNF.

Create new data for SNFs when considering occupancy, staffing, and contracts.

CONTACT INFORMATION

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Skilled Nursing Facility (SNF) Mortality Model

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PROBLEM/OPPORTUNITY

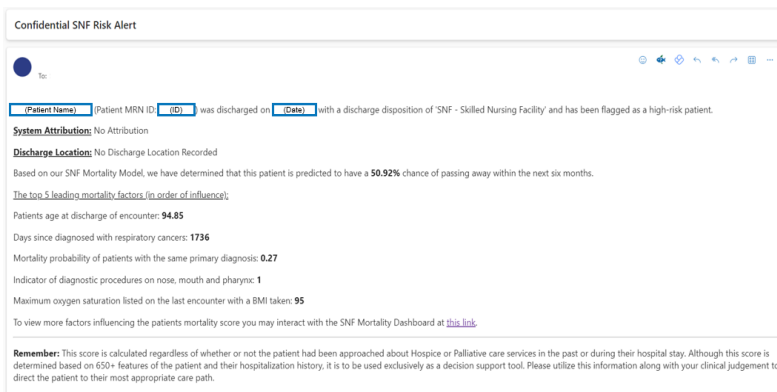
Patients, their family, Care Managers, and Providers are faced with uncertain decisions when considering the transfer of patients from inpatient acute inpatient settings to post-acute care skilled nursing facilities (SNF). For patients, the considerations include end-of-life planning focused on maximizing comfort. For hospitals and SNFs, transitions in care must include both quality of care, staffing needs, and financial considerations of managing patient care.

SOLUTION/PRODUCT

Data for nearly 50,000 Cleveland Clinic patients representing nearly 78,000 encounters from 2018-2022 was identified and used to train the model and validate the mortality risk model. The final model chosen used XGBoost, or extreme gradient boosting. This model has an efficient prediction capability, a high level of interpretability, and is resilient to over-fitting, which can introduce issues when using large datasets like in this case. The model is robust to multicollinearity, is capable of handling missing values, and is highly efficient compared to other machine learning models due to decision construction process.

Model results are visualized and surfaced to case managers utilizing Tableau workbooks and the Tableau server. The dashboard offers multiple views including a daily SNF-related encounter list ordered by discharge date and indicated color risk as well as a patient-specific detailed view of the features driving the predicted mortality risk.

Finally, the python notebook environment that runs the model also contains a service used to email caregivers about their specific patients.



Confidential SNF Risk Alert

To: [Patient Name] (Patient MRN ID: [ID]) was discharged on [Date] with a discharge disposition of 'SNF - Skilled Nursing Facility' and has been flagged as a high-risk patient.

System Attribution: No Attribution

Discharge Location: No Discharge Location Recorded

Based on our SNF Mortality Model, we have determined that this patient is predicted to have a **50.92%** chance of passing away within the next six months.

The top 5 leading mortality factors (in order of influence):

- Patients age at discharge of encounter: **94.85**
- Days since diagnosed with respiratory cancers: **1736**
- Mortality probability of patients with the same primary diagnosis: **0.27**
- Indicator of diagnostic procedures on nose, mouth and pharynx: **1**
- Maximum oxygen saturation listed on the last encounter with a BMI taken: **95**

To view more factors influencing the patients mortality score you may interact with the SNF Mortality Dashboard at [this link](#).

Remember: This score is calculated regardless of whether or not the patient had been approached about Hospice or Palliative care services in the past or during their hospital stay. Although this score is determined based on 650+ features of the patient and their hospitalization history, it is to be used exclusively as a decision support tool. Please utilize this information along with your clinical judgement to direct the patient to their most appropriate care path.

Cleveland Clinic is informing SNF transfers decisions using the model. Supported by leadership in Cleveland Clinic's Community Care and Medicare ACO, a team is using a prototype solution to assess the likelihood of a patient passing away within six (6) months of being discharged to a SNF. By introducing objective and reliable measures into this process, critical planning and associated discussions inform shared decision making for patient, family, and caregiver team to determine the optimal care path and transition of care