# Cognitive Computing Custom Model Cookbook

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# Cognitive Computing Custom Model Cookbook

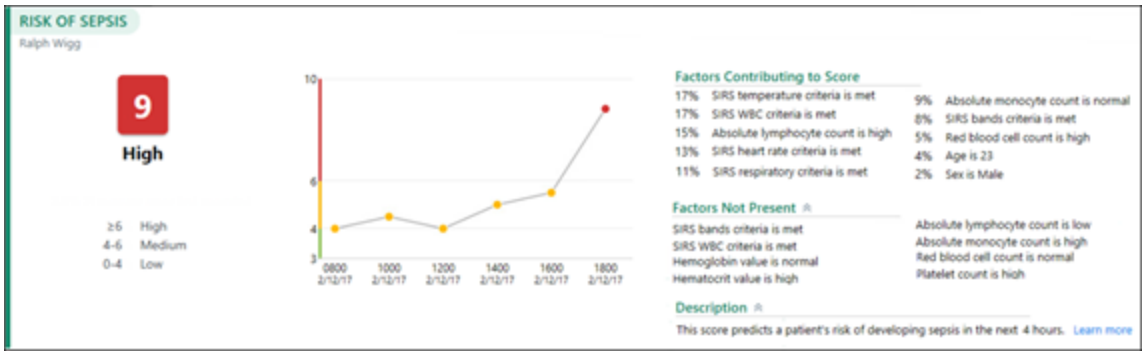
This cookbook provides a starting point for deploying a custom predictive model in Epic. It is based on the lessons we've learned by creating models and what we've seen work best for our community members. The cookbook gives you a high-level overview of what's possible with Epic and includes information about the four key ingredients for successfully deploying a model in Epic: model integration points, model features, model evaluation, and model scheduling.

## Model Integration Points

For a model to drive outcomes, you must be able to embed the model's scores into users' workflows. It's important to figure out how and when you will show scores, as well as to whom, before you start your custom model project. Epic offers many ways to show model scores to users. The following options are common workflow integration points, but additional options are possible because model scores are filed to a patient's chart:

- BestPractice Advisories (BPAs). BPAs allow you to provide targeted, patient-specific guidance to your users and can include links to relevant actions, such as placing additional orders or sending an In Basket message. You can create a BPA that appears to users when a patient's score exceeds a certain value. Refer to the Use a BestPractice Advisory to Warn Users When a Score Reaches a Certain Level topic for more information.

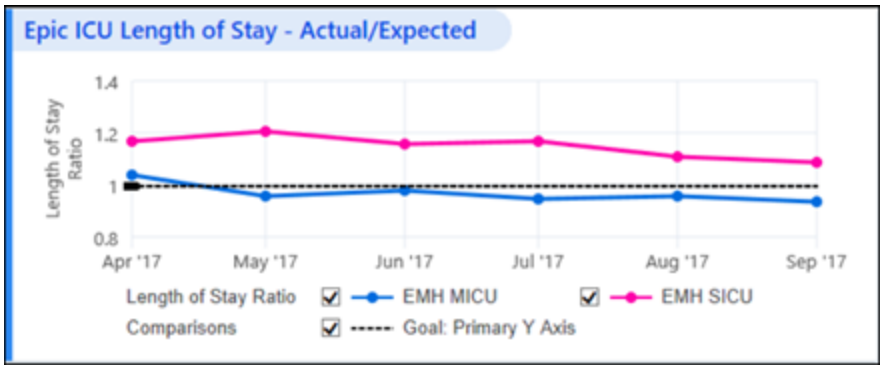

- Chart Review, Patient Snapshot, or summary reports. You can add a model scoring print group to a report that's a part of users' existing workflows. Refer to the Show Scores in Print-Group-Based Reports topic for more information.



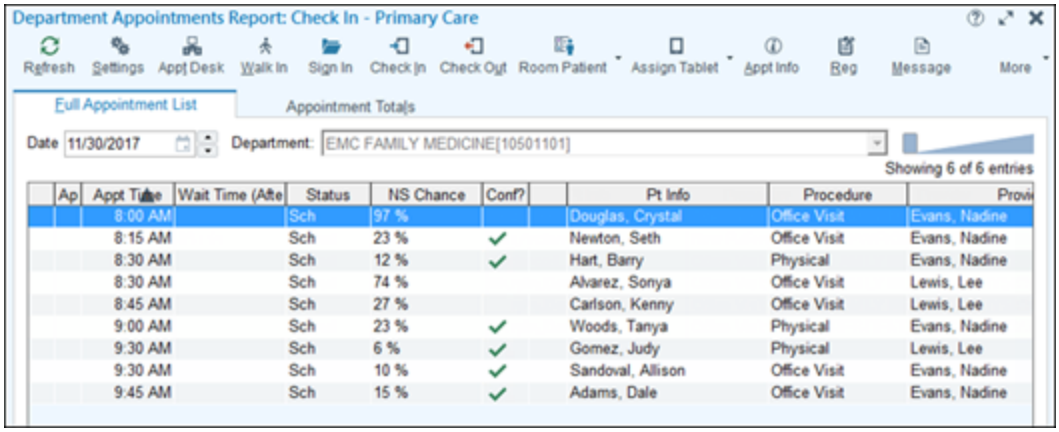

- Column in Storyboard or the workspace header. For model scores intended to continuously inform care decisions, such as a readmission risk model, you can add a model score column to the workspace header

or Storyboard. Refer to the Show Scores in the Workspace Header topic for more information.

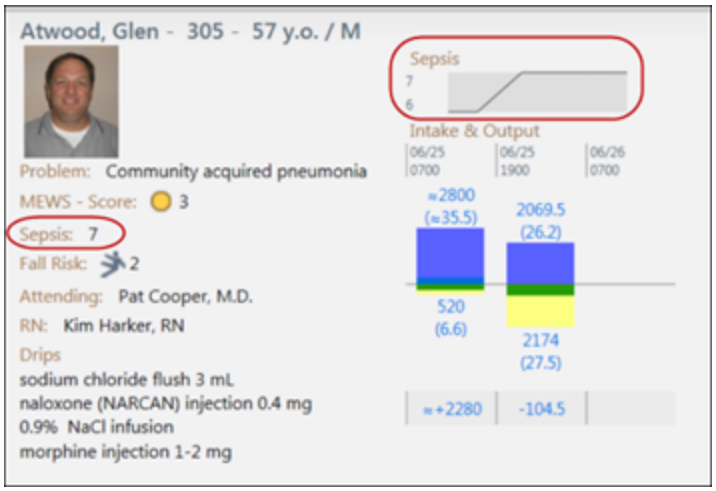

- Dashboards. You can add model scores to Radar dashboards related to the subject of the model. For example, Epic has dashboard components that show our risk-adjusted benchmarking model scores for ICU stay and risk of mortality in a dashboard for quality managers. Refer to the Give Users Access to Risk-Adjusted Benchmarking Cognitive Computing Model Scores topic for more information.




- Department Appointments Report. You can add scheduling-related model scores to a report used by schedulers. For example, you might add a no-show risk model score to the report for schedulers to review when determining which patients to prioritize for reminders calls. Refer to the Risk of Patient No-Show Setup and Support Guide for more information.




- Epic Monitor's Watch List. If your organization uses the Epic Monitor, you can add model scores to the Watch List to help nurses determine which patients need attention. Refer to the Show Scores on the Epic Monitor's Watch List topic for more information.




- Flowsheet rows. You can use a batch job to periodically file model scores to a flowsheet row. For example, you might file a patient's deterioration score to flowsheets so that nurses can see it while documenting a patient's vital signs. Refer to the Automatically File Clinical Cognitive Computing Model Scores topic for more information.
- Patient Lists, Trackboard, Grease Board, and Reporting Workbench reports. You can add a model score column that can change color based on configured score thresholds. Users can hover over the score column to see a detailed breakdown of the factors contributing to a patient's score, as well as a graph that shows the score's trend. Refer to the Show Scores in Patient Lists topic for more information.


- Push notifications and In Basket messages. Starting in February 2019, you can notify clinicians if a risk score gets too high using a push notification or In Basket message. Refer to the Create an Asynchronous BPA section of the Use a BestPractice Advisory to Warn Users When a Score Reaches a Certain Level topic for more information.
- Registry metrics. When you show a risk score in a registry metric, users can view a patient's risk at the same time they view other information about him from within a registry. This option lets clinicians track a number of pieces of relevant clinical information at the same time. For more information, refer to the Show a Risk Score as a Registry Metric topic.
- Surgical reports. Starting in August 2019, you can create and file custom surgical cognitive computing model scores and configure them to appear in surgical reports, such as the PAT triage report. Refer to the Create a Custom Surgical Cognitive Computing Model topic for more information.

# Model Features

When you deploy a custom model in Epic, you have access to the wealth of information captured in Epic. We provide a released set of rule properties that we recommend using as a starting point for accessing that

information for use as features in predictive models. The properties can be used easily by predictive models because they have defined data sources, output types (generally numeric or string), contexts from which they can be accessed, and recommended configuration settings. This set of properties, documented in the Cognitive Computing Feature Library, includes the most common features used by predictive models, is regularly reviewed by Epic community members, and is updated and expanded regularly. Although the properties in the Cognitive Computing Feature Library work best as features for models, you are not limited to using those properties. We recommend working with your Epic representative to request a custom property if there's no property in the library that meets your needs. Cloud-based models can also access web APIs to pull in additional features for your models. Refer to the Choose and Build Your Data-Gathering Record topic for more details on the feature build process.

# Model Evaluation

Epic offers two methods of evaluating a model: Python in Cloud Foundation or PMML in Chronicles. Both methods translate your custom model into something that can be run in Epic.

### Cloud Foundation

If you are writing your own model code or using tools like TensorFlow or XGBoost, then you will likely need Cloud Foundation to support custom model evaluation. Some Epic-released models also require Cloud Foundation for localization to better fit your patient population. You can also use Slate in Cloud Foundation to build a model. Refer to the Custom Model Development with Cloud Foundation Setup and Support Guide for more information.

### Chronicles

Chronicles-based models are imported from PMML files, which require the model to be simple. The advantage of simple models is that they can take advantage of our visualization framework out of the box for things like feature contributions. For more information about PMML-based models, refer to the Generate a PMML File for Your Model topic.

# Model Scheduling

Epic offers two common ways to run a model regularly on a set of patients: registries and batch jobs. The method you choose also determines which set of patients the model is run on. Determine which method you'll use to run your custom model on a given model population.

### Registry-Based Models

The model runs on the patients included in a registry. The model is reevaluated for a patient whenever that patient's relevant registry metrics are updated. This is a good option for broad populations because the model is reevaluated for a patient only when something that affects that patient's score has actually changed. Model scores are stored in the registry. For example, Epic's Risk of Opioid Abuse or Overdose and Risk of Hospital Admission or ED Visit models are examples of registry-based models. Refer to the Verify That Your System Can Calculate Scores topic for more information.

### Batch-Based Models

The model runs based on a batch you configure for a particular set of patients. The model is reevaluated for the entire set of patients at the frequency that you configure. For example, Epic's Early Detection of Sepsis model is configured to run every 15 minutes. This is a good option for models that have a more narrow focus, such as all

admitted patients. There are five batch types that can be used to run models:

- IP acuity score batch. You can run the batch on patients in an inpatient setting, including those in the ED and inpatient units. For example, Epic's ED Likelihood to Occupy a Bed model and Inpatient Risk of Falls model use this type of batch. Refer to the Automatically File Clinical Cognitive Computing Model Scores topic for more information.
- OR acuity score batch. You can run the batch on patients with a pending surgical case. For example, starting in August 2019, Epic's Surgical Site Infection model will use this type of batch. Refer to the File Surgical Cognitive Computing Model Scores Using a Batch Job topic for more information.
- Cadence scheduling batch. You can run the batch on a set of appointments in your system. For example, Epic's Risk of Patient No-Show model uses this batch type. Refer to the Automatically File the Patient's No-Show Probability Score Calculated by a Custom Cloud Foundation Model topic for more information.
- Grand Central forecasting batch. You can run the batch on a department to forecast census. For example, you might use this type of batch to run a model to predict ED utilization or the number of occupied beds to expect for a given unit. Refer to the Show Expected Values in a Dashboard topic for details.
- Reporting Workbench batch. This type of batch can be configured to run on a set of patients using criteria you define in a Reporting Workbench report. This batch type should be used for any models for which the other batch types don't work. For example, you might use this batch type to run a model to predict patients who will leave the ED without being seen. That way, you can calculate a score for patients who are not yet triaged in the ED. Refer to the 1000-RW Batch Template topic for more information.