Title: Mayo TCU/STR Placer Tool

The Mayo Clinic Health System (MCHS) is a community-based health care provider that brings the resources and expertise of the Mayo Clinic to communities in the state's broader regions, including our city – Mankato.

When patients are are discharged from the hospital, sometimes they need to be placed in short term rehabilitation (STR) care (also called "transitional care") because they are not yet ready to go home on their own. MCHS's current process for placing discharged patients at transitional care sites is in great need of improvement. The currently-used matching process is entirely manual, wastes considerable time and money, and creates safety problems when hospitals get full because discharge-able patients have nowhere to go to make room for incoming patients.

The purpose of this project is to automate and thereby greatly improve the efficiency of the placement of discharged patients who need transitional care at appropriate care sites.

The project team will work with MCHS leaders and staff members to design and build a system that finds matches between patient needs and the capabilities available at a variety of distinct transitional care sites within the Mayo regional system. In the ideal case, the Placer tool will be able to provide one or more exact matches between patient and transitional care site(s). However, if this is not possible, the Placer tool should provide a list of partial matches, each of which is annotated with the "what's missing" information that keeps the match from being perfect. (The length of the list of partial matches produced should be controllable by the user.)

What makes a match "perfect" can be quite complex, so the first phase of the project will be about agreeing on and documenting a detailed model that will underly the placement tool's operation. Examples of components of this underlying "matching model" include (but are not limited to) **levels of care** available (*e.g.,* can the facility provide one-on-one care?), **types of medical services** available (*e.g.,* are bariatric services available?), **disciplines of care** available (*e.g.,* does the facility provide occupational therapy?), *etc.*

Once an underlying "matching model" has been agreed with the client (which will include client-led internal user reviews to get feedback and validation), the project team will then focus on two things:

1. Creating a data set that captures both sample/representative patient data (de-identified) and a complete representation of all of the transitional care sites to be included in the Placer tool.
2. Building and testing a prototype Placer tool that creates matches (hopefully "perfect", but if not then "partial with annotations of what's missing").

Team members working on this project will rely on systems analysis, data engineering, data preparation, and software development skills. The Placer tool will most likely be built using techniques drawn from linear programming, game theory, and other types of optimization and scheduling solutions.

The MCHS client lead for this project will be April Lanz (Lanz.April@mayo.edu).

Deliverables	Type of work	Activities	Resources	Tech Skills	Priority
Requirements Analysis Document (RAD)	Requirements analysis	Work with main client and her colleagues/SMEs to understand the details of what the Placer Tool needs to do, and why, and how – both in the long term and by the end of the first phase (first semester) project	Client lead and SMEs	System and requirements analysis and documentation	High
Data Model Design and Plan Document (DMDP)	Data engineering and data model planning – what are the fields and structures of the data to be used? What is the complete model of a "match"?	Work with main client and her colleagues/SMEs to identify all useful and reasonably accessible sources of data to be used in construction of the Placer; define all data fields and structures. Define the details of all components of the underlying model for "what makes a match a match"	Client lead and SMEs. Project coach and online materials about data engineering, HIPAA, and other regulatory constraints.	Data engineering, data model design and documentation	High
Match model testing and validation	User validation of match model – is the model sufficient and workable?	Working with client, get internal MCHS to agree that the proposed model for "what makes a match a match" will work	Client lead, SMEs, and internal MCHS users who validate the model	Model validation	High
Data sets: both a) patient test set (representative but de-identified patients) and b) actual transitional care sites data set	Creating the data sets to be used development, test, and (in the case of transitional care sites) deployment	Create either de-identified or synthetic data sets for patients and full data sets for transitional care sites based on the underlying "match model" as agreed above	Client lead and SMEs, project coach, and – if needed – online information about how to synthesize data sets against a data design plan	Data engineering, data preparation	High
Placer core algorithm that creates either "perfect matches" or a list of "near matches with missing components", test environment, and test results	Software development and testing of core algorithm that matches patient needs to transitional care sites	Use optimization and scheduling techniques to build a prototype predictor tool; create a working core algorithm, use iterative testing methods, provide thorough documentation of design, test, and operational environments and choices	Project coach, online resources for algorithm options	Algorithm development in a programming language to be agreed with the client	High
Placer Tool prototype application for use by MCHS hospital staff	Application development that makes core algorithm usable by MCHS staff	Prototype a "field use" (hospital use) app that wraps the core Placer algorithm into an easy-to-use format for hospital staff (platform(s) TBD)	Client lead and colleagues, project coach, internal MCHS users	App dev (platforms TBD)	Medium
Handover document	Project next-phase planning and documentation	Descriptions and plans for what to tackle in the next phase of the project. An example might be: if this project team used "only" synthesized data for patients, how to move to "real" data in the next phase. Another example might be that development is required to produce useful "near matches with missing components". Yet another example might be: if the Placer Tool app only runs on one platform, port to new platform(s).			High