

## Froedtert & Medical College of Wisconsin Clinical Cancer Center

### Day Hospital Room Utilization Modeling and Simulation

## 2. System Description

The first step in constructing the as-is simulation model of the chemotherapy treatment system is to describe the basic elements of the system as a text narrative. The system description is typically generated through interviews with *domain experts* - key individuals familiar with operation of the system. The intent of this step in the analysis is not to include every detail of system operation, but rather to create an information framework for following steps in the analysis. In short, the purpose of this step is to obtain as much information as possible in as short of a time as possible, and to then organize the information to expedite validation of the description by the domain experts.

### **Human Resources:**

The first portion of this system description identifies the *human resources*, or *people* associated with the Chemotherapy Treatment System:

- Scheduler
- Shift Coordinator
- Middle Nurse
- Chair Nurse
- Technician

### **Physical Resources:**

The second portion of the system description focuses on *physical resources*. For the Chemotherapy Treatment System, there is only one primary physical resource, which is a *treatment room*. Rooms can contain a single treatment bed or treatment chair. Some treatments require the use of a treatment bed, but where not required, a patient can specify either a bed or a chair. Some rooms in the Day Hospital are reserved for particular treatments, but for this analysis only the general use chairs and beds will be included as physical resources. Rooms are organized into areas associated with teams of nurses as follows:

- Team 1: 6 beds – general use
- Team 2: 6 beds – general use
- Team 3: 6 chairs – general use
- Team 4: 6 chairs – general use
- Injection: 2 chairs – dedicated to injection procedures
- Triage
  - 3 beds – dedicated to photophoresis procedures
  - 3 beds – dedicated to bone marrow collection procedures
  - 8 bed/chair – general use

### **Material Resources:**

The final portion of the system description identifies *material resources*, which includes primarily the consumable elements of the process. The primary material resource considered in this analysis are the medicines used for chemotherapy treatments. The medicines are typically prepared to order at the time that treatment is to be given to a patient. Medicines are prepared by a pharmacy within the Day Hospital dedicated to preparing the chemotherapy medicines.

**Definitions:**

The following definitions apply to terms that will be used on the following steps in this analysis. Wherever possible, the terms and definitions have been chosen to be readily recognized and understood by Day Hospital staff.

- Appointment: One visit by one patient to the Day Hospital at a specific time and date to receive a set of treatments determined by the patient's doctor.
- Orders: List of one or more treatments that a patient will receive during an appointment.
- Treatment: The administration of a set of medicines to a patient according to a defined protocol.
- Protocol: Pre-defined instructions for performing a treatment. Includes the medicine to be used and directions on how to apply the medicine (e.g., sequence, timing).
- Schedule: Daily list of appointments containing patient name, scheduled treatment start time, and chair nurse assignment.
- Lab Report: Results of lab tests performed on a patient by the clinical laboratory. A lab report is required before treatment can be started.
- Lab Update: Lab tests can be run after treatment on a patient has been started, and lab updates can be received over the entire time that a patient is receiving treatment.

**System Operation:**

The following is a brief description of some of the key elements of the operation of the Chemotherapy Treatment System:

- A patient with an appointment enters the chemotherapy treatment system for treatments described in the orders for the patient.
- The patient's doctor defines the orders for the appointment. The orders may be modified before or during treatment by the patient's doctor or by the Day Hospital middle nurse or chair nurse, depending on lab results, lab updates, and the condition of the patient during treatment.
- At the beginning of an appointment, the shift coordinator assigns a chair nurse and a room to a patient. The chair nurse is then responsible for executing the patient's orders.
- A patient leaves the system after all treatments are completed, or after treatments are started but not completed, or before treatments are started, depending on lab results or updates and/or the condition of the patient before or during treatment.
- The chair nurse sends the patient's orders to the pharmacy, where the pharmacy prepares the required medicines. The patient's chair nurse picks up the medicines at the pharmacy. Medicines for all treatments required by a patient's orders may be prepared before any treatments are started, or may be prepared for each treatment as treatments in the patient's orders are completed.
- The laboratory performs tests on a patient before the patient receives treatment. The laboratory sends a lab report and lab updates to the Day Hospital as they become available. The doctor and/or middle and chair nurses can request lab updates as treatments progress.
- If lab results or lab updates are abnormal and/or if the patient condition requires, then the chair nurse can request that the lab report or the lab updates, the patient's orders, and the patient's condition be sent to the patient's doctor for review. The doctor may cancel the patient's treatments or change the patient's orders before treatments are started, or may change a patient's orders or terminate a patient's treatment while treatment is in progress.