

# Cytokine Release Syndrome

## Inpatient care for side effects of CAR T-cell therapy

Laura T. Smith, MSN, CRNP, and Kimberly Venella, MSN, CRNP



**BACKGROUND:** Pediatric patients with relapsed and refractory acute lymphoblastic leukemia are more often being treated with chimeric antigen receptor (CAR) T-cell therapy. As with any new therapy, the management of this patient population has a unique set of challenges. The side effects of this therapy can range from mild to severe, with cytokine release syndrome being the most common reason for hospitalization.

**OBJECTIVES:** This article presents common side effects, treatments, and challenges of caring for hospitalized patients who have received CAR T-cell therapy.

**METHODS:** A case study is used to illustrate a patient's inpatient hospitalization course after receiving CAR T-cell therapy, including the management of treatment-related toxicities.

**FINDINGS:** As treatments emerge, nurses will be challenged with learning the associated side effects and toxicities. CAR T-cell therapy can result in a unique trajectory of potential symptoms and the potential for complete resolution of disease.

### KEYWORDS

cytokine release syndrome; CAR T-cell therapy; pediatric patients; immunotherapy

### DIGITAL OBJECT IDENTIFIER

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**CHIMERIC ANTIGEN RECEPTOR (CAR) T-CELL THERAPY** is being used more often for pediatric patients with relapsed and refractory acute lymphoblastic leukemia (ALL). As with any new therapy, CAR T-cell therapy comes with a unique set of challenges for symptom management. Side effects can range from mild to severe. Mild side effects can be managed in an outpatient setting, and severe events with multisystem organ failure may require care in an intensive care unit (ICU). The primary complications of CAR T-cell therapy are well documented and include cytokine release syndrome (CRS), neurologic symptoms, tumor lysis syndrome, and graft-versus-host disease (GVHD), each of which may require hospitalization for symptom management (see Table 1). As frontline providers, nurses are often first to identify the signs and symptoms of complications and acute changes in a patient's status. Understanding the hallmark complications, signs, symptoms, and management of these common complications can better prepare nurses to deliver safe and effective care in the clinical setting. This article uses a case study to address inpatient management of the moderate to severe toxicities that are specifically related to CAR T-cell therapy.

### Case Study

D.M. is a 21-year-old man who was initially diagnosed in 2001 with ALL at age six years. Ten months after therapy, he experienced his first relapse, was treated, and achieved remission again. He developed his second relapse four years off therapy, after which he was not able to achieve chemotherapy-induced remission. Prior to receiving CAR T-cell therapy targeting the CD19 antigen (CART-19), his bone marrow had 93% blasts, and his minimal residual disease was 68%. He received the T-cell infusions without incident in the outpatient clinic. Information about the infusion process is outlined in this supplement by Callahan, Baniewicz, and Ely (2017). After he received the infusion, his family was educated on symptoms that would require inpatient medical interventions, and he was sent home with instructions for a follow-up appointment and 24/7 contact information for the team.

### Cytokine Release Syndrome

CRS is a constellation of symptoms that occur when T cells engage and begin to proliferate in the body and lead to a general inflammatory response. It is the main complication requiring hospitalization after CAR T-cell therapy