Tocilizumab for the Management and Prevention of Cytokine Release Syndrome in Hematologic Malignancies: A Systematic Review of Clinical Evidence

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Introduction

Cytokine release syndrome (CRS) is a common and potentially life-threatening complication of novel cellular therapies such as chimeric antigen receptor T-cell (CAR-T) therapy in hematologic malignancies. Tocilizumab, an IL-6 receptor antagonist, is approved for CRS treatment, but its preventive efficacy and broader safety profile require clarification.

Objectives

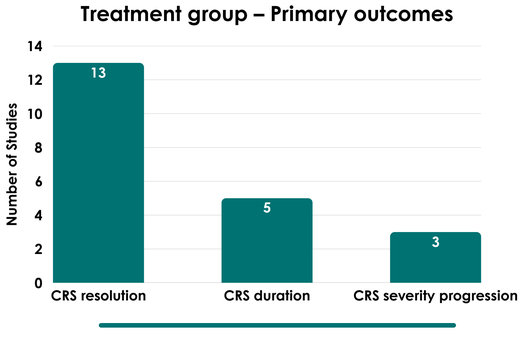
To systematically review clinical studies evaluating Tocilizumab for the treatment or prevention of CRS in hematologic malignancies, focusing on clinical effectiveness, toxicity, and impact on anti-tumor response.

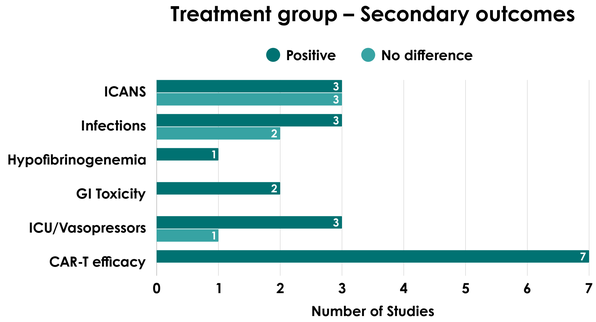
Aim

To evaluate the therapeutic and preventive role of Tocilizumab in cytokine release syndrome (CRS) across hematologic malignancies to enhance patient safety, preserve anti-tumor efficacy, and support optimal integration into clinical care pathways.

Results

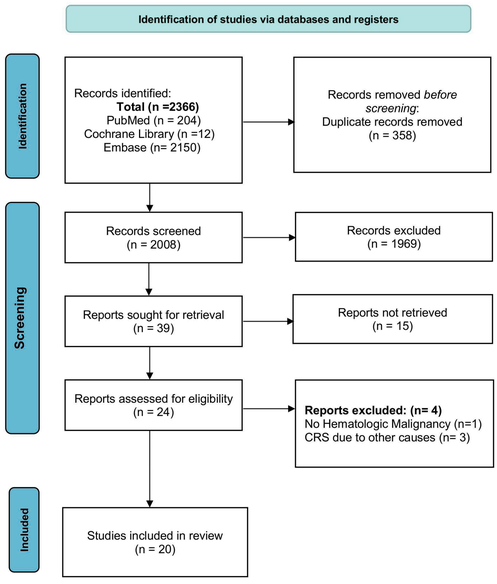
- A total of 20 studies (13 cohorts, 3 clinical trials, 4 case reports/series) comprising over 900 patients were included.
- Tocilizumab was used for CRS treatment in 17 studies and for prevention in 3 studies.
- CRS was triggered by CAR-T therapy (17 studies), bispecific antibodies (1 study), or hematopoietic stem cell transplantation (2 studies).
- Among treatment studies (n=17), CRS resolution was reported in 13 studies, with success rates of 60–100%.
- In 5 studies, CRS duration was shortened by a median of 2–3 days.
- In safety endpoints, 3 studies reported reduced ICU admissions while neurotoxicity (ICANS) in toci-treated groups was increased in 3 studies.
- 3 studies also reported increased infections, while 2 studies reported no difference.
- Other significant adverse events included hypofibrinogenemia (1 study) and GI toxicity (2 studies).
- Pre-emptive or prophylactic Tocilizumab reduced progression to Grade ≥3 CRS in all 3 prevention studies, with no compromise in CAR-T efficacy observed across any comparator study.





Methods

- A comprehensive literature search was conducted on PubMed, Embase, and the Cochrane Library for studies published up to April 2025.
- Eligible studies included clinical trials, cohort studies, and case series reporting Tocilizumab use for CRS due to any therapeutic intervention for hematologic malignancies.
- Only human studies published in English were included.
- Outcomes assessed included efficacy endpoints (CRS resolution, CRS duration, and severity); safety endpoints (neurotoxicity/ICANS, infection rates, ICU admissions, other adverse events); and CAR-T efficacy (response rates, MRD negativity, survival).

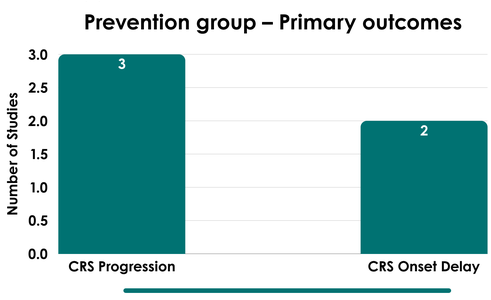


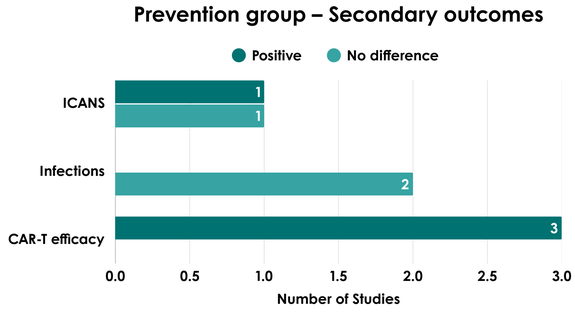
Summary

Tocilizumab is effective for CRS treatment and prevention in hematologic malignancies. While generally safe, early use may cause neurotoxicity or infection in selected patients. Further prospective trials are needed to optimize timing and patient selection.

References

- Kadauke S, Myers RM, Li Y, et al. Risk-adapted preemptive tocilizumab for cytokine release syndrome in high-tumor burden B-ALL. Blood Adv. 2021;5(22):5047–5056.
- De Philippis C, Mele S, et al. Early preemptive tocilizumab use in low-grade CRS: a prospective single-center study. Transplant Cell Ther. 2023;29(4):249.e1–249.e8.





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