THROMBOCYTOPENIA FOLLOWING CAR-T CELL THERAPY, A SYSTEMATIC REVIEW OF PROSPECTIVE TRIALS

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INTRODUCTION

Chimeric antigen receptor T-cell (CAR-T) therapy has transformed outcomes for relapsed/refractory B-cell malignancies. Among hematologic toxicities, thrombocytopenia is common after CAR-T and may be prolonged, creating clinically important risks such as bleeding and delays to subsequent therapies or trial enrolment

AIM

To systematically review prospective clinical trial data on the incidence, severity, duration, risk factors, and management of thrombocytopenia after FDA-approved CAR-T therapies.

METHOD

We searched PubMed, Embase, and the Cochrane Library for prospective interventional clinical trials of axicabtagene ciloleucel, tisagenlecleucel, and lisocabtagene maraleucel published between January 2016 and January 2026. We identified 790 records. After removal of 210 duplicates, 580 unique records were screened by title and abstract, 520 were excluded (preclinical studies, non FDA approved therapies, case reports, reviews, non-CAR-T immunotherapies, pediatric-only cohorts, or clearly irrelevant outcomes). 60 full-text articles were assessed for eligibility, 51 were excluded for reasons including non-prospective design, absence of thrombocytopenia outcomes, or being reviews/editorials. Nine prospective interventional trials met inclusion criteria and were included in the qualitative synthesis.

CONCLUSIONS

Prospective trial data confirm that thrombocytopenia is a common and sometimes prolonged toxicity after CAR-T therapy. Standardized cytopenia reporting and prospective evaluation of mitigation strategies (including TPO-RAs and hematopoietic support) are needed.

RESULTS

Across nine pivotal CAR-T trials (ZUMA-1, JULIET, TRANSCEND NHL-001, ZUMA-7, ZUMA-5, ELARA, TRANSCEND CLL-004, ZUMA-2, BELINDA), a total of 1,254 patients were infused. Thrombocytopenia incidence varied widely: ZUMA-1: 38/101 (38% grade ≥3, 7% persistent at 3 months); JULIET: ~46/115 (40% any-grade, ~35/115 [30%] grade ≥3); TRANSCEND NHL-001: 85/270 (31% any-grade), 73/270 (27% grade ≥3), 81/270 (30%) prolonged at day 29; ZUMA-7: 51/170 (30% any-grade), 34/170 (20% grade ≥3); ZUMA-5: 37/148 (25% any-grade), 27/148 (18% grade ≥3); ELARA: 5/97 (5% any-grade and grade ≥3); TRANSCEND CLL-004: 59/117 (50% any-grade), 35/117 (30% grade ≥3), with 27/37 recovering by day 90; ZUMA-2: 18/74 (25% any-grade), 12/74 (16% grade ≥3); BELINDA: 53/162 (33% any-grade), 41/162 (25% grade ≥3). Overall, thrombocytopenia ranged from 5% (ELARA) to 50% (CLL-004), with grade ≥3 events in 16–38% of patients, highlighting its frequency and clinical relevance across CAR-T therapies.

Trial	**Total Patients No.**	**Thrombocytopenia** incidence any grade	**Thrombocytopenia Grade ≥3**	**Persistent thrombocytopenia (Day +28 to 90)**
ZUMA-1 (axicabtagene ciloleucel)	101	38 (38%)	Not reported	%7 at 3 months
Juliet (Tisagenlecleucel)	115	14 (13%)	Not Reported	Not Reported
Transcend NHL-001	270	85 (31%)	73 (27%)	81 (30%) defined as grade **≥3 platelet decrease at day 29**
ZUMA-7 Axicabtagene Ciloleucel	170	51 (30%)	34 (20%)	Not repored
ZUMA-5 Axicabtagene Cel	148	37 (25%)	27 (18%)	Not reported
ELARA (tisagenlecleucel)	97	5 (5%)	5 (5%)	Not reported
Transcend CLL-004	117	59 (50%)	35 (30%)	27/37 recovered to ≤ grade 2 by day 90 (10 remained thrombocytopenic)
ZUMA-2 (brexucabtagene autoleucel)	74 infused	18 (25%)	12 (16%)	Not reported
BELINDA* (tisagenlecleucel)	162	53 (33%)	41 (25%)	Not reported

Table: Summary of Thrombocytopenia Across Core CAR-T Trials
*Non FDA approved

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CONTACT INFORMATION

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