

Promising Investigational Agents and Strategies

Lindsey Roeker, MD

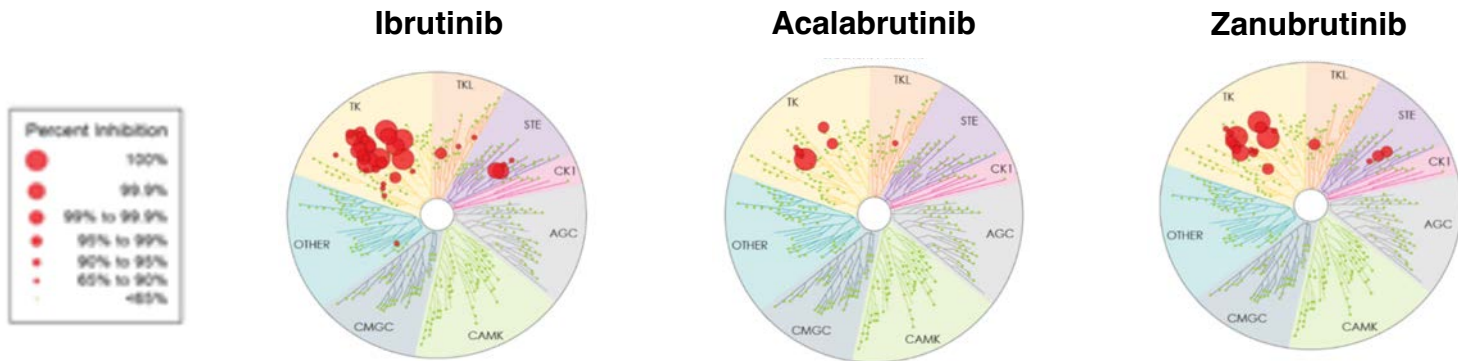
Assistant Attending L1

Memorial Sloan Kettering Cancer Center

New York, NY

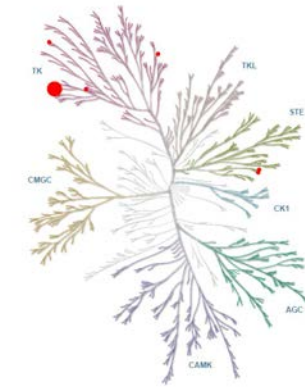
BTK inhibitors: comparing kinome selectivity and *in vivo* activity

Covalent



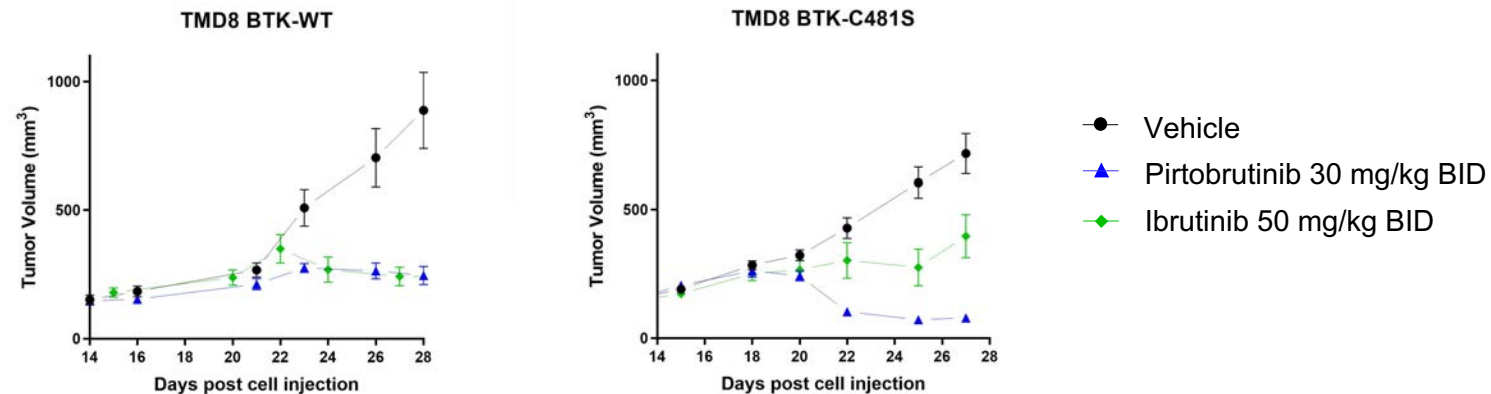
Non-Covalent

Pirtobrutinib



Xenograft models

In vivo activity similarly efficacious as ibrutinib in WT; superior in C481S



Pirtobrutinib

- >300-fold selectivity for BTK vs 370 other kinases
- Favorable pharmacologic properties allow sustained BTK inhibition throughout dosing interval
- Nanomolar potency against WT & C481-mutant BTK in cell and enzyme assays
- Due to reversible binding mode, BTK inhibition not impacted by a high intrinsic rate of BTK turnover

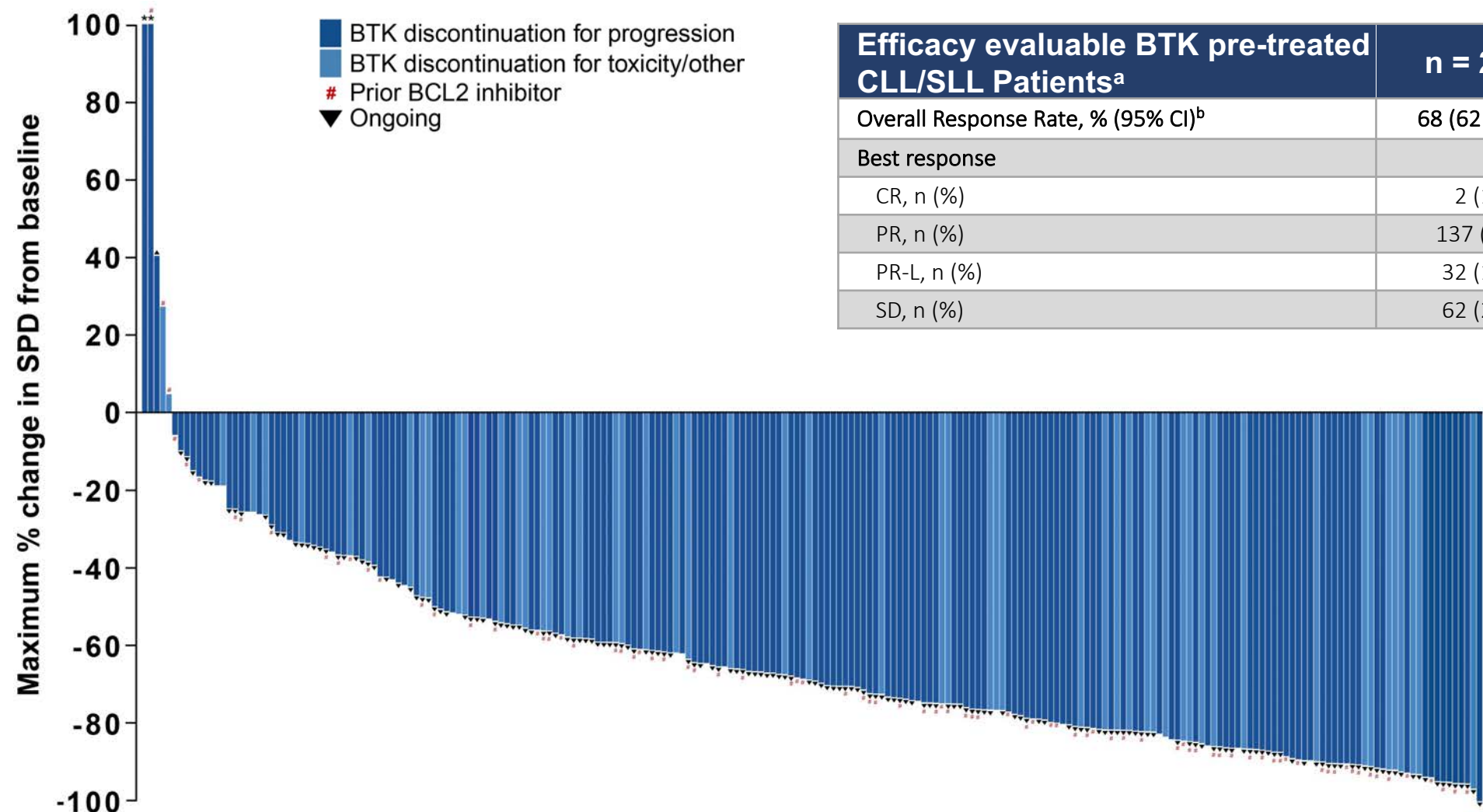
BRUIN: phase I/II study of Pirtobrutinib

The most recent clinical update focused on CLL/SLL patients previously treated with BTK inhibitor

Characteristics	N = 261
Median age, years (range)	69 (36-88)
Female, n (%)	84 (32)
Male, n (%)	177 (68)
ECOG PS ^a , n (%)	
0	138 (53)
1	104 (40)
2	19 (7)
Median number of prior lines of systemic therapy (range)	3 (1-11)
Prior therapy, n (%)	
BTK inhibitor	261 (100)
Anti-CD20 antibody	230 (88)
Chemotherapy	207 (79)
BCL2 inhibitor	108 (41)
PI3K inhibitor	51 (20)
CAR-T	15 (6)
Stem cell transplant	6 (2)
Allogeneic stem cell transplant	5 (2)
Autologous stem cell transplant	1 (<1)
Reason discontinued prior BTKi, n (%)	
Progressive disease	196 (75)
Toxicity/Other	65 (25)

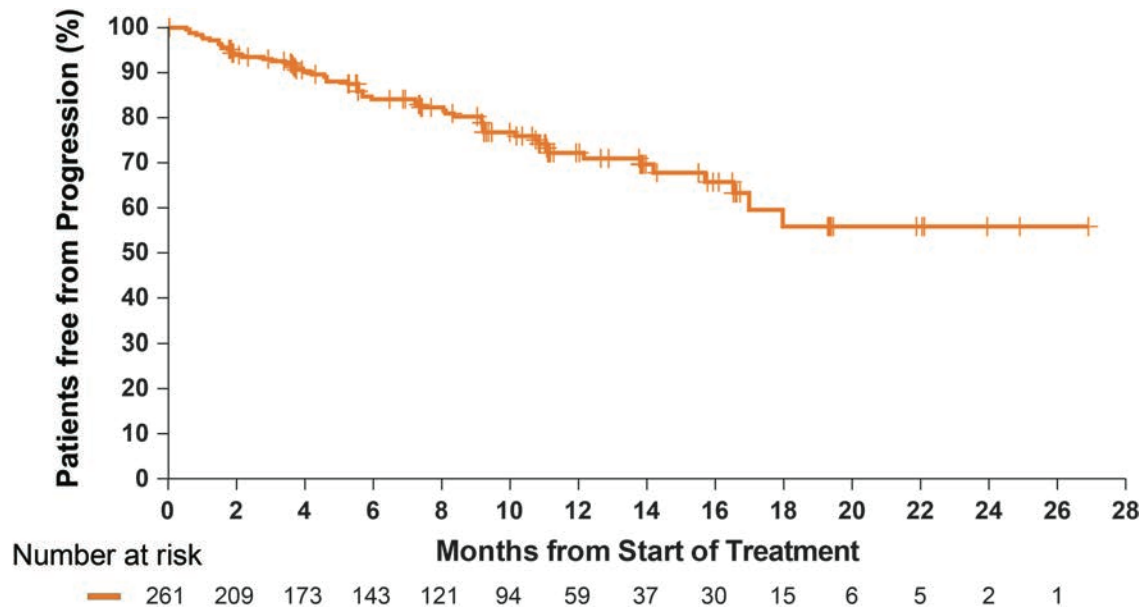
Baseline Molecular Characteristics	
Mutation status, n (%)	
BTK C481-mutant	89 (43)
BTK C481-wildtype	118 (57)
PLCG2-mutant	33 (16)
High Risk Molecular Features, n (%)	
17p deletion	51 (28)
TP53 mutation	64 (37)
17p deletion or TP53 mutation	77 (36)
Both 17p deletion and TP53 mutation	38 (27)
IGHV unmutated	168 (84)
11q deletion	45 (25)

Pirtobrutinib efficacy in BTK pre-treated CLL/SLL patients



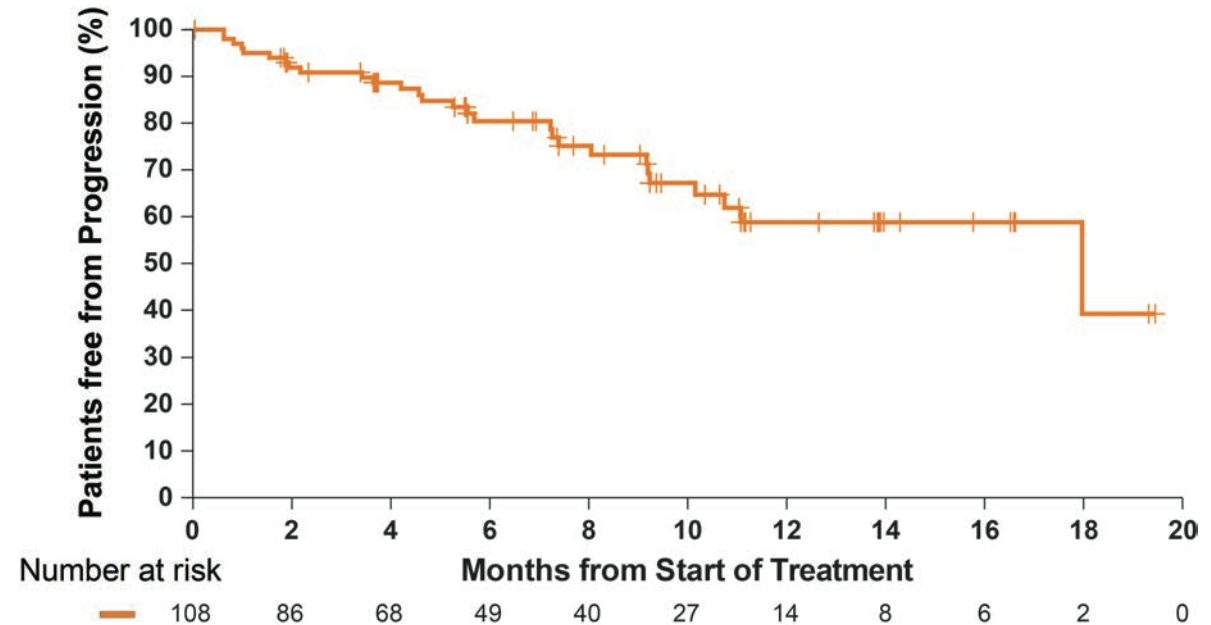
Progression-free survival in BTK pre-treated CLL/SLL patients

PFS in at least BTK pre-treated patients
Median prior lines = 3



Median PFS: Not Estimable (95% CI: 17.0 months – Not Estimable)

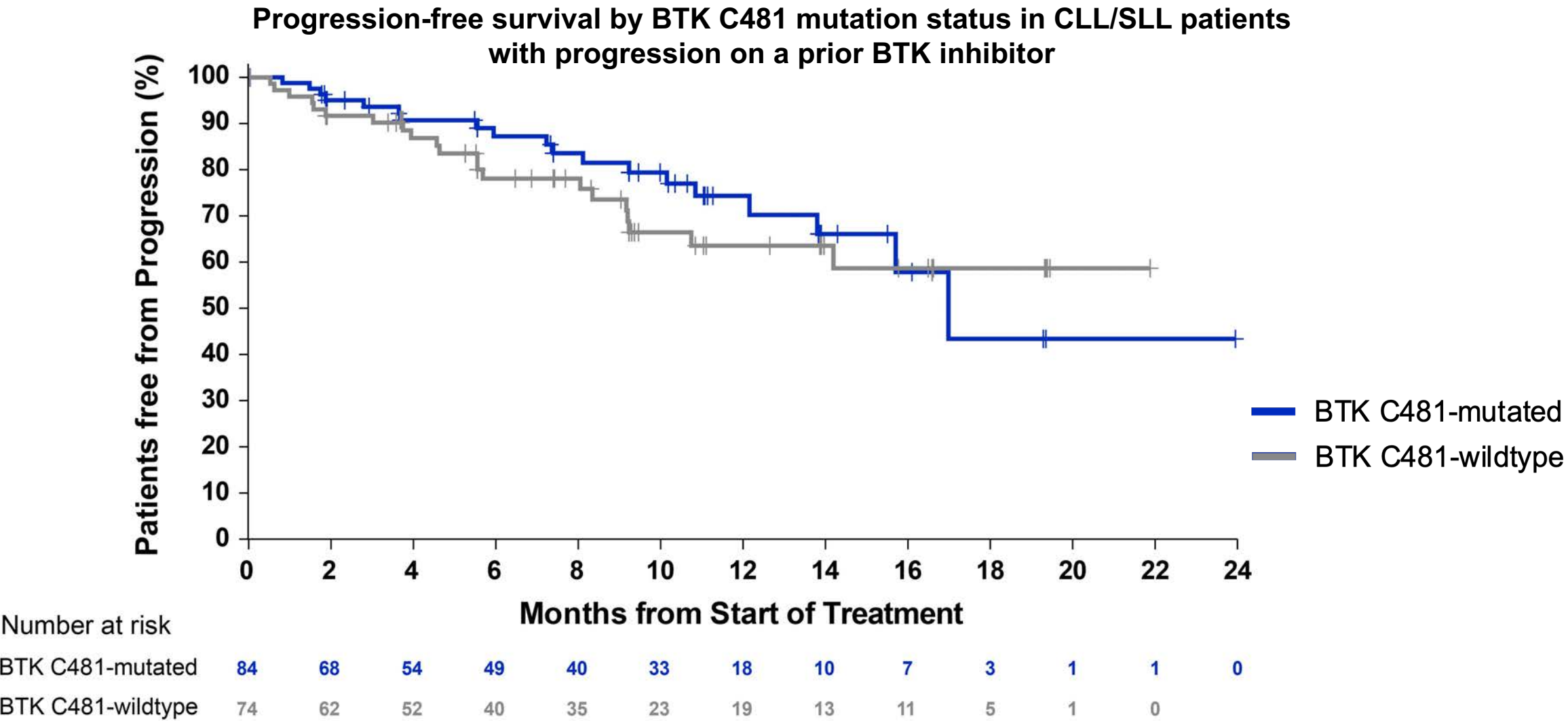
PFS in at least BTK and BCL2 pre-treated patients
Median prior lines = 5



Median PFS: 18 months (95% CI: 10.7 months – Not Estimable)

- 74% (194/261) of BTK pre-treated patients remain on pirtobrutinib
- Median follow-up of 9.4 months (range, 0.3 – 27.4) for all BTK pre-treated patients

BTK C481 mutation status is not predictive of Pirtobrutinib benefit



Mato A, et al. *Blood*. 2021;136(Supplement 1):35-37; Mato AR et al. EHA 2022; Abstract S147.

Pirtobrutinib safety profile

All doses and patients (n=618)							
Adverse Event	Treatment-emergent AEs, (≥15%), %					Treatment-related AEs, %	
	Grade 1	Grade 2	Grade 3	Grade 4	Any Grade	Grades 3/4	Any Grade
Fatigue	13%	8%	1%	-	23%	1%	9%
Diarrhea	15%	4%	<1%	<1%	19%	<1%	8%
Neutropenia	1%	2%	8%	6%	18%	8%	10%
Contusion	15%	2%	-	-	17%	-	12%
AEs of special interest							
Bruising	20%	2%	-	-	22%	-	15%
Rash	9%	2%	<1%	-	11%	<1%	5%
Arthralgia	8%	3%	<1%	-	11%	-	3%
Hemorrhage	5%	2%	1% ^g	-	8%	<1%	2%
Hypertension	1%	4%	2%	-	7%	<1%	2%
Atrial fibrillation/flutter	-	1%	<1%	<1%	2% ^h	-	<1%

No DLTs reported and MTD not reached

96% of patients received ≥1 pirtobrutinib dose at or above RP2D of 200 mg daily

1% (n=6) of patients permanently discontinued due to treatment-related AEs

ASH 2022: Pirtobrutinib in CLL

Saturday, 4:00 – 5:30 PM

347 (Oral). Efficacy of Pirtobrutinib, a Highly Selective, Non-Covalent (Reversible) BTK Inhibitor in Richter Transformation: Results from the Phase 1/2 BRUIN Study

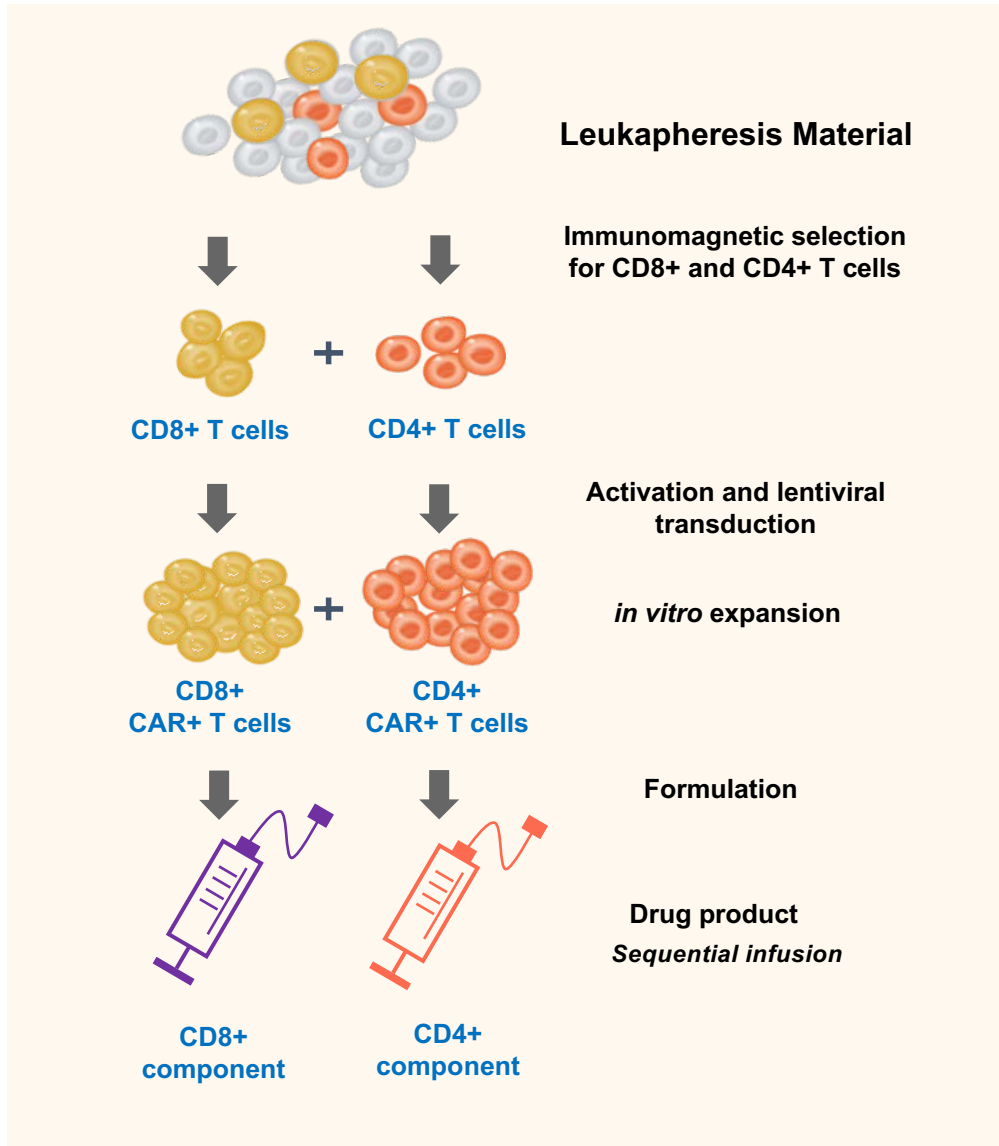
Saturday, 5:30 – 7:30 PM

1797 (Poster). Safety and Tolerability of Pirtobrutinib Monotherapy in Patients with B-Cell Malignancies Who Were Previously Intolerant to a Covalent BTK Inhibitor: Results from the Phase 1/2 BRUIN Study

Monday, 4:30 – 6:30 PM

961 (Oral). Efficacy of Pirtobrutinib in Covalent BTK-Inhibitor Pre-Treated Relapsed / Refractory CLL/SLL: Additional Patients and Extended Follow-up from the Phase 1/2 BRUIN Study

TRANSCEND CLL 004: Liso-Cel in CLL



CD19-Directed, Defined Composition, 4-1BB CAR T Cell Product

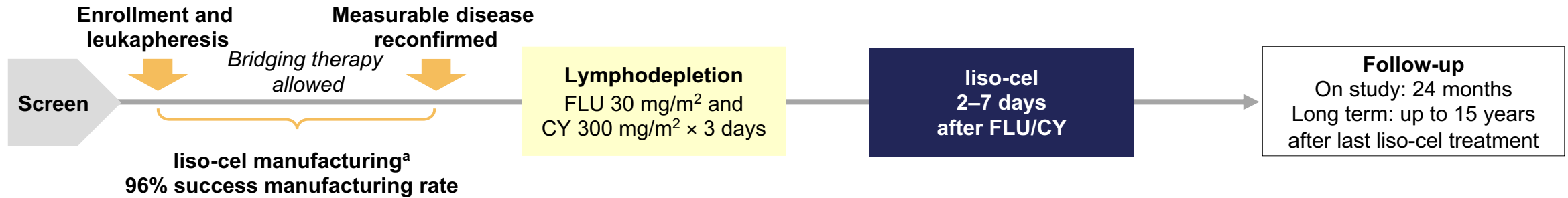
CD8+ and CD4+ CAR+ T cell components are administered separately at equal target doses of CD8+ and CD4+ CAR+ T cells

The defined composition of liso-cel results in:

- Consistent administered CD8+ and CD4+ CAR+ T cell dose
- Low variability in the CD8+/CD4+ ratio

Dose and ratio of CD8+ and CD4+ CAR+ T cells may influence the incidence and severity of CRS and neurological events

TRANSCEND CLL 004 Study Design



Key Eligibility

- Relapsed/refractory CLL/SLL
- Failed or ineligible for BTKi^b
- High-risk disease^c: failed ≥2 prior therapies
- Standard-risk disease: failed ≥3 prior therapies
- ECOG PS of 0–1

Dose Escalation: mTPI-2 Design^d

28-day DLT period

Primary Objectives

- Safety
- Determine recommended dose

Exploratory Objectives

- Antitumor activity
- Pharmacokinetic profile

Dose Level	Dose	Evaluable (N=23)
1	50 × 10 ⁶ CAR+ T cells	9
2	100 × 10 ⁶ CAR+ T cells	14

ClinicalTrials.gov identifier: NCT03331198.

^aOne patient received nonconforming product. ^bFailure defined as SD or PD as best response, or PD after previous response, or discontinuation due to intolerance (unmanageable toxicity). Ineligibility defined as requirement for full-dose anticoagulation or history of arrhythmia. ^cComplex cytogenetic abnormalities, del(17p), *TP53* mutation, or unmutated IGHV. ^dGuo W, et al. *Contemp Clin Trials*. 2017;58:23-33. BTKi, Bruton tyrosine kinase inhibitor; CAR, chimeric antigen receptor; CLL, chronic lymphocytic leukemia; CY, cyclophosphamide; DLT, dose-limiting toxicity; ECOG PS, Eastern Cooperative Oncology Group performance status; FLU, fludarabine; IGHV, immunoglobulin heavy-chain variable region; mTPI, modified toxicity probability interval for dose escalation; PD, progressive disease; SD, stable disease; SLL, small lymphocytic lymphoma.

Baseline Characteristics

	All Patients (N=23)	Failed BTKi and Venetoclax (n=9)
Age, years, median (range)	66 (49–79)	68 (59–76)
Male, n (%)	11 (48)	4 (44)
Time from diagnosis, months, median (range)	87.5 (30–209)	145 (30–209)
Bulky disease >5 cm, n (%) ^a	8 (35)	4 (44)
BALL risk score, ¹ median (range)	2 (0–3)	2 (0–3)
SPD, cm ² , median (range)	25 (2–197)	46 (2–197)
LDH, U/L, median (range)	243 (119–634)	245 (119–634)
Received bridging therapy, n (%)	17 (74)	7 (78)
Stage, n (%)		
Rai stage III/IV	15 (65)	7 (78)
Binet stage C	16 (70)	7 (78)
High-risk features (any), n (%)	19 (83)	8 (89)
Del(17p)	8 (35)	2 (22)
TP53 mutation	14 (61)	6 (67)
Complex karyotype ^b	11 (48)	3 (33)
Lines of prior therapy, median (range)	5 (2–11)	6 (5–10)
Prior ibrutinib, n (%)	23 (100)	9 (100)
Ibrutinib refractory/relapsed, n (%)	21 (91)	9 (100)
BTKi progression and failed venetoclax, ^c n (%)	9 (39)	9 (100)

Treatment emergent AEs ($\geq 20\%$ all grades)

	Any grade	Grade ≥ 3		
	Total (n = 23)	Total (n = 23)	Dose level 1 (n = 9)	Dose level 2 (n = 14)
Patients with any TEAE	23 (100)	22 (96)	8 (89)	14 (100)
Anemia	19 (83)	17 (74)	6 (67)	11 (79)
Cytokine release syndrome	17 (74)	2 (9)	0	2 (14)
Thrombocytopenia	17 (74)	16 (70)	4 (44)	12 (86)
Neutropenia/Neutrophil count decrease	16 (70)	16 (70)	5 (56)	11 (79)
Leukopenia	11 (48)	10 (43)	4 (44)	6 (43)
Pyrexia	10 (43)	0	0	0
Hypokalemia	9 (39)	0	0	0
Diarrhea	8 (35)	0	0	0
Hypophosphatemia	8 (35)	5 (22)	0	5 (36)
Nausea	8 (35)	0	0	0
Chills	7 (30)	0	0	0
Headache	7 (30)	0	0	0
Tremor	7 (30)	0	0	0
Acute kidney injury	6 (26)	1 (4)	1 (11)	0
Decreased appetite	6 (26)	0	0	0
Febrile neutropenia	6 (26)	6 (26)	0	6 (43)
Hypomagnesemia	6 (26)	0	0	0
Hyponatremia	6 (26)	0	0	0
Lymphopenia	6 (26)	6 (26)	2 (22)	4 (29)
Confusional state	5 (22)	2 (9)	0	2 (14)
Encephalopathy	5 (22)	4 (17)	1 (11)	3 (21)
Hypogammaglobulinemia	5 (22)	0	0	0
Insomnia	5 (22)	0	0	0

DLTs occurred in 2 patients receiving liso-cel at DL2

- Patient 1: grade 4 hypertension
- Patient 2: grade 3 encephalopathy, grade 3 muscle weakness, and grade 4 TLS

Nine deaths occurred

- 7 due to PD
- 1 patient with pneumonia, respiratory failure (2.5 mo after liso-cel)
- 1 patient with septic shock (>90 days after liso-cell)
- No deaths within 30 days of liso-cel administration

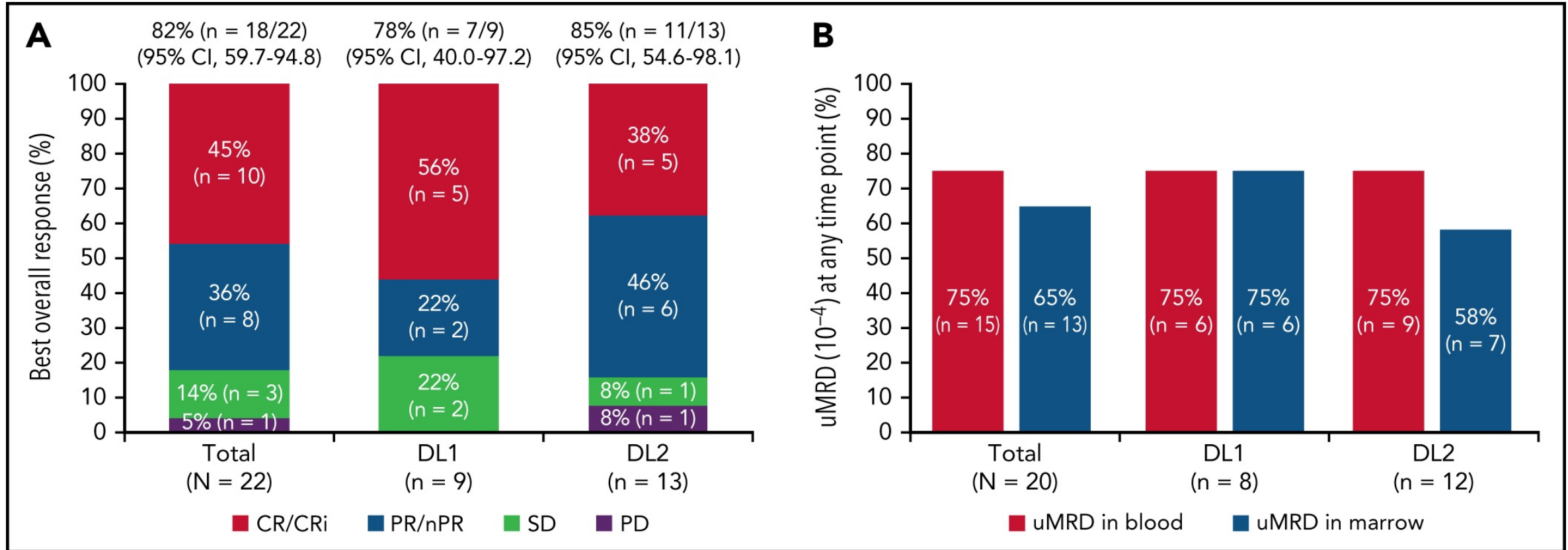
CRS and neurologic events

	All Patients (N=23)	Dose level 1 (n = 9)	Dose level 2 (n = 14)
CRS—any grade, n (%)	17 (74)	7 (78)	10 (71)
Median time to onset, days (range)	3 (1-10)	7 (1-10)	2 (1-10)
Median time to resolution, days (range)	12 (2-50)	6 (2-30)	12.5 (2-50)
Grade 3, n (%)	2 (9)	0	2 (14)
NE^a—any grade, n (%)	9 (39)	2 (22)	7 (50)
Median time to onset, days (range)	4 (2-21)	16 (11-21)	4 (2-11)
Median time to resolution, days (range)	20.5 (6-50)	8.5 (6-11)	29.5 (9-50)
Grade ≥3, ^a n (%)	5 (22)	2 (22)	3 (21)
Any CRS or NE, n (%)	18 (78)	7 (78)	11 (79)
CRS only, n (%)	9 (39)	5 (56)	4 (29)
NE only, n (%)	1 (4)	0	1 (7)
Tocilizumab and/or steroid use			
Tocilizumab only	6 (26)	3 (33)	3 (21)
Corticosteroids only	1 (4)	0	1 (7)
Both tocilizumab and corticosteroids	8 (35)	2 (22)	6 (43)
Tocilizumab and/or corticosteroids	15 (65)	5 (56)	10 (71)

Best overall response and undetectable MRD

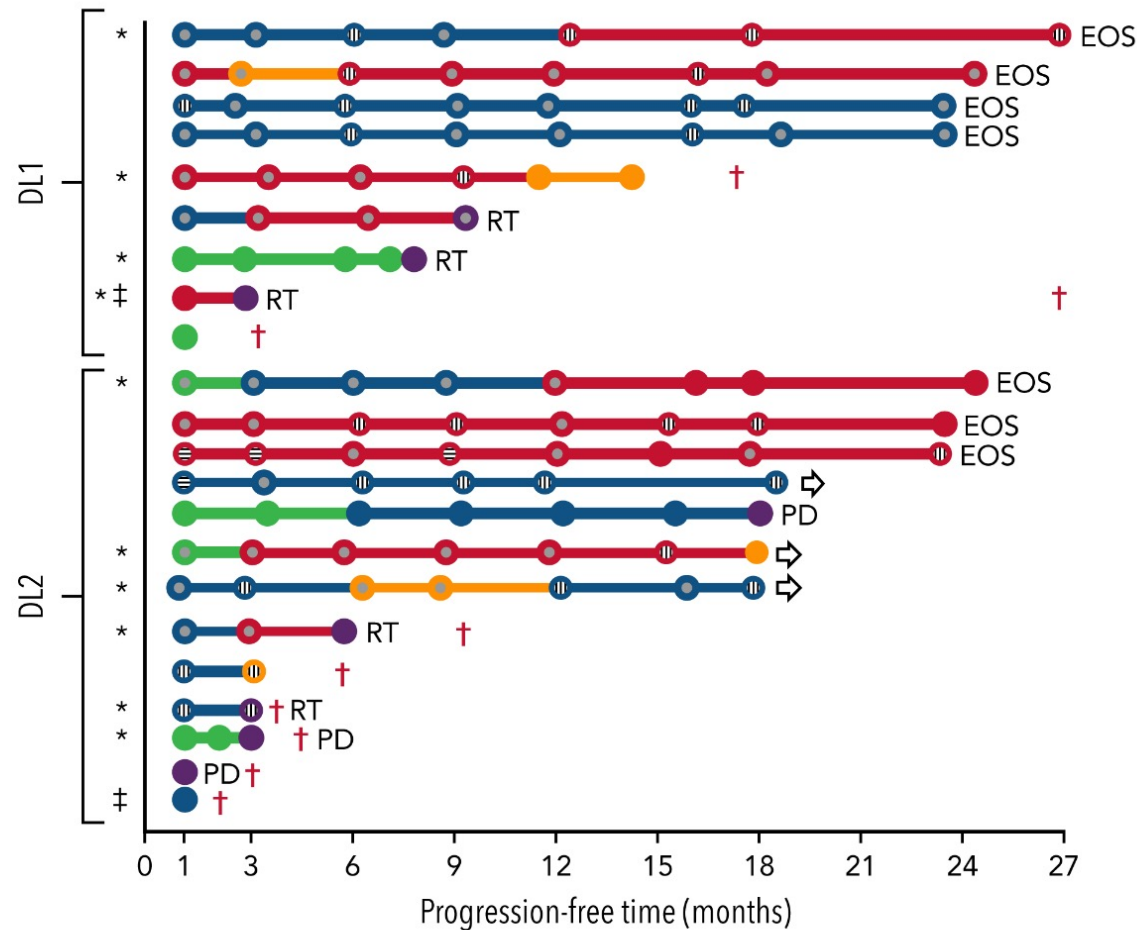
Best Overall Response (n = 22 evaluable for efficacy)

uMRD (n = 20 evaluable for MRD)

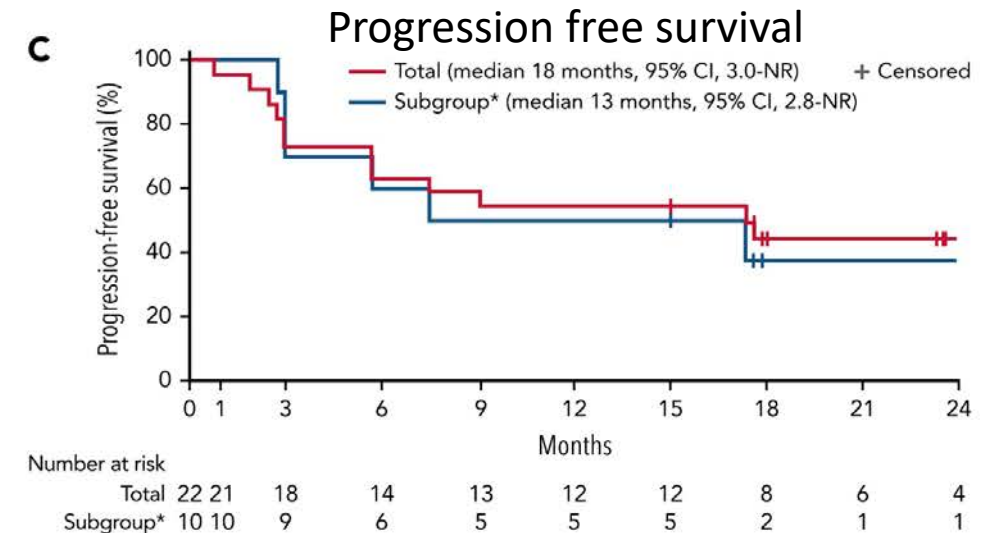
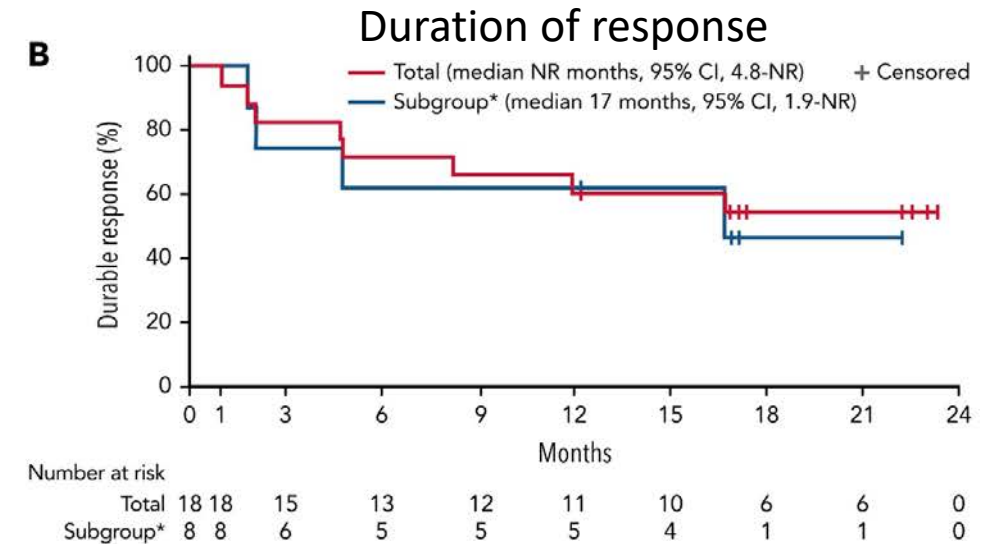


Median follow up = 24 months

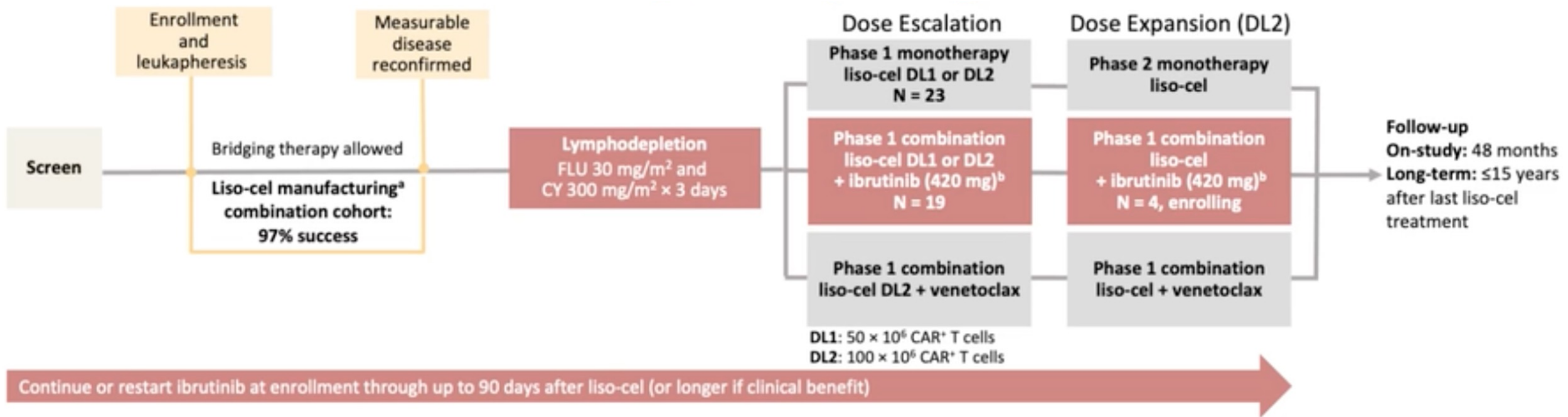
Individual patient efficacy, duration of response, and progression free survival



Investigator response ■ CR/CRi ■ PR ■ SD ■ PD ■ ND/unk † Death ⇨ Ongoing
 ⊖ uMRD-blood ⊖ uMRD-blood + bone ⊖ uMRD-bone marrow



TRANSCEND CLL 004: Liso-cel + Ibrutinib



Patients were eligible if they had 1 or more:

- received ibrutinib and progressed at time of study enrollment
- high-risk features and received ibrutinib for ≥6 months with less than a complete response
- *BTK* or *PLCγ2* gene mutation, with or without progression on ibrutinib
- received prior ibrutinib with no contraindication to reinitiating ibrutinib

Baseline Characteristics	N = 23
Age, median (range)	61 (50 – 77)
High risk features	
del17p	9 (39%)
TP53 mutation	8 (35%)
complex karyotype	10 (43%)
Prior lines of therapy, median (range)	4 (1-10)
Ibrutinib refractory	23 (100%)
Venetoclax refractory	12 (53%)

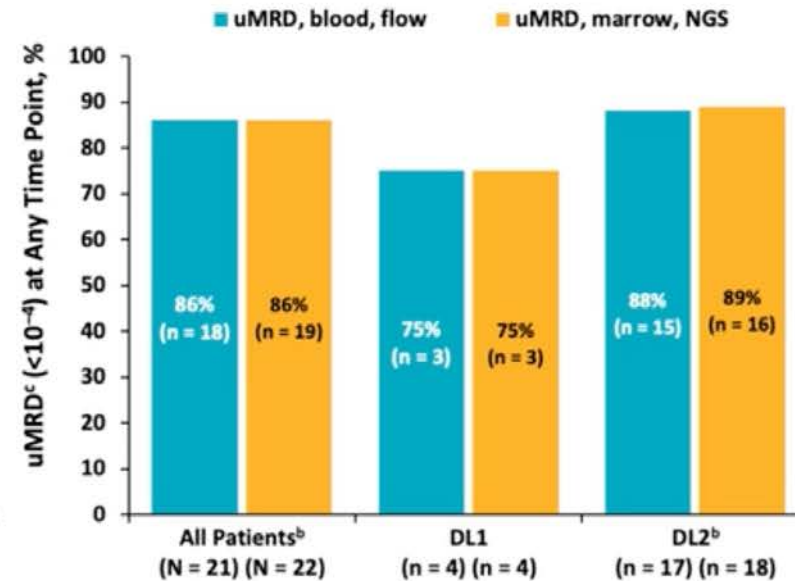
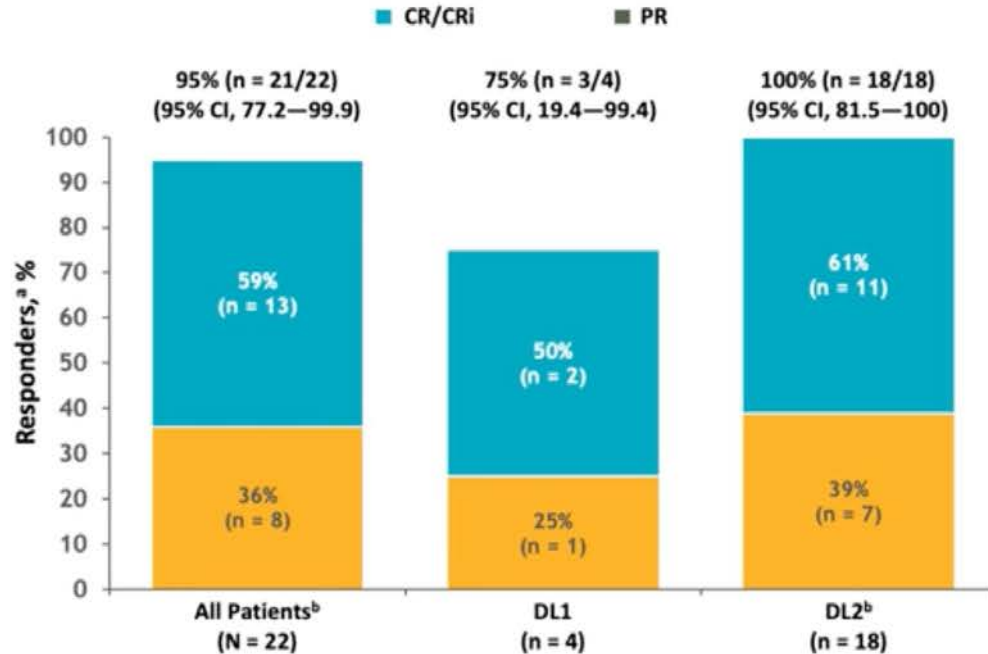
Liso-cel + Ibrutinib Safety

- The combination of liso-cel and ibrutinib was well tolerated, with no reported dose-limiting toxicities
- No grade 5 AEs or grade 4 or 5 cytokine release syndrome (CRS) or neurological events (NE) were reported

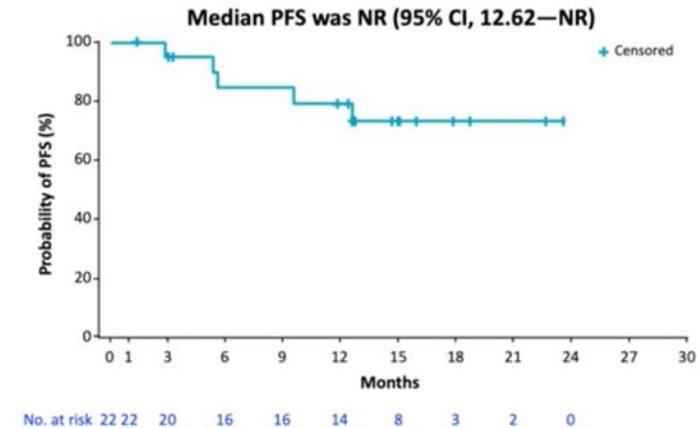
Parameter	All Patients (N = 23)	DL1 + Ibrutinib (n = 4)	DL2 + Ibrutinib (n = 19)
Common grade 3/4 treatment-emergent AEs (TEAEs), n (%)	22 (96)	4 (100)	18 (95)
Neutropenia/neutrophil count decrease	20 (87)	3 (75)	17 (89)
Anemia	10 (43)	3 (75)	7 (37)
Febrile neutropenia	7 (30)	1 (25)	6 (32)
CRS^a			
All-grade CRS, n (%)	18 (78)	4 (100)	14 (74)
Median time to CRS onset, days (range)	7 (1–13)	8 (6–13)	6.5 (1–11)
Median duration of CRS, days (range)	5.5 (3–13)	6.5 (4–7)	5 (3–13)
Grades 1–2 CRS, n (%)	17 (74)	3 (75)	14 (74)
Grade 3 CRS, n (%)	1 (4)	1 (25)	0
NEs			
All-grade NEs, n (%)	7 (30)	2 (50)	5 (26)
Median time to NE onset, days (range)	9 (5–13)	9 (6–12)	9 (5–13)
Median duration of NE, days (range)	7 (1–10)	8 (8–8)	6 (1–10)
Grades 1–2 NEs, n (%)	3 (13)	2 (50)	1 (5)
Grade 3 NEs, ^b n (%)	4 (17)	0	4 (21)
Management of CRS and/or NEs, n (%)			
Tocilizumab only	3 (13)	0	3 (16)
Corticosteroids only	3 (13)	2 (50)	1 (5)
Tocilizumab and corticosteroids	5 (22)	1 (25)	4 (21)

Liso-cel + Ibrutinib Efficacy

Best Objective Response by iwCLL and uMRD ($<10^{-4}$)



Progression Free Survival Median follow up = 17 months



- No patients had PD during the first month after liso-cel
- One patient at DL1 had SD for 6 months but later progressed

ZUMA-8: To be presented at ASH 2022

(Sunday, 6 – 8 PM, abstract 3319)

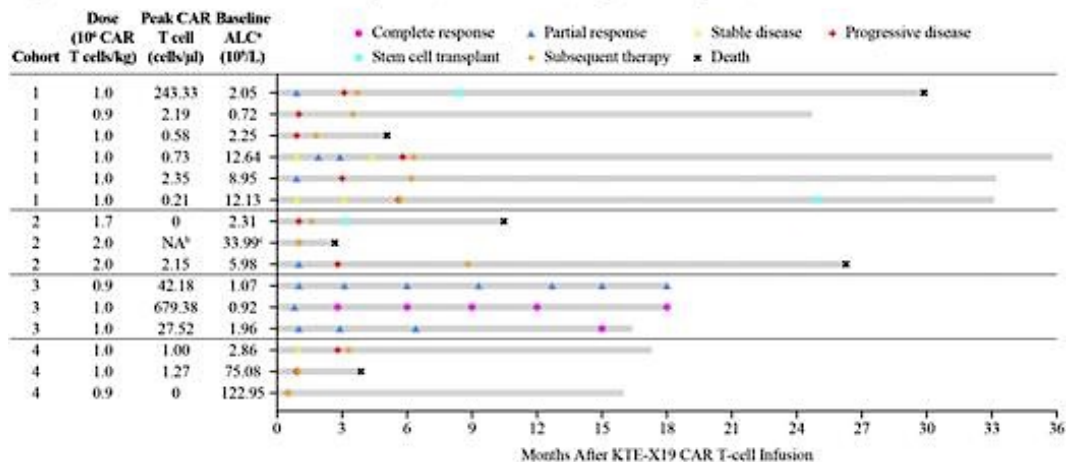
Study Design:

- Brexucabtagene autoleucel: CD-19 Autologous CAR T-cell
- Patients with relapsed/refractory CLL
 - ≥ 2 prior lines of therapy
 - Including a BTK inhibitor
- Conditioning: Fludarabine / Cyclophosphamide
- 2 dose levels
 - DL1: 1×10^6 CAR T cells/kg
 - DL2: 2×10^6 CAR T cells/kg

Table: ZUMA-8 Patient Characteristics and AE Summary.

	Cohort 1 (low dose) n=6	Cohort 2 (high dose) n=3	Cohort 3 (low tumor burden) n=3	Cohort 4 (post ibrutinib) n=3	Overall N=15
Median follow-up duration, months (range)	35.8 (33.6–40.4)	30.3 (29.9–30.6)	18.2 (18.2–18.4)	17.05 (15.5–17.9)	30.3 (15.5–40.4)
Baseline Characteristics					
Median age, years (range)	60.5 (53–68)	61.0 (52–63)	69.0 (56–79)	67.0 (53–70)	63.0 (52–79)
Male, n (%)	3 (50)	2 (67)	3 (100)	2 (67)	10 (67)
ECOG PS 1, n (%)	4 (67)	1 (33)	1 (33)	2 (67)	8 (53)
≥ 3 prior therapy lines, n (%)	6 (100)	3 (100)	1 (33)	2 (67)	12 (80)
17p deletion, n (%)	1 (17)	1 (33)	0	2 (67)	4 (27)
Complex karyotype, n (%) ^a	3 (50)	3 (100)	1 (33)	0	7 (47)
Median tumor burden, mm ³ (range)	7,026.0 (464.0–26,688.3)	7,458.1 (2,140.4–9,715.0)	625.0 (614.0–2,472.0)	1,434.0 (786.0–2,308.5)	2,308.50 (464.0–26,688.3)
Median CLL lymphocytes in bone marrow aspirate, % (range) ^b	75.0 (0.1–93.5)	86.4 (16.0–97.0)	30.0 (5.0–40.0)	91.0 (33.0–96.0)	75.0 (0.1–97.0)
AE Summary					
Grade ≥ 3 AE, n (%)					
Any	6 (100)	3 (100)	3 (100)	3 (100)	15 (100)
Treatment related	4 (67)	2 (67)	2 (67)	1 (33)	9 (60)
CRS					
Any	5 (83)	2 (67)	3 (100)	2 (67)	12 (80)
Grade ≥ 3	0	0	1 (33)	0	1 (7)
NE					
Any	6 (100)	1 (33)	3 (100)	1 (33)	11 (73)
Grade ≥ 3	2 (33)	0	1 (33)	0	3 (20)

Figure: Patient-level Peak CAR T-cell Expansion, Baseline ALC, Objective Response, and Survival Over Time.



*Baseline ALC data were based on central assessment, except for 1 patient in Cohort 2. ^aPeak CAR T-cell data were not available. ^bBased on local assessment. ALC, absolute lymphocyte count; CAR, chimeric antigen receptor; NA, not available.

ASH 2022: Promising investigational agents in CLL

- **BTK Degraders**

- 965. NX-2127-001, a First-in-Human Trial of **NX-2127**, a Bruton's Tyrosine Kinase-Targeted Protein Degradar, in Patients with Relapsed or Refractory Chronic Lymphocytic Leukemia and B-Cell Malignancies

- **Bispecific T cell Engagers**

- 348. Subcutaneous **Epcoritamab** in Patients with Richter's Syndrome: Early Results from Phase 1b/2 Trial (EPCORE CLL-1)

- **Protein Kinase C β Inhibitor**

- 963. Initial Results from a Phase 1/2 Dose Escalation and Expansion Study Evaluating **MS-553**, a Novel and Selective PKC β Inhibitor, in Patients with CLL/SLL

- **ROR1**

- 1810. First-in-Human Phase I Trial of a ROR1 Targeting Bispecific T Cell Engager (**NVG-111**) in Combination with Ibrutinib or As Monotherapy in Subjects with Relapsed Refractory Chronic Lymphocytic Leukaemia (CLL) and Mantle Cell Lymphoma (MCL)

- **New BCL2i**

- 962. A Phase 1 Study with the Novel B-Cell Lymphoma 2 (Bcl-2) Inhibitor **Bgb-11417** As Monotherapy or in Combination with Zanubrutinib (ZANU) in Patients (Pts) with CLL/SLL: Preliminary Data
- 964. **Lisaftoclax** (APG-2575) Safety and Activity As Monotherapy or Combined with Acalabrutinib or Rituximab in Patients (pts) with Treatment-Naïve, Relapsed or Refractory Chronic Lymphocytic Leukemia/Small Lymphocytic Lymphoma (R/R CLL/SLL): Initial Data from a Phase 2 Global Study

Appendix

Editorial Review

- **Pharmacologic similarities and differences between the investigational noncovalent BTK inhibitor pirtobrutinib and covalent BTK inhibitors**
 - **Slide 2**
- **Updated results among patients with R/R CLL in the BRUIN study of pirtobrutinib**
 - **Slides 3-8**
- **Documented efficacy and safety of CAR T-cell therapies alone or combined with other systemic therapies among patient with R/R CLL (eg, TRANSCEND CLL 004, ZUMA-8)**
 - **Slides 9-19**
- **Other promising agents and strategies under investigation for CLL**
 - **Slide 20**

Appendix Slides – None