Trends in Cancer

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Session Objectives

1. Discuss the current state of cancer in 2025

2. Describe advancements in cancer treatment and their impact.

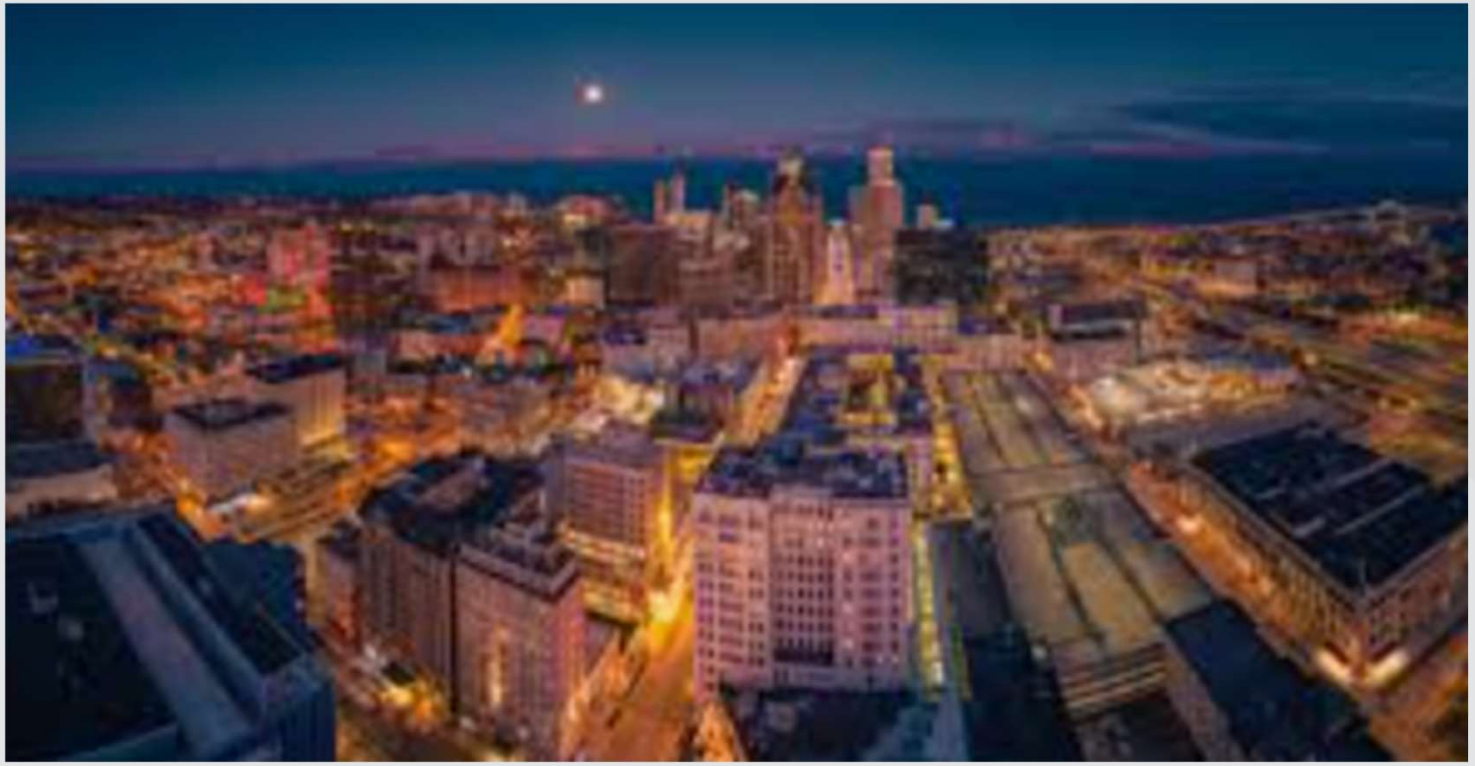
3. Evaluate emerging technologies towards personalization in cancer.

4. Introduce lifestyle modification and early detection strategies for cancer risk reduction.

Oncology 2025

2,041,910

Oncology 2025



Oncology 2025--XX

- **Women under 50**: Cancer diagnoses rates are now 82% higher than in men of the same age group, up from 51% in 2002.

- **Lung Cancer**: For the first time, lung cancer diagnoses in women under 65 have outpaced those in men.

Oncology 2025--XX

- **Women under 50**: Cancer diagnoses rates are now 82% higher than in men of the same age group, up from 51% in 2002.

- **Lung Cancer**: For the first time, lung cancer diagnoses in women under 65 have outpaced those in men.

ACS 2025

Oncology in 2025--Specifics

- **Oral Cavity/Pharynx Cancers**: Largely due to HPV-associated cancers, the incidence rates have increased by 0.7% per year from 2012 to 2021.
- **Pancreatic Cancer**: Rising to the 3rd leading cause of cancer death in the U.S the incidence and mortality rates continue to rise.
- **Colorectal Cancer**: Increase in incidence among adults under 65, prompting recommendations to lower screening at age 45.

ACS 2025

Oncology in 2025--Disparities

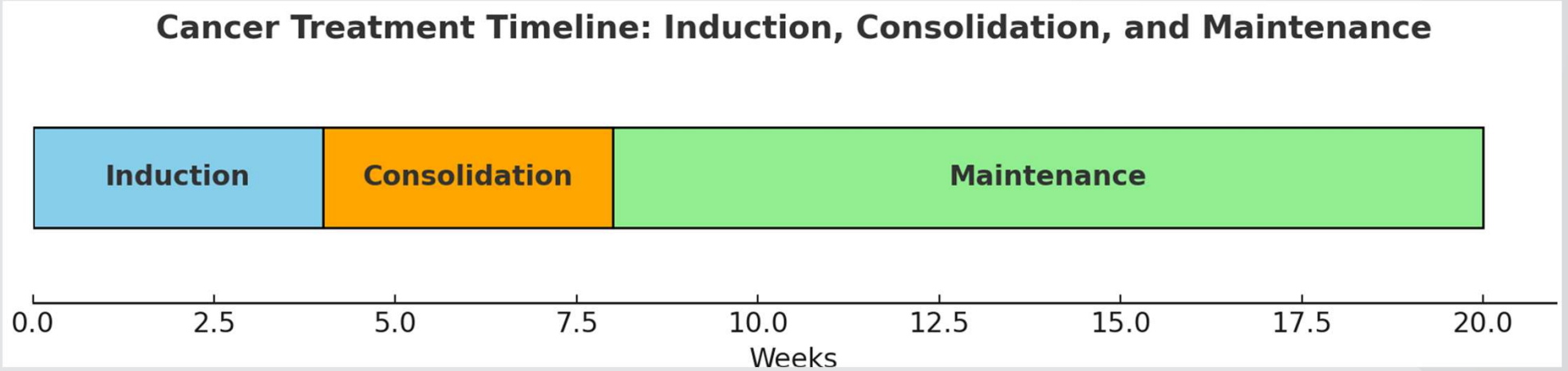
2-3 X higher incidence of kidney, liver, stomach, and cervical cancers

ACS 2025

Oncology 2025—Getting Better

34%

Paradigms in Cancer

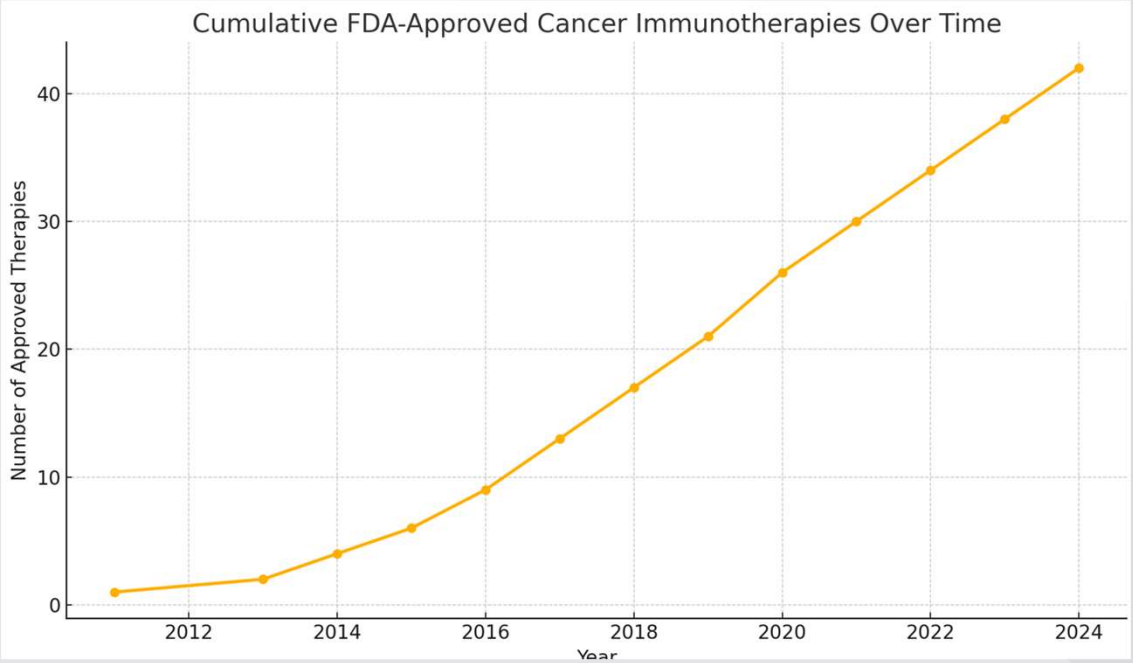


How We Move the Needle

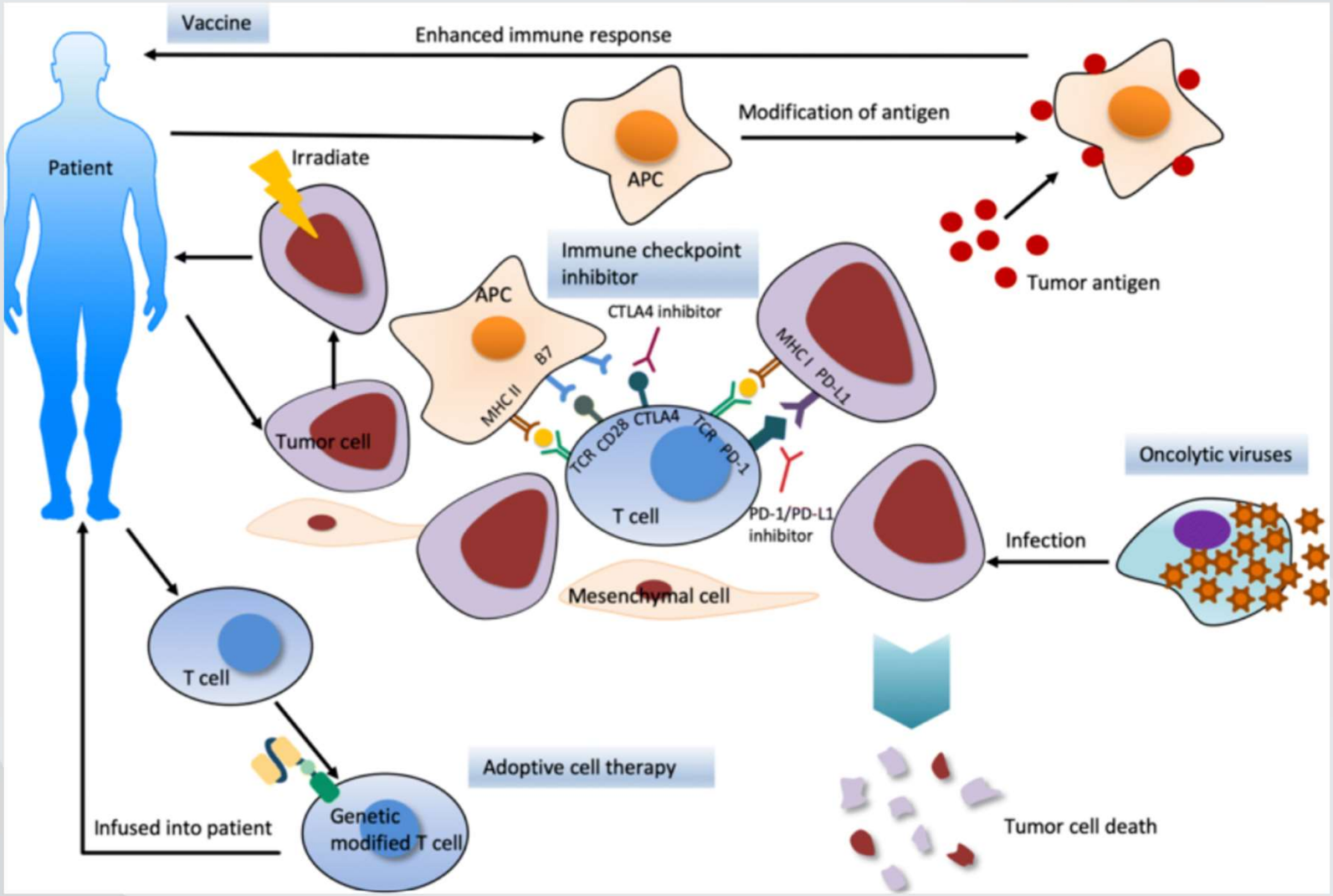
Generated by ChatGPT

In My Career

- Checkpoint inhibitors
- CAR-T
- Radioimmunotherapy
- ADCs
- Oncolytic viruses

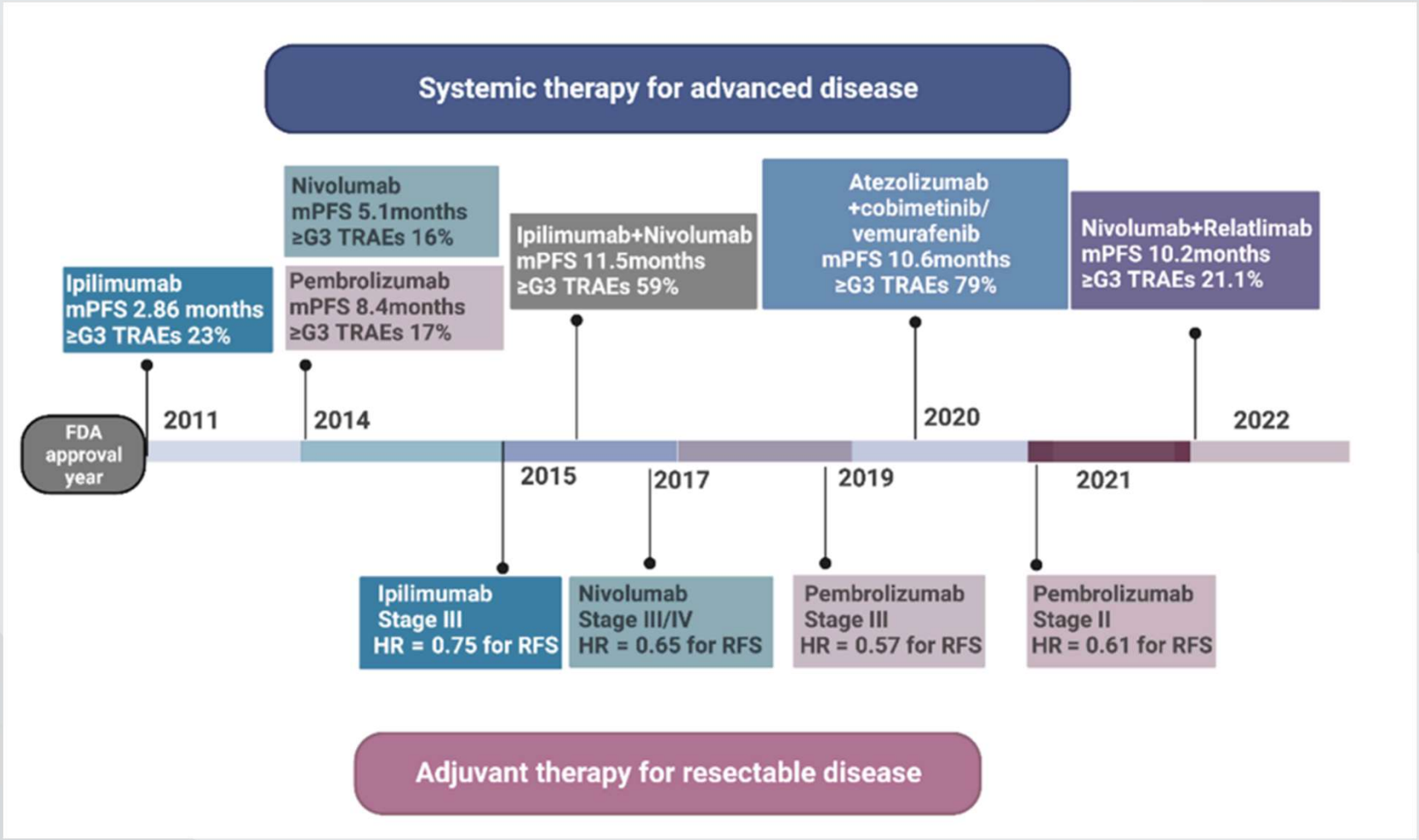


Rapid Advancements



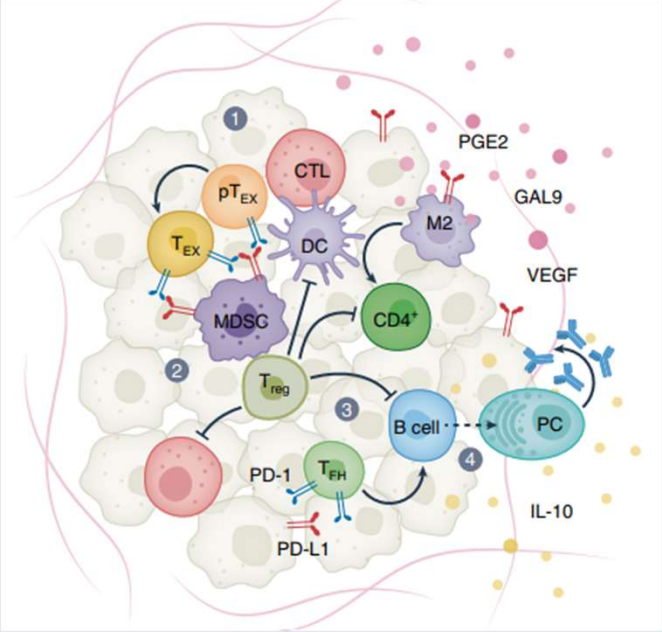
Wu et al. Digestive Diseases & Sciences 2020

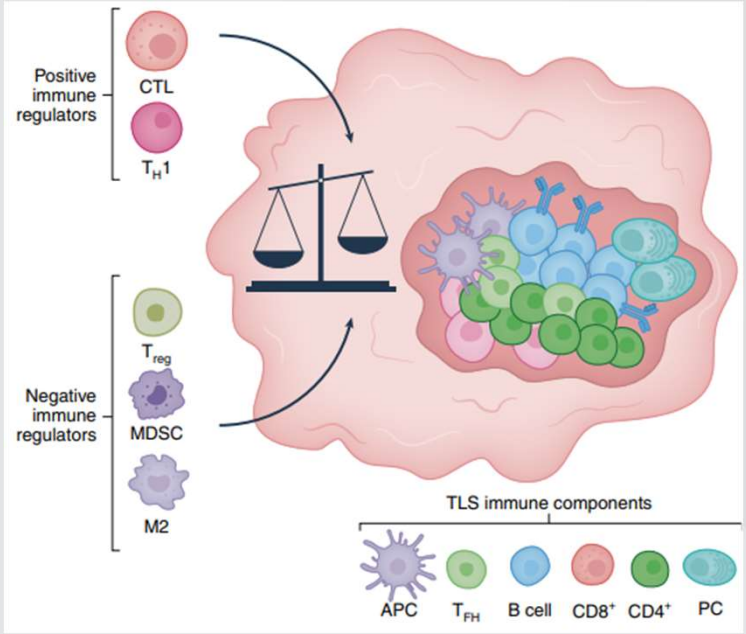
Checkpoint Inhibitors in Melanoma: Story of 6's



Knight et al. Cancers 2023

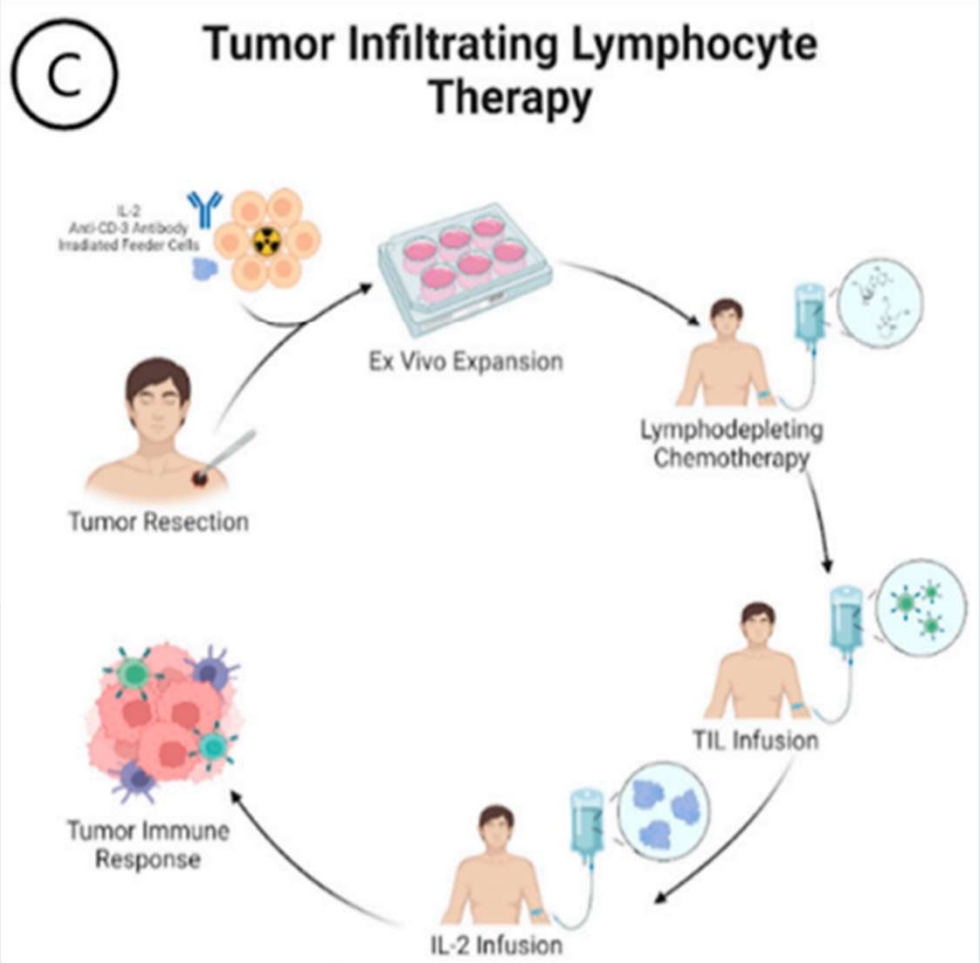
Research in Parallel Checkpoint Inhibitors

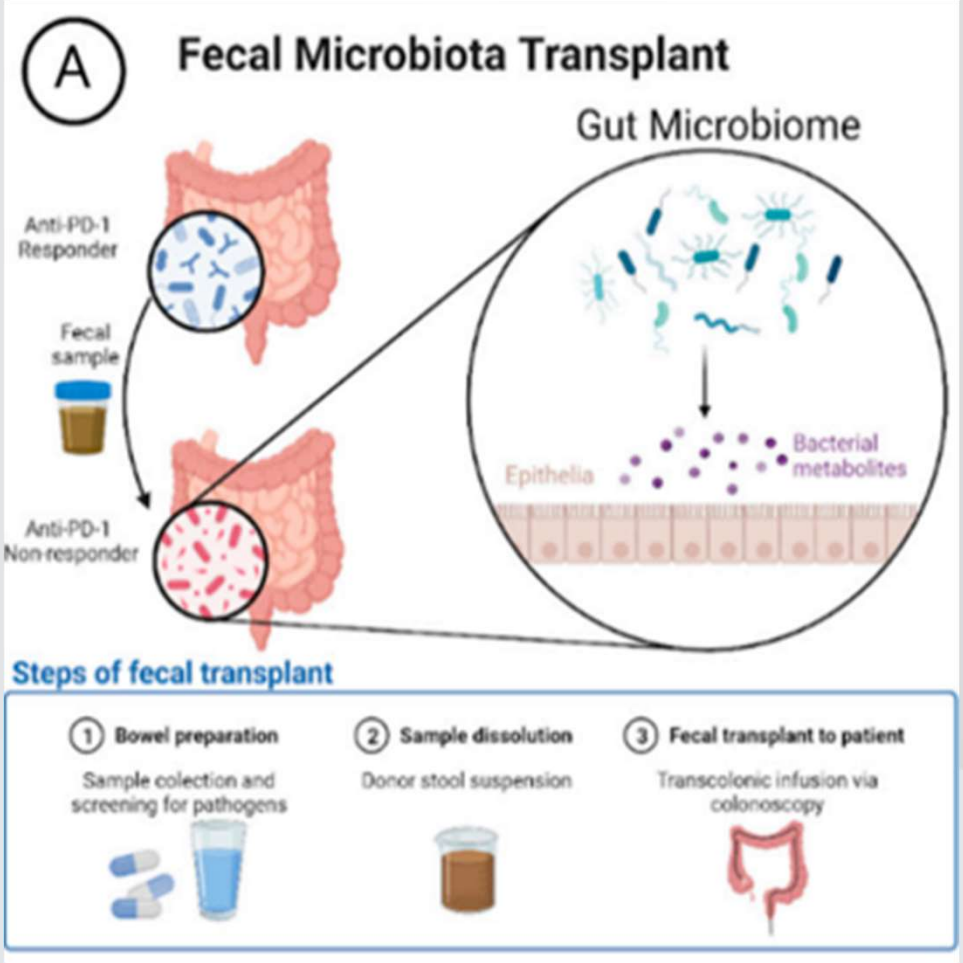




Knight et al. Cancers 2023

Pushing the Research Envelope





Knight et al. Cancers 2023

2018 Nobel Prize in Medicine

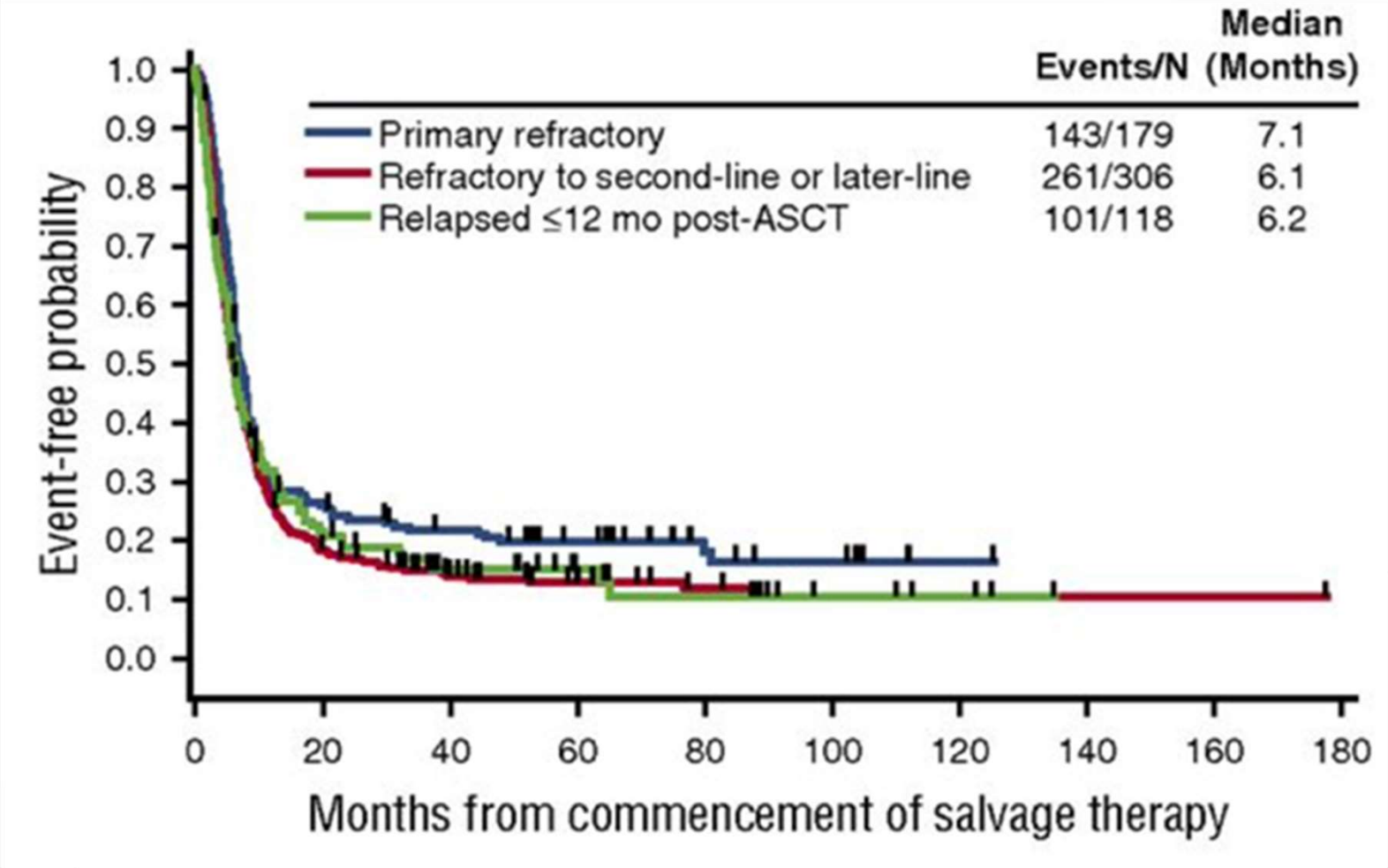
CTLA-4

James Allison Ph.D.
MSKCC/MDACC

PD-1/PD-1L

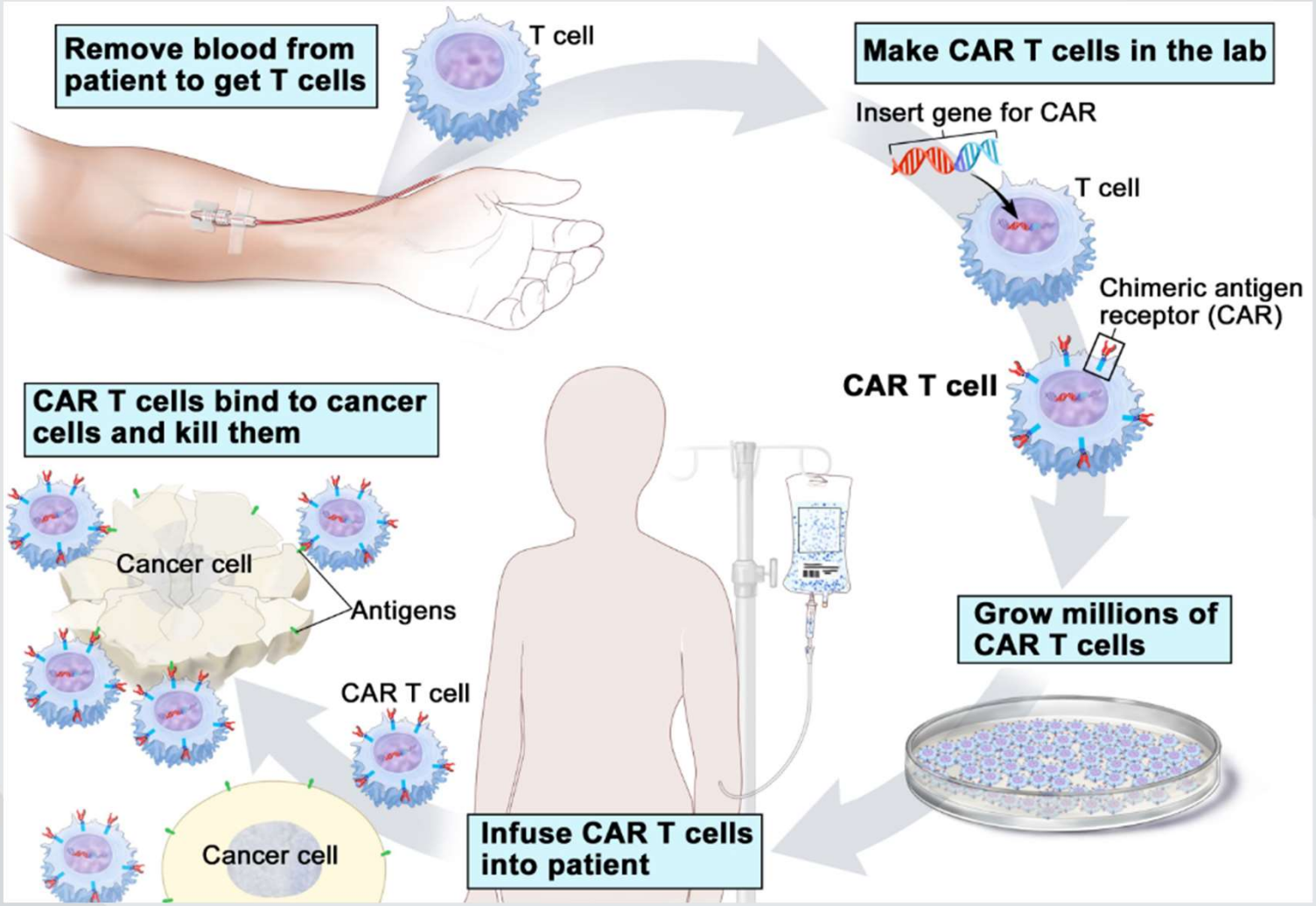
Tasuku Honjo M.D. Ph.D.
Kyoto University

Large B-cell Lymphoma: Chemo Bombs



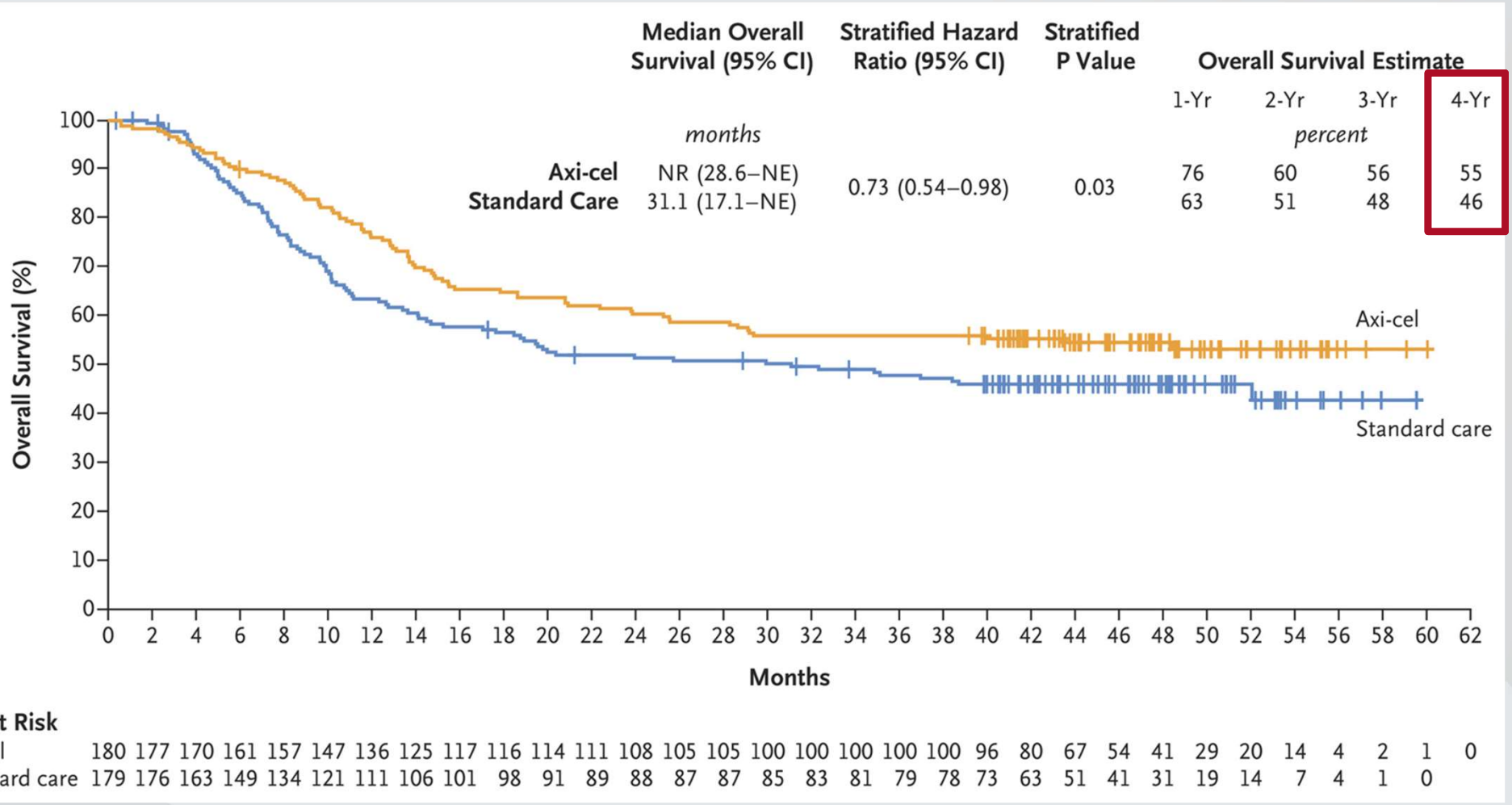
Crump et al. Blood 2017

Vein to Vein



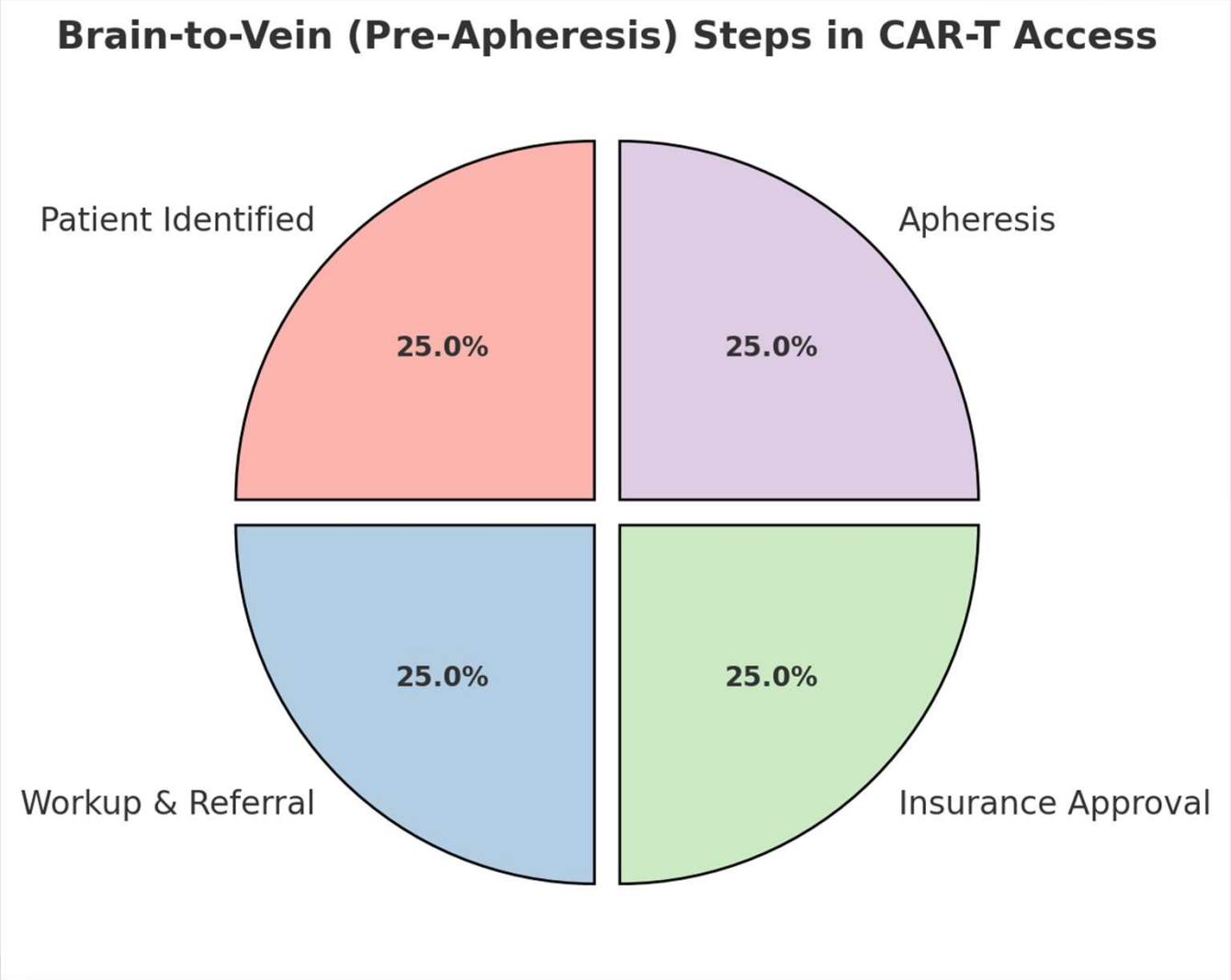
NCI.gov

LBCL in 2025: CAR-T > Chemo Bombs



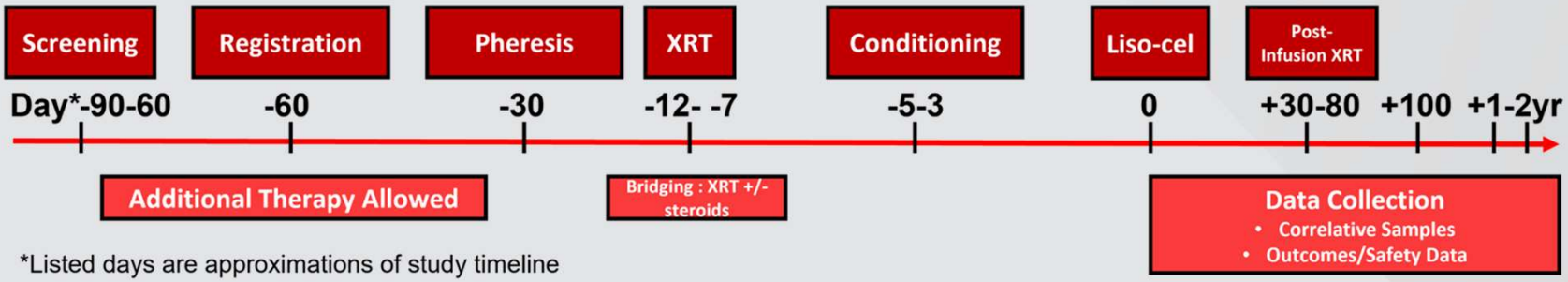
Westin et al. NEJM 2023

Barrier to Massive Progress

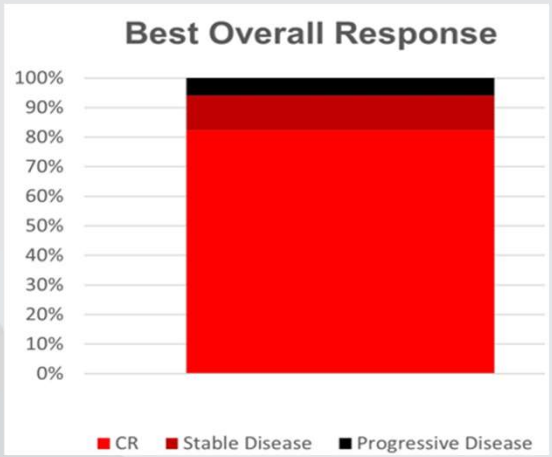


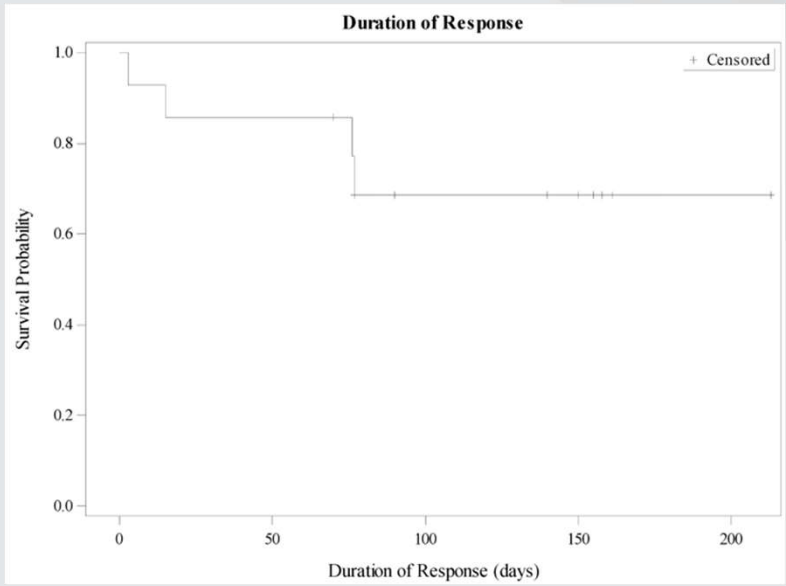
Pushing the Research Envelope

- Relapsed B-cell lymphoma
- Eligible for liso-cel



*Listed days are approximations of study timeline





D'Angelo et al. ASH 2024

Personalization of Cancer: 2025

Generated by ChatGPT

Personalization of Cancer in 6 Notes

BLOW

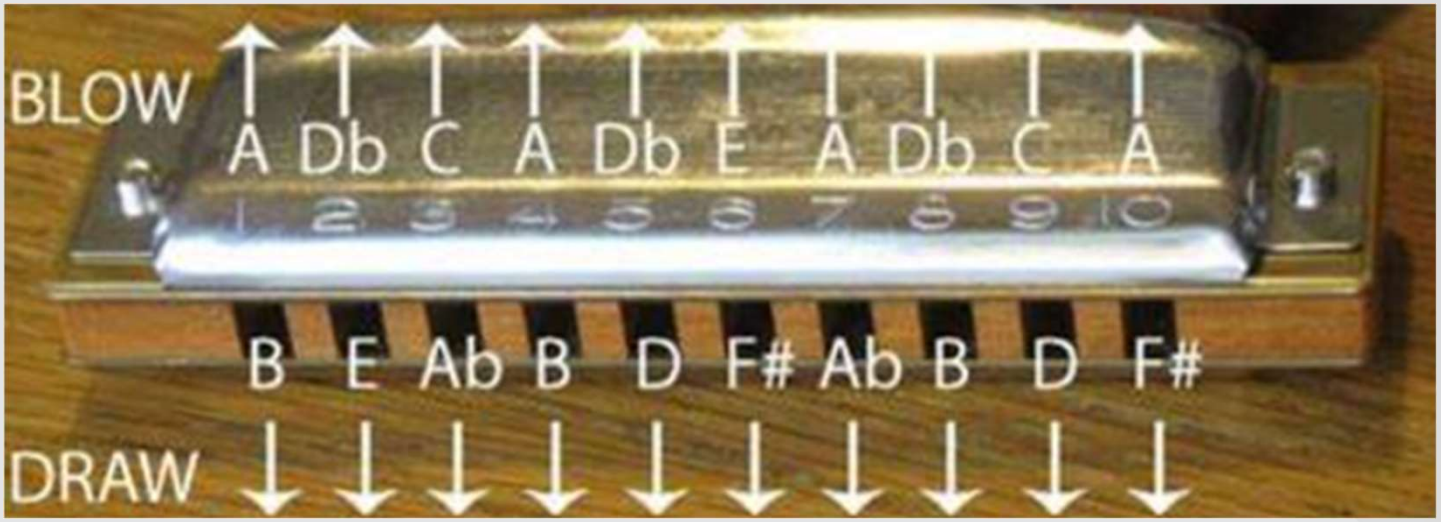
Universal Molecular Testing for All Patients

- Immediate clinical utility lacking
- Cost and resource constraints
- Turnaround time delays

DRAW

Molecular Testing in Select or Refractory Patients

- Research-driven utility vs. clinical utility
- Selective value in certain subtypes
- Risk of overinterpretation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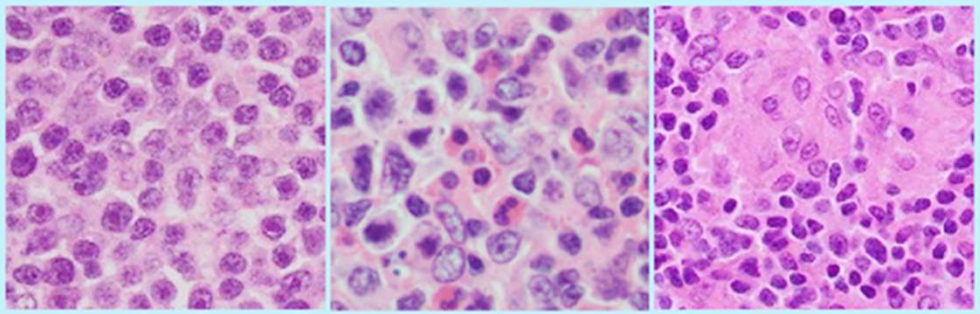
DRAW

A Note:
Lack of Immediate Clinical Utility

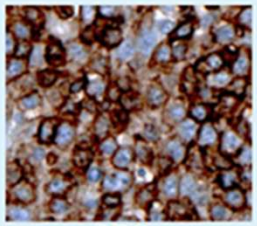
Morphology



Broad spectrum

Phenotype

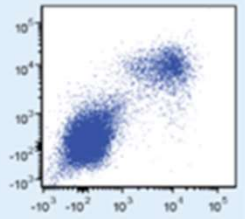
Immunohistochemistry (IHC)



CD3

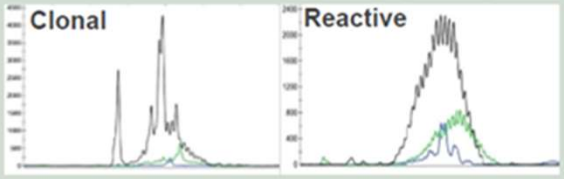
CD3 > CD20
CD4:CD8
Aberrant panT-cell antigen loss

Flow Cytometry



T-cell Clonality

PCR of the T-cell receptor (TCR) genes (α,β,γ,δ)



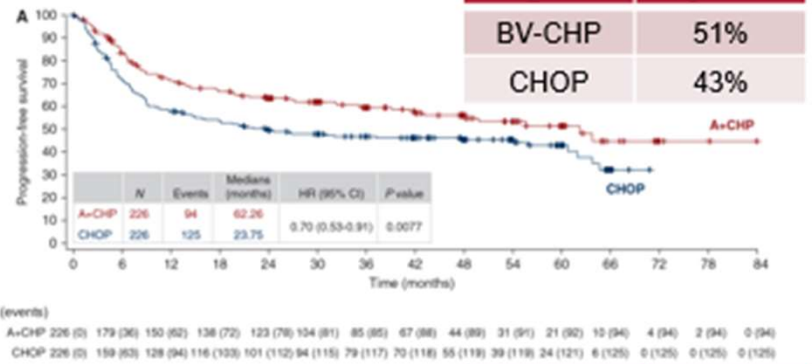
PTCL: Predominance of a single TCR-gene rearrangement pattern

Courtesy of Catalina Amador

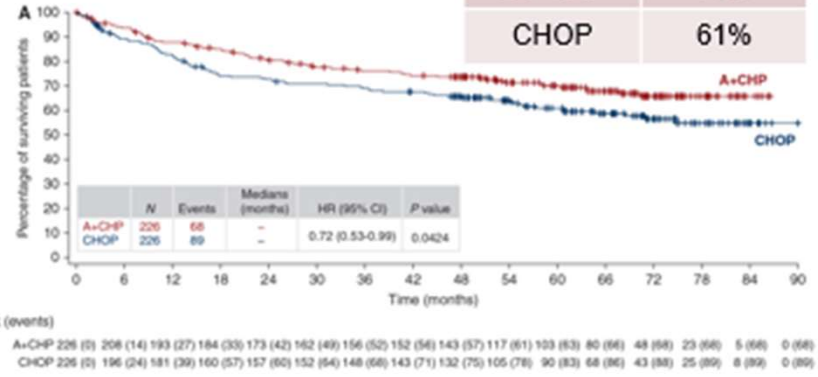
A Note:
Lack of Immediate Clinical Utility

Intent to Treat

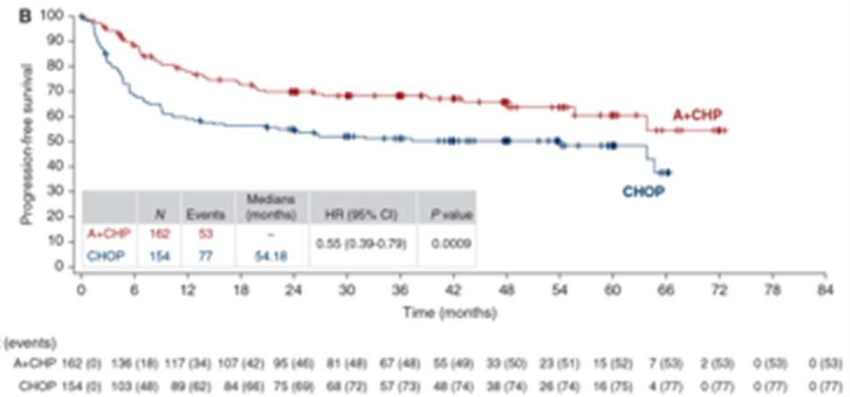
Regimen	5-yr PFS
BV-CHP	51%
CHOP	43%

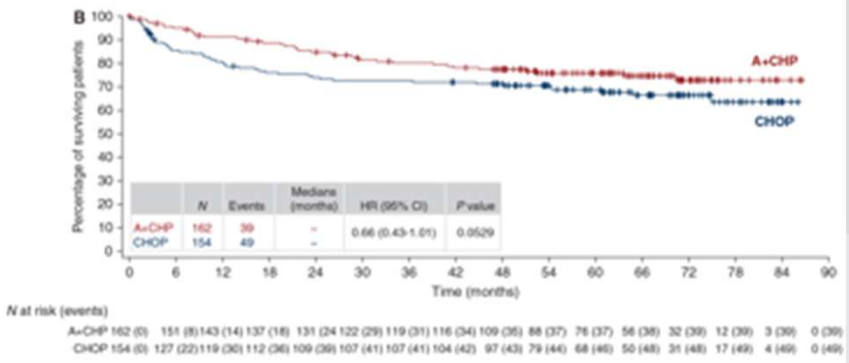


Regimen	5-yr OS
BV-CHP	71%
CHOP	61%



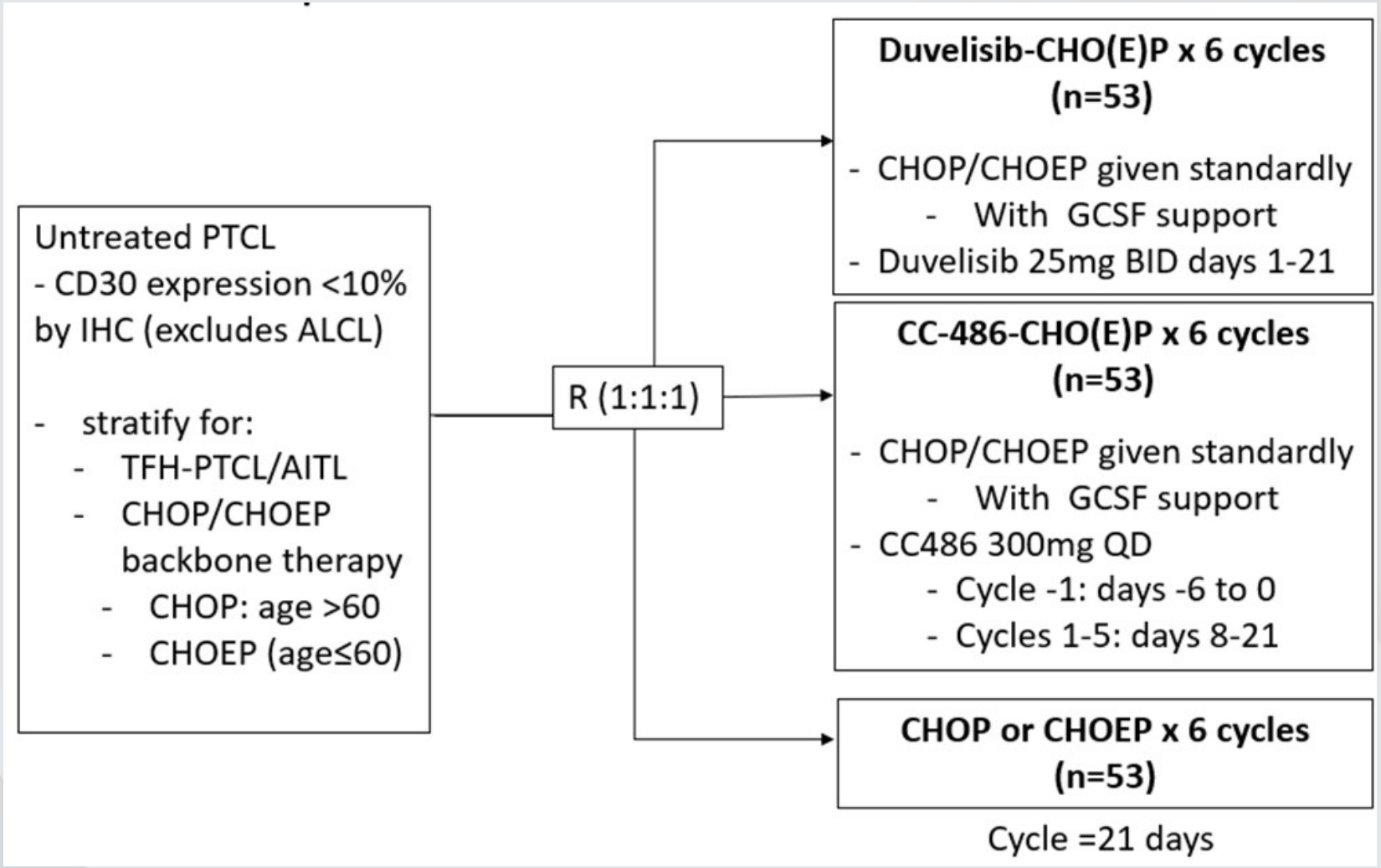
ALCL Only



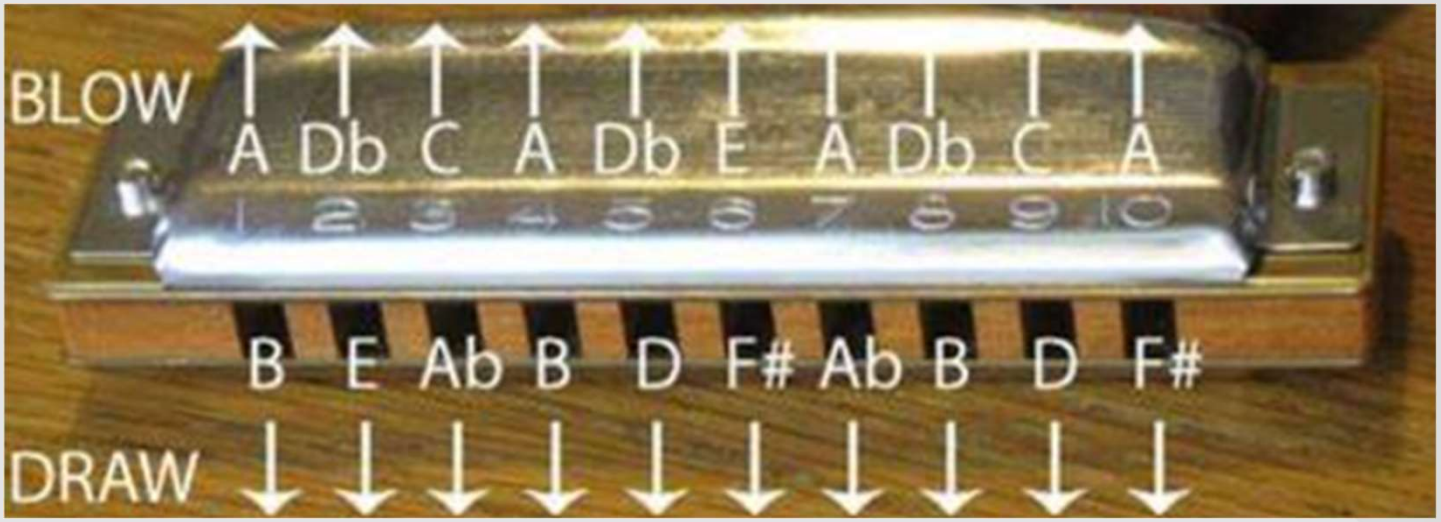


Horwitz et al. Ann Oncology 2022

A Note:
Lack of Immediate Clinical Utility



Courtesy of Neha Metha-Shah M.D.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B E Ab B D F# Ab B D F#
DRAW

C Note:
Cost and Resource Constraints

- Foundation One Heme
  - Cost: $5800-7200
  - FDA cleared

- TEMPTUS xT
  - Cost: $3000-5500

    Not FDA cleared (LTD)

- Neogenomics
  - Cost: $2500-4500
  - Not FDA cleared (LTD)

C Note:
Cost and Resource Constraints

- MSKCC IMPACT
  - CLIA, CAP, and FDA cleared
- Stanford Hematologic Malignancy NGS
  - CLIA, CAP, but not FDA cleared
- Dana-Farber's HemePACT
  - CLIA, CAP, but not FDA cleared
- MD Anderson Heme-STAM
  - CLIA, CAP, but not FDA cleared

C Note:
Cost and Resource Constraints

Context	FDA-Cleared Preferred?
Community oncology clinic	✅ Yes
Commercial clinical trial enrollment	✅ Yes
Billing with Medicare/private payers	✅ Yes
Academic center using institutional testing	❌ Not always
Rapid adoption of emerging biomarkers	❌ CLIA-only may be faster

C Note:
Cost and Resource Constraints

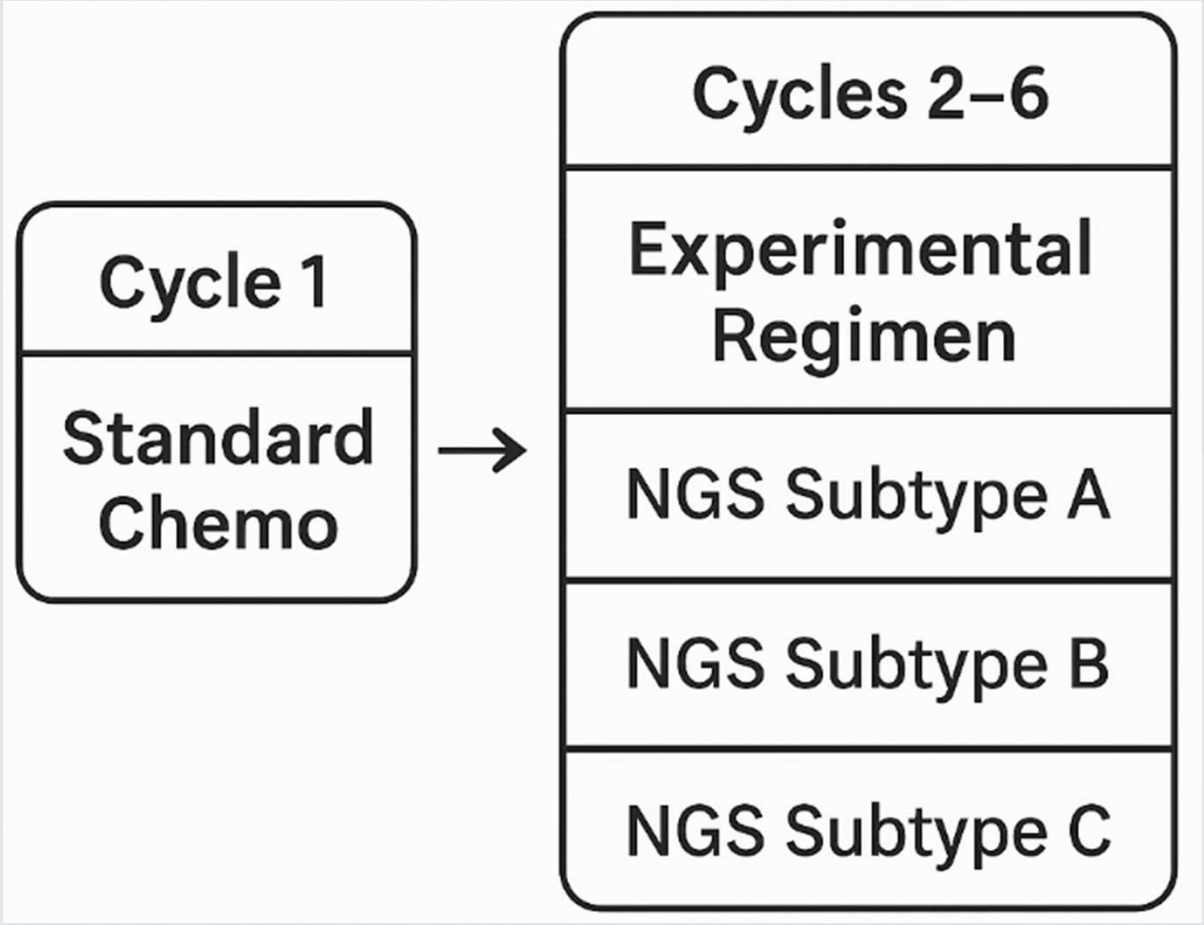
- Requires:
- 5–10 **unstained slides** (4–5 microns thick) **OR**
- 1 FFPE block (preferred if RNA analysis is planned)

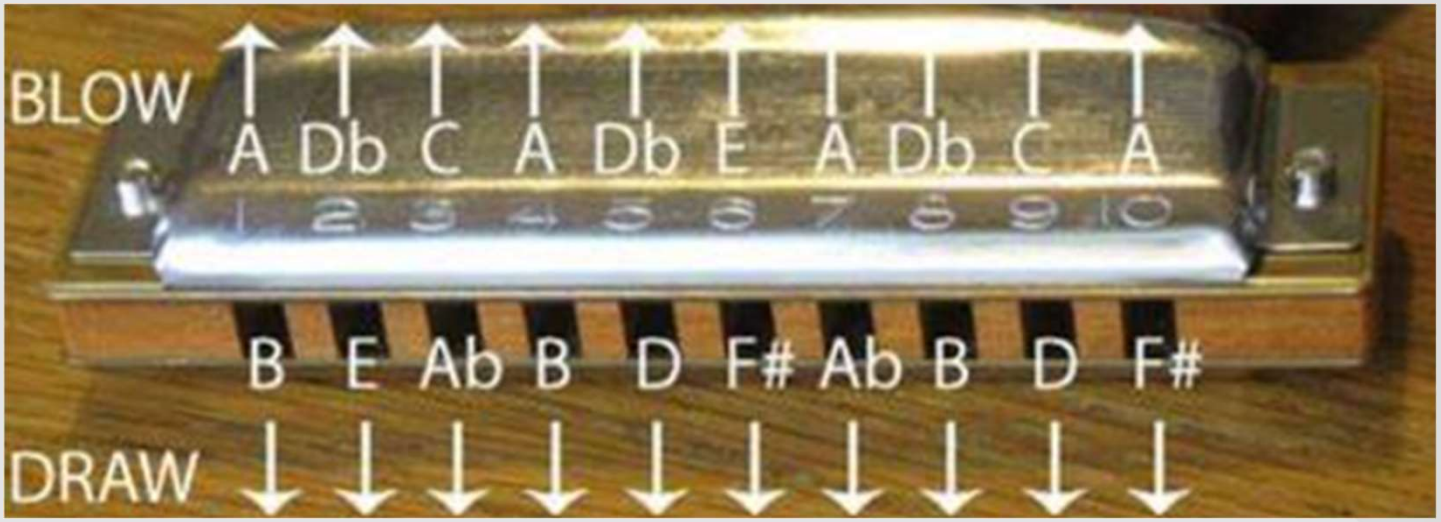
- Must have:
- **>20% tumor content** for accurate mutation calling
- **Pathologist-reviewed** H&E slide for quality control

E: Note Turnaround Time (TAT) & Delays

Commercial Platform	Panel Name	Typical TAT	Potential Issues
Foundation Medicine	FoundationOne Heme	~12–14 business days	Includes DNA + RNA; can be delayed by insurance paperwork
Tempus	Tempus xT / xE / xR	~10–14 business days	RNA fusion testing may take longer
NeoGenomics	Lymphoid NGS Panel	7–14 business days	Quicker for DNA-only; FISH or add-ons may extend time
Institution	**Panel Name**	**Typical TAT**	**Potential Issues**
MSKCC	MSK-IMPACT (Heme)	10–21 calendar days	Often faster for internal MSK patients; includes CLIA report
Stanford	Stanford Heme NGS Panel	10–15 business days	Turnaround may be longer if samples are from outside
Dana-Farber / BWH	HemePACT	14–21 business days	Used internally or with DFCI affiliations
MD Anderson	HemeSTAMP	10–14 business days	Faster when run for internal patients

E: Note Turnaround Time (TAT) & Delays

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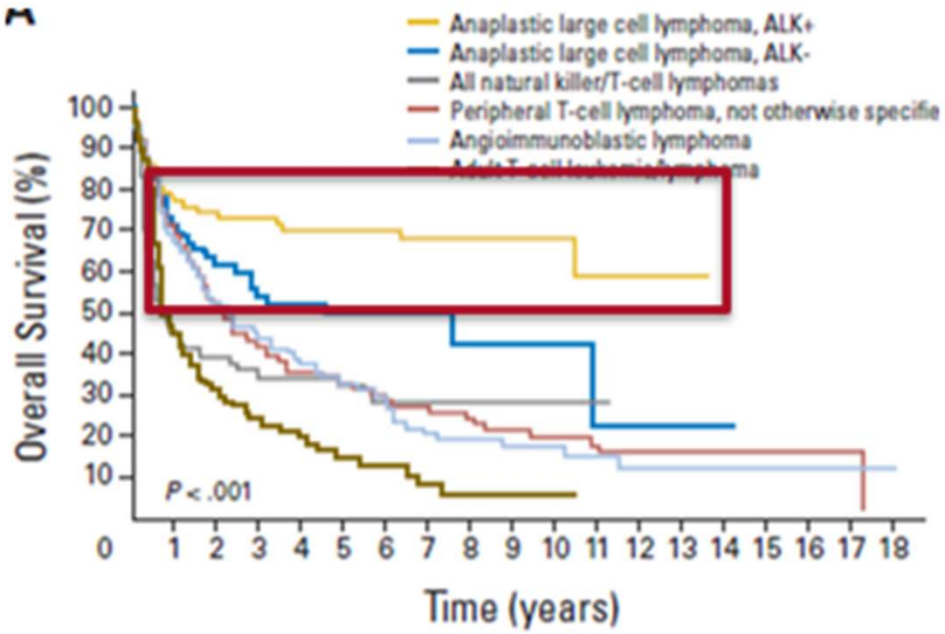
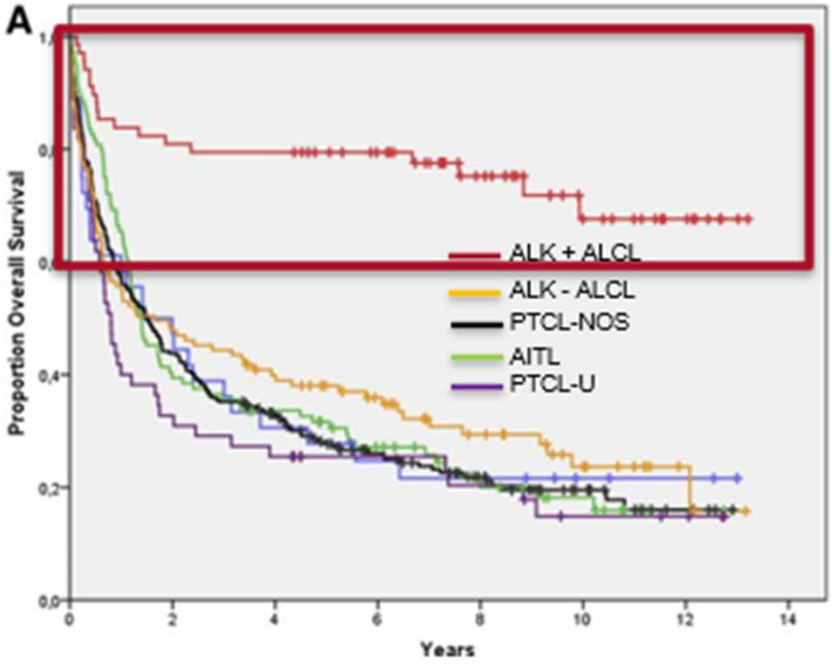
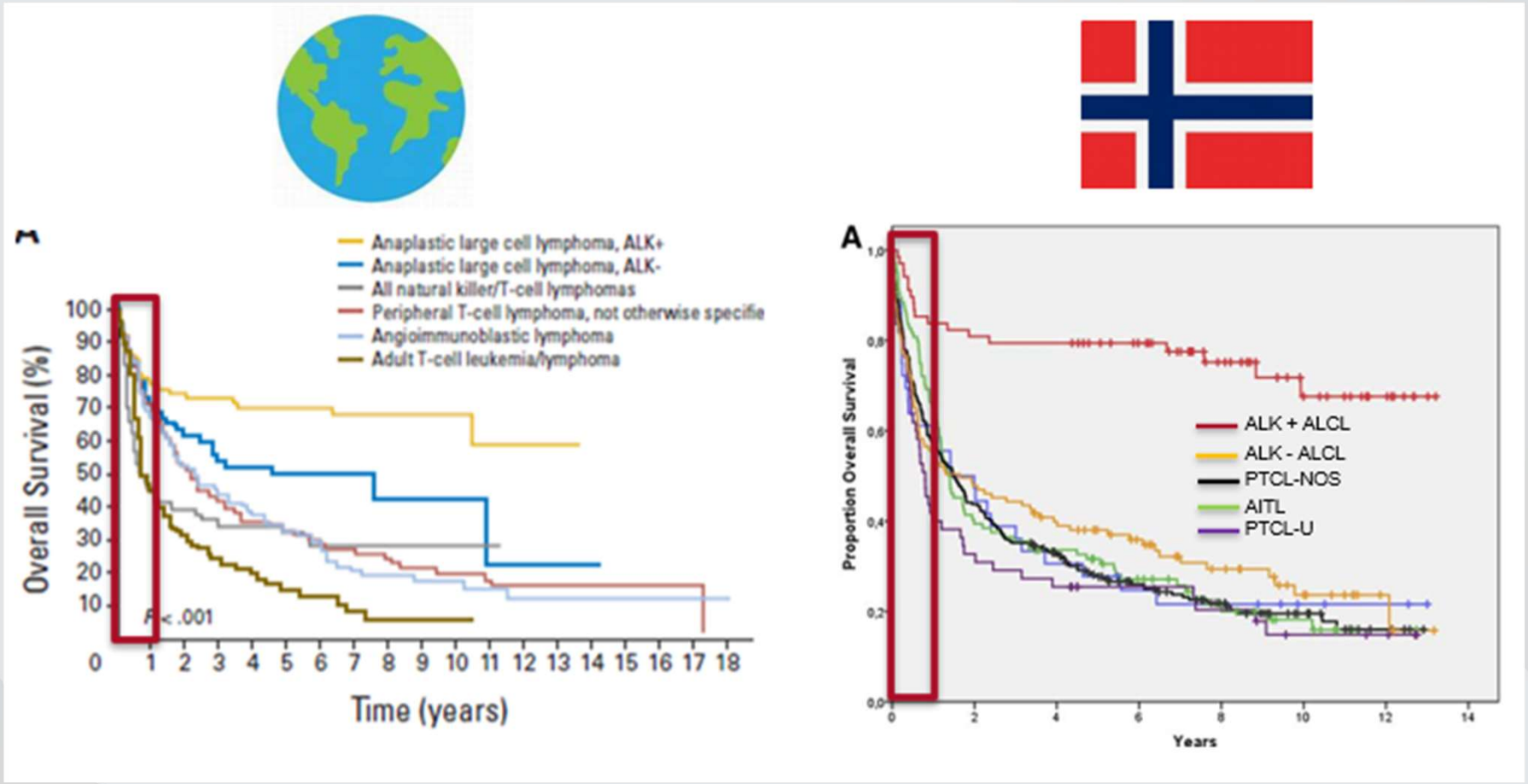
B Note: Selective Value in Certain Subtypes





Vose et al. JCO 2008; Ellin et al. Blood 2014

B Note: Selective Value in Certain Subtypes

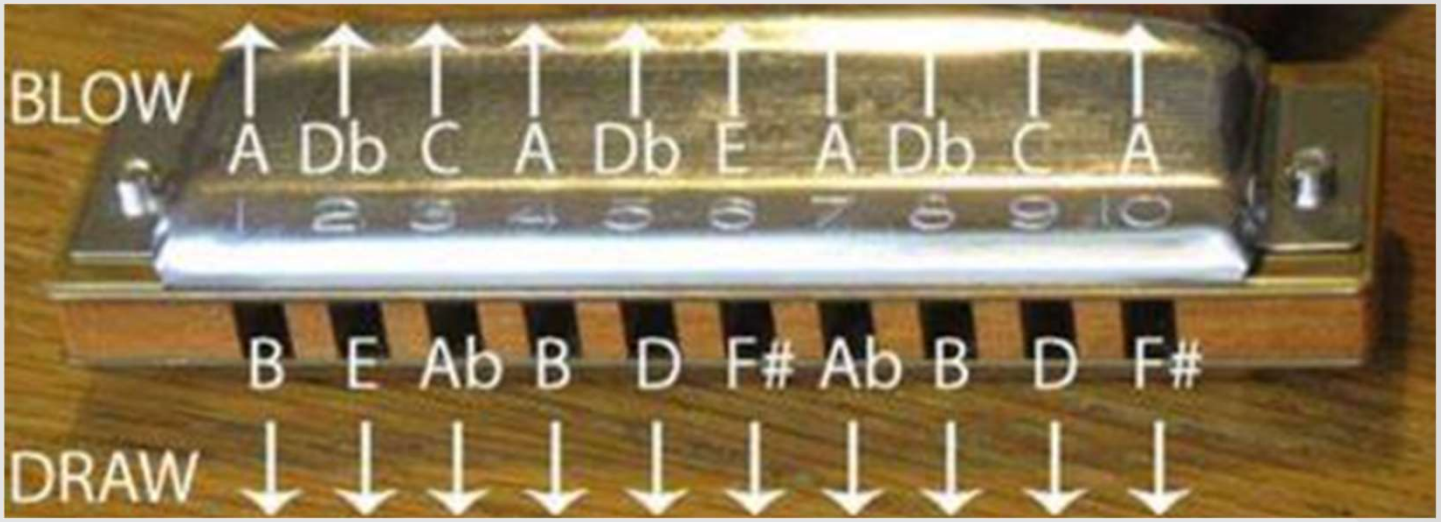


Vose et al. JCO 2008; Ellin et al. Blood 2014

B Note: Selective Value in Certain Subtypes

Purpose	Example
Identifying TFH phenotype	*TET2*, *DNMT3A*, *RHOA*, *IDH2* combo
Prognostication	*TP53*, *CDKN2A* alterations = poor risk
Target identification	*IDH2* → IDH2 clinical trials
Eligibility for clinical trials	Many trials now require sequencing data

WHO 5th Edition; Johnson et al. Blood Advances 2023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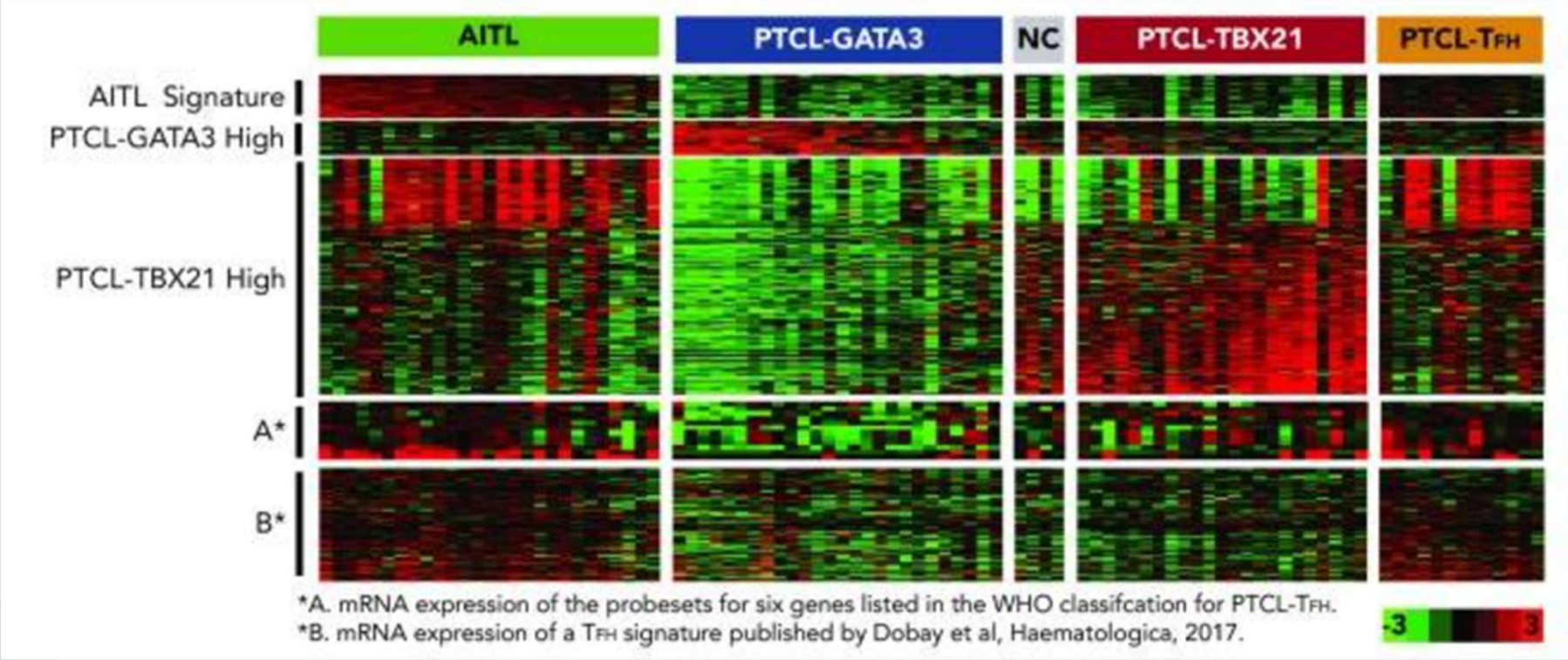
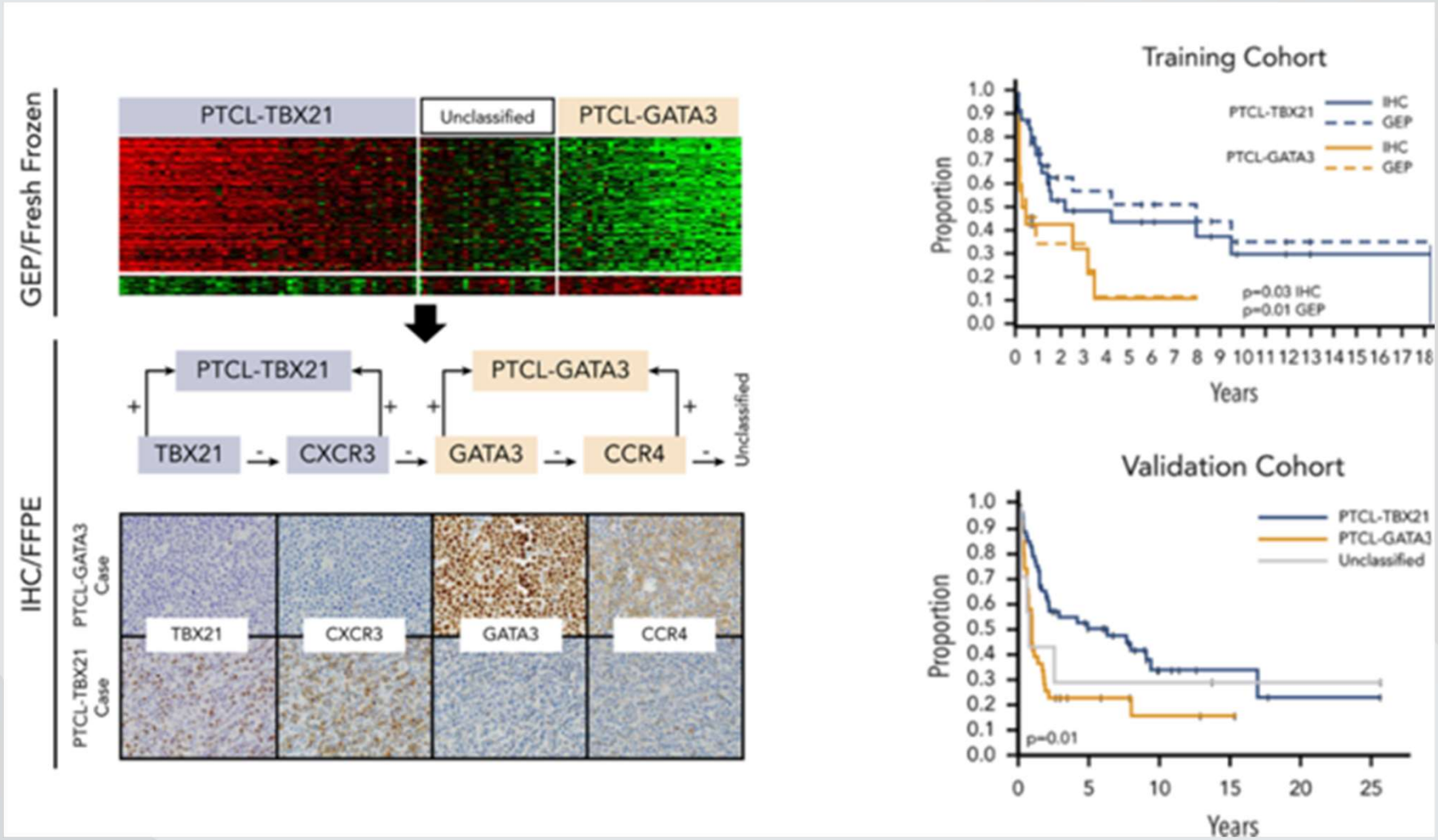
D Note:
Research-Driven Utility



Heavican et al. Blood 2019

D Note: Research-Driven Utility



Heavican et al. Blood 2019

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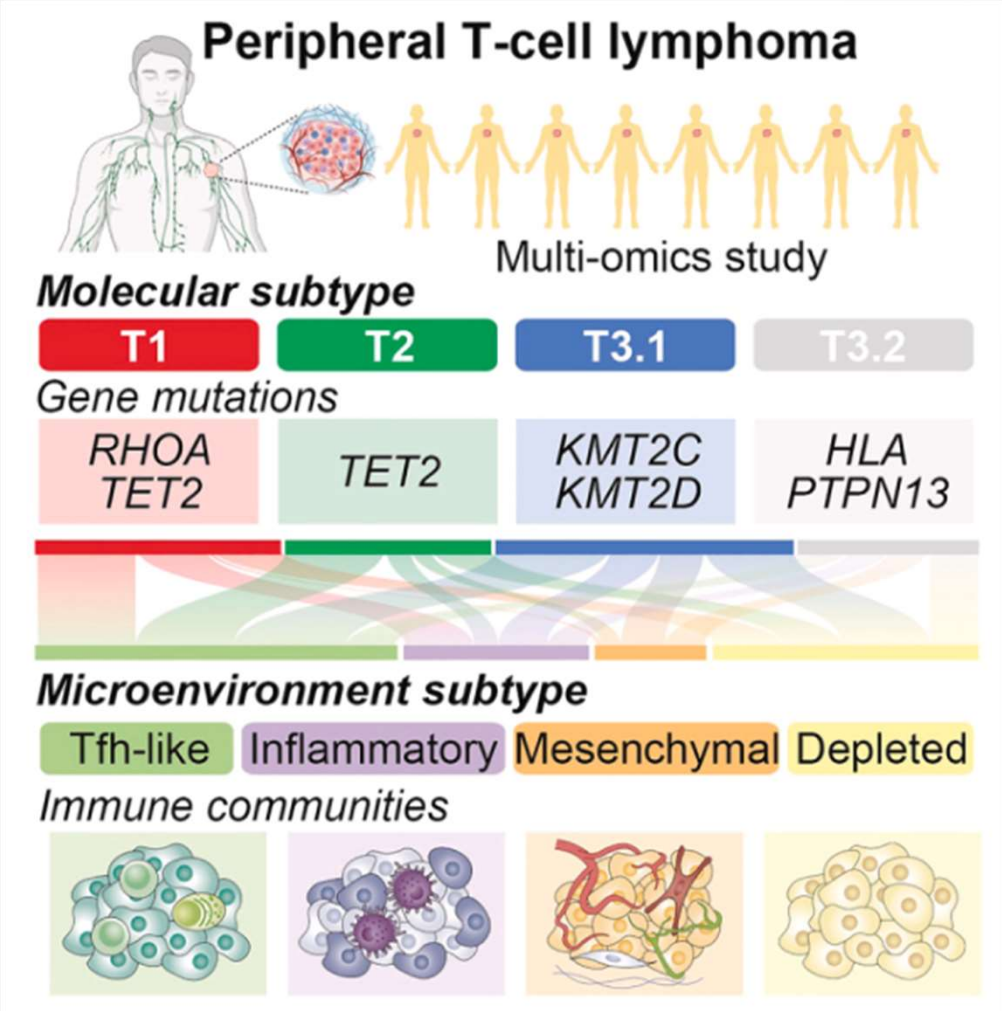

Huang et al. Cell Rep Med 2024

D Note:
Research-Driven Utility

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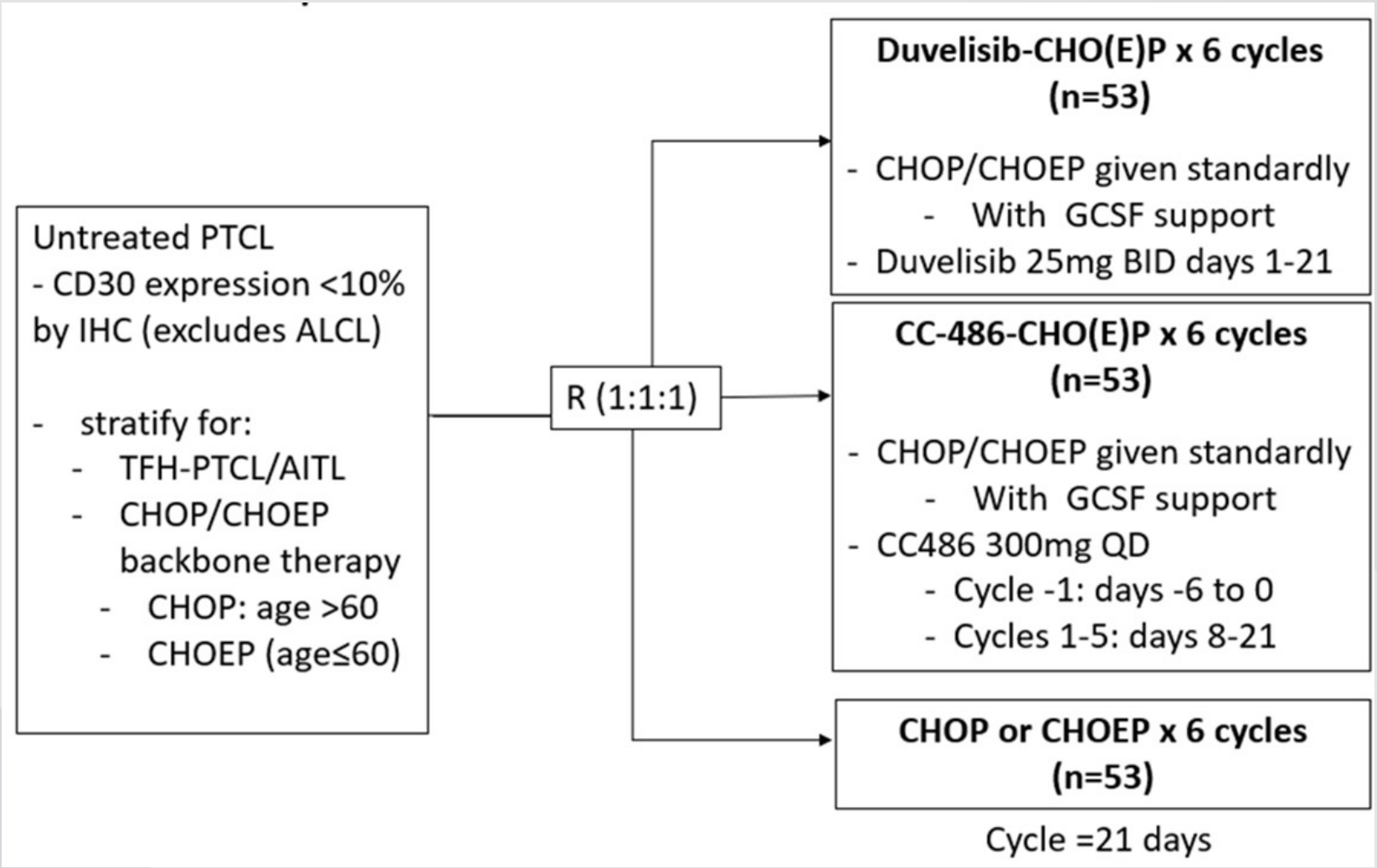
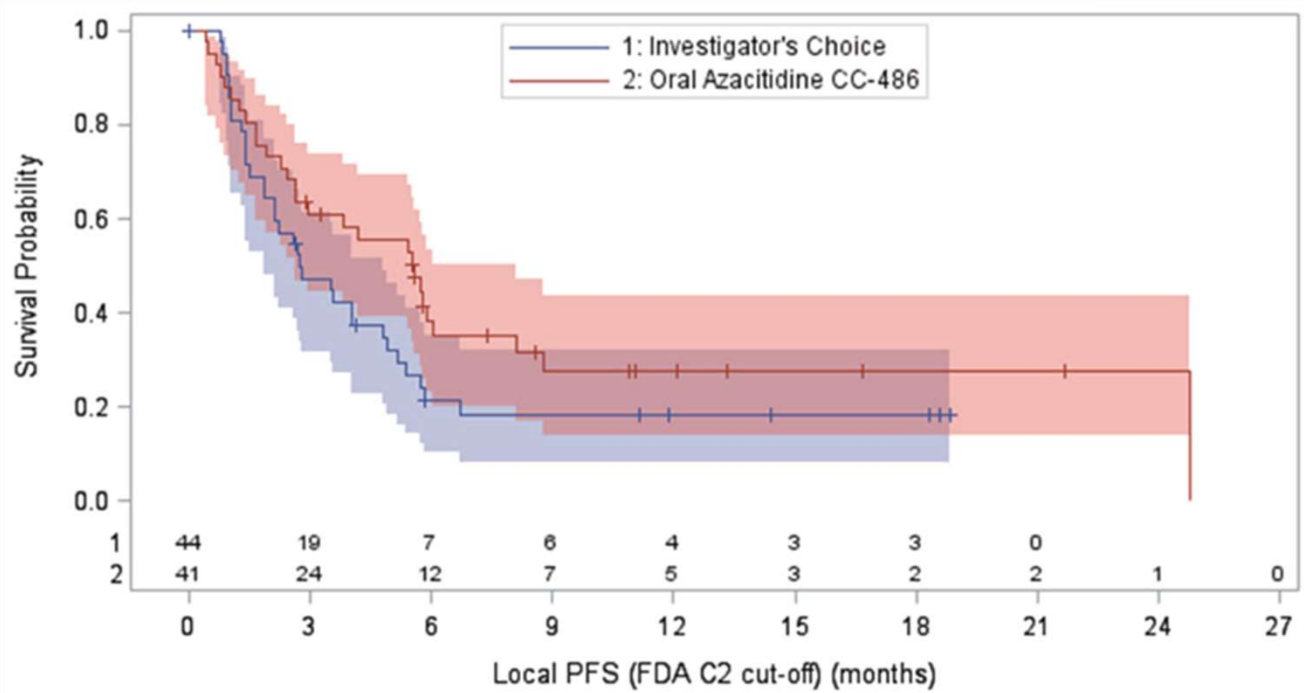


Courtesy of Neha Metha-Shah M.D.

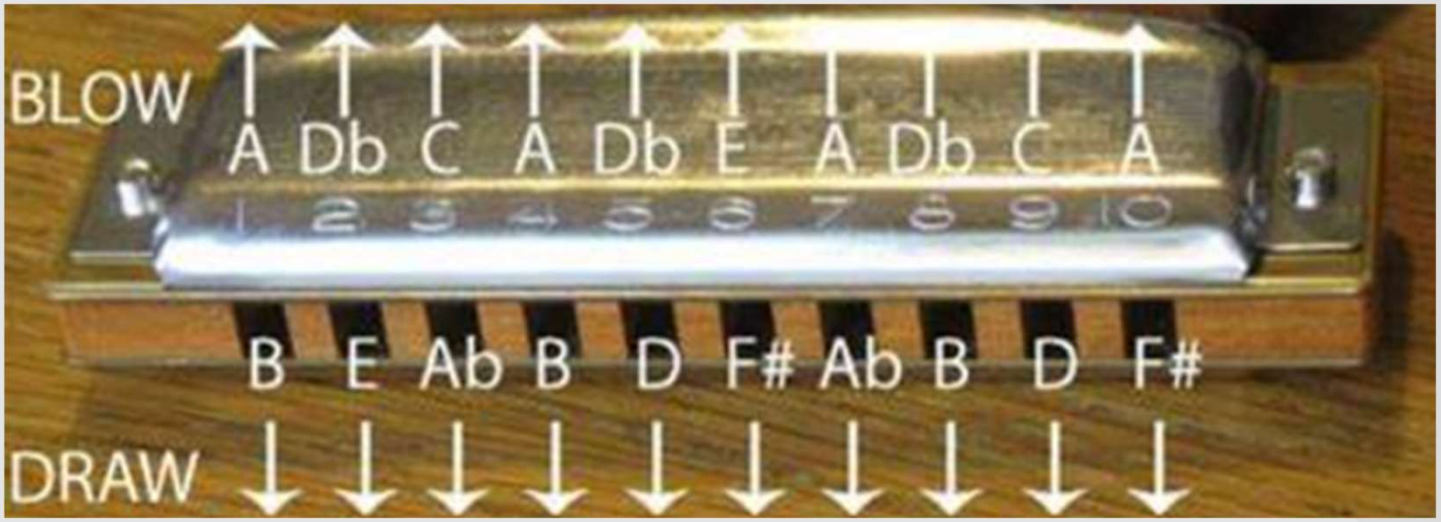
D Note: Research-Driven Utility



	No. of Subjects	Event	Censored	Median Survival
Investigator's Choice	44	75 % (33)	25 % (11)	2.8
Oral Azacitidine CC-486	41	68.3 % (28)	31.7 % (13)	5.6

* Progression assessment based on local assessment using the Lugano classification

Dupuis et al. Blood 2022 (ORACLE trial)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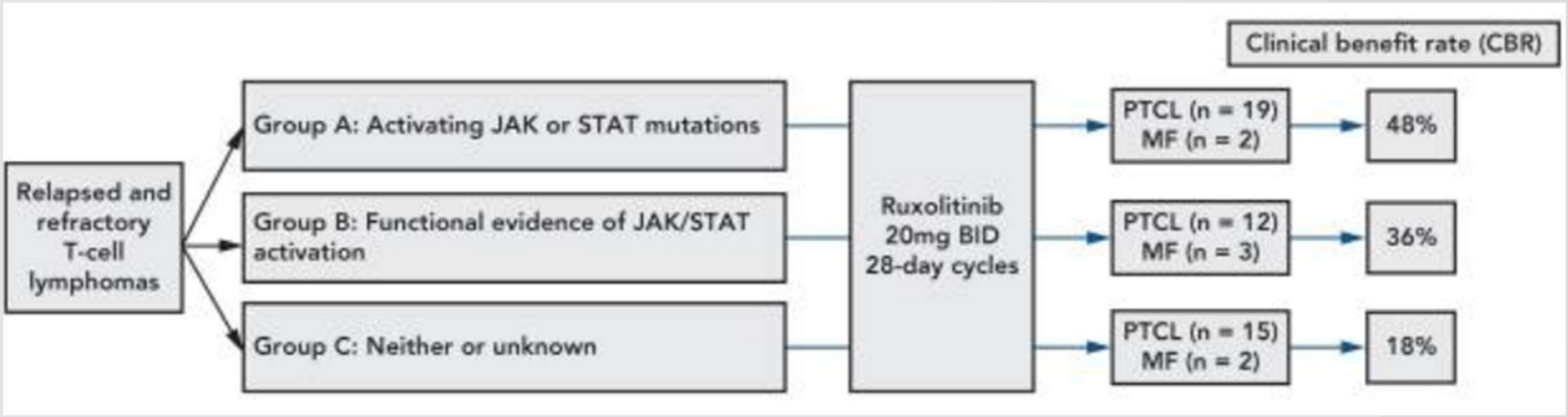
B E Ab B D F# Ab B D F#
DRAW

F Note:
Risk of Overinterpretation

Risk	Description	Example
Clonal hematopoiesis confusion	CHIP mutations misread as tumor	TET2, DNMT3A in elderly patient
Misclassification	Mutation pattern used alone to subtype	RHOA without TFH morphology
A variant of unknown significance misuse	Variants incorrectly considered actionable	Unproven IDH2 variant
Targeted therapy misapplication	Mutation does not equal actionable	STAT3 mutation → off-label ruxolitinib
Inappropriate sample	Non-tumor DNA sequenced	Blood sample without tumor involvement
Non-expert interpretation	NGS data misread or misused	Over-reliance on lab report summary

F Note:
Risk of Overinterpretation



Moskowitz et al. Blood 2021

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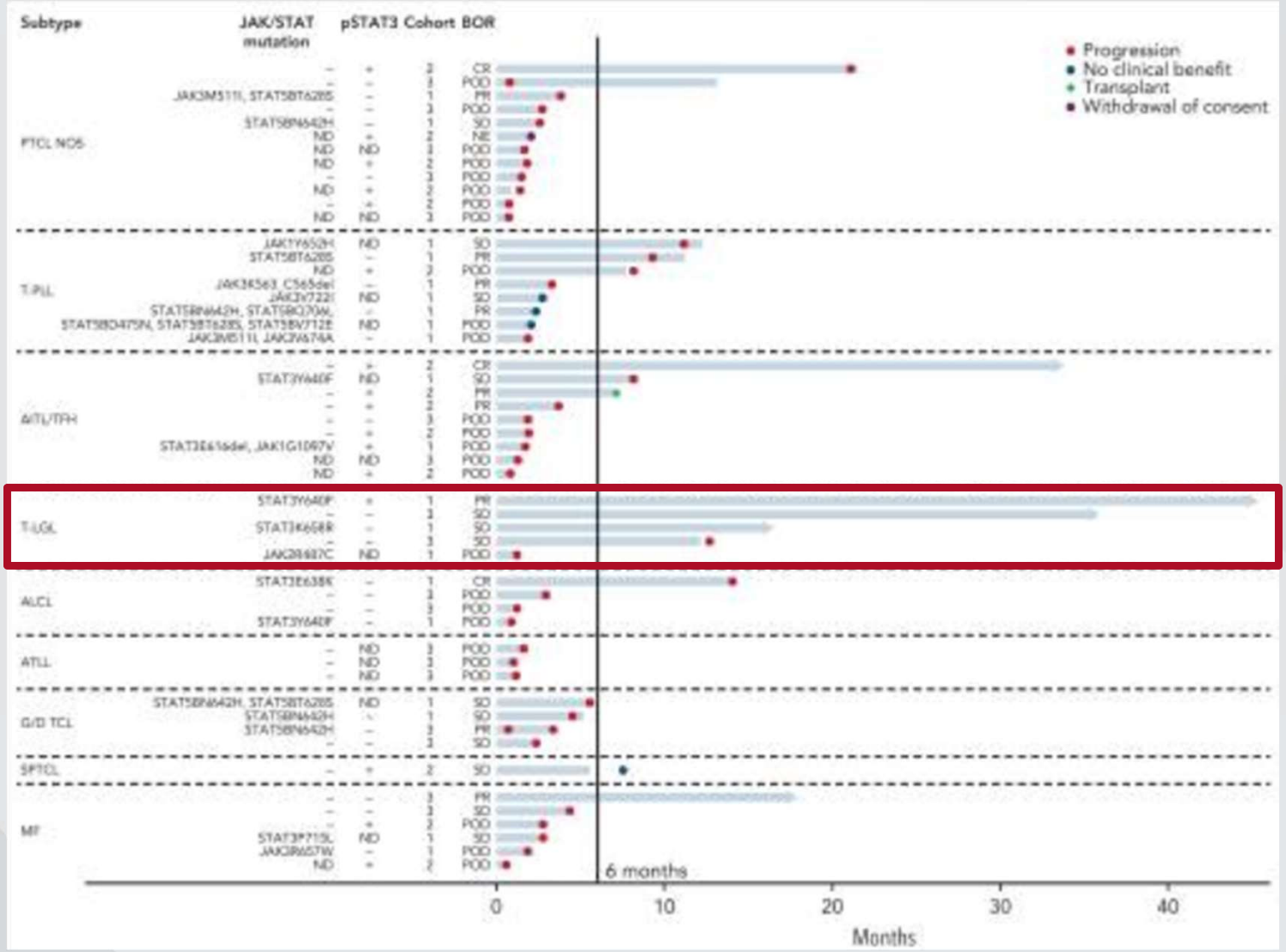
Risk of Overinterpretation



Moskowitz et al. Blood 2021

Aways to Go

BLOW

Universal Molecular Testing for All Patients

- Immediate clinical utility lacking
- Cost and resource constraints
- Turnaround time delays

DRAW

Molecular Testing in Select or Refractory Patients

- Research-driven utility vs. clinical utility
- Selective value in certain subtypes
- Risk of overinterpretation

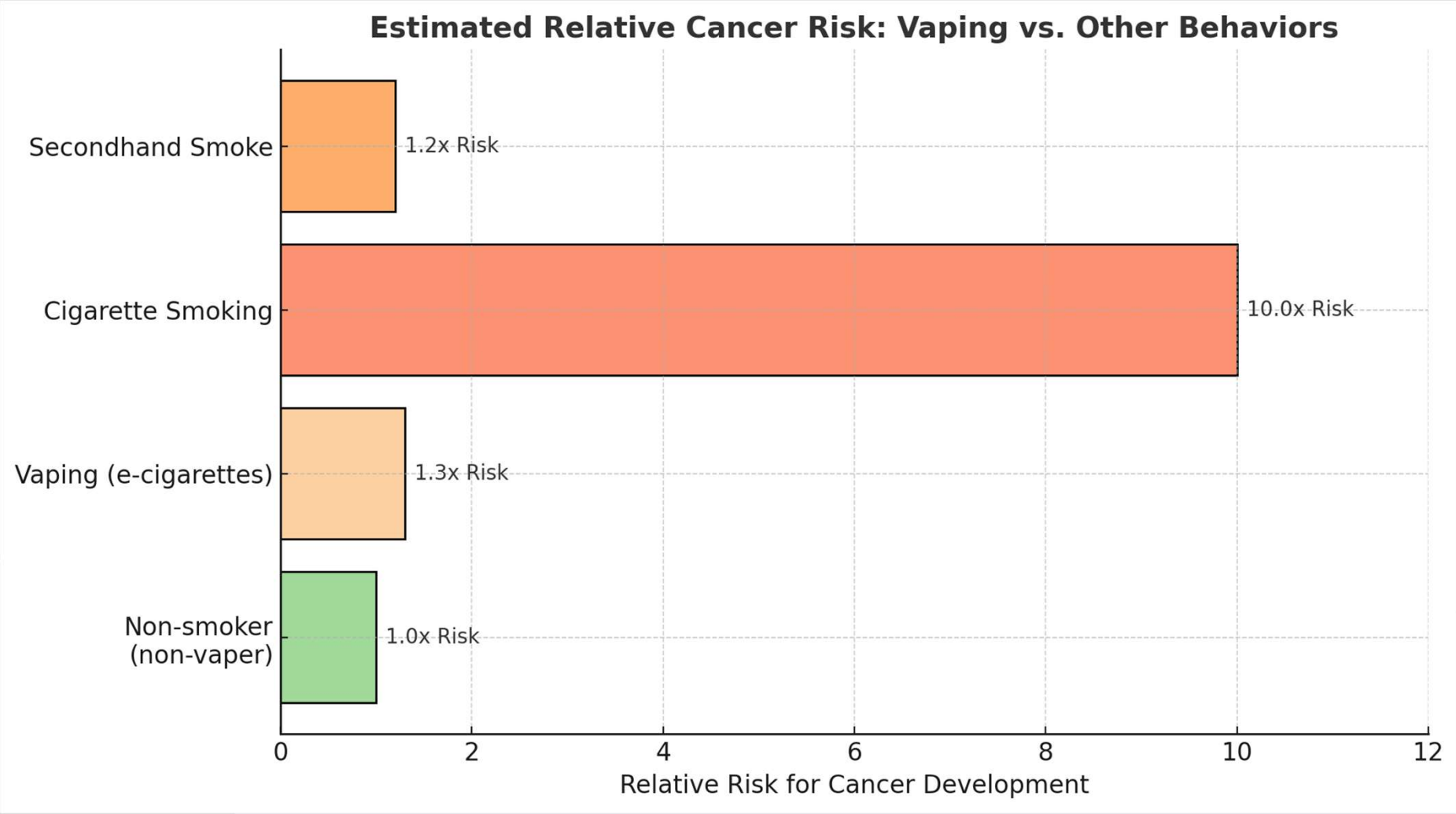
Lifestyle Modification for Cancer Risk Reduction

Generated by ChatGPT

Cancer Prevention: Lifestyle Factors

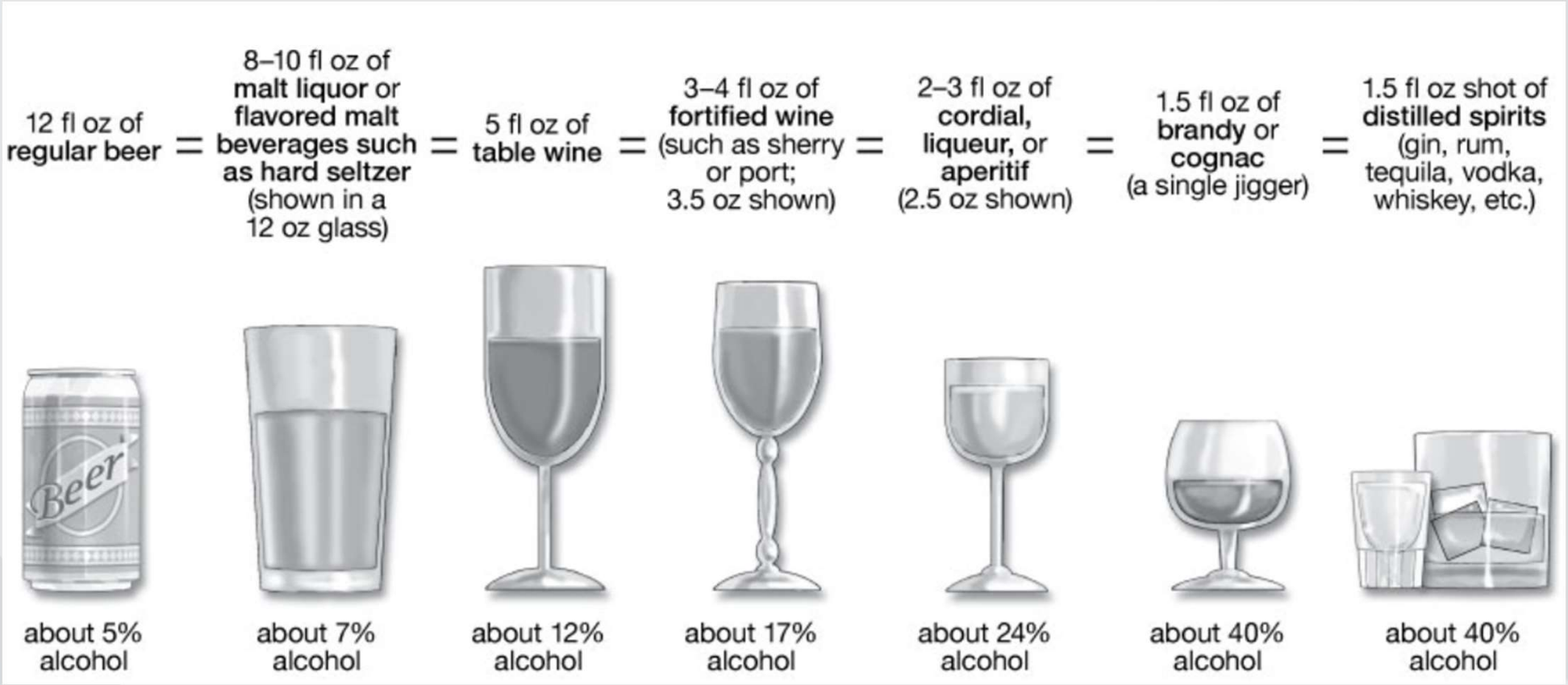
Lifestyle Factor	Associated Cancer(s)	Approximate OR Range
Smoking	Lung, bladder, esophagus, head & neck	**10–30+**
Alcohol	Liver, oral, esophagus, breast	1.5–5
Obesity	Breast, endometrial, colorectal, kidney	1.2–2.5
UV Exposure	Melanoma, squamous/basal cell skin cancer	2–4
HPV (sexual behavior)	Cervical, anal, oropharyngeal	5–100 (varies by subtype)

What About Vaping….

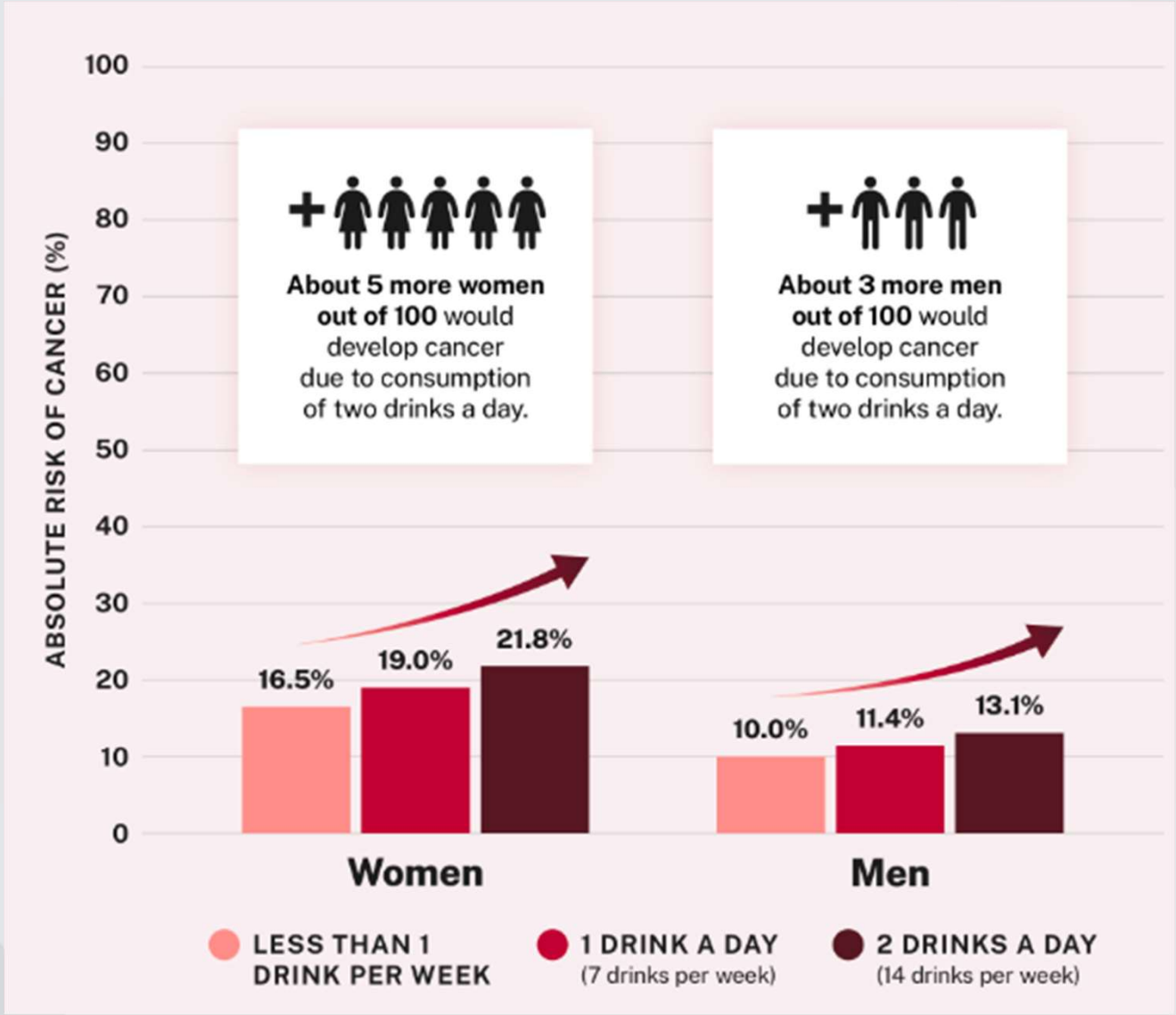


ACS Facts & Figures; Surgeon General Report 2006; National Academies of Sciences, Engineering, and Medicine (2018)

Definition of “a Drink”



Risk of Alcohol & Cancer



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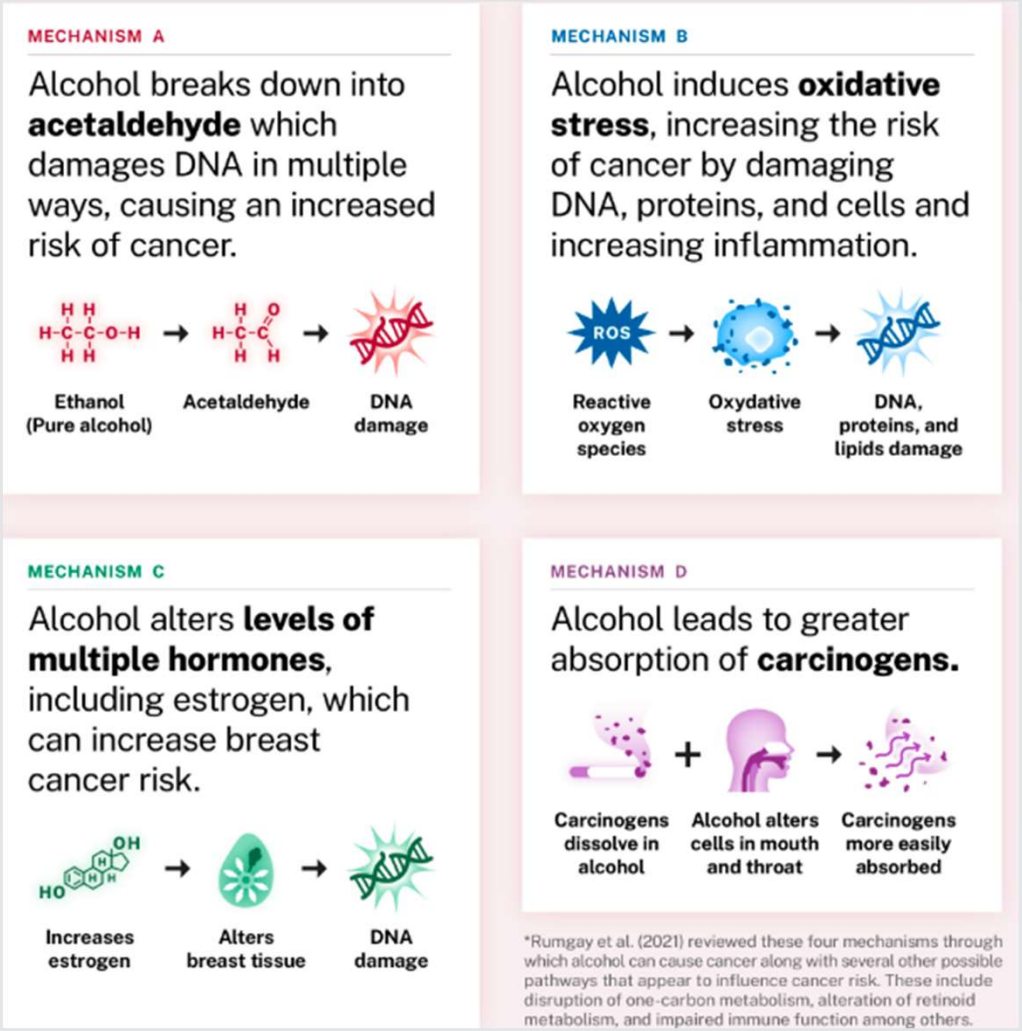
The “How” of Alcohol



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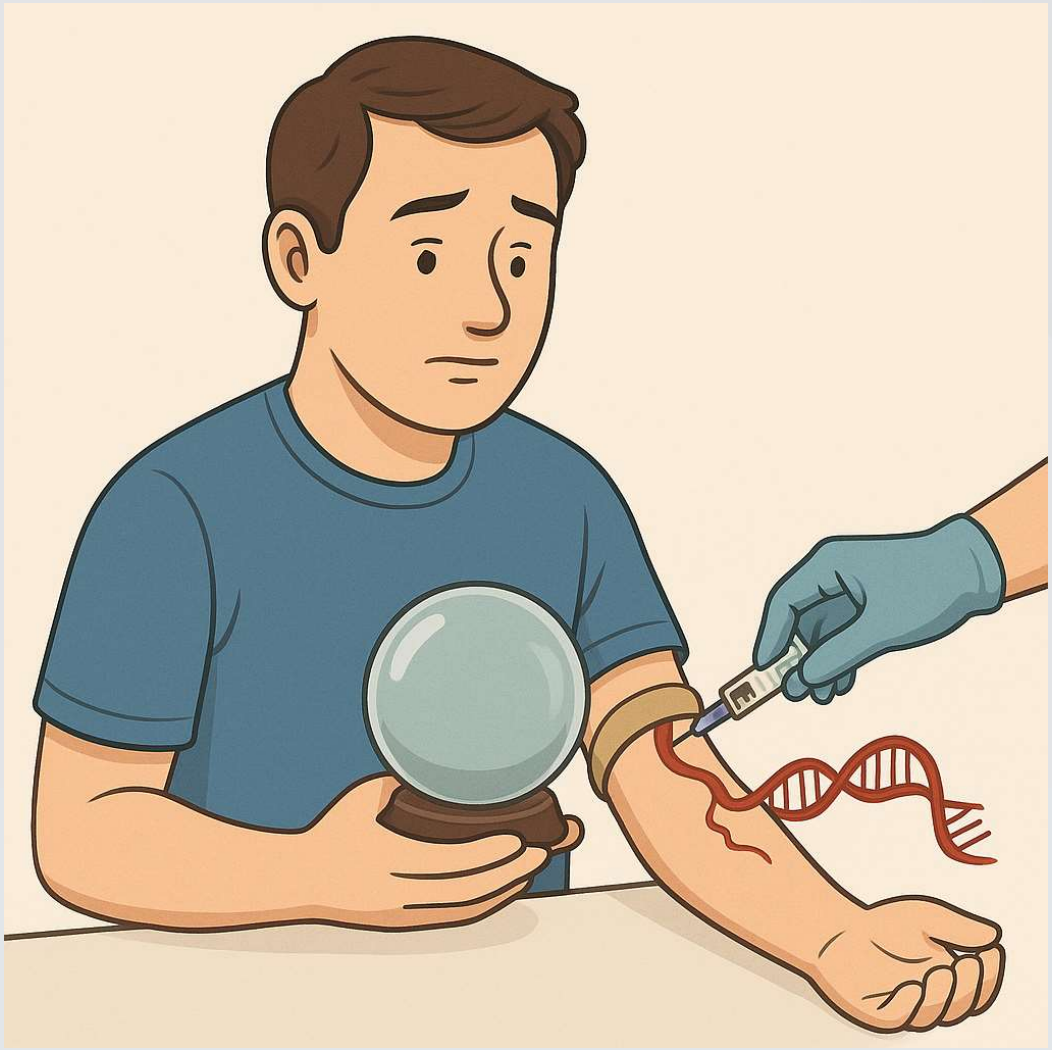
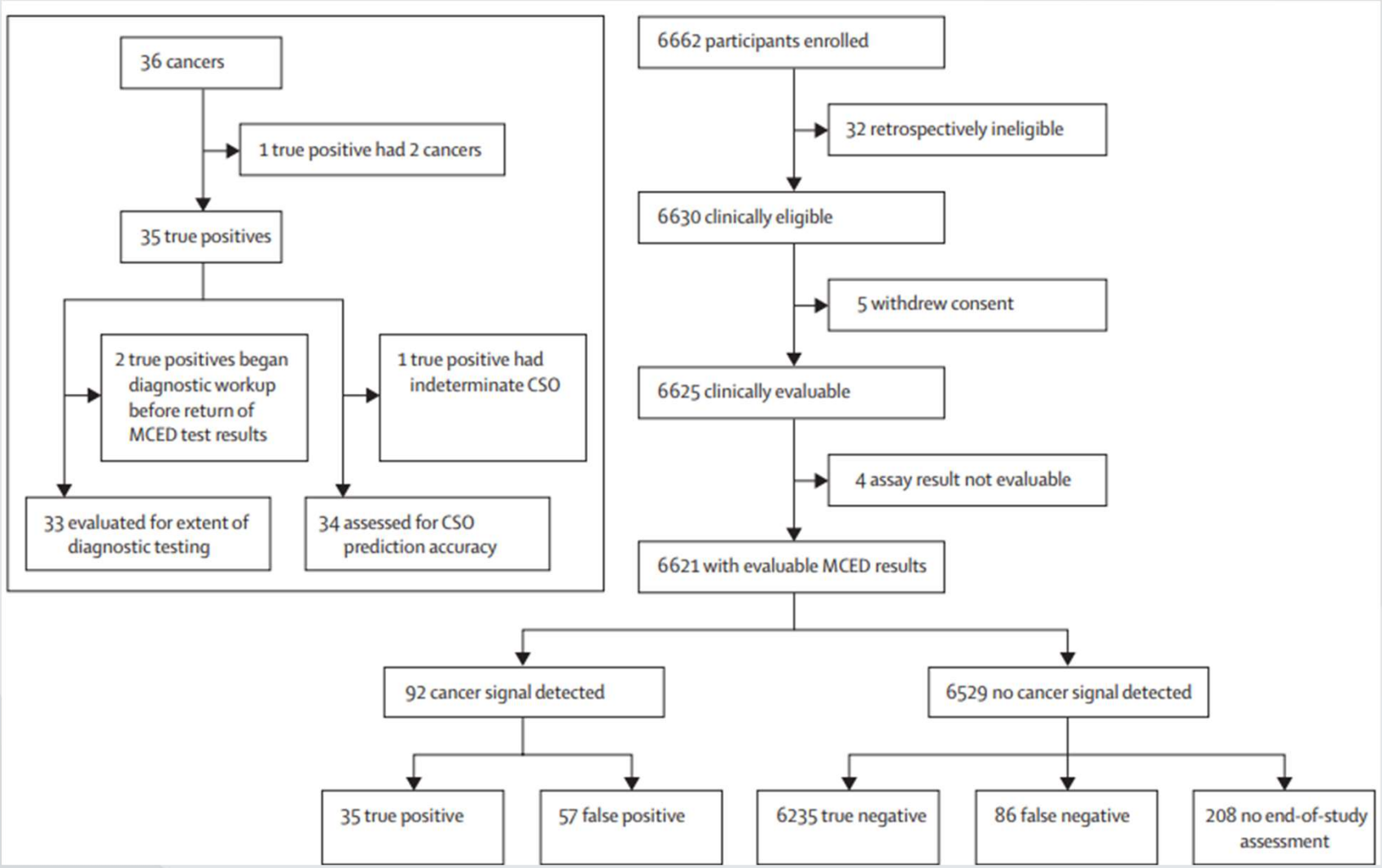
Cancer Prevention: Very Early Detection



Generated by ChatGPT

PATHFINDER Study



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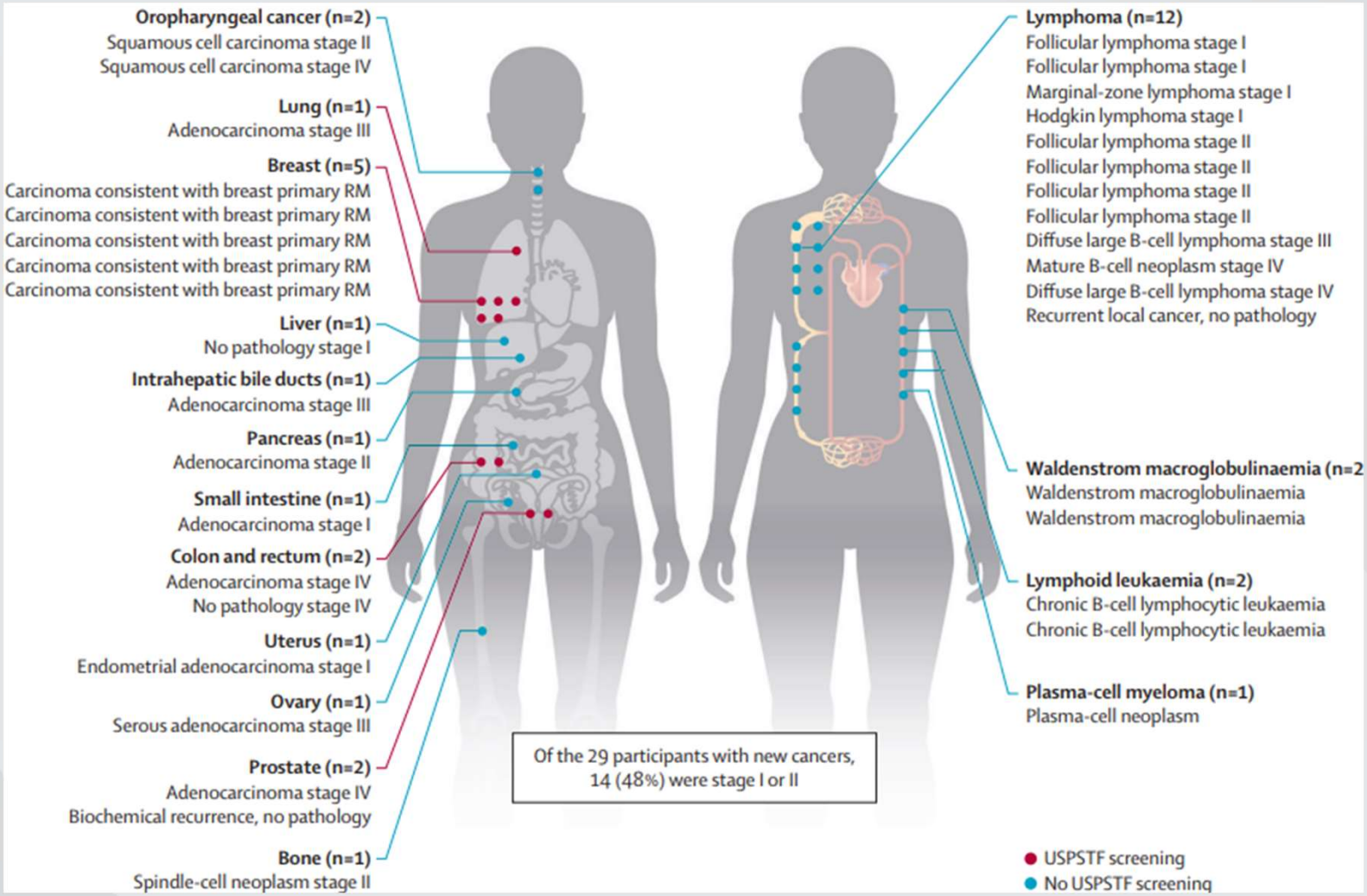
Liquid Biopsy→Biopsy



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Practical…

	Age ≥50 years with additional cancer risk (n=3681)	Age ≥50 years without additional cancer risk (n=2940)	Total (n=6621)
Resolution			
All	56 (1·5%)	36 (1·2%)	92 (1.4%)
True positive	24 (0·7%)	11 (0·4%)	35 (0·5%)
False positive	32 (0·9%)	25 (0·9%)	57 (0·9%)
Positive predictive value	24/56; 43% (30·8–55·9)	11/36; 31% (18·0–46·9)	35/92; 38% (28·8–48·3)
Negative predictive value	3449/3502; 98·5% (98·0–98·8)	2786/2819; 98·8% (98·4–99·2)	6235/6321; 98·6% (98·3–98·9)
Specificity	3449/3480; 99·1% (98·7–99·4)	2786/2810; 99·1% (98·7–99·4)	6235/6290; 99·1% (98·9–99·3)
Yield rate	24/3681; 0·65% (0·41–0·92)	11/2940; 0·37% (0·17–0·61)	35/6621; 0·53% (0·36–0·71)
Number needed to screen	3681/24; 153 (108–245)	2940/11; 267 (163–588)	6621/35; 189 (141–276)
Predicted origin accuracy*			
First CSO correct	20/23; 87% (67·9–95·5)	9/11; 82% (52·3–94·9)	29/34; 85% (69·9–93·6)
First or second CSO correct	23/23; 100% (85·7–100)	10/11; 91% (62·3–99·5)	33/34; 97% (85·1–99·8)

Data are n (%), n/N, or % (95% CI). CSO=cancer signal origin. *Excludes one participant with indeterminate CSO from the true-positive set.

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Future Directions

- Cancer vaccines
- Microbiome and immunomodulation
- Health equity and access to innovation

Summary

- Cancer treatment is rapidly evolving
- Personalized medicine is improving outcomes
- Prevention remains vital and very early detection remain continues to evolve

Q&A

University of Nebraska Medical Center