Acute Myeloid Leukemia (AML):

Diagnosis, Treatment and Side Effect Management

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LEARNING OBJECTIVES

- Describe the various types and subtypes of AML
- Identify tests used to diagnose disease and monitor treatment of AML
- Explain the overarching goals of treatment for AML
- Explain approved and emerging treatment options for AML, including stem cell transplantation, and the role of clinical trials
- Describe strategies to manage treatment side effects as well as potential long-term and late effects of treatments for AML
- Describe the healthcare professional's role in managing patients with AML

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FACULTY

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Case

A 68-year-old woman is seen for routine exam and noted to have low platelets with circulating blasts. She is referred to the hematologist who performs a bone marrow biopsy. The results confirm the diagnosis of AML with complex cytogenetics. Molecular mutations reveal IDH2 mutation.

- What is her prognostic risk classification?
- What would be the treatment of choice initially?
- What about treatment if there is a relapse?

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ABC's of Leukemia

- What is Acute Myeloid Leukemia?
- How does AML affect the bone marrow?
- How is the diagnosis made?
- What are the subtypes of AML?

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Diagnosis and Workup of AML

- Bone marrow aspirate and biopsy morphologic evaluation
- Flow-cytometry
- Karyotype analysis (cytogenetics)
- Mutational analysis

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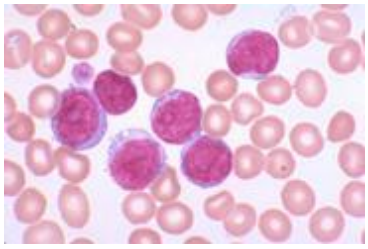
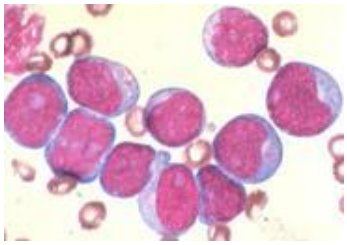
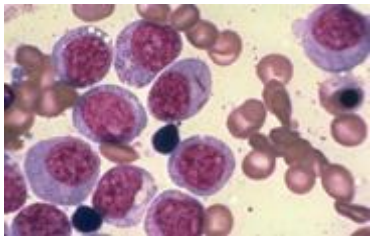
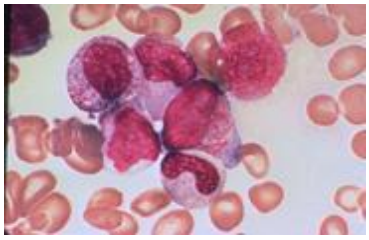
Acute Myeloid Leukemia

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French-American-British (FAB) System

- M0: Myelocytic leukemia without maturation
- M1: Myelocytic leukemia with minimal differentiation
- M2: Myelocytic leukemia with maturation
- M3: Promyelocytic leukemia
- M4: Myelomonocytic leukemia
- M5: Monocytic leukemia
- M6: Erythroleukemia
- M7: Megakaryocytic leukemia

British journal of haematology. 33(4). 451-458.

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Acute Myeloid Leukemia

- Most common acute leukemia in adults
- Median age at diagnosis = 67
- Male to female ratio = 5:3
- Associated with chemo +/- radiation exposure, environmental factors, genetic abnormalities, other benign and malignant hematologic *diseases*

http://seer.cancer.gov/statfacts/html/leuks.html

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Standard Prognostic Criteria for Non-M3 AML

- Age
- Subtype of AML
- Cytogenetics
- Mutational profiling of AML
- Clinical factors
  - Performance status
  - Lactate dehydrogenase (LDH)
  - Creatinine

Current opinion in hematology. 12(1). 62-67.

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Risk Stratification

Risk Status	Cytogenetics
Better-risk	• t(8;21)(q22;q22) • inv(16)(p13.q22) • t(16;16)(p13.q22) • t(15;17)
Intermediate	• Normal cytogenetics • +8 only • t(3;5) • t(9;11)(p22q23) • Other non-defined
Poor-risk	• Complex karyotype (> 3 abnormalities) • MK+ • -5 / 5q- • -7 / 7q- • Other 11q23 abnormalities, excluding t(9;11) • inv(3)(q21q26.2) • t(3;3)(q21q26.2) • t(6;9) • t(9;22) • 17p abnormalities

Foran JM. *ASH Education Program Book*. 2010:47-55.

11

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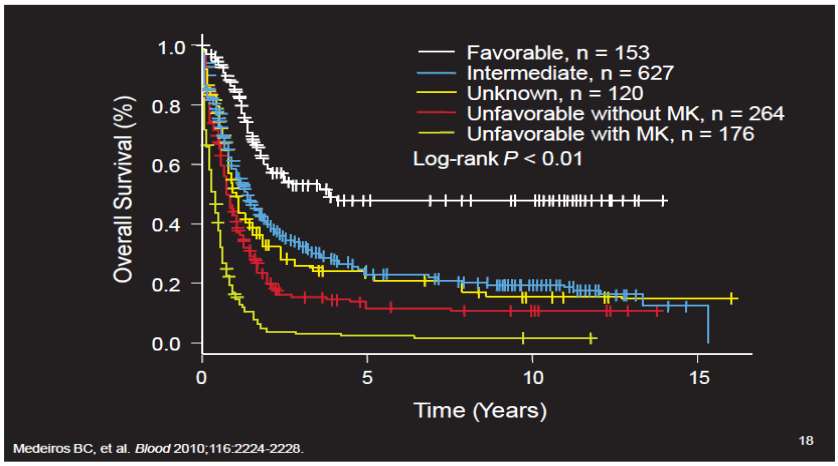
Overall Survival According to Revised Cytogenetic Risk



Medeiros BC, et al. *Blood* 2010;116:2224-2228.

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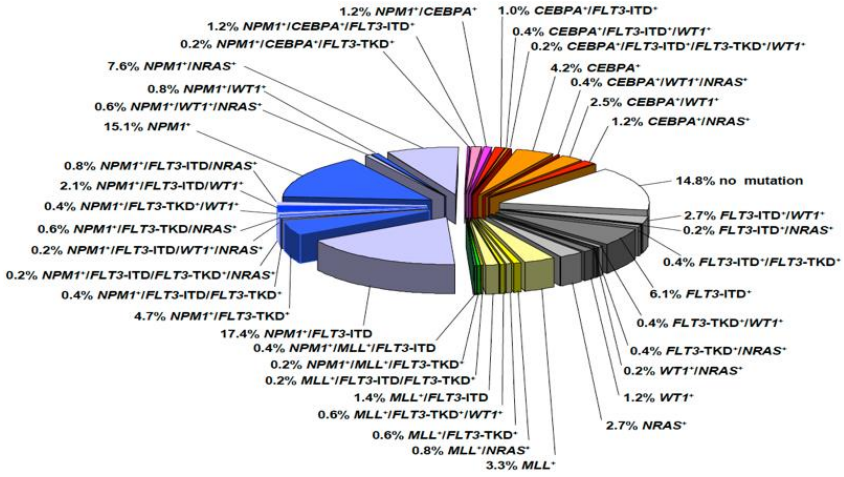
Cytogenetically Normal AML is Highly Heterogeneous

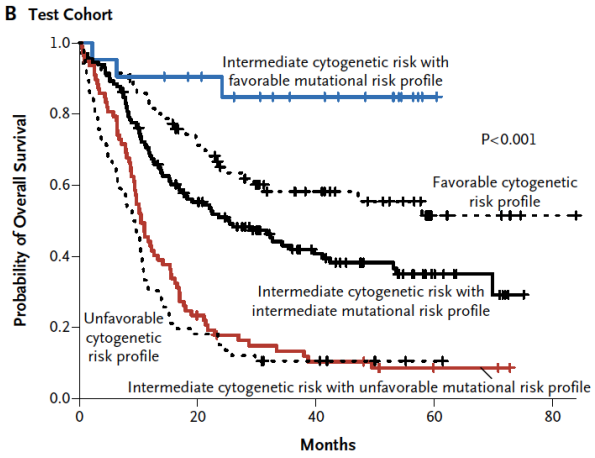


Dohner, H. Blood 2010.

European Leukemia Net Prognostic Classification of Non-M3 AML

Genetic group	Subsets
Favorable	t(8;21)(q22;q22); *RUNX1-RUNX1T1*
	inv(16)(p13.1q22) or t(16;16)(p13.1;q22); *CBFB-MYH11*
	Mutated *NPM1* without *FLT3*-ITD (normal karyotype)
	Mutated *CEBPA* (normal karyotype)
Intermediate-I*	Mutated *NPM1* and *FLT3*-ITD (normal karyotype)
	Wild-type *NPM1* and *FLT3*-ITD (normal karyotype)
	Wild-type *NPM1* without *FLT3*-ITD (normal karyotype)
Intermediate-II	t(9;11)(p22;q23); *MLLT3-MLL*
	Cytogenetic abnormalities not classified as favorable or adverse†
Adverse	inv(3)(q21q26.2) or t(3;3)(q21;q26.2); *RPN1-EVI1*
	t(6;9)(p23;q34); *DEK-NUP214*
	t(v;11)(v;q23); *MLL* rearranged
	−5 or del(5q); −7; abnl(17p); complex karyotype‡

Revised Risk Stratification of Patients with AML on the Basis of Integrated Genetic Analysis



Patel et al. NEJM 2012 March 22; 366(12):1079-89.

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Goals of Treatment in AML

- Young adults (< 60 yrs)
  - Induce remission, consolidate with chemotherapy or allo-SCT with a goal to cure
- Fit elderly (> 60 yrs)
  - Induce remission, consider allo-SCT in selected patients
- Unfit elderly
  - Induce remission, focus on improving quality-of-life

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AML: Currently Effective Modalities of RX

- Cytotoxic chemotherapy (7+3)
- Hypomethylating agents (azacitidine or decitabine)
- Chemo + targeted agents

Leukemia & Lymphoma 54.9 (2013): 2003-2007.
Journal of Clinical Oncology 28.4 (2010): 562-569.
New England Journal of Medicine 361.13 (2009): 1249-1259.

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Role of Oncology Pharmacist

Chemotherapy Selection
- Dose modifications (age, organ function, toxicities)
- Chemotherapy counseling

Medication Review
- Toxicity checks
- Drug interactions
- Dose adjustments

Supportive Care
- Side effect management
- Therapeutic drug monitoring
- Antibiotic recommendations

Discharge Preparation
- Prior authorization
- Discharge counseling

Holle LM, et al. Oncology pharmacists in health care delivery: vital members of the cancer care team. J Oncol Pract. 2014 May;10(3):e142-5.

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Acute Myeloid Leukemia Agents

- Anthracyclines
  - Daunorubicin
  - Idarubicin
  - Daunorubicin/cytarabine (Vyxeos®)
- Antimetabolites
  - Cytarabine
  - Clofarabine
  - Cladribine
  - Fludarabine
- Tyrosine Kinase Inhibitors
  - Ivosidenib (Tibsovo®)
  - Enasidenib (Idhifa®)
  - Olutasidenib (Rezlidhia®)
  - Midostaurin (Rydapt®)
  - Quizartinib (Vanflyta®)
  - Gilteritinib (Xospata®)
- Anthracenedione
  - Mitoxantrone
- Podophyllotoxin
  - Etoposide
- Hypomethylating Agents
  - Decitabine
  - Azacitidine
  - Oral Azactidine (Onureg®)
- Anti-CD33 Antibody
  - Gemtuzumab ozogamicin (Mylotarg®)
- BCL-2 Inhibitor
  - Venetoclax (Venclexta®)
- Hedgehog Pathway Inhibitor
  - Glasdegib (Daurismo™)

Devita, Vincent T. *Cancer Principles and Practice of Oncology*. New York: Wolters Kluwer, 2014. Print.

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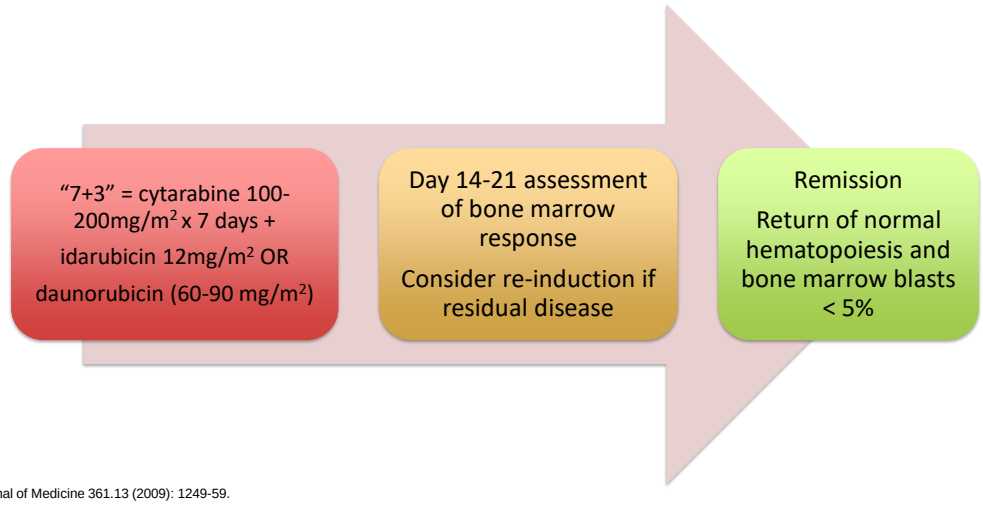
Induction Chemotherapy for Fit AML Patients



New England Journal of Medicine 361.13 (2009): 1249-59.

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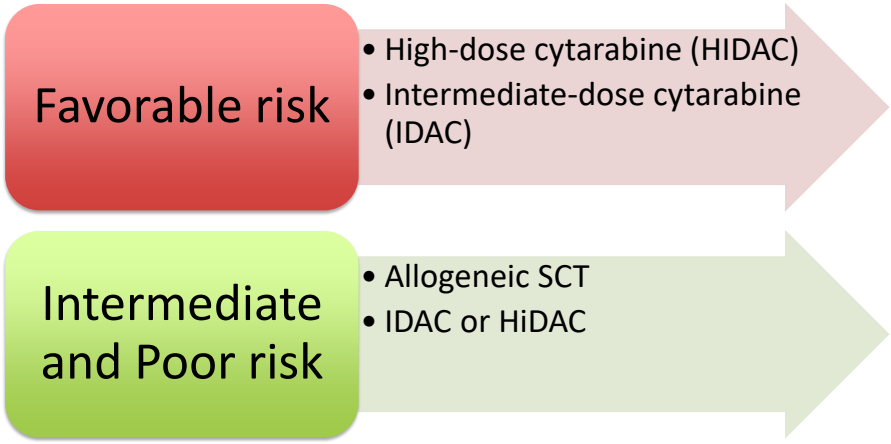
Consolidation Therapy in Fit AML Patients



Journal of Clinical Oncology 31.17 (2013) 2067-69.

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Daunorubicin & Idarubicin

- **Mechanism of action:**
  - Anthracyclines inhibit DNA replication and induce DNA strand breakage through several mechanisms including intercalation of DNA strands, inhibition of DNA polymerase, and topoisomerase II inhibition
- **Dosing / Administration**:
  - IV push over ≤ 15 minutes or IV infusion over 15-30 minutes
- **Common toxicities:**
  - Myelosuppression
  - Gastrointestinal (nausea, vomiting, diarrhea, mucositis)
  - Extravasation
  - Red/orange discoloration of body fluids
  - Alopecia
  - Cardiotoxicity

Daunorubicin [package insert]. Bedford, OH: Bedford Laboratories; June 2013.
Idarubicin® [package insert]. Schaumburg, IL: APP Pharmaceuticals, LLC; December 2008.

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Anthracycline Cardiotoxicity

- Increased reactive oxygen species formation and targeting of topoisomerase 2 in cardiomyocytes; can be acute (rare) or chronic (more common)
  - Risk factors: cumulative anthracycline dose, history of cardiovascular (CV) disease, reduced LVEF, radiation, age, CV risk factors (smoking, hypertension, diabetes, hyperlipidemia, obesity)
- All patients should have an echocardiogram prior to anthracycline administration to confirm adequate left ventricular heart function (LVEF)
  - Caution in patients with LVEF ≤45% or those with ≥10-15% drop from baseline
- Several cardiotoxicity prevention and treatment strategies have been studied:
  - Cumulative lifetime anthracycline monitoring
  - Continuous or extended infusion, dose fractionation
  - Dexrazoxane administration (can also be used for extravasation)

Drug	Maximum Lifetime Dose
Daunorubicin	550 mg/m^2
Doxorubicin	450-550 mg/m^2
Epirubicin	900 mg/m^2
Idarubicin	150 mg/m^2
Mitoxantrone	140 mg/m^2

Volkova M, et al. Anthracycline Cardiotoxicity: Prevalence, Pathogenesis, and Treatment. *Curr Cardiol Rev*. 2011;7(4):214-20.
Bubalo J, et al. Anthracycline-Induced Cardiotoxicity in Adults. *JHOP*. 2018.

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Cytarabine

- **Mechanism of action:**
  - Pyrimidine analog that is incorporated into DNA chains, as well as inhibits DNA polymerase, resulting in decreased DNA synthesis and repair
- **Dosing and Administration:**
  - 7+3 Induction: 100-200 mg/m2 IV continuous 24-hour infusion on Days 1-7
  - HiDAC or IDAC Consolidation: 1500-3000 mg/m2 IV infusion over 3 hours twice a day on Days 1, 3, and 5
- **Common toxicities:**
  - Gastrointestinal toxicity (nausea, vomiting, diarrhea)
  - Hand-foot syndrome
  - Hepatic toxicity
  - Cytarabine syndrome (fevers, myalgias, bone pain, chest pain, rash)
  - Corneal toxicity
  - Neurotoxicity

Cytarabine [package insert]. Rockford, Il: Mylan Institutional; December 2013.

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High-Dose Cytarabine

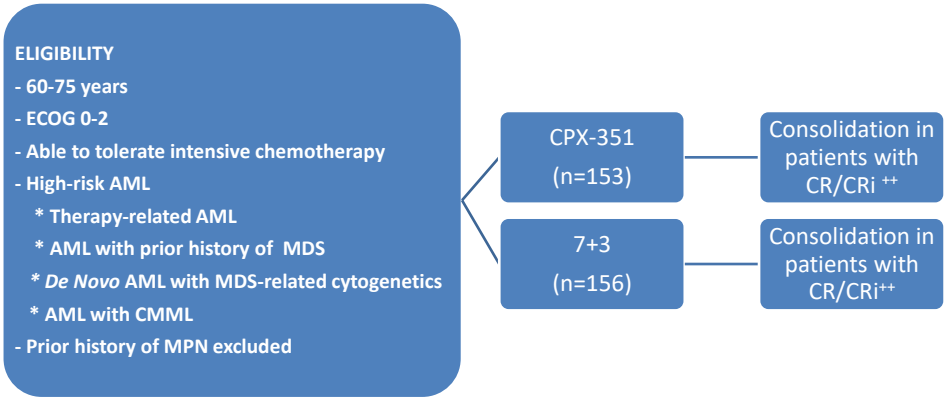
High-dose cytarabine (≥1,000 mg/m^2) is associated with several toxicities that require unique prophylaxis and monitoring

- Conjunctivitis
  - Can present as itching, irritation, burning sensation, rare: mild-moderate temporary vision loss
  - High cytarabine concentrations in the aqueous humor or deposits in the corneal epithelium can trigger inflammatory cascade and result in conjunctivitis
  - Patients should receive prophylaxis with dexamethasone 0.1% eye drops (alternative prednisolone or artificial tears), administered as 2 drops in each eye every 6 hours until 48 hours after the last cytarabine dose
- Neurotoxicity
  - High-dose cytarabine readily crosses the blood-brain barrier, and can result in cerebellar toxicity which presents as difficulty with speech, confusion, tremors, gait instability, somnolence, and rarely seizures
  - Risk factors for the development of cerebellar toxicity include age >50 years, renal impairment, and higher cytarabine doses
  - Patients should be assessed for cerebellar toxicity prior to every dose

Cytarabine [package insert]. Rockford, Il: Mylan Institutional; December 2013.
Chabner, Bruce A. Cancer Chemotherapy and Biotherapy: Principles and Practice. New York: Wolters Kluwer, 2011. Print.

25

Phase III Trial of CPX-351* (Vyxeos®) in Newly Diagnosed High-Risk (secondary) AML



++CR = complete remission; CRi = complete remission with incomplete hematologic recovery
J Clin Oncol 34, 2016 (suppl; abstr 7000)
*Daunorubicin and cytarabine, Vyxeos®

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CPX-351 (Vyxeos®) Improves OS in High-Risk AML

	CPX-351	7+3
CR	37.3 %*	25.6 %
CR + CRi	47.7 %*	33.3 %
Overall survival	9.56 months*	5.95 months
Percent receiving stem cell transplant	34 %	25 %
60-day mortality	13.7 %*	21.2 %
Grade 3-5 Adverse Events	92 %	91 %
Reduced Ejection Fraction	5%	5%

** Statistically significant*

J Clin Oncol 34, 2016 (suppl; abstr 7000).

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Safety

Grade 3-5 Non-hematologic Adverse Events (event frequency ≥ 5%)

MedDRA Preferred Term	CPX-351 (n=153) n (%)	7+3 (n=151) n (%)	All Patients (n=304) n (%)
Febrile Neutropenia	104 (68)	107 (71)	211 (69)
Pneumonia	30 (20)	22 (15)	52 (17)
Hypoxia	20 (13)	23 (15)	43 (14)
Sepsis	14 (9)	11 (7)	25 (8)
Hypertension	16 (10)	8 (5)	24 (8)
Respiratory Failure	11 (7)	10 (7)	21 (7)
Fatigue	11 (7)	9 (6)	20 (7)
Bacteraemia	15 (10)	3 (2)	18 (6)
Ejection Fraction Decreased	8 (5)	8 (5)	16 (5)

PRESENTED AT: ASCO ANNUAL MEETING '16

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Presented By Jeffrey Lancet at 2016 ASCO Annual Meeting.

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Daunorubicin/Cytarabine (Vyxeos®)

- **Mechanism of Action:**
  - Combination product consisting of cytarabine: daunorubicin in a fixed 5:1 molar ratio encapsulated in a lipid formulation
  - Liposomes are taken up by bone marrow cells and undergo degradation following internalization, releasing the active chemotherapeutic agents within the leukemia cells
- **Dosing / Administration:**
  - IV infusion over 90 minutes on Days 1, 3 and 5
- **Common Toxicities:**
  - Gastrointestinal (nausea/vomiting- 47%, diarrhea - 45%)
  - Febrile neutropenia and infections
  - Fatigue (32%)
  - Rash (54%)
  - Reduced ejection fraction or cardiotoxicity (20%)

Vyxeos® (daunorubicin and cytarabine [liposomal]) [prescribing information]. Palo Alto, CA: Jazz Pharmaceuticals Inc; August 2017.

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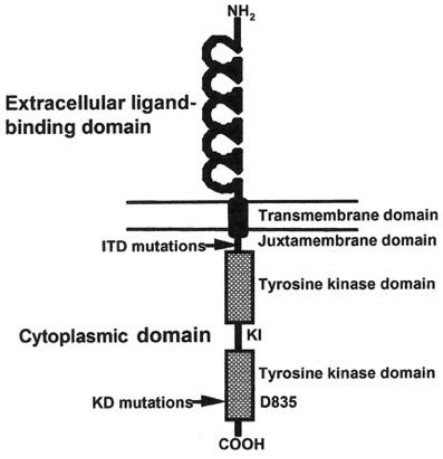
FLT3-ITD

- FML-like tyrosine kinase 3 internal tandem duplication
- Mutated in about one-third of AML patients
- FLT3 is a receptor tyrosine kinase with important roles in hematopoietic stem cell survival and proliferation
- Associated with an aggressive disease phenotype (increased relapse rates and worse survival)



D. Small ASH Education Book 2006.

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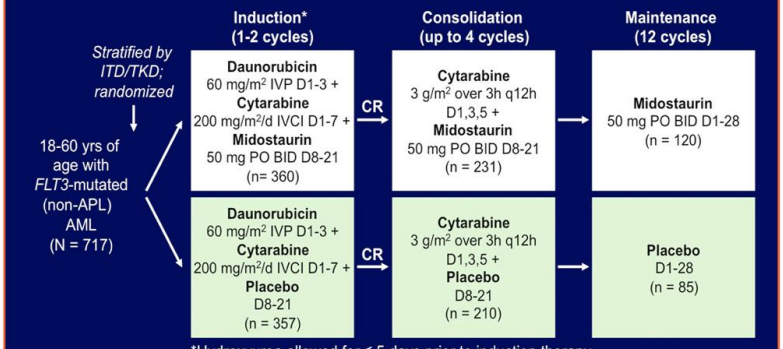
RATIFY: Study Design



*Hydroxyurea allowed for ≤ 5 days prior to induction therapy.

- Double-blind, placebo-controlled, randomized phase III study
  - Primary endpoint: OS (not censored for SCT)
  - Secondary endpoint: EFS

Stone RM, et al. ASH 2015. Abstract 6.

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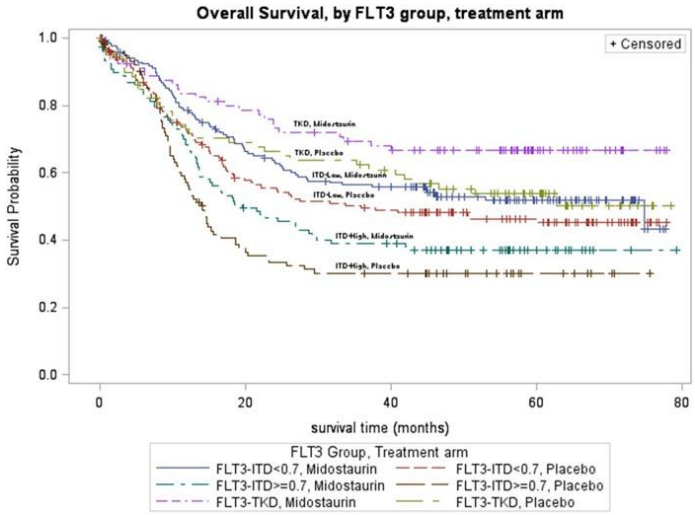
Midostaurin Improves Survival in All FLT3 Mutated AML



Richard M. Stone et al. Blood 2015;126:6.

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Overall Safety Profile

- No statistically significant differences were observed in the overall rate of grade 3 or higher hematologic and non-hematologic adverse events (AEs) in the midostaurin versus the placebo group.
- The most frequent all-grade AEs were febrile neutropenia, nausea, exfoliative dermatitis, vomiting, headache, and petechiae.
- No difference in treatment-related deaths observed between groups

Richard M. Stone et al. Blood 2015;126:6.

33

Midostaurin

- Mechanism of Action:
  - Tyrosine kinase inhibitor that inhibits signaling at multiple receptors, including wild-type and mutant FLT3 (both ITD & TKD), KIT, PDGFRα/β, VEGFR2, and PKC
- Dose / Administration:
  - 50 mg (2 x 25 mg tablets) oral twice daily on Days 8-21 of Induction and Consolidation cycles
  - Take with food approximately 12 hours apart from each dose
  - Dose interruptions for pulmonary toxicities
  - Antiemetics are recommended prior to midostaurin to prevent nausea/vomiting

Rydapt® (midostaurin) [prescribing information]. East Hanover, NJ: Novartis Pharmaceuticals Corporation; April 2017.

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Midostaurin

- **Drug Interactions:**
  - Major CYP3A4 substrate: avoid strong CYP3A4 inhibitors/inducers
    - Monitor or consider dose reduction
  - Others: OATP1A1/SCLO1A1 inhibitor; CYP2B6 and MRP2 inducer
  - Avoid QTc prolonging medications with midostaurin
- **Common Toxicities**
  - Gastrointestinal (nausea/vomiting – 82%, diarrhea - 54%)
  - Headaches (26%)
  - Edema (40%)
  - Abdominal or musculoskeletal pain (35%)
  - Hyperglycemia (80%)
  - Transaminitis (30%)
  - Qtc prolongation (11%)
  - Rare: pulmonary toxicities

Rydapt® (midostaurin) [prescribing information]. East Hanover, NJ: Novartis Pharmaceuticals Corporation; April 2017.

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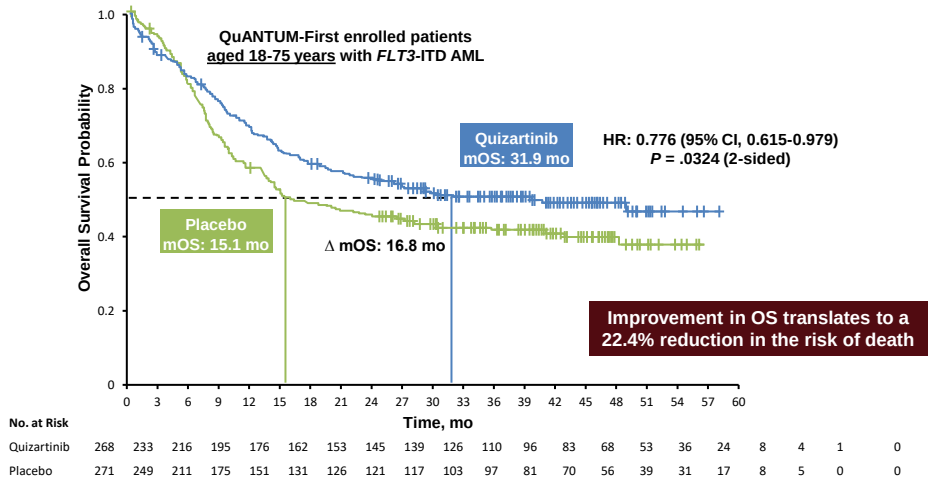
QuANTUM-First: Addition of Quizartinib Improves OS vs Placebo in ND *FLT3*-ITD+ AML[1]



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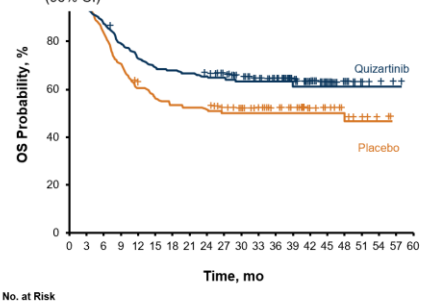
QuANTUM-First: Overall Survival by Age[1]

OS of Patients <60 Years of Age

	Quizartinib (n = 161)	Placebo (n = 162)
Events, n (%)	62 (39.1)	83 (51.2)
mOS, mo (95% CI)	NR (NE-NE)	23.0 (13.0-NE)
Unstratified HR (95% CI)	0.684 (0.493-0.949)	

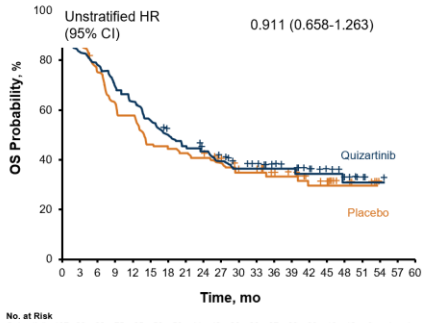


No. at Risk

Quizartinib	161	145	134	120	111	104	103	101	97	90	81	69	60	48	37	24	15	4	3	1	0
Placebo	162	150	128	108	90	83	79	77	75	65	58	53	48	37	25	20	11	4	2	0	0

OS of Patients ≥60 Years of Age

	Quizartinib (n = 107)	Placebo (n = 109)
Events, n (%)	70 (65.4)	75 (68.8)
mOS, mo (95% CI)	17.5 (13.9-25.5)	14.2 (9.7-20.5)
Unstratified HR (95% CI)	0.911 (0.658-1.263)	



No. at Risk

Quizartinib	107	88	82	75	65	58	50	44	42	36	29	27	23	20	16	12	9	4	1	0	0
Placebo	109	99	83	67	61	48	47	44	42	38	33	28	22	19	14	11	6	4	3	0	0

Erba H et al. *Lancet*. 2023;401:1571-1583.

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Quizartinib

- **Mechanism of Action**
  - Small molecular inhibitor that suppresses FLT3 receptor autophosphorylation and signaling by binding to the inactive conformation; limited to FLT3-ITD mutations
- **Dosing / Administration**
  - 35.4 mg (2 x 17.7 mg) by mouth once daily on Days 8-21 during Induction and Days 6-19 during consolidation cycles
  - Take with or without food at the same time each day
  - Dose modifications and interruptions for toxicities
- **Drug Interactions**
  - Major CYP3A4 substrate: dose adjust for strong CYP3A4 inhibitors
  - Minor P-gp/ABCB1, BCRP/ABCG2 substrate
  - Avoid QTc prolonging medications
- **Common Toxicities:**
  - Qtc prolongation (14%)
  - Gastrointestinal (nausea/vomiting - 34%, diarrhea - 42%)
  - Headache (28%)

Vanflyta® (quizartinib) [prescribing information]. Basking Ridge, NJ: Daiichi Sankyo; July 2023.

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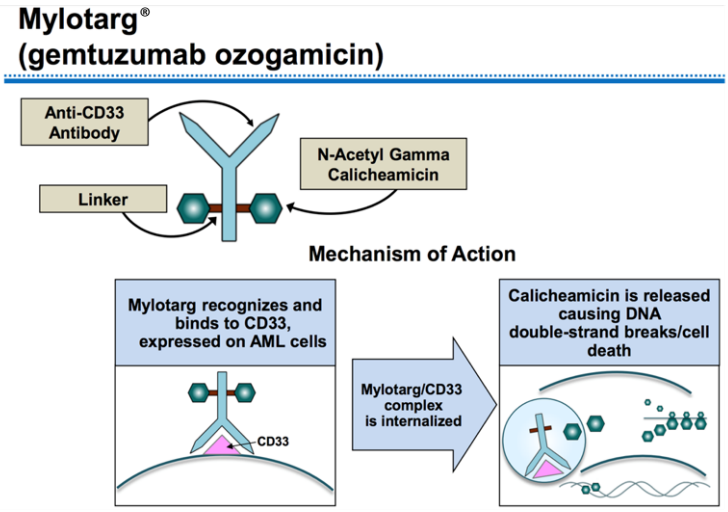
Gemtuzumab Ozogamicin



https://www.mdpi.com/2072-6694/13/13/3214

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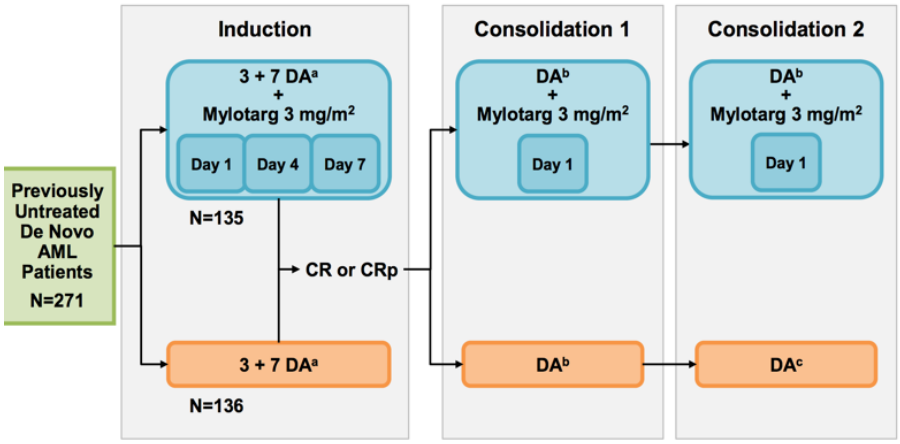
ALFA-0701 (MF3): Phase 3 Study Design



Blood 2014 124:376.

40

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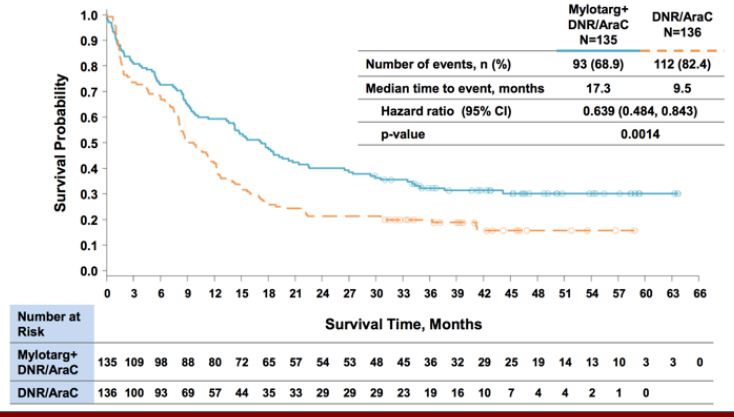
Gemtuzumab Ozogamicin Increases Event-Free Survival

ALFA-0701:
Event-Free Survival – Longer Follow-Up



Blood 2014 124:376.

41

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Gemtuzumab Ozogamicin

- **Mechanism of Action:**
  - Humanized anti-CD33 monoclonal antibody-drug conjugate with a cytotoxic calicheamicin derivative; after binding to CD33 antigen on leukemia cell receptors, gemtuzumab ozogamicin is internalized, released, and causes DNA double strand breaks and cell death
- **Dosing/Administration:**
  - 3 mg/m2 (capped at 4.5 mg) IV infusion over 2 hours either once between Days 1-4 or for three doses on Days 1, 4, and 7 during induction
  - Will receive up to 2 more doses during consolidation
- **Common Toxicities:**
  - Infusion reactions (low-grade fever, hypotension, chills, rash)
  - Gastrointestinal (nausea/vomiting, constipation stomatitis – 21%)
  - Thrombocytopenia
  - Liver function abnormalities (hepatic veno-occlusive disease)

Mylotarg™ (gemtuzumab ozogamicin) [prescribing information]. Philadelphia, PA: Wyeth Pharmaceuticals; April 2018.

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Gemtuzumab Ozogamicin

US Boxed Warning

Hepatotoxicity, including severe or fatal hepatic veno-occlusive disease (VOD), also known as sinusoidal obstruction syndrome (SOS), has been reported in association with the use of gemtuzumab ozogamicin as a single agent and as part of a combination chemotherapy regimen. Monitor frequently for signs and symptoms of VOD/SOS after treatment with gemtuzumab ozogamicin.

Note: Median onset occurs 9 days after drug administration, but occurred at a range of 2 to 298 days. The risk is highest in patients receiving higher gemtuzumab doses, those with moderate to severe baseline hepatic impairment, in patients receiving gemtuzumab following stem cell transplant, and patients undergoing stem cell transplant after receiving gemtuzumab.

Mylotarg™ (gemtuzumab ozogamicin) [prescribing information]. Philadelphia, PA: Wyeth Pharmaceuticals; April 2018.

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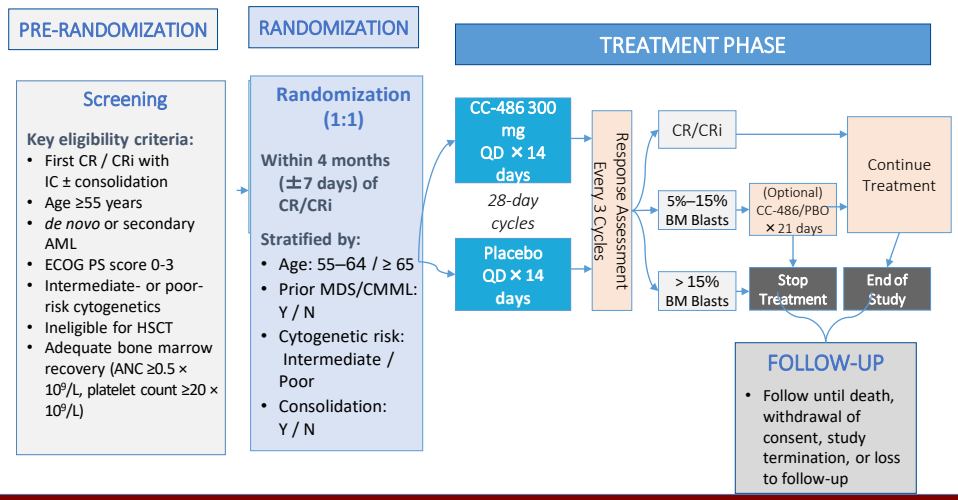
QUAZAR AML-001

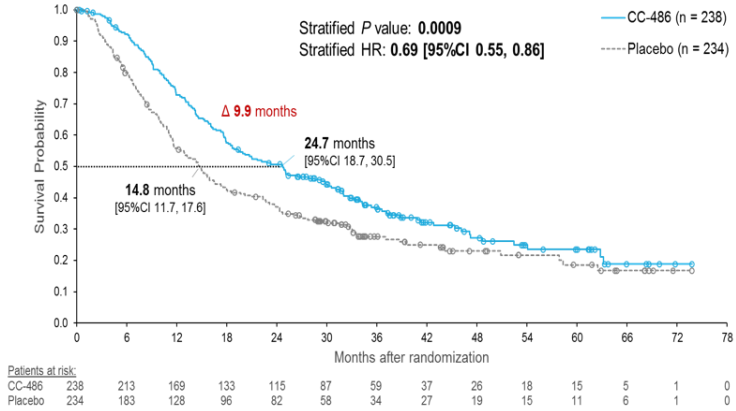
International, multicenter, placebo-controlled, double-blind, randomized, phase III study that enrolled patients from 148 sites in 23 countries (NCT01757535)



44

Primary Endpoint: Overall Survival from Randomization

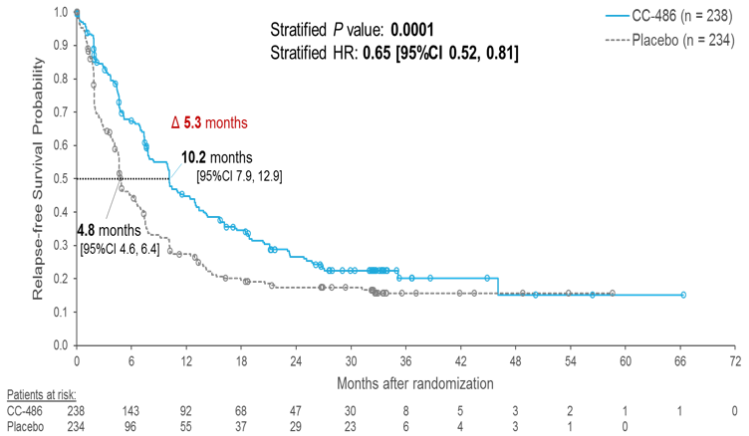
Median follow-up: 41.2 months



95%CI, 95% confidence interval; HR, hazard ratio.

45

Relapse-free Survival from Randomization



1-year relapse rate was 53% in the CC-486 arm [95%CI 46, 59] and was 71% in the placebo arm [65, 77]

Data cutoff: July 15, 2019. RFS was defined as the time from randomization to relapse or death by any cause, whichever occurred first. Kaplan-Meier estimated RFS was compared for CC-486 *vs.* placebo by stratified log-rank test. HRs and 95%CIs were generated using a stratified Cox proportional hazards model.
95%CI, 95% confidence interval; HR, hazard ratio; PBO, placebo.

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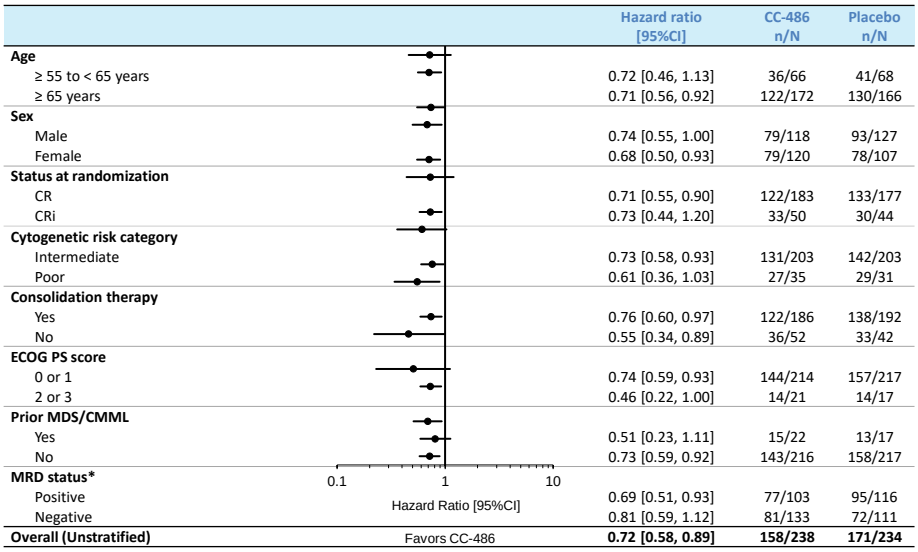
Overall Survival: Key Subgroups



	Hazard ratio [95%CI]	CC-486 n/N	Placebo n/N
Age			
≥ 55 to < 65 years	0.72 [0.46, 1.13]	36/66	41/68
≥ 65 years	0.71 [0.56, 0.92]	122/172	130/166
Sex			
Male	0.74 [0.55, 1.00]	79/118	93/127
Female	0.68 [0.50, 0.93]	79/120	78/107
Status at randomization			
CR	0.71 [0.55, 0.90]	122/183	133/177
CRi	0.73 [0.44, 1.20]	33/50	30/44
Cytogenetic risk category			
Intermediate	0.73 [0.58, 0.93]	131/203	142/203
Poor	0.61 [0.36, 1.03]	27/35	29/31
Consolidation therapy			
Yes	0.76 [0.60, 0.97]	122/186	138/192
No	0.55 [0.34, 0.89]	36/52	33/42
ECOG PS score			
0 or 1	0.74 [0.59, 0.93]	144/214	157/217
2 or 3	0.46 [0.22, 1.00]	14/21	14/17
Prior MDS/CMML			
Yes	0.51 [0.23, 1.11]	15/22	13/17
No	0.73 [0.59, 0.92]	143/216	158/217
MRD status*			
Positive	0.69 [0.51, 0.93]	77/103	95/116
Negative	0.81 [0.59, 1.12]	81/133	72/111
Overall (Unstratified)	**0.72 [0.58, 0.89]**	**158/238**	**171/234**

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Oral Azacitidine

- **Mechanism of Action:**
  - Hypomethylating agent that inhibits methyltransferase, resulting in DNA hypomethylation, differentiation and apoptosis of malignant cells, and restoration of normal gene differentiation and proliferation
- **Dosing/administration:**
  - 300 mg once daily on Days 1-14 of a 28-day cycle
  - Take with or without food at approximately the same time each day
  - Antiemetic should be given prior to oral azacitidine for the first two cycles
  - Dose modifications and treatment delays for neutropenia, thrombocytopenia, and toxicities
- **Drug Interactions:** none
- **Common Toxicities:**
  - Gastrointestinal (nausea, vomiting, diarrhea or constipation)
  - Fatigue

Onureg® (azacitidine) [prescribing information]. Summit, NJ: Celgene; September 2020.

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Elderly or Unfit AML: Treatment Options

- Palliative care
- Traditional induction chemotherapy
- Low-intensity Rx – Hypomethylating agents and low-dose cytarabine
- Targeted treatments and clinical trials

Leukemia & Lymphoma 54.9 (2013): 2003-2007.
Journal of Clinical Oncology 28.4 (2010): 562-569.

49

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Low-Intensity Options in AML

- Can be administered as outpatient
- Relative lack of non-hematologic side effects and generally well tolerated
- Take several cycles to respond
- Effective in achieving CR and improving overall survival compared to supportive care alone

The Leukemia & Lymphoma 54.9 (2013): 2003-2007.
Journal of Clinical Oncology 28.4 (2010): 562-569.

50

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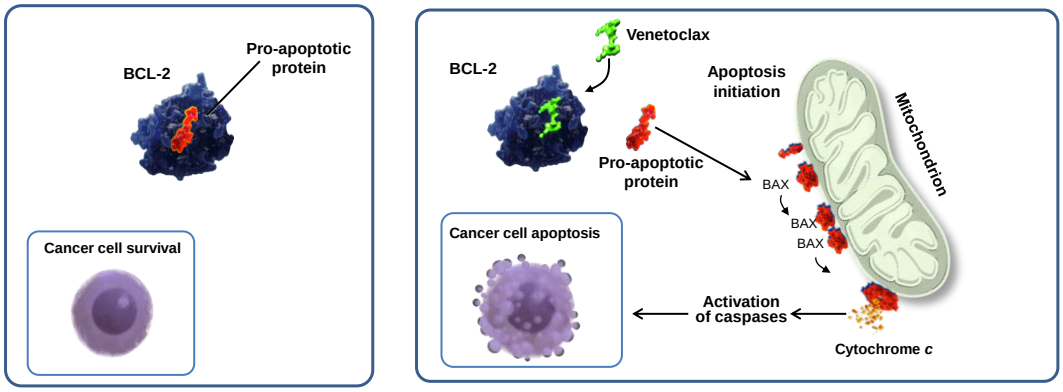
Venetoclax: Selective Inhibitor of BCL-2

Promotes apoptosis through selective inhibition of BCL-2

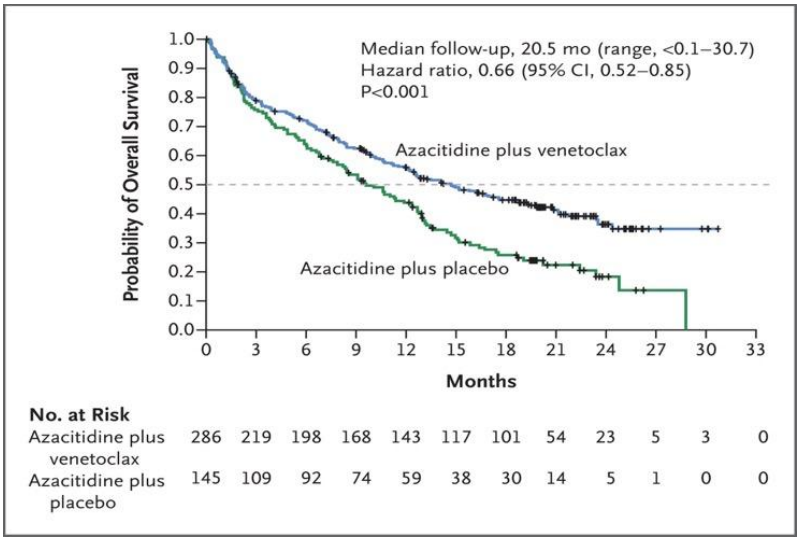


BCL-2 overexpression allows cancer cells to evade apoptosis by sequestering pro-apoptotic proteins[1–3]

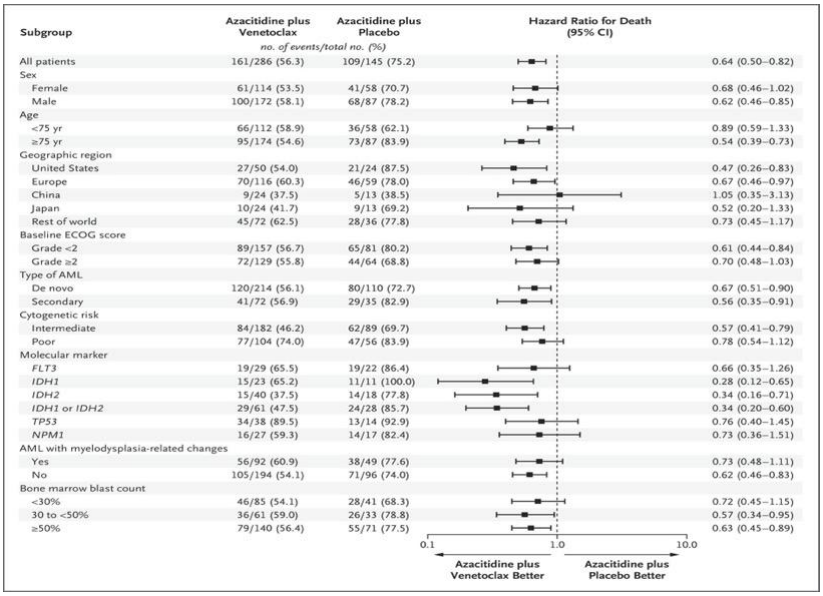
Venetoclax binds selectively to BCL-2, freeing pro-apoptotic proteins that initiate programmed cell death (apoptosis)[4–7]

1. Leverson JD, et al. Sci Transl Med. 2015;7:279ra40; 2. Czabotar PE, et al. Nat Rev Mol Cell Biol. 2014;15:49–63; 3. Plati J, et al. Integr Biol (Camb). 2011;3:279–96; 4. Certo M, et al. Cancer Cell. 2006;9:351–65; 5. Souers AJ, et al. Nat Med. 2013;19:202–8; 6. Del Gaizo Moore V, et al. J Clin Invest. 2007;117:112–21; 7. Wei A, et al. Blood. 2017;130:890

Phase III VIALE-A trial- OS



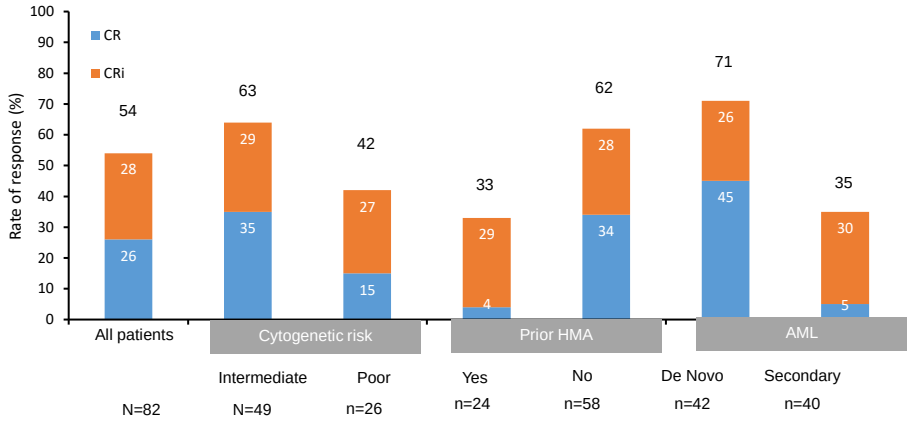
DiNardo CD et al. N Engl J Med 2020;383:617-629.



Subgroup	Azacitidine plus Venetoclax	Azacitidine plus Placebo	Hazard Ratio for Death (95% CI)
	no. of events/total no. (%)		
All patients	161/286 (56.3)	109/145 (75.2)	0.64 (0.50–0.82)
Sex			
Female	61/114 (53.5)	41/58 (70.7)	0.68 (0.46–1.02)
Male	100/172 (58.1)	68/87 (78.2)	0.62 (0.46–0.85)
Age			
<75 yr	66/112 (58.9)	36/58 (62.1)	0.89 (0.59–1.33)
≥75 yr	95/174 (54.6)	73/87 (83.9)	0.54 (0.39–0.73)
Geographic region			
United States	27/50 (54.0)	21/24 (87.5)	0.47 (0.26–0.83)
Europe	70/116 (60.3)	46/59 (78.0)	0.67 (0.46–0.97)
China	9/24 (37.5)	5/13 (38.5)	1.05 (0.35–3.13)
Japan	10/24 (41.7)	9/13 (69.2)	0.52 (0.20–1.33)
Rest of world	45/72 (62.5)	28/36 (77.8)	0.73 (0.45–1.17)
Baseline ECOG score			
Grade <2	89/157 (56.7)	65/81 (80.2)	0.61 (0.44–0.84)
Grade ≥2	72/129 (55.8)	44/64 (68.8)	0.70 (0.48–1.03)
Type of AML			
De novo	120/214 (56.1)	80/110 (72.7)	0.67 (0.51–0.90)
Secondary	41/72 (56.9)	29/35 (82.9)	0.56 (0.35–0.91)
Cytogenetic risk			
Intermediate	84/182 (46.2)	62/89 (69.7)	0.57 (0.41–0.79)
Poor	77/104 (74.0)	47/56 (83.9)	0.78 (0.54–1.12)
Molecular marker			
FLT3	19/29 (65.5)	19/22 (86.4)	0.66 (0.35–1.26)
IDH1	15/23 (65.2)	11/11 (100.0)	0.28 (0.12–0.65)
IDH2	15/40 (37.5)	14/18 (77.8)	0.34 (0.16–0.71)
IDH1 or *IDH2*	29/61 (47.5)	24/28 (85.7)	0.34 (0.20–0.60)
TP53	34/38 (89.5)	13/14 (92.9)	0.76 (0.40–1.45)
NPM1	16/27 (59.3)	14/17 (82.4)	0.73 (0.36–1.51)
AML with myelodysplasia-related changes			
Yes	56/92 (60.9)	38/49 (77.6)	0.73 (0.48–1.11)
No	105/194 (54.1)	71/96 (74.0)	0.62 (0.46–0.83)
Bone marrow blast count			
<30%	46/85 (54.1)	28/41 (68.3)	0.72 (0.45–1.15)
30 to <50%	36/61 (59.0)	26/33 (78.8)	0.57 (0.34–0.95)
≥50%	79/140 (56.4)	55/71 (77.5)	0.63 (0.45–0.89)

DiNardo CD et al. N Engl J Med 2020;383:617-629.

Venetoclax+LDAC in Older Patients with AML



Wei AH, et al. J Clin Oncol. 2019;37:1277–84.

Venetoclax

- **Mechanism of Actions**
  - Selectively inhibits anti-apoptotic protein BCL-2, which mediates tumor cell survival and associated with chemotherapy resistance
- **Dosing / Administration:**
  - AML: 100 mg on Day 1, 200 mg on Day 2, 400 mg on Day 3
    - With azacitidine or decitabine: continue 400 mg daily up to Day 28
    - With low dose cytarabine: 600 mg daily starting Day 4 up to Day 28
  - Administer with a meal and water; take as instructed
  - Avoid Seville oranges, grapefruit, Star Fruit
- **Common Toxicities:**
  - Tumor lysis syndrome (electrolyte changes 4%-60%, true TLS 2%)
  - Gastrointestinal (nausea/vomiting, diarrhea - 43%)
  - Cytopenias: neutropenia (50%-87%), anemia (33%-71%) thrombocytopenia (29%-64%),
  - Rash (18%) or fatigue (32%)
  - Febrile neutropenia (6%)

Venclexta® (venetoclax) [prescribing information]. North Chicago, IL: AbbVie Inc; November 2020.

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Venetoclax Drug Interactions and Dose Adjustments

Dose modifications for managing potential interactions[1,3,4]

Coadministered drug	Initiation and ramp-up phase	Steady daily dose after ramp-up phase
Posaconazole	Day 1: 10 mg Day 2: 20 mg Day 3: 50 mg Day 4: 70 mg	Reduce the VENCLEXTA dose to 70 mg
Other strong CYP3A inhibitors* Clarithromycin, indinavir, itraconazole, ketoconazole, lopinavir, ritonavir, voriconazole	Day 1: 10 mg Day 2: 20 mg Day 3: 50 mg Day 4: 100 mg	Reduce the VENCLEXTA dose to 100 mg
Moderate CYP3A inhibitors* Aprepitant, ciprofloxacin, conivaptan, cyclosporine, diltiazem, dronedarone, erythromycin, fluconazole, isavuconazole, verapamil	Reduce the VENCLEXTA dose by at least 50%	
P-gp inhibitors* Amiodarone, cyclosporine, dronedarone, quinidine, ranolazine, verapamil		

Note: AVOID venetoclax with strong or moderate CYP3A inducers!

Examples: rifampin, phenytoin, St. John's Wort, carbamazepine

Venclexta® (venetoclax) [prescribing information]. North Chicago, IL: AbbVie Inc; November 2020.

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Azacitidine and Decitabine

- **Mechanism:**
  - Hypomethylating agents that inhibit methyltransferase, resulting in DNA hypomethylation, differentiation and apoptosis of malignant cells, and restoration of normal gene differentiation and proliferation
- **Dosing / Administration:**
  - Azacitidine: 75 mg/m2 IV infusion between 10-40 minutes or SQ injection on Days 1-7 (schedule varies)
    - Give prophylactic antiemetic prior to azacitidine
  - Decitabine: 20 mg/m2 IV infusion over 1-3 hours on Days 1-5 (sometimes Days 1-10)
    - Minimal emetic risk – no routine prophylaxis
- **Common toxicities:**
  - Myelosuppression
  - Gastrointestinal (nausea, vomiting, diarrhea or constipation)
    - More common with azacitidine than decitabine
  - Peripheral edema
  - Fatigue or dizziness

Azacitidine [package insert]. Summit, NJ: Celgene Corporation; January 2014.
Decitabine [package insert]. Rockville, MD: Otsuka America Pharmaceutical; October 2014.

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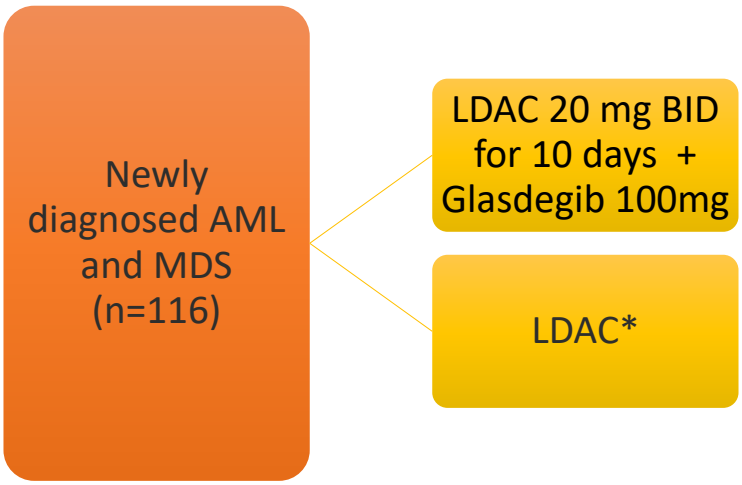
Glasdegib: BRIGHT 1003 study



*Low-dose Cytarabine
Jorge E. Cortes et al. Blood 2016;128:99.

58

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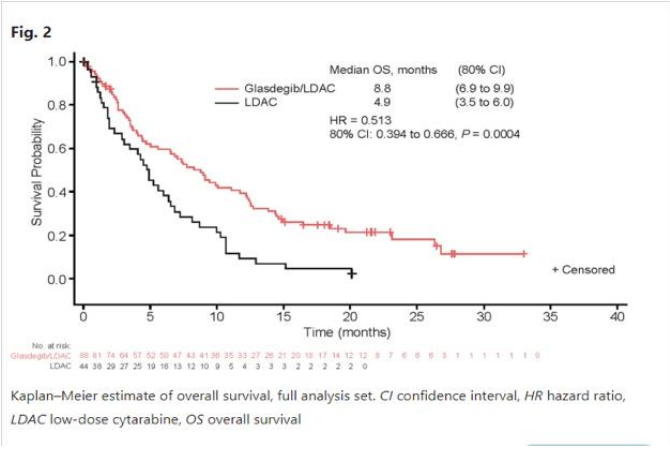
Randomized Comparison of Low Dose Cytarabine With or Without Glasdegib in Patients With Newly Diagnosed Acute Myeloid Leukemia or High-Risk Myelodysplastic Syndrome



Cortes, J.E., Heidel, F.H., Hellmann, A. *et al.* Randomized comparison of low dose cytarabine with or without glasdegib in patients with newly diagnosed acute myeloid leukemia or high-risk myelodysplastic syndrome. *Leukemia* **33,** 379–389 (2019).

Glasdegib

- **Administration:**
  - 100mg once daily for a minimum of 6 cycles
    - Dose interruptions or modifications for neutropenia, thrombocytopenia, and QTc prolongation
    - Caution in patients with impaired renal function, particularly with CrCl <30
- **Adverse reactions:**
  - Most common: cytopenias, fatigue (36%), myalgias (30%), nausea (29%), decreased appetite (21%)
  - Clinically notable: febrile neutropenia (29%), pneumonia (23%), bleeding (12%), sepsis (7%), QTc prolongation (5%)
- **Drug interactions:**
  - Substrate of CYP3A4 (major), CYP2C8 (minor), UGT1A9
    - Avoid co-administration of strong or moderate CYP3A4 inhibitors or inducers
  - Avoid concomitant use of QTc prolonging agents

Daurismo™ (glasdegib) [prescribing information]. New York, NY: Pfizer Labs; March 2020.

Gilteritinib: FDA Approved for Relapsed/Refractory *FLT3*-Mutant AML

- Gilteritinib 120 mg PO daily is approved for adults with relapsed/refractory AML with a *FLT3* mutation detected by FDA-approved test
- Approval based on interim analysis of phase III ADMIRAL trial, which included adults with relapsed/refractory AML an a *FLT3*-ITD, D835, or I836 mutation[1,3]
  - After median follow-up of 4.6 mos, CR/CRh rate was 21%
  - Conversion to transfusion independence occurred in 31%

1. Gilteritinib PI. 3. Gorcea. Future Oncol. 2018;14:1995.

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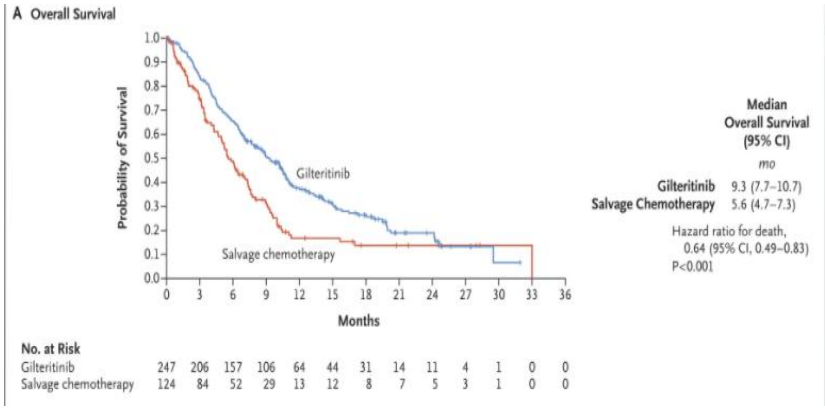
Overall Survival Among Patients with *FLT3*-Mutated Relapsed or Refractory AML Treated with Gilteritinib or Salvage Chemotherapy



N Engl J Med 2019; 381:1728-1740.

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Gilteritinib

- **Mechanism of Action:**
  - Tyrosine kinase inhibitor that inhibits FLT3 receptor signaling of both FLT3 and TKD mutations
- **Dosing/Administration:**
  - 120 mg (3 x 40 mg tablets) oral once daily with or without food
  - Dose interruptions and modifications for differentiation syndrome, pancreatitis, QTc prolongation
- **Drug Interactions:**
  - Major CYP3A4 substrate
    - Monitor or consider dose reduction for toxicity when using concomitantly with strong or moderate inhibitors of CYP3A4
  - Minor P-gp/ABCB1 substrate
  - Avoid concomitant use of QTc prolonging medications when possible
  - May decrease effect of SSRIs (e.g. escitalopram, fluoxetine, sertraline)
- **Common Toxicities:**
  - Gastrointestinal (nausea/vomiting - 30%, diarrhea - 35%)
  - Fatigue (44%) or myalgia/arthralgias (50%)
  - Qtc prolongation (9%)
  - Pancreatitis (5%)
  - Rare: Differentiation syndrome (3%), PRES (1%)

Xospata® (gilteritinib) [prescribing information]. Northbrook, IL: Astellas Pharma US, Inc; May 2019.

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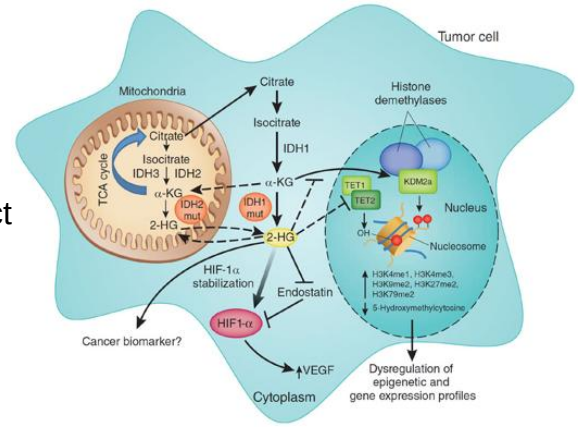
Mutations in Metabolic Enzyme Pathways: IDH1 and IDH2

- First identified in gliomas
- Alter physiologic enzyme function by converting α-ketoglutarate into 2-hydroxyglutarate, an oncogenic metabolite
- Associated with NPM1 mutations and predict worse outcome



Nature Medicine 17, 291–293 (2011).

64

AG-221 (Enasidenib) in IDH2-Mutated AML

- 198 patients treated on phase I and II study
- Median age 69 years
- 70% patients had relapsed/refractory disease, 64% had more than 2 treatment regimens
- Median treatment duration 6 months
- Highest dose 450 mg
- MTD* not reached
- Response rate seen in all types of IDH2 mutation
- Among responders, ANC increased by 1 month of therapy

SIDE EFFECTS

- Indirect hyperbilirubinemia (19%)
- Nausea (18%)
- Leucocytosis (treatment-related N=7)
- Differentiation syndrome?

MTD= Maximum Tolerated Dose
Stein et al Blood, 126(23), 323.

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Response

	RR-AML (n = 159)	Untreated AML (n = 24)	MDS (n = 14)	All (N = 209)
Overall Response (CR, CRp, CRi, mCR, PR)	59 (37%)	10 (42%)	7 (50%)	79 (38%)
CR	29 (18%)	4 (17%)	3 (21%)	37 (18%)
CRp	1 (1%)	1 (4%)	1 (7%)	3 (1%)
CRi	3 (2%)	0	0	3 (1%)
mCR	9 (6%)	1 (4%)	3 (21%)	14 (7%)
PR	17 (11%)	4 (17%)	0	22 (11%)
SD	72 (45%)	9 (38%)	6 (43%)	96 (46%)
PD	10 (6%)	1 (4%)	0	11 (5%)
Not evaluable	18 (11%)	4 (17%)	1 (7%)	23 (11%)

Memorial Sloan Kettering Cancer Center

Presented By Eytan Stein at 2016 ASCO Annual Meeting.

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Enasidenib

- **Mechanism of Action:**
  - Targets mutant and wild-type IDH2 (targets mutant IDH2 at 40-fold lower concentrations), reducing abnormal histone hypermethylation and restoring normal myeloid differentiation
- **Dosing/Administration:**
  - 100 mg once daily without regard to food
  - Take at approximately the same time each day with a full glass of water
  - Dose interruptions or modifications for differentiation syndrome, hepatotoxicity
- **Drug interactions:**
  - Extensive CYP substrate: CYP3A4 CYP1A2, CYP2B6, CYP2C19, CYP2C8, CYP2C9, CYP2D6,
  - Extensive UGT substrate: UGT1A1, UGT1A3, UGT1A4, UGT1A9, UGT2B15, UGT2B7
- **Common Toxicities:**
  - Gastrointestinal (nausea/vomiting, diarrhea)
  - Increased bilirubin
  - Decreased appetite

Idhifa® (enasidenib) [prescribing information]. Summit, NJ: Celgene Corporation; August 2017.

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Ivosidenib

- **Mechanism of Action:**
  - Inhibits mutant IDH1 enzyme and decreases intracellular levels of 2-HG, reducing blast counts and inducing differentiation to mature myeloid cells
- **Dosing / Administration:**
  - 500 mg (2 x 250 mg tablets) once daily
  - Take at approximately the same time each day with water
  - Avoid high-fat meal
  - Dose interruptions or modifications for differentiation syndrome, QTc prolongation, Guillain-Barre syndrome (GBS, discontinuation)

Tibsovo® (ivosidenib) [prescribing information]. Cambridge, MA: Agios Pharmaceuticals; May 2019.

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Ivosidenib

- **Drug Interactions:**
  - Major CYP3A4 substrate
    - Avoid strong CYP3A4 inhibitors – reduce dose to 250 mg if combination is not avoidable
  - Others: 2C9 inducer, P-gp/ABCB1 minor substrate
  - Avoid concomitant use of QTc prolonging medications when possible

- **Common Toxicities:**
  - Gastrointestinal (nausea – 36%, diarrhea – 61%)
  - Fatigue (50%) or arthralgia (32%)
  - Leukocytosis (36%)
  - Qtc prolongation (up to 14%)
  - GBS or PRES (< 1%)

Tibsovo® (ivosidenib) [prescribing information]. Cambridge, MA: Agios Pharmaceuticals; May 2019.

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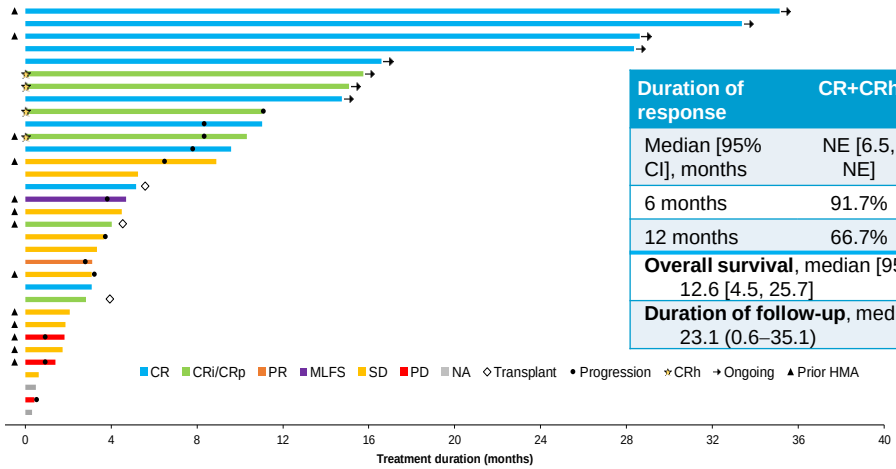
Ivosidenib Duration of Treatment and Best Overall Response: Untreated AML 500 mg (n=33)



Duration of response	CR+CRh	CR	Overall response
Median [95% CI], months	NE [6.5, NE]	NE [4.2, NE]	NE [6.5, NE]
6 months	91.7%	77.8%	77.4%
12 months	66.7%	77.8%	59.5%
Overall survival, median [95% CI], months 12.6 [4.5, 25.7]			
Duration of follow-up, median (range), months 23.1 (0.6–35.1)			

CD DiNardo et al. N Engl J Med 2018;378:2386-2398.

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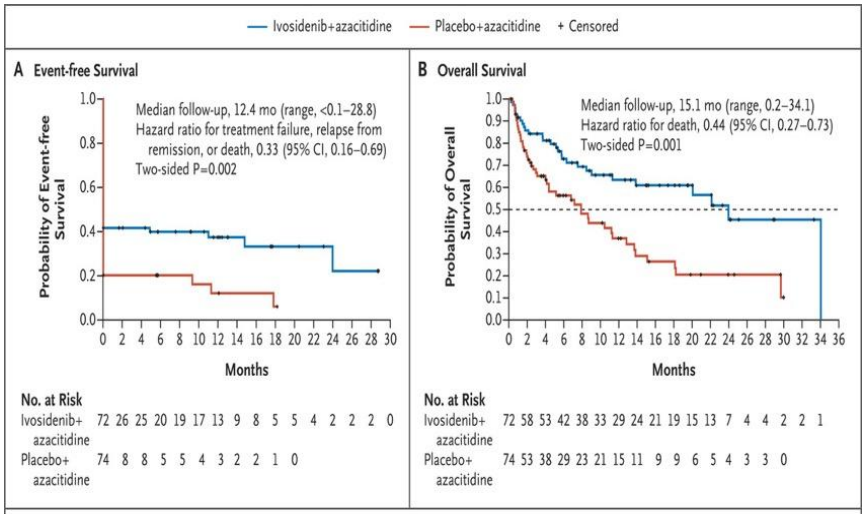
AGILE Study



Montesinos et al. N Engl J Med 2022;386:1519-1531.

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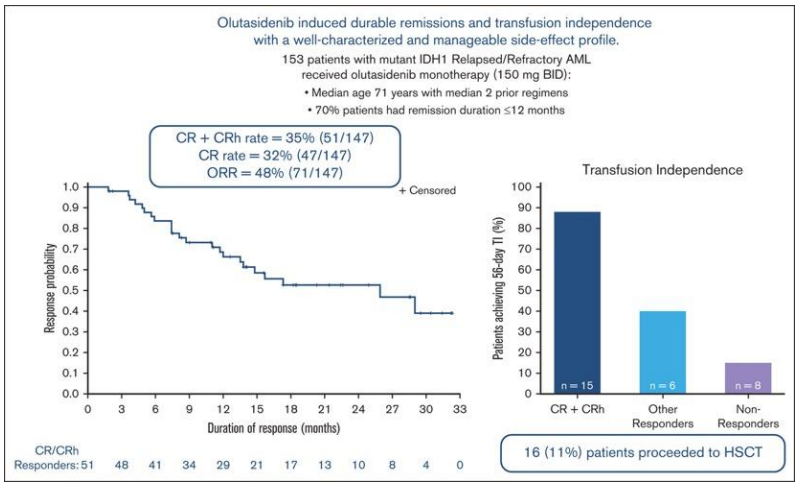
Olutasidenib (FT-2102) Induces Durable Complete Remissions in Patients with Relapsed or Refractory IDH1-Mutated AML



Stéphane de Botton et al , Blood Adv, 2023.

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Olutasidenib

- **Mechanism of Action:**
  - Small molecule inhibitor of IDH1 enzyme, resulting in decrease in 2-HG production and restoration of normal cell differentiation
- **Dosing / Administration:**
  - 150 mg by mouth twice daily
  - Take on an empty stomach (at least 1 hour before or 2 hours after meal)
  - Dose interruptions and modifications for differentiation syndrome, hepatotoxicity or significant toxicity
- **Drug Interactions:**
  - Major CYP3A4 substrate
  - Minor substrate of CYP1A2, CYP2C19, CYP2C8, CYP2C9
- **Common Toxicities:**
  - Gastrointestinal (nausea/vomiting - 38%, diarrhea - 20%, constipation - 26%)
  - Transaminitis (47%) or increased serum bilirubin (26%)
  - Fatigue/malaise (36%) or arthralgias (28%)
  - Rash (24%)
  - Rare: Differentiation syndrome (16%)

Rezlidhia® (olutasidenib) [prescribing information]. New York, NY: Pfizer Labs; March 2020.

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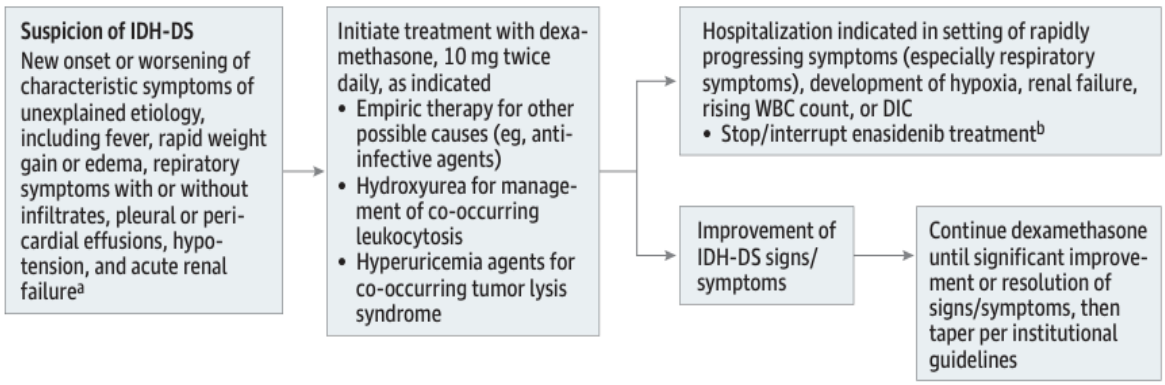
Management of Differentiation Syndrome



Fathi. JAMA Oncology. 2018;4:1106.

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Financial Assistance Programs

- The Leukemia and Lymphoma Society offers patients various types of financial support
  - Please visit https://lls.org/support-resources/financial-support, call 877-557-2672, or email FinancialAssistance@LLS.org
- Other charitable grants or advocacy groups
  - Healthwell
  - Cancer Care
  - American Cancer Society
  - Patient Access Network
  - Cancer Support Community
  - Good Days

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Financial Assistance Programs

Medication	**Patient Assistance Programs** *Provides support to patients with no or inadequate insurance meeting certain income qualifications*	**Co-Pay Card Programs** *Reduces monthly co-pay* for qualifying patients with commercial insurance*
Midostaurin *(Rydapt®)*	Novartis Patient Assistance Program Rydapt® NOW: free 14-day supply for qualifying patients facing delays due to financial hardship	Novartis Oncology Universal Co-Pay Card Program $10 monthly copay; $15,000 annual benefit cap
Quizartinib *(Vanflyta®)*	Vanflyta Patient Assistance Program QuickStart Program: free 14-day supply for eligible patients with coverage delay ≥ 5 days	Vanflyta Co-Pay Program $0 monthly copay; $26,000 annual benefit cap
Venetoclax *(Venclexta®)*	Genentech Patient Foundation	Genentech Oncology Co-pay Assistance Program $0 monthly copay; $25,000 annual benefit cap
Azacitidine *(Onureg®)*	Bristol Myers Squibb Patient Assistance Foundation	BMS Commercial Co-Pay Program $0 monthly copay; $15,000 annual benefit cap
Ivosidenib *(Tibsovo®)*	ServierOne Patient Assistance Program Quick Start: free 30-day supply for qualifying patients with coverage delay ≥ 3-5 days	ServierOne Commercial Co-Pay Program $25 monthly copay; $10,000 annual benefit cap
Enasidenib *(Idhifa®)*	Bristol Myers Squibb Patient Assistance Foundation	BMS Commercial Co-Pay Program $0 monthly copay; $15,000 annual benefit cap
Olutasidenib *(Rezlidhia®)*	Rigel One Care Patient Assistance Program Free Drug Supply: free supply up to 60-days worth for coverage delay ≥ 5 days	Rezlidhia Co-Pay Program $15 monthly copay; $25,000 annual benefit cap
Gilteritinib *(Xospata®)*	Astellas Patient Assistance Program Quick Start: free 7-day supply for coverage delay ≥ 5 days	Astellas Co-Pay Program $0 monthly copay; $7000 annual benefit cap

* Exact copay reduction subject to change and will also depend on commercial insurance type

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Case Revisited..

- A 68-year-old woman is seen for routine exam and noted to have low platelets with circulating blasts. She is referred to the hematologist who performs a bone marrow biopsy. The results confirm the diagnosis of AML with complex cytogenetics. Molecular mutations reveal IDH2 mutation.
  - What is her prognostic risk classification?
  - What would be the treatment of choice initially?
  - What about treatment if there is a relapse?

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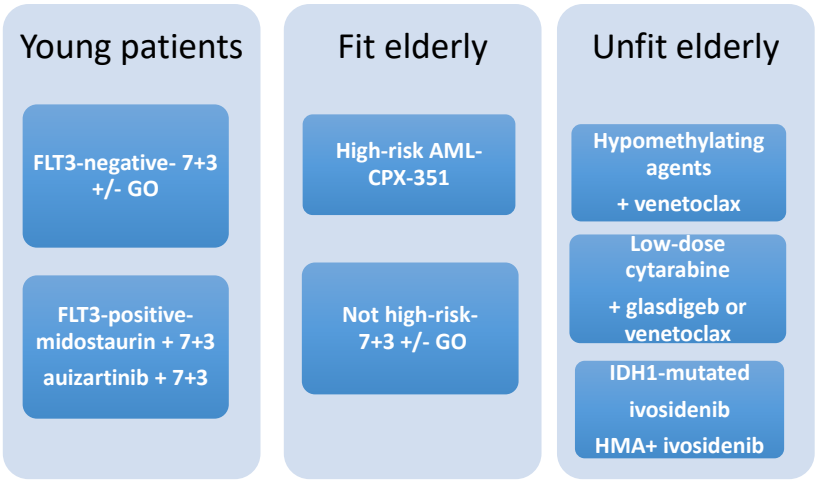
Upfront Treatment in AML



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Current Standard of Care in Relapsed AML

Targeted treatments	Non targeted treatments
enasidenib (IDH2 mutated)	Hypomethylating backbone
ivosidenib and olutasenib (IDH1 mutated)	gemtuzumab ozogamicin
giltertinib (FLT3 ITD/TKD mutated)	Intensive chemotherapy backbone

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The Weill Cornell/NYP Leukemia Program

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Nurses' Role in AML Management

Kaitlin Rancani, MSN, CRNP
Thomas Jefferson University Hospital
Philadelphia, PA

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Ensure	Ensure patient understands diagnosis
Provide	Provide emotional support
Find out	Find out social situation •Who do they live with? •Transportation? •Work?
Involve	Involve social work

Diagnosis of Acute Myeloid Leukemia

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Blood counts

Educate patient on complete blood count and what it means

Monitor labs 1-3x/week depending on transfusion needs

WBC

- Fight infection
- ANC (WBC x neutrophils + bands)/100)
- Neutropenic when ANC <1000

Hemoglobin

- Carries oxygen to our organs
- Transfuse <7.5
- Symptoms of low HGB include lightheadedness, fatigue, DOE

Platelets

- Allows our blood to clot to prevent bleeding
- Transfuse <15,000
- Symptoms of low platelets include bleeding nose, bleeding gums, petechiae, headache
- Risk for spontaneous brain bleed for platelets <10,000

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Treatment

Will patient need admission? Prepare them for what to expect

Outpatient treatment

Provide schedule, treatment time

Will they need a PICC line?

-Daunorubicin and Cytarabine requires central line

May need echocardiogram prior to treatment

Provide chemotherapy education

Provide education on supportive medication

Provide calendar

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Medications

- Allopurinol for new treatment to prevent tumor lysis syndrome
- Prophylactic antimicrobials
  - Acyclovir or Valacyclovir (antiviral, continuous)
  - Levofloxacin or Ciprofloxacin (antibacterial, when ANC <500)
  - Voriconazole or Posaconazole (antifungal, when ANC <500)
- Antiemetics
  - Zofran
  - Compazine

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Goal of Treatment

- Chemotherapy is given to clear out bone marrow to eliminate leukemia cells
- Monitor labs at least twice weekly following treatment
- Expect count recovery after 28-42 days (Day 1 is first day of chemo)
- Transfuse HGB <7-8 and platelets <10-20 (determined by institute guidelines)
- Perform bone marrow biopsy after first cycle of chemo when counts recover to assess for remission

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After remission

- After patient achieves remission, they will need to continue treatment with more chemotherapy and/or bone marrow transplant.
- Favorable risk AML may be cured with chemotherapy alone
  - Induction with 7+3, followed by 4 cycles of consolidation with high dose Cytarabine
- Moderate to poor risk AML will proceed to bone marrow transplant for only potential chance for cure
- If not a transplant candidate, chemotherapy is continued indefinitely

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Neutropenic Fever

- Fever >100.4 and ANC <1000
- Requires immediate medical attention and hospitalization
- If able to begin outpatient workup:
  - Blood cultures x 2, Urine Culture, Lactate, Respiratory Swabs
  - Administer, at least, 1L IVF
  - Begin IV antibiotic as soon as possible, e.g. Cefepime
- If vitals and labs stable, direct admit to hospital
- Emergency Room recommended if outpatient workup not possible
- Platelet transfusions are recommended for platelets <10 and febrile

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Other Common Side Effects

- Nausea/vomiting
- Mucositis
- Diarrhea

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Long Term Survival

- MRD testing, when applicable
  - FLT3, MPN1, RUNX1, CBFB
- Labs every 3 months until 3 years, then every 6 months until 5 years, then yearly
- Referral to survivorship clinic, support groups
- Ongoing emotional support

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Final Thoughts

- Intimate RN/APP care is imperative to the success of AML patients.
- AML is a disease of inconvenience. Patients can be in the office 2-4x/week. Clustering and coordinating care to keep patient safe while providing some quality life is important.

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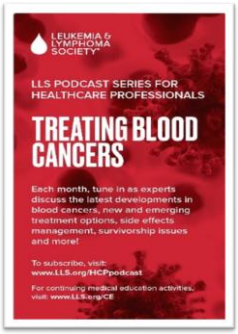
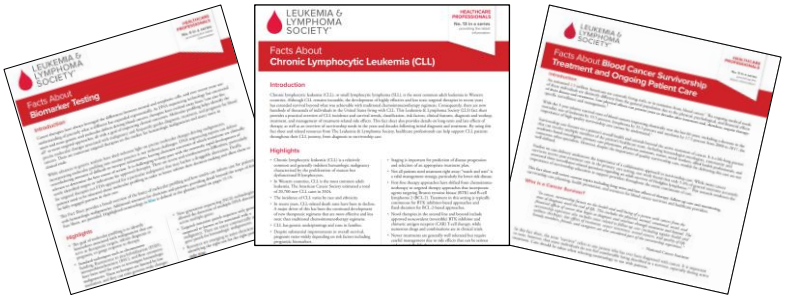
FREE LLS RESOURCES FOR HEALTHCARE PROFESSIONALS

- ❑ Free CME & CE courses www.LLS.org/CE
- ❑ Fact Sheets www.LLS.org/HCPbooklets
- ❑ Videos for HCPs www.LLS.org/HCPvideos
- ❑ Podcast series for HCPs www.LLS.org/HCPpodcast





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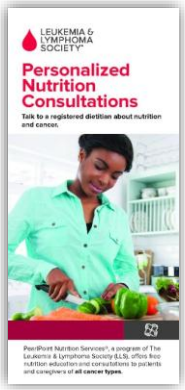
FREE LLS RESOURCES FOR PATIENTS

- **Information Specialists** – Personalized assistance for managing treatment decisions, side effects, and dealing with financial and psychosocial challenges (IRC)
  - www.LLS.org/IRC
- **Nutrition Education Services Center** – one-on-one consultation with a registered dietician for patients/caregivers of all cancer types (NESC)
  - www.LLS.org/Nutrition
- **Clinical Trial Nurse Navigators** – RNs and NPs provide personalized service for patients seeking treatment in a clinical trial, sift through and provide information to bring back to their HC team (CTSC)
  - www.LLS.org/CTSC
- **Reach out** **Monday–Friday, 9 am to 9 pm ET**
  - Phone: (800) 955-4572
  - Live chat: www.LLS.org/IRC
  - Email: infocenter@LLS.org
  - HCP Patient Referral Form: www.LLS.org/HCPreferral



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HERE TO HELP: LLS COMMITMENT

to providing education & resources to help patients access clinical trials

CLINICAL TRIAL SUPPORT CENTER

- A team of highly trained nurses and nurse practitioners experienced with hematological malignancies and clinical research.
- Provide education to patients about clinical trials, treatment options, and other disease specific information.
- Provide patients, families, and their caregivers with a professional, detailed, individualized search to discuss with their HCP.
- Provide guidance and serve as advocates throughout the clinical trial process. Help make connections between the patient and the trial site to facilitate enrollment as appropriate.
- Provide a personal connection and develop long term relationships to help better serve our patients.

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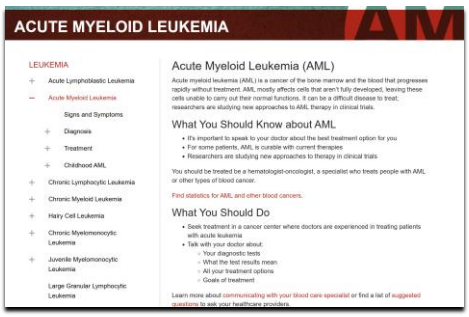
FREE LLS RESOURCES FOR PATIENTS AND CAREGIVERS

- **Webcasts, Videos, Podcasts, booklets**:
  - www.LLS.org/Webcasts
  - www.LLS.org/EducationVideos
  - www.LLS.org/Podcast
  - www.LLS.org/Booklets
  - **www.LLS.org/Leukemia**

- **Support Resources**
  - Financial Assistance: www.LLS.org/Finances
    - Urgent Need
    - Patient Aid
    - Travel Assistance
  - Other Support: www.LLS.org/Support
    - LLS Regions
    - Online Weekly Chats Facilitated by Oncology SW
    - LLS Community Social Media Platform
    - First Connection Peer to Peer Program



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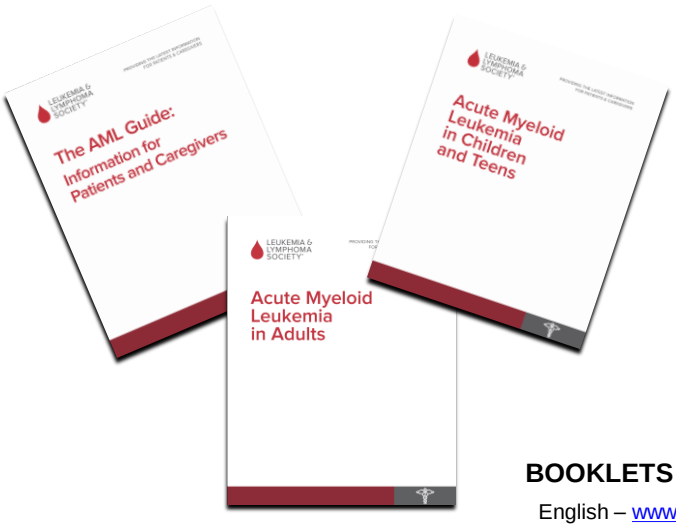
FREE LLS RESOURCES FOR YOUR PATIENTS



BOOKLETS AND FACT SHEETS

English – www.LLS.org/Booklets
Spanish – www.LLS.org/Materiales

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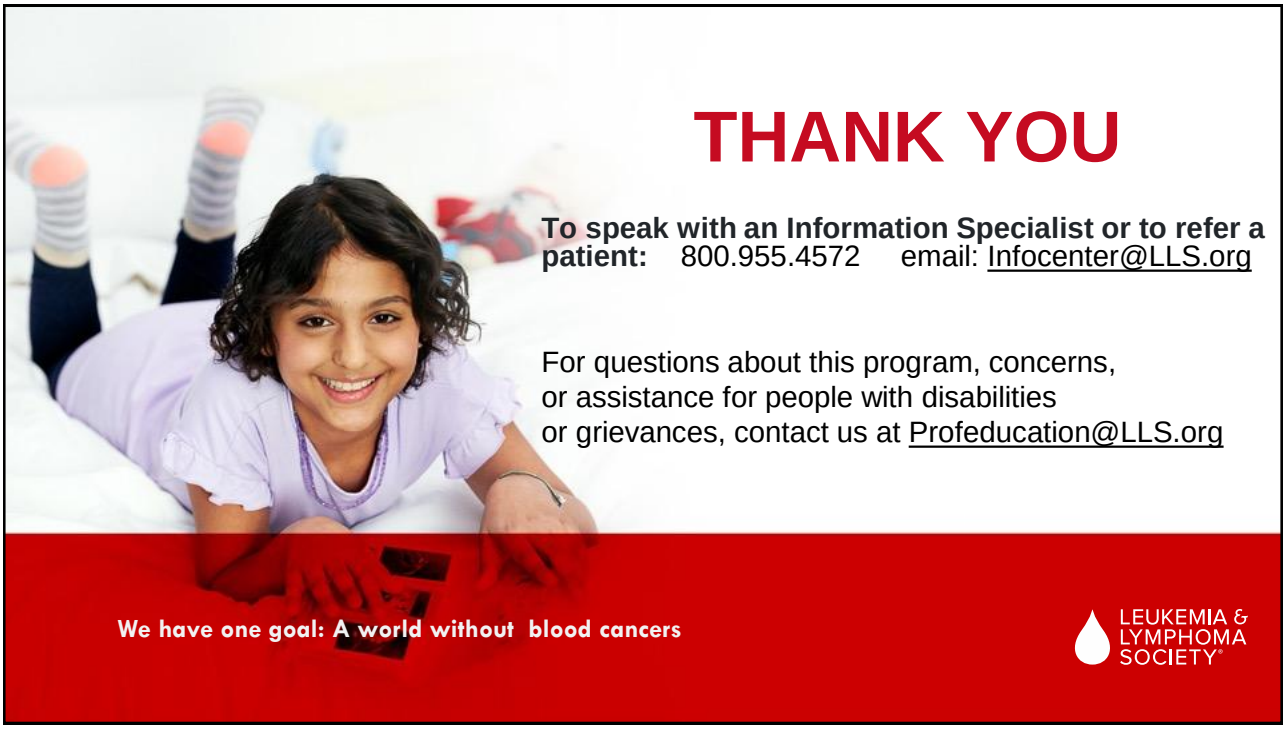
THANK YOU
To speak with an Information Specialist or to refer a patient: 800.955.4572 email: Infocenter@LLS.org
For questions about this program, concerns, or assistance for people with disabilities or grievances, contact us at Profeducation@LLS.org
We have one goal: A world without blood cancers
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