

Haematologica
HAEMATOL/2020/252569
Version 4

Outcomes of relapsed or refractory acute myeloid leukemia after
frontline hypomethylating agent and venetoclax regimens

Abhishek Maiti, Caitlin R. Rausch, Jorge E. Cortes, Naveen
Pemmaraju, Naval G. Daver, Farhad Ravandi, Guillermo
Garcia-Manero, Gautam Borthakur, Kiran Naqvi, Maro Ohanian,
Nicholas J. Short, Yesid Alvarado, Tapan M. Kadia, Koichi Takahashi,
Musa Yilmaz, Nitin Jain, Steven Kornblau, Guillermo Montalban Bravo,
Koji Sasaki, Michael Andreeff, Prithviraj Bose, Alessandra Ferrajoli,
Ghayas C. Issa, Elias J. Jabbour, Lucia Masarova, Philip A. Thompson,
Sa Wang, Sergej Konoplev, Sherry A. Pierce, Jing Ning, Wei Qiao,
John S. Welch, Hagop M. Kantarjian, Courtney D. DiNardo, and Marina
Y. Konopleva

Disclosures: AM: Research funding from Celgene Corporation

CRR: None

JEC: Research funding from Ambit BioSciences, ARIAD, Arog, Astellas Pharma, AstraZeneca, Bristol-Myers Squibb, Celator, Celgene, Novartis, Pfizer, Sanofi, Sun Pharma, Teva; consultant for Ambit BioSciences, ARIAD, Astellas Pharma, BiolineRx, Bristol-Myers Squibb, Novartis; Pfizer.

NP: Consulting/honorarium: Celgene; Stemline; Incyte; Novartis; MustangBio; Roche Diagnostics, LFB; Research funding/clinical trials support: Stemline; Novartis; Abbvie; Samus; Cellectis; Plexxikon; Daiichi-Sankyo; Affymetrix; Grants/funding: Affymetrix, SagerStrong Foundation

NGD: Sunesis Pharmaceuticals, Inc.: Consultancy, Research Funding;

Karyopharm: Consultancy, Research Funding; Immunogen: Research Funding;

Pfizer Inc.: Consultancy, Research Funding; Incyte Corporation: Honoraria,

Research Funding; Bristol-Myers Squibb Company: Consultancy, Research

Funding; Daiichi-Sankyo: Research Funding; Novartis Pharmaceuticals

Corporation: Consultancy; Otsuka America Pharmaceutical, Inc.: Consultancy;

Kiromic: Research Funding; Jazz: Consultancy.

FR: Research funding from Amgen, Bristol-Myers Squibb, Merck, Seattle Genetics,

Sunesis Pharmaceuticals, Honoraria from Amgen, Pfizer, Seattle Genetics,

Sunesis Pharmaceuticals; Consulting or advisory role for Amgen, Seattle

Genetics, Sunesis Pharmaceuticals.

GGM: None

GB: AbbVie: Research Funding; Incyte: Research Funding; Janssen: Research

Funding; GSK: Research Funding; Cyclacel: Research Funding; BioLine Rx:

Consultancy and Research Funding; NKarta: Consultancy; PTC Therapeutics:

Consultancy; Oncoceutics, Inc.: Research Funding.

KN: None

MO: None

NJS: Takeda Oncology: Consultancy and Research Funding; AstraZeneca:

Consultancy; Amgen: Honoraria

YA: Jazz Pharmaceuticals: Research Funding; Abbott: Honoraria

TMK: None

KT: Consultancy Symbio Pharmaceuticals.

MY: None

NJ: AbbVie: Consultancy, Honoraria, Membership on an entity's Board of

Directors or advisory committees and Research Funding; Pharmacyclics, an

AbbVie company: Consultancy, Honoraria, Membership on an entity's Board of

Directors or advisory committees and Research Funding; Janssen

Pharmaceuticals, Inc.: Consultancy, Honoraria and Membership on an entity's

Board of Directors or advisory committees; Genentech: Consultancy, Honoraria,

Membership on an entity's Board of Directors or advisory committees and

Research Funding; BMS: Research Funding; Pfizer: Consultancy, Honoraria,

Membership on an entity's Board of Directors or advisory committees and

Research Funding; ADC Therapeutics: Consultancy, Honoraria, Membership on

an entity's Board of Directors or advisory committees and Research Funding;

Incyte: Research Funding; AstraZeneca: Consultancy, Honoraria, Membership on

an entity's Board of Directors or advisory committees and Research Funding;

Servier: Consultancy, Honoraria, Membership on an entity's Board of Directors

or advisory committees and Research Funding; Cellectis: Research Funding; Verastem: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding; Precision Biosciences: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding; Adaptive Biotechnologies: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding

SK: None

GMB: None

KS: Otsuka: Honoraria; Pfizer: Consultancy

MA: Daiichi Sankyo, Inc. Consultancy, Patents & Royalties: Patents licensed, royalty bearing and Research Funding Jazz Pharmaceuticals Consultancy; Celgene Consultancy; Amgen Consultancy; AstaZeneca Consultancy; 6 Dimensions Capital Consultancy; Reata Equity Ownership; Aptose Equity Ownership; Eutropics Equity Ownership; Senti Bio Equity Ownership and Membership on an entity's Board of Directors or advisory committees; Oncoceutics Equity Ownership; Oncolyze Equity Ownership; Breast Cancer Research Foundation Research Funding; CPRIT Research Funding; NIH/NCI Research Funding; Center for Drug Research & Development Membership on an entity's Board of Directors or advisory committees; Cancer UK Membership on an entity's Board of Directors or advisory committees; NCI-CTEP Membership on an entity's Board of Directors or advisory committees; German Research Council Membership on an entity's Board of Directors or advisory committees; Leukemia Lymphoma Society Membership on an entity's Board of Directors or advisory committees; NCI-RDCRN (Rare Disease Clin Network) Membership on an entity's Board of Directors or advisory committees; CLL Foundation Membership on an entity's Board of Directors or advisory committees; BiolineRx

Membership on an entity's Board of Directors or advisory committees;

PB: Incyte Corporation Consultancy, Research Funding and Speakers Bureau; Celgene Corporation Consultancy and Research Funding; Blueprint Medicines Corporation Consultancy and Research Funding; Kartos Therapeutics Research Funding; Constellation Pharmaceuticals Research Funding; Pfizer Research Funding; Astellas Pharmaceuticals Research Funding; NS Pharma Research Funding; Promedior Research Funding; CTI BioPharma Research Funding;

AF: None

GCI: None

EJJ: Consultancy Research funding from Takeda, BMS, Adaptive, Amgen, AbbVie, Pfizer, Cyclacel LTD

LM: None

PAT: None

SAW: None

SK: None

SAP: None

JN: None

WQ: None

JSW: ArcherDx: Honoraria. Rigel Pharmaceuticals: Honoraria. Jansen Pharmaceuticals: Research Funding. Notable Laboratories: Research Funding.

CDD: AbbVie: Honoraria, Research Funding; Agios: Honoraria, Research Funding; Novartis: Honoraria, Research Funding; Celgene: Honoraria, Research Funding;

Daiichi-Sankyo: Honoraria, Research Funding, Calithera Biosciences – Research Funding, Jazz Pharmaceuticals – Honoraria, Notable Laboratories – Honoraria, Scientific Advisory Board Member

HMK: Ariad Research Funding; Astex Research Funding; BMS Research Funding; Cyclacel Research Funding; Daiichi-Sankyo Research Funding; Pfizer Honoraria and Research Funding; Immunogen Honoraria and Research Funding; Jazz Research Funding; Actinium Honoraria; Novartis Research Funding; Takeda Honoraria.

MYK: Calithera Research Funding; Stemline Therapeutics Consultancy, Honoraria and Research Funding; Forty-Seven Consultancy and Honoraria; Eli Lilly Research Funding; AbbVie Consultancy, Honoraria and Research Funding; Cellectis Research Funding; Amgen Consultancy and Honoraria; F. Hoffman La-Roche Consultancy, Honoraria and Research Funding; Genentech Honoraria and Research Funding; Ascentage Research Funding; Kisoji Consultancy and Honoraria; Reata Pharmaceuticals Equity Ownership and Patents & Royalties; Ablynx Research Funding; Astra Zeneca Research Funding; Agios Research Funding.

Contributions: Conception and design: AM, CDD, MYK

Administrative support: CDD, MYK, GGM, HMK, JEC, GGM

Provision of study materials or patients: CRR, JEC, NP, NGD, FR, GGM, GB, KN, MO, NJS, YA, CBB, TMK, KT, MY, NJ, SK, GMB, KS, A, PB, AF, GCI, EJJ, LM, PAT, SW, SJ, MG, REM, JAG, CAB, AW, SLA, ST, RT, KV, SAP, JN, WQ, JSW, HMK, MYK, CDD
Collection and assembly of data: CRR, JEC, NP, NGD, FR, GGM, GB, KN, MO, NJS, YA, CBB, TMK, KT, MY, NJ, SK, GMB, KS, A, PB, AF, GCI, EJJ, LM, PAT, SW, SJ, MG, REM, JAG, CAB, AW, SLA, ST, RT, KV, SAP, JN, WQ, JSW, HMK, MYK, CDD
Data analysis and interpretation: AM, CDD, MYK, CRR, JN, WQ, QZ, AC, HM, SAW, SNK, ZC, MG.

Manuscript writing: AM, CDD, MYK

Critical revision for important intellectual content: All authors

Final approval of manuscript: All authors reviewed and approved the final version of the manuscript.

Disclosures: AM: Research funding from Celgene Corporation

CRR: None

JEC: Research funding from Ambit BioSciences, ARIAD, Arog, Astellas Pharma, AstraZeneca, Bristol-Myers Squibb, Celator, Celgene, Novartis, Pfizer, Sanofi, Sun Pharma, Teva; consultant for Ambit BioSciences, ARIAD, Astellas Pharma, BiolineRx, Bristol-Myers Squibb, Novartis; Pfizer.

NP: Consulting/honorarium: Celgene; Stemline; Incyte; Novartis; MustangBio; Roche Diagnostics, LFB; Research funding/clinical trials support: Stemline; Novartis; Abbvie; Samus; Cellectis; Plexxikon; Daiichi-Sankyo; Affymetrix; Grants/funding: Affymetrix, SagerStrong Foundation

NGD: Sunesis Pharmaceuticals, Inc.: Consultancy, Research Funding;

Karyopharm: Consultancy, Research Funding; Immunogen: Research Funding;

Pfizer Inc.: Consultancy, Research Funding; Incyte Corporation: Honoraria,

Research Funding; Bristol-Myers Squibb Company: Consultancy, Research

Funding; Daiichi-Sankyo: Research Funding; Novartis Pharmaceuticals

Corporation: Consultancy; Otsuka America Pharmaceutical, Inc.: Consultancy;

Kiromic: Research Funding; Jazz: Consultancy.

FR: Research funding from Amgen, Bristol-Myers Squibb, Merck, Seattle Genetics, Sunesis Pharmaceuticals, Honoraria from Amgen, Pfizer, Seattle Genetics, Sunesis Pharmaceuticals; Consulting or advisory role for Amgen, Seattle Genetics, Sunesis Pharmaceuticals.

GGM: None

GB: AbbVie: Research Funding; Incyte: Research Funding; Janssen: Research

Funding; GSK: Research Funding; Cyclacel: Research Funding; BioLine Rx:

Consultancy and Research Funding; NKarta: Consultancy; PTC Therapeutics:

Consultancy; Oncoceutics, Inc.: Research Funding.

KN: None

MO: None

NJS: Takeda Oncology: Consultancy and Research Funding; AstraZeneca:

Consultancy; Amgen: Honoraria

YA: Jazz Pharmaceuticals: Research Funding; Abbott: Honoraria

TMK: None

KT: Consultancy Symbio Pharmaceuticals.

MY: None

NJ: AbbVie: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding; Pharmacyclics, an AbbVie company: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding; Janssen

Pharmaceuticals, Inc.: Consultancy, Honoraria and Membership on an entity's Board of Directors or advisory committees; Genentech: Consultancy, Honoraria,

Membership on an entity's Board of Directors or advisory committees and

Research Funding; BMS: Research Funding; Pfizer: Consultancy, Honoraria,

Membership on an entity's Board of Directors or advisory committees and

Research Funding; ADC Therapeutics: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding;

Incyte: Research Funding; AstraZeneca: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding;

Servier: Consultancy, Honoraria, Membership on an entity's Board of Directors

or advisory committees and Research Funding; Cellectis: Research Funding;

Verastem: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding; Precision Biosciences: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding; Adaptive Biotechnologies: Consultancy, Honoraria, Membership on an entity's Board of Directors or advisory committees and Research Funding

SK: None

GMB: None

KS: Otsuka: Honoraria; Pfizer: Consultancy

MA: Daiichi Sankyo, Inc. Consultancy, Patents & Royalties: Patents licensed, royalty bearing and Research Funding Jazz Pharmaceuticals Consultancy; Celgene Consultancy; Amgen Consultancy; AstaZeneca Consultancy; 6 Dimensions Capital Consultancy; Reata Equity Ownership; Aptose Equity Ownership; Eutropics Equity Ownership; Senti Bio Equity Ownership and Membership on an entity's Board of Directors or advisory committees; Oncoceutics Equity Ownership; Oncolyze Equity Ownership; Breast Cancer Research Foundation Research Funding; CPRIT Research Funding; NIH/NCI Research Funding; Center for Drug Research & Development Membership on an entity's Board of Directors or advisory committees; Cancer UK Membership on an entity's Board of Directors or advisory committees; NCI-CTEP Membership on an entity's Board of Directors or advisory committees; German Research Council Membership on an entity's Board of Directors or advisory committees; Leukemia Lymphoma Society Membership on an entity's Board of Directors or advisory committees; NCI-RDCRN (Rare Disease Clin Network) Membership on an entity's Board of Directors or advisory committees; CLL Foundation Membership on an entity's Board of Directors or advisory committees; BiolineRx

Membership on an entity's Board of Directors or advisory committees;

PB: Incyte Corporation Consultancy, Research Funding and Speakers Bureau; Celgene Corporation Consultancy and Research Funding; Blueprint Medicines Corporation Consultancy and Research Funding; Kartos Therapeutics Research Funding; Constellation Pharmaceuticals Research Funding; Pfizer Research Funding; Astellas Pharmaceuticals Research Funding; NS Pharma Research Funding; Promedior Research Funding; CTI BioPharma Research Funding;

AF: None

GCI: None

EJJ: Consultancy Research funding from Takeda, BMS, Adaptive, Amgen, AbbVie, Pfizer, Cyclacel LTD

LM: None

PAT: None

SAW: None

SK: None

SAP: None

JN: None

WQ: None

JSW: ArcherDx: Honoraria. Rigel Pharmaceuticals: Honoraria. Jansen

Pharmaceuticals: Research Funding. Notable Laboratories: Research Funding.

CDD: AbbVie: Honoraria, Research Funding; Agios: Honoraria, Research Funding;

Novartis: Honoraria, Research Funding; Celgene: Honoraria, Research Funding;

Daiichi-Sankyo: Honoraria, Research Funding, Calithera Biosciences – Research

Funding, Jazz Pharmaceuticals – Honoraria, Notable Laboratories – Honoraria, Scientific Advisory Board Member
HMK: Ariad Research Funding; Astex Research Funding; BMS Research Funding; Cyclacel Research Funding; Daiichi-Sankyo Research Funding; Pfizer Honoraria and Research Funding; Immunogen Honoraria and Research Funding; Jazz Research Funding; Actinium Honoraria; Novartis Research Funding; Takeda Honoraria.
MYK: Calithera Research Funding; Stemline Therapeutics Consultancy, Honoraria and Research Funding; Forty-Seven Consultancy and Honoraria; Eli Lilly Research Funding; AbbVie Consultancy, Honoraria and Research Funding; Cellectis Research Funding; Amgen Consultancy and Honoraria; F. Hoffman La-Roche Consultancy, Honoraria and Research Funding; Genentech Honoraria and Research Funding; Ascentage Research Funding; Kisoji Consultancy and Honoraria; Reata Pharmaceuticals Equity Ownership and Patents & Royalties; Ablynx Research Funding; Astra Zeneca Research Funding; Agios Research Funding.

Contributions: Conception and design: AM, CDD, MYK
Administrative support: CDD, MYK, GGM, HMK, JEC, GGM
Provision of study materials or patients: CRR, JEC, NP, NGD, FR, GGM, GB, KN, MO, NJS, YA, CBB, TMK, KT, MY, NJ, SK, GMB, KS, A, PB, AF, GCI, EJJ, LM, PAT, SW, SJ, MG, REM, JAG, CAB, AW, SLA, ST, RT, KV, SAP, JN, WQ, JSW, HMK, MYK, CDD
Collection and assembly of data: CRR, JEC, NP, NGD, FR, GGM, GB, KN, MO, NJS, YA, CBB, TMK, KT, MY, NJ, SK, GMB, KS, A, PB, AF, GCI, EJJ, LM, PAT, SW, SJ, MG, REM, JAG, CAB, AW, SLA, ST, RT, KV, SAP, JN, WQ, JSW, HMK, MYK, CDD
Data analysis and interpretation: AM, CDD, MYK, CRR, JN, WQ, QZ, AC, HM, SAW, SNK, ZC, MG.
Manuscript writing: AM, CDD, MYK
Critical revision for important intellectual content: All authors
Final approval of manuscript: All authors reviewed and approved the final version of the manuscript.