

WINSHIP CANCER INSTITUTE





EMORY UNIVERSITY SCHOOL OF MEDICINE

Management of Induction and its impact

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Induction Principles

- Goals are to induce a rapid and deep response
- Do above without significant toxicity

- Current standard of care is IMID+PI+Dex
- Rapidly expanding towards IMID+PI+ Dex+ CD38 Moab

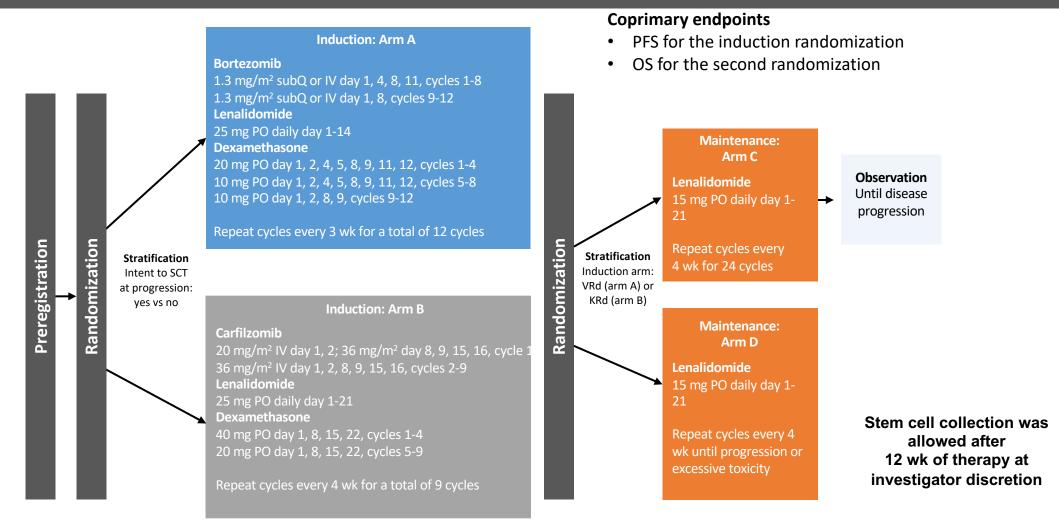
Phase 2 KRd Studies in NDMM

Trial	Response	Grade 3/4 AEs
Jakubowiak et al ¹ (N=53)	nCR: 78% sCR: 61% 24-month PFS: 92%	Hypophosphatemia: 25% Hyperglycemia: 23% Anemia: 21% Thrombocytopenia: 17% Neutropenia: 17%
Korde et al ² (N=45)	CR/sCR: 56% ≥nCR: 62% ≥VGPR: 89% ≥PR: 98%	Lymphopenia: 76% Anemia: 27% Neutropenia: 33% Thrombocytopenia: 24%
Zimmerman et al ³ (N=76)	VGPR: 96% CR: 73% sCR: 69%	Lymphopenia: 28% Neutropenia: 18% Infections: 8%
Gay et al ⁴ (N=474); FORTE trial	KRd_ASCT_KRd vs KRd12 ≥VGPR: 89% vs 87% ≥CR: 60% vs 61% sCR: 44% vs 43%	_

• KRd12, 12 cycles of KRd; nCR, near complete response; PR, partial response.

• 1. Jakubowiak AJ, et al. Blood. 2012;120:1801-1809. 2. Korde N, et al. JAMA Oncol. 2015;1:746-754. 3. Zimmerman T, et al. ASH 2016 (abstr 675). 4. Gay F, et al. ASH 2020 (abstr 294).

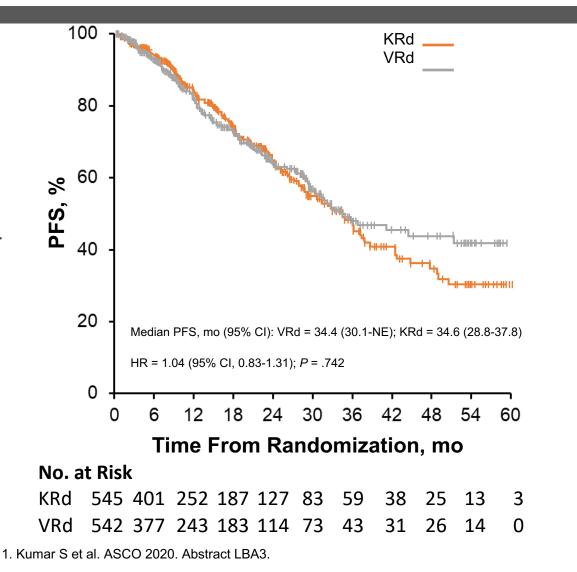
Phase 3 ENDURANCE Study¹ ECOG-ACRIN E1A11



1. Kumar S et al. American Society of Clinical Oncology 2020 Annual Meeting (ASCO 2020). Abstract LBA3.

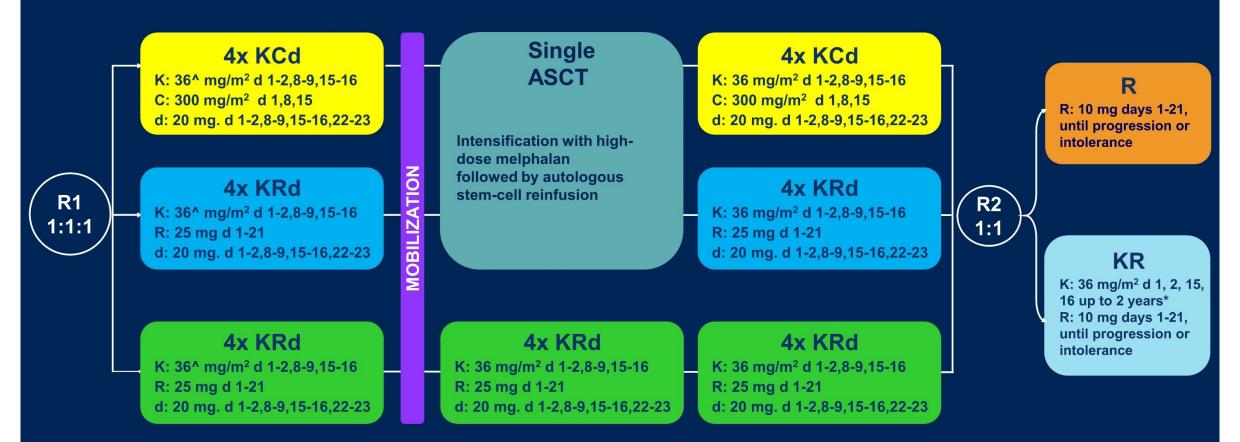
ENDURANCE: PFS From Induction Randomization¹

- Second interim analysis of PFS (January 2020): 298 PFS events (75% of 399 planned)
- Median (95% CI) estimated follow-up of 15 mo (13-18)
- For patients aged ≥70 y, median PFS (95% CI) for VRd = 37 mo (29-NE) and KRd = 28 mo (24-36)
- With censoring at SCT or alternative therapy: median PFS (95% CI) for VRd = 31.7 mo (28.5-44.6) and KRd = 32.8 mo (27.2-37.5)



Trial design

474 NDMM patients, transplant-eligible and younger than 65 years



^20 mg/m² on days 1-2, cycle 1 only. *Carfilzomib 70 mg/m² days 1, 15 every 28 days up to 2 years for patients that have started the maintenance treatment from 6 months before the approval of Amendment 5.0 onwards.

NDMM, newly diagnosed multiple myeloma, R1, first randomization (induction/consolidation treatment); R2, second randomization (maintenance treatment); ASCT, autologous stem-cell transplantation; K, carfilzomib; R, lenalidomide; C, cyclophosphamide; d, dexamethasone; KCd_ASCT, KCd induction-ASCT-KCd consolidation; KRd_ASCT, KRd induction-ASCT-KRd consolidation; KRd12, 12 cycles of KRd.

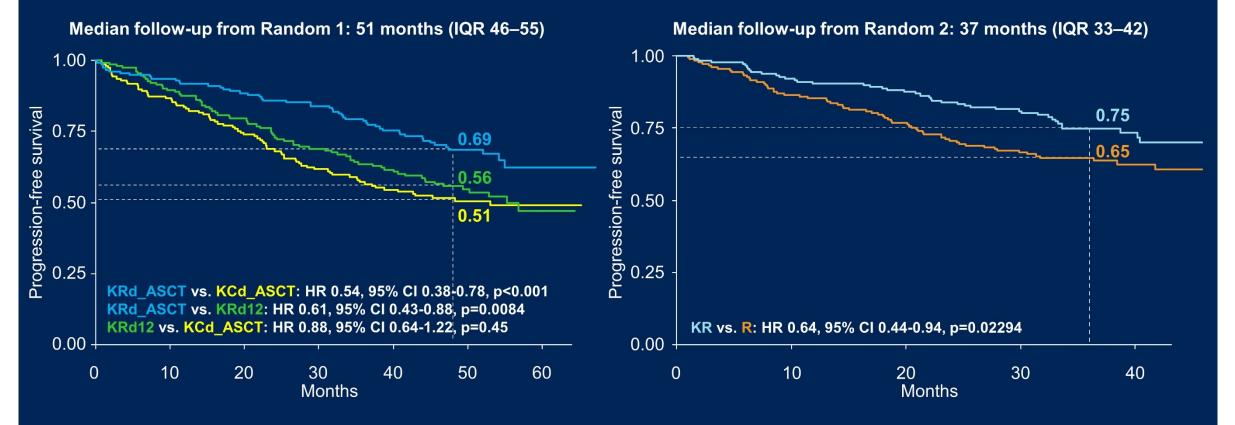
Presented By: Francesca Gav



Progression-free survival

KRd_ASCT vs. KRd12 vs. KCd_ASCT

KR vs. R



3-year PFS reported in the figure. Random 1, first randomization (induction/consolidation treatment); ASCT, autologous stem-cell trasplantation; K, carfilzomib; R, lenalidomide; C, cyclophosphamide; d, dexamethasone; KCd_ASCT, KCd induction-ASCT-KCd consolidation; KRd_ASCT, KRd induction-ASCT-KRd consolidation; KRd12, 12 cycles of KRd; Random 2, second randomization (maintenance treatment); p, p-value; HR, hazard ratio; Cl, confidence interval.

Presented By: Francesca Gav

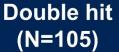


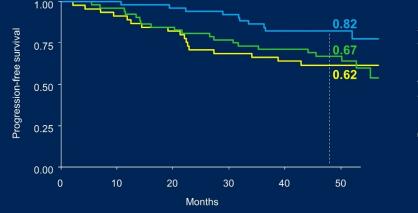
Progression-free survival: Random 1 KRd_ASCT vs. KRd12 vs. KCd_ASCT

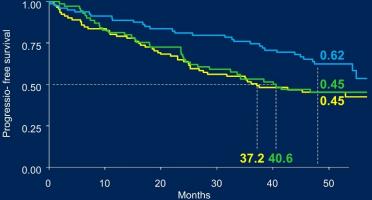
Median follow-up from Random 1: 51 months (IQR 46-55)

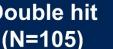
Standard risk (N=153)

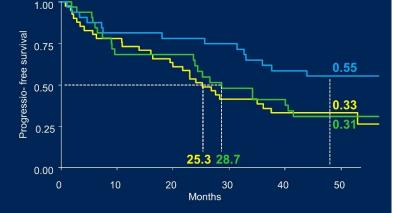












KRd ASCT vs. KCd ASCT: HR 0.44, p=0.04 KRd ASCT vs. KRd12: HR 0.46, p=0.04 KRd12 vs. KCd ASCT : HR 0.96, p=0.9

KRd ASCT vs. KCd ASCT: HR 0.57, p=0.01 KRd ASCT vs. KRd12: HR 0.6, p=0.04 KRd12 vs. KCd ASCT: HR 0.95, p=0.8

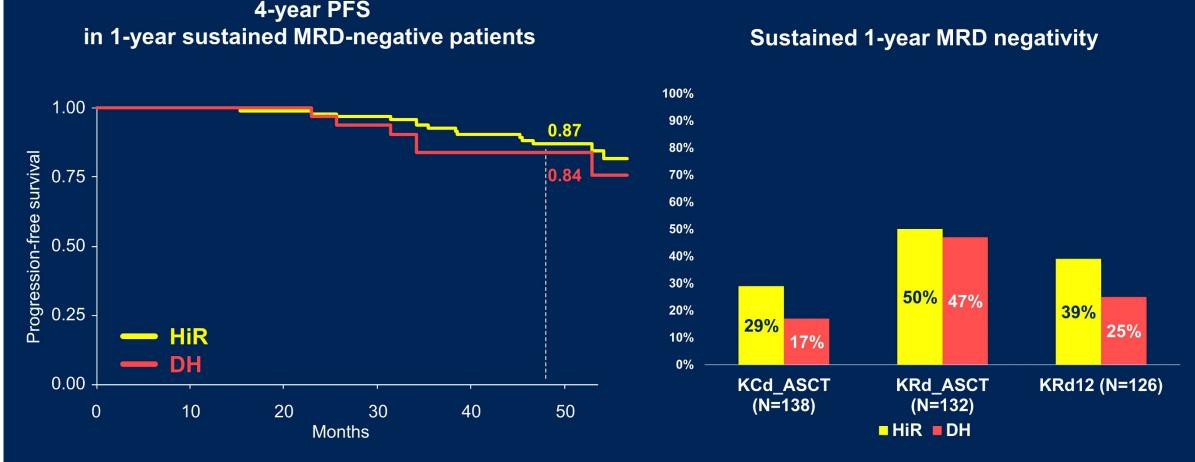
KRd ASCT vs. KCd ASCT: HR 0.49, p=0.03 KRd ASCT vs. KRd12: HR 0.53, p=0.07 KRd12 vs. KCd ASCT: HR 0.91, p=0.75

Random 1, first randomization (induction/consolidation treatment); ASCT, autologous stem-cell trasplantation; K, carfilzomib; R, lenalidomide; C, cyclophosphamide; d, dexamethasone; KCd ASCT, KCd induction-ASCT-KCd consolidation; KRd ASCT, KRd induction-ASCT-KRd consolidation; KRd12, 12 cycles of KRd; HR, hazard ratio; CI, confidence interval; p, p-value; iQR, interguartile range.

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Sustained 1-year MRD negativity in High-risk patients KRd_ASCT vs. KRd12 vs. KCd_ASCT



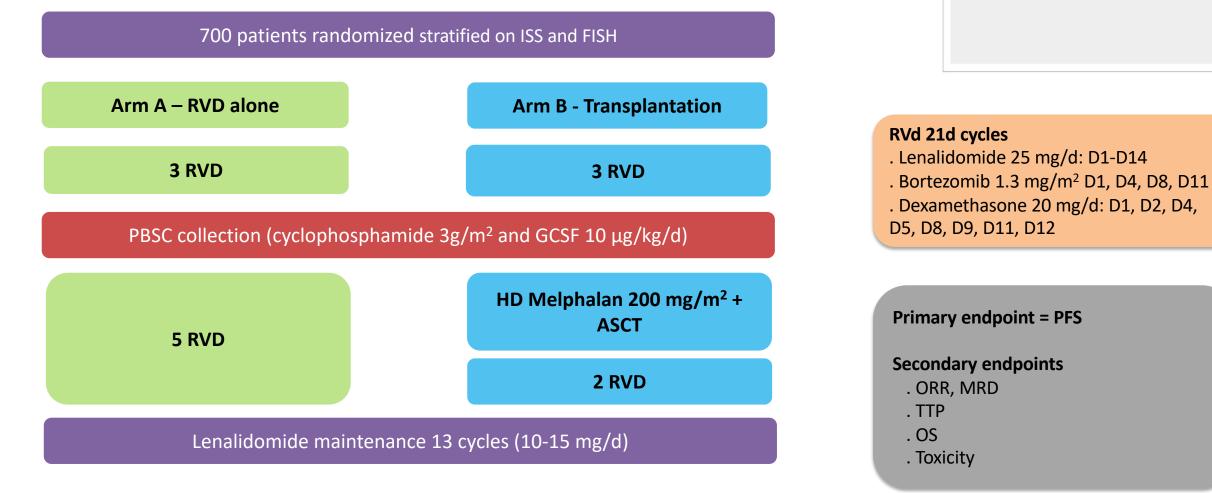
ASCT, autologous stem-cell trasplantation; K, carfilzomib; R, lenalidomide; C, cyclophosphamide; d, dexamethasone; KCd_ASCT, KCd induction-ASCT-KCd consolidation; KRd_ASCT, KRd induction-ASCT-KRd consolidation; KRd12, 12 cycles of KRd; MRD, minimal residual disease; HiR, high risk; DH, double hit; N, number; PFS, progression-free survival.

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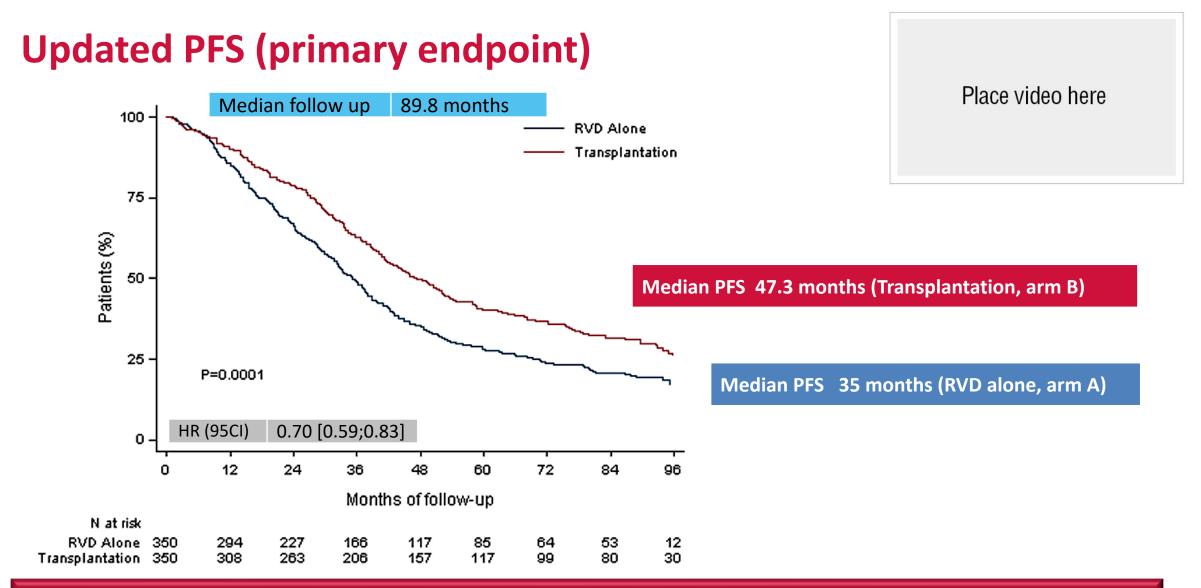
IFM 2009 Study design

Place video here





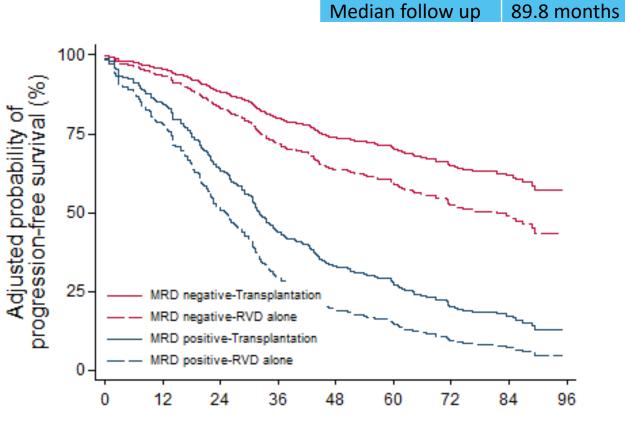
M Attal et al, N Engl J Med 2017



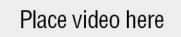
30% reduction in the risk of progression or death in patients receiving transplant

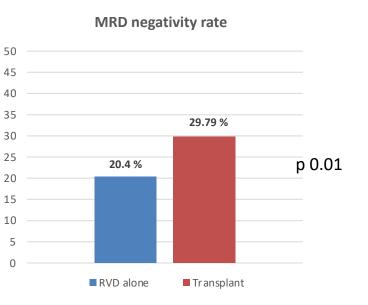
American Society of Hematology

Subgroup analyses



Time since MRD assessment (months)





Transplant is superior to VRD alone, even in patients who achieved undetectable MRD at 10⁻⁶

American Society of Hematology



RVd ± ASCT and Lenalidomide Maintenance to Progression for NDMM

The Phase 3 DETERMINATION Trial

Paul G. Richardson, MD, RJ Corman Professor of Medicine, Harvard Medical School Clinical Program Leader, Director of Clinical Research, Jerome Lipper Multiple Myeloma Center, Dana-Farber Cancer Institute, Boston, MA

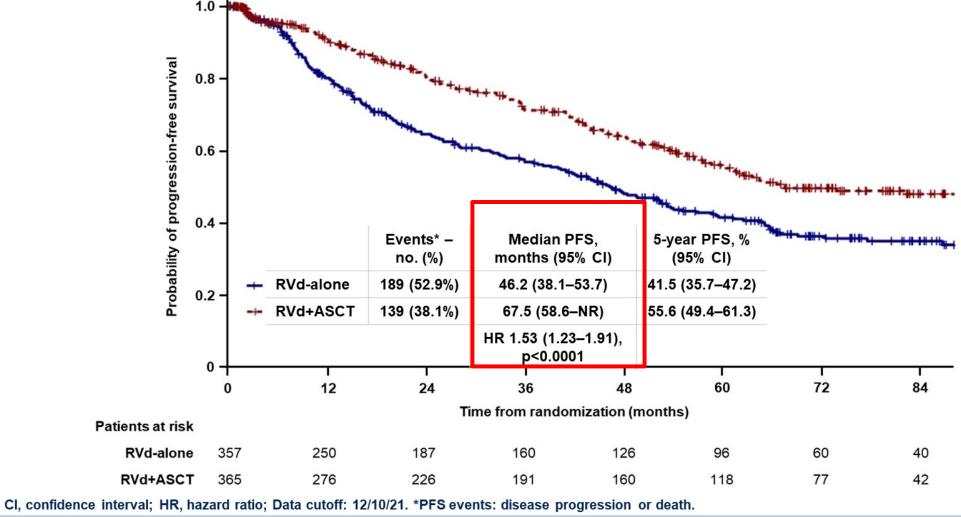
2022 ASCO ANNUAL MEETING #ASC022

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Primary endpoint: Progression-free survival (PFS)

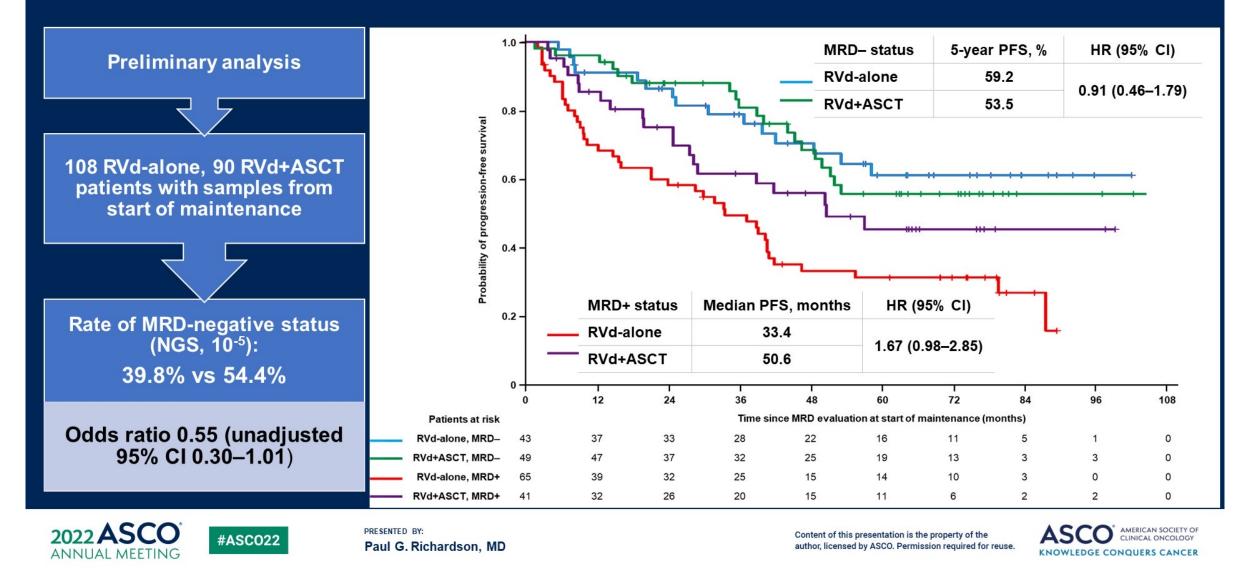




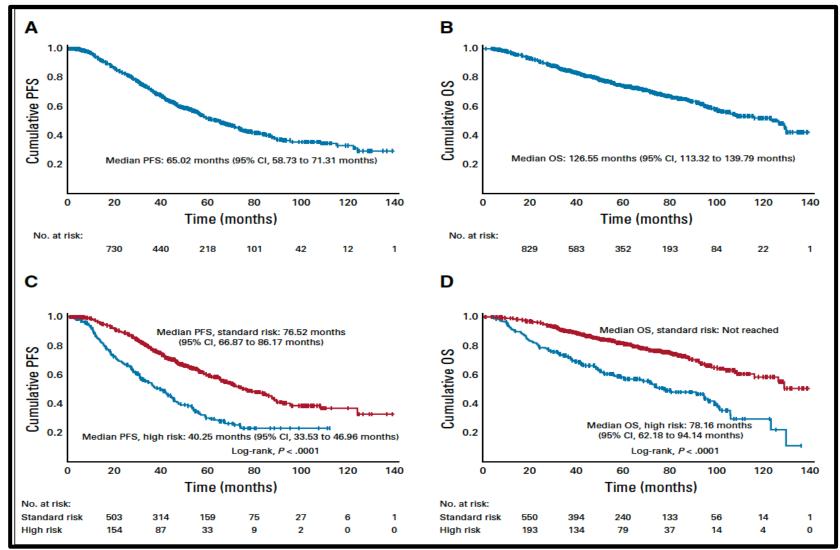
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MRD / PFS by MRD status



Outcomes From RVD 1000 Series

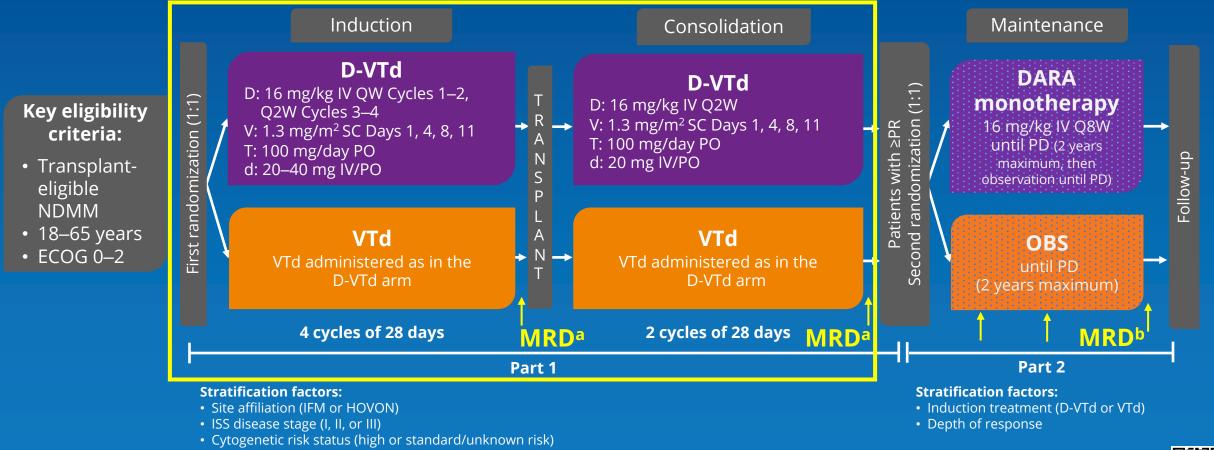


RVD, lenalidomide, bortezomib, and dexamethasone combination therapy. Joseph NS, et al. J Clin Oncol. 2020;38:1928-1937.

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CASSIOPEIA: Induction/Consolidation

 Analyses in Part 1 were conducted in the ITT population (N=1085), which included all first-randomization patients

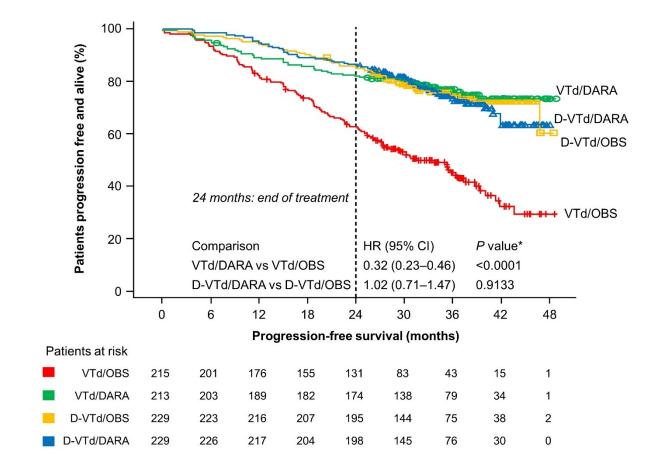


PR, partial response or better; IV, intravenous; Q8W, every 8 weeks; OBS, observation; ECOG, Eastern Cooperative Oncology Group; QW, every week; Q2W, every 2 weeks; SC, subcutaneous; PO, oral; IFM, Intergroupe Francophone du Myélome; HOVON, the Dutch-Belgian Cooperative Trial Group for Hematology-Oncology; ISS, International Staging System; PD, progressive disease; >VGPR, very good partial response or better.
^aMRD analyses were performed at predefined timepoints for all patients, regardless of response. ^bMRD analyses were performed in patients with >VGPR at Weeks 25, 52, and 105.

Presented at the 63rd American Society of Hematology (ASH) Annual Meeting and Exposition; December 11-14, 2021; Atlanta, GA/Virtual

DARA Significantly Improved PFS vs OBS in Patients Treated With VTd Induction/Consolidation

- A prespecified analysis showed significant interaction between maintenance and induction/consolidation therapy
- A PFS benefit was observed for VTd/DARA vs VTd/OBS
- PFS was not different for D-VTd/DARA vs D-VTd/OBS



*Nominal P value. CI, confidence interval; D-VTd, daratumumab, bortezomib, thalidomide, and dexamethasone; DARA, daratumumab

HR, hazard ratio; OBS, observation; PFS, progression-free survival; VTd, bortezomib, thalidomide, and dexamethasone.

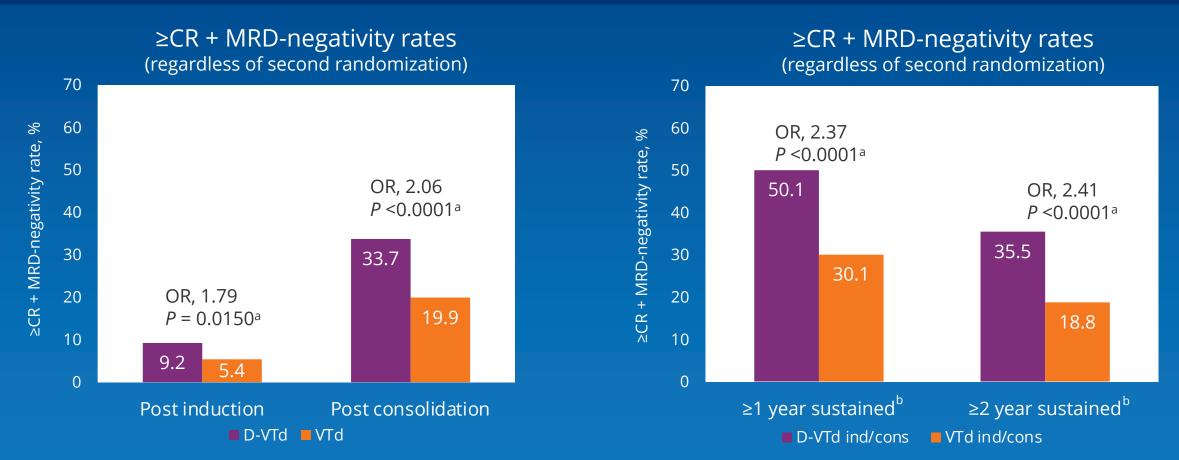
Presented By: Philippe Moreau

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CASSIOPEIA: D-VTd Improved Rates of ≥CR + MRD Negativity (MFC; 10⁻⁵) Versus VTd Following Induction and Consolidation



• Post-consolidation MRD-negativity rates among patients who achieved ≥CR were consistent across subgroups, including ISS disease stage and high-risk cytogenetics

MFC, multiparametric flow cytometry

^aCochran-Mantel-Haenszel estimate of the common odds ratio for stratified tables was used. The stratification factors were study site affiliation, ISS disease stage, and cytogenetics. *P* value was calculated based on a stratified Cochran-Mantel-Haenszel chi-squared test.





Daratumumab (DARA) Plus Lenalidomide, Bortezomib, and Dexamethasone (RVd) in Patients (Pts) With Transplant-eligible Newly Diagnosed Multiple Myeloma (NDMM): Updated Analysis of GRIFFIN After 24 Months of Maintenance

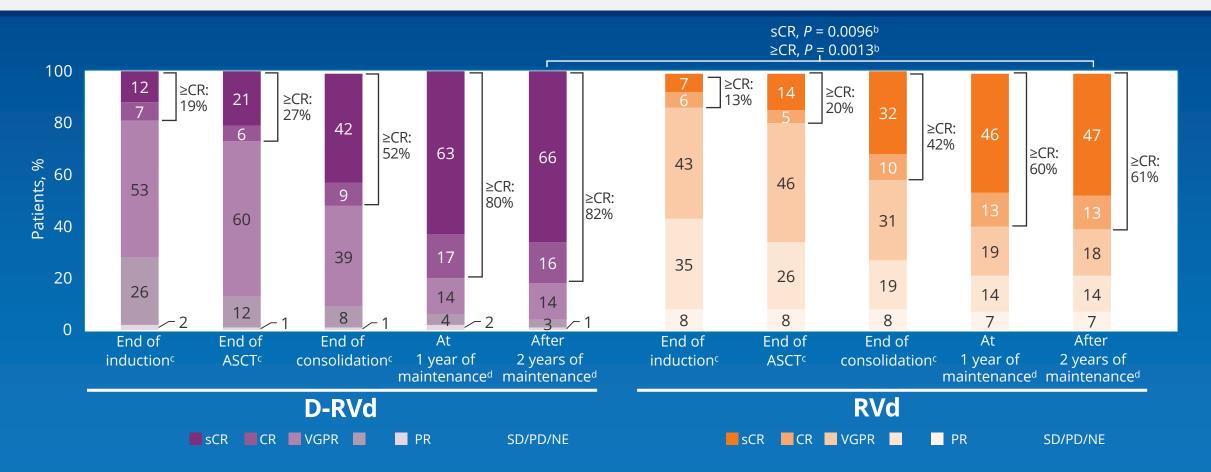
Jacob Laubach,^{1,*} Jonathan L. Kaufman,² Douglas W. Sborov,³ Brandi Reeves,⁴ Cesar Rodriguez,⁵ Ajai Chari,⁶ Rebecca Silbermann,⁷ Luciano J. Costa,⁸ Larry D. Anderson Jr,⁹ Nitya Nathwani,¹⁰ Nina Shah,¹¹ Naresh Bumma,¹² Yvonne A. Efebera,¹³ Sarah A. Holstein,¹⁴ Caitlin Costello,¹⁵ Andrzej Jakubowiak,¹⁶ Tanya M. Wildes,¹⁷ Robert Z. Orlowski,¹⁸ Kenneth H. Shain,¹⁹ Andrew J. Cowan,²⁰ Huiling Pei,²¹ Annelore Cortoos,²² Sharmila Patel,²² J. Blake Bartlett,²³ Jessica Vermeulen,²⁴ Thomas S. Lin,²² Paul G. Richardson,¹ Peter M. Voorhees²⁵

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Presented at the 63rd American Society of Hematology (ASH) Annual Meeting & Exposition; December 11-14, 2021; Atlanta, GA/Virtual Additional information can be viewed by scanning the QR code or accessing this link: https://www.oncologysciencehub.com/ ASH2021/Daratumumab/Laubach The QR code is intended to provide scientific information for individual reference, and the information should not be altered or reproduced in any way.



GRIFFIN: Responses Deepened Over Time^a

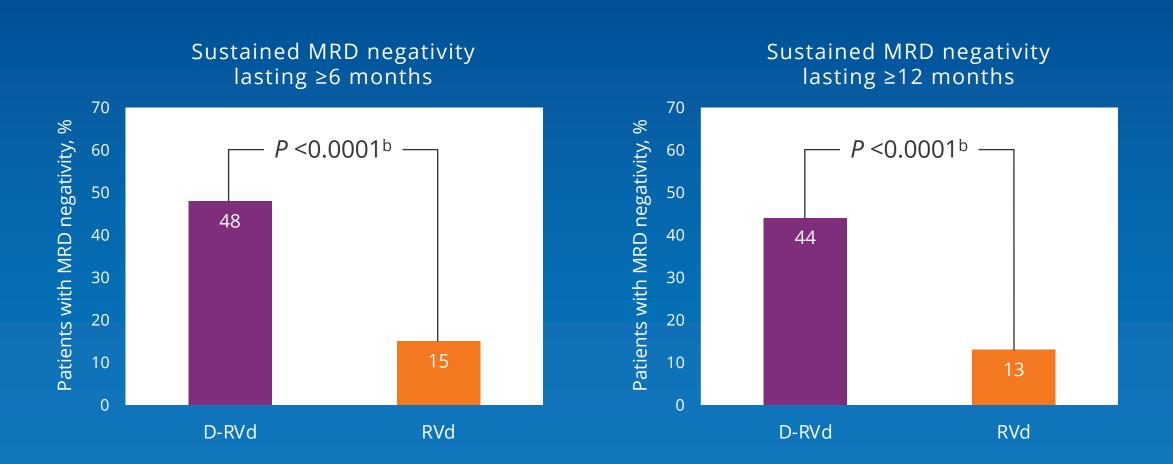


Response rates for sCR and ≥CR were greater for D-RVd versus RVd at all time points, with the deepest responses occurring after 2 years of maintenance therapy

PR, partial response; SD/PD/NE, stable disease/progressive disease/not evaluable. ^aData are shown for the response-evaluable population. ^b*P* values (2-sided) were calculated using the Cochran–Mantel–Haenszel chi-square test. ^cResponse rates are from the primary analysis cutoff (median follow-up: 13.5 mo), and the response-evaluable population included 196 patients (D-RVd, n = 99; RVd, n = 97). ^aResponse rates for the maintenance phase have longer follow-up (median: 38.6 mo), and the response-evaluable population included 197 patients (D-RVd, n = 100; RVd, n = 97). Percentages may not add up due to rounding. Presented at the 63rd American Society of Hematology (ASH) Annual Meeting & Exposition; December 11-14, 2021; Atlanta, GA/Virtual



GRIFFIN: D-RVd Improved Rates of Durable MRD Negativity^a (10^{-5}) Lasting ≥ 6 Months or ≥ 12 Months Versus RVd



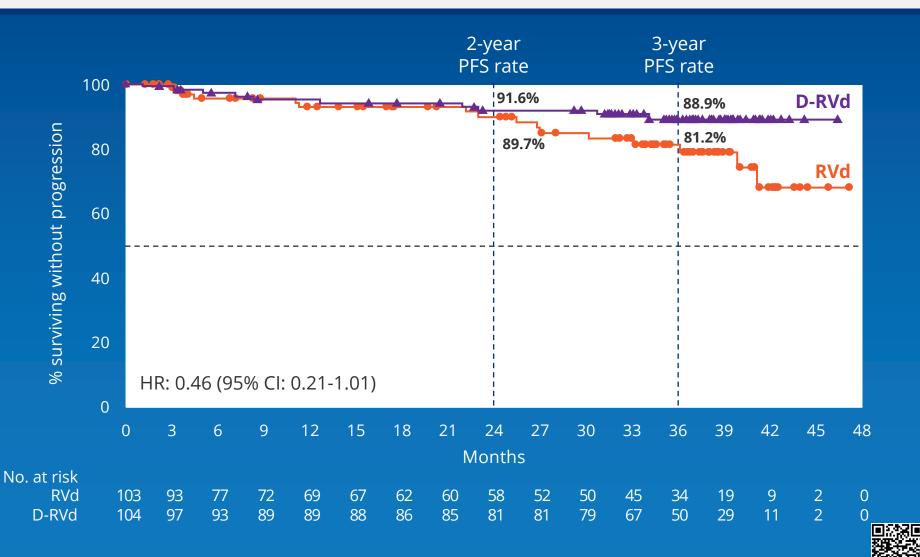
^aThe threshold of MRD negativity was defined as 1 tumor cell per 10⁵ white cells. MRD status is based on the assessment of bone marrow aspirates by NGS in accordance with International Myeloma Working Group criteria. Median follow-up was 38.6 months, and MRD-negativity rates are among the ITT population (D-RVd, n = 104; RVd, n = 103). Bone marrow aspirates were assessed at baseline, at first evidence of suspected CR or sCR (including patients with VGPR or better and suspected DARA interference), at the end of induction and consolidation, and after 1 and 2 years of maintenance, regardless of response. ^bP values were calculated using the Fisher's exact test.

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GRIFFIN: PFS in the ITT Population

- Median follow-up: 38.6 months
- Median PFS was not reached in either group
- There is a positive trend toward improved PFS for D-RVd/DR versus RVd/R
- The separation of the PFS curves begins beyond
 1 year of maintenance and suggests a benefit of prolonged DR therapy



HR, hazard ratio.



UNIVERSITÄTS KLINIKUM **HEIDELBERG**

Addition of Isatuximab to Lenalidomide, Bortezomib and Dexamethasone as Induction Therapy for Newly-Diagnosed, Transplant-Eligible Multiple Myeloma: The Phase III GMMG-HD7 Trial



Hartmut Goldschmidt^{1,2}, Elias K. Mai¹, Eva Nievergall¹, Roland Fenk³, Uta Bertsch^{1,2}, Diana Tichy⁴, Britta Besemer⁵, Jan Dürig⁶, Roland Schroers⁷, Ivana von Metzler⁸, Mathias Hänel⁹, Christoph Mann¹⁰, Anne Marie Asemissen¹¹, Bernhard Heilmeier¹², Stefanie Huhn¹, Katharina Kriegsmann¹, Niels Weinhold¹, Steffen Luntz¹³, Tobias A. W. Holderried¹⁴, Karolin Trautmann-Grill¹⁵, Deniz Gezer¹⁶, Maika Klaiber-Hakimi¹⁷, Martin Müller¹⁸, Cyrus Khandanpour¹⁹, Wolfgang Knauf²⁰, Markus Munder²¹, Thomas Geer²², Hendrik Riesenberg²³, Jörg Thomalla²⁴, Martin Hoffmann²⁵, Marc-Steffen Raab¹, Hans J. Salwender²⁶, Katja C. Weisel¹¹ for the German-speaking Myeloma Multicenter Group (GMMG)

¹Department of Internal Medicine V, University Hospital Heidelberg, Heidelberg, Germany; ²National Center for Tumor Diseases Heidelberg, Heidelberg, Germany; ³Department of Hematology, Oncology and Clinical Immunology, University Hospital Düsseldorf, Düsseldorf, Germany; ⁴Division of Biostatistics, German Cancer Research Center (DKFZ) Heidelberg, Heidelberg, Germany; ⁵Department of Internal Medicine II, University Hospital Tübingen, Tübingen, Germany; ⁶Department for Hematology and Stem Cell Transplantation, University Hospital Essen, Essen, Germany; ⁷Medical Clinic, University Hospital Bochum, Bochum, Germany; ⁸Department of Internal Medicine III, Clinic Chemnitz, Chemnitz, Germany; ¹⁰Department of Internal Medicine III, Clinic Chemnitz, Chemnitz, Germany; ¹⁰Department of Oncology, Hematology and BMT, University Medical Center Hamburg-Eppendorf, Hamburg, Germany; ¹¹Department of Oncology, Hematology and BMT, University Medical Center Hamburg-Eppendorf, Hamburg, Germany; ¹²Clinic for Oncology and Hematology, University Hospital Barmherzige Brueder Regensburg, Regensburg, Germany; ¹³Coordination Centre for Clinical Trails (KKS) Heidelberg, Heidelberg, Germany; ¹⁴Department of Oncology, Hematology, and Stem Cell Transplantation, Faculty of Medicine, RWTH Aachen University, Aachen, Germany; ¹⁷Clinic for Hematology, Oncology and Palliative Care, Marien Hospital Düsseldorf, Düsseldorf, Germany; ¹⁸Clinic for Hematology, Oncology and Immunology, Klinikum Siloah Hannover, Germany; ¹⁹Medical Clinic A, University Hospital Münster, Münster, Germany; ²⁰Department of Internal Medicine III, University Hospital Clinic A, University Hospital Münster, Germany; ²⁰Department of Internal Medicine III, University Hospital Clinic A, University Hospital Münster, Germany; ²⁰Department of Internal Medicine III, University Hospital Clinic A, University Hospital Münster, Germany; ²⁰Department of Internal Medicine III, University Hospital Clinic A, University Hospital Münster

²³Hematology/Oncology Center, Bielefe

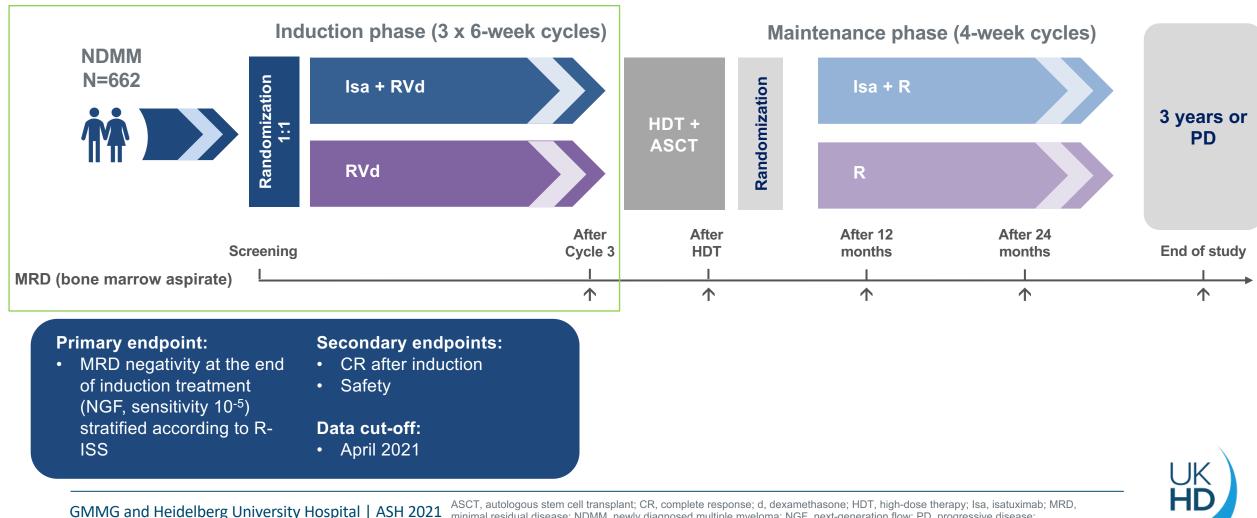
ASH 2021; Final Abstract Code: 463

symptomatic MM 1st line treatment 18-70 years Randomization dwigshafen, Ludwigshafen, Germany;





Primary endpoint: MRD negativity at the end of induction phase



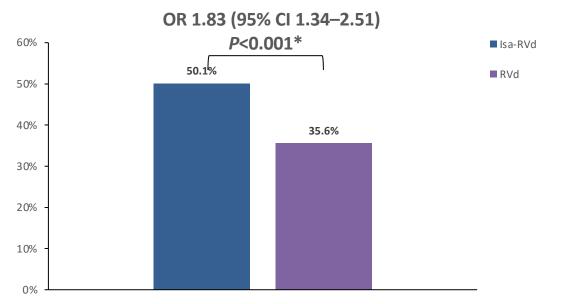
1. ClinicalTrials.gov: NCT03617731

minimal residual disease; NDMM, newly diagnosed multiple myeloma; NGF, next-generation flow; PD, progressive disease;

R, lenalidomide; R-ISS, Revised International Staging System; Te, transplant eligible; V, bortezomib

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First primary endpoint, end of induction MRD negativity by NGF (10⁻⁵), was met in ITT analysis



Patients with MRD negativity at the end of induction therapy

Low number of not assessable/missing[†] MRD status: Isa-RVd (10.6%) and RVd (15.2%)

Isa-RVd is the first regimen to demonstrate a rapid and statistically significant benefit from treatment by reaching a MRD negativity of 50.1% at the end of induction and to show superiority vs. RVd in a Phase 3 trial



*P value derived from stratified conditional logistic regression analysis

GMMG and Heidelberg University Hospital ASH 2021 *Missing NGF-MRD values were due to either patients' loss to follow-up during induction therapy or to missing bone marrow samples or technical failures in measurement counted as non-responders, i.e. NGF-MRD positive

CI, confidence interval; d, dexamethasone; Isa, isatuximab; ITT, intent-to-treat; MRD, minimal residual disease; NGF, next-generation flow; OR, odds ratio; R, lenalidomide; V, bortezomib

LLABAMA AT BIRMINGHAM

Daratumumab, Carfilzomib, Lenalidomide and Dexamethasone (Dara-KRd), Autologous Transplantation and MRD Response-Adapted Consolidation and Treatment Cessation-Final Primary Endpoint Analysis of the MASTER Trial

<u>Luciano J. Costa¹</u>, Saurabh Chhabra², Natalie S. Callander, MD³, Eva Medvedova⁴, Bhagirathbhai Dholaria⁵, Rebecca Silbermann⁴, Kelly Godby¹, Binod Dhakal², Susan Bal¹, Smith Giri¹, Anita D'Souza², Timothy Schmidt³, Aric Hall³, Pamela Hardwick¹, Robert F. Cornell⁵, Parameswaran Hari²

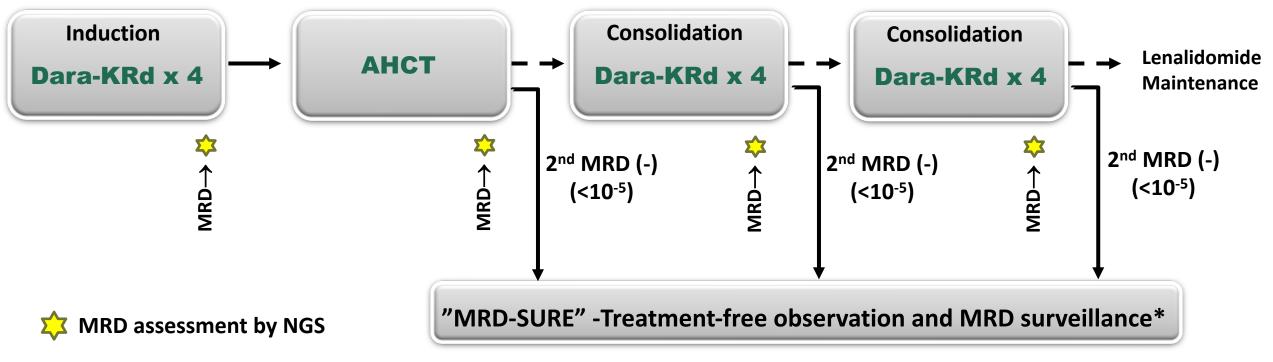
1- University of Alabama at Birmingham; 2- Medical College of Wisconsin; 3- University of Wisconsin at Madison;
 4- Oregon Health and Science University; 5- Vanderbilt University

COMMIT- Academic Consortium to Overcome Multiple Myeloma through Innovative Trials

Treatment

Dara-KRd

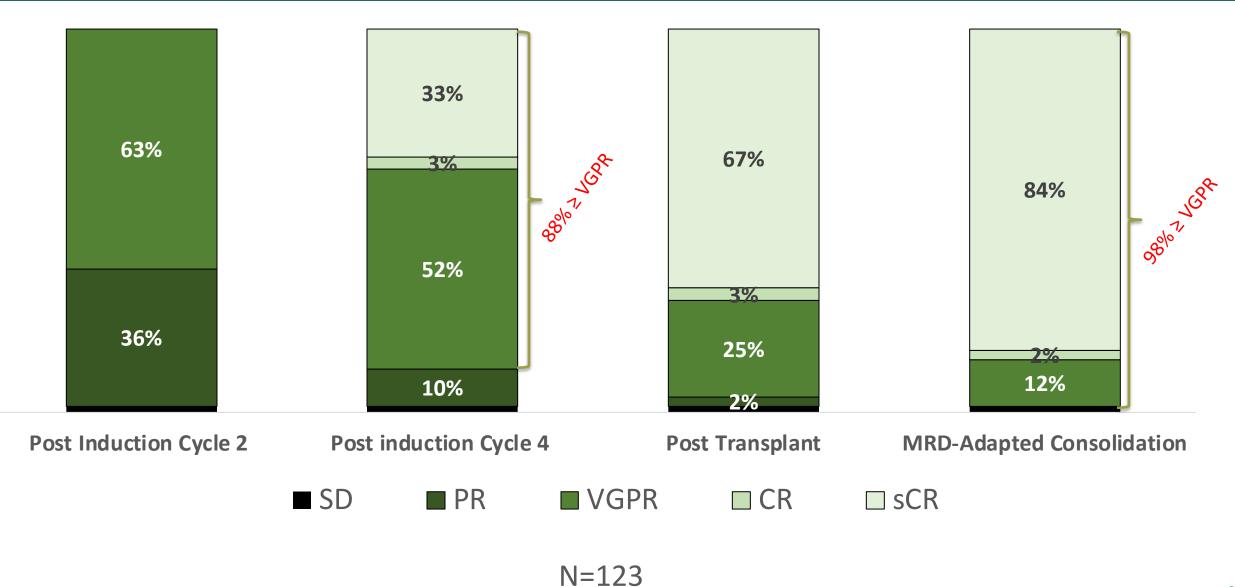
- Daratumumab 16 mg/m² days 1,8,15,22 (days 1,15 C 3-6; day 1 C >6)
- Carfilzomib (20) 56 mg/m² Days 1,8,15
- Lenalidomide 25 mg Days 1-21
- Dexamethasone 40mg PO Days 1,8,15,22



*24 and 72 weeks after completion of therapy

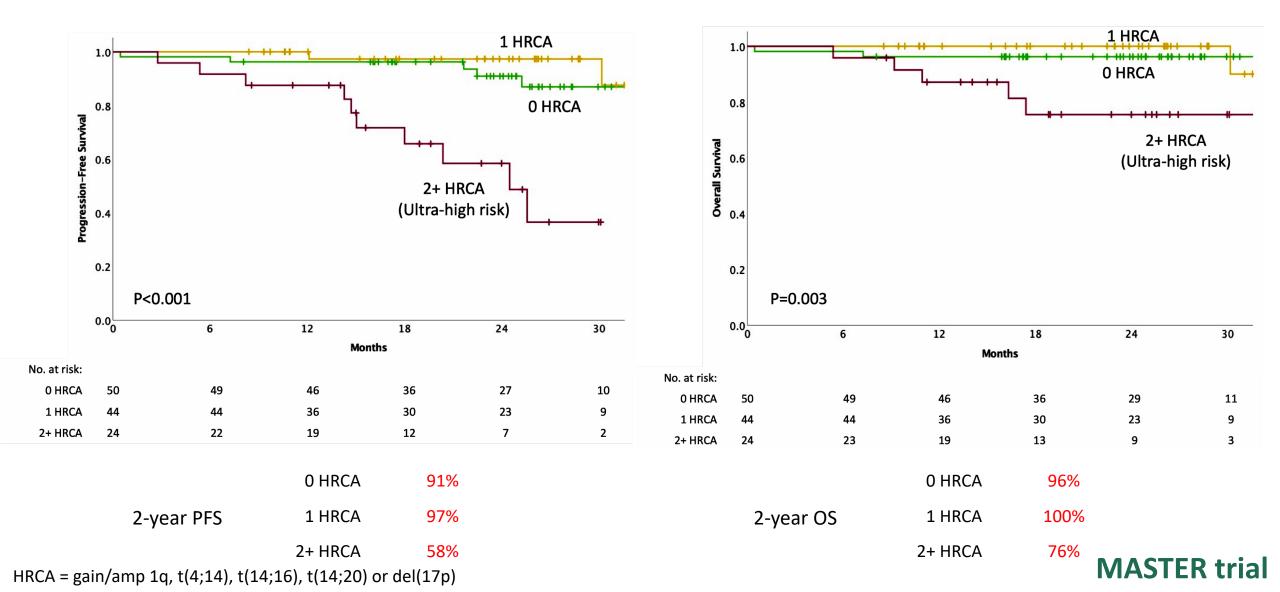
MASTER trial

Best IMWG response by phase of therapy (ITT)

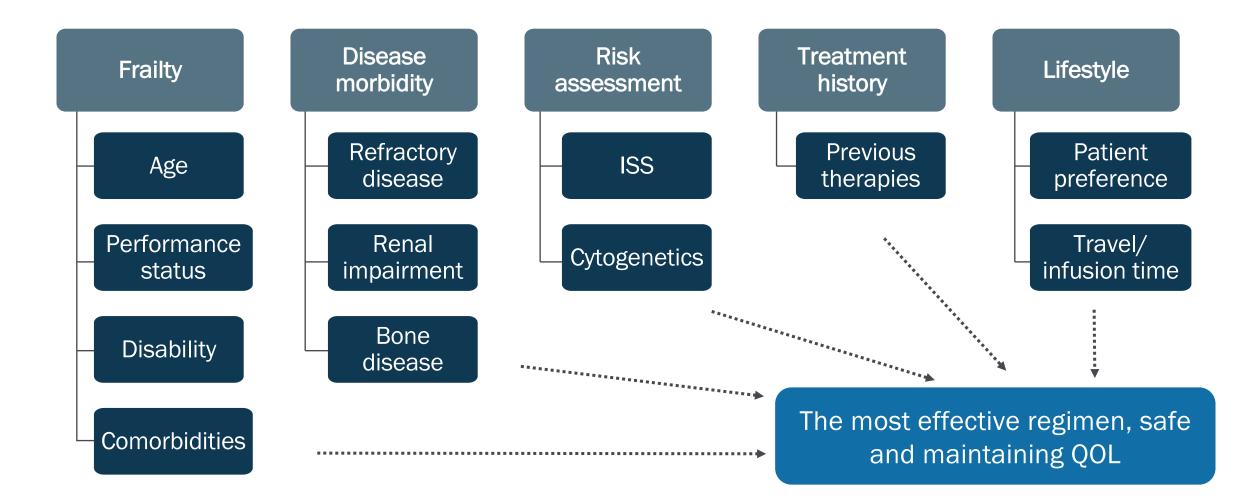


MASTER trial

Progression-Free and Overall Survival



Disease and Patient Factors Influence Treatment Choices in Relapsed/Refractory MM



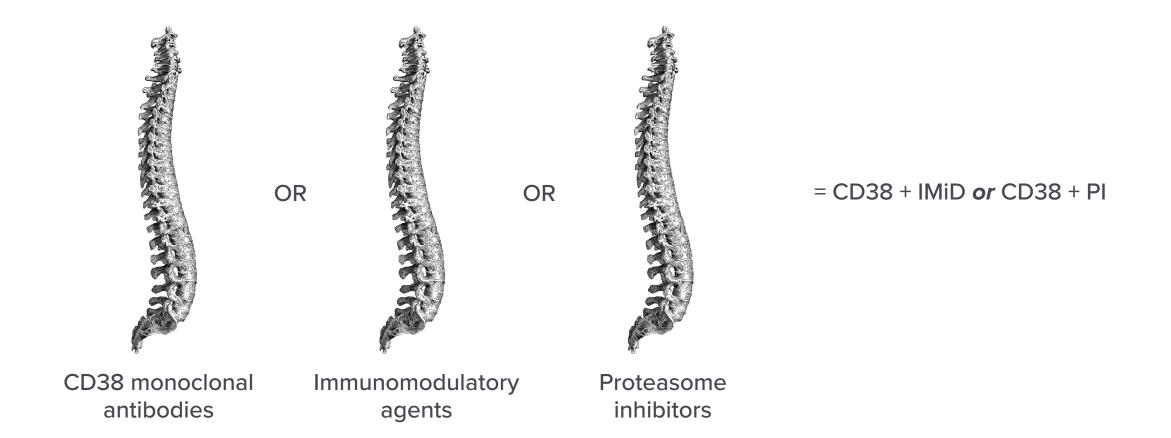
ISS, International Staging System; QOL, quality of life.

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Questions in relapse

- How long was the first remission
- What is the patient progressing on (Len, Dara, Bz/Car?)
- Resistance/sensitivity drives choice of salvage therapy.
- Ideally if not CD38 resistant, then that becomes the backbone to which you add either an IMID or PI

Backbones in MM: How to Decide



When choosing a combination in relapsed MM, the true backbone is a CD38 monoclonal antibody among patients who are not CD38-resistant

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Result	dara/len/dex ¹	dara/car/dex ²	dara/pom/dex ³
	vs len/dex	vs car/dex	vs pom/dex
Prior line of therapy median in months	1 (1-11, range)	2 (1-2, IQR)	2 (2-3, IQR; 1-5 range)
	1 (1-8, range)	2 (1-2, IQR)	2 (2-3, IQR; 1-5 range)
First relapse (%)	52.1	46	11
	51.6	45	12
Len non refractory (%)	100	68	21
	100	64	20
PFS	44.5 (HR 0.44)	28.6 (0.59)	12.4 (HR 0.63)
(median in months)	17.5	15.2	6.9
PFS, not refractory to len	44.5 (HR 0.44)	28.6 (HR 0.63)	NE (HR 0.36)
	17.5	19.9	10.6
PFS, 1 st relapse	NR (HR 0.42)	NE (HR 0.66)	14.1 (HR 0.70)
	19.6	21.3	12.6
1 st relapse len refractory	0	6	≤ 11
(%)	0	4	≤ 12

1. Leukemia. 2020 Jul;34(7):1875-1884. doi: 10.1038/s41375-020-0711-6. Epub 2020 Jan 30.

2. Lancet Oncol. 2021 Dec 3:S1470-2045(21)00579-9. doi: 10.1016/S1470-2045(21)00579-9.

3. Lancet Oncol. 2021 Jun;22(6):801-812. doi: 10.1016/S1470-2045(21)00128-5. PMID: 34087126

Result	dara/len/dex ¹	isa/car/dex ²	isa/pom/dex ³
	vs len/dex	vs car/dex	vs pom/dex
Prior line of therapy median in months	1 (1-11, range)	2 (1-2, IQR)	3 (2-4, range)
	1 (1-8, range)	2 (1-3, IQR)	2 (2-4range)
First relapse (%)	52.1	44	0
	51.6	45	0
Len non refractory (%)	100	68	6
	100	66	8
PFS	44.5 (HR 0.44)	NE (HR 0.53)	11.5 (HR 0.60)
(median in months)	17.5	19.15	6.5
PFS, not refractory to len	44.5 (HR 0.44)	NC (HR 0.48)	1/10* (HR 0.18)
	17.5	NC	7/13*
PFS, 1 st relapse	NR (HR 0.42)	NC (HR 0.59)	N/A
	19.6	NC	N/A
1 st relapse len refractory	0	NR	0
(%)	0	NR	0

Leukemia. 2020 Jul;34(7):1875-1884. doi: 10.1038/s41375-020-0711-6.
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DPd in First Relapse: Emory Experience

Figure 1. Median Progression Free Survival in standard risk vs high risk patients treated with DPD at first relapse

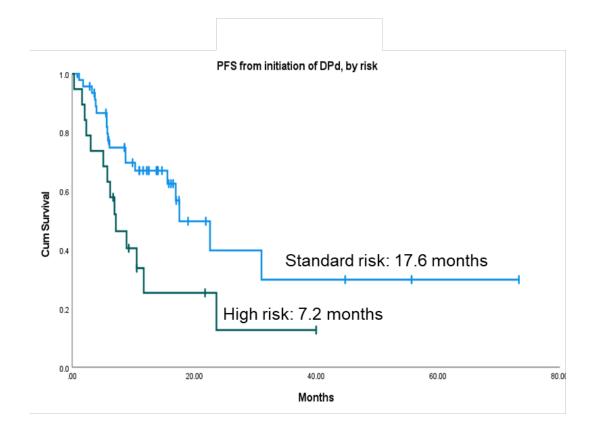
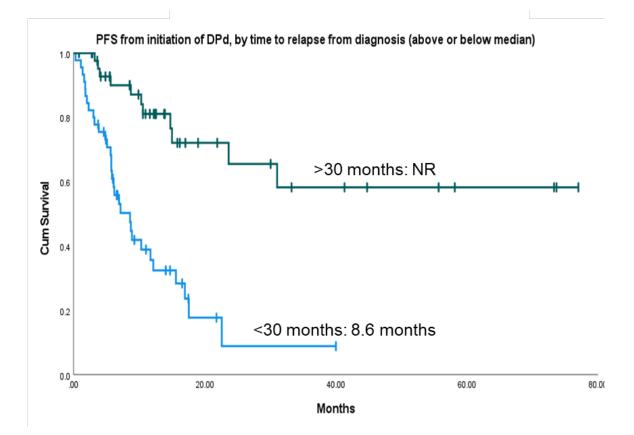


Figure 2. Median Progression Free Survival by time to first relapse from diagnosis (<30 months vs >30 months)



Joseph N, et al. Blood. 2021;138:1616.

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How to Choose

- If CD38 resistant go with IMID and PI that have not been used
- If CD38 exposed but sensitive IMID or PI partner based on tolerance and comorbidity
- If CD38 naïve, then consider early relapse approach with longest PFS to date
- Alternatives include Selinexor based combinations or venetoclax t(11;14)
- New targets such as CelMods, and other precision medicine approaches on the way

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