

Conflict of Interest Disclosure

Dr. Bhattacharya, Dr. Yang, Dr. Bentley, Dr. Ramachandran, Dr. Banahan, Dr. Shah, and Dr. Bhakta do not have any financial relationships related to the topic of this presentation

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Phase-specific and Lifetime Costs of Multiple Myeloma (MM) among Elderly Patients in the United States

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Background

- MM accounts for ~1.6% of all new cancer cases in the US; 5-year survival rate: 51%; median age at diagnosis: 69 years
- Healthcare costs associated with treatment of MM are higher than treatment of most other types of cancer
- Studies that have assessed incremental costs associated with MM have reported a significant increase in costs in the past decade
- Important to assess healthcare expenditures across phases of MM care
- However, there is very limited literature on disease lifetime costs of MM

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Study Objectives

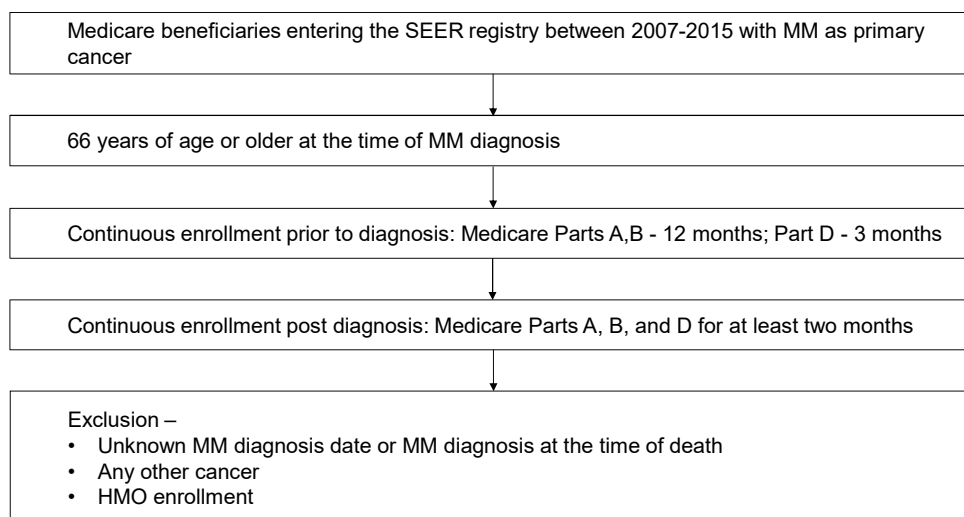
- To identify duration of initial care phase and terminal care phase among elderly newly diagnosed MM (NDMM) patients using Joinpoint regression
- To assess phase-specific costs and drivers of phase-specific costs attributable to MM among elderly NDMM patients
- To assess disease lifetime costs attributable to MM among elderly NDMM patients

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Study Methods

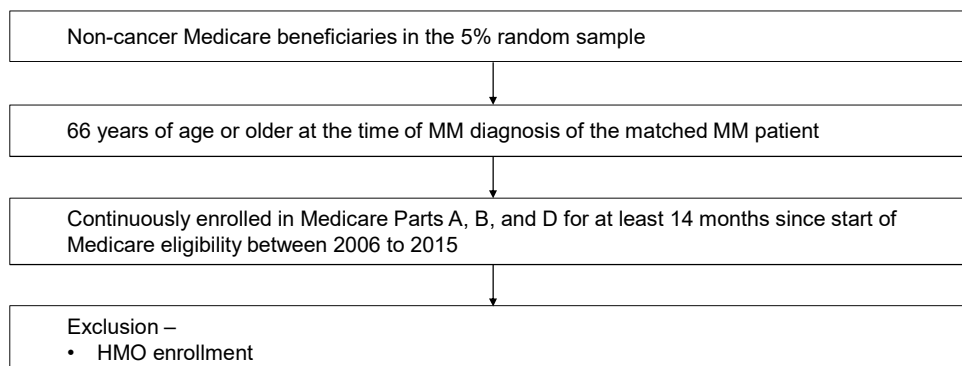
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Study Sample – NDMM



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Study Sample – Non-cancer Group



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Matching NDMM and Non-cancer Groups

- NDMM and non-cancer groups matched on
 - Date of death, for those who died
 - Date of end of follow-up (loss of Medicare eligibility or end of study measurement period), for those who did not die
 - Groups were also matched on months of continuous Medicare eligibility until death or end of follow-up, in addition to date of death/date of end of follow-up, to ensure similar follow-up periods
 - A 1:1 match was performed using the greedy match algorithm

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Study Measures

- The outcome variable of interest was all-cause healthcare cost
 - Healthcare costs assessed from Medicare's perspective
 - All cost estimates adjusted to 2016 US dollars using the Medical Care Component of the Consumer Price Index
- Covariates
 - Patient demographic variables - age, sex, race, rural/urban status, region
 - Patient clinical variables - comorbidity and disability status

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Data Analysis

- Joinpoint Regression - to identify duration of initial and terminal phases for MM patients
- Estimated lifetime costs using the phase-based approach
 - Once the duration of the various phases was determined, time (in months) spent and costs in each phase were calculated for the entire cohort
 - Lifetime costs were determined using phase-specific cost data and monthly survival probabilities
- For all cost outcomes (lifetime and phase-specific), incremental costs attributable to MM were estimated controlling for clinical and sociodemographic characteristics at baseline

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Study Results

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Joinpoint Regression for Identifying Duration of Initial and Terminal Phases of Care

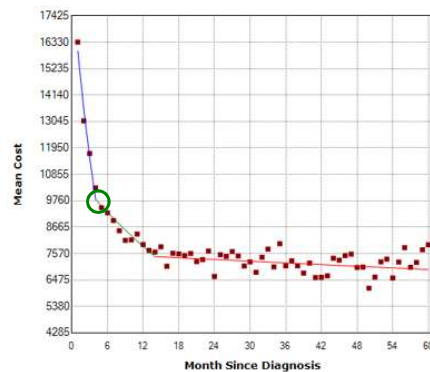


Figure 1. Duration of Initial Phase



Figure 2. Duration of Terminal Phase

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Table 1. Clinical and Sociodemographic Characteristics of NDMM Patients vs Non-cancer Beneficiaries Enrolled in Medicare

Demographic and Clinical Characteristics	Category	Non-cancer group		MM group		p
		N = 4,533		N = 4,533		
Living in urban areas (n, %)	No	313	6.9%	524	11.6%	<0.001
	Yes	4,220	93.1%	4,009	88.4%	
Geographical region (n, %)	Northeast	768	16.9%	954	21.0%	<0.001
	South	941	20.8%	1,231	27.2%	
	Midwest	424	9.3%	575	12.7%	
	West	2,400	53.0%	1,773	39.1%	
Gender (n, %)	Male	1,837	40.5%	2,159	47.6%	<0.001
	Female	2,696	59.5%	2,374	52.4%	
Race (n, %)	White	3,253	71.8%	3,418	75.4%	<0.001
	African American	332	7.3%	663	14.6%	
	Hispanic	230	5.1%	130	2.9%	
	Other	718	15.8%	322	7.1%	

Demographic and Clinical Characteristics	Category	Non-cancer group		MM group		p
		N = 4,533		N = 4,533		
Charlson Comorbidity Index score category (n, %)	0	1,567	34.6%	1,156	25.5%	<0.001
	1	937	20.7%	964	21.3%	
	2	586	12.9%	709	15.6%	
	3+	1,443	31.8%	1,704	37.6%	
Age category (n, %)	66-69	2,046	45.1%	942	20.8%	<0.001
	70-74	793	17.5%	1,278	28.2%	
	75-79	504	11.1%	983	21.7%	
	80-84	424	9.4%	740	16.3%	
	85+	766	16.9%	590	13.0%	
Disability status (n, %)	No	3,460	76.3%	3,668	80.9%	<0.001
	Yes	1,073	23.7%	865	19.1%	
Death (n, %)	No	2,460	54.3%	2,460	54.3%	-
	Yes	2,073	45.7%	2,073	45.7%	

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Table 2. Unadjusted Healthcare Cost Comparison Between Elderly NDMM and Non-cancer Beneficiaries

Cost Type (PMPM)	MM group		Non-cancer group		p
	Mean	Std. Dev	Mean	Std. Dev	
Disease Lifetime*	\$212,475	149,539.6	\$54,086	78,265.3	<0.001
Pre-diagnosis Phase	\$2,081	3,971.0	\$1,567	4,601.3	<0.001
Initial Phase	\$10,385	9,108.2	\$1,618	4,177.1	<0.001
Continuing Care Phase	\$6,083	5,582.0	\$1,495	3,096.5	<0.001
Terminal Phase	\$14,417	11,572.1	\$8,853	13,575.5	<0.001
*Total estimates, not PMPM					

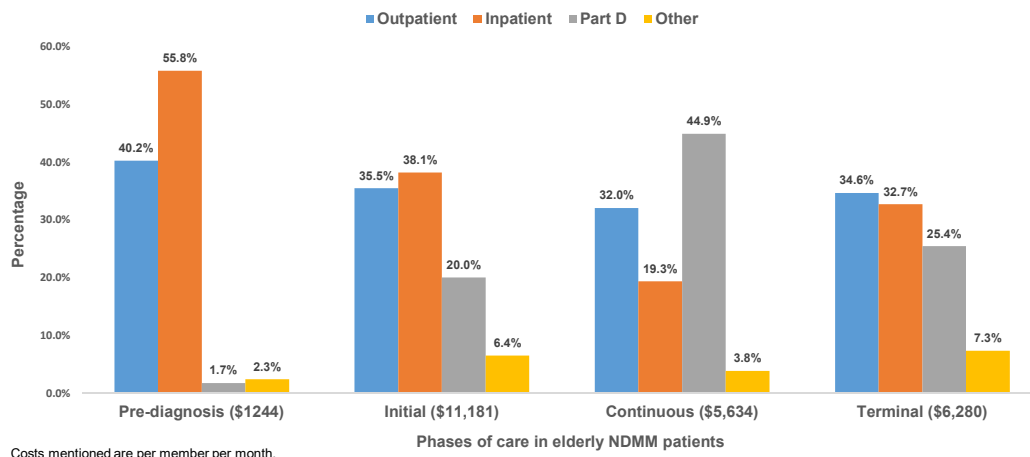
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Table 3. Adjusted Incremental Lifetime and Phase-specific Costs Attributable to MM

Cost Type (PMPM)	Attributable to MM		
	Estimate	95% LCL	95% UCL
Disease Lifetime*	\$184,495	\$183,099	\$185,968
Pre-diagnosis Phase	\$1,244	\$1,216	\$1,272
Initial Phase	\$11,181	\$11,052	\$11,309
Continuing Care Phase	\$5,634	\$5,577	\$5,694
Terminal Phase	\$6,280	\$6,248	\$6,314
*Total estimates, not PMPM; estimates adjusted for clinical and sociodemographic characteristics at baseline			

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Figure 3. Drivers of Incremental MM Costs by Phases of Care



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Discussion

- First study to have used a data-driven approach to estimate the duration of initial and terminal care phases among elderly NDMM patients
- Used a phase-based costing approach to estimate incremental costs for each phase of MM care
 - Post diagnosis cost trends followed a U-shaped curve
- Inpatient and outpatient costs were the major drivers of costs in all the four phases
 - Pharmacy costs were a significant driver of costs in the initial and terminal phases, and were the biggest cost driver in the continuing care phase

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Study Strengths and Limitations

STRENGTHS

- Used a data-driven approach to identify duration of various phases of MM care
- SEER data more accurate than claims-based algorithms for identifying MM diagnosis
- Majority of NDMM patients are 65 years of age or older and Medicare is the primary payer for such patients
- Findings from our study can inform policy decisions, and aid evaluation of alternative payment models in MM

LIMITATIONS

- Claims billing code errors can bias study estimates
- Limited to MM patients enrolled in fee-for-service Medicare
- Lacked information to inform MM staging

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Key takeaway: Findings help quantify burden to Medicare. Results from this study can inform future HTA submissions and aid development of bundled payment models.

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