Abstract
PCN118

Treatment Sequencing Patterns and Costs of Care in Patients With Relapsed/Refractory Multiple Myeloma

Ravi Potluri,[1] Amanda M Farr,[2] Ishan Hirji,[3] Catherine Davis,[4] Hitesh Bhandari,[5] Abderrahim Oukessou[4]

[1]SmartAnalyst Inc., New York, NY, USA; [2]Truven Health Analytics, Cambridge, MA, USA; [3]Bristol-Myers Squibb, Wallingford, CT, USA; [4]Bristol-Myers Squibb, Princeton, NJ, USA; [5]SmartAnalyst India (Pvt.) Ltd, Gurgaon, India

INTRODUCTION

- Multiple myeloma (MM) is a cancer of plasma cells of the bone marrow, and the 5-year survival rate among patients with MM is 45%.[1,2]
- Treatment practices are changing rapidly, with novel agents and stem cell transplantation now recommended for MM treatment.[3]
- An analysis of data from 1999–2007 found that use of traditional chemotherapies has decreased substantially in the US, while use of novel agents (thalidomide, bortezomib, and lenalidomide) has increased.[4]
- Despite the availability of novel therapies and a general improvement in survival, the unmet need continues to be high, with patients requiring multiple lines of treatment.
- As patients go through multiple relapses, the complexity of treatment regimens increases, likely increasing the burden on healthcare resources.
- The current analysis evaluates treatment regimens, sequences, and associated healthcare costs across lines of therapy of patients who have initiated a 2nd-line (2L) therapy.

Objectives

- To evaluate treatment sequences and associated healthcare costs among patients with relapsed or refractory multiple myeloma (RRMM) who have initiated a 2L therapy.

Methods

Study design

- Retrospective cohort analysis.
- Administrative claims data from the 2006–2013 Truven Health MarketScan Commercial and Medicare Research databases were extracted.
- Eligible patients were identified and followed from initiation of a 2L treatment (study index date) until the end of continuous enrollment or end of the follow-up period.
- Progression to subsequent treatment lines was determined using an algorithm based on the timing of administrative claims.

Study population

- Patients were included in the study if they met the following criteria:
  - At least 2 medical claims with a diagnosis of MM (International Classification of Diseases, Ninth Revision, Clinical Modification diagnosis code 203.0x) between January 1, 2007 and December 31, 2013 and initiated a 2L treatment for MM
  - Aged ⩾18 years at diagnosis
- ⩾6 months of continuous enrollment in an employer-sponsored primary or Medicare supplemental health insurance plan, with pharmacy benefits, prior to diagnosis.

Results

- Baseline patient characteristics and clinical characteristics (6 months pre-index period)
- Treatment regimens by line of therapy (2L–4L)
  - 2L (and subsequent lines) of therapy was defined as initiating a new RRMM therapy/regimen >28 days following prior line. Addition of dexamethasone or prednisone did not signal a new line of therapy.
- Sequences of treatment regimens
- Monthly all-cause and MM-specific costs, including inpatient, outpatient, emergency department, and drug costs
- Monthly costs per line (2L vs >2L)
- Costs of progression

Analysis

- To describe lines of therapy and treatment sequencing used as standard of care, trends in usage of treatment regimens and sequences were analyzed:
  - Most frequent treatment regimens used in 2L (1 prior therapy) and in 3L/4L (⩾2 prior therapies) were calculated overall and by prior immunomodulatory drug (IMiD) exposure (i.e. in any of the prior lines).
  - Common treatment sequences of treatment regimens were evaluated.
- Costs were calculated monthly. Average cost measures were reported for treatment regimens and presented by line of therapy. Mean monthly healthcare costs for each cohort were adjusted for censoring.
  - The mean monthly cost of the cohort was estimated by considering both the estimated costs for censored patients and the actual costs for non-censored patients.

Results

Patients

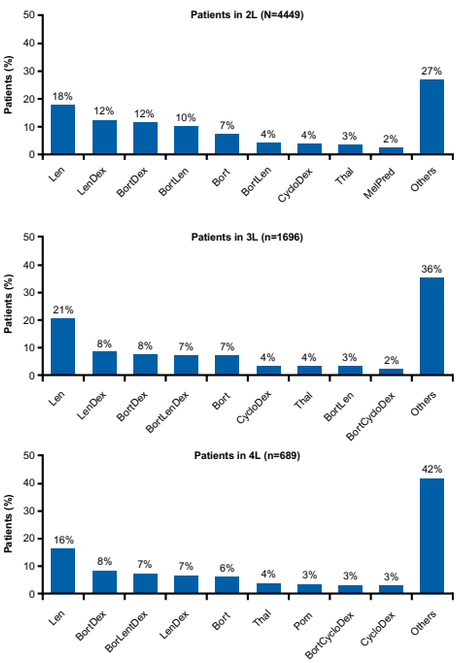
- A total of 4449 patients were identified as initiating 2L treatment for MM. Of these:
  - 1696 (38%) progressed to 3L
  - 689 (15%) progressed to 4L.
- Median follow-up time was 14 months (range 1–83).
- Baseline characteristics of patients with RRMM by line of therapy are described in **Table 1**.
- Median time from start of 2L to start of 3L treatment was 5.8 months. Median time from start of 3L to start of 4L treatment was x.x months.
- The most frequent 2L regimens were lenalidomide, lenalidomide-dexamethasone, bortezomib-dexamethasone, bortezomib-lenalidomide-dexamethasone, and bortezomib (**Figure 1**). The most commonly observed regimens used across 2L–4L are also presented in **Figure 1**.

Table 1. Patient baseline characteristics

Characteristic	All patients receiving 2L (N=4449)	Patients progressing to 3L (n=1696)	Patients progressing to 4L (n=689)
Age, years			
Mean (SD)	64.5 (11.5)	63.9 (11.3)	63.4 (11.1)
Median (range)	63 (22–96)	63 (26–97)	63 (33–88)
Sex			
Male	2506 (56)	956 (56)	400 (58)
Female	1943 (44)	740 (44)	289 (42)
Payer			
Commercial	2436 (55)	981 (58)	422 (61)
Medicare	2013 (45)	715 (42)	0.4
Pre-Charlson Comorbidity Index			
Mean (SD)	4.4 (2.9)	NA	NA
Median (range)	3 (0–16)	NA	NA
Prior stem cell transplantation	480 (11)	NA	NA
Prior immunomodulatory drug	1752 (39)	1348 (79)	643 (93)
Prior proteasome inhibitor	1807 (41)	1248 (74)	597 (87)

Data reported as n (%) unless indicated otherwise.

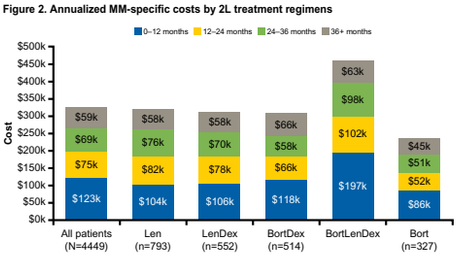
Figure 1. Regimens used in RRMM based on line of therapy



Bort, bortezomib; Cyclo, cyclophosphamide; Dex, dexamethasone; Len, lenalidomide; Pom, pomalidomide; Thal, thalidomide.

- Of patients whose prior therapy included an IMiD, bortezomib-dexamethasone was the most common 2L regimen.
- For patients with no prior IMiD exposure, lenalidomide was the most common 2L treatment.
- Treatment sequences included switches between IMiDs and proteasome inhibitors (PIs).
  - Among the 27% of patients taking lenalidomide in 2L who then progressed to 3L, 64% had bortezomib-based regimens in 3L.
  - Among the 47% of patients taking bortezomib-dexamethasone in 2L who then progressed to 3L, 63% had lenalidomide-based regimens in 3L.
- MM-specific costs were highest for all patients during the first year of 2L treatment compared with subsequent months thereafter (**Figure 2**).
  - This trend was consistent regardless of 2L treatment regimen initiated.

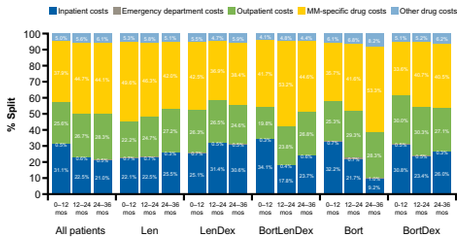
Figure 2. Annualized MM-specific costs by 2L treatment regimens



Bort, bortezomib; Dex, dexamethasone; k, thousand; Len, lenalidomide.

- All drug-related costs accounted for 39–62% of all-cause costs and were dependent on regimen and treatment line (**Figure 3**).
  - For the overall cohort, MM-specific drug-related costs, including regimen and supportive therapies, accounted for 41.5% over a 3-year period.
- Cumulative monthly post-progression costs over 36 months were higher for all treatments (**Table 2**).
  - MM-specific costs after progression from 2L were higher by $122,823 compared with costs incurred pre-progression to a 2L treatment (**Table 2**).

Figure 3. All-cause costs for each regimen cohort in 2L treatment, % split by type of cost



Bort, bortezomib; Dex, dexamethasone; Len, lenalidomide; mo, months.

Table 2. Incremental cost of progression to 3L treatment, based on mean cumulative costs at 36 months by treatment regimen cohort

	n	Cumulative costs at 36 months	Incremental cost for progression to 3L
Overall*	4449	$266,473	
Pre-progression		$216,290	
Post-progression		$339,113	$122,823
Lenalidomide	793	$261,903	
Pre-progression		$238,910	
Post-progression		$324,286	$85,376
Lenalidomide-dexamethasone	552	$253,753	
Pre-progression		$213,904	
Post-progression		$352,951	$139,047
Bortezomib-dexamethasone	514	$241,929	
Pre-progression		$157,279	
Post-progression		$323,894	$166,615

*The overall sum is a weighted average of the pre-progression costs and the post-progression costs.

Limitations

- The study included patients with commercial and Medicare coverage; therefore, results may not be generalizable to patients with RRMM who have other insurance or are without health insurance coverage.
- Progression to subsequent treatment lines was dependent on an algorithm based on the timing of administrative claims. As these data are collected for billing and reimbursement, rather than for clinical factors, misclassification of treatment regimens identified within the lines of therapy is possible.

Conclusions

- In this study of patients with RRMM, 38% progressed from 2L to subsequent treatment lines, with variability in subsequent regimens and treatment sequences.
- Highest costs were incurred during the first 12 months after initiating 2L treatment.
- The cost of managing progressive disease in RRMM is high, as observed by the difference in costs before and after progression from 2L.

References

1. Mayo Clinic. Multiple myeloma. Available at: http://www.mayoclinic.org/diseases-conditions/multiplemyeloma/basics/definition/con-20026607.
2. National Cancer Institute. SEER Stat Fact Sheets: Myeloma. Available at: http://seer.cancer.gov/statfacts/html/mulmy.html.
3. National Comprehensive Cancer Network. NCCN Clinical Practice Guidelines in Oncology: Multiple Myeloma. V2. 2014. Available at www.nccn.org.
4. Warren JL et al. J Clin Oncol 2013;31:1984–9.

Acknowledgments

This study was supported by Bristol-Myers Squibb. The data were provided by Truven Health Analytics, which received funding from Bristol-Myers Squibb. The file build was conducted by Gilwan Kim and Derek Fugh of Truven Health Analytics. SmartAnalyst Inc. was contracted by Bristol-Myers Squibb to assist with methodology design, to carry out data analysis, and to provide publication support. SmartAnalyst India (Pvt.) Ltd assisted SmartAnalyst Inc. and Bristol-Myers Squibb with methodology design, data analysis, and publication support. Professional medical writing and editorial assistance was provided by Kate Jesien, PhD, at Caudex, and was funded by Bristol-Myers Squibb.

Disclosures

RP: employment: SmartAnalyst Inc. AMF: employment: Truven Health Analytics. IH: employment: Bristol-Myers Squibb. CD: employment: Bristol-Myers Squibb. HB: employment: SmartAnalyst India (Pvt.). AO: employment: Bristol-Myers Squibb.

Position only