

Healthcare resource utilization and associated costs for hematopoietic cell transplant recipients: hospital perspective

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INTRODUCTION

- Hematopoietic cell transplantation (HCT) is a potentially curative therapy for certain malignant and non-malignant diseases.¹
- Advances have allowed HCT to be offered as a potential therapy for a greater number of life-threatening diseases.^{1,2}
- A statistical brief of the Agency for Healthcare Research and Quality reported that although HCT is a relatively uncommon procedure, it was among the top 10 procedures with the highest increase in hospital costs from 2004 to 2007 in the United States, increasing from \$694 million to \$1.3 billion during this time, representing a growth rate of 85%.^{2,3}
 - Of this 85% increase, 59% was attributed to an increase in the number of days spent in hospital for HCT.^{2,3}
- Studies that have estimated costs for allogeneic (allo)-HCT and autologous (auto)-HCT vary widely in their methodology: time horizons (e.g. initial hospitalization, first 100 days), payer perspectives, and other factors.⁴
- Because HCT represents a large cost to society, and the majority of the increasing costs are associated with the initial hospitalization, it is important to quantify healthcare resource use and its associated costs from a hospital perspective.

PURPOSE

- The purpose of this study was to evaluate healthcare resource utilization and the associated costs of HCT from a hospital perspective.

METHODS

Study population

- Patients who received an HCT between January 2009 and September 2013 were identified from hospital discharge records based on the International Classification of Diseases, Ninth Revision (ICD-9) codes in the Premier Hospital database. The first HCT procedure was defined as the index event.

Demographics and clinical characteristics

- Demographics, including age, sex, US region of residence, race/ethnicity, health plan type, urban/rural hospital setting, hospital teaching status, hospital size, and clinical characteristics, including Charlson Comorbidity Index (CCI) score and All Patient Refined Diagnosis Related Group (APR-DRG) severity of illness level were evaluated during the index hospitalizations and during the 12 months prior to HCT.
 - The CCI is a commonly used method to assess the overall comorbidity levels among patients. It is a weighted score based on the diagnosis of 19 specific diseases.
 - APR-DRG is a method designed to identify patients by disease severity level. There are 4 different levels of severity: Level 1—Minor, Level 2—Moderate, Level 3—Major, Level 4—Extreme.

Outcome measurements

- Hospital resource utilization in terms of hospital length of stay (LOS) and costs associated with the initial hospitalization for HCT were determined using hospital discharge records.
- Hospital resource utilization was grouped into the following hospital department levels based on the hospitalization records:
 - pharmacy department
 - room and board
 - laboratory tests
 - blood bank services
 - chemotherapy and radiation treatment services

RESULTS

Patients

- Of patients who received allo-HCT (n=1617), mean age was 42.5 years, 38.5% were ≤40 years of age, and 57.0% were male (Table 1).
 - Mean CCI score was 2.3, indicating the average number of comorbid conditions per patient (Table 2).
 - Greater than one-third of allo-HCT recipients had an APR-DRG illness severity level of 3—Major and 4—Extreme (Table 2).
 - During index HCT hospitalizations 118 deaths occurred, resulting in an evaluable population of 1499 allo-HCT patients.
- Of patients who received auto-HCT (n=2776), mean age was 55.0 years, 15.1% were ≤40 years of age, and 58.5% were male (Table 1).
 - Mean CCI score was 3.0, indicating the average number of comorbid conditions per patient (Table 2).
 - The majority (57.0%) of auto-HCT recipients had an APR-DRG illness severity level of 1—Minor (Table 2).
 - During index HCT hospitalizations 39 deaths occurred, resulting in an evaluable population of 2737 auto-HCT patients.

Table 1. Demographics

Demographic	Allo-HCT n=1617	Auto-HCT n=2776
Age (years)		
Mean (SD)	42.5 (20.7)	55.0 (15.5)
Median	48	59
	n	%
Age group		
0–20 years	325	20.1
21–40 years	297	18.4
41–50 years	262	16.2
51–60 years	367	22.7
≥61 years	366	22.6
Adult/Pediatric		
Adult (≥18 years old)	1328	82.1
Pediatric (<18 years old)	289	17.9
Sex		
Female	696	43.0
Male	921	57.0
US region		
Midwest	133	8.2
Northeast	909	56.2
South	554	34.3
West	21	1.3
Race/Ethnicity		
Black	179	11.1
Hispanic	37	2.3
Other	375	23.2
White	1026	63.5
Urban/Rural hospital		
Rural	92	5.7
Urban	1525	94.3
Teaching		
No	57	3.5
Yes	1560	96.5
Number of beds		
<200	127	7.9
200–399	140	8.7
400–599	180	11.1
≥600	1170	72.4

Allo-HCT: allogeneic hematopoietic cell transplantation; Auto-HCT: autologous HCT; SD: standard deviation.

Table 2. Clinical characteristics

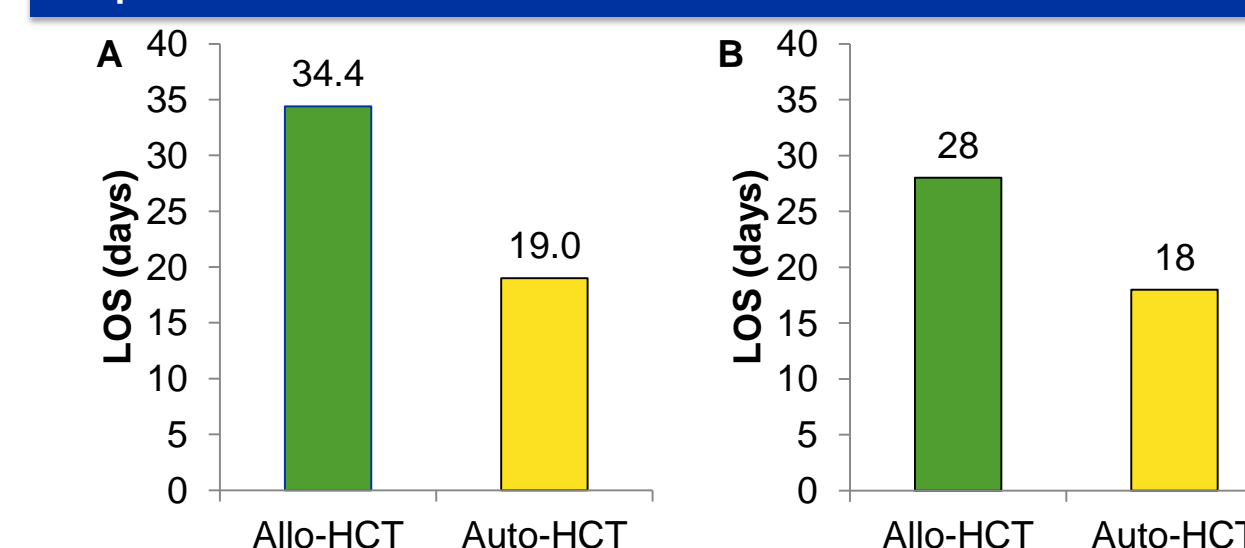
Clinical characteristic	Allo-HCT n=1617	Auto-HCT n=2776
CCI		
Mean (SD)	2.3 (1.7)	3.0 (1.8)
Median	2	2
	n	%
CCI group		
0	257	15.9
1–2	830	51.3
3–4	415	25.7
≥5	115	7.1
APR-DRG severity level		
1—Minor	466	28.8
2—Moderate	551	34.1
3—Major	263	16.3
4—Extreme	337	20.8

Allo-HCT: allogeneic hematopoietic cell transplantation; Auto-HCT: autologous HCT; SD: standard deviation; CCI: Charlson Comorbidity Index; APR-DRG: All Patient Refined Diagnosis Related Group.

Outcomes

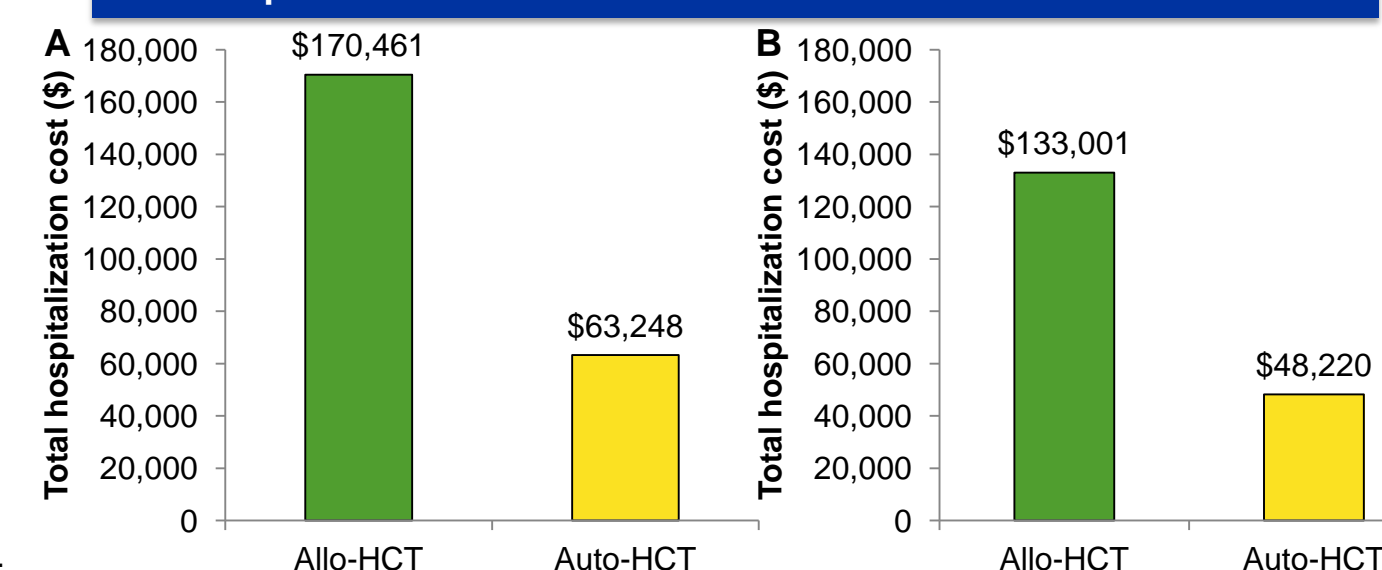
- The mean LOS for the initial hospitalizations for HCT per patient were 34.4 days (standard deviation [SD]: ±23.3; median: 28) and 19.0 days (SD: ±9.1; median: 18) for patients who received allo-HCT and auto-HCT, respectively (Figure 1).

Figure 1. A) Mean and B) median length of stay (LOS) for initial HCT hospitalization



- Total mean hospitalization costs for the initial hospitalizations for HCT per patient were \$170,461 (SD: ±\$165,291; median: \$133,001; quartile [Q] 3: \$198,543, Q1: \$84,141) and \$63,248 (SD: ±\$56,357; median: \$48,220; Q3: \$68,413, Q1: \$36,424) for patients who received allo-HCT and auto-HCT, respectively (Figure 2).
 - Total mean hospitalization costs per day for the initial hospitalizations for HCT per patient were \$5,002 (SD: ±\$4,240; median: \$4,572; Q3: \$5,823, Q1: \$3,333) and \$3,381 (SD: ±\$1,998; median: \$2,894; Q3: \$3,664, Q1: \$2,324) for patients who received allo-HCT and auto-HCT, respectively.

Figure 2. A) Mean and B) median total hospitalization costs for initial HCT hospitalization



- The greatest contributors to mean total hospitalization costs of HCT recipients were the pharmacy department (allo-HCT: \$53,735; auto-HCT: \$26,662), followed by room and board (allo-HCT: \$47,068; auto-HCT: \$23,916), and laboratory tests (allo-HCT: \$28,602; auto-HCT: \$6,810) (Table 3).

Table 3. Breakdown of mean total hospitalization costs for initial HCT hospitalization by hospital department (US\$)

Hospital department (selected list)	Allo-HCT	Auto-HCT
Pharmacy department	53,735	26,662
Room and board	47,068	23,916
Laboratory tests	28,602	6,810
Blood bank services	17,416	4,411
Chemotherapy and radiation treatment services	3,536	1,112
Total cost	170,461	63,248

Allo-HCT: allogeneic hematopoietic cell transplantation; Auto-HCT: autologous HCT.

LIMITATIONS

- While the Premier Hospital database has information from a large number of hospitals across the United States, it may not be representative of all types of transplant centers. Thus, the study findings may not be representative of all HCT transplant recipients.
- While errors in the hospital administrative data and diagnosis coding could potentially have occurred in the database, the Premier Hospital database is considered a high quality data source that has been widely used in many other real-world research studies.

CONCLUSIONS

- Our study helps to quantify the mean and range of current hospital outlays for the initial hospitalization for recipients of both allo- and auto-HCTs.
- Based on this analysis of hospital records between 2009 and 2013, implementation of strategies to optimize the care of HCT recipients continues to be critical to reduce the healthcare and economic burden of HCT to hospitals.

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DISCLOSURES

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