3270 The Cost of Hematopoietic Stem Cell Transplantation and Associated Conditioning Regimens

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Background

- Hematopoietic stem cell transplantation (HSCT) requires highly specialized, resource-intensive care
- Nearly 20,000 HSCTs were performed in the United States in 2011[1]
- From 2004 to 2007, HSCT-related costs grew to US$1.3 billion, among the largest (84.9%) increases for hospital procedures[2]
- Choice of transplant graft type (autologous [auto] or allogeneic [allo]) and conditioning regimen (myeloablative [MA], nonmyeloablative [NMA], or reduced-intensity conditioning [RIC]) may influence health outcomes and costs associated with HSCT

Objective

- To estimate 100-day and 1-year costs associated with HSCT, adjusting for conditioning regimen and other potential contributors of cost

Methods

STUDY DESIGN & DATA SOURCE

- Retrospective cohort study using MarketScan database from 1/2/2010 to 9/23/2013

SELECTION CRITERIA

- Inclusion criteria: 1) underwent inpatient allo or auto HSCT and 2) received MA or NMA/RIC conditioning regimen prior to HSCT
- Exclusion criteria: 1) admitted to hospital for HSCT during 1-year baseline period; 2) had enrollment gap during baseline or within 100 days after index HSCT; 3) patients whose conditioning regimen was undeterminable

IDENTIFICATION OF CONDITIONING REGIMEN

- Clinician expert input used to develop an algorithm to determine conditioning regimen
- Algorithm based on underlying malignancy, type of treatment (eg, chemotherapy type, radiation), location of service, and therapy timing

PRIMARY OUTCOME

- Healthcare costs occurring between 10 days prior to 100 days and 1 year post-HSCT, stratified by graft type, conditioning regimen, and age group (pediatric age was <18 years)

Results

PATIENT COHORT

- 1564 patients, who were predominantly adults (**Table 1**), had inpatient HSCT and identifiable graft and conditioning regimen types: 398 MA allo, 195 NMA/RIC allo, and 969 MA auto
  - —Initially, 6671 patients had inpatient HSCT (ICD-9-CM: 41.0x)
  - —We excluded 25 patients with unknown graft type, 4300 whose regimen was undeterminable, 782 not continuously enrolled, and all NMA/RIC auto patients due to a sample size (n=3)

Table 1. Baseline Characteristics

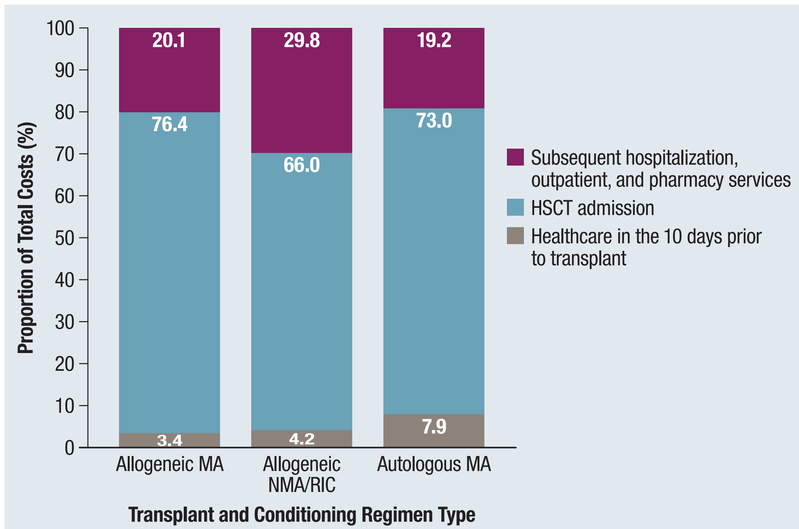
Characteristic		All (N=1564)
Age, mean (SD)		48.6 (16.4)
Age group, n (%)	<18 years	111 (7.1)
	18–40 years	287 (18.4)
	41–60 years	788 (50.4)
	≥61 years	378 (24.2)
Female, n (%)		610 (39.0)
Diagnosis for HSCT, n (%)[a]		1560 (99.7)
	Lymphoma	976 (62.4)
	Aplastic anemia	724 (46.3)
	Acute lymphocytic leukemia	336 (21.5)
	Acute myeloid leukemia	176 (11.3)
	Chronic lymphocytic leukemia	112 (7.2)
	Multiple myeloma and plasma cell neoplasms	111 (7.1)
	Myelodysplastic syndrome	46 (2.9)
	Chronic myeloid leukemia	21 (1.3)
	Sarcoma	2 (0.1)

[a]Patients could have had more than 1 diagnosis indicated in relation to the index HSCT.
HSCT, hematopoietic stem cell transplantation; SD, standard deviation.

100-DAY AND 1-YEAR COSTS AND HOSPITALIZATION

- In the first 100 days after HSCT, median total healthcare costs (US$) were $289,283 (MA allo), $253,467 (NMA/RIC allo), and $140,792 (MA auto)
  - —Cost of the HSCT admission made up 73%–76% of 100-day costs for MA patients and 66% for those receiving NMA/RIC (**Figure 1**)
  - —Mean lengths of stay (LOS) for the index HSCT admission were 35.6 (MA allo), 26.6 (NMA/RIC allo), and 21.8 days (MA auto)

Figure 1. Relative Contribution of Services to Total Costs within 100 Days after HSCT



HSCT, hematopoietic stem cell transplantation; MA, myeloablative; NMA, nonmyeloablative; RIC, reduced-intensity conditioning.

- Subsequent hospitalization in the first 100 days occurred in 42.5% of MA allo patients with mean LOS of 9 days compared with 43.6% and 11 days (NMA/RIC allo), and 20.8% and 6.5 days (MA auto)
- 100-day total median costs (US$) were more than two-thirds of costs at 1 year (**Table 2**), which were $408,876 (MA allo), $374,065 (NMA/RIC allo), and $181,933 (MA auto)
- 1-year and 100-day hospitalization results had similar patterns
- Costs for the index HSCT and 100-day inpatient and outpatient services were greater among pediatric patients compared with adults, for all graft and conditioning types (results not shown)

Table 2. Costs (US$) and Hospitalization within 100 Days and 1 Year after HSCT

	100-Day Follow-up			1-Year Follow-up		
	Allogeneic		Autologous	Allogeneic		Autologous
	MA n=398	NMA/RIC n=195	MA n=969	MA n=398	NMA/RIC n=195	MA n=969
Total healthcare costs,[a] median (US$)	289,283	253,467	140,792	408,876	374,065	181,933
Inpatient costs	239,959	182,256	113,272	276,620	235,620	121,277
Outpatient costs	40,655	41,349	18,400	81,575	83,435	42,294
Pharmacy costs	6,451	6,551	673	14,429	15,487	2,043
Cost of index HSCT admission,[b] median (US$)	208,857	161,241	110,209	n/a	n/a	n/a
Length of stay of index HSCT admission, mean (SD)	35.6 (26.4)	26.6 (22.1)	21.8 (12.8)	n/a	n/a	n/a
Any subsequent hospitalization, n (%)[c]	160 (42.5)	85 (43.6)	202 (20.8)	268 (67.2)	135 (69.2)	367 (37.9)
Total days of stay, mean (SD)[d]	9.0 (15.0)	11.0 (16.8)	6.5 (12.8)	26.6 (32.5)	30.2 (31.9)	18.0 (21.4)

[a]Total costs derived from claims between 10 days prior to 100 days/1 year after transplantation. [b]Index HSCT admission cost is a component of total healthcare costs; it represents healthcare costs from 10 days prior to through discharge from the index admission. [c]Within 100 days/1 year of transplant. [d]Among patients with hospitalization within 100 days/1 year of follow-up.
HSCT, hematopoietic stem cell transplantation; MA, myeloablative; n/a, not applicable; NMA, nonmyeloablative; RIC, reduced-intensity conditioning; SD, standard deviation.

Discussion

- HSCT is a costly procedure, with 100-day median costs (US$) ranging from $140,792 to $289,283, and 1-year costs from $181,933 to $408,876
- HSCT costs vary substantially by graft type, conditioning regimen, and age group
  - —Allo HSCT was more expensive than auto HSCT, similar to previous work,[3] and MA conditioning was more costly than NMA/RIC, likely due to more complex procedures and higher-intensity regimens (evidenced by longer hospital stays)
  - —Consistent with past research,[3] pediatric patients had higher admission and healthcare costs after HSCT compared with adults controlling for graft and regimen type, which may reflect special resources needed to perform pediatric transplants
  - —Factors such as underlying malignancy and disease severity may also influence costs, but could not be adjusted for in our analysis due to sample size and absent clinical data to assess severity
- A limitation of this initial analysis is that our results are sample-specific because we excluded nearly two-thirds of patients whose conditioning regimen was undeterminable. In addition, few NMA/RIC auto patients were identified because they are treated in the outpatient setting
- Future research should target a broader patient population that includes complete conditioning regimen data and all HSCT regardless of treatment setting

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