

## Supplemental Methods

Supplemental Table 1. Definition and extraction of geriatric and laboratory variables

<b>Variables</b>	<b>Definition</b>	<b>Extraction Time</b>
<b>Delirium</b>	An acute, transient, usually reversible, fluctuating disturbance in attention, usually associated with either disorganized thinking and cognition, or altered level of consciousness based on Confusion Assessment Method (CAM) <sup>32</sup> . Primary neurological events such as seizure, stroke, or significant hemorrhage were excluded.	Start of conditioning to 100 days post stem cell infusion
<b>Fall</b>	A patient coming to rest on the ground or another lower level; sometimes a body part strikes against an object that breaks the fall <sup>37</sup> . Syncope, loss of consciousness, or primary neurological events were excluded.	Start of conditioning to 100 days post stem cell infusion
<b>Activities of Daily Living (ADL)</b>	Bathing, dressing, toileting, transferring, continence, and feeding.	Within 2 weeks of transplant admission
<b>Potentially inappropriate medications (PIM)</b>	Defined by 2015 American Geriatrics Society (AGS) Beers Criteria <sup>33</sup> . Some examples include daily use of following drug categories: <ol style="list-style-type: none"> <li>1. First-generation antihistamines (anticholinergics)</li> <li>2. Antispasmodics</li> <li>3. Central or peripheral alpha blockers</li> <li>4. Short and long-acting benzodiazepines</li> <li>5. Barbiturates</li> <li>6. Antidepressants with anticholinergic activity</li> <li>7. Proton-pump inhibitors</li> <li>8. Sliding scale insulin and long-acting sulfonylureas</li> </ol>	Within 2 weeks of transplant admission

	9. Pain medications (meperidine, nonsteroidal anti-inflammatory drugs, and skeletal muscle relaxants)	
<b>Prior falls</b>	Any fall within the last year.	Within 2 weeks of transplant admission
<b>Weight loss</b>	More than 10 pounds within the last 3 months.	Within 2 weeks of transplant admission
<b>Albumin level (g/dL)</b>	Serum albumin level in gram/deciliter	Within 2 weeks of transplant admission
<b>Platelet (k/<math>\mu</math>L)</b>	Platelet in 1,000/microliter	Within 2 weeks of transplant admission
<b>Creatinine clearance (mL/min)</b>	Creatinine clearance calculated by the Cockcroft-Gault Equation in milliliter/minute	Within 2 weeks of transplant admission

Supplemental Table 2. Univariates associated with delirium and fall

		Delirium			Fall		
		No./Total	HR (95% CI)	<i>p</i>	No./Total	HR (95% CI)	<i>p</i>
<b>Age</b>				<b>0.065</b>			<b>0.017</b>
	<70	104/466	Reference		25/466	Reference	
	≥70	8/61	0.54 (0.26-1.11)		9/61	2.77 (1.29-5.93)	
<b>Gender</b>				<b>0.006</b>			0.245
	Female	56/203	Reference		10/203	Reference	
	Male	56/324	0.59 (0.41-0.86)		24/324	1.53 (0.73-3.2)	
<b>Transplant year</b>				<b>0.096</b>			0.499
	<2010	32/121	Reference		6/121	Reference	
	≥2010	80/406	0.70 (0.46-1.05)		28/406	1.34 (0.56-3.24)	
<b>KPS</b>				0.227			0.497
	≥90	50/261	Reference		19/261	Reference	
	<90	62/266	1.26 (0.87-1.82)		15/266	0.79 (0.4-1.56)	
<b>HCT-CI</b>				<b>0.086</b>			0.432
	0-2	42/233	Reference		13/233	Reference	
	≥3	70/294	1.39 (0.95-2.04)		21/294	1.32 (0.66-2.63)	
<b>DRI, revised</b>				0.218			<b>0.09</b>
	Low/Interm.	77/386	Reference		29/386	Reference	
	High/very high	35/141	1.29 (0.87-1.93)		5/141	0.47 (0.18-1.21)	
<b>Graft source</b>				<b>0.006</b>			0.459
	BM	12/40	Reference		2/40	Reference	
	PBSC	85/453	0.61 (0.34-1.12)		28/453	1.24 (0.3-5.21)	
	CBU	15/34	1.55 (0.72-3.31)		4/34	2.47 (0.45-13.5)	
<b>GVHD prophy.</b>				0.797			0.43
	CD34+	47/241	Reference		12/241	Reference	
	Unmodified	61/265	1.13 (0.77-1.65)		20/265	1.52 (0.74-3.12)	
	PT-Cy	4/21	0.94 (0.34-2.6)		2/21	1.97 (0.44-8.82)	
<b>Conditioning</b>				0.408			<b>0.034</b>
	Myeloablative	72/327	Reference		15/327	Reference	
	RIC/NMA	40/200	0.85 (0.58-1.25)		19/200	2.07 (1.05-4.08)	
<b>Recipient CMV</b>				>0.99			0.882
	Negative	44/208	Reference		14/208	Reference	
	Positive	68/319	1.0 (0.68-1.46)		20/319	0.95 (0.48-1.88)	
<b>ADL</b>				0.141			<b>0.004</b>
	Normal	105/507	Reference		29/507	Reference	
	Impaired	7/20	1.87 (0.87-4.03)		5/20	5.49 (2.12-14.2)	

<i>PIM user</i>				<b>0.003</b>		0.373
	<b>No</b>	47/284	Reference		16/284	Reference
	<b>Yes</b>	65/243	1.75 (1.21-2.55)		18/243	1.36 (0.69-2.66)
<i>Prior falls</i>				<b>&lt;0.001</b>		<b>0.056</b>
	<b>No</b>	77/427	Reference		23/427	Reference
	<b>Yes</b>	35/99	2.18 (1.46-3.25)		11/99	2.09 (1.02-4.29)
<i>Weight loss</i>				0.453		0.947
	<b>No</b>	95/435	Reference		28/435	Reference
	<b>Yes</b>	17/92	0.82 (0.49-1.38)		6/92	1.03 (0.43-2.49)
<i>Albumin</i>				0.128		0.152
	<b>&lt;3.5</b>	10/31	Reference		4/31	Reference
	<b>≥3.5</b>	102/496	0.58 (0.30-1.11)		30/496	0.43 (0.15-1.21)
<i>Platelet (k/<math>\mu</math>L)</i>				<b>0.002</b>		0.709
	<b>≥50</b>	87/459	Reference		29/459	Reference
	<b>&lt;50</b>	25/68	2.15 (1.38-3.36)		5/68	1.2 (0.47-3.11)
<i>Creatinine Cl.</i>				<b>0.009</b>		0.793
	<b>≥60</b>	93/472	Reference		31/472	Reference
	<b>&lt;60</b>	19/55	2.03 (1.24-3.33)		3/55	0.86 (0.26-2.8)

**Abbreviations:** No., Number of events; Total, Number of patients with each variable; HR, Hazard Ratio; CI, Confidence Interval; KPS, Karnofsky Performance Scale; HCT-CI, Hematopoietic cell transplantation-comorbidity index; DRI, Disease Risk Index; Interm., Intermediate; BM, Bone Marrow; PBSC, Peripheral Blood Stem Cell; CBU, Cord Blood Unit; RIC/NMA, Reduced-intensity/non-myeloablative conditioning; CMV, Cytomegalovirus; GVHD, Graft versus host disease; PT-Cy, Post-transplant cyclophosphamide; ADL, Activities of Daily Living; PIM, Potentially inappropriate medication; Creatinine Cl., Creatinine Clearance in milliliter/minute

Supplemental Table 3. Univariates associated with NRM and OS

	NRM			OS		
	No./Total	HR (95% CI)	<i>p</i>	No./Total	HR (95% CI)	<i>p</i>
<b><i>Delirium (d100)</i></b>			<b>0.004</b>			0.224
<b>No</b>	82/362	Reference		192/389	Reference	
<b>Yes</b>	32/71	1.88 (1.24-2.85)		44/76	1.23 (0.89-1.72)	
<b><i>Fall (d100)</i></b>			<b>0.018</b>			<b>0.055</b>
<b>No</b>	102/409	Reference		218/437	Reference	
<b>Yes</b>	12/24	2.23 (1.23-4.07)		18/28	1.66 (1.03-2.68)	
<b><i>Age</i></b>			0.55			0.997
<b>&lt;70</b>	152/466	Reference		266/466	Reference	
<b>≥70</b>	15/61	0.85 (0.5-1.45)		32/61	1 (0.69-1.44)	
<b><i>Gender</i></b>			0.571			0.387
<b>Female</b>	62/203	Reference		108/203	Reference	
<b>Male</b>	105/324	1.1 (0.8-1.5)		190/324	1.11 (0.88-1.41)	
<b><i>Transplant year</i></b>			<b>0.019</b>			0.106
<b>&lt;2010</b>	56/121	Reference		87/121	Reference	
<b>≥2010</b>	111/406	0.66 (0.48-0.93)		211/406	0.81 (0.62-1.04)	
<b><i>KPS</i></b>			<b>0.01</b>			<b>0.031</b>
<b>≥90</b>	69/261	Reference		134/261	Reference	
<b>&lt;90</b>	98/266	1.5 (1.1-2.05)		164/266	1.29 (1.02-1.62)	
<b><i>HCT-CI</i></b>			<b>&lt;0.001</b>			<b>0.001</b>
<b>0-2</b>	55/233	Reference		118/233	Reference	
<b>≥3</b>	112/294	1.98 (1.43-2.75)		180/294	1.48 (1.17-1.87)	
<b><i>DRI, revised</i></b>			0.129			<b>&lt;0.001</b>
<b>Low/Interm.</b>	123/386	Reference		200/386	Reference	
<b>High/very high</b>	44/141	1.32 (0.93-1.86)		98/141	1.74 (1.36-2.22)	
<b><i>Graft source</i></b>			<b>0.009</b>			<b>0.009</b>
<b>BM</b>	12/40	Reference		24/40	Reference	
<b>PBSC</b>	137/453	0.71 (0.39-1.28)		249/453	0.64 (0.42-0.97)	
<b>CBU</b>	18/34	1.61 (0.77-3.35)		25/34	1.13 (0.64-1.98)	
<b><i>GVHD prophyl.</i></b>			0.673			0.759
<b>CD34+</b>	90/241	Reference		139/241	Reference	
<b>Unmodified</b>	72/265	0.87 (0.64-1.19)		149/265	1.08 (0.86-1.37)	
<b>PT-Cy</b>	5/21	0.96 (0.39-2.36)		10/21	1.15 (0.6-2.19)	
<b><i>Conditioning</i></b>			<b>0.084</b>			0.501
<b>Myeloablative</b>	117/327	Reference		191/327	Reference	
<b>RIC/NMA</b>	50/200	0.75 (0.54-1.05)		107/200	0.92 (0.73-1.17)	

<b>Recipient CMV</b>			<b>0.027</b>		<b>0.002</b>
<b>Negative</b>	57/208	Reference		102/208	Reference
<b>Positive</b>	110/319	1.43 (1.04-1.97)		196/319	1.45 (1.14-1.84)
<b>ADL</b>			<b>0.029</b>		<b>0.082</b>
<b>Normal</b>	159/507	Reference		286/507	Reference
<b>Impaired</b>	8/20	2.47 (1.2-5.05)		12/20	1.75 (0.98-3.12)
<b>PIM user</b>			<b>0.005</b>		<b>0.036</b>
<b>No</b>	76/284	Reference		151/284	Reference
<b>Yes</b>	91/243	1.54 (1.14-2.09)		147/243	1.28 (1.02-1.6)
<b>Prior falls</b>			0.944		0.563
<b>No</b>	136/427	Reference		239/427	Reference
<b>Yes</b>	30/99	1.01 (0.68-1.51)		58/99	1.09 (0.82-1.45)
<b>Weight loss</b>			0.682		0.116
<b>No</b>	139/435	Reference		242/435	Reference
<b>Yes</b>	28/92	1.09 (0.73-1.64)		56/92	1.27 (0.95-1.7)
<b>Albumin</b>			0.246		0.107
<b>&lt;3.5</b>	12/31	Reference		21/31	Reference
<b>≥3.5</b>	155/496	0.69 (0.39-1.25)		277/496	0.68 (0.44-1.06)
<b>Platelet (k/μL)</b>			0.247		0.164
<b>≥50</b>	143/459	Reference		257/459	Reference
<b>&lt;50</b>	24/68	1.3 (0.84-2.01)		41/68	1.27 (0.92-1.77)
<b>Creatinine Cl.</b>			<b>0.03</b>		<b>0.032</b>
<b>≥60</b>	144/472	Reference		261/472	Reference
<b>&lt;60</b>	23/55	1.69 (1.08-2.62)		37/55	1.49 (1.05-2.1)

**Abbreviations:** No., Number of events; Total, Number of patients with each variable; HR, Hazard Ratio; CI, Confidence Interval; KPS, Karnofsky Performance Scale; HCT-CI, Hematopoietic cell transplantation-comorbidity index; DRI, Disease Risk Index; Interm., Intermediate; BM, Bone Marrow; PBSC, Peripheral Blood Stem Cell; CBU, Cord Blood Unit; RIC/NMA, Reduced-intensity/non-myeloablative conditioning; CMV, Cytomegalovirus; GVHD, Graft versus host disease; PT-Cy, Post-transplant cyclophosphamide; ADL, Activities of Daily Living; PIM, Potentially inappropriate medication; Creatinine Cl., Creatinine Clearance in milliliter/minute

**Supplemental Table 4. Examples of Prevention and Treatment Strategies**

<b>Delirium (references 32, 42, 47)</b>	<b>Fall (references 36, 41, 48)</b>
Early recognition of risk factors	Early recognition of risk factors
Engage family caregiver and volunteers	Intensified physical and occupational therapy
Treat modifiable risk factors, infections, metabolic, toxic, acute illness etc.	Assess visual and hearing impairments and provide assistive devices as needed
Meticulous medication management	Meticulous medication management
Nonpharmacologic approaches first before antipsychotic agents	Vitamin D supplementation
Proactive, multifactorial nonpharmacologic delirium prevention protocols	Proactive, multifactorial nonpharmacologic fall prevention protocols
Proactive geriatric consultation in high risk patients	Rehabilitation consultation