Medical Complications and Predictive Factors for Medically Unstable Conditions in an Acute Inpatient Cancer Rehabilitation Service

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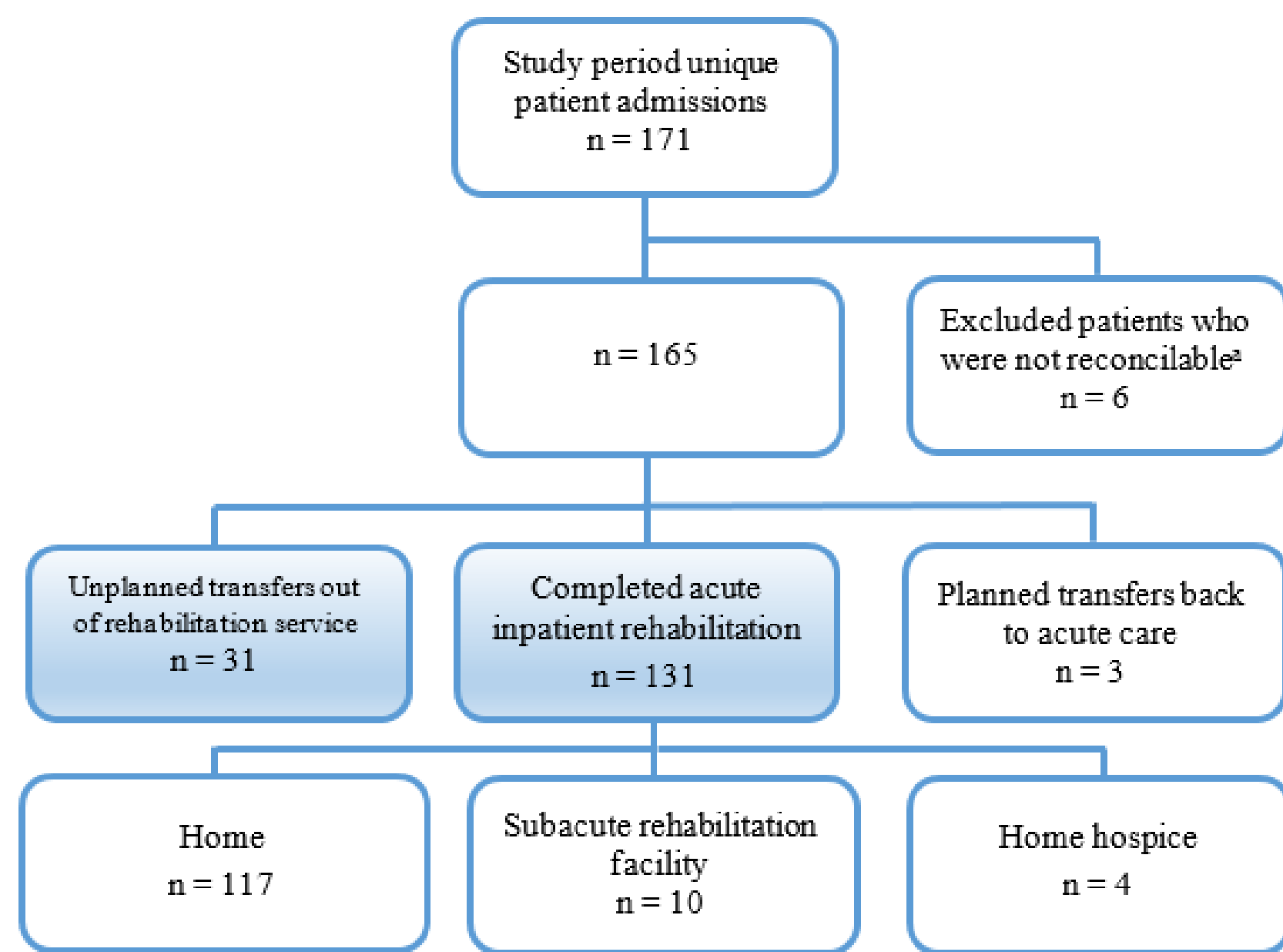The future of physiatry happens here.
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Objectives

- Cancer patients may require acute care management that is typically not performed in conventional acute inpatient rehabilitation programs.
- The purpose of this study was to describe the frequency and types of medical complications and interventions in cancer patients undergoing acute inpatient rehabilitation.
- We also analyzed factors predictive for return to acute care services in this heterogeneous mix of neoplasm patients.

Design

- We reviewed the records of all consecutive patients admitted to acute inpatient rehabilitation from September 1, 2017 through February 28, 2018.
- Presenting problem noted to be a significant change in medical status using the Centers for Medicare & Medicaid Services' (CMS) Evaluation and Management Service Guide was defined as a medical complication.
- We recorded demographic and clinical characteristics, medical complications and related interventions, and the discharge or transfer destinations. Multivariable logistic regression analysis were performed to assess factors predicting for returning to acute care services.

Figure 1. Flow of Patients

a These were patients from the admissions log whose names and medical record numbers did not match in the electronic health records.

Results

- Among 165 evaluable patients, 158 (96%) had at least one medical complication, and 31 (19%) had an unplanned return to acute care.
- The most common medical complications categories were electrolyte abnormalities 81 (50%), musculoskeletal 70 (43%), genitourinary/renal 61 (38%), hematologic 58 (36%), and cardiovascular problems 46 (28%).
- The interventions included medication management 151 (93%), laboratory tests 106 (65%), diagnostic tests 101 (62%), consultations 124 (77%), and procedures 32 (20%).
- Multivariable analysis showed that tachycardia (OR=7.83, 95% CI (2.23, 27.54), p=0.001) and weekly or more frequent red blood cell transfusions (OR=5.23, 95% CI (1.39, 19.64), p=0.014) were independently associated with unplanned return to acute care.

Conclusions

- A high frequency and wide range of medical complications and interventions occur in cancer patients undergoing acute inpatient rehabilitation.
- Close monitoring and expertise are needed for this patient population.

Table 1: Demographic and clinical characteristics of patients who underwent acute inpatient rehabilitation (n=165)

	Total Unplanned transfers + completed rehabilitation + planned transfers n = 165 (%)	Unplanned transfer group + completed rehab group n = 162		p-value[b]
		Group 1 Unplanned return to acute care service n = 31 (%)	Group 2 Completed rehabilitation n = 131 (%)[c]	
	Median (IQR[c])	Median (IQR)	Median (IQR)	
Age	64 (55-71)	63 (58-71)	65 (53-71)	0.356
Hospital length of stay in days before transfer to rehabilitation	11 (8-18)	17 (10-34)	11 (7-17)	0.043
Acute inpatient rehabilitation length of stay in days	11 (8-14)	8 (5-12)	12 (9-15)	0.018
Hospital length of stay total number of days	26 (20-36)	41 (30-59)	23 (18-32)	<0.001
Race	n (%)	n (%)	n (%)	
· Caucasian/White	118 (72)	21 (68)	95 (73)	0.786
· African American/Black	20 (12)	3 (10)	16 (12)	
· Asian	7 (4)	2 (6)	5 (4)	
· Other	20 (12)	5 (16)	15 (11)	
Hispanic ethnicity	26 (16)	4 (13)	22 (17)	0.596
Female gender	84 (51)	19 (61)	65(50)	0.242
Married	117 (71)	25 (74)	92 (70)	0.826
Insurance				
· Medicare	94 (57)	17 (55)	75 (57)	0.602
· Commercial	58 (35)	13 (42)	44 (34)	
· Self-pay	7 (4)	0	7 (5)	
· Medicaid	4 (2)	1 (3)	3 (2)	
· Other governmental	2 (1)	0	2 (2)	
Neoplasm type[d]				
· Brain and other nervous system	39 (24)	4 (13)	35 (27)	0.106
· Hematologic and lymphatic	34 (21)	11 (35)	23 (18)	0.028
· Bones and connective tissues	25 (15)	1 (3)	24 (18)	0.036
· Genitourinary	19 (12)	4 (13)	15 (11)	0.821
· Breast	12 (7)	2 (6)	10 (8)	0.821
· Respiratory	12 (7)	4 (13)	8 (6)	0.194
· Digestive system	9 (6)	1 (3)	8 (6)	0.529
· Skin	6 (4)	2 (6)	4 (3)	0.368
· Others	6 (4)	2 (6)	4 (3)	0.368
Laboratory values upon admission to acute inpatient rehabilitation	Median (IQR)	Median (IQR)	Median (IQR)	p-value
· White blood cell count, reference range: 4-11 K/µL	7.4 (5.1-9.5)	5.7 (2.9-8.3)	7.7 (5.5-9.7)	0.021
· Hemoglobin, reference range: 12-16 gm/dL	10.0 (9.1-11.1)	9.65 (8.7-11.1)	10.2 (9.2-11.2)	0.239
· Platelet, reference range: 140-440 K/µL	205 (110-303)	118 (27-225)	229 (127-309)	0.005
· Creatinine, reference range: 0.60-1.00 mg/dL	0.68 (0.56-0.87)	0.67 (0.54-0.97)	0.69 (0.56-0.87)	0.601
· Sodium, reference range: 135-147 mEq/L	138.5 (136-141)	138 (135-141)	139 (136-141)	0.842
· Albumin,[d] reference range: 3.5-4.7 mg/dL	3.3 (2.9-3.9)	3.0 (2.8-3.4)	3.3 (3-3.95)	0.100
· Prealbumin, reference range: 20-40 mg/dL	18.7 (13.4-27.2)	17.5 (12-23)	19.5 (13.4-27.5)	0.306

[a]Three patients had a planned return to acute care after completion of rehabilitation and are not included in this group.
[b]Nonparametric equality-of-medians test for continuous variables and Pearson's chi-square or Fisher's exact test for categorical variables. Boldface indicates a statistically significant difference.
[c]Results as median (IQR 25-75)
[d]Included oral cavity and pharynx, endocrine, and other soft tissue neoplasms.
[e]Laboratory values are those reported upon admission to acute inpatient rehabilitation service except for albumin, which is from the closest day within 3 weeks of admission to rehabilitation.

Table 2: Medical complications and interventions during acute inpatient rehabilitation

Medical complications[a] by organ system	Total Unplanned transfers + completed rehabilitation[b] n=162 (%)	Group 1 Unplanned return to acute care service n=31 (%)	Group 2 Completed rehabilitation n=131 (%)	p-value[c]
· Electrolyte abnormalities	81 (50)	16 (52)	65 (50)	0.842
· Hypomagnesemia	52 (32)	11 (35)	41 (31)	0.653
· Hypokalemia	22 (14)	6 (19)	16 (12)	0.297
· Musculoskeletal	70 (43)	13 (42)	57 (44)	0.873
· Pain	60 (37)	11 (35)	49 (37)	0.842
· Edema	14 (9)	3 (10)	11 (8)	0.82
· Genitourinary/renal	61 (38)	13 (42)	48 (37)	0.584
· Urinary tract infection	23 (14)	7 (23)	16 (12)	0.137
· Urinary retention	14 (9)	2 (6)	12 (9)	0.629
· Hematologic	58 (36)	16 (52)	42 (32)	0.041
· Anemia	48 (30)	12 (39)	36 (27)	0.218
· Thrombocytopenia	24 (15)	9 (29%)	15 (11)	0.013
· Cardiovascular	46 (28)	14 (45)	32 (24)	0.021
· Hypotension	23 (14)	7 (23)	16 (12)	0.137
· Tachycardia	14 (9)	8 (26)	6 (5)	<0.001
· Neurologic	43 (27)	8 (26)	35 (27)	0.918
· Seizures	10 (6)	4 (13)	6 (5)	0.083
· Altered mental status	8(5)	3 (10)	5 (4)	0.180
· Gastrointestinal	41 (25)	11 (35)	30 (23)	0.147
· Nausea/vomiting	19 (12)	6 (19)	13 (10)	0.142
· Poor appetite	13 (8)	5 (16)	8 (6)	0.065
· Respiratory	34 (21)	9 (29)	25 (19)	0.221
· Dyspnea	18 (11)	3 (10)	15 (11)	0.778
· Cough	8 (5)	2 (6)	6 (5)	0.665
· Psychiatric	30(19)	8 (26)	22 (17)	0.245
· Anxiety	21 (13)	3 (10)	18 (14)	0.545
· Depression	8 (5)	3 (10)	5 (4)	0.176
· Other organ systems[d]	75 (46)	19 (61)	56 (43)	0.065
Total number of system based medical complications[e]	564			
Median number of organ system based medical complications per patient (IQR)	3 (2-5)			
Interventions				
· Medications management	151 (93)	30 (97)	121 (92)	0.38
· Laboratory tests	106 (65)	25 (81)	81 (62)	0.048
· Diagnostic tests	101 (62)	22 (71)	79 (60)	0.271
· Consultations	124 (77)	27 (87)	97 (74)	0.123
· Procedures	32 (20)	9 (29)	23 (18)	0.149

[a]Only the top two most frequent medical complications were used for statistical analysis to condense the extensive list into relevant information. Most patients had more than one medical complication.
[b]Does not include the three patients who had a planned return to acute care after completion of rehabilitation.
[c] Pearson's Chi-square or Fisher's exact test. Boldface indicates a statistically significant difference.
[d]Other organ systems included integumentary, endocrine, ear-nose-mouth-throat, allergic/immune, eye complications and others such as fall and insomnia (which were categorized as involving multiple organ systems).
[e]The total number of medical complications is greater than the number of patients because most patients had more than one medical complication.