

# Malnutrition and Overall Survival in Older Cancer Patients

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# Background

- More than 60% of cancer patients are older adults.
- Patients undergo age and cancer therapy related changes.
- Malnutrition is frequently seen in older cancer patients.
- Malnutrition affects clinical outcomes, and despite significant medical advances, malnutrition remains a significant and highly prevalent public health problem among older cancer patients.

## Objective

The aim of our study was to determine the effect of malnutrition diagnosed via Comprehensive Geriatric Assessment (CGA) on the survival of older cancer patients in a retrospective cohort study 2013-2017, at MD Anderson cancer center.

## Methods

- Single site, retrospective study.
- Patients 65 years of age and older who were undergoing cancer care and underwent comprehensive geriatric assessment, including cognitive, functional, mood, nutritional, physical, and comorbidity assessment.
- Hematologic malignancies or solid tumors.
- Malnutrition status was determined through the Mini nutritional assessment (MNA) and Comprehensive geriatric assessment.
- Patients received recommendations for nutritional supplementation, nutrition consult, and when necessary, appetite stimulants. Follow up was scheduled.
- We determined the prevalence of malnutrition and used univariate and multivariable Cox regression survival analysis to assess the association between baseline malnutrition and survival.

## Results

- A total of 454 patients with hematologic, gastrointestinal, urologic, breast, lung and gynecologic cancers were included in the analysis.
- The median age was 78, range 65-96 years and males and females were equally represented.
- Forty-one percent (n= 190) were malnourished at baseline and 33% died during the 3-year follow-up.
- The median follow up is 32.4 months, range 0.2-51.1 months.

## Results Cont'd

- In univariate analysis malnutrition increased the risk of all-cause mortality in all cancers (**HR = 1.47, 95% CI = 1.07, 2.03**).
- In multivariate Cox regression analysis, after adjustment for gender, age major depression, Charlson age-adjusted comorbidity, cancer stage, living arrangement, frailty and functional impairment, malnutrition increased the risk of all-cause mortality in older patients with (**HR = 1.64, 95% CI = 1.03, 2.63**).
- In the stratification analysis by cancer type, after adjustment for gender, age major depression, Charlson age-adjusted comorbidity, cancer stage, living arrangement and functional impairment, malnutrition increased the risk of all-cause mortality (**HR =1.86, 95% CI = 1.10, 3.16**) in older patients with solid tumor. However, malnutrition did not increase the risk of all-cause mortality for hematologic malignancies.

# Results,-Table 1

**TABLE 1 Patient baseline characteristics according to malnutrition status. (N=454)**

Table 1. Patient baseline characteristics according to malnutrition status. (N=454)

Variable	Category	Total n=454 n (%)	Normal Nutrition n=264 n (%)	Malnutrition n=190 n (%)	P-value for difference
Gender	Male	225 (49.6)	129 (48.9)	96 (50.5)	0.73
	Female	229 (50.4)	135 (51.4)	94 (49.5)	
Age	Age between 65-74 years	157 (34.6)	85 (32.2)	72 (37.9)	0.07
	Age between 75-84 years	217 (47.8)	138 (52.3)	79 (41.6)	
	Age 85+ years	80 (17.6)	41 (15.5)	39 (20.5)	
	Median, Range	78, 65-96	78, 65-96	78, 65-94	
Race	Black or African American	75 (16.5)	37 (14.0)	38 (20.0)	0.93 0.16
	White	358 (78.9)	215 (81.4)	143 (75.3)	
	Other	15 (3.3)	7 (2.7)	8 (4.2)	
	Missing	6 (1.3)	5 (1.9)	1 (0.5)	
Cancer Stage	Local	231 (50.9)	138 (52.3)	93 (49.0)	0.67
	Metastasis	80 (17.6)	50 (18.9)	30 (15.8)	
	N/A or Missing	143 (31.5)	76 (28.8)	67 (35.3)	
Cancer type	Solid tumor	310 (68.3)	188 (71.2)	122 (64.2)	0.13
	Hematologic	143 (31.5)	76 (28.8)	67 (35.3)	
	Missing	1 (0.2)	0 (0.0)	1 (0.5)	
Function of status	ADL <=5	356 (78.4)	212 (80.3)	144 (75.8)	0.04
	ADL>5	48 (10.6)	21( 8.0)	27 (14.2)	
	Missing	50 (11.0)	31 (11.7)	19 (10.0)	
Frailty	Yes	190 (41.9)	74 (28.0)	116 (61.1)	<0.01
	No	175 (28.6)	128 (48.4)	47 (24.7)	
	Missing	89 (19.6)	62 (23.5)	27 (14.2)	
Weight loss	>3kg in past 6 month	175 (38.6)	57 (21.6)	125 (65.8)	<0.01
	<3kg in past 6 months	182 (40.1)	136 (51.5)	39 (20.5)	
	Missing	97 (21.4)	71 (26.9)	26 (13.7)	
Gait speed	Normal (<= 3.62 sec)	200 (44.1)	130 (49.2)	70 (36.8)	<0.01
	Abnormal (>3.62 sec)	152 (33.5)	72 (27.3)	80 (42.1)	
	Missing	102 (22.5)	62 (23.5)	40 (21.1)	
Cognitive diagnosis	Dementia	134 (29.5)	61 (23.1)	73 (38.4)	<0.01
	MCI	157 (34.6)	98 (37.1)	59 (31.0)	
	Normal	155 (34.1)	100 (37.9)	55 (29.0)	
	Missing	8 (1.8)	5 (1.9)	3 (1.6)	
Major depression	Yes	126 (27.8)	52 (19.7)	74 (39.0)	<0.01
	No	323 (71.2)	210 (80.0)	113 (59.5)	
	Missing	5 (1.1)	2 (0.8)	3 (1.6)	
Low physical activity	Yes	198 (43.6)	103 (39.0)	95 (50.0)	0.05
	No	112 (24.7)	71 (26.9)	41 (21.6)	
	Missing	144 (31.7)	90 (34.1)	54 (28.4)	
	Mean (SD)	1.6 (0.8)	1.4 (0.8)	1.7 (0.8)	
ECOG	Mean (SD)	1.6 (0.8)	1.4 (0.8)	1.7 (0.8)	<0.01
KPS	Mean (SD)	73.7 (14.5)	76.6 (14.0)	70.1 (14.5)	<0.01

\*Difference in the variable by individual/partner status assessed with X<sup>2</sup> does not include refusals or missing values, and where p<0.05. \*\* Fisher exact test were used due to existing expected counts less than 5

1. Malnutrition was diagnosed by geriatrician via comprehensive geriatric assessment.  
 2. ADL: Activities of Daily Living; MOS: Medical Outcomes Study; CCI: Charlson Comorbidity Index; SPPB: Short Physical Performance Battery; MCI: Mild Cognitive Impairment; ECOG: Eastern Cooperative Oncology Group; KPS: Karnofsky scales.



# Results,-Table 2

Table 2. Univariate Cox Regression analysis to assess factors associated with malnutrition among older patients with cancer. (N=454)

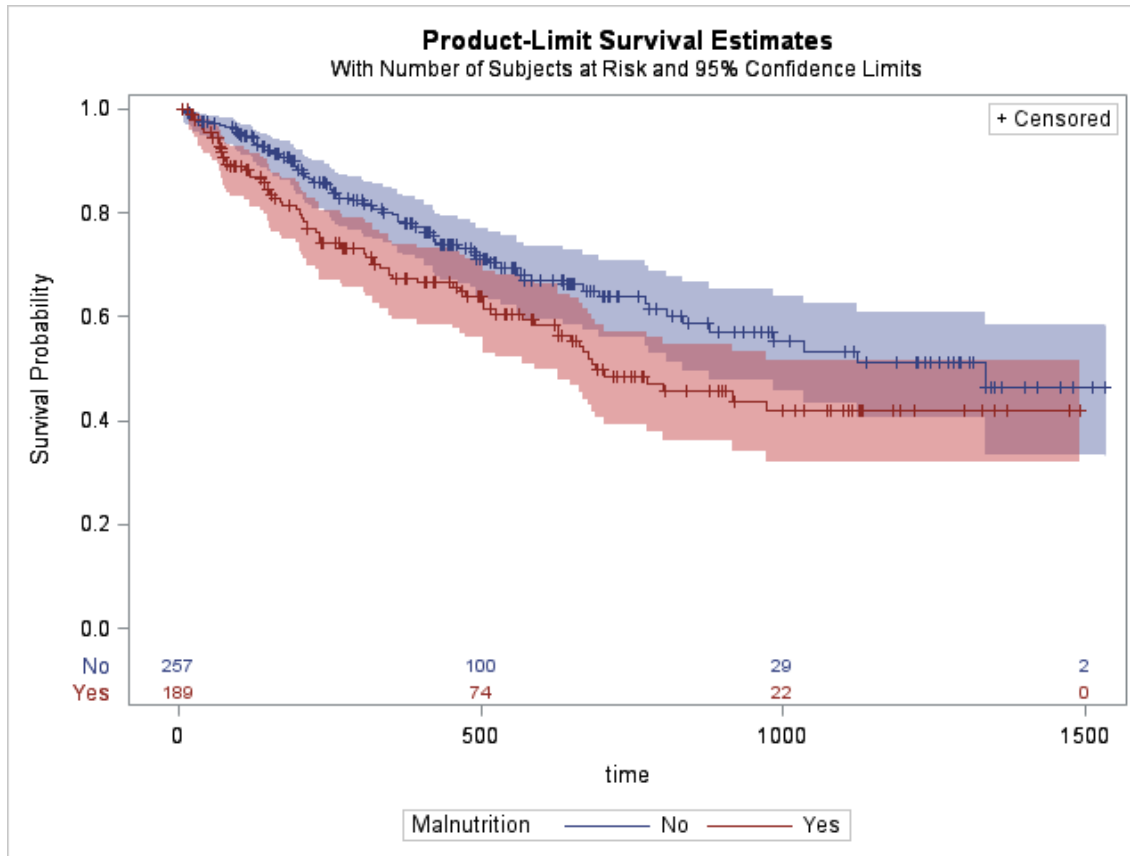
Variable		Univariate Cox Regression	HR	95% CI	P-value
Age	In 1-unit change	0.02	0.99	1.04	0.16
	65-74	Ref			
	75-84	1.22	0.84	1.77	0.08
	85 and older	1.49	0.95	2.34	0.30
BMI	In 1-unit change	0.95	0.93	0.98	<0.01
Gender	Female	Ref			
	Male	1.80	1.30	2.49	<0.01
Cancer Type	Solid	Ref			
	Hematologic	1.34	0.97	1.87	0.08
Cancer stage	Local Solid	Ref			
	Metastatic Solid	2.45	1.60	3.75	<0.01
Malnutrition	Normal	Ref			
	Malnutrition	1.47	1.07	2.03	0.02
Age adjusted comorbidity	CCI≤5	Ref			
	CCI>5	1.77	0.98	3.20	0.06
Mobility	Normal (SPPB>10)	Ref			
	Abnormal (SPPB≤10)	1.03	0.59	1.82	0.91
Frailty	No	Ref			
	Yes	1.50	1.05	2.16	0.03
Functional Impairment	Normal (≥5)	Ref			
	Abnormal (<5)	1.71	1.06	2.76	0.03
Major depression	No	Ref			
	Yes	1.71	1.23	2.37	<0.01
Living arrangement	Living alone	Ref			
	Living with relatives	1.28	0.82	2.00	0.28
	Retirement home	3.90	1.17	13.04	0.03
	Nursing home	0.93	0.32	2.67	0.89
KPS	In 10-unit change	0.79	0.70	0.89	<0.01
ECOG	In 1-unit change	1.76	1.42	2.16	<0.01

In univariate analysis malnutrition increased the risk of all-cause mortality in all cancers (HR = 1.47, 95% CI = 1.07, 2.03).

1. Malnutrition was diagnosed by geriatrician via comprehensive geriatric assessment.  
 2. ADL: Activities of Daily Living; MOS: Medical Outcomes Study; CCI: Charlson Comorbidity Index; SPPB: Short Physical Performance Battery; MCI: Mild Cognitive Impairment; ECOG: Eastern Cooperative Oncology Group; KPS: Karnofsky scales.

# Results,-Figure 1

Figure 1 Kaplan Meier Survival Curve for all older cancer patients (Log rank test for difference  $p=0.01$ )



**FIGURE 1 KAPLAN-MEIER SURVIVAL PLOT**

**Malnutrition** was associated with **worse OS** in older patients with cancer.

**Table 3. Multivariable Cox Regression analysis to assess factors associated with malnutrition among older patients (N=454)**

Variables	Multivariable Cox Regression											
	Model 1*			Model 2			Model 3			Model 4		
	HR	95% CI	P-value	HR	95% CI	P-value	HR	95% CI	P-value	HR	95% CI	P-value
Malnutrition												
No	Ref			Ref			Ref			Ref		
Yes	1.55	(1.12, 2.15)	<0.01	1.45	(1.03, 2.04)	0.04	1.64	(1.11, 2.43)	0.01	1.64	(1.03, 2.63)	0.04
Age												
65-74	Ref			Ref			Ref			Ref		
75-84	1.34	(0.92, 1.95)	0.02	1.07	(0.71, 1.59)	0.76	0.94	(0.59, 1.49)	0.78	1.04	(0.63, 1.73)	0.88
85 and older	1.74	(1.1, 2.75)	0.13	1.54	(0.96, 2.47)	0.07	1.54	(0.91, 2.61)	0.11	1.59	(0.89, 2.87)	0.12
Gender												
Female	Ref									Ref		
Male	1.98	(1.42, 2.76)	<0.01	1.92	(1.33, 2.75)	<0.01	1.67	(1.1, 2.53)	0.02	1.97	(1.26, 3.1)	<0.01
Major depression												
No										Ref		
Yes										1.49	(0.95, 2.36)	0.08
Comorbidity												
CCI≤5							Ref			Ref		
CCI>5							1.12	(0.59, 2.15)	0.73	0.84	(0.41, 1.73)	0.64
Functional impairment												
Normal (≥5)				Ref			Ref			Ref		
Abnormal (<5)				1.87	(1.14, 3.05)		1.54	(0.87, 2.72)	0.14	1.32	(0.68, 2.53)	0.42
Living arrangement												
Living alone							Ref			Ref		
Living with relatives							1.45	(0.85, 2.46)	0.17	1.74	(0.96, 3.12)	0.07
Retirement home							0.91	(0.27, 3.13)	0.88	2.66	(0.74, 9.55)	0.13
Nursing home							4.37	(1.15, 16.58)	0.03	5.7	(1.14, 28.46)	0.03
Frailty												
No										Ref		
Yes										1.18		0.51

1. Malnutrition was diagnosed by geriatrician via comprehensive geriatric assessment.  
 2. ADL: Activities of Daily Living; MOS: Medical Outcomes Study; CCI: Charlson Comorbidity Index; SPPB: Short Physical Performance Battery; MCI: Mild Cognitive Impairment; ECOG: Eastern Cooperative Oncology Group; KPS: Karnofsky scales.  
 3. Model 1: Age, gender adjusted in the model; Model 2: Model plus functional impairment; Model 3: Model plus comorbidity, living arrangement; Model 4: Model 3 plus major depression, frailty

In univariate analysis malnutrition increased the risk of all-cause mortality in all cancers (**HR = 1.47, 95% CI = 1.07, 2.03**).

# Results,-Table 3

**Table 5. Multivariable Cox Regression analysis to assess factors associated with malnutrition among older patients with Solid Tumor (N=310)**

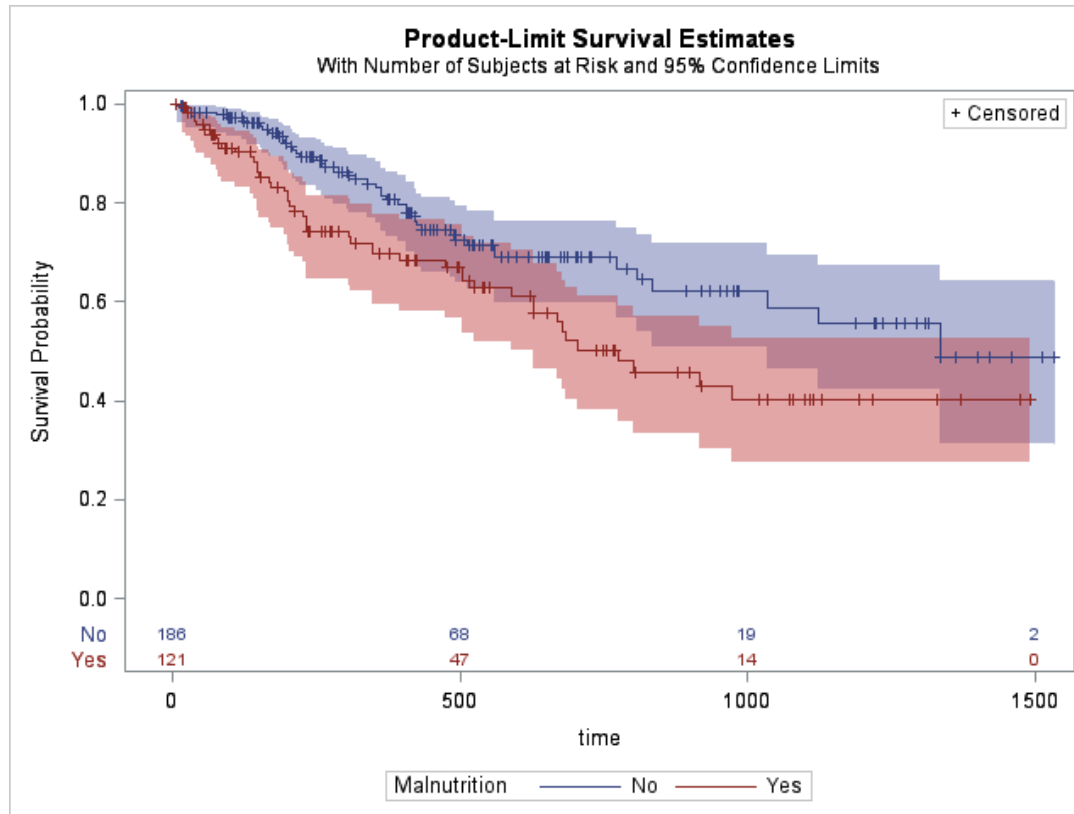
Variable		Multivariable Cox Regression HR	95% CI		P-val
<b>Malnutrition</b>					
	No	Ref			
	Yes	<b>1.86</b>	<b>1.10</b>	<b>3.16</b>	<b>0.02</b>
<b>Age</b>					
	65-74	Ref			
	75-84	2.60	1.20	5.66	0.02
	85 and older	3.23	1.44	7.26	<0.01
<b>Gender</b>					
	Female	Ref			
	Male	1.50	0.89	2.54	0.13
<b>Cancer stage</b>					
	Local Solid	Ref			
	Metastatic Solid	3.25	1.86	5.67	<0.01
<b>Major depression</b>					
	No	Ref			
	Yes	1.38	0.81	2.35	0.24
<b>Comorbidity</b>					
	CCI≤5	Ref			
	CCI>5	1.12	0.26	4.74	0.88
<b>Functional impairment</b>					
	Normal (≥5)	Ref			
	Abnormal (<5)	1.35	0.68	2.70	0.40
<b>Living arrangement</b>					
	Living alone	Ref			
	Living with relatives	1.27	0.65	2.48	0.49
	Retirement home	0.90	0.25	3.26	0.88
	Nursing home	4.48	1.05	19.16	0.04

After adjustment for gender, age, major depression, Charlson age-adjusted comorbidity, cancer stage, living arrangement and functional impairment, malnutrition increased the risk of all-cause mortality (**HR =1.86, 95% CI = 1.10, 3.16**) in older patients with solid tumor.

1. Malnutrition was diagnosed by geriatrician via comprehensive geriatric assessment.  
 2. ADL: Activities of Daily Living; MOS: Medical Outcomes Study; CCI: Charlson Comorbidity Index; SPPB: Short Physical Performance Battery; MCI: Mild Cognitive Impairment; ECOG: Eastern Cooperative Oncology Group; KPS: Karnofsky scales.

## Results,-Figure 2

Figure 2 Kaplan Meier Survival Curve for older patients with solid tumor (Log rank test for difference  $p=0.01$ )

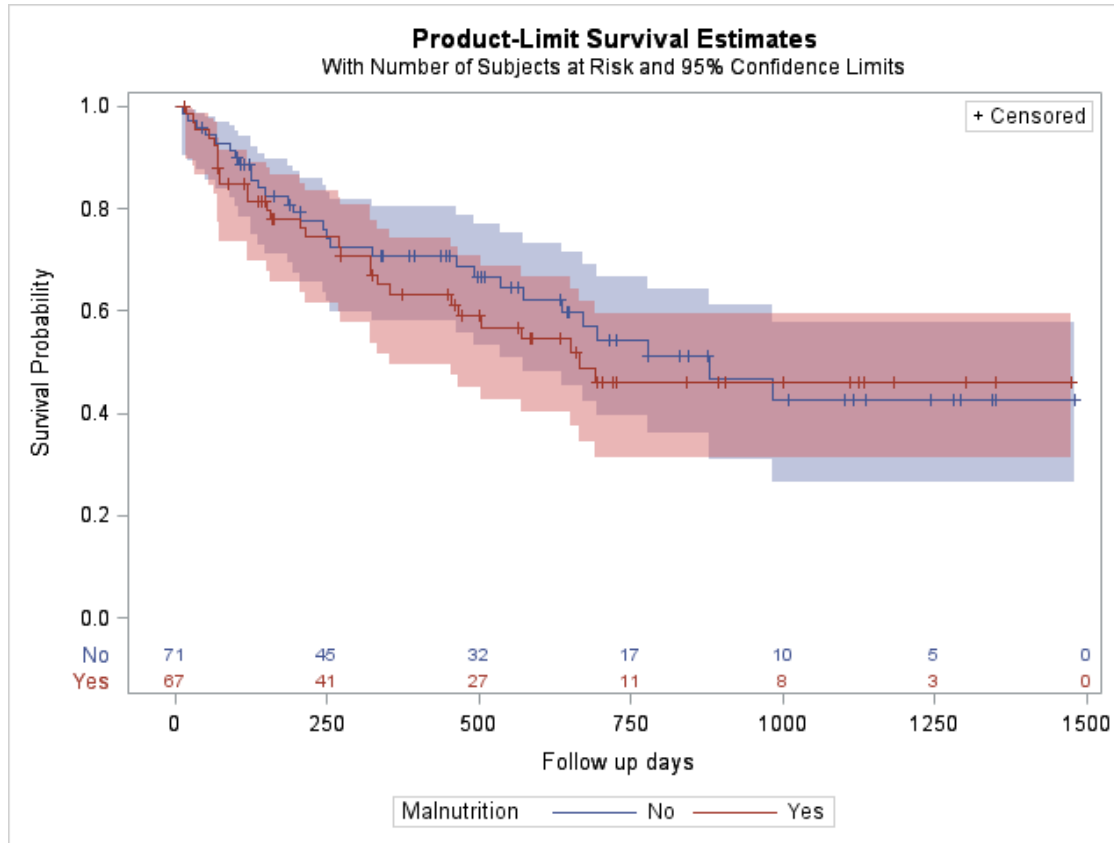


**FIGURE 2 KAPLAN-MEIER SURVIVAL PLOT**

**Malnutrition** was associated with **worse OS** in older patients with solid tumor.

# Results,-Figure 3

Figure 3. Kaplan Meier survival curve in older patients with hematological cancer (log rank test for difference  $p = 0.60$ ).



**FIGURE 2 KAPLAN-MEIER SURVIVAL PLOT**

**Malnutrition** was not significant associated with **worse OS** in older patients with hematological malignancy

## Conclusion

- **Malnutrition is an independent risk factor for mortality in a cohort of older cancer patients.**
- Earlier identification will allow for timely therapy.
- **Timely treatment, intervention or nutrition support for older patients with cancer malnutrition may alter clinical outcomes.**
- Prospective studies are recommended.

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~~Cancer Center~~

