

Desnutrición y su Impacto en los Resultados en el Paciente Crítico



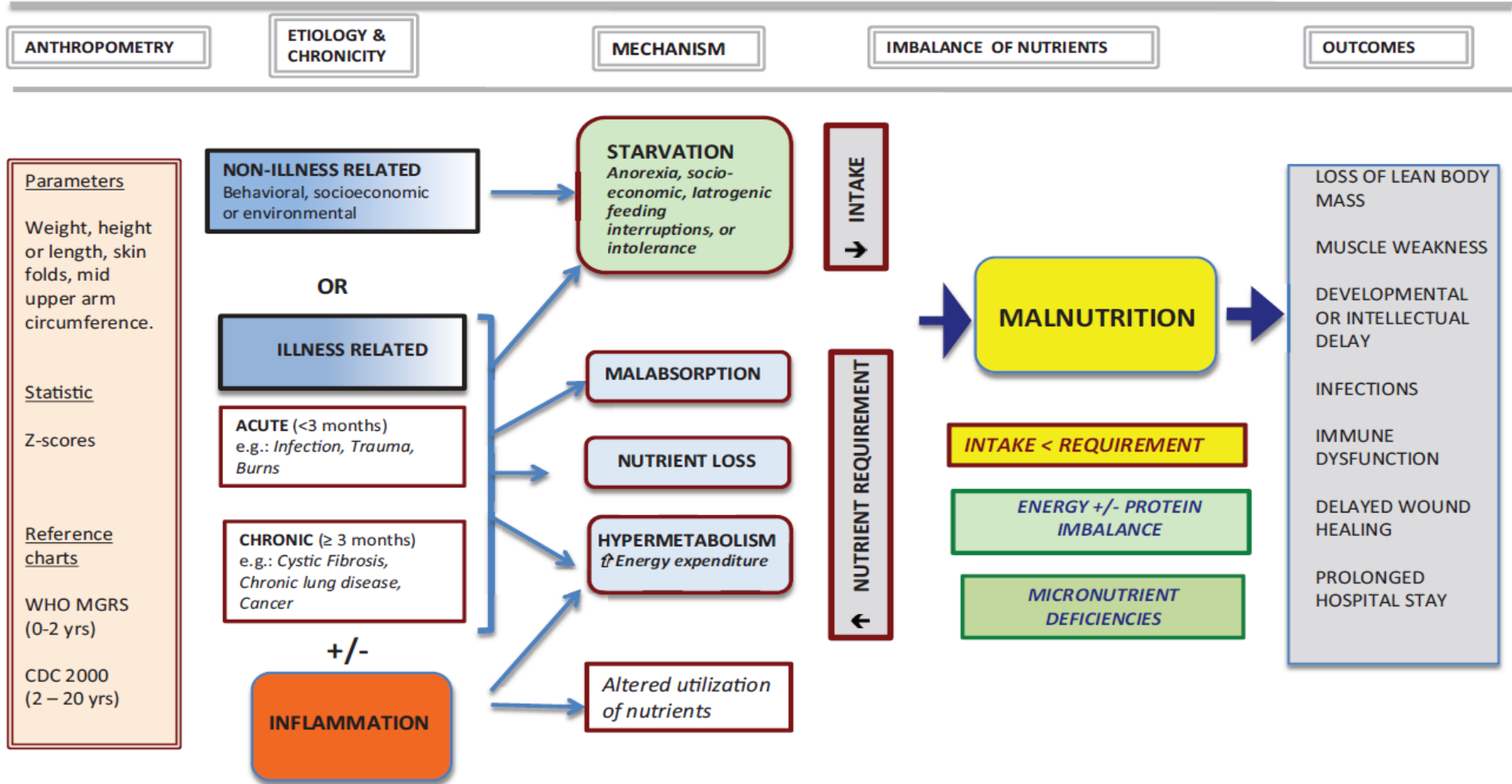
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Pediatric Malnutrition Definition in Hospitalized Children



Malnutrition: Z Score Definitions, Percentiles and Waterlow Criteria

Z Score BMI/WFL	Growth Percentiles	Waterlow Criteria (%)	Malnutrition Class
0		≥ 90	No risk
-1	2.4 – 15.9	< 90	Mild
-2	0.2 – 2.3	80 – 89.9	Moderate
-3	< 0.2	< 80	Severe

Beer, S. et al. *Nutr Clin Pract.* 2015;30:609-624

Pediatric Malnutrition Malnutrition Classification

Classification	Variable	Grade	Definition
Gomez et al ¹⁰	Median WFA (%)	Mild (grade 1) Moderate (grade 2) Severe (grade 3)	75%–90% WFA 60%–74% WFA <60% WFA
Waterlow (wasting) ¹³	Median WFH (%)	Mild Moderate Severe	80%–89% WFH 70%–79% WFH <70% WFH
Waterlow (stunting) ¹³	Median HFA (%)	Mild Moderate Severe	90%–94% HFA 85%–90% HFA <85% HFA
WHO (wasting)	WFH (<i>z</i> scores below median WFH)	Moderate Severe	<i>z</i> score between –2 and –3 <i>z</i> score <–3
WHO (stunting)	HFA (<i>z</i> scores below median HFA)	Moderate Severe	<i>z</i> score between –2 and –3 <i>z</i> score <–3
Kanawati and McLaren ¹⁸	MUAC/HC	Mild Moderate Severe	<0.31 <0.28 <0.25
Cole et al ³⁰	BMI (BMI <i>z</i> scores for age)	Grade 1 Grade 2 Grade 3	BMI <i>z</i> scores for age <–1 BMI <i>z</i> scores for age <–2 BMI <i>z</i> scores for age <–3

Pediatric Malnutrition

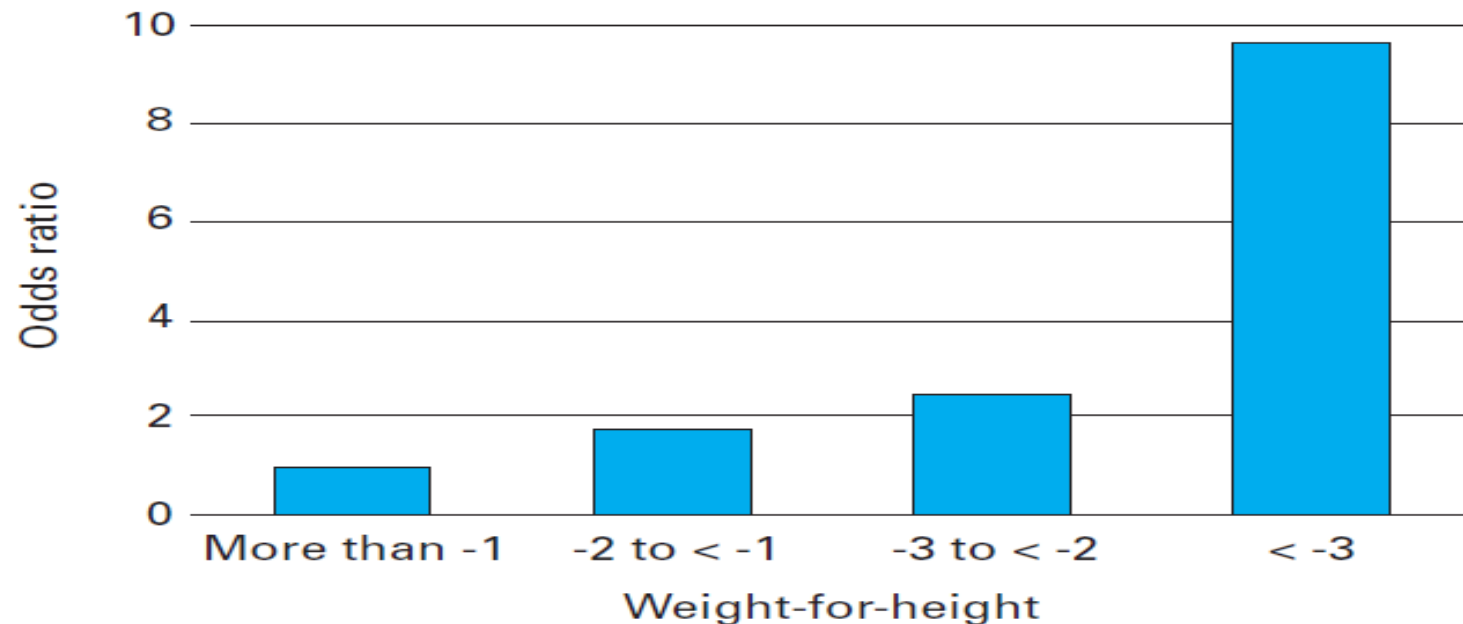
- Anthropometrics

- WHO Growth Standard for 0 to 24 months
- WHO Child Growth Standards (birth to age 5)
- WHO Reference 2007 (ages 5 to 19)
- CDC Growth calculator for 0 to 36 months
- CDC Growth calculator for 2 to 20 years

<http://peditools.org/>

Malnutrition in Children Mortality Risk

Odds ratio for mortality by weight-for-height.



Note: reference category: children with a weight-for-height > -1 SD.

Bull World Health Organ. 2010 Jan;88(1):39-48

Pediatric Nutrition Screening Tools for Hospitalized Children

- Pediatric Nutritional Risk Score
- Subjective Global Nutrition Assessment: SGA
- Screening Tool for the Assessment of Malnutrition in Pediatrics: STAMP
- Pediatric Yorkhill Malnutrition Score: PYMS
- Screening Tool Risk on Nutritional Status and Growth: STRONGkids

Hartman C. et al. *Curr Opin Clin Nutr Metab Care* 2012;15:303-309

Critically Ill Children

Nutritional Status & Outcomes

N = 1057	
Age, yrs	5.4 (1.2 – 13)
Gender (M/F)	582/475
Hospital LOS; days	8 (4 – 17)
PICU LOS, days	2 (1 – 5)
Mechanical ventilation on day 1	547 (52%)
PIM 2 Risk of Mortality (%)	3.9 ± 9
Weight for age, z-score	-0.44±1.9
Height for age, z-score	-0.81±1.9
Weight for height/BMI, z-score	0.25±1.9

Values are median (IQR 25th-75th), or mean ± SD

Marroquin, A. , Submitted to SCCM Meeting, 2018

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Prevalence of Malnutrition

At Risk of Malnutrition, Moderate and Severe Malnutrition

	<u>Underweight</u> Weight for Age z-scores		<u>Chronic Malnutrition</u> Height for Age z-scores		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores	
	< -1	> -1	< -1	> -1	< -1	> -1
N = 1057	< -1	> -1	< -1	> -1	< -1	> -1
0 – 2 yrs	20 %	13 %	18 %	14 %	22 %	11 %
2 – 13 yrs	30 %	11 %	25 %	16 %	33 %	8 %
13 – 20 yrs	18 %	8 %	14 %	13 %	21 %	5 %
	68 %	32 %	57 %	43 %	76 %	24 %
	N=719	N=338	N=602	N=455	N=804	N=253

z-scores by WHO 0-2 yrs; by CDC 2-20 yrs. Weight for height for 0-2 yrs and BMI for age z-scores for 2-20 yrs

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Prevalence of Malnutrition

Moderate and Severe malnutrition

	<u>Underweight</u> Weight for Age z-scores		<u>Chronic Malnutrition</u> Height for Age z-scores		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores	
	< -1	> -2	< -1	> -2	< -1	> -2
N = 1057	< -1	> -2	< -1	> -2	< -1	> -2
0 – 2 yrs	25 %	8 %	24 %	9 %	28 %	5 %
2 – 13 yrs	35 %	6 %	33 %	7 %	37 %	4 %
13 – 20 yrs	21 %	5 %	20 %	6 %	23 %	3 %
	81 %	19 %	77 %	23 %	88 %	12 %
	N=853	N=204	N=818	N=239	N=928	N=129

z-scores by WHO 0-2 yrs; by CDC 2-20 yrs. Weight for height for 0- 2 yrs and BMI for age z-scores for 2-20 yrs

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Nutritional Status & Ethnic Group

At Risk of Malnutrition, Moderate and Severe Malnutrition

	African American N=199	Asian N=45	Caucasian N=308	Hispanic N=472	Others N=33
N=1057					
WFA z-score	-0.61 ± 2.1	-1.32 ± 2.6*	-0.36 ± 1.8	-0.35 ± 1.9	-0.12 ± 1.8
Underweight	21 %	6.5 %	26 %	44 %**	2.5 %
HFA z-score	-0.82 ± 2.4	-1.02 ± 1.9	-0.80 ± 1.9	-0.83 ± 1.9	-0.24 ± 1.7
Stunting	19 %	5 %	27 %	47 %	2 %
WFH/BMI z-score	-0.11 ± 1.9	-0.87 ± 2.1*	0.08 ± 1.9	0.14 ± 1.9	-0.12 ± 2.2
Wasting	25 %	7.5 %	25 %	39 %**	3.5 %

- p < 0.01 vs Hispanic by ANOVA corrected for multiple comparisons; ** p < 0.05 by chi-square test
- WFA: Weight for age; HFA: Height for age; WFL: Weight for length or height; BMI: Body mass index

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Nutritional Status & Ethnic Group

Moderate and Severe Malnutrition

	African American N=199	Asian N=45	Caucasian N=308	Hispanic N=472	Others N=33
N=1057					
WFA z-score	-0.61 ± 2.1	-1.32 ± 2.6*	-0.36 ± 1.8	-0.35 ± 1.9	-0.12 ± 1.8
Underweight	22 %	8 %	24 %	44 %**	2 %
HFA z-score	-0.82 ± 2.4	-1.02 ± 1.9	-0.80 ± 1.9	-0.83 ± 1.9	-0.24 ± 1.7
Stunting	23 %	5 %	26 %	44 %	2 %
WFL/BMI z-score	-0.11 ± 1.9	-0.87 ± 2.1*	0.08 ± 1.9	0.14 ± 1.9	-0.12 ± 2.2
Wasting	27 %	10 %	23 %	37 %**	3 %

- p < 0.01 vs Hispanic by ANOVA corrected for multiple comparisons; ** p < 0.05 by chi-square test
- WFA: Weight for age; HFA: Height for age; WFL: Weight for length or height; BMI: Body mass index

PICU at Texas Children's Hospital

Nutritional Status & Ethnic Group

Insurance Coverage

	African American N=199	Asian N=45	Caucasian N=308	Hispanic N=472	Others N=33
N=1057					
Medicaid/Government*	84%	64%	42%	81%	79%
Private*	16%	36%	58%	19%	21%
Underweight < -2SD*	22%	8%	24%	44%	2%
Stunting < -2SD	23%	5%	26%	44%	2%
Wasting > -2SD*	27%	10%	23%	37%	3%

* p < 0.05 by Chi Square

Patients with Medicaid/Government insurance coverage (n=181) were more likely to have moderate-severe stunting on admission to the PICU vs. patients with Private insurance coverage (n=58); OR(95% CI): 1.51 (1.09-2.10); p < 0.05

PICU at Texas Children's Hospital

Nutritional Status & Outcomes

Mild Malnutrition

	<u>Underweight</u> Weight for Age z-scores > -1		<u>Chronic Malnutrition</u> Height for Age z-scores > -1		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores > -1	
	NO	YES	NO	YES	NO	YES
N = 1057						
PICU LOS, days	1.8	1.9	1.8	1.9	1.8	2.0
Hospital LOS, days	8	11*	8	11*	9	10
MV on day 1 (%)	39	61**	42	58**	42	58**
PIM2 ROM (%)	1.1	1.4**	1.1	1.3**	1.1	1.3
Mortality (%)	3.2	5.6	3.8	4.2	3.4	5.5
	N=719	N=338	N=602	N=455	N=804	N=253

Values for PICU and Hospital LOS and PIM2 (ROM) are median; * p < 0.05 by Mann-Whitney; ** p < 0.05 by chi-square test
 MV : Mechanical ventilation; PIM2: Pediatric Index of Mortality; ROM: Risk of Mortality

PICU at Texas Children's Hospital

Nutritional Status & Outcomes

Moderate and Severe Malnutrition

	<u>Underweight</u> Weight for Age z-scores > -2		<u>Chronic Malnutrition</u> Height for Age z-scores > -2		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores > -2	
	NO	YES	NO	YES	NO	YES
N = 1057	NO	YES	NO	YES	NO	YES
PICU LOS, days	1.9	2.2*	1.8	1.9	1.8	2.4
Hospital LOS, days	9	11.5*	9	12*	9	10
MV on day 1 (%)	39	61**	48	64**	50	62**
PIM2 ROM (%)	1.1	1.6*	1.1	1.4*	1.1	1.2
Mortality (%)	3.2	5.6	79	21	81	19
	N=853	N=204	N=818	N=239	N=928	N=129

Values for PICU and Hospital LOS and PIM2 ROM (%) are median; * p < 0.05 by Mann-Whitney; ** p < 0.05 by chi-square test
 MV : Mechanical ventilation; PIM2: Pediatric Index of Mortality; ROM: Risk of Mortality

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Nutritional Status & Outcomes

Pediatric Cerebral Performance Category Scale (PCPC)

		<u>Underweight</u> Weight for Age z-scores > -1		<u>Chronic Malnutrition</u> Height for Age z-scores > -1		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores > -1	
N = 1057		NO n=719	YES* n=338	NO n=602	YES* n=455	NO n=804	YES n=253
PCPC	Normal	73%	50%	77%	51%	66%	64%
	Mild	13%	16%	13%	16%	14%	14%
	Moderate	8%	18%	6%	17%	11%	11%
	Severe	6%	16%	4%	16%	9%	11%

* p < 0.0.001 by Chi-square test

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Nutritional Status & Outcomes

Pediatric Cerebral Performance Category Scale (PCPC)

	<u>Underweight</u> Weight for Age z-scores > -1		<u>Chronic Malnutrition</u> Height for Age z-scores > -1		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores > -1	
	OR	95%CI	OR	95%CI	OR	95%CI
N = 1057						
PCPC Normal						
Mild	1.75*	1.2-2.6	1.80*	1.3-2.6	1.09	0.7-1.6
Moderate	3.25*	2.2-4.9	4.12*	2.7-6.3	1.04	0.7-1.6
Severe	3.97*	2.6-6.2	5.95*	3.7-9.7	1.29	0.8-2.1

OR: Odds ratio; p < 0.005 vs. normal category

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Nutritional Status & Outcomes

Pediatric Overall Performance Category Scale (POPC)

		<u>Underweight</u> Weight for Age z-scores > -1		<u>Chronic Malnutrition</u> Height for Age z-scores > -1		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores > -1	
N = 1057		NO n=719	YES* n=338	NO n=602	YES* n=455	NO n=804	YES n=253
POPC	Normal	35%	15%	38%	15%	28%	27%
	Mild	20%	18%	22%	16%	19%	20%
	Moderate	37%	48%	34%	50%	41%	40%
	Severe	8%	19%	6%	19%	11%	13%

* $p < 0.0001$ by Chi-square test

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Nutritional Status & Outcomes

Pediatric Overall Performance Category Scale (POPC)

		<u>Underweight</u> Weight for Age z-scores > -1		<u>Chronic Malnutrition</u> Height for Age z-scores > -1		<u>Acute Malnutrition</u> Weight for Height/BMI z-scores > -1	
N = 1057		OR	95%CI	OR	95%CI	OR	95%CI
POPC	Normal						
	Mild	2.03*	1.3-3.1	1.81*	1.2-2.6	1.06	0.7-1.6
	Moderate	2.99*	2.1-4.3	3.78*	2.7-5.2	1.01	0.7-1.4
	Severe	5.74*	3.6-9.2	8.50*	5.2-14	1.27	0.7-2.0

OR: Odds ratio; p < 0.005 vs. normal category

PICU at Texas Children's Hospital

Nutritional Status & Mortality

N = 1057	Odds Ratio	95% CI	p value
Underweight > -2 z-score	2.17	1.12 – 4.20	p< 0.05
Chronic Malnutrition > -2 z-score	0.93	0.44 – 1.97	NS
Acute Malnutrition > -2 z-score	1.73	0.78 – 3.84	NS

Overall mortality was 3.9 % (n=42) for this cohort

Pediatric Malnutrition in Critically Ill Children

- Conclusions

- The new definition of malnutrition incorporates new elements
- Anthropometrics is the most important component in the definition of malnutrition
- Very important to obtain weight and height/length on admission to the hospital and to the pediatric intensive care unit

Pediatric Malnutrition in Critically Ill Children

- Conclusions

- No validated screening method to assess nutritional status in hospitalized children
- The prevalence of different types of malnutrition was high, with values up to half of the cohort
- There was association of malnutrition and ethnic group, and type of insurance coverage, hospital LOS, cognitive and functional status, risk of mortality, and mortality



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