



Predictors of Pediatric Palliative Care Team Utilization from EHR Data at an Academic Healthcare Center

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Outline:

- **Background/Motivation**
- Methods
- Results
- Summary

Palliative Care Consultation:

- Improved detection of symptoms
- Fewer hospital days & procedures
- Improved documentation of end-of-life wishes
- Families feel more prepared

Palliative Care Utilization:

- Overall low in pediatrics
- Consultation rates are highly variable
 - 4% Keele et. al (2013)
 - 34% Zhukovsky et. al (2009)*
 - 44% Wolfe et. al (2008)*
 - 88% Jonhston et. al (2012)*

*Oncology patients only

Palliative Care Integration:

- Early integration recommended
- Timing of consults varies
 - 8 days prior to death, Zhukovsky et. al (2009)
 - 47 days prior to death, Vern-Goss et. al (2015)
 - 107 days prior to death, Feudtner et. al (2011)

Our Questions:

- What patient groups are at risk to not receive consults?
- What patient groups are at risk to have consults placed late?
- How does the end-of-life experience differ between patients based upon receiving a consult ?

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Methods:

- Retrospective EHR review
- Single academic center
- 233 pediatric mortalities over 3 year period

Patient Groups:

NICU (N=83)

- Any patient cared for exclusively in the NICU

Chronic (N=119)

- At least 1 Life-Threatening Complex Chronic Condition
 - Neuromuscular
 - Cardiovascular
 - Respiratory
 - Renal
 - Gastrointestinal
 - Hematologic/immunodeficiency
 - Metabolic
 - Congenital or genetic
 - Malignancy

Acute (N=31)

- No Life-Threatening Complex Chronic Condition

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NICU vs Non-NICU:

- Fewer consults in the NICU
 - 12% vs 31%, $p < 0.01$
- Consults are placed closer to death in the NICU
 - 52.9 days versus 186.9 days, $p = 0.05$

Presence of Chronic Illness:

- 136 (58%) children died with at least one chronic illness
- Chronically ill patients more are likely to receive consults
 - 39% vs 10%, $p < 0.01$
- Chronic conditions are predictive of consultation
 - Malignancy (OR 3.6, $p < 0.01$, 95% CI [1.4-9.1])

End-of-life experience:

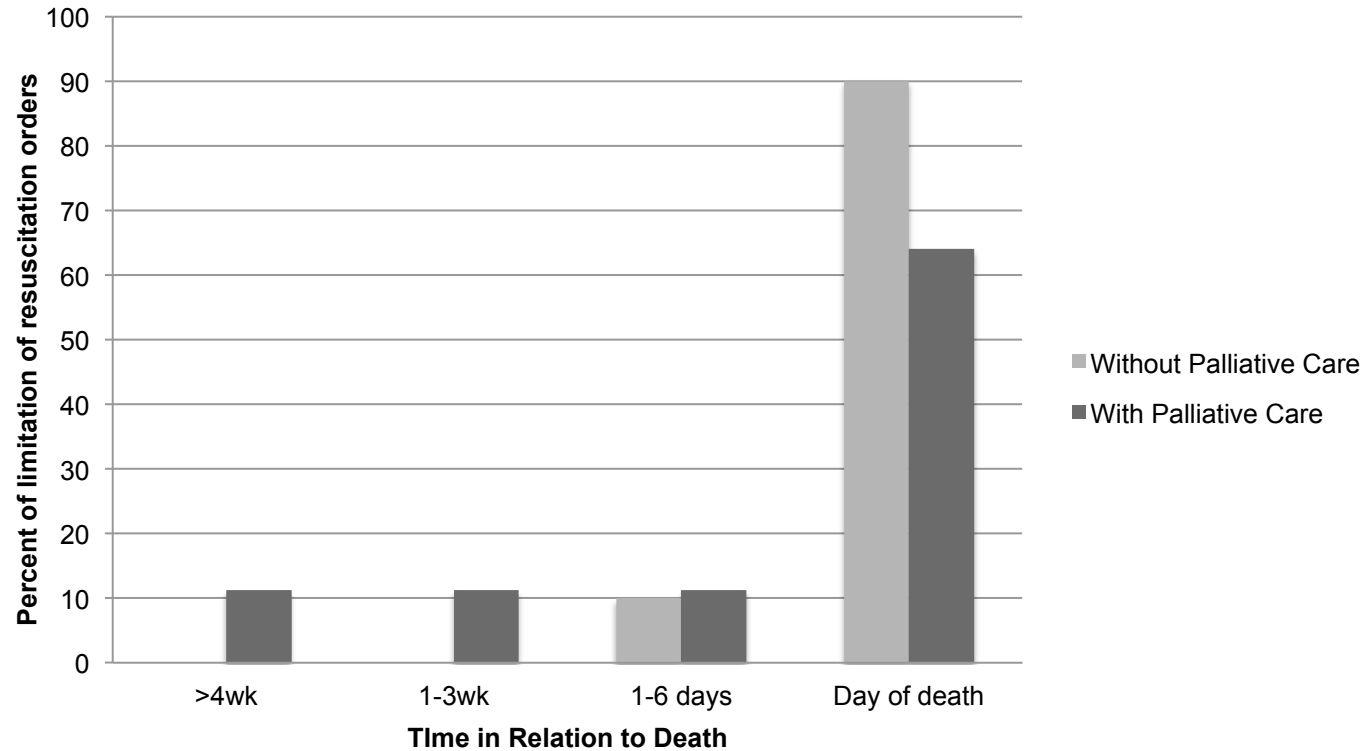
NICU

- Increased limitation-of-resuscitation orders
 - 70% vs 23% $p=0.005$
- Increased time from limitation-of-resuscitation order until death
 - 6.7 days vs 0.4 days $p=0.004$

Non-NICU

- Increased time from limitation-of-resuscitation order until death
 - 46.2 days vs 13.6 days $p=0.039$
- Reduced likelihood of death in the PICU
 - 9.7% vs 90.3% $p<0.001$
- Decreased ventilator use within 2 days of death
 - 24.2% vs 75.7% $p=0.014$

Timing of Limitation of Resuscitation Order in Relation to Death



Mental Health Disorders:

- Only 15 children (10% of non-NICU patients) had documented mental health disorders
- Post-hoc review of data showed 13/15 (86%) of documented diagnoses were made after consultation

Physician Orders for Life-Sustaining Treatment (POLST) :

- Increased POLST form completion rates from 0% to 100%
- Role for clinical decision support

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Summary:

- Consultation is underutilized
- NICU and acutely ill patients are at risk
- Consultation improves documentation of mental health disorders
- Consultation improves end-of-life planning

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Location of Death:

Patient Location	No PPC (n=103)	PPC (n=47)	p-value
Home/Hospice	2 (2%)	8 (17.3%)	<0.01
Emergency	13 (12.6%)	3 (6.4%)	
Inpatient	14 (13.9%)	27 (57.5%)	
PICU	72 (71.4%)	7 (14.9%)	
Unknown	0 (0%)	2 (4.3%)	

Consultation Rates by Disease Category:

	PPC NICU	p-value	PPC Non-NICU	p-value
Neuromuscular	0/0 (NA)	NA	2/5 (40%)	0.65
Cardiovascular	4/21 (19%)	0.26	7/25 (28%)	0.82
Respiratory	2/7 (28.6%)	0.20	11/33 (33.3%)	0.83
Renal	0/2 (0%)	1	6/15 (40%)	0.56
Gastrointestinal	0/3 (0%)	1	7/20 (35%)	0.80
Hematologic or immunodeficiency	0/1 (0%)	1	5/8 (62.5%)	0.11
Metabolic	0/1 (0%)	1	2/10 (20%)	0.73
Genetic or Congenital	5/27 (18.5%)	0.28	17/57 (29.8%)	0.86
Malignancy	0/2 (0%)	1	20/31 (64.5%)	<0.01
Transplant	0/2 (0%)	1	12/27 (44.4%)	0.11
Mental Health Disorder	0/2 (0%)	1	9/15 (60%)	0.02
<u>LT-CCC Diagnosis Count</u>				
0 'Acutely Ill'	NA		3/31 (9.7%)	<0.01
≥ 1 'Chronically Ill'	NA		44/119 (40%)	
1	4/46 (8.7%)	0.4	11/45 (24.4%)	<0.01
2	1/12 (8.3%)		18/38 (47.4%)	
3	4/18 (22.2%)		12/25 (48%)	
>3	0/3 (0%)		3/11 (27.3%)	

Patient Demographics:

	No PPC NICU (n=73)	PPC NICU (n=10)	p-value	No PPC Non- NICU (n=103)	PPC Non- NICU (n=47)	p-value
Mean age at death in years (SD)	0 (0)	0 (0)	NA	7.1 (6.1)	6.4 (6)	0.52
Gender			0.73			0.86
Female	29 (39.7%)	3 (30%)		44 (42.7%)	19 (40.4%)	
Male	44 (60.3%)	7 (70%)		59 (57.3%)	28 (59.6%)	
Race/Ethnicity			0.23			0.81
White or Caucasian	17 (23.3%)	5 (50%)		42 (40.8%)	22 (46.8%)	
Other	26 (35.6%)	3 (30%)		29 (28.2%)	12 (25.5%)	
Asian	30 (41.1%)	2 (20%)		32 (31.1%)	13 (27.7%)	
Insurance			0.40			0.42
Commercial	43 (58.9%)	4 (40%)		44 (42.7%)	15 (31.9%)	
Government	29 (39.7%)	6 (60%)		55 (53.4%)	31 (66%)	
International Payer	1 (1.4%)	0 (0%)		4 (3.9%)	1 (2.1%)	
Language			0.23			1
English	58 (79.5%)	8 (80%)		87 (84.5%)	41 (87.2%)	
Spanish	6 (8.2%)	2 (20%)		12 (11.7%)	5 (10.6%)	
Other	9 (12.3%)	0 (0%)		4 (3.9%)	1 (2.1%)	
Religion			0.03			0.32
Catholic	17 (23.3%)	6 (60%)		44 (42.7%)	19 (40.4%)	
Protestant	15 (20.5%)	3 (30%)		22 (21.4%)	16 (34%)	
Other	16 (21.9%)	0 (0%)		17 (16.5%)	4 (8.5%)	
None	25 (34.2%)	1 (10%)		20 (19.4%)	8 (17%)	

Multivariate Regression Model:

Variable	OR (95% CI)	p-value
Non NICU Patients (acute and chronic)		
Malignancy	3.6 (1.4-9.1)	<0.01
Mental Health Diagnosis	3.3 (0.9-11.7)	0.06
Patient location		<0.01
Outpatient	Reference	
Emergency	0.2 (0.0-1.5)	
Inpatient	1.3 (0.0-9.2)	
Newborn	0.2 (0.0-1.7)	
PICU	0.1 (0.0-0.4)	
Unknown	0.3 (0.0-5.3)	
Ventilator use with two days of death	0.7 (0.3-1.6)	0.46
NICU Patients		
Religion		0.025
Catholic	Reference	
Protestant	0.3 (0.5-1.8)	
Other	0 (0-infinity)	
No affiliation	0.18 (0.0-1.9)	
Resuscitation status		0.005
Limitation	Reference	
No Limitation	0.1 (0.0-0.6)	