Scaling Up and Validating a Nursing Acuity Tool to Ensure Synergy in Pediatric Critical Care

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• Courtney Porter MPH

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• American Association of Critical-Care Nurses (AACN) Research Impact Grant (2017)
Outline

• Rationale for measurement
• Previous measurement and terminology
• Development of Nursing CAMEO© Acuity Tool
• Internal validation of Nursing CAMEO© Acuity Tool
• Multi-Site CAMEO© Validation Study
Rationale for Development of Nursing Measurement Tools

• Nurse staffing models remain debatable across the country
  – Consider beyond nurse to patient ratio
  – Evidence has shown nursing experience impacts patient outcomes (Serial work by Hickey et al.)

• The nursing care at the bedside has changed due to an increase in complexity of patients and families and their surrounding environment

• Nursing models must balance effectiveness as well as efficiency

• Synergy between patient needs and nursing competency is the conceptual framework of practice at Boston Children’s Hospital
Historically How Nursing Work Has Been Measured

Intense
Severity
Resource Use
Acuity
Patient Classification
Direct Workload
Manpower
Management
Cognitive Workload
Complexity
Productivity
Nursing Care Needs

HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL
Boston Children's Hospital
Heart Center
Historically: Measuring Nursing Workload, Resource Use and Intensity

- Therapeutic Intervention Scoring System (TISS) developed to capture nursing interventions performed:
  - TISS - 70 items (Cullen et al, 1974)
  - TISS - 76 items (Keene et al, 1983)
  - TISS - 26 items (Miranda et al, 1996)
- Correlated well with severity of illness & nursing manpower use in adult intensive care patients
- Nine Equivalents of Nursing Manpower Use Score (NEMS) (Miranda et al, 1997)

All tools were developed for use in adult intensive care units
In 2009, we began to develop a pediatric-based measure to include both direct and indirect care.

Measures **cognitive workload**:
- Intellectual processing of patient information that drives performance and decision making.

Quantifies the **complexity** of pediatric nursing care:
- Skill, concentration, and level of surveillance required of nurses to provide care to a patient or group of patients.
Methodology

- Utilized language of nursing interventions classifications
- Initiated Delphi rounds with expert panel
- Convened with core group of bedside RNs representing each unit
- Use of modified delphi technique – four rounds
CAMEO© 15 Domains of Care

1. Monitoring
2. Intermittent Medications
3. Vasoactive IV Medications
4. Continuous IV Medications
5. Respiratory Support
6. Nursing Assessment, Monitoring & Intervention
7. Procedures/Testing on the Unit
8. Resuscitation
9. ADLs/Self/Assisted Care
10. Transfers/Admissions/Transport
11. Inpatient Coordination of Care/Teaching/Anticipatory Guidance to Patient/Family
12. Discharge Planning/Education
13. Assessment of Anxiety/Coping/Mood/Family Adjustment
14. Infection Control
15. Professional/Environmental Management
CAMEO© Weighing Complexity

• Evaluates 15 domains of nursing care with a line item detail in each domain

• Each line item was assigned a complexity value based on a scale of 1 to 5
  – 1 point = 17 items
  – 2 points = 61 items
  – 3 points = 41 items
  – 4 points = 23 items
  – 5 points = 10 items
CAMEO© Scores and Classifications

• Specific line items on the CAMEO© were identified as standard of care for all patients admitted to the units
  – These line items were summed to create a baseline score for all patients

• Total score is calculated by summing line items selected by the bedside nurse for their shift with the baseline score

• This total score is then used to classify the complexity of nursing care
  – Classifications range from I to V
BCH Internal Validation

- **Therapeutic Intervention Scoring System for Children (TISS-C)** established to capture nursing interventions performed (*Trope et al.*)
  - Correlated well with severity of illness & nursing manpower use in adult intensive care patients
- **Pediatric Risk of Mortality III (PRISM III)** developed as a third-generation pediatric physiology-based score for mortality risk in ICUs (*Pollack et al.*)
- **CAMEO©** acuity tool developed to quantify patient acuity in terms of nursing cognitive workload complexity
Boston Children’s Hospital
Cardiovascular and Critical Care Units

• Large urban quaternary care free-standing children’s hospital in northeast United States with 405 inpatient beds
• ANCC Magnet status since 2008, redesignation in 2012
• Four intensive care units (101 beds):
  – Medical-Surgical
  – Medicine
  – Neonatal
  – Cardiac
  • Each of 4 ICUs have achieved AACN Gold Beacon Status
# Patient and Clinical Characteristics (N=184)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number (%)</th>
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<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
</tr>
<tr>
<td>&lt; 1 month</td>
<td>24 (13.0)</td>
</tr>
<tr>
<td>&lt; 1 year</td>
<td>37 (20.1)</td>
</tr>
<tr>
<td>1 year – 18 years</td>
<td>114 (62.0)</td>
</tr>
<tr>
<td>&gt; 18 years</td>
<td>9 (4.9)</td>
</tr>
<tr>
<td><strong>Sex (male)</strong></td>
<td>108 (58.7)</td>
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<tr>
<td><strong>Race</strong></td>
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<tr>
<td>White</td>
<td>105 (57.1)</td>
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<tr>
<td>Nonwhite</td>
<td>46 (25)</td>
</tr>
<tr>
<td>Not Assigned</td>
<td>33 (17.9)</td>
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<tr>
<td><strong>Type of Admission</strong></td>
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<tr>
<td>Medical</td>
<td>85 (46.7)</td>
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<tr>
<td>Surgical</td>
<td>97 (53.3)</td>
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<tr>
<td>Not Assigned</td>
<td>2 (1.1)</td>
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<tr>
<td><strong>Unit</strong></td>
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<tr>
<td>Cardiac ICU</td>
<td>87 (47.3)</td>
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<tr>
<td>Medical-Surgical ICU</td>
<td>60 (32.6)</td>
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<tr>
<td>Medicine ICU</td>
<td>37 (20.1)</td>
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## Tool Descriptive Statistics

<table>
<thead>
<tr>
<th>Classification</th>
<th>Total Score</th>
<th>n (%)</th>
<th>Mean</th>
<th>Median</th>
<th>Range</th>
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<tr>
<td><strong>CAMEO©</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I</td>
<td>19 (10.3)</td>
<td>98.5</td>
<td>98.0</td>
<td>59-176</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>44 (23.9)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>III</td>
<td>39 (21.2)</td>
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<tr>
<td>IV</td>
<td>55 (29.9)</td>
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<td></td>
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<tr>
<td>V</td>
<td>27 (14.7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><strong>PRISM III</strong></td>
<td></td>
<td>4.1</td>
<td>3.0</td>
<td>0-29</td>
<td></td>
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<tr>
<td>0</td>
<td>75 (41.4)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>1-9</td>
<td>80 (44.2)</td>
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<tr>
<td>10-19</td>
<td>24 (13.3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20-20</td>
<td>2 (1.1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>TISS-C</strong></td>
<td></td>
<td>22.0</td>
<td>17.3</td>
<td>1.5-74.0</td>
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Boston Children’s Hospital
Heart Center

Harvard Medical School Teaching Hospital
Correlating Nursing Workload and Patient Physiologic Indicators using PRISM-III Tool

- $r^2 = 0.446$
- $p = 0.000$
- PRISM III explained 45% of nursing work
Correlating Nursing Workload and Patient Physiologic Indicators using the TISS-C Tool

- $r^2 = 0.567$
- $p = 0.000$
- TISS-C explained 57% of nursing work
Next Steps: CAMEO© Multi-Site Validation Study

• Purpose: To utilize the CAMEO© acuity tool to describe the cognitive workload complexity of pediatric critical care nursing across 8 children’s hospitals and to validate the use of the CAMEO© in these settings
  – Aim to establish external benchmarking

• Seek to enroll 1000 (100 patients per site) pediatric patients admitted to intensive care units across participating sites
# CAMEO© Multi-Site Participating Centers

<table>
<thead>
<tr>
<th>Site</th>
<th>Lead/s</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Boston Children’s Hospital (lead)</strong></td>
<td>Jean Connor PhD, RN, CPNP, FAAN</td>
<td>Director of Nursing Research, Cardiovascular &amp; Critical Care Services</td>
</tr>
<tr>
<td><strong>Cleveland Clinic Children’s</strong></td>
<td>Janie Burke MBA, BSN, RN, CPN, NE-BC</td>
<td>Clinical Director of Nursing</td>
</tr>
<tr>
<td><strong>Children’s National</strong></td>
<td>Lisa Williams MHA, BSN, RNC, NE-BC Justine Fortkiewicz MSN, RN-BC, CCRN-K, CPN</td>
<td>Director, Inpatient Nursing Professional Practice Specialist, CICU</td>
</tr>
<tr>
<td><strong>Cincinnati Children’s Hospital Medical Center</strong></td>
<td>Amy Donnellan DNP, CPNP-AC Katie Myers RN</td>
<td>CICU Clinical Specialist/Nurse Practitioner Manager of Quality and Safety</td>
</tr>
<tr>
<td><strong>Golisano Children’s Hospital</strong></td>
<td>Melinda Zalewski MSN, RN, CCRN-K</td>
<td>Clinical Nurse Specialist, Pediatric Cardiac Care Center</td>
</tr>
<tr>
<td><strong>Miami Children’s Health System</strong></td>
<td>Ruby Whalen MSN, RN, CCRN</td>
<td>Nurse Clinical Specialist, Cardiac Care Center</td>
</tr>
<tr>
<td><strong>Children’s Hospital New Orleans</strong></td>
<td>Danielle Gottlieb Sen MD</td>
<td>Assistant Professor of Clinical Surgery, Section of Pediatric Surgery</td>
</tr>
<tr>
<td><strong>Children’s Hospital of Pittsburgh</strong></td>
<td>Ashlee Shields MSN, RN, CCRN</td>
<td>Programmatic Nurse Specialist, CICU</td>
</tr>
<tr>
<td><strong>Children’s Hospital of Omaha</strong></td>
<td>Anne Day RN</td>
<td>Director of Critical Care</td>
</tr>
<tr>
<td><strong>Seattle Children’s</strong></td>
<td>Colin Crook BSN, RN</td>
<td>Clinical Quality Leader, CICU</td>
</tr>
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</table>
Conclusions

• CAMEO© is a nursing measurement tool focusing on the complexity of cognitive workload of nursing care for patients and their families
  – Considers nursing care beyond frequency and time required for “tasks” as well as patient physiologic indicators
  – Supports *standardized communication* of nursing care as well as staffing projections and assignments

• Current exploration includes multi-site use to establish external benchmarking
Thank You!
The Commonwealth of Massachusetts

In the Year Two Thousand Fourteen

An Act relative to public health.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

SECTION 1. Chapter 111 of the General Laws is hereby amended by inserting after section 229 the following 2 sections:

Section 230. The department of public health shall administer a folic acid awareness initiative to increase public awareness of and education on the importance of folic acid to patients, families and health care providers. As part of the initiative, the department shall consider efforts to ensure that women receive the following daily recommended dosage levels of folic acid to prevent neural tube defects: 400 micrograms (mcg) for women of childbearing age, and 600 mcg for women during pregnancy. The department shall consult with public and not-for-profit statewide maternal and child health care organizations to promote folic acid awareness.

Section 231. For the purposes of this section, the term “intensive care units” shall have the same meaning as defined in 105 CMR 130.020 and shall include intensive care units within a hospital operated by the commonwealth.

Notwithstanding any general or special law to the contrary, in all intensive care units the patient assignment for the registered nurse shall be 1.1 or 1.2 depending on the stability of the patient as assessed by the acuity tool and by the staff nurses in the unit, including the nurse manager or the nurse manager’s designee when needed to resolve a disagreement.

The acuity tool shall be developed or chosen by each hospital in consultation with the staff nurses and other appropriate medical staff and shall be certified by the department of public health. The health policy commission shall promulgate regulations governing the implementation and operation of this act including: the formulation of an acuity tool; the method of reporting to the public on staffing compliance in hospital intensive care units; and the identification of 3 to 5 related patient safety quality indicators, which shall be measured and reported by hospitals to the public.