High Reliability and Microsystem Stress

Helping leaders identify and mitigate unit level stress: Next steps towards the journey of high reliability

Whitney Brady RN, DNP
Jackie Hausfeld, RN, MSN, NEA-BC

Objectives

<table>
<thead>
<tr>
<th>Identify</th>
<th>Quantitative metrics and qualitative measures indicative of microsystem stress</th>
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</thead>
<tbody>
<tr>
<td>Mitigate</td>
<td>Describe mitigation and escalation strategies at the unit, microsystem and organizational levels to prevent serious harm and other types of poor outcomes in stressed systems.</td>
</tr>
<tr>
<td>Predict</td>
<td>Discuss a systematic approach to predict stressed microsystems.</td>
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We have no financial, professional or personal conflict of interest to disclose
Develop a system to identify, mitigate and predict microsystem stress in order to prevent serious harm and other undesirable outcomes.

Global Aim

Identify
Mitigate
Predict

Definitions

Unit Level = Microsystem

Inpatient System Level = Mesosystem

Organizational Level = Macrosystem

The First Stressed Microsystem

CANCER & BLOOD DISEASES INSTITUTE (CBDI)
CBDI: Quantitative Measures

- 56 beds in CBDI 6/13
- 68 beds in CBDI 2/14
- 80 beds in CBDI 4/14
- 360 new oncology patients per year
- 100-110 bone marrow transplants per year

CBDI: Quantitative Measures

Identify Staffing

Average Daily Float Nurse Hours per Month in the CBDI

Identify Volume

CBDI: Quantitative Measures

Identify Volume

Number of Non-Reject/Refractory Oncology Patients

Average Daily Days in the CBDI
CBDI: Quantitative Measures

Identify Staffing

Less Experienced Nurses

2013 RP Nursing Census Years

- 1 year
- 1.5 years
- 2 years
- 2.5 years
- 3 years
- 3.5 years
- 4 years
- 4.5 years

2014 RP Nursing Census Years

July_11 (n=1247)
Aug_11 (n=1094)
Sept_11 (n=1122)
Oct_11 (n=1238)
Nov_11 (n=1295)
Dec_11 (n=1380)
Jan_12 (n=1526)
Feb_12 (n=1362)
Mar_12 (n=1434)
Apr_12 (n=1550)
May_12 (n=1352)
Jun_12 (n=1410)
Jul_12 (n=1501)
Aug_12 (n=1415)
Sep_12 (n=1240)
Oct_12 (n=1280)
Nov_12 (n=1058)
Dec_12 (n=1136)
Jan_13 (n=1228)
Feb_13 (n=1081)
Mar_13 (n=1234)
Apr_13 (n=1314)
May_13 (n=1368)
June_13 (n=1246)
Jul_13 (n=1695)
Aug_13 (n=1652)
Sep_13 (n=1456)
Oct_13 (n=1606)
Nov_13 (n=1473)
Dec_13 (n=1414)
Jan_14 (n=1553)
Feb_14 (n=1426)
Mar_14 (n=1774)
Apr_14 (n=2157)
May_14 (n=2222)

Primary BSI Rate in CCHMC CBDI (July 2011-May 2014)

Monthly Primary BSI Rate
Median BSI rate
Control Limits

CBDI: Quantitative Measures

Identify Acuity

Primary BSI Rate per 1000 line days

Stressed Microsystem: CBDI

Mitigate

Interventions

Unit

- Serious Harm: BSI
  - Stabilization of current processes
  - 2 person dressing changes
  - Daily prevention standard rounding with real time feedback

Inpatient System

- Increased education to float staff and review of CVC care by all staff
- Physician engagement in BSI prevention work
- Pre assignment of float staff

Organization

- Implementation of a system to improve allocation of resources and support to deescalate system stress
- Implementation of an experienced based knowledge bonus
The Second Stressed Microsystem

NEWBORN INTENSIVE CARE UNIT (NICU) – CY2014

- Decrease in primary BSI rate from 1.8 primary BSIs per 1000 line days to 0.21 BSIs per 1000 line days.
- Prolonged stress in complex systems with high-risk patients can contribute to increased BSI rates.
- Identifying key processes and executing mitigation strategies at the unit, microsystem and organizational levels can stabilize outcomes when under stress.
- Building on continued learnings from CBDI helped to identify the next stressed microsystem: NICU.
NICU

- Record High Census
- High Acuity
- Major Construction
- New Staff

NICU: Record High Census

NICU Daily Census CY 2014

Date

Identify Volume

NICU: High Acuity

Fetal Care Patients

- Record number of CDH Patients with ALOS of 72 days
- "Managing census" utilizing level II and III NICUs in our region
- Landscape of the NICU has changed: Cincinnati Fetal Care Center
NICU: Major Construction

NICU patients located on 5 different units.

NICU: New Staff

October, 2014 – We had just over 200 RN's… 94 had been hired since 1/1/2013

NICU: Quantitative Measures

<table>
<thead>
<tr>
<th>Identify</th>
<th>Volume</th>
<th>NICU ADC by Fiscal Year</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>FY 13: ADC 45</td>
</tr>
<tr>
<td></td>
<td></td>
<td>FY 16: ADC 53</td>
</tr>
</tbody>
</table>

FY 13: ADC 45
FY 16: ADC 53
NICU: Quantitative Measures

- Increase in over 48 FTE’s

Snap Shot: Quantitative Metrics

10/19/14 – 10/25/14
- 108% occupancy to budgeted ADC
- (4.31) variance to budgeted HPPD
- 13% operational vacancy (before we added more FTEs)
- 1185 hours of float staff

Stressed Microsystem: NICU

- PICC Team
  - Targeted rounding
  - Prediction (Watchers)
  - Multi-disciplinary Huddles 4 times per day
- Leadership Prevention Standard Rounds: all patients on all units. Weekly report out on all serious harm in leadership meeting. Pre-assignment of float staff.
- Implementation of a system to improve allocation of resources
  - Organizational support to de-escalate system stress
  - Implementation of an experienced based knowledge bonus
  - Added FTE's
NICU: Qualitative Measures

Family Stress

NICU Notes

Week 2 Results – 4th Floor
Very Supported – 50
Somewhat Supported – 0
Minimally Supported – 0

Week 1 Results – 6th Floor
Very Supported – 12
Somewhat Supported – 0
Minimally Supported – 0

Parents Feedback

“Frank just up and exploded. I hope I never get that burned out.”
Staff Stress

NICU Notes

Staff Qualitative Stress Measure
### NICU: Staff Definitions

#### Yellow
- Good day, went well
- Appropriate assignments
- Not feeling stressed
- Not feeling like you couldn’t get things done in a timely manner
- Well supported
- People there to help
- Peers with good attitudes
- Able to take a break and lunch
- Able to teach families
- Received the resources form the house you requested

#### Orange
- Busy assignment but received the help needed
- Overall busy and unorganized
- Some support but needed more
- Assignment busy and you don’t have the supplies you need
- Chaotic and cannot catch up
- Road trip, assignment changes but received the help
- Had to change assignments during the shift
- Changes in patient condition

#### Red
- Super busy with no help
- Inappropriate assignments
- Leave work feeling overwhelmed
- Entire unit busy, you know but there is nothing that can be done
- No support from the people you work with
- Assignment unsafe
- Staff not flexible
- House takes your resources away and creates less than ideal assignments/admit plan
- “Stupid busy” – phones ringing off the hook
- Staff with bad attitudes

### Qualitative Scoring

**IS YOUR UNIT . . . . . . .**

- **GREEN:** Routine risk/stress level within normal variability met by daily operations
- **YELLOW:** Minimal risk/stress level with some variability met by minor operational adjustments
- **ORANGE:** Moderate risk/stress level with high level of variability, predicted or unanticipated that require considerable number of interventions and support
- **RED:** High risk/stress level with a high amount of variability predicted or unanticipated, that require a large amount of intervention and support but very challenging to meet.
Initial Testing
- Unit staff used colors to denote their stress level for the day
- 4 level color scale utilized
- Staff defined what each color represented
- Expanded separate rating process by charge nurses
- Correlation found between charge nurse and aggregate staff ratings

Current Process
- Charge nurses determine overall color rating each shift with input from staff and key roles on their unit
- Rating is entered into automated system every 4 hours and comment entered if rated orange or red
- Comments provide information for resource allocation
- Comments also give insight into why the unit “feels” stressed
- Shift and aggregate data is utilized for shift decisions and trending
What did we learn?

BUILDING A SYSTEM

Global Aim

Develop a system to identify, mitigate and predict microsystem stress in order to prevent serious harm and other undesirable outcomes.

- Identify
- Mitigate
- Predict
Develop a system to identify, mitigate and predict microsystem stress in order to prevent serious harm (and other undesirable outcomes).

Global Aim

Right factors (quantitative and qualitative) are identified, validated, then utilized.

Primary Key Drivers

- Timely access to the right data representing right factors
- Effective data analysis, review and data driven decisions
- Roles and processes for management and decision-making are clear
- Appropriate oversight and support by leadership

Mitigation and Prediction Strategies

- Identification and validation of quantitative factors
  - Volume
  - Staffing
  - Patient Acuity
- Identification and validation of qualitative factors
  - Duration Stressed System
- Identification and validation of quantitative factors
  - Duration Stressed System
- Identification and validation of qualitative factors
  - Assessment of stress level by nursing

QUANTITATIVE FACTORS

- Microsystem Quantitative Daily Indicator Data
  - Reviewed published evidence
  - Validated relationship between indicators and harm
- Indicators
  - Actual and budgeted Average Daily Census (ADC) and percent occupancy
  - Average actual Nursing Hours Per Patient Day (NHPPD) to budget
  - Operational vacancy rate
    - Medical Leave of Absence (MLOA), orientation, hired and waiting for boards, posted and not yet hired
  - Percent of float staff used
  - Multiple sites of care
**Updated List of Predictor Variables**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Periodicity</th>
<th>CBD Variable</th>
<th>NICU Variable</th>
</tr>
</thead>
<tbody>
<tr>
<td>SRU Hours (RNs)</td>
<td>Monthly</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Location</td>
<td>Daily</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Percent Occupancy</td>
<td>Daily</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>NHPPD Hours</td>
<td>Monthly</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Number of International Patient - Estimated Monthly</td>
<td>Monthly</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>BMT New US Referral</td>
<td>Monthly</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>BMT Non-Chemo Stages</td>
<td>Monthly</td>
<td>X</td>
<td></td>
</tr>
<tr>
<td>NIC Action Phase</td>
<td>Monthly</td>
<td>X</td>
<td></td>
</tr>
</tbody>
</table>

*Note: data sources, periodicity, and assumptions subject to change based on final model. Current data sources used as they contained historical data.*

**Microsystem Stress: Staffing**

PS Ops: Unit Requests

Pick correct shift:

Add requests for needed staff:

Microsystem Stress: Staffing

NHPPD
MITIGATION ESCALATION AND PREDICTION

So now what?

Microsystem Stress Report

Inpatient Unit Level I Interventions

Mitigate

Ask available current staff to work additional 4 hours

Evaluate need to move manager into charge or direct care role

All meetings and other non-clinical activities cancelled and resources reassigned
Inpatient Unit Level II Interventions

- Maintain current processes with distribution of SRU/Float Resources.
- Consider microsystems that have been stressed for over a week in distribution of resources.
- Include AVP/VP in discussion around support for unit microsystem.
- Implement all applicable interventions denoted at Orange level.
- Evaluate the ability to partner with another unit with similar competency and has a lower volume or more positive operational vacancy.
- Evaluate the need to pre-assign some SRU resources to promote consistency in support and decrease the staffing gap.
- Increase Month's Team support.
- Evaluate the need to increase RN and Allied Health resources permanently related to new trends in ADC. Implement if appropriate.
- Evaluate the need for a special pay program based on prediction of operational vacancy and longer term staffing gaps.
- Evaluate the ability to cancel or hold off on accepting Destination and Tertiary Patients depending on clinical need, impact on program, etc.
- Support manager and educators working extra clinical shifts.
- Evaluate the need for the use of Supplemental staff. Post positions if needed.
- Provide support to providers to assist with rounding and other clinical work.

Dashboard Analysis

Average Weekly Occupancy
- 13 units: Average ADC over budget ADC
- 7 units: >85% Occupancy
- 5 units: >90% Occupancy

Average Nursing Hours per Patient Day (NHPPD)
- 7 units: Overstaffed by >5%
- 7 units: Understaffed by >5%
- 4 units: Within target range = GOAL

Operational Vacancy Rate
- 5 units: >10% vacancy rate

Float Use
- 6 units: >10%
  - Decreasing over time as new hires leave orientation
  - 2 units <12 beds

Qualitative
- 3 units: >10% of shifts rated orange or red

Identify
- Guides drill-downs into the data, why are the number high or low and do we have opportunity?
  - Initiative around sitter use

Mitigate
- Supports responding to trended data:
  - Increase and/or reissuing RN FTEs
  - Increase SRU RNs preassigned to an area
  - Implement a knowledge bonus
  - Utilize in decision making around distribution of resources from SRU

Predict
- Helps to predict intervention needs and explain current state
  - Trended data helps to show duration

How are we using this information?

Mitigate

- Predict
Summary of Data/Analytics

1. Performed statistical analysis to inform what measures might lead to harm (tested with CBDI/NICU)
2. Operationalized a microsystem stress measure that could be collected and sustained in the inpatient setting (nursing) (informed by PDAS cycles in CBDI/NICU)
3. Built a patient services operations system to collect and feedback the data (used for various nursing processes to ensure use). Incorporate PMRS dashboard reporting into PS system to help inpatient units mitigate.
4. Using SPC and empirical analysis to see if correlation exists between harm+concerns+803-SAFE calls (composite measure of “not good care”)
5. Future: determine if statistical analysis would show relationships with stress duration and outcome to help us be able to predict.

Microsystem Dashboard CONCEPT

Microsystem Outcomes

Microsystem “Key” Processes

Composite Measure

Harm & Stress - TCC
Summary of Learnings

• Both quantitative and qualitative metrics are helpful in identifying unit and system level stress

• Standardized mitigation and escalation strategies expedite decision making and execution of interventions

• Examination of trending data supports prediction and early detection of stressed systems

Next Steps

• Incorporate year to date data into the report
• Consistently review and understand weekly trended data
• Quantitative and qualitative data utilized in decision making and resource allocation
• Spread to other mesosystems beyond inpatient
• Transition to utilizing new Daily Microsystem Report

Questions?