HOSPITAL-COMMUNITY ANALYSIS AND PLAN TO REDUCE NEONATAL INTENSIVE CARE UTILIZATION AND COST

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18297B – CAPSTONE PROJECT, MASTER OF PUBLIC HEALTH, MEDICAL COLLEGE OF WISCONSIN

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The purpose of this project is to explore how hospitals or health systems can achieve population health goals through:

- the identification of evidence-based initiatives that address social determinants of health which influence a health condition
- develop programming or partnerships with community-based organizations to address determinants, resulting in financial savings for health system

There is increasing pressure on health systems’ finances through changes in reimbursement through 30-day readmission penalties as well as capitated payment schemes.

- Growing importance for hospitals and health systems to consider the role social determinants of health play in overall health
Introduction: Focus

- Individual NICU expenses vary considerably based upon several complex factors
- NICU expenses are reimbursed at higher rates than other areas of hospital\(^1\)
- Expenses related to NICU births extend beyond NICU utilization
  - Financial analysis related to medical expense avoidance in first year of life
    - Premature Infant = $32,000 in first year medical expenses (2010 figures)\(^2\)
    - Full term Infant = $3,000 in first year medical expenses (2010 figures)\(^2\)
INTRODUCTION: FOCUS

- UnityPoint Health – Meriter
  - Located in Madison, WI
  - 448-bed tertiary care community hospital with more than 100 years in the community
  - In 2014, joined UnityPoint Health, a 32 hospital system based out of Des Moines, Iowa
  - Busiest birthing center in Wisconsin
    - Very busy neonatal intensive care unit (NICU) with approximately 450 admissions per year.
INTRODUCTION:
FOCUS

- 12% of Meriter babies born at Meriter were admitted to NICU
- Estimated total first year medical costs for NICU infants = $13,712,000
- Estimated total first year medical costs if infants were born healthy = $1,258,500
INTRODUCTION: FOCUS

- Used findings of Master of Public Health Field Placement course work: Using Social Determinants of Health to Predict Birth Outcomes

  - Use aggregate de-identified patient perinatal and birth records in the birthing center (Peridata Net) to identify social and/or behavioral risk which may predict NICU utilization
    - Use findings to inform a process to proactively identify patients who may be at increased risk for poor health outcomes
    - Use findings to inform the development of programming or partnerships to address the social/behavioral needs of patients who may be at increased risk for poor health outcomes
INTRODUCTION:
FOCUS

SOCIAL FACTOR RISK ASSESSMENT – NICU UTILIZATION

Race:
Black/African American
Asian (inc Asian Indian)

Education:
Some College (no degree)
Associates Degree
High School or GED
9-12th grade

Depression:
YES

Illicit Drug Use:
Yes

Smoking status:
Personal Smoking
Lives with Smoker

Ability to Impact during Pregnancy:
- Smoking status
- Illicit Drug Use
- Depression
METHODS:
LITERATURE FINDINGS

- Smoking Cessation - 31 Studies
  - Smoking Cessation Counseling – 21
  - Telephone interventions – 3
  - Home Visits – 1
  - Referrals to outside organizations - 6

- Prenatal Depression -20 Studies
  - Exercise Intervention - 10
  - Group counseling – 2
  - Cognitive-Behavioral Interventions – 3
  - Partner-assisted psychotherapy – 1
  - Mindfulness – 1
  - Midwives – 1
  - Community health workers – 1
  - Repetitive transcranial magnetic stimulation - 1

- Illicit Drug Use-16 Studies
  - Prenatal visits – 5
  - “Early Start” – 4
  - Case Managers – 2
  - Peer-Oriented Intervention- 1
  - Residential Treatment – 1
  - Motivational Interviewing – 1
  - “I am Concerned” - 2
METHODS:
PROGRAM EXPLORATION

- Hospital-Led Program
- Nurse-Family Partnership (NFP)
  - Home-Visiting Program connects nurses with low-income pregnant women, connection persists until child is 2 years old
  - Financial Analysis: Significant financial burden relative to potential NICU impact
    - Not feasible within parameters of project
METHODS:
PROGRAM EXPLORATION

- Community Partnership Opportunities:
  - Community Partnerships, Inc., Madison, WI
  - Wisconsin Women’s Health Foundation, Madison, WI
  - YMCA of Dane County, Madison, WI
METHODS:
PROGRAM EXPLORATION

- Community Partnerships
  - Experience with home visiting program & complex care coordination
  - Early Childhood Initiative (ECI) Home-Visiting Program\(^5\)
    - Similar to NFP
  - Financial Analysis: Significant financial burden relative to potential NICU impact
    - Not feasible within parameters of project
Wisconsin Women’s Health Foundation

- Statewide organization based in Madison
- First Breath, evidence-based smoking cessation
  - Published finding of 43% of participants successfully quitting smoking during pregnancy
- Financial Analysis: Modest Cost to Meriter compared to NICU impact
  - Not feasible within parameters of project
  - However, if data could show benefit in birth outcomes through second-hand smoke reduction, would be a strong model to pursue
METHODS:
PROGRAM EXPLORATION

- YMCA of Dane County
  - Provides services at 3 locations and onsite for corporate partners
  - Offer Prenatal Yoga
    - Positive impact of prenatal yoga on depression\(^8\)
    - Positive impact of prenatal yoga on preterm births\(^9\)
  - Financial Analysis: Potential cost savings to Meriter compared to NICU impact
    - May be feasible within parameters of project
RESULTS: PROGRAM DEVELOPMENT

- On-site prenatal yoga class
  - YMCA employs full-time yoga instructor to offer:
    - Drop-in classes
    - Assists in educating providers about program
    - Available to answer questions about class
    - Receives referrals from providers
    - Tracks attendance and administers pre- and post tests
      - Edinburgh Postnatal Depression Scales
      - Beck Depression Inventory
      - Quick Inventory of Depressive Symptomatology

Photo credit: Kona Yoga via Foter.com / CC BY-NC-SA
RESULTS: PROGRAM DEVELOPMENT

- On-site prenatal yoga class
  - Provides at least 20 minute yoga class with information to take home
  - Instructor can provide transportation vouchers
  - Incentives for participation
    - 24 classes considered to be full session
    - Encourage 2 classes per week following 20th gestational week
    - Incentive after attending 12 classes
    - Incentive after attending 22 classes
RESULTS: PROGRAM DEVELOPMENT

- On-site prenatal yoga class
  - YMCA employs 2 part-time child care staff:
    - Provides childcare for anyone taking class
    - Childcare area located near yoga space

Photo Credit: Tina Floersh, https://unsplash.com/search/children-playing
**RESULTS: PROGRAM DEVELOPMENT**

**Program: Meriter & YMCA of Dane County Prenatal Yoga Logic Model**

Situation: Prenatal depression is a risk factor for NICU utilization. Approximately 6-7% of women in Dane County who give birth at Meriter report prenatal depression. Among these births, between 23-24% require admission to the NICU. Moderate, gentle exercise has been proven to be a non-pharmaceutical method for reducing prenatal depression and ultimately reducing the rate of preterm and low gestational weight births. Among the exercises, yoga appears to lend itself well to this population.

<table>
<thead>
<tr>
<th>Inputs</th>
<th>Activities</th>
<th>Outputs</th>
<th>Participation</th>
</tr>
</thead>
</table>
| • Funding  
• Time  
• Space for class and childcare  
• Yoga supplies (including mats, towels, sanitation, blocks)  
• Staffing (instructor and childcare staff)  
• Clinical staff engaged in process  
• Transportation  
• Relationships with external OB/GYN | • Provide on-site drop-in yoga for pregnant women who report pre-natal depression.  
• Provide outreach and education to Meriter primary care physicians and clinics (including Family Practice, internal medicine and OB/GYN).  
• Provide outreach and education to non-Meriter primary care groups who patients are likely to deliver babies at Meriter | • Pregnant women with prenatal depression who are likely to or plan to deliver infants at Meriter  
• Primary care physicians and office staff | • Pregnant women with prenatal depression who report knowledge that gentle exercise can positively benefit stress management, symptoms of depression and positive birth outcomes |

<table>
<thead>
<tr>
<th>Outcomes — Impact</th>
<th>Short</th>
<th>Medium</th>
<th>Long</th>
</tr>
</thead>
</table>
| During pregnancy... | • Pregnant women with prenatal depression will report knowledge that gentle exercise can positively benefit stress management, symptoms of depression and positive birth outcomes  
• Pregnant women with depression will report increased comfort with integrating gentle exercise into weekly schedule. | |  
| Postpartum impact | • Women with prenatal depression will report reduced stress and improved symptom management.  
• Fewer preterm infants will be born to women suffering from prenatal depression  
• Fewer infants born to women suffering from prenatal depression will be admitted to the NICU | |  
| Women who experienced prenatal depression will participate in an exercise regimen following delivery.  
• Infants born to women with prenatal depression will experience a reduction in median and long term health issues.  
• Women with prenatal depression who receive education on exercise as a method to improve birth outcomes will have healthier subsequent pregnancies | | |

**Assumptions**

• Open, drop-in prenatal yoga classes are accessible to the majority of Dane County women with prenatal depression who give birth at Meriter.

**External Factors**

• Women with prenatal depression may have other social pressures which prevent participation in group classes.
• Women with prenatal depression may have other risk factors which negatively impact birth outcomes.

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RESULTS:
PROGRAM DEVELOPMENT

- Performance Management Plan
  - Evaluate NICU utilization for mothers with depression who did or did not take prenatal yoga
  - Determine number of patients referred compared to patients with depression
  - Determine number of patients who attend classes compared to patients referred
  - Assess adequacy and quality of space for yoga class and child care
  - Evaluate patient satisfaction and identify barriers to participation
RESULTS:
PROGRAM DEVELOPMENT

- Outcome Evaluation
  - Assess knowledge of impact of gentle exercise on birth outcomes
    - Pre- and Post test administered by yoga instructor and through the mail
  - Assess patient stress levels, depression and anxiety
    - Pre-and Post-test administered by yoga instructor and through the mail
    - Conversations between referring physician and Meriter staff
  - Assess impact on children’s health
    - Review of medical records
    - Impact on subsequent pregnancies
### RESULTS: PROGRAM DEVELOPMENT

#### Prenatal yoga impact

<table>
<thead>
<tr>
<th>Meriter prenatal patients with depression</th>
<th>% preterm without intervention</th>
<th>Estimated first year Preterm expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>15.50%</td>
<td>$992,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Meriter prenatal patients with depression following prenatal yoga</th>
<th>% preterm</th>
<th>Estimated first year Preterm expense</th>
</tr>
</thead>
<tbody>
<tr>
<td>200</td>
<td>12.40%</td>
<td>$793,600</td>
</tr>
</tbody>
</table>

Total first year savings following yoga program $198,400

- Meriter preterm births % in depressed patients = 15.5%*
  - Randomized control trial demonstrated mean increase in gestational age nearly 2 weeks in depressed women following prenatal yoga session
  - Case-Controlled, matched study of pregnant women (no depression) showed a greater than 50% decrease in preterm births.
- Reducing preterm births in depressed women by 25%, the rate of preterm birth in this population would drop to 12.4%
  - Decrease would reduce first-year medical costs for preterm infants by nearly $200,000

*Total NICU utilization in infants born to depressed women is higher than the percent born preterm. However, since studies showed a change in preterm births, analysis focused only on this aspect.
RESULTS: PROGRAM DEVELOPMENT

Prenatal Yoga Program Expense

- Total HR Costs = $90,922
- Total Facility Costs = $44,500
- Total Program Supply Costs = $10,040
- Total Marketing Costs = $450
- Total Program Expenses - $145,912

Total Savings for Compared to First-Year Medical Costs = $52,488

<table>
<thead>
<tr>
<th>Staff</th>
<th>Rate</th>
<th>FTE</th>
<th>Base pay</th>
<th>Fringe Benefits</th>
<th>Administrative fee</th>
<th>Total Salary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prenatal yoga instructor</td>
<td>$24</td>
<td>1</td>
<td>$49,920</td>
<td>30%</td>
<td>15%</td>
<td>$72,384</td>
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<tr>
<td>Child Care Staff</td>
<td>$8</td>
<td>0.5</td>
<td>$8,060</td>
<td>N/A</td>
<td>15%</td>
<td>$9,269</td>
</tr>
<tr>
<td>Child Care Staff</td>
<td>$8</td>
<td>0.5</td>
<td>$8,060</td>
<td>N/A</td>
<td>15%</td>
<td>$9,269</td>
</tr>
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Total HR Costs - $90,922

<table>
<thead>
<tr>
<th>Facility</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Room Cost</td>
<td>$41,800</td>
</tr>
<tr>
<td>Telephone cost</td>
<td>$1,200</td>
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<tr>
<td>Computer access</td>
<td>$1,500</td>
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</tbody>
</table>

Total Facility Cost - $44,500

<table>
<thead>
<tr>
<th>Program supplies</th>
<th>Per set</th>
<th># of sets</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yoga supplies</td>
<td>Mats, blocks $60 30</td>
<td>$1,800</td>
<td></td>
</tr>
<tr>
<td>Childcare supplies</td>
<td>toys, diaper supplies $1,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Towel service</td>
<td>$240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transportation costs</td>
<td>$2,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Incentive costs</td>
<td>$4,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mileage to referring physician office</td>
<td>$500</td>
<td></td>
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</tr>
</tbody>
</table>

Total Program Costs - $10,040

Marketing costs

- Flyers $300
- Referral pads $150 (leave-behind for physician office)

Total Marketing Costs - $450

Total Program Expenses - $145,912
CONCLUSION

- Prenatal yoga can help improve birth outcomes in pregnant women with depression
- Prenatal yoga offered to women with depression may reduce NICU expenses and first-year medical costs
- Through broadening of criteria beyond immediate impact of NICU utilization, other programs may have longer term and more significant return on investment for health system
  - First Breath
  - Nurse-Family Partnership
REFERENCES


REFERENCES


THANK YOU

- Unless otherwise noted, photos used were through publicly available websites, clip art or UnityPoint Health – Meriter website.
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