Sex and Race Differences in Safety and Effectiveness of a Chest Pain Accelerated Diagnostic Protocol

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• Dr. Mahler:
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Background

• Chest pain in the ED
  • ~7-9 million patients
  • >50% admitted
  • <10% with ACS

• Patients with low-risk of ACS
  • Unnecessary testing
    • Crowding
    • Cost
    • Potential harms
The HEART Pathway

• An accelerated diagnostic protocol (ADP) for patients with symptoms concerning for ACS

• Based on a modified HEART score

• Designed to identify low-risk patients for early discharge without objective cardiac testing

- History
- ECG
- Age
- Risk Factors
- Troponin
HEART Pathway Evidence

• Decreases:
  • Hospitalization
  • Objective cardiac testing
  • Hospital length of stay
  • Cost

Evidence Gaps

• Lack of data evaluating performance of the HEART Pathway for sex and race
  • Safety
  • Effectiveness
Objective

• To compare the safety and effectiveness of the HEART Pathway among women vs. men and white vs. non-white patients presenting to the ED with acute chest pain
Methods: Study Design

• Pre-planned sub-group analysis of the HEART Pathway Implementation Study

Pre-Cohort
Usual Care
12 months
3,713 patients

Wash-In
3 months

Post-Cohort
HEART Pathway
12 months
4,761 patients

November 2013 → January 2016
Methods: Data Collection

- Claims Data
- EMR
- Death Index

Patient Variables and Outcomes
Methods: The HEART Pathway Implementation
Methods: Outcomes

Safety
Primary
• Death or MI at 30 days
Secondary (index and 30 days)
• Death
• MI
• Coronary revascularization
• MACE

Effectiveness
Primary
• Hospitalization rate at 30 days
Secondary
• Objective cardiac testing
• Early discharge rate
Methods: Statistical Analysis

• Fisher’s exact tests

• Multivariable logistic regression
  • Interaction terms
    • Sex x Implementation
    • Race x Implementation
  • Adjusted odds ratios within subgroups
Results

**Pre-Implementation**
N = 3,713

- Male: 47.1%
- Female: 52.9%

**Post-Implementation**
N = 4,761

- Male: 45.9%
- Female: 54.1%

Total: 8,474 patients

**Race**

- White: 66.9%
- Non: 33.1%

- White: 65.2%
- Non: 34.8%
Results: Low-Risk

- Women are more likely to be identified as low-risk ($p=0.002$)

- Non-white patients are more likely to be identified as low-risk ($p<0.0001$)
Results: Death and MI at 30 Days

- No difference in rates of death or MI at 30 days among low-risk patients
  - Sex: p=0.70
  - Race: p=0.69
Results: Hospitalization at 30 Days

- No difference in reduction of hospitalizations in subgroups
  - Sex: p=0.59
  - Race: p=0.09
Multivariable Models: Index MI

• Index MI detected more frequently among women and whites
  - Women aOR 1.71 (1.24-2.38)
  - Men aOR 1.20 (0.95-1.53)
  - Non-white aOR 1.15 (0.78-1.70)
  - White aOR 1.46 (1.17-1.82)
• No significant interaction within subgroups
  - \( p = 0.15 \)
  - \( p = 0.28 \)
Multivariable Models: Death or MI

• Death or MI at 30-days
  • Significant aOR in female and white patients
    • Women aOR 1.65 (1.21-2.24)
    • Men aOR 1.07 (0.86-1.34)
    • Non-white aOR 1.19 (0.82-1.72)
    • White aOR 1.28 (1.04-1.57)
  • Interaction terms were not significant

\( p = 0.07 \)
\( p = 0.59 \)
Multivariable Models: Hospitalization

• Hospitalization at 30-days
  • Significant aOR in female, non-white, and white patients
    • Women aOR 0.74 (0.64-0.85)  
      p = 0.24
    • Men aOR 0.87 (0.75-1.02)
    • Non-white aOR 0.72 (0.60-0.86)  
      p = 0.23
    • White aOR 0.83 (0.73-0.94)
  • Interaction terms were not significant
Limitations

• Susceptible to time differences

• Generalizability

• Use of electronic data capture

• Does not explain differences in risk classification by sex or race
Conclusions

• The HEART Pathway Implementation
  • Fewer hospitalizations
  • Very low rate of MACE

• Women and non-white patients
  • More likely to be classified as low-risk

• Safe and effective in all subgroups

Questions?
Sex and Race Disparities

• Implicit biases?
• Atypical presentation?
• More likely to present?
Time

- Pre-implementation
  - More variability
  - Upward trend

- Post-implementation
  - Less variability
  - Downward trend

Mahler et al, Circulation, 2018
Adjusting for Confounders

- Age
- Sex*
- Race*
- Ethnicity
- Body Mass Index (BMI)
- Emergency Department location
- Insurance status
- Smoking
- Coronary artery disease

- History of coronary artery disease
- Diabetes
- Hyperlipidemia
- Hypertension
- Presence of chest pain vs other symptoms concerning for coronary artery disease

*depending on interaction variables (women vs. men; non-white vs white)
Claims Data

• Blue Cross Blue Shield (BCBS) of NC*

• MedCost

• North Carolina Medicaid

*Dominant insurer in the state