Association of Catheter Associated Urinary Tract Infection with the Practice Environment at the Unit Level

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Dissertation University of Kansas

Disclosures

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Background

Patient Outcomes – Importance in Acute Care

- **Financial Impact in the USA**
  - Centers for Medicare & Medicaid – Reimbursement
  - Public Reporting
- **Hospital Acquired Conditions (HAC)**
  - Falls with Injury
  - Pressure Ulcers
  - Nosocomial Infections

Nosocomial Infections

- **Five Preventable**
  - Ventilator Associated Pneumonia VAP
  - Surgical Site Infection (SSI)
  - Clostridium Difficile Infection (CDI)
  - Central Line Bloodstream Infection (CLBSI)
  - Catheter Associated Urinary Tract Infection (CAUTI)

- *Estimated Cost in USA $9.8 billion (95%CI, $8.3-$11.5 billion) in 2012 dollars**

*Zimlichman et al. (2013)

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Catheter Associated Urinary Tract Inf. (CAUTI)

- **Most frequent nosocomial infection**

- **13,000 deaths associated with UTI (CDC, 2010)**

- **75% of UTIs- associated with a urinary catheter (CDC, n.d.)**

- **17% of bacteremias have a urinary source**

- **Prevention supported by:**
  - Decreased use
  - Standardized care

- **Association between nurse staffing and UTI** (Aiken, Sloane, & Wu, 2012)

Practice Environment & Outcomes

- **1983 Original Study, Magnet Hospitals (McClure & Hinshaw Eds., 2002)**
  - Identified characteristics of good practice environments

- **Nurse-to-patient staffing level major factor in prevention of HACs (Multiple investigators)**
  - Practice environment affects outcomes associated with staffing levels (Aiken et al., 2011)

Practice Environment & Outcomes

- **Healthy work environment**
  - Important to nurse satisfaction
  - Patient outcomes Magnet [®] vs non-Magnet [®] hospitals (Aiken & Colleagues, 2000; Kramer & Colleagues, 2011)

- **Leiter & Laschinger (2006)** Posited *Nurse Worklife Model*
  - Practice Environment associated w/burnout & personal accomplishment

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Gap in the Literature

Studies to date of NWLM:

– Aggregated Individual-level nurse survey data

– Nurse perception of adverse patient outcomes

Other studies of outcomes related to the practice environment:

– Hospital-level using administrative data

– Hospital-level adverse event rates

Gap: Evaluation of the association of unit level measures of practice environment with measured clinical outcomes.

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Design

- **Correlational path analysis:**

  - Structural Equation Modelling (SEM) NWLM of Job Enjoyment fit to the data

  - **Secondary Analysis**

    - National Database for Nursing Quality Indicators (NDNQI)® 2012 RN Satisfaction Survey Data Reporting Practice Environment Scale (PES) and Job Enjoyment Scale (JES)

    - Unit types: medical, surgical, combined medical-surgical

Measures

- *Job Enjoyment Scale (JES) –*
  - Seven item scale
  - Likert-type responses from strongly disagree (1) to strongly agree (6) ($\alpha = .97$)
- *Practice Environment Scales (PES) –*
  - Five Subscales ($\alpha = .87- 90$)
  - *3-10 items*
  - Likert-type responses, strongly disagree (1) to strongly agree (4)

Measures (cont'd)

- **CAUTI (USA-National Healthcare Safety Network definition)**
  - Raw data from 2012 were annualized to calculate rates
  - Rate - Total number of reported CAUTIs /total number of catheter days x 1000.

Practice Environment Scale

Variable	Definition	# Items	α
PES-Collegial RN-MD Relations	Presence of collaborative working relationship (RN-MD Collaboration)	3	.87
PES-Nurse Participation in Hospital Affairs	Policy development and decisions about practice (Policy Involvement)	9	.90
PES-Staffing and resource adequacy	Staffing level is adequate to provide the care needed (Staffing Adequacy)	4	.88

PES (cont'd)

PES-Nurse manager ability, leadership, and support	Nursing manger viewed as a leader who provides strong support (Strong Leadership)	5	.90
PES-Nursing Foundations for Quality Care	Nursing practice is supported by high standards, professional nursing philosophy, education, expectation of competency, and measurement of quality (Nursing Model of Care)	10	.88

Job Enjoyment Scale Items (1-6 Scale)

Stem:	*Nurses with whom I work would say that they:*
1.	Are fairly well satisfied with their jobs.
2.	Would not consider taking another job
3.*	Have to force themselves to come to work much of the time.
4.	Are enthusiastic about their work almost every day.
5.	Like their jobs better than the average worker does.
6.*	Feel that each day on their job will never end.
7.	Find real enjoyment in their work.

*Reverse scored so that a higher score = higher Job Enjoyment

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Data Analysis

- **Descriptive statistics & ANOVA (SPSS version 18)**

- **SEM –correlational path analysis**
  - Mplus Software version 7 to test the hypothesized *a priori* NWLM-JE
- **Incremental fit indices**
  - Comparative Fit Index (CFI) - Acceptable range: > .90
  - Root Mean Square Error of Approximation (RMSEA) - Acceptable range: < .08
  - Standardized Root Mean Square Residual (*SRMR*) < .08

(Hooper, Couglan & Mullen, 2008)

National Database for Nursing Quality Indicators

2012 RN Satisfaction Data and Quality Outcomes data
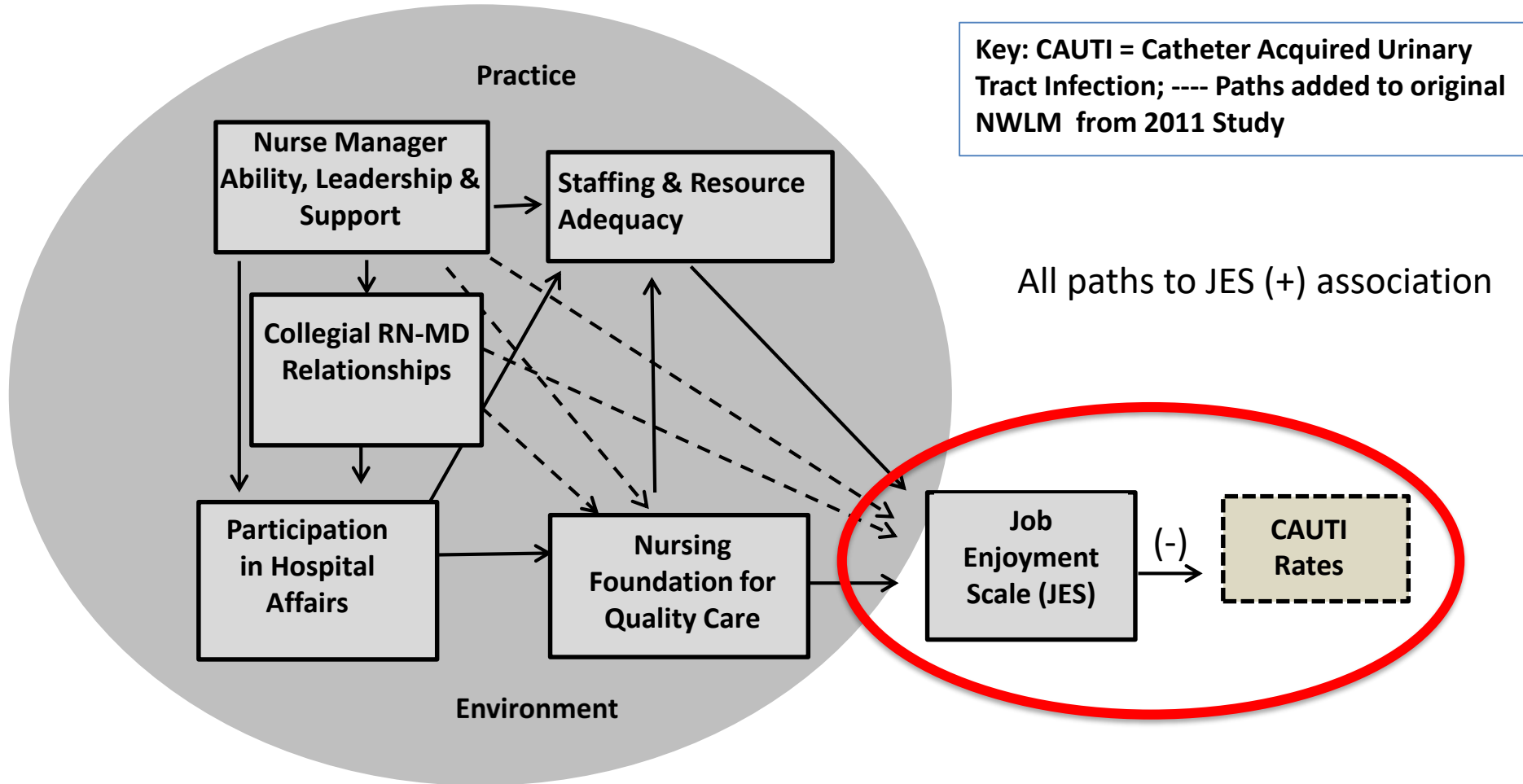
- **Study Aim**
  - Confirm structure of the modified NWLM of Job Enjoyment from previous study of unit level 2011 data set

  - Evaluate the relationship of elements of the nurse practice environment with CAUTI

Study Assumptions

- Unit level data with at least 40% response rate accurately reflect the score for the unit (Kramer et al., 2009)

- CAUTI rates sufficient to determine the pathways for association of the NWLM-JE with CAUTI rate at the unit level.

Hypothesized Nurse Worklife Model of Job Enjoyment & CAUTI rates

Key: CAUTI = Catheter Acquired Urinary Tract Infection; ---- Paths added to original NWLM from 2011 Study

Practice

Nurse Manager Ability, Leadership & Support

Staffing & Resource Adequacy

Collegial RN-MD Relationships

Participation in Hospital Affairs

Nursing Foundation for Quality Care

All paths to JES (+) association

Job Enjoyment Scale (JES)

(-)

CAUTI Rates

Environment

Results: Hospital & Unit Type Characteristics (*N*=1,106)

Bed Size	%	Unit Types	%
< 100	8.1	Medical	33.9
100-199	18.8	Surgical	25.2
200-299	22.3	Medical-Surgical	40.5
300-399	16.4		
400-499	14.3		
500+*	20.1		

RN Characteristics	*Range* %	*M* %
Female	50-100	92
White	0-100	67
BSN or higher	0-100	56
Certification	0-100	16

Teaching Status & Magnet Status	%
Academic Medical Center*	19.4
Teaching	34.5
Non-teaching	46.0
Magnet Status	45.0

*ANOVA indicated a significant difference on CAUTI rate for Academic Medical Center status & Hospital bed size > 500

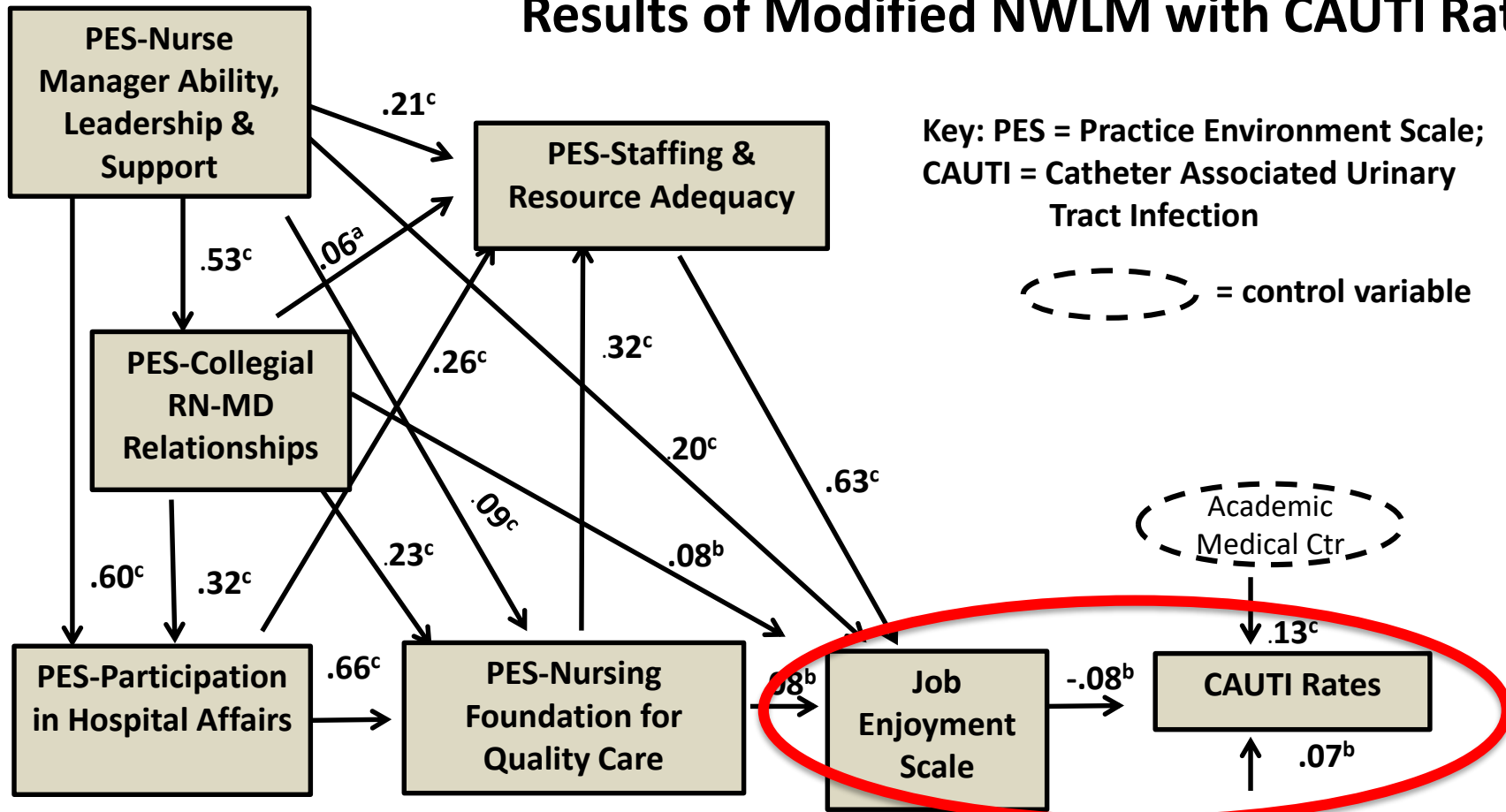KENNESAW STATE UNIVERSITY

Results:

- **PES subscales moderately to highly correlated (*r* =.53 to .88); reliabilities *range* = .94 to .97**

- ***CFA* for subscales-*CFI =* .91-1.0 with the exception of Participation in Hospital Affairs (*CFI =* .85)**

- **Job Enjoyment Scale similar across all unit types
  [*M* = 3.71 (*SD*=.58) to 3.78 (*SD*=.58)]**

Results (cont'd)

- **CAUTI Rate**
  - **Medical** $M = 1.91$ ($SD=2.7$)
  - **Surgical** $M = 1.54$ ($SD=2.1$)
  - **Medical-Surgical** $M = 1.91$ ($SD=2.5$)

- **Model Fit Indices:**
  - *CFI = .995*
 - *RMSEA= 0.04 (95% CI = .028-.056)*
  - *SRMR=0.02*

Results of Modified NWLM with CAUTI Rates

Key: PES = Practice Environment Scale; CAUTI = Catheter Associated Urinary Tract Infection

⬭ = control variable

PES-Nurse Manager Ability, Leadership & Support

PES-Staffing & Resource Adequacy

PES-Collegial RN-MD Relationships

PES-Participation in Hospital Affairs

PES-Nursing Foundation for Quality Care

Job Enjoyment Scale

CAUTI Rates

Academic Medical Ctr

Bed Size > 500

.21^c .53^c .06^a .26^c .32^c .20^c .63^c .09^c .08^b .60^c .32^c .23^c .66^c .08^b -.08^b .13^c .07^b

Coefficients depicted in the model are standardized; $^a p$ <.05; $^b p$<.01; $^c p$<.001

Associated Impact on CAUTI Rate

| Job Enjoyment Scale | $-.08^{b}$ → | CAUTI Rates |
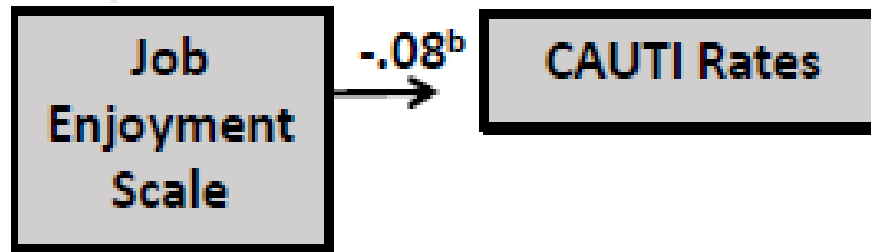
1 point Change in Job Enjoyment associated with change in CAUTI Rate of .08, *p*=< .01

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Significance

- Modified NWLM of Job Enjoyment paths from previous study supported

- *Significant negative* association of CAUTI rate with Practice Environment through Job Enjoyment at the unit level

- Positive association of academic medical centers and hospitals with > 500 beds

- Impact of the practice environment on CAUTI aligns with work at the hospital level by Aiken

- Pervasive impact of nurse manager in NWLM aligns research on importance of first-line nurse leadership

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Limitations:

- Sample may not be representative of hospital populations across the U.S.

- Under representation of rural & smaller hospitals

- Higher proportion of Magnet® designated hospitals in the NDNQI ® database.

- Units with poor practice environments may be under represented due to lack of a 40% response rate.

- Cross-sectional data limits inference of causality

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Strengths

- Large national sample from all census divisions

- Well-defined valid and reliable measures for variables

- Measured clinical outcome

Questions?