RN Reductions, Workload Increases, and Patient Safety Events in Florida Hospitals 1996-2004: New Variable and Longitudinal Approaches

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Presentation Topics

- Research rationale & hypotheses
- Design
- Key variables
- Data sources
- Analysis
- Results
- Conclusion

Research Rationale

- Growing evidence of relationship between nurse staffing and patient adverse events, but
- Inconsistencies in evidence
  - Within studies
  - Between studies
- Some issues
  - Lack of consensus on nursing-sensitive adverse events
  - Multiple measures of adverse events
  - No modeling of causation
  - Administrative data problems

Research Hypotheses

1. A reduction in RN staff is associated with an increase in individual Patient Safey Indicators (PSIs) and composite patient safety events (PSE).
2. A decrease in RN/APDC (increase in workload) is associated with an increase in PSIs and PSE.
3. A reduction of RN staff is associated with a reduction in RN/APDC (increase in workload).

Research Hypotheses

4. Initially lower levels of RN FTE are associated with initially higher rates of, and a greater growth in, PSIs and PSE.
5. Initially lower levels of RN/APDC are associated with initially higher rates of, and a greater growth in, PSIs and PSE.
6. Initially lower levels of RN FTE are associated with lower RN/APDC and reductions in RN/APDC.

Design

- 9 years of panel data
- Latent growth curve model assesses the impact of
  - change trajectory of RN FTE on that of RN/APDC
  - change trajectory in RN FTE & RN/APDC on that of PSI & PSE
  - initial # of RN FTE on the change trajectory of RN/APDC
  - Initial # of RN FTE and initial RN/APDC on the change trajectory of PSI & PSE
  - Initial # of RN FTE on initial RN/APDC
  - Initial # of RN FTE & RN/APDC on initial PSI & PSE

Time-Varying Endogenous Variables

- 6 of 20 AHRQ Patient Safety Indicators (PSI) in separate models:
  - Decubitus ulcers
  - Failure to rescue
  - Pneumothorax
  - Infection
  - Post-operative respiratory failure
  - Post-operative sepsis
- A composite PSE in a separate model
  - Derived from the PSI through principal components analysis (PCA)

Time-Varying Endogenous Variables

- RN workload
  - RN FTEs/ adjusted patient days of care
  - An inverse measure of workload
  - Patient days of care are adjusted for out-patient care and for patient turnover

Time-Varying Exogenous Variable

- RN FTE

Time-Invariant Exogenous Variables

- Hospital case mix
- Ownership status
- Size (number of beds)
- Urban status
- # of HMO patient days
- # of Medicaid patient days or rural status

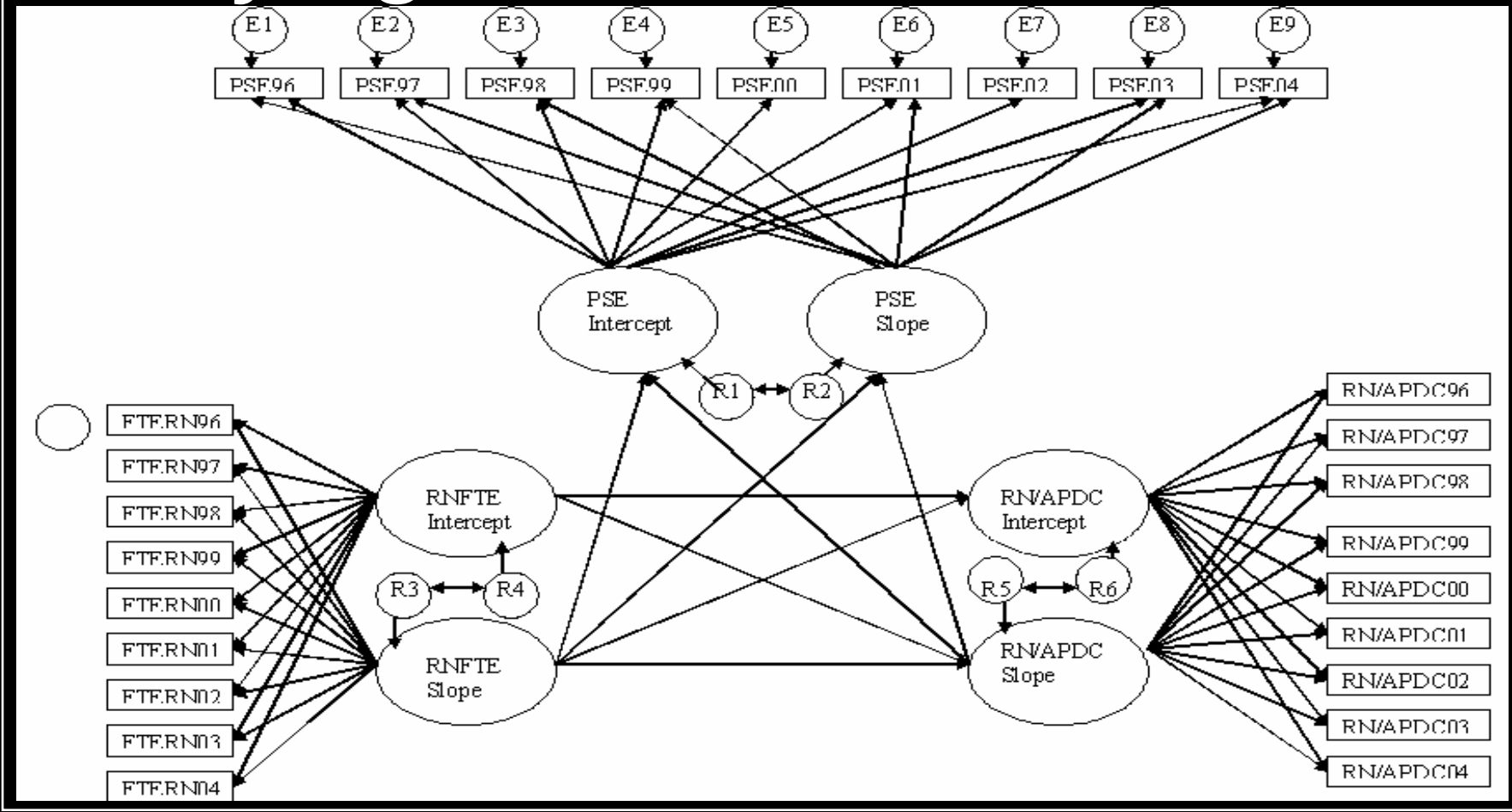
Data Sources

Variable	Sources
Patient safety Event	FHIPD (AHCA)
LOS	FHIPD (AHCA)
RNFTEs	AHA Annual Survey
Adjusted Patient Days	AHA Annual Survey
Ownership, Beds	AHA Annual Survey
CMI, Urban Status	Medicare Public Use File
HMO Pt Days	FHURS (AHCA)
Medicaid Pt Days	FHURS (AHCA)

Analysis: LGCM

- Time-varying variables entered into model as having
  - fixed and linear intercepts
  - Free and therefore possibly non-linear slopes
- Slope origin = 1996
- Structural Equation Modeling
  - M-Plus program
  - Maximum likelihood estimation

Analysis: Model with Time-Varying Variables



Results:

	PSI Decubitus Ulcer	PSI: Failure to rescue	PSI: Infection
	CV	CV	CV
PSI Slope on:			
RN FTE I	NS	-2.978	NS
RN FTE S	NS	-3.051	2.227
RN/APDC S	-2.061	NS	NS
RN/APDC I	NS	NS	-2.250
PSI Intercept on:			
RN FTE I	NS	NS	NS
RN/APDC I	3.982	NS	2.219

Results:

	PSI: Decubitus Ulcer	PSI: Failure to rescue	PSI: Infection
	CV	CV	CV
RN/APDC Slope on:			
RN FTE Intercept	NS	NS	NS
RN FTE Slope	5.946	5.881	5.827
RN/APDC Intercept on:			
RN FTE Intercept	6.236	6.143	6.099

Results:

	PSI: Decubitus Ulcer	PSI: Failure to rescue	PSI: Infection
	CV	CV	CV
PSI Slope on:			
CMI 1996	NS	2.138	NS
Urban status	NS	3.041	NS
For-profit ownwership	NS	NS	NS
Medicaid days of care	NS	2.200	-2.673
HMO days of care	NS	NS	NS
Beds	--	--	--

Results:

	PSI: Decubitus Ulcer	PSI: Failure to rescue	PSI: Infection
	CV	CV	CV
PSI Intercept on:			
CMI 1996	-3.284	NS	NS
Urban Status	NS	-2.291	NS
For-profit ownership	NS	NS	NS
Medicaid days of care	NS	NS	2.987
HMO days of care	NS	NS	NS
Beds	--	--	--

Results:

	PSI: Pneumo-thorax	PSI: Post-op Resp. Fail	PSI: Post-op Sepsis
	CV	CV	CV
PSI Slope on:			
RN FTE I	NS	NS	NS
RN FTE S	NS	-3.606	-3.606
RN/APDC S	NS	NS	NS
RN/APDC I	NS	2.817	2.817
PSI Intercept on:			
RN FTE I	NS	NS	NS
RN/APDC I	NS	NS	NS

Results:

	PSI: Pneumo-thorax	PSI: Post-op Resp. Fail	PSI: Post-op Sepsis
	CV	CV	CV
RN/APDC Slope on:			
RN FTE I	NS	NS	NS
RN FTE S	5.849	6.439	6.439
RN/APDC Intercept on:			
RN FTE I	6.060	5.688	5.688

Results:

	PSI: Pneumo-thorax	PSI: Post-op Resp. Fail	PSI: Post-op Sepsis
	CV	CV	CV
PSI Slope on:			
CMI 1996	-2.275	NS	NS
Urban Status	NS	NS	NS
For-profit ownership	NS	NS	NS
Medicaid days of care	NS	NS	NS
HMO days of care	NS	NS	NS
Beds	--	2.721	2.721

Results:

	PSI: Pneumo-thorax	PSI: Post-op Resp. Fail	PSI: Post-op Sepsis
	CV	CV	CV
PSI Intercept on:			
CMI 1996	3.526	NS	NS
Urban Status	NS	-2.011	-2.011
For-profit ownership	NS	NS	NS
Medicaid days of care	NS	3.686	3.686
HMO days of care	-2.045	NS	NS
Beds	--	NS	NS

Results:

	PSE: Composite	
		CV
PSE Slope on:		
RN FTE I		NS
RN FTE S		NS
RN/APDC S		NS
RN/APDC I		NS
PSE Intercept on:		
RN FTE I		NS
RN/APDC I		4.332

Results:

	PSE: Composite	
		CV
RN/APDC Slope on:		
RN FTE I		NS
RN FTE S		6.148
RN/APDC Intercept on:		
RN FTE I		5.633

Results:

	PSE: Composite	
		CV
PSE Slope on:		
CMI 1996		NS
Urban Status		NS
For-profit ownership		NS
Medicaid days of care		--
HMO days of care		--
Beds		NS

Results:

	PSE: Composite	
		CV
PSE Intercept on:		
CMI 1996		-2.025
Urban Status		-2.083
For-profit ownership		NS
Medicaid days of care		
HMO days of care		
Beds		NS

Little Consistency Across PSEs

- As with prior studies we find little consistency across PSIs and PSE
- Many of the relationships were insignificant
  - decubitus ulcers had mostly insignificant results
  - composite PSE had mostly insignificant results
  - higher initial workload was not related to higher rates of any PSIs or PSEs
  - lower initial RN FTE was not related to changes in workload

Counter-Intuitive Results

- Increases in workload ⟶ reductions in
  - Post-operative respiratory failure
  - Post-operative sepsis
- Higher initial workload ⟶ lower rates of
  - Decubitus ulcers
  - Infections
  - Composite PSE
- Reduction in RN FTE ⟶ reduction in FTR

Significant results that support our Hypotheses

- Lower initial RN FTE ⟶ greater growth in
  - Failure to rescue
- Higher initial workload ⟶ greater growth in
  - Decubitus
- Lower initial RN FTE ⟶
  - Higher workload (across PSEs)

Significant results that support our Hypotheses

- A fall in RN FTE ⟶ greater growth in
  - Failure to rescue
  - Post-operative respiratory failure
  - Post-operative sepsis
- An increase in workload ⟶ a greater growth in
  - Infection
- A fall in RN FTE ⟶ an increase in
  - RN workload (across PSEs)

Conclusion

- Issues plaguing staffing-outcomes studies not resolved
- Causality partially supported in five of 7 PSEs
- Strongest case for causality is with failure to rescue

Conclusion: Study limitations

- Data
  - State of Florida only
    - Staffing data from AHA Annual Survey
    - Patient outcomes data from AHCA
- Measures
  - PSIs need more testing on staffing measures
  - PSIs rely on correct hospital coding of patient information
- Model
  - Poor fit

Conclusion

- Need to repeat study with
  - PSIs again
  - a larger, multi-state data set
  - cleaner staffing data
  - a better model