BOSTON COLLEGE

WILLIAM F. CONNELL SCHOOL OF NURSING

Testimony of
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ICU Nurse Staffing Regulations
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Good morning members of the Committee on Quality Improvement and Patient Protection. Thank you for this opportunity to present testimony on ICU Registered Nurse Staffing Regulations. My name is Dr. Judith Shindul-Rothschild, PhD, RNPC. I am a registered nurse who has practiced for over 35 years in the Commonwealth. I am employed as an associate professor at the William F. Connell School of Nursing at Boston College. To my knowledge, I am the only researcher who has been studying the relationship of registered nurse staffing to nurse sensitive patient outcomes in Massachusetts hospitals. In the interest of brevity, I will present a brief summary of my recommendations of 5 nurse sensitive patient outcomes associated with registered nurse staffing in Massachusetts hospitals.

We conducted a longitudinal analysis of registered nurse to patient ratios in Massachusetts hospitals using publically available data from the Massachusetts Hospital Association. We calculated the average nurse to patient ratio on medical-surgical, stepdown and ICUs from 2009 to 2013 and examined associations with patient safety indicators (PSI) and health care acquired conditions (HAI) from the Agency for Healthcare Research and Quality (AHRQ) as well as clinical quality measures of patient's experience measured in the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey by the Centers for Medicare and Medicaid Services (CMS). In total we examined the relationship of 15 indicators described in the National Quality Measure Clearinghouse. An appendix provides additional information on the technical specifications on each of these indicators from AHRQ and CMS as well the statistical analysis we conducted that led us to recommend these 5 indicators. I will present my recommendations of 5 indicators in order of robustness across ICU, stepdown and medical-surgical units in Massachusetts.

1.  **Recommended Nurse Sensitive Outcome: Adult inpatients who reported how often their pain was controlled.**

The measure is collected by: Centers for Medicare & Medicaid Services (CMS).

The measure set name is: HCAHPS survey, Clinical Quality Measures the Patient Experience

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The CMS rationale states*:* *"This specific measure is used to assess the percentage of adult inpatients who reported how often ("Never," "Sometimes," "Usually," "Always") their pain was controlled by asking patients: During this hospital stay, how often was your pain well controlled?"*

Dr. Shindul-Rothschild's rationale:

Our research suggests that patient's perception of pain control is a robust indicator associated with RN staffing on ICU/CCUs, stepdown and medical-surgical units in Massachusetts hospitals from 2009 to 2013. Higher percentages of patient's self-reporting their pain was "always" well controlled is significantly associated with fewer numbers of patients assigned to RNs on ICUs/CCUs, stepdown, and medical surgical units. (see Appendix pgs. 4 & 5).

2. **Recommended Nurse-Sensitive Outcome: Postoperative wound dehiscence**

The measure is collected by:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

The measure set name is: Patient Safety Indicators, (PSI) #14

The National Quality Measure Clearinghouse rationale states:  *"Studies show that proper surgical and nursing care can prevent wound dehiscence from occurring in many cases. (NQMC-8101)"*

Dr. Shindul-Rothschild's rationale:

Our research suggests that postoperative wound dehiscence is significantly associated with RN staffing on stepdown and medical-surgical units in Massachusetts hospitals.  There is a nonsignificant, curvilinear pattern of association in ICU/CCUs, however the rate is lowest for units where ICU RNs care for the fewest number of patients. (see Appendix pgs. 6-9)

3. **Recommended Nurse Sensitive Outcome: Poor Glycemic Control**

The measure is collected by:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

The measure set name: Healthcare Acquired Conditions (HAC)

The CMS rationale states:  *"Extreme manifestations of poor glycemic control are reasonably prevented through careful nursing surveillance, application of evidence based guidelines and routine serum glucose measurement."*

Dr. Shindul-Rothschild's rationale:

Our research suggests that as the numbers of patients assigned to RNs on stepdown and medical surgical units increases, poor glycemic control increases. There is a curvilinear pattern between poor glycemic control and RN staffing in ICUs/CCUs, however the rate is lowest for ICU/CCUs where ICU RNs care for the fewest number of patients. (see Appendix pgs. 9-12)

4. **Recommended Nurse Sensitive Outcome: Death among surgical inpatients with serious treatable complications: deaths per 1,000 discharges.**

The measure is collected by:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators

The measure set name is: Patient Safety Indicators, Hospital Inpatient Quality Reporting Program

The National Quality Measure Clearinghouse rationale states:  *"Characteristics associated with better outcomes where complications are identified quickly and treated include the nurse to patient ratio"*

Dr. Shindul-Rothschild's Rationale: Our research found that significantly higher numbers of preventable deaths occur with higher numbers of patients assigned to RNs in ICUs/CCUs. There is a linear pattern on medical-surgical units where higher preventable deaths occur when higher numbers of patients are assigned to RNs.  The pattern on stepdown units is a bell shaped curve with the fewest preventable deaths occurring on units where RNs care for the fewest patients (see Appendix pgs. 13 & 14).

5. **Recommended Nurse Sensitive Outcome: Acute care prevention of falls and trauma: rate of inpatient falls with injury per 1,000 patient days**

Measure Collection Name:  Centers for Medicare and Medicaid Services (CMS)

Measure Set Name: Hospital Acquired Condition

CMS Rationale states*:  "Falls are the most common adverse event reported in hospitals. Preventable hospital injuries are related to nursing surveillance to assess and intervene to minimize the patient's fall risk."*

Dr. Shindul-Rothschild's rationale:

Our analysis suggests there is evidence of a linear pattern with higher falls occurring when RNs care for greater numbers of patients in ICU/CCUs.  (see Appendix pgs. 15 & 16)

**In Summary**

The five nurse sensitive outcome measures I recommend to the Committee on Quality Improvement and Patient Protection are: pain control (as reported by patients in HCAHPS); postoperative wound dehiscence (a Patient Safety Indicator reported by AHRQ); poor glycemic control (a Healthcare Acquired Conditions reported by AHRQ); failure to rescue (a Patient Safety Indicator reported by AHRQ); and, inpatient falls with injury (a Healthcare Acquired Condition reported by CMS).

I want to express my appreciation to members of the Committee on Quality Improvement and Patient Protection for this opportunity to present my testimony as you promulgate regulations pertaining to registered nurse staffing in Massachusetts ICUs.  If I can be of any further assistance to you or the Executive Director and staff of the Health Policy Commission, my contact information is listed at the end of this testimony.

**APPENDIX**

<u>Recommended Nurse Sensitive Outcome #1</u>**: Hospital inpatients' experiences: percentage of adult inpatients who reported how often their pain was controlled.**
<u>Measure Collection Name:</u>  Centers for Medicare & Medicaid Services (CMS).
<u>Measure Set Name:</u> Clinical Quality Measures: Patient Experience
<u>Source:</u>  Centers for Medicare & Medicaid Services (CMS) (2013). *HCAHPS survey*. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS);18 p.
<u>CMS Rationale:</u>    The Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) Survey is part of a larger Consumer Assessment of Healthcare Providers and Systems (CAHPS) program sponsored by the Agency for Healthcare Research and Quality (AHRQ). The purpose of HCAHPS is to produce comparable data on patients' perspectives of care that allows objective comparisons between hospitals and create incentives for hospitals to improve their quality of care. This specific measure is used to assess the percentage of adult inpatients who reported how often ("Never," "Sometimes," "Usually," "Always") their pain was controlled by asking patients: During this hospital stay, how often was your pain well controlled?

<u>Dr. Shindul-Rothschild's Rationale:</u>
Our research suggests that patient's perception of pain control is a robust indicator associated with RN staffing on ICU/CCUs, stepdown and medical-surgical units in Massachusetts hospitals from 2009 to 2013. Higher percentages of patient's self-reporting their pain was "always" well controlled is significantly associated with fewer numbers of patients assigned to RNs on ICUs/CCUs ($p = .006$ in 2009; $p < .005$ in 2012; $p = .044$ in 2013), stepdown units ($p = .024$ in 2009; $p = .008$ in 2011) and medical surgical units ($p = .005$ in 2009; $p < .001$ in 2010; $p = .021$ in 2012). (See Figures 1-3).

Figure 1. *Patient's pain was "always" well controlled, 2011 -2012 with mean quartiles for patients assigned to RNs on ICU/CCU units, 2009-2013*
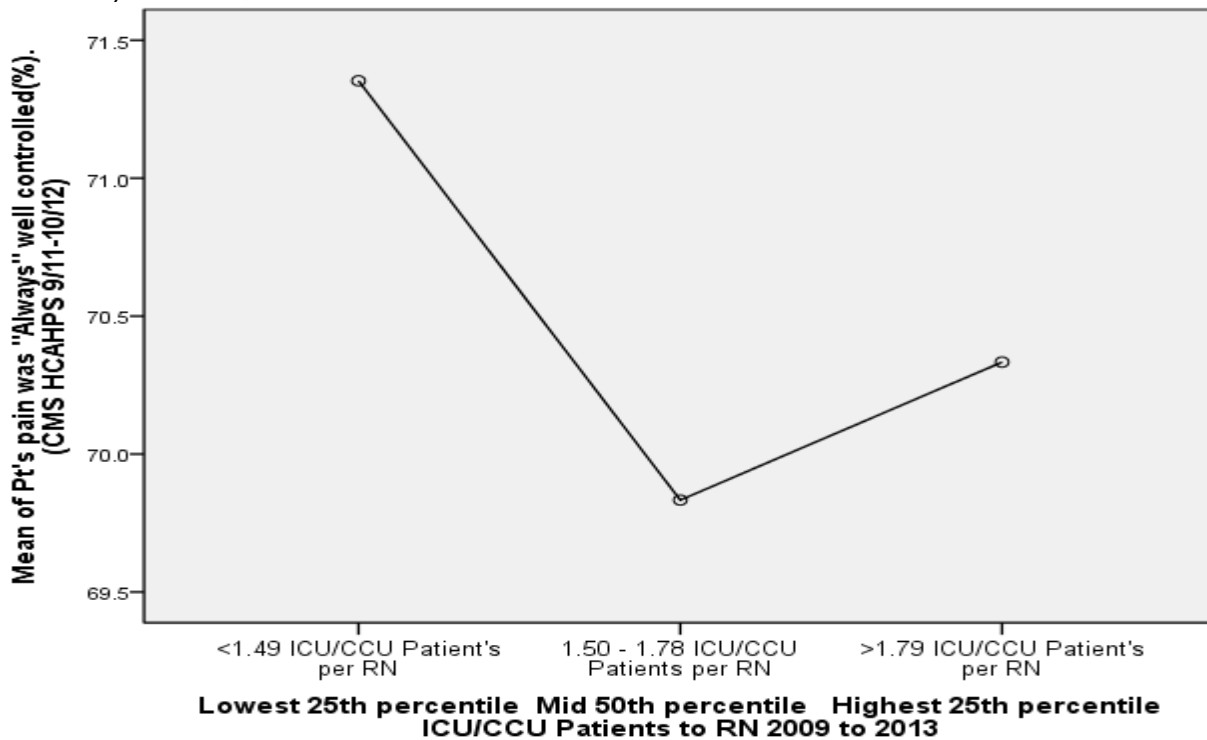
Figure 2. *Patient's pain was "always" well controlled, 2011 -2012 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
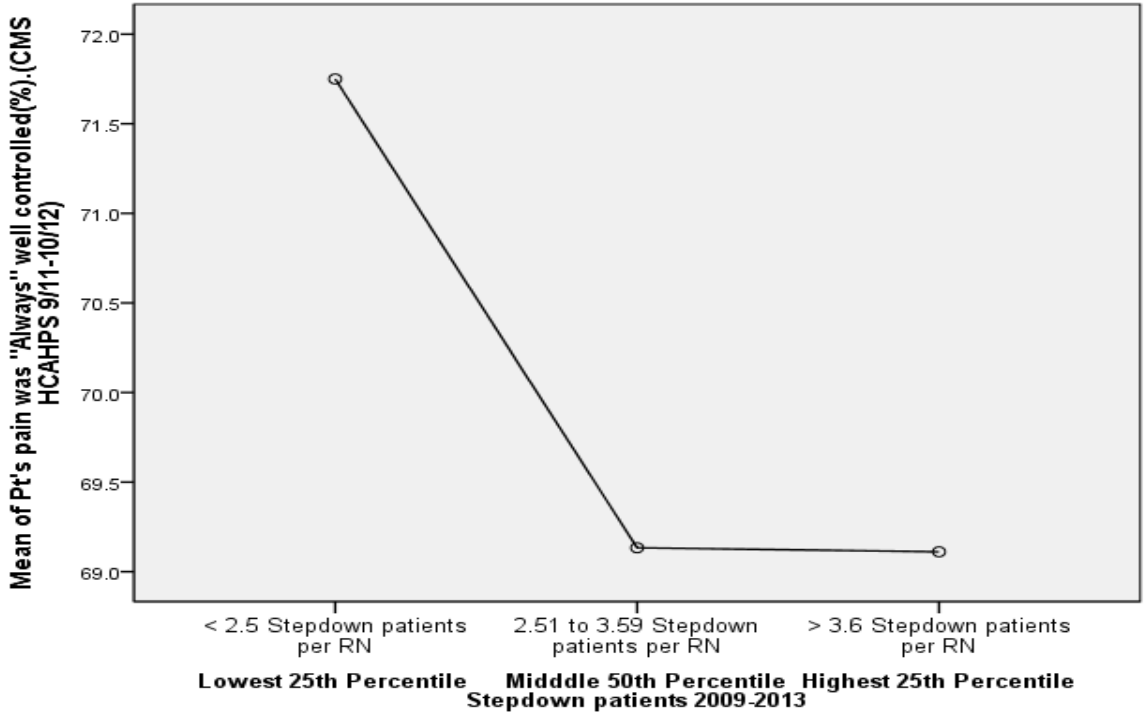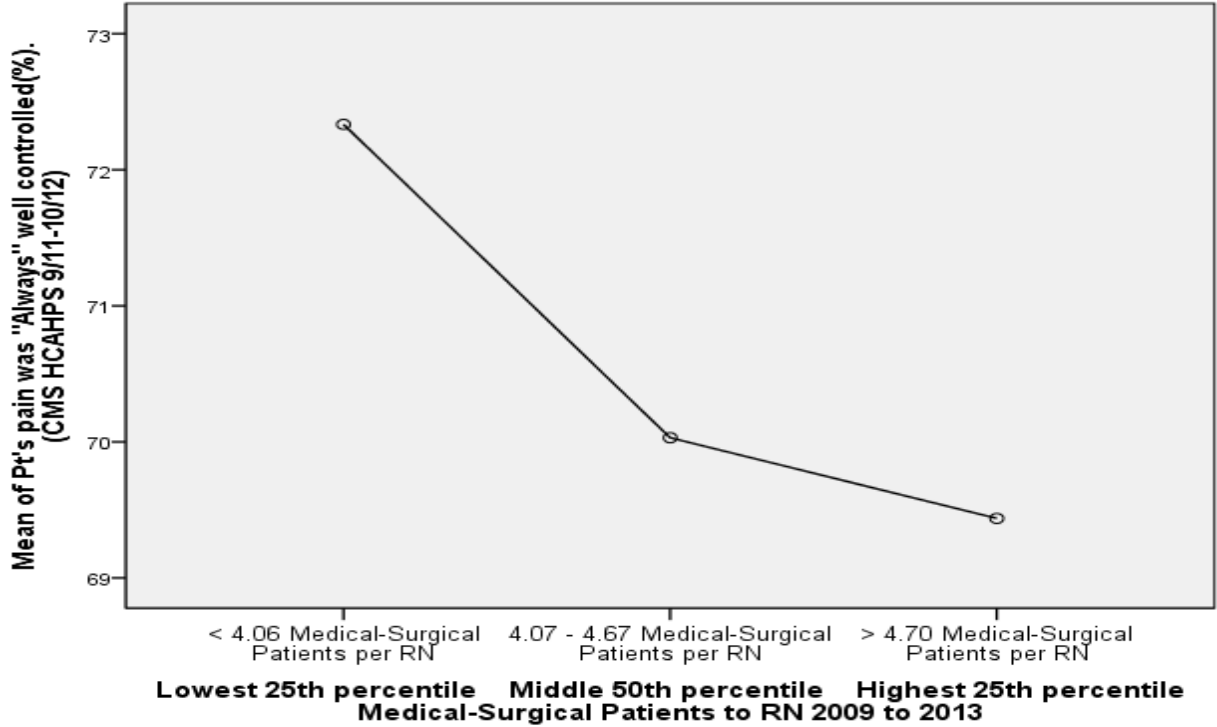


Figure 3. *Patient's pain was "always" well controlled, 2011 -2012 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013*

Recommended Nurse-Sensitive Outcome #2: *Postoperative wound dehiscence*
Measure Collection Name:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators
Measure Set Name: Patient Safety Indicators, (PSI) #14
Source:  AHRQ quality indicators (March, 2012). *Patient safety indicators: technical specifications* [version 4.4]. Appendices. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ).
National Quality Measure Clearinghouse Rationale: This indicator captures how often a surgical wound in the stomach or pelvic area split open after an operation (postoperative wound dehiscence in abdominopelvic surgical patients). Studies show that proper surgical and nursing care can prevent wound dehiscence from occurring in many cases. (NQMC-8101)

Dr. Shindul-Rothschild's Rationale: Our research suggests that postoperative wound dehiscence is a robust indicator associated with RN staffing on ICU/CCUs, stepdown and medical-surgical units in Massachusetts hospitals from 2009 to 2013.  Higher postoperative wound dehiscence is significantly associated with higher numbers of patients assigned to RNs on stepdown units ($p = .033$ 2009 to 2011) and medical surgical units ($p = .009$ in 2012; $p = .026$ in 2013).  There is a nonsignificant, curvilinear pattern of association in ICU/CCUs, however the rate is lowest for units where ICU RNs care for the fewest number of patients. (See Figures 4 – Figure 9).

Figure 4. *Dehiscence postsurgery 2009-2011 with mean quartiles for patients assigned to RNs on ICU/CCU units, 2009-2013*
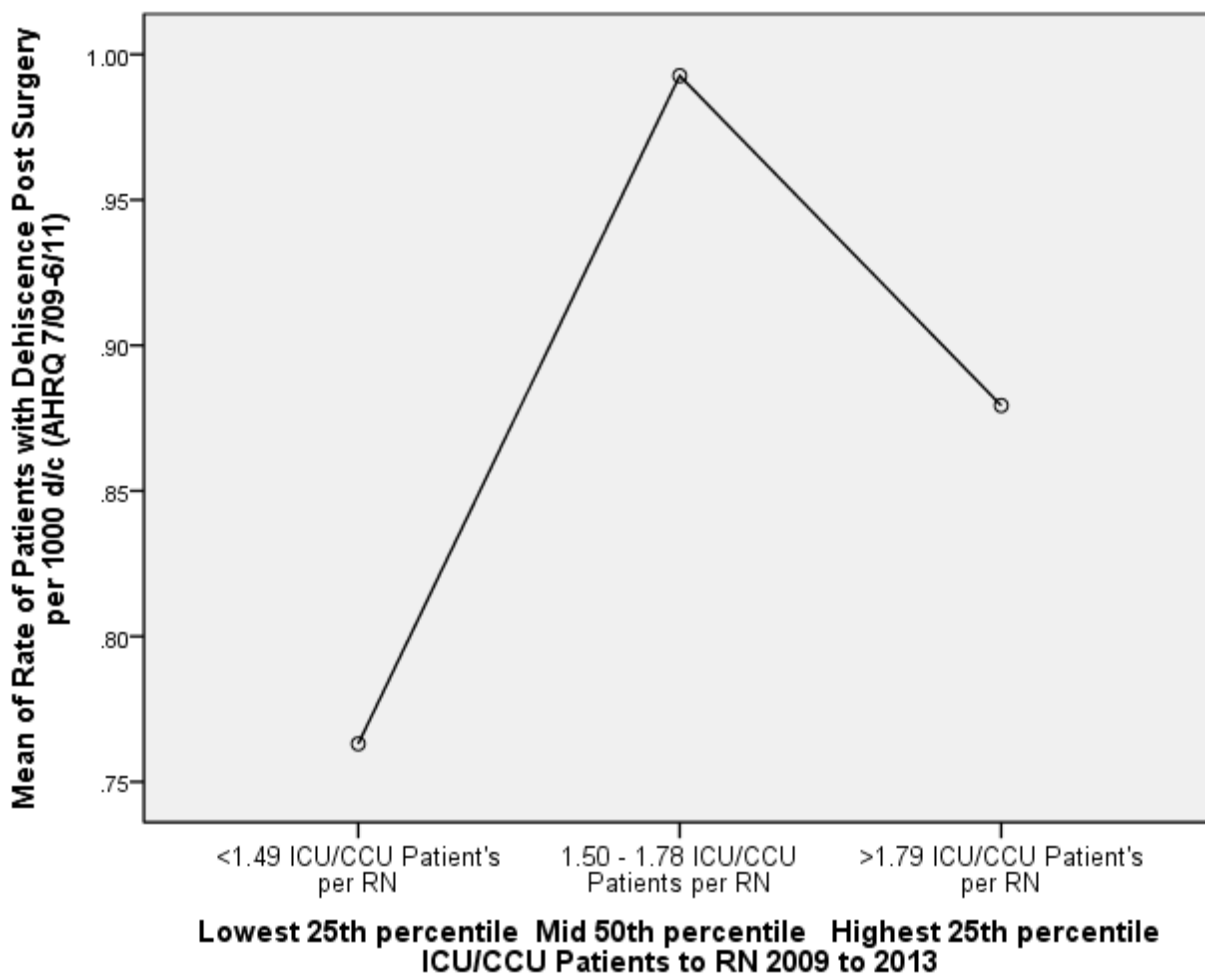
Figure 5. *Dehiscence postsurgery 2010-2012 with mean quartiles for patients assigned to RNs on ICU/CCU units, 2009-2013*
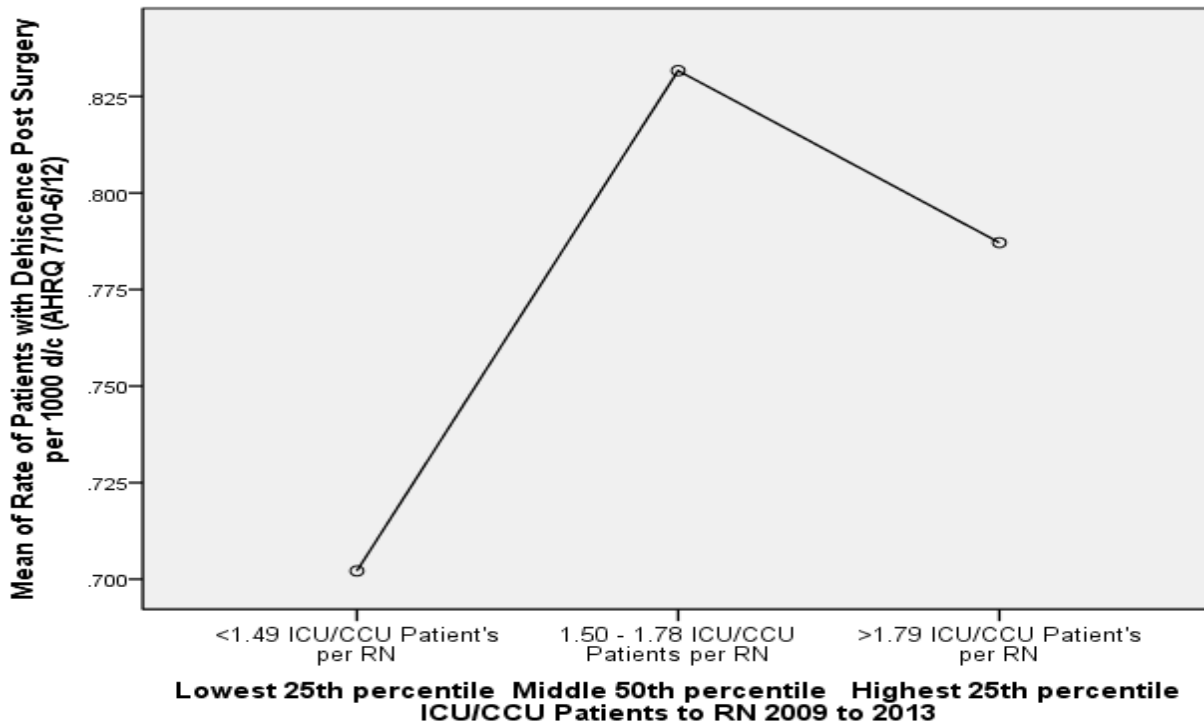


Figure 6. *Dehiscence postsurgery 2009-2011 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
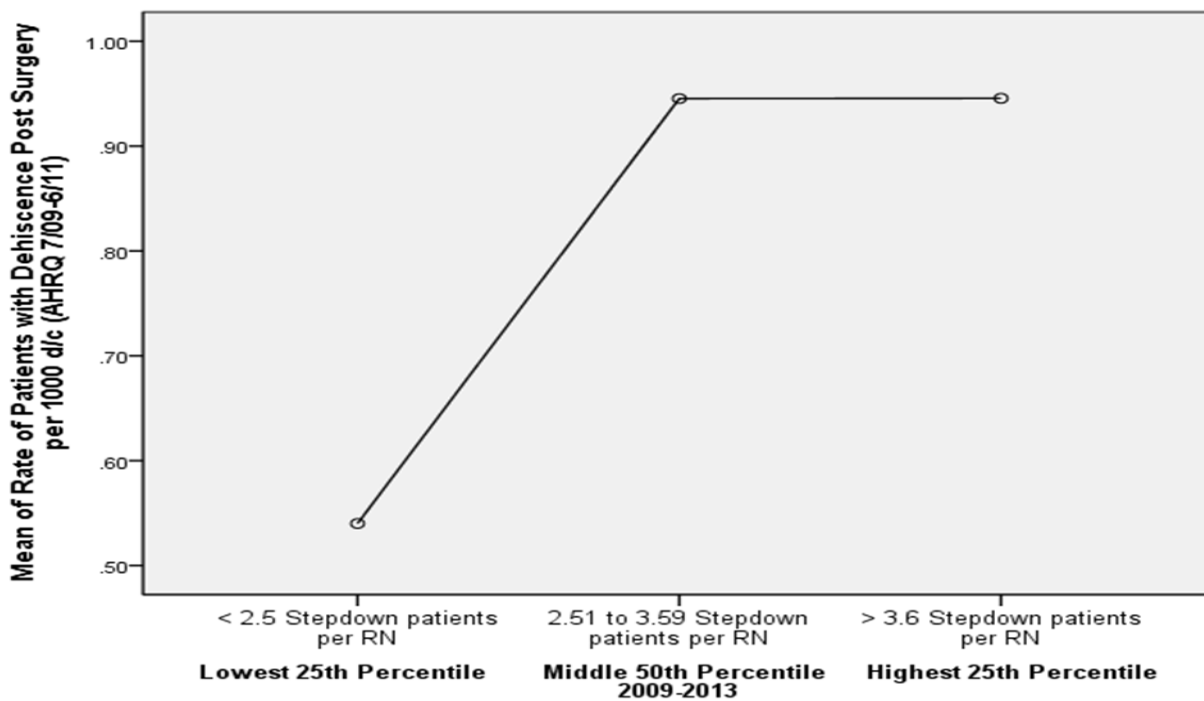
Figure 7. *Dehiscence postsurgery 2010-2012 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
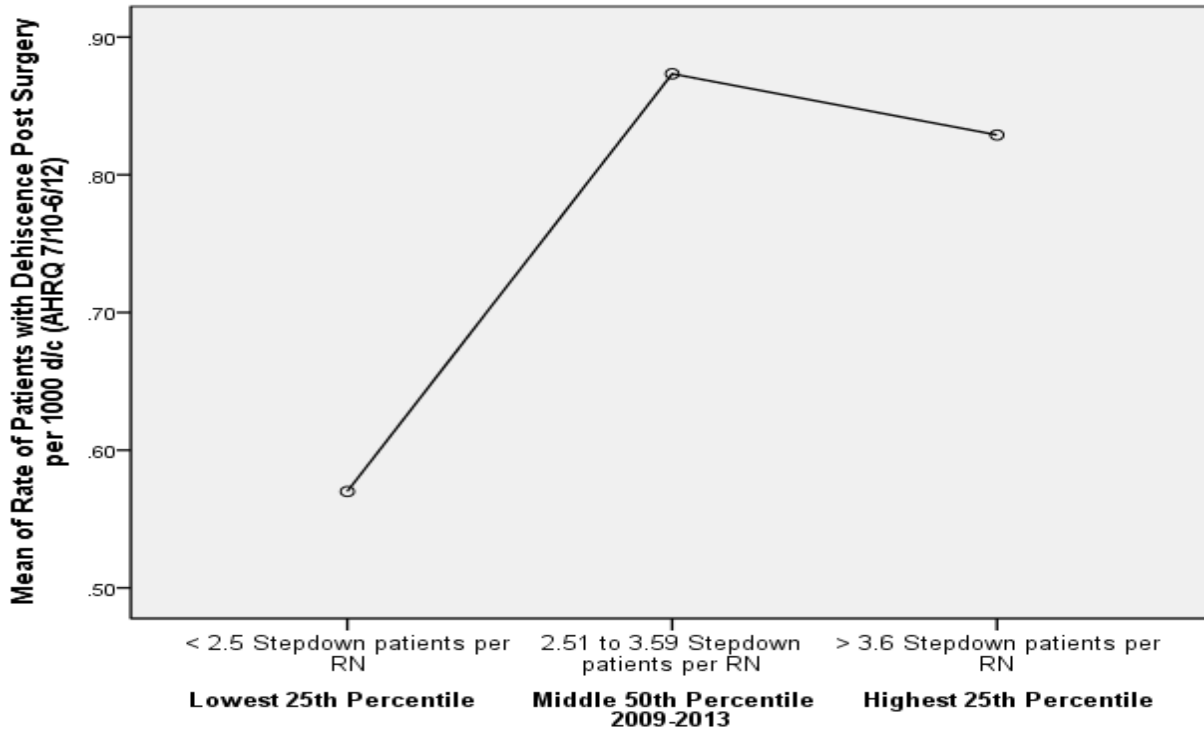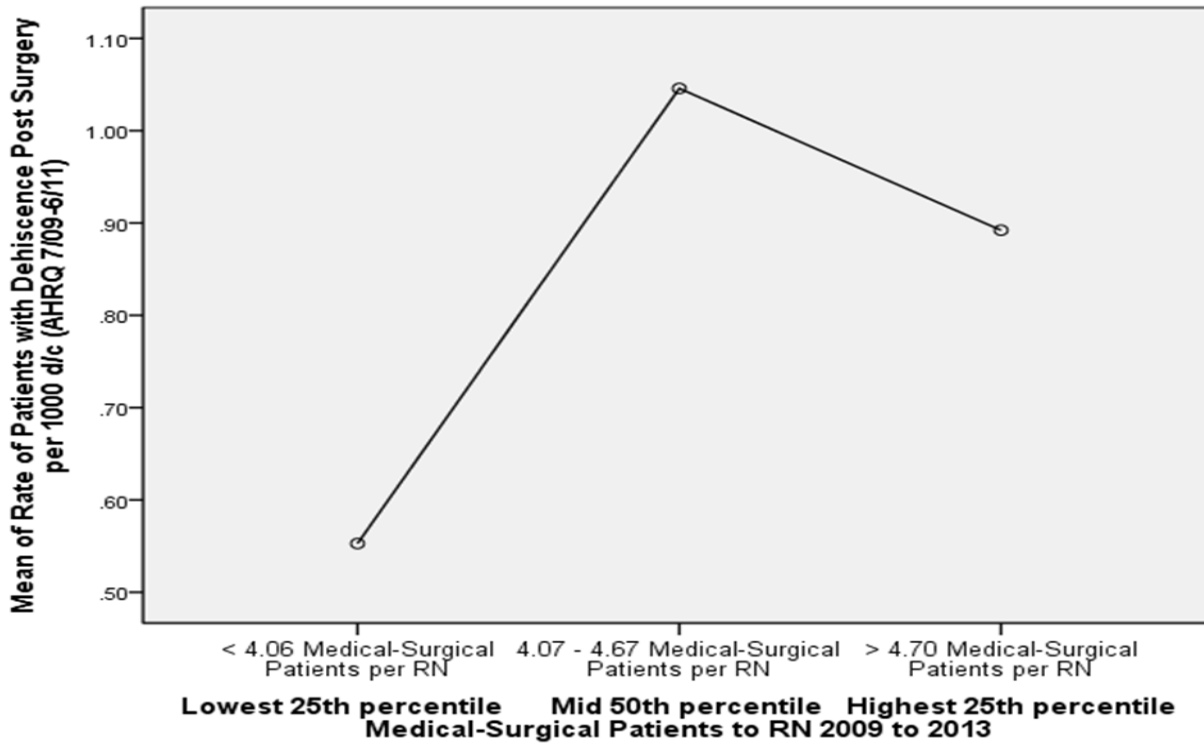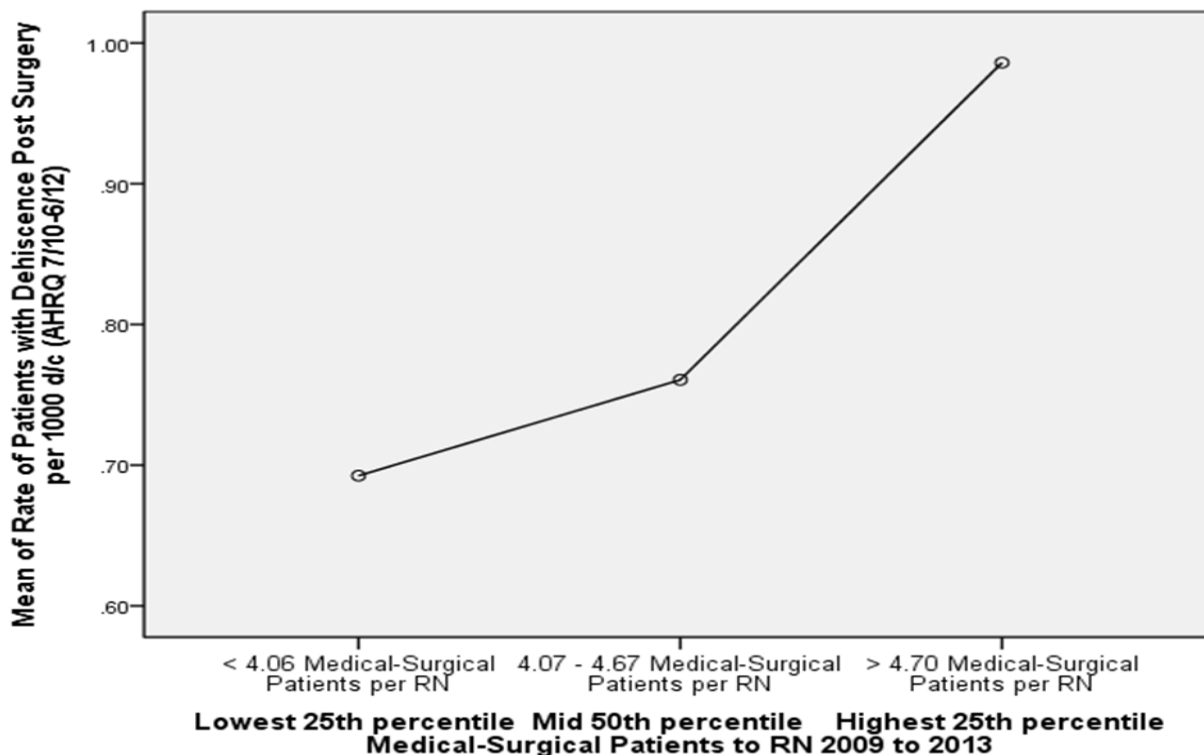


Figure 8. *Dehiscence postsurgery 2009-2011 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013* ($p$ = .003)

Figure 9. *Dehiscence postsurgery 2010-2012 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013*



Recommended Nurse Sensitive Outcome #2**: Poor Glycemic Control**
Measure Collection Name:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators
Measure Set Name: Healthcare Acquired Conditions (HAC)
Source:  Center for Medicare and Medicaid Services (CMS)
CMS Rationale:    Poor glycemic control is one of 11 categories of HACs defined by CMS by final rule in 2009. Manifestations of poor glycemic control include: Diabetic Ketoacidosis, Nonketotic Hyperosmolar Coma, Hypoglycemic Coma, Secondary Diabetes with Ketoacidosis and Secondary Diabetes with Hyperosmolarity. CMS notes that these extreme manifestations of poor glycemic control are reasonably prevented through careful nursing surveillance, application of evidence based guidelines and routine serum glucose measurement.

Dr. Shindul-Rothschild's Rationale:
Our research suggests that there is a linear pattern associated with poor glycemic control and RN staffing in Massachusetts hospitals from 2009 to 2013 but there is not a statistically significant relationship.  As the numbers of patients assigned to RNs on stepdown and medical surgical units increases, poor glycemic control increases. There is a curvilinear pattern between poor glycemic control and RN staffing in ICUs/CCUs, however the rate is lowest for ICU/CCUs where ICU RNs care for the fewest number of patients. (See Figures 10 – Figure 15).

Figure 10. *Poor glycemic control, 2009-2011 with mean quartiles for patients assigned to RNs on ICU/CCU units, 2009-2013*
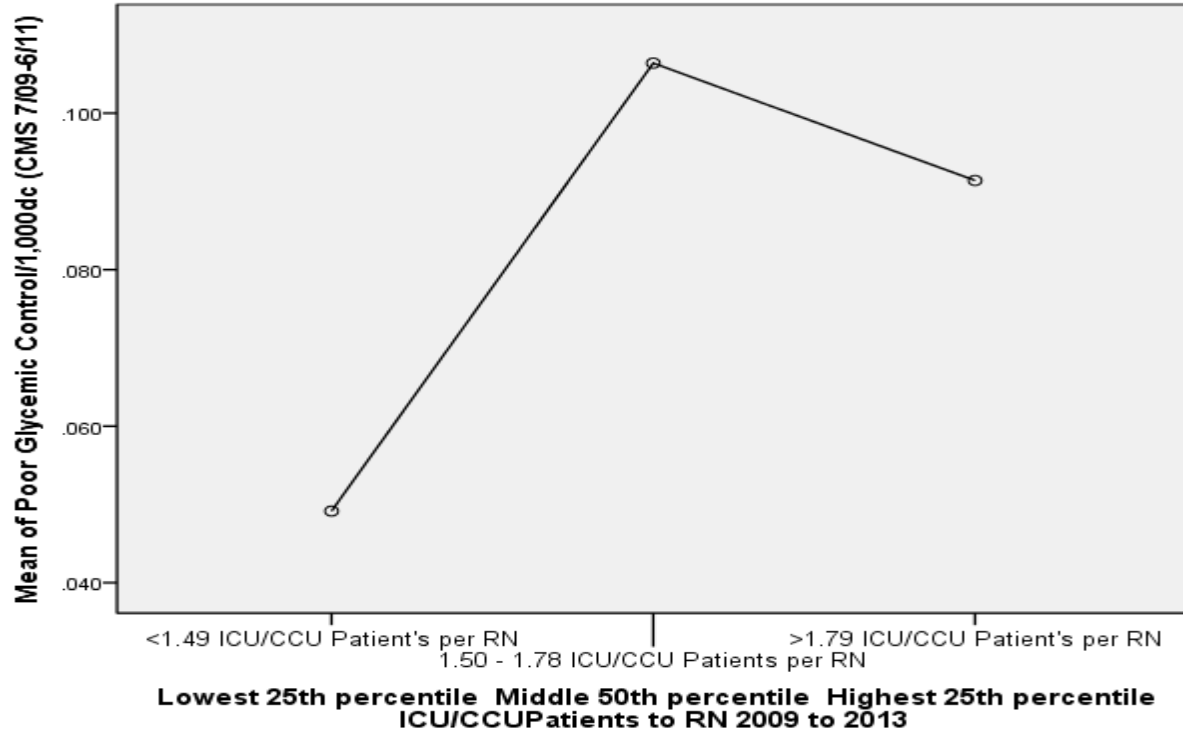


Figure 11. *Poor glycemic control, 2010-2013 with mean quartiles for patients assigned to RNs on ICU/CCU units, 2009-2013*
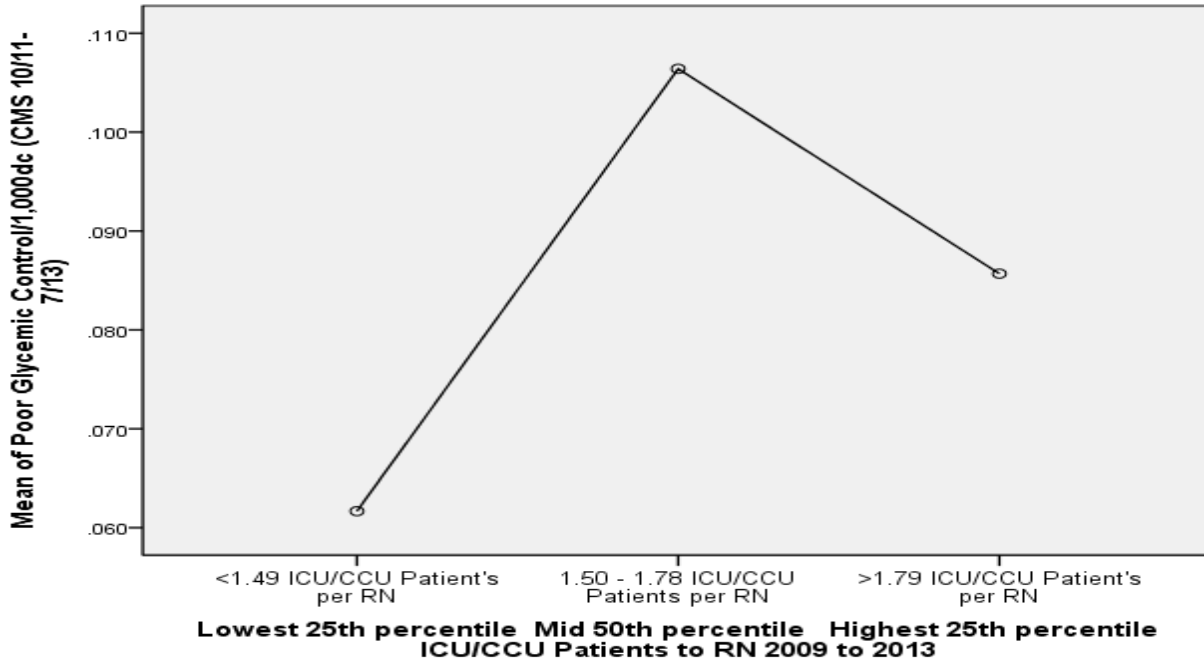
Figure 12. *Poor glycemic control, 2009-2011 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
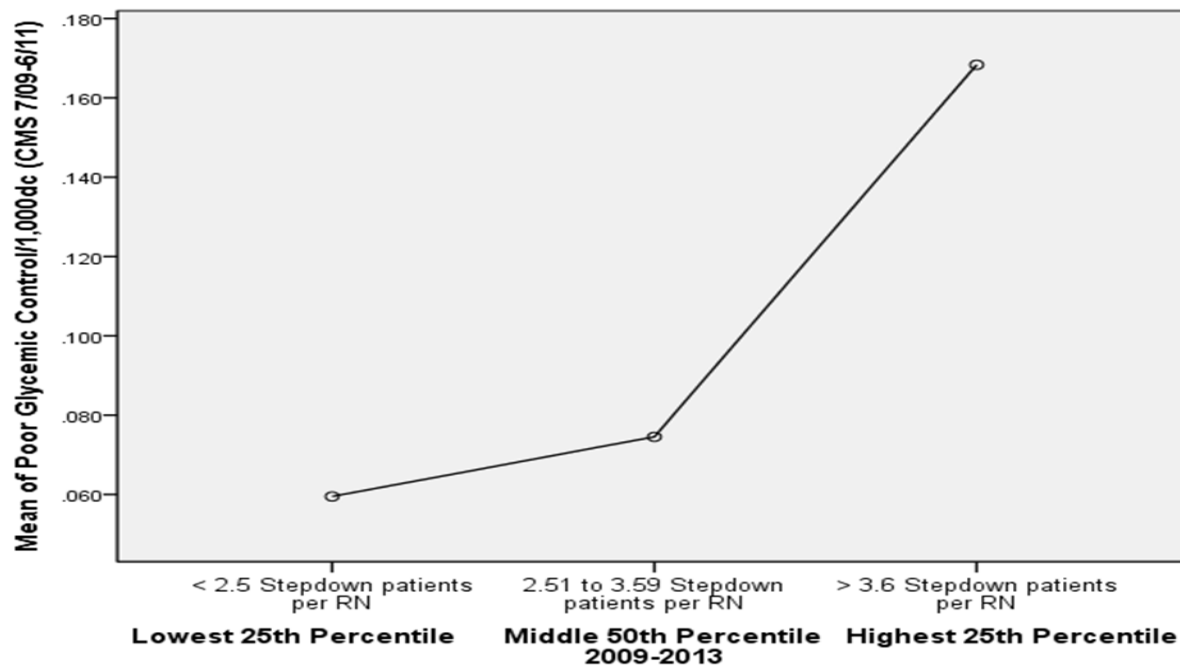


Figure 13. *Poor glycemic control, 2011-2013 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
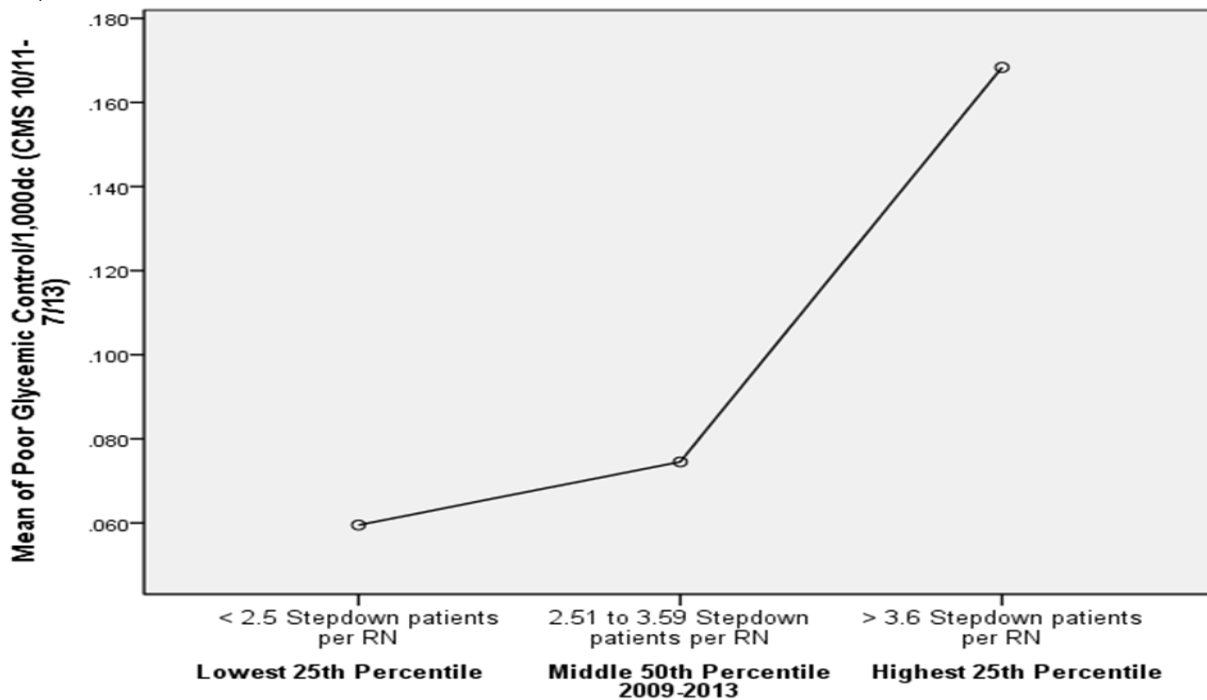
Figure 14. *Poor glycemic control, 2009-2011 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013*
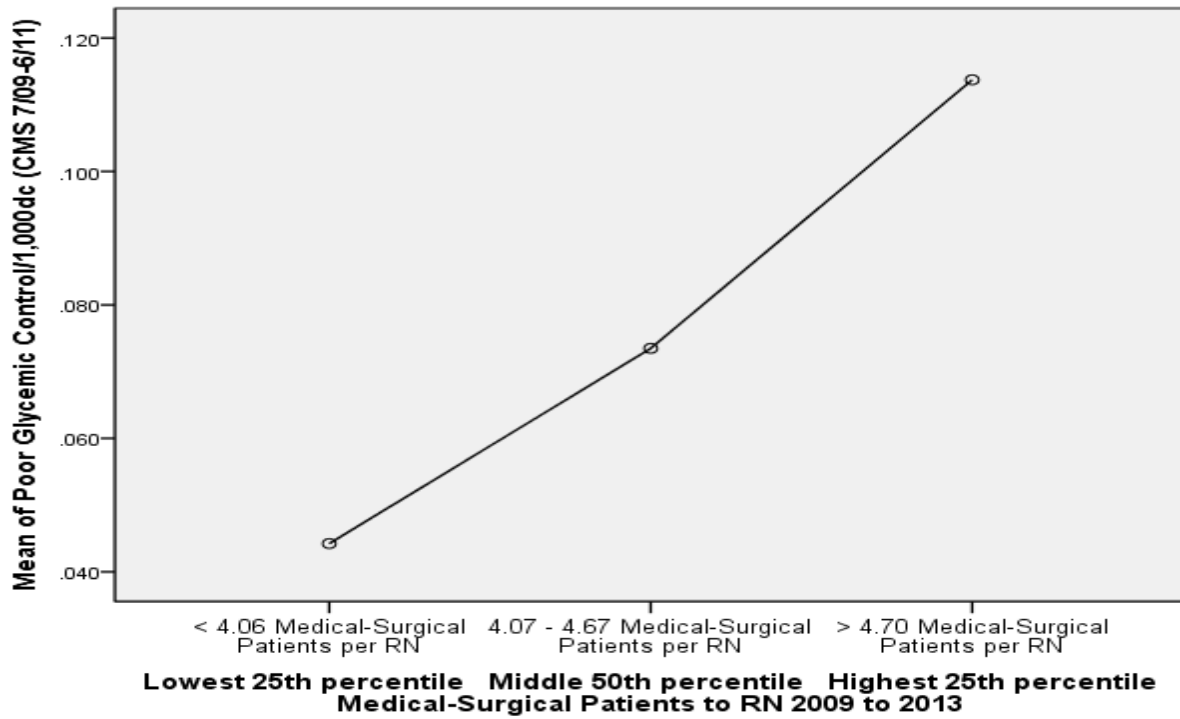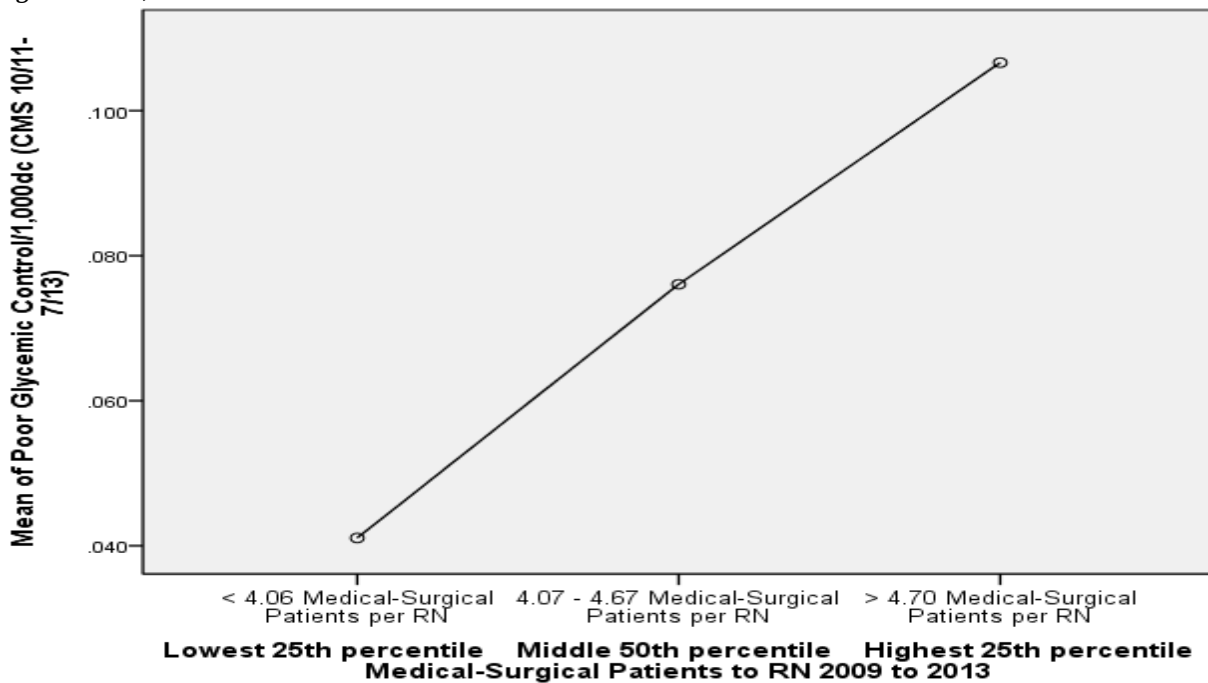


Figure 15. *Poor glycemic control, 2010-2013 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013*

Recommended Nurse Sensitive Outcome #4: **Death among surgical inpatients with serious treatable complications: deaths per 1,000 discharges.**
Measure Collection Name:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators
Measure Set Name: Patient Safety Indicators, Hospital Inpatient Quality Reporting Program
Source:  AHRQ quality indicators (March, 2012). *Patient safety indicators: technical specifications* [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 79 p.
National Quality Measure Clearinghouse Rationale:    This indicator measures how often patients died after developing a complication that should have been identified quickly and treated (also called failure to rescue). The underlying assumption is that high quality hospitals identify these complications quickly and treat them aggressively.  Serious treatable complications of care listed in death among surgical inpatients include: pneumonia, deep vein thrombosis/pulmonary embolism ,sepsis, shock/cardiac arrest, or gastrointestinal hemorrhage/acute ulcer.  Characteristics associated with better outcomes include: bed-to-nurse ratio (where nurses are the sum of registered nurse plus licensed practical nurse full-time equivalent positions); and nursing skill mix (the ratio of RN/[RN+LPN]) (Silber et al., 2007; Aiken et al., 2002; Aiken et al., 2003). (NQMC-8084 and NQMC-9283)

Dr. Shindul-Rothschild Rationale: Our research suggests that failure to rescue is associated with RN staffing in Massachusetts hospitals.  Significantly higher numbers of preventable deaths occur with higher numbers of patients assigned to RNs in ICUs/CCUs ($p = .034$ in 2013).   There is a linear pattern on medical-surgical units where higher preventable deaths occur when higher numbers of patients are assigned to RNs.  The pattern on stepdown units is a bell shaped curve with the fewest preventable deaths occurring on units where RNs care for the fewest patients (See Figures 16 – Figure 19).

Figure 16. *Patient deaths from serious treatable complications postsurgery, 2009-2011 with quartiles for patients assigned to RNs on ICU/CCUs, 2013*
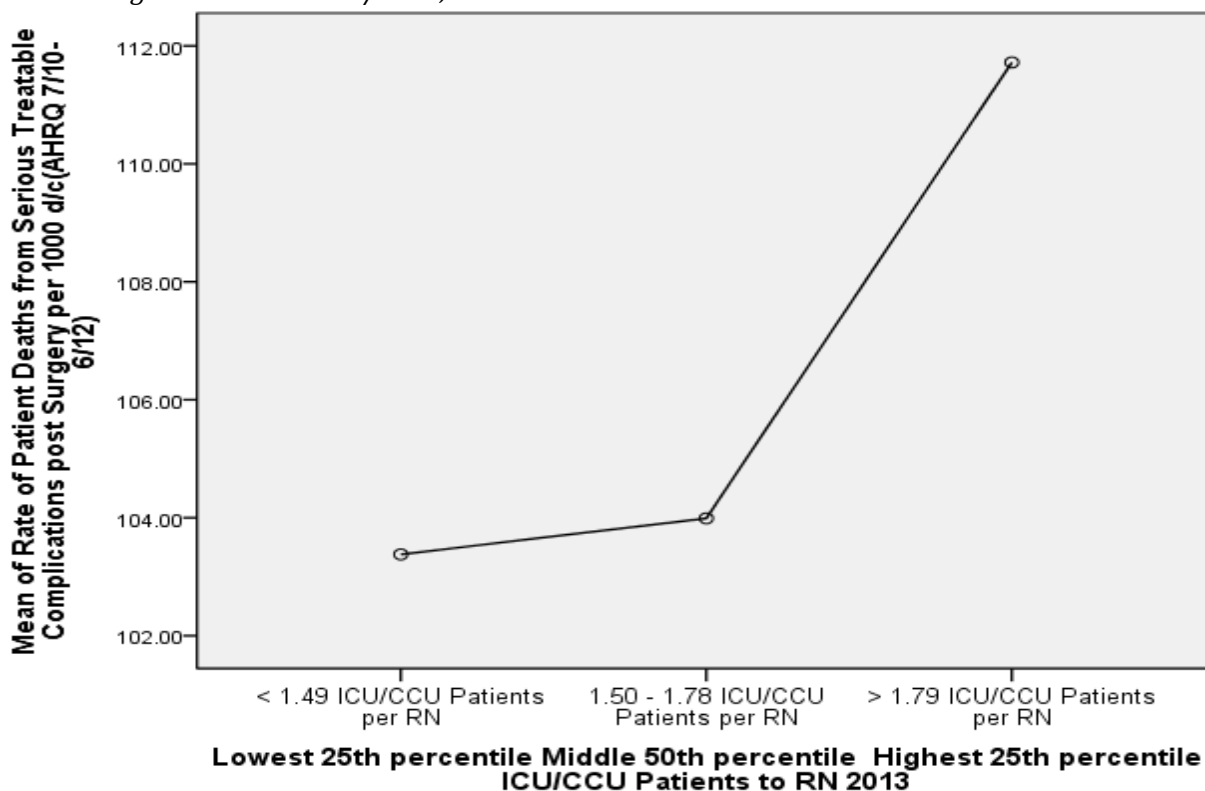
Figure 17. *Patient deaths from serious treatable complications postsurgery, 2009-2011 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
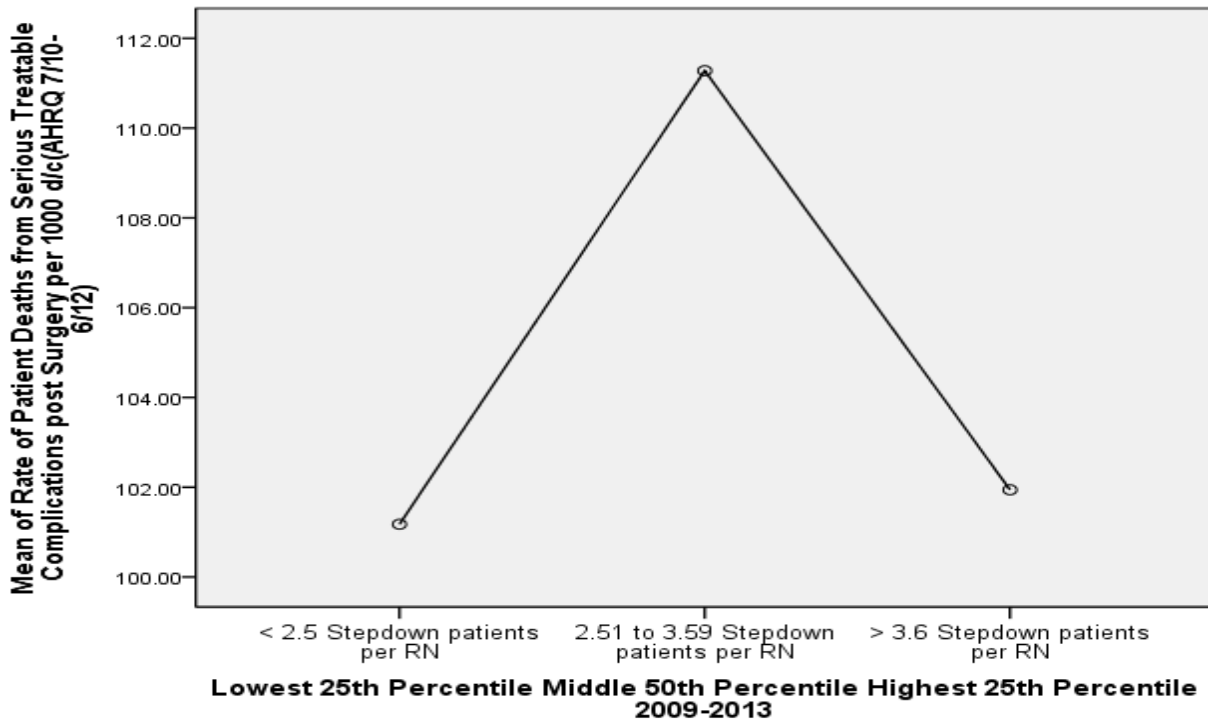


Figure 18. *Patient deaths from serious treatable complications postsurgery, 2009-2011 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013*
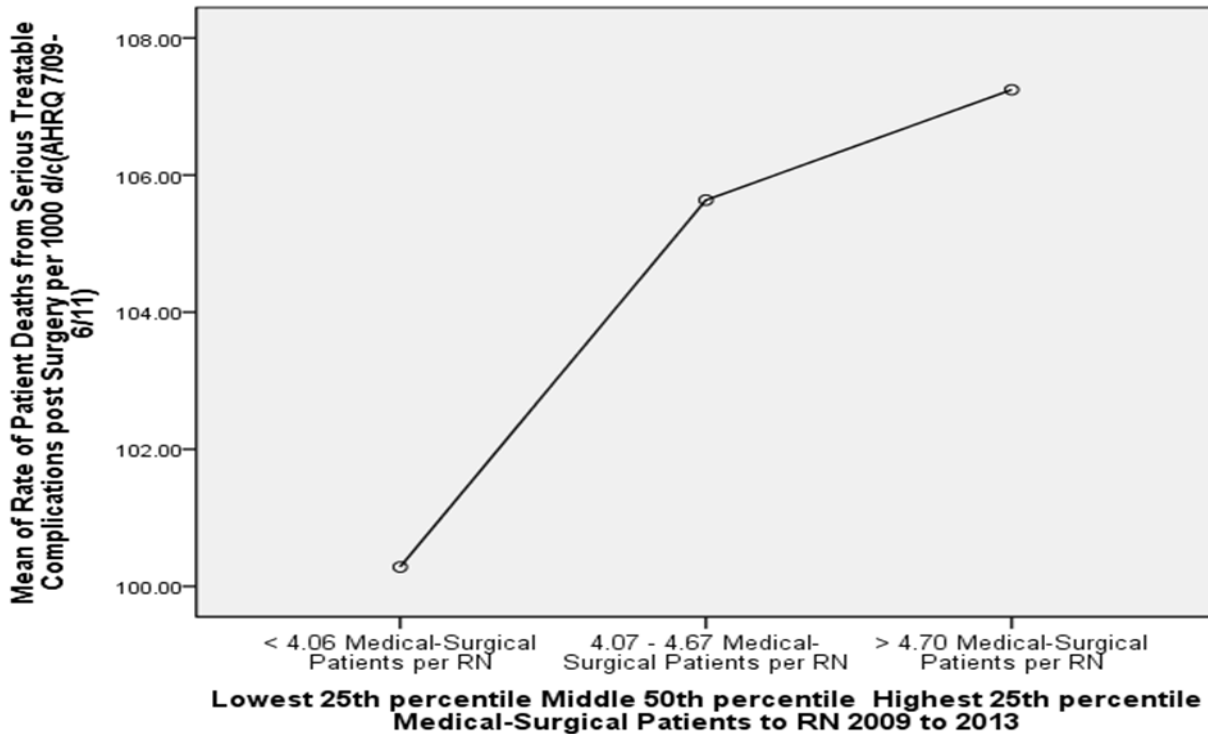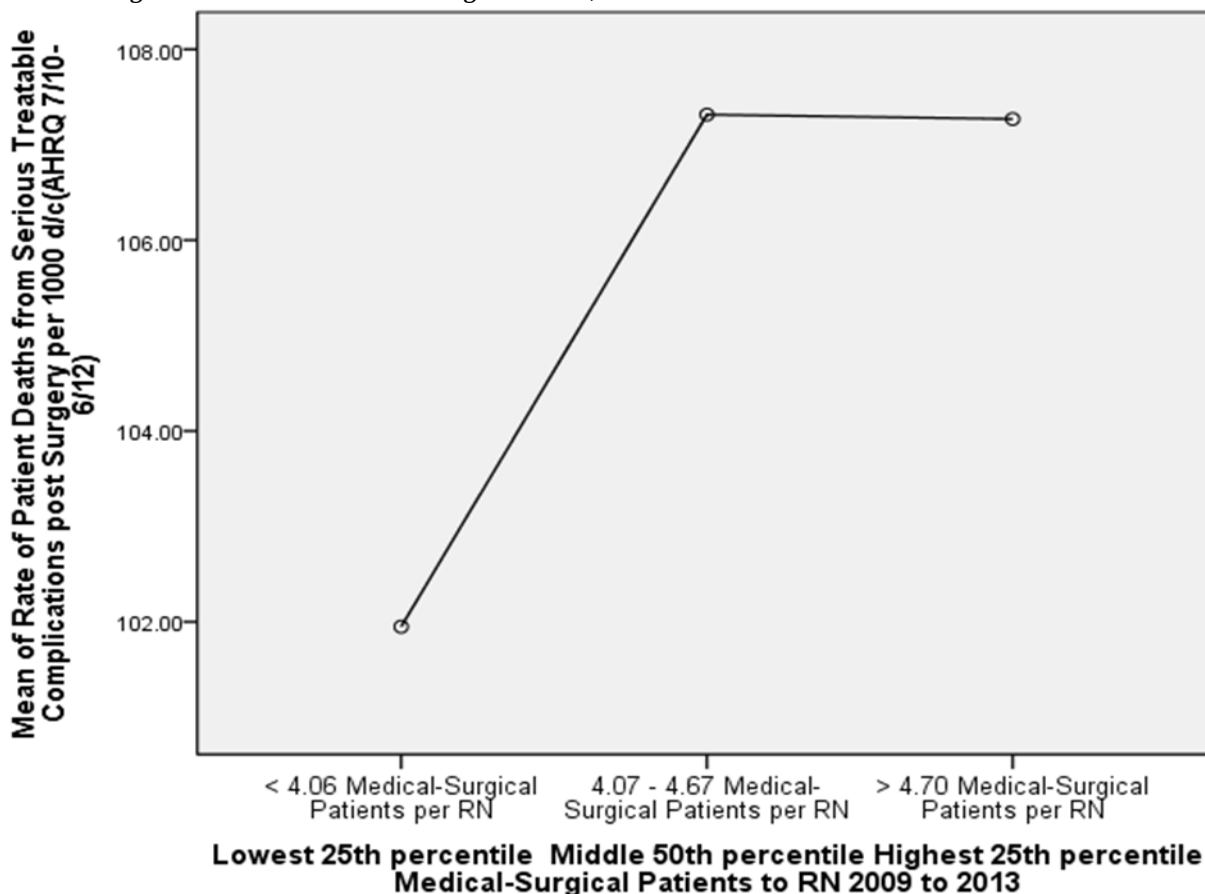
Figure 19. *Patient deaths from serious treatable complications postsurgery, 2010-2012 with mean quartiles for patients assigned to RNs on medical-surgical units, 2009-2013*



Recommended Nurse Sensitive Outcome #5: **Acute care prevention of falls and trauma: rate of inpatient falls with injury per 1,000 patient days**
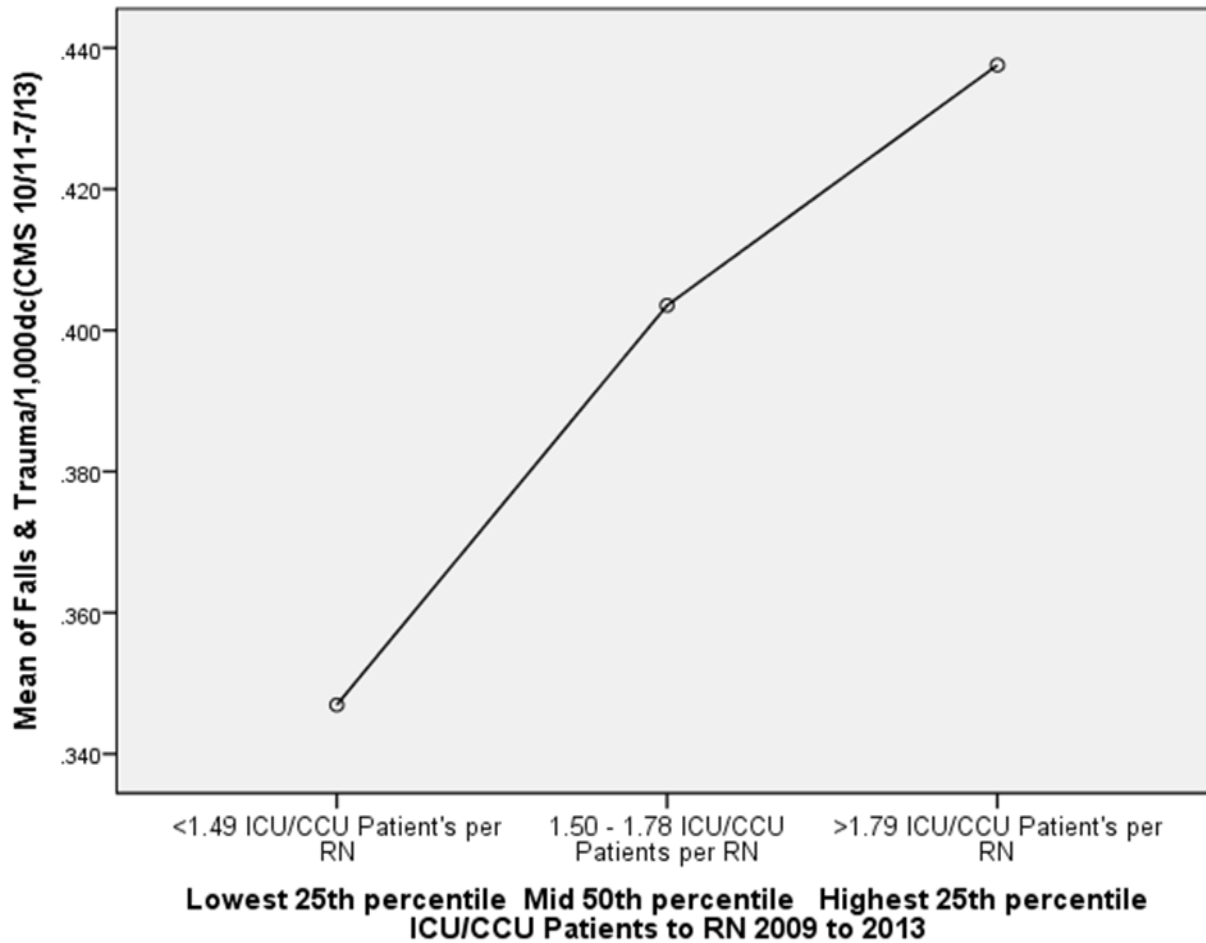Measure Collection Name:  Centers for Medicare and Medicaid Services (CMS)
Measure Set Name: Hospital Acquired Condition
Source:  Centers for Medicare & Medicaid Services (October, 2012).*Hospital-Acquired Conditions (HAC) in Acute Inpatient Prospective Payment System (IPPS) Hospitals.* Washington, DC: Department of Health and Human Services. Retrieved on August 25, 2014 from: http://www.cms.gov/Medicare/Medicare-Fee-for-Service-Payment/HospitalAcqCond/downloads/HACFactSheet.pdf
CMS Rationale:  Falls are the most common adverse event reported in hospitals. Preventable hospital injuries are related to nursing surveillance to assess and intervene to minimize the patient's fall risk. Many falls occur when a patient is attempting to access the bathroom or has a syncope episode related to multiple hypotensive or anticholinergic medication.   This measure includes fracture, dislocation, intracranial injury, crushing injury, burn and other injuries that occur while a patient is hospitalized.

Dr. Shindul-Rothschild's Recommendation:  Our analysis suggests there is evidence of a linear pattern with higher falls occurring when RNs care for greater numbers of patients in ICU/CCUs.  (See Figure 20)

Figure 20. *Falls and trauma, 2011-2013 with mean quartiles for patients assigned to RNs on ICU/CCUs, 2009-2013*



**Other Nurse-Sensitive Patient Outcome Indicators For Future Consideration**

Nurse Sensitive Outcome: **Central venous catheter-related blood stream infections (CLABSI) (provider-level): rate per 1,000 discharges.**
Measure Collection Name:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators
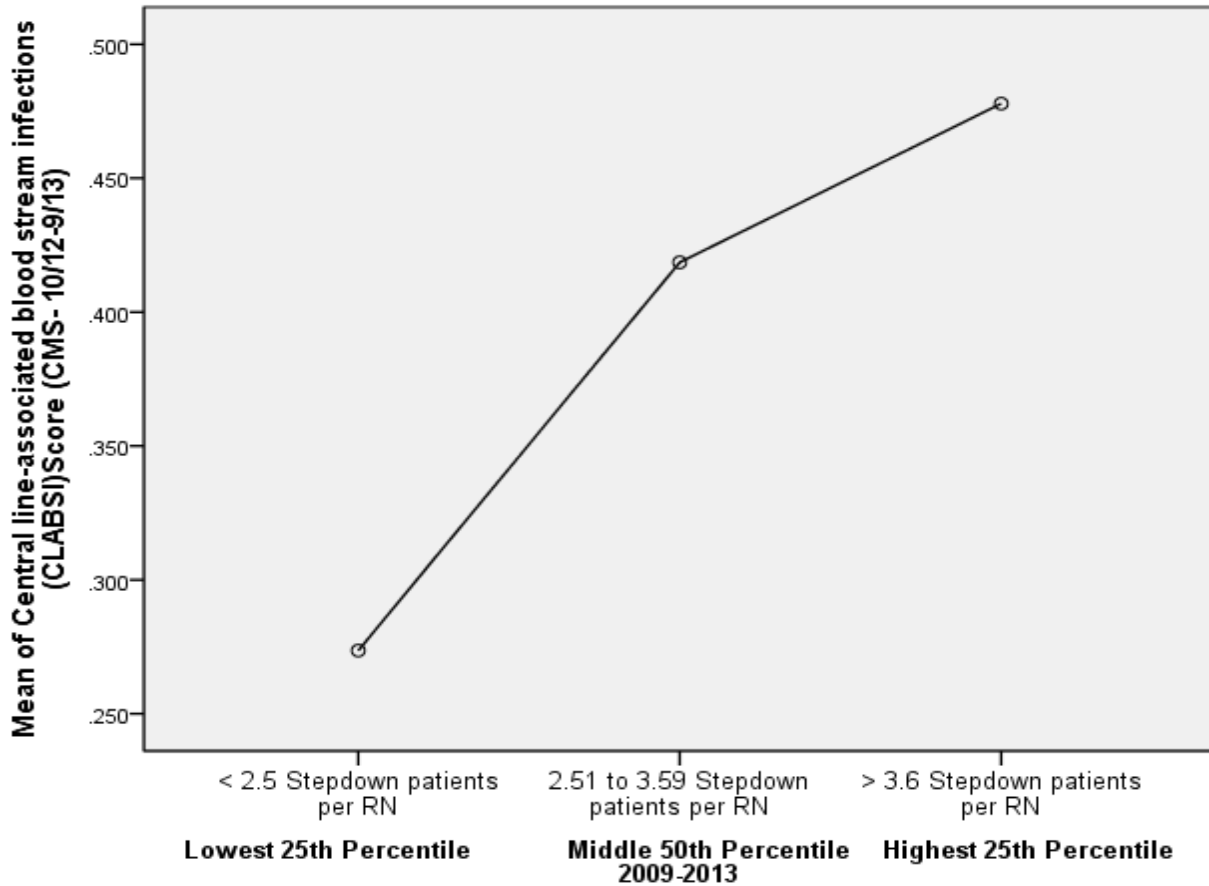Measure Set Name: Patient safety indicator #7
Source:  AHRQ quality indicators (March, 2012). *Patient safety indicators: technical specifications* [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality. 79 p.
National Quality Measure Clearinghouse Rationale:  This indicator measures how often hospitalized patients with intravenous (IV) lines and catheters acquired blood infections as a result of the care they received in the hospital. Studies have shown that most of these infections related to large venous catheters can be prevented by inserting the catheter properly and careful nursing management. (See NQMC – 8086)
Dr. Shindul-Rothschild's Recommendation:  Our analysis suggests there is evidence of linear pattern of higher CLABSI occurring when RNs care for greater numbers of patients only in stepdown units.  Given these limited findings, do not recommend the Massachusetts Nurses Association consider use of this measure as a nurse-sensitive outcome for use on all units in Massachusetts hospital until further study. (See Figure 21).

Figure 21. *CLABSI, 2010-2012 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*



Nurse Sensitive Outcome: **Pressure ulcer: rate per 1,000 discharges**.
Measure Collection Name:  Agency for Healthcare Research and Quality (AHRQ) Quality Indicators
Measure Set Name: Patient safety indicator #3
Source: .AHRQ QI (March, 2012). Patient safety indicators #3: technical specifications. Pressure ulcer rate [version 4.4]. Rockville (MD): Agency for Healthcare Research and Quality (AHRQ); 3 p.
National Quality Measure Clearinghouse Rationale:  This indicator measures how often patients developed a bed sore (pressure ulcer) during a hospital stay of more than four days. The National Quality Measure Clearinghouse notes that pressure ulcers can occur because people are lying in one position for too long and can often be prevented with proper care. (See NQMC-8083)
Dr. Shindul-Rothschild's Recommendation:  Our analysis suggests there is evidence of linear pattern of higher pressure ulcers occurring when RNs care for greater numbers of patients in stepdown units.  Given these limited findings, do not recommend the Massachusetts Nurses Association consider use of this measure as a nurse-sensitive outcome for use on all units in Massachusetts hospital until further study. (See Figures 22 and Figure 23).

Figure 22. *Pressure ulcers, 2009-2011 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*
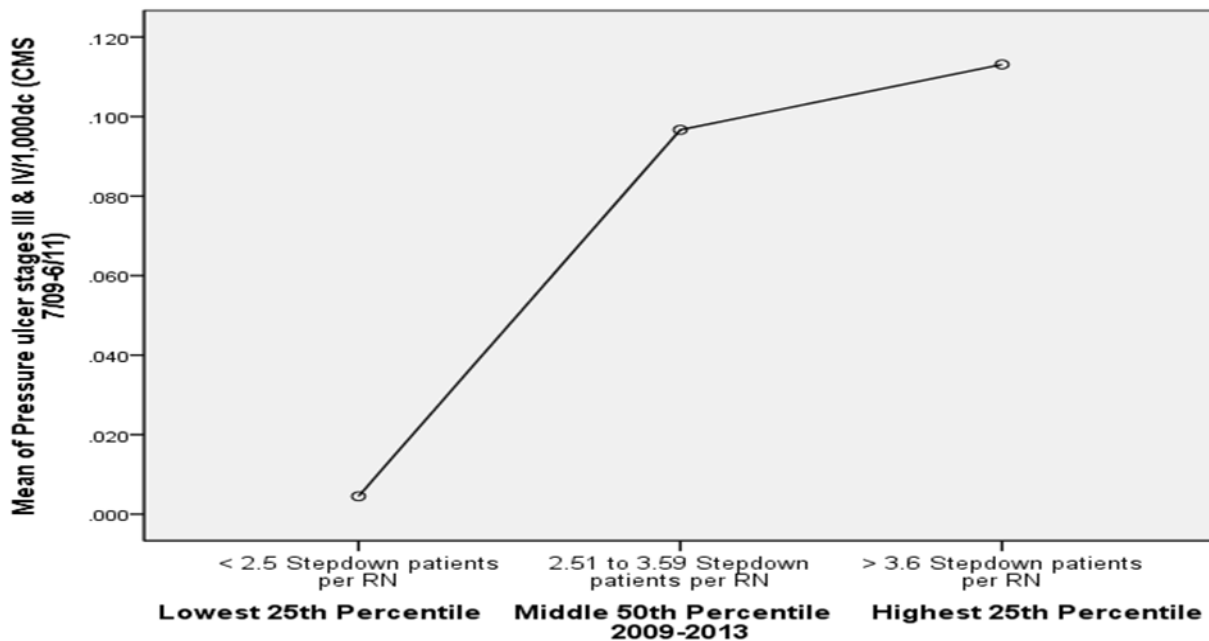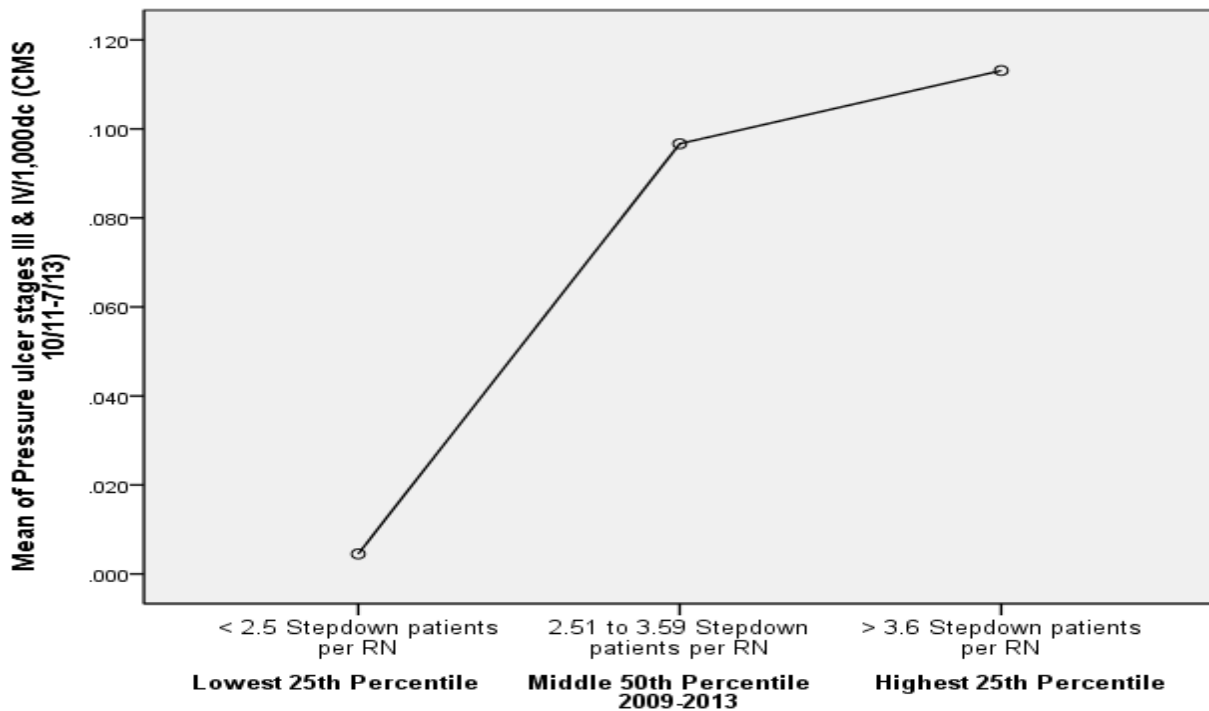
Figure 23. *Pressure ulcers, 2011-2013 with mean quartiles for patients assigned to RNs on stepdown units, 2009-2013*



**AHRQ & CMS Patient Outcome Measures Not Recommended**

Findings: No positive linear pattern or statistical significance was found between the patient outcome measures listed below and RN staffing in ICU/CCU, stepdown or medical-surgical patients units in Massachusetts hospitals from 2009-2013

Dr. Shindul-Rothschild's Recommendation:  Given these findings, I recommend the Committee on Quality Improvement and Patient Protection *removes* from consideration the following measures as nurse-sensitive indicators in Massachusetts hospitals.

1. Vascular catheter associated infections/1,000 discharges (CMS - 7/2009-6/2011 and 10/2011 to 7/2013)
2. Catheter associated urinary tract infections/1,000 discharges (CMS – 7/09-6/11 and 10/11 to 7/13)
3. Healthcare associated infection procedure score (CMS – Base 2010, Performance 2012)
4. Clostridium difficile laboratory identified events (intestinal infections) (CMS 1/2013 to 9/2013)
5. Surgical site infection from colon surgery (CMS – 10/2012 to 9/2013)
6. Iatrogenic pneumothorax/1,000 discharges (AHRQ 7/2009 to 6/2011 and 7/2010 to 6/2012)
7. Pulmonary embolus or DVT postsurgery/1,000 discharges (AHRQ 7/2009 to 6/2011 and 7/2010 to 6/2012)
8. Accidental punctures and lacerations from medical treatment/1,000 discharges (AHRQ 7/2009 to 6/2011 and 7/2010 to 6/2012)
9.  Patient safety indicator composite score of serious complications (AHRQ 7/2010 to 6/2012) (Note: Composite score includes: pneumothorax, PE/DVT, punctures/lacerations, pressure ulcers, CLABSI, hip fracture and sepsis)
10.  Hospital 30-day mortality rates from acute myocardial infarction, heart failure and pneumonia (CMS 7/2010 to 6/2012)


**Further Information on Nurse-Sensitive Outcomes Measures Referenced in this Testimony**

Centers for Medicare and Medicaid Services, Hospital Compare Data:
https://data.medicare.gov/data/hospital-compare

Massachusetts Hospital Association, Patient Care link: http://www.patientcarelink.org/

National Quality Measure Clearinghouse: http://www.qualitymeasures.ahrq.gov/browse/nqf-endorsed.aspx

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