WENNBERG INTERNATIONAL COLLABORATIVE SPRING POLICY MEETING 2018

Relationship between neonatal care intensity and outcomes across Texas hospitals

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Background: What is wrong with the neonatal intensive care (NICU) picture?

- Higher regional supply of NICU beds and neonatologists is not located where perinatal needs are greater and is not reliably associated with lower neonatal mortality.
  (Goodman, Little, Stukel, Chang, Fisher. *N Eng J Med*, 2002.)
- Higher NICU bed supply is associated with higher probability of NICU admissions in low risk newborns (but not in high risk newborns)
  (Harrison, Wasserman, Goodman. *J Pediatr*. October 2017)
- With growing NICU capacity, the most common NICU admission is for newborns >2500 grams (i.e. not low birth weight). (Harrison & Goodman. *JAMA Pediatrics*, 2015.)
- Risk adjusted utilization and mortality varies across NICUs, but determinants and consequences of the variation have been poorly studied.
  (Horbar J D et al. *Pediatrics* 1997;99:149-156, and others)

Study Objectives:

- To measure newborn medical care utilization across hospitals.
- To determine the extent that variation can be explained by differences in newborn need.
- To model the association between risk adjusted (i.e. need) utilization and health related outcomes.

Study Methods I:

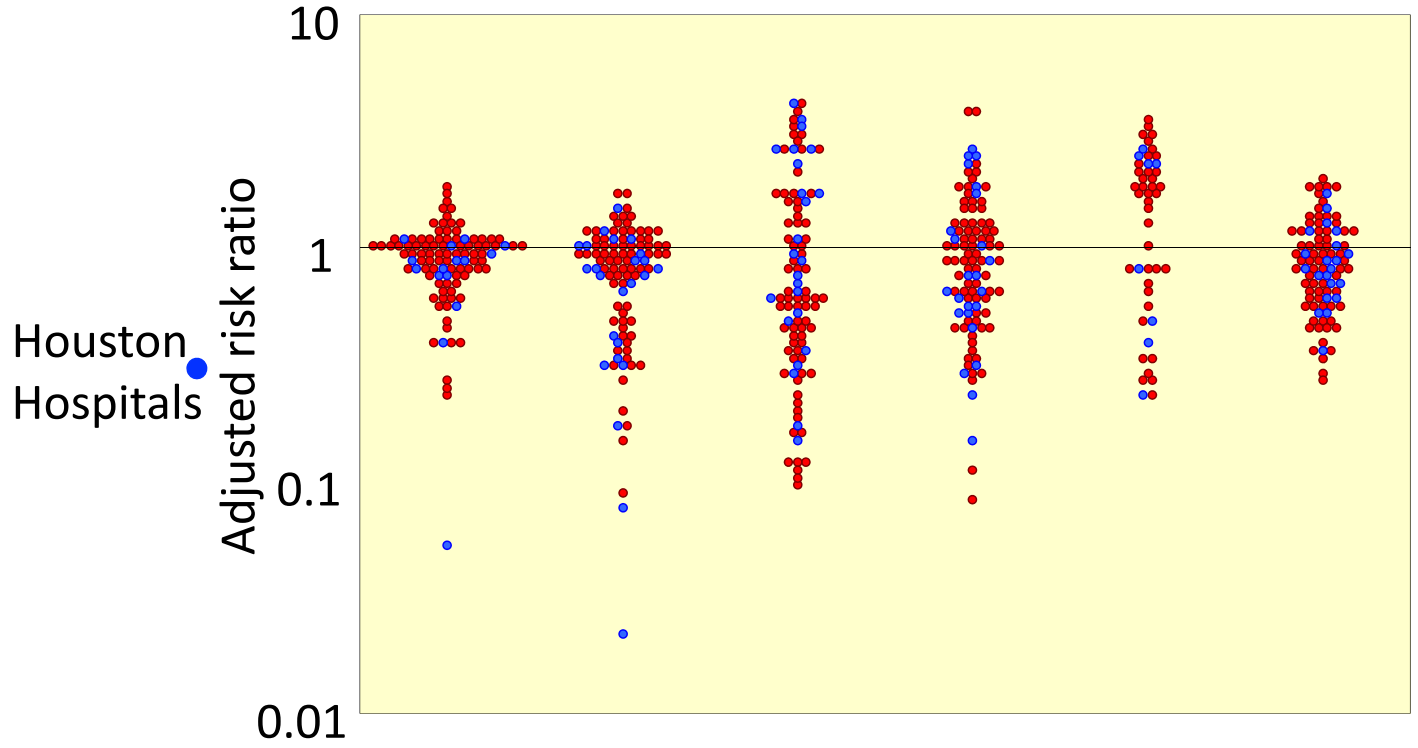
- Retrospective cohort of live births ≥ 400 grams, insured by Texas Medicaid.
- Time period: Jan 1 2010 - Dec 31, 2014.
- Data: Linkage of natality, mortality, and utilization files with rich indicators of health risk prior to medical care, and detailed inpatient and outpatient utilization and mortality through 365 days of life.
- Three cohorts:
  - Very low birth weight singletons (<1500 grams) - high risk/need (n=12,903)
  - Later preterm singletons (34-36 week gestations) - lower risk/need (n=77,098)
  - Non preterm (≥37 weeks gestation) - low risk/need (n=999,416)
- All newborns assigned to the hospital with highest number inpatient days, prior to discharge home or death.

Risk Adjustment:

- Dependent variable: a death within 27 days.
- Logit models well predicted mortality.
- Predicted mortality for each newborn estimated. (“risk score”)
- Risk score entered into 2nd stage models (Poisson and negative binomial) with utilization events as the dependent variable: utilization adjusted risk ratios by hospital.
- Resulting adj. risk ratios were then used to calculate adjusted rates.

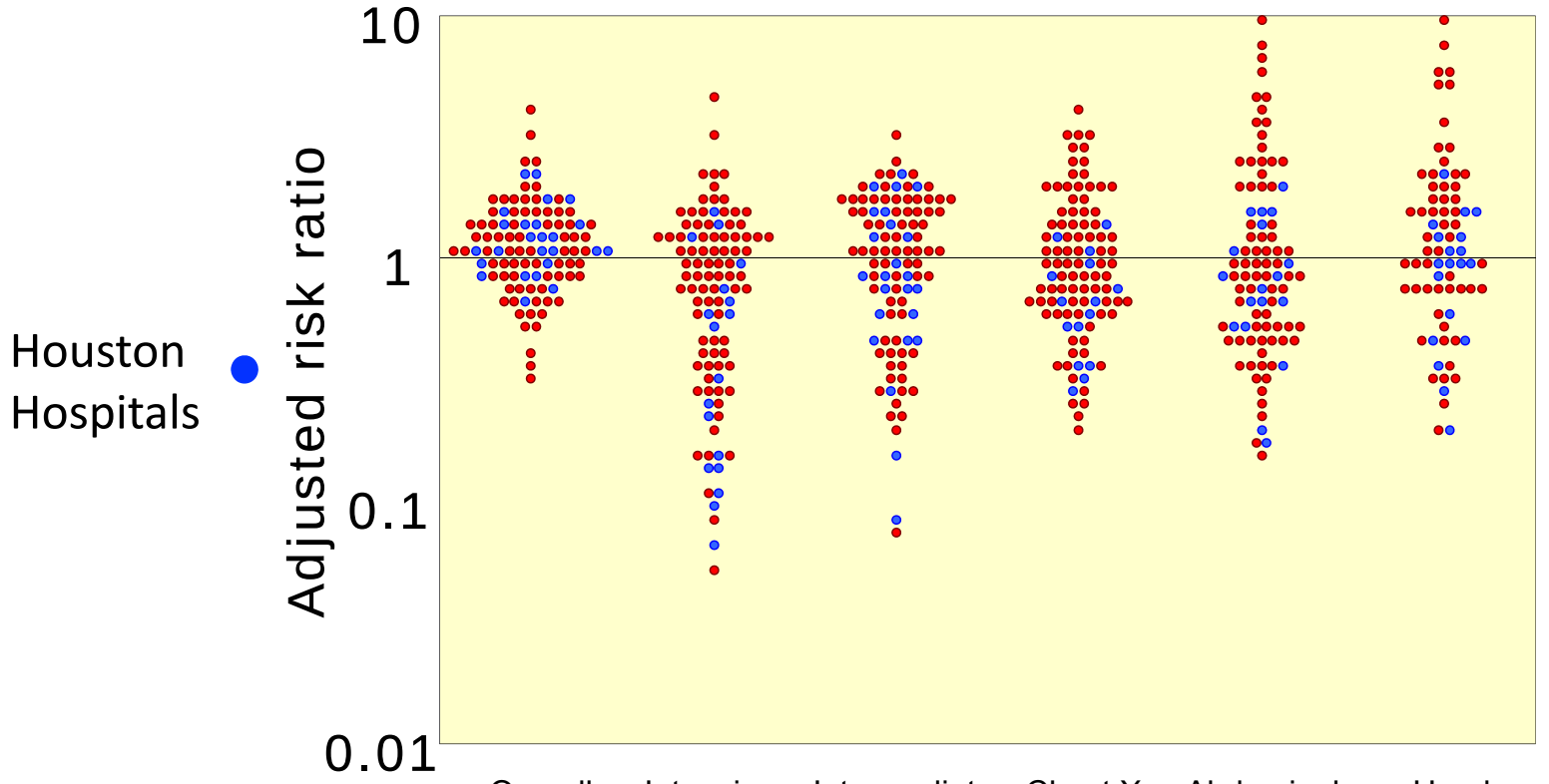
	Very Low Birth Weight	Late Preterm	Non Pretem
	Birth weight3	Birth weight4	Birth weight4
	Congenital	Congenital	Congenital
	Gestational Age	Gestational Age	Gestational Age
	Sex	Sex	Sex
	Race	Race	Race
	Hispanic	Hispanic	Hispanic
	Polyhydramnios	Polyhydramnios	Polyhydramnios
	Hypertension	Hypertension	
	Breech	Breech	Breech
	Maternal Link	Maternal Link	Maternal Link
	Outborn	Outborn	Outborn
	Education	Education	Education
			Fetal Distress
	Oligohydramnios	Oligohydramnios	
	Steroid		
	Cord Prolapse		
	Hematologic		
		RH Isoimmunization	
	Preeclampsia		
Total Variables	17	14	12
DF	24	19	19
Somers' D	0.713	0.737	0.565
C-statistic	0.856	0.868	0.782

Texas Medicaid Very Low Birth Weight Adjusted Utilization
By the 100 Largest Hospitals (92% of all VLBW births)



	Overall SC Days	Intensive SC Days	Intermediate SC Days	Chest X-Rays	% Head MRI	Head Ultrasounds
State rate (per newborn)	57.8	49.6	81.8	17.0	19.8	2.56
Extremal ratio	34.1	83.0	44.0	49.8	14.9	7.65
Interquartile ratio	1.35	2.11	4.34	2.45	3.28	1.89
Coefficient of variation	33	45	94	68	62	44

Texas Medicaid Late Preterm Newborn Adjusted Utilization
By the 100 Largest Hospitals (82% of all late preterm births)



	Overall SC Days	Intensive SC Days	Intermediate SC Days	Chest X-Rays	Abdominal X-Rays	Head Ultrasounds
State rate (per newborn)	4.5	2.5	2.0	0.93	0.41	0.09
Extremal ratio	14.0	87.0	480.0	21.3	62.3	53.1
Interquartile ratio	1.66	3.28	2.85	2.27	3.30	2.29
Coefficient of variation	48	77	60	69	116	106

Study Methods II:

- Is more care better? Is less care harmful?
- Hospital level analysis (largest 100 hospitals)
- 30 day outcomes: re-admissions to any hospital
  emergency room visit without hospital admission
  mortality
- Ordinary least squares regression weighted by the number newborns in each hospital

Exposure: Proportion of Newborns Admitted to a NICU

	Very Low Birth Weight	Late Preterm	Non Preterm
30 Day Re-Admissions			
30 ER Visits			
30 Day Mortality			

Unpublished Preliminary Results

Exposure: Special Care Days Per Newborn

Very Low Birth Weight

Non Preterm

30 Day Re-Admissions

Unpublished Preliminary Results

30 ER Visits

30 Day Mortality

Exposure: Chest X-Rays Per Newborn

	Very Low Birth Weight	Late Preterm	Non Preterm
30 Day Re-Admissions			
30 ER Visits			
30 Day Mortality			

Unpublished Preliminary Results

Summary:

- Across hospitals, medical care varies markedly for high and low risk newborns
- Very little of the hospital variation is explained by differences in newborn risk.
- Greater intensity of care is not associated with lower 30 day re-admissions, emergency room use, or mortality.

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