Week 2: Neonatal Health Services Research/Quality Improvement

Neo-Perinatal Care Delivery: Epi/HSR - So Much Variation

Thursday, June 18 4:30-6:30 pm EDT

Moderators
Margaret Parker
Wanda Barfield

EDT	Abstract	Title	Presenting Author
4:30 pm	3379797	Predicting Length of Stay in the Neonatal Intensive Care Unit with Deep Learning and Chest Radiographs	Kristyn Beam
4:40 pm	3374956	Variations in length of stay for infants born at 24-31 weeks' gestation: an international comparison study	Prakesh Shah
4:50 pm	3376777	Neurodevelopmental Outcomes of Preterm Infants (<29 weeks Gestational Age) Conceived by Assisted Reproductive Technology	Smita Roychoudhury
5:00 pm	3340693	Chicago-born Latina women's upward economic mobility and preterm birth rates	John Feister
5:10 pm	3374422	Risk of Stratified Preterm Births by Maternal Nativity: Evidence Against an Immigrant Paradox	Teniola Egbe
5:20 pm	3379972	Epidemiology and outcomes of infants after cardiopulmonary resuscitation in the neonatal and pediatric intensive care unit in a national registry	Sara Handley
5:30 pm	3381150	Cumulative Cost of Clinician-Driven Tests and Treatments in Preterm Infants	Brian King
5:40 pm	3373871	Health Care Costs of Major Morbidities associated with Prematurity in United States Children's Hospitals	Kuan-Chi Lai

5:50 pm	3370757	Evaluating Care in Safety Net Hospitals: Clinical Outcomes and NICU Quality of Care in California	Emily Pang
6:00 pm	3379633	Everyday executive functioning of a national cohort of adults born very low birth weight	Alice Hyun Min Kim
6:10 pm	3376273	Association between gestational age at birth and neurodevelopmental disorders in children: a population-based cohort study in Taiwan	Chi-Nien Chen
6:20 pm	3376095	Outcomes of Outborn Very-Low-Birth-Weight Infants: A Propensity Score-Matched Analysis using Neonatal Research Network of Japan Database	Katsuya Hirata

Question Asked	Answer Given	Answerer
What aspects of the chest xray are used in the model? (bones, lungs, etc?)	Thank you for this question. As of our current analysis in this feasibility study we have not examined which part of the films are driving our early results. However, we plan on looking at saliency maps in the future which can help elucidate which parts of the films the algorithm is focusing on for the analysis and prediction. We have also annotated these images with notations that we feel may be driving predictions, such as presence of an endotracheal tube, presence of a central line, or presence of a chest tube. These may be indicating a higher severity of illness and may be associated with longer length of stay. In further subgroup analysis we will examine these relationships.	Kristyn Beam
How do you speculate this could be helpful in clinical care?	My hope is that this study is a stepping stone for more studies which will lead to bedside decision support. If we are able to understand earlier on which infants may have longer length of stay, we may be able to more carefully and accurately target clinical care. With further data gathering and analysis, we may be able to predict other neonatal outcomes and also target our care towards improving these outcomes.	Kristyn Beam
What does the Densenet121 algorithm do to analyze the radiographs? Thank you.	The Densenet121 algorithm is a deep convolutional neural network that utilizes multiple layers of analysis to examine relationships between pixels and predict outcomes on the basis of labeling of inputs.	Kristyn Beam
Will you look at the characteristics of Xray to predict death as well as survival?	Yes, it is obvious from looking at our length of stay distributions that we currently have 2 modes – one indicating mortality and one indicating survival to discharge. It is likely that we would be able to provide a probability of both mortality and length of stay within the same predictive model.	Kristyn Beam
It looks that the reliance on just CXR is over-simplistic and has no logical clinical rational.	Thank you for this comment. The rationale behind examining chest radiographs as a predictor for neonatal outcomes is based on several studies examining deep learning's predictive ability on retinal images. Other groups have shown that outcomes not specifically related to the purpose of the image are able to be predicted. Poplin et al. *[Nature Biomedical Engineering. February 2018]* demonstrated the ability to predict cardiovascular risk based on retinal fundus photographs obtained for diabetic retinopathy. While many predictive calculators have been developed in Neonatology, none have utilized image information, which is so prevalent in the early days of a neonate's life – obtained for tube placement, line placement, and evaluation of severity of RDS. Deep learning provides a new methodology for examining how	Kristyn Beam

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	chest imaging may hold information beyond the typical predictive variables used (GA, BW, etc). While this methodology and work is in it's early phase, based on other groups' results, we are hopeful that we may find interesting results on the basis of these chest images in the first few days of life.	
Question for Prakesh Shah - Did you quantify the proportion of variation in length of stay due to country, rather than individual patient factors? (IE - The intraclass correlation coefficient)	Thank you for the excellent question. We have not qualtified what is the average LOS should be. The idea would be explored further using a country with median LOS and then variation from that median would be quantified. We do not plan to calculate ICC.	Prakesh Shah
why did you exclude babies discharged before 34 weeks (you did not exclude deaths)	We felt that among the group of neonates of 24-31 weeks GA, discharge before 34 weeks would be extremely unusual and likely a coding error.	Prakesh Shah
Question to DR Shah, Does the variation of LOS affected by each country setting and practice? for e.g. post discharge support, discharging babies on Caffeine or not	Absolutely, yes. Unfortunately, we do not have such details. Idea here is to make people aware of this variability and then further reasons for differences could be explored.	Prakesh Shah
Could you speculate on specific clinical care practices why Japan has a longer LOS despite having the same median GA?	Speculation would be the availability or lack thereof community support to care for such babies and higher survival rates.	Prakesh Shah
I have a question to Dr Shah Prakesh: Thank you for this very interesting study. Was it possible to take the mean LOS of the countries as a reference group instead of the Asstralian network? and what is the rational for choosing it as a reference? Thanks you, Rym el Rafei (PhD student, Sorbonne, France)	Thank you. yes, that is the plan for main manuscript. It does not matter much but by using median we will be able to line up countries in ascending or descending order.	Prakesh Shah
Is there any effect of differences in do not resuscitate or euthanasia protocol of countries	There are differences in end of life care for critically ill neonates; however, to avoid the selection bias arising from such differences, we only included 24-31 weeks GA as >90% of neonates received active care at these gestation.	Prakesh Shah
why outworn infants were excluded?	We have not excluded outborn neonates if they were admitted on day of birth.	Prakesh Shah
Do you have any information on social cohesion? Integration into community?	We do not have any information on social cohesion or integration into the community as this is birth certificate data linked to hospital administrative records. No social cohesion data is available in these data sources. That is something of interest to our group, which could possibly help explain this phenomenon known as the immigrant paradox. One may believe that even though these women are foreign born their sense of social cohesion or community before arriving to the states is very strong and therefore they seek out community after	Teniola Egbe-Children's Hospital of Philadelphia

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	arrival, which could assist them in learning about or receiving protective resources despite health care access barriers. By the same token, some believe that if and when women integrate into a community or have assimilate to American society it may impede the immigrant health paradox because such women begin to adopt deleterious health behaviors, such that the health benefits to immigrants deteriorate over time. Since we don't know how long the foreign-born women have been in the US in our dataset, we can't comment on concepts of acculturation or assimilation in our population. However, we did see that foreign-born women were more likely to be married than their U.S ethnic/racial counterparts and had lower rates of tobacco use than their U.S born counter parts, which points towards the argument that recently immigrated women retain health promoting vs. health risking behaviors.	
Based on your research, do you believe that the trends you found would be mirrored in other U.S. hospitals?	Our trends were not hospital-specific, they were statewide. I believe our findings are likely to be mirrored in other states and may be amplified in states with a larger immigrant population. Generalizability also depends on the differences in health outcomes related to structural issues such as health insurance, education, etc. For example, PA has a Medicaid state waiver that allows for insurance coverage of pregnant women. Other states without this emergency Medicaid, or who haven't expanded Medicaid may have even more stark differences, and based on our data in PA, it would be hard to speculate about whether that may show the same trends with respect to nativity. This is something we hope to investigate in the future.	Teniola Egbe-Children's Hospital of Philadelphia
From Tonse Raju: Do you have information about the demographics (race/ethnicity etc) of the spouses?	The birth certificate does contain some information about spousal demographics, but the accuracy of the data is decreased compared to the accuracy of the demographic information for mother so we chose not to use this information. However, we agree that spouses demographics are important and some people are exploring the contribution of these variables to birth outcomes.	Teniola Egbe-Children's Hospital of Philadelphia
Teniola Egbe - Any speculations as to why these differences by nativity occur?	One speculation is the immigrant paradox reflects better pre-existing health of migrating populations. Another theory is that recently arrived immigrants live in protective enclaves that offer them resources, which may protect against the barriers to health care access they face. Acculturation may also help explain some of these findings, which is why it's important though challenging to ascertain how long women have been in the country after immigration and whether they have begun to change their way of life as a result. These theories could explain some of the differences you see for non-Black populations.	Teniola Egbe-Children's Hospital of Philadelphia

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	However, something else is at play regarding Black women, and we believe that may be related to the structural and individual racism that is uniquely experienced by Black women, regardless of nativity. Our findings are novel because research does not usually account for nativity heterogeneity among women.	
Great presentation. Is there any prenatal selection on survival that might account for increased survival among immigrant women?	There may be, again related to the immigrant paradox. The paradox states foreign-born patients and their children sometimes have the same or better health outcomes then their U.S.-born racial ethnic counterparts despite their socioeconomic risk factors. There is something about being foreign-born that may provide a protective factor. So perhaps pregnancies are healthier somehow and as a result, birth outcomes are better. Some might argue there is evidence of this because even without access to regular or early prenatal care, sometimes foreign-born women, especially foreign-born Hispanic women, have better birth outcomes than US born Hispanic or Black women.	Teniola Egbe-Children's Hospital of Philadelphia
How did you account for infants that had multiple code events?	One of study definitions, which I did not include in the brief presentation, was that this was an analysis of index (first) CPR events, which lasted > 1 minute. We did not adjust for infants with multiple events in this analysis.	Sara C. Handley, MD, MSCE
I agree that we can learn from the PICU - but could there be an interpretation that fewer patients in the NICU required CPR and therefore the ones that needed it were particularly ill?	This is an important question. One of the limitations of using this registry is that we do not have a denominator. A denominator would allow to us report the frequency of CPR events in the NICU versus the PICU, which may start to address this question.	Sara C. Handley, MD, MSCE
Do you know how much the safety-net vs. non-safety net hospitals have participated in CPQCC initatives? Do you think the fact that the fact that quality scores weren't different is because collaborative QI structures are effective?	Thank you for your engagement in our work. These are questions we are also interested in answering in our future work. Right now, we are unsure whether there are clear differences in participation in CPQCC's initiatives between the safety net and non-safety net hospitals; however, understanding the relationship between quality scores and efficacy of collaborative QI work would be a valuable insight for tailoring future improvement efforts.	Emily Pang
Are you concerned that excluding DR deaths and deaths less than 12 hour of age could influence your results?	Thank you for your question. Excluding delivery room deaths and deaths less than 12 hours of age was pertinent to assess our outcomes of interest, because many of the subcomponents of Survival Without Major Morbidity or Baby-MONITOR scoring would not apply to this infant subpopulation. However, we plan to investigate this potential influence with sensitivity analyses that include these infants, while	Emily Pang

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	noting this limitation. In prior research we found very high correlation of hospital performance across NICUs when altering definitions of mortality as suggested, which implies that our exclusion criteria are unlikely to be significant drivers of our results (https://pubmed.ncbi.nlm.nih.gov/22854328/).	
To your knowledge, have there been studies beyond your selected age groups and the outcomes on executive function? If so, what were the findings?	To my knowledge, there have been no studies looking at executive function outcomes of VLBW adults beyond the age groups studied in our presentation (ages up to 30 years). Although, there has been an increasing body of research focused on young adult outcomes (late teens-early 20s), consensus is yet to be reached on the extent of executive function difficulties among the VLBW population. This makes longer term follow up studies on VPT and VLBW survivors all the more necessary to ensure that we provide the most appropriate intervention/medical care.	Alice Hyun Min Kim