Assessment of the 2019 Florida Infant Risk Screen

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Executive Summary

The Florida infant risk screen is designed to identify infants who are at increased risk of postneonatal death, which is an infant death that occurs between ages 28 to 364 days of life. Infants at higher risk are referred to additional health care services after they leave the hospital. The Florida Department of Health (FDOH) periodically reviews and assesses the performance of the most current infant risk screen implemented in 2012. In 2019, anew analysis was completed to explore the value of including new variables as risk factors to improve the current infant risk screen. This report shows the results of this analysis comparing the variables included in the current prenatal screen with a new model based on the 2019 birth record data called the optimal infant screen. The current infant risk screen identified 16.6% of infants as high risk, and 57.9% of neonatal deaths occurred among these identified infants. The optimal infant screen identified 14.1% of infants as high risk, and 55.5% of neonatal deaths occurred among these identified infants. Since these differences between the current and optimal risk screens were not statistically significant, the current infant screen will continue to be used to identify infants who need services.

Introduction

In 1991, the Florida Legislature enacted the Healthy Start legislation, which requires the implementation of a universal prenatal and infant screen process to identify pregnant women and infants at increased risk for adverse birth outcomes and infant health problems. As stated in the statute: “A risk factor analysis using the department’s designated risk assessment instrument shall also be conducted as part of the medical screening process upon the birth of a child and submitted to the department’s Office of Vital Statistics for recording and other purposes provided for in this chapter.” [Title XXIX, S. 383.14, (1), (b), F.S.].

FDOH’s universal infant risk screen is based on information collected on the birth record. A risk score is computed from this information by assigning point values to each of the items on the birth record determined to be risk factors. The risk score points are summed. A total of four points or more is classified as a positive score on the infant risk screen. Using recorded birth registration information to compute the infant risk score avoids the added workload required to collect additional information. This was a concern when the screen was originally developed. There were also concerns that information collected in addition to the birth registration information would be less accurate and complete.

The infant risk screen is designed to identify infants who are at increased risk of postneonatal death, which is an infant death that occurs between ages 28 to 364 days of life. The intent of the legislation is to identify infants in need of additional health care services after they leave the hospital. Infant deaths that occur before the 28th day of life very often do not leave the hospital or would not have time to receive and benefit from additional health care services.

When the infant risk screen was developed in 1992, 48% of the postneonatal deaths occurred among the 14% of the infants who were classified as positive on the infant risk screen. This is also known as a 14% positive rate and 48% sensitivity.

In March 2004, a new Florida birth certificate was implemented. The new birth certificate added more information to the Florida birth record, which raised the possibility that the new information could be used to improve the infant risk screen.

To have enough data for a reliable analysis, several years of birth and postneonatal death data was preferred. Linked birth and postneonatal death data for the years 2005 through 2008 were not available until late 2009.The infant risk screen analysis was started in 2010 and completed in 2011. As result a new infant risk screen (current screen) was implemented in 2012. In the years since the current screen was developed, the FDOH has periodically reviewed and assessed the performance of the screen.

The purpose of this analysis was to compare the performance of the current screen, implemented in 2012, with a new model. Using the latest information available, the analysis included review of the validity of risk factors included in the linked file and assessed the possibility of including new variables as risk factors to improve the current infant risk screen. A paper that describes the analyses, the results and the development of the new criteria, entitled "Summary of Healthy Start Infant Screening Analysis," is available on the FDOH website at: http://www.floridahealth.gov/healthy-people-and-families/childrens-health/healthy-start/healthy-start-docs/summaryinfantscreeninganalysis2013.pdf

Methods

The data used in this analysis to construct the optimal model came from 2019 Florida resident birth records linked to infant death records. Birth records were excluded from the analysis if consent for the infant risk screen was not provided by parent or guardian. There were 220,010 linked resident births in the data set in 2019 and 11,836 (5.4%) were excluded due to the screen being declined.

Trends in the infant positive screen rates for the years 2009 through 2019 were also examined to compare the positive percentage for the current screen established in 2012.

In this analysis, birth records linked to infant death records were used to evaluate all the items on the birth record that might be associated with postneonatal deaths (infant deaths at age 28 to 364 days).

First, a Poisson regression was calculated to evaluate the factors included in the current screen. Second, other factors were included in a new model to evaluate the new factors. This new model is called the optimal screen. Third, to assess the performance of the current and optimal screen, the sensitivity and positivity percentages were calculated to compare both the current and the optimal screen to determine which of the two screening criteria yielded better results.

Results

Current Infant Screen

Table 1 shows the current screen factors and the corresponding risk factor point value. Infants with a risk screen score total of four or more points are classified as positive on the screen. The factors included in the analysis of the current screen were: birthweight less than 2,000 grams, one or more selected abnormal conditions, infant transferred within 24 hours of delivery, mother used tobacco in one or more trimesters, father's name not present or unknown, maternal race Black, prenatal visits less than two or unknown, principal source of payment Medicaid, maternal age less than 18 or unknown and mother unmarried. The infant screen is available at the FDOH website.

Table 1. 2019 Florida Infant Risk Screen Risk Factors and Scoring Points for the Current Infant Screen

Risk Factor	Risk Score Points*
Birthweight < 2000 grams	4
One or more of selected abnormal conditions**	4
Infant transferred within 24 hours of delivery	4
Tobacco use	1
Father's name not present	1
Maternal race Black	1
Prenatal visits < 2 or unknown	1
Principal source of payment Medicaid	1
Maternal age < 18 or unknown	1
Mother unmarried	1

*Total points of four or more is a positive screen

**Selected abnormal conditions are:

- Assisted ventilation (≥ 30 minutes)
- Assisted ventilation (≥ 6 hours)
- Neonatal Intensive Care Unit Admission
- Newborn given surfactant replacement therapy
- Hyaline membrane disease
- Respiratory distress syndrome
- Seizure of serious neurological dysfunction

Optimal Infant Screen

Table 2 shows the optimal screen factors and the corresponding risk factor point value. Infants with a risk screen score total of four or more points are classified as positive on the screen. The optimal screen excluded maternal age less than 18 and mother unmarried because the values were not significant (p>0.05) in the Poisson regression and included two new factors: pregnancy interval less than 18 months and breastfeeding initiation.

Table 2. 2019 Florida Infant Risk Screen Risk Factors and Scoring Points for the Optimal Infant Screen

Risk Factor	Risk Score Points*
Birthweight < 2000 grams	4
One or more of selected abnormal conditions**	4
Infant transferred within 24 hours of delivery	4
Tobacco use	1
Father's name not present	1
Maternal race Black	1
Prenatal visits < 2 or unknown	1
Principal source of payment Medicaid	1
Pregnancy interval	1
Breastfeeding initiation	1

*Total points of 4 or more is a positive screen

**Selected abnormal conditions are:

- Assisted ventilation (≥ 30 minutes)
- Assisted ventilation (≥ 6 hours)
- Neonatal Intensive Care Unit Admission
- Newborn given surfactant replacement therapy
- Hyaline membrane disease
- Respiratory distress syndrome
- Seizure of serious neurological dysfunction

Comparison of Current and Infant Screen

Table 3 compares the screen results and birth outcomes for the current and optimal infant risk screen calculations. The percentage of positives was higher for the current infant risk screen at 16.6% compared to the optimal infant risk screen positive of 14.1%. Table 3 also shows the sensitivity percentage for the current screen of 57.9% is not statistically significantly higher than the optimal screen of 55.5%. The result of the current screen means that 57.9% of the postneonatal deaths occurred within the 16.6% of infants who screened positive in 2019.

Table 3. Comparison of Current Screen Results in 2019 versus the Optimal Infant Screen in 2019

Characteristics	Infants Born in 2019 Screened with the Current Infant Screen	Infants Born in 2019 Screened with the Optimal Infant Screen	Current Minus Optimal Difference	P-value of Difference
Total Infants Screened	208,174	208,174		
Positive Screens	34,532	29,331		
Positive Percentage	**16.6%**	**14.1%**	**-2.5%**	**<0.001**
PNND with Positive Screen	220	211		
PNND with Negative Screen	160	169		
	380	380		
PNND Sensitivity Percentage[1]	**57.9%**	**55.5%**	**-2.4%**	**Not sig.[2]**
PNND Rate for Positive Screen	6.37	7.19		
PNND Rate for Negative Screen	0.92	0.94		
PNND Rate Ratio-Positive to Negative	6.9	7.7	1.1	Not sig.

[1]/PNND = Postneonatal infant death (death at age 28 to 364 days)
[2]/Sig. = Significant

Table 4 shows the results of applying the current and optimal screen criteria to the infants screened in 2019. There were 6,714 infants identified by the optimal screen criteria as positive but were classified as negative by the current screen. Eighteen of these 6,714 infants died during the postneonatal period for a postneonatal death rate of 2.7 deaths per 1,000 live births. This is a relatively high postneonatal death rate compared to the overall rate of 1.8 deaths per 1,000 births among infants born in 2019.

There were also 1,513 infants who were classified as negative by the optimal infant screen criteria and positive by the current screen criteria. Nine of these 1,513 infants died postneonatal for a postneonatal mortality rate of 5.9 per 1,000 live births. This rate is higher than the overall postneonatal rate of 1.8 deaths per 1,000 live births (Table 4).

Table 4. Comparison of Screen Results Using Current Infant Screen and Optimal Infant Screen for Infants Born in 2019

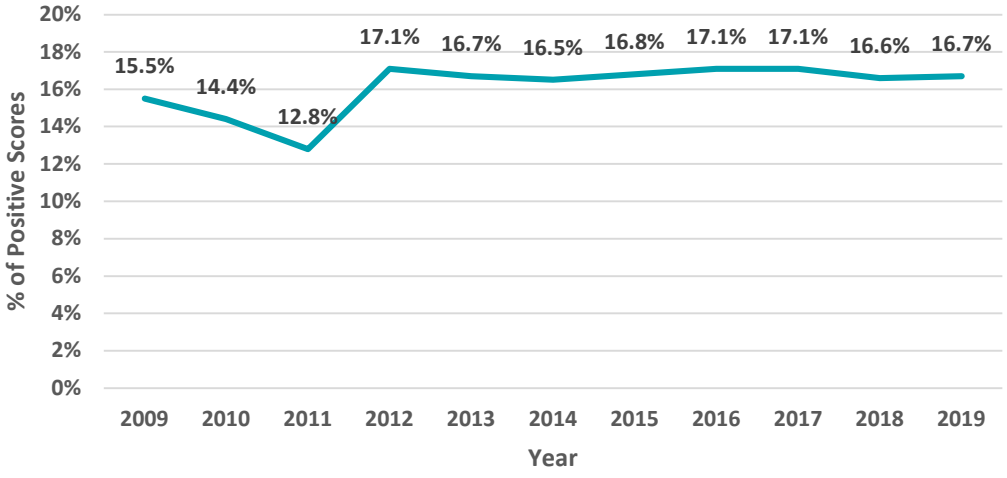
Optimal Screen Results	Current Screen Results	PNND	Births	PNND Rate Per 1,000 Births
Positive	Negative	18	6,714	2.7
Negative	Positive	9	1,513	5.9
Negative	Negative	151	172,129	0.9
Positive	Positive	202	27,818	7.3
Total		380	208,174	1.8

PNND= Postneonatal infant death (death at age 28 to 364 days)

Infant Screen Comparisons and Trends

Graph 1 shows the trend in the infant positive screen rates for the years 2009 through 2019 based on the current infant screen criteria. The 2009–2019 trend was not statistically significant.

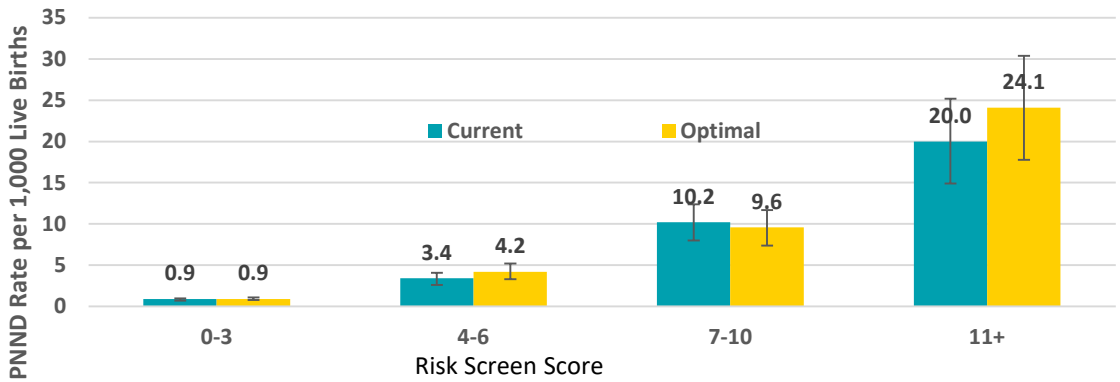
Graph 1. Current[1] Infant Risk Screen Percentage Positive by Year



[1]/This graph comes from the Screening Reports website, using data reported on the Florida Infant Screen. We recalculated the screen by pulling data reported on birth certificates using the factors identified in Table 1 and excluding neonatal deaths. The results are not significantly different.

Graph 2 shows that risk of postneonatal death increases with higher screen risk scores for both the optimal and current infant screen criteria. For example, the postneonatal rate is 20.0 in the current screen for infants with a risk score of 11 or more, compared to 0.9 for infants with risk score less than 4.

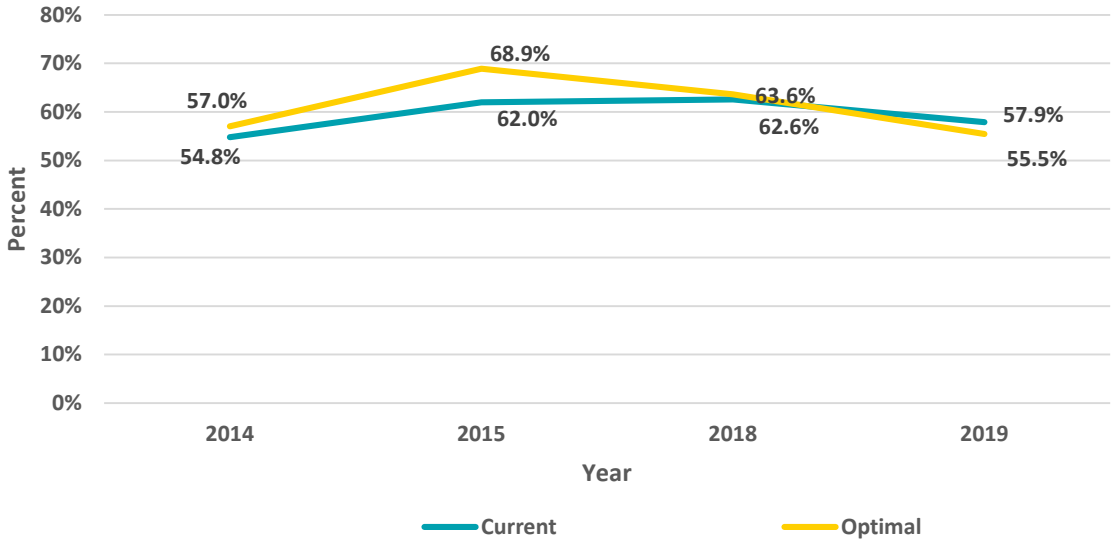
Graph 2. Postneonatal Rate per 1,000 Live Births by the Current Infant Risk Screen and Optimal Infant Screen Score for Infants Born in 2019



PNND=Postneonatal infant death (deaths at age 28 to 364 days

Graph 3 shows the sensitivity percentages comparing the current screen, implemented in 2012, with the optimal screen for the years 2014 through 2019. The sensitivity was not significant for the current screen compared the optimal screen for the years 2014 through 2019.

Graph 3. Sensitivity Percentage Trend for the Current Screen and the Optimal Screen



Discussion

This analysis provides evidence that the current screen, implemented in 2012, is still a good instrument to identify infants who need services. As in the past, the infant risk screen criteria should be evaluated annually to validate whether the level of performance is maintained and to determine if there are potential changes that would improve the effectiveness of the screen. As discussed in the introduction, this has been done since the inception of the infant risk screen in 1992. Most years, the performance of the infant screen criteria was found to be consistent and no changes were identified that would substantially improve the effectiveness.