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Comparison of Revised Florida Infant Risk Screening Implemented in 2012 to Previous Screening

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Introduction

The Florida Legislature enacted the Healthy Start legislation in 1991. Part of the legislation is a universal prenatal and infant screening 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.]. In 1991 and 1992, the infant risk screening criteria were developed by a multidisciplinary advisory committee that included epidemiologists, nurses, physicians, social workers, hospital administrators, researchers, and policy and program representatives from key infant and child health care providers.

The Florida Department of Health's universal infant risk screening 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 that were determined to be risk factors. The risk score points are summed and 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 that would be required to collect additional information. This was a concern when the screening 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 screening 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 screening was developed in 1992, the percentage of infants classified as positive was 14 percent and 48 percent of the postneonatal deaths occurred among the 14 percent of the infants that were positive on the infant risk screening. This is also known as a 14 percent positive rate and 48 percent sensitivity. In the years since the infant risk screening was implemented, the Department has periodically reviewed and assessed the performance of the screening and has found essentially the same level of positive percentage and sensitivity.

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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 screening.

In order 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 screening analysis was started in 2010 and completed in 2011.

This analysis indicated the infant risk screening could be substantially improved by using some of the new birth record data and changing the risk point values and scoring for some of the existing screening factors. The results of these analyses were reviewed by Department Maternal and Child Health Epidemiology staff, Healthy Start Program staff and Florida's Healthy Start Coalitions. Ultimately, a new infant screening criterion was developed and implemented statewide on January 1, 2012. Infants born prior to that date were screened and scored with the old screening criterion and infants born on or after January 1, 2012 were screened and scored with the new screening criterion. A paper that describes the analyses, the results, and the development of the new criterion, entitled "Summary of Healthy Start Infant Screening Analysis", is available on the Department website at: <http://www.floridahealth.gov/healthy-people-and-families/childrens-health/healthy-start/healthy-start-docs/summaryinfantscreeninganalysis2013.pdf>

The purpose of this analysis is to compare the performance of the new screening criteria, which was used for infants born in 2012, to the performance of the old screening criteria which was used for infants born in 2011.

Methods

The data used in this analysis were 2011 and 2012 Florida resident birth records linked to infant death records. Birth records were excluded from the analysis if there was no consent for infant risk screening. There were 424,717 total resident births in the data set and 42,068 (9.9%) were excluded due to the screening being declined.

Trends in the infant positive screening rates for the years 2005 through 2012 were also examined to compare the positive percentage for the new screening in 2012 to the percentages for the old screening in the years before 2012.

To directly compare the old and the new infant risk screening criteria, both sets of criteria were applied to the infants originally screened in 2012. This is possible because the risk factors for both screening criteria are on the birth record. In cases where the 2011 and 2012 infant risk screening criteria produced different results for the same infants (i.e., 2011 screen criteria = positive screen score and 2012 screen criteria = negative screen score), the birth outcomes were analyzed to determine which of the two screening criteria yielded the correct result.

Results

Table 1 shows the risk screening factors and the corresponding risk scoring points. All of the factors are items on the birth record. Infants with a risk screen score total of 4 or more scoring points are classified as positive on the screening.

Table 2 compares the screening results and birth outcomes for the old and new infant risk screening. The percentage of positives was higher for the new infant risk screen at 17.0 percent compared to the old infant risk screening positive percentage of 12.7. However, as shown by Graph 1, the percentage positive decreased in the years 2008 through 2011. In effect, the new infant risk screening positive percentage of 17.0 in 2012 is a return to the level of positive percentages in the years prior to 2009.

Table 2 also shows a substantial increase in the sensitivity percentage for the new screen (60.9 percent) compared to the old screen (49.0 percent). This means that 60.9 percent of the postneonatal deaths occurred within the 17.0 percent of infants that screened positive in 2012.

Table 3 shows the results of applying the old and newer screening criteria to the infants originally screened in 2012.

- There were 19,072 infants identified by the new infant risk screening criteria as positive, but were classified as negative by the older screening criteria.
 - Sixty-four of these 19,072 infants died postneonatally for a postneonatal mortality rate of 3.36 deaths per 1,000 births. This is a relatively high postneonatal death rate compared to the overall rate of 2.01 deaths per 1,000 births among infants born in 2012.
 - Due to this relatively high postneonatal mortality rate, these infants should be classified as positive on the infant risk screen.
 - These correct positive classifications were accomplished by the new infant screening criteria; however, the old infant risk screening criteria classified these infants as negative.

- There were also 9,649 infants who were classified as negative by the new infant screen criteria and positive by the old screen criteria.
 - There were 19 postneonatal deaths in this group, which is a postneonatal death rate of 1.97 per 1,000 births. This rate is lower than the overall rate of 2.01 of postneonatal death among infants born in 2012.
 - Due to this relatively low rate for these infants, this group should be classified as negative on the infant screening.
 - The correct negative classifications were accomplished by the new infant screening criteria; however, the old infant risk screening criteria classified these infants as positive.

In summary, for the infants where the old and newer screening criteria disagree, the new screening criteria performs better at identifying infants who are at risk for postneonatal death.

Graph 2 shows that risk of postneonatal death increases dramatically with higher screening risk scores based on the newer infant screening criteria.

Discussion

This analysis provides evidence that the new Department infant risk screening, implemented in 2012, is a better screening than the previous screening. The new screening has an increased sensitivity for postneonatal death and is more likely to identify infants at risk of postneonatal death. This is noteworthy, because approximately 200,000 infants are screened each year with this risk screening. Due to the efforts of the Florida Department of Health staff who developed

and implemented the new screening, nearly 200,000 infants each year are now screened with a better instrument.

As in the past, the infant risk screening 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 screening. As discussed in the introduction, this has been done since the inception of the infant risk screening in 1992. Most years, the performance of the infant screening criteria was found to be consistent and no changes were identified that would substantially improve the effectiveness. However, the new screening is the end result of the 2011 evaluation that showed substantial improvements could be made. Due diligence to evaluate the infant screening criteria on an annual basis is warranted to ensure the level of performance is sustained.

Table 1

2012 Florida Infant Risk Screening Risk Factors and Scoring Points

| | Risk |
|---|----------------|
| | Score |
| Risk Factor | 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 age < 18 or unknown | 1 |
| Maternal Race Black | 1 |
| Mother unmarried | 1 |
| Prenatal visits < 2 or unknown | 1 |
| Principal source of payment Medicaid | 1 |
| *Total points of 4 or more is a positive screen | |
| ** Selected abnormal conditions are: | |
| Assisted ventilation (≥ 30 min.) | |
| Assisted ventilation (≥ 6 hrs.) | |
| Neonatal Intensive Care Unit admission | |
| Newborn given surfactant replacement therapy | |
| Hyaline Membrane Disease | |
| Respiratory Distress Syndrome | |
| Seizure or serious neurological dysfunction | |

Table 2

**Comparison of Old versus New Infant Screening Results
Infants Screened in 2011 versus Infants Screened in 2012**

| | Infants Born in 2011 | Infants Born in 2012 | | |
|--|----------------------|----------------------|--------------|--------------------|
| | Screened With | Screened With | New - Old | p value of |
| | Old Infant Screen | New Infant Screen | Difference | Difference |
| Total Infants Screened | 190,253 | 192,396 | | |
| Positive Screens | 24,110 | 32,759 | | |
| Positive percent | 12.7% | 17.0% | 4.35 | < 0.0001 |
| PNND with Positive Screen | 198 | 235 | | |
| PNND with Negative Screen | 206 | 151 | | |
| PNND Sensitivity Percent | 49.0% | 60.9% | 11.87 | < 0.0001 |
| PNND Rate for Positive Screen | 8.21 | 7.17 | | |
| PNND for Negative Screen | 1.24 | 0.95 | | |
| PNND Rate Ratio - Positive to Negative | 6.62 | 7.58 | 0.96 | < 0.0001 |
| PNND = Postneonatal infant death (death at age 28 to 364 days) | | | | |

Graph 1

Infant Risk Screening Percentage Positive by Year

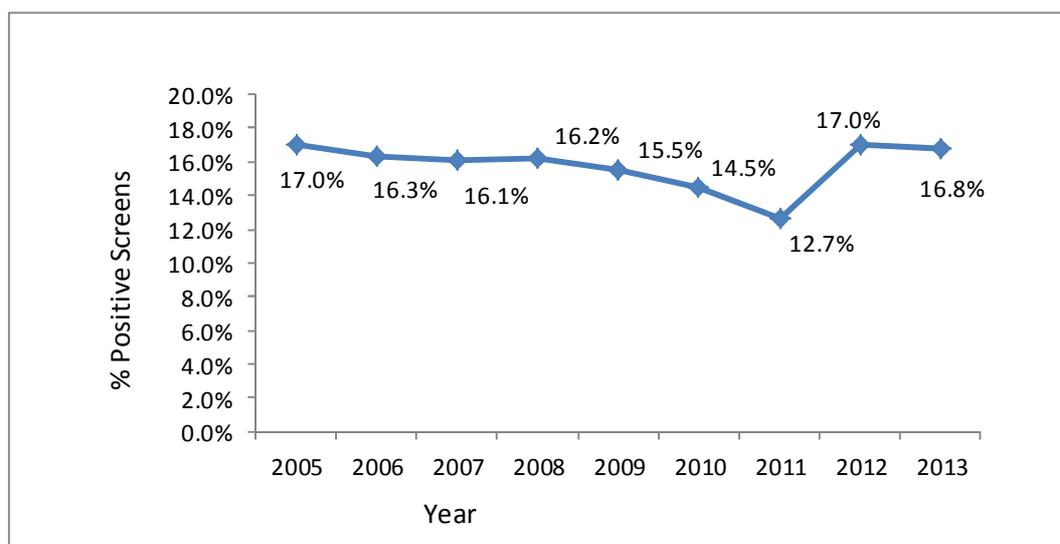


Table 3

**Comparison of Screening Results Using new Screen and Old Screen
For Infants Born in 2012**

| | | | | PNND Rate |
|------------|------------|------|--------|-----------|
| New Screen | Old Screen | | | Per 1,000 |
| Result | Result | PNND | Births | Births |
| Positive | Negative | 64 | 19072 | 3.36 * |
| Negative | Positive | 19 | 9649 | 1.97 * |
| Negative | Negative | 132 | 149988 | 0.88 |
| Positive | Positive | 171 | 13687 | 12.49 |
| Total | | 386 | 192396 | 2.01 |

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

* The difference between these two rates is statistically significant, p value = 0.035

Graph 2

**Postneonatal Death Rate per 1,000 Births by Infant Risk Screening Score
For Births Screened in 2012**

