



# Preterm Infants

Prematurity and the First Year of Life

# **Preterm Infants Prematurity and the First Year of Life**

## **Disclaimer**

**I have no actual or potential conflict of interest in relation to any product or service mentioned in this presentation.**



# Preterm Infants

## Prematurity and the First Year of Life

### Objectives

1. Know what defines a preterm infant.
2. Understand the degrees of severity of prematurity.
3. Know some of the expected outcomes.
4. Have an awareness of the short-term and long-term health problems of preterm infants.
5. Be attuned to the importance of the transition process when a premature infant is discharged from the hospital.
6. Know the term Corrected Age and why it is important.



# Defining Premature Infants

- **What qualifies as a premature baby?**
- Preterm babies are born before their due date
- Premature is before the start of week 37 of the pregnancy
  - Before they're developmentally ready.
- In the United States 1 in 10 infants are premature
  - roughly 10 to 13 percent
- Twins have a high rate of preterm deliveries
  - More than 60 percent of twins deliver before 37 weeks GA
- Nearly every set of triplets also comes early



# Defining Premature Infants

- There are 5 categories of premature infants
- The classification is based upon the infant's gestational age (GA) at birth:
  - **Early term:**
    - **Late preterm.**
  - **Moderate preterm.**
  - **Very preterm.**
  - **Extremely preterm.**



# Defining Premature Infants

- **Early term:**
- Born between 37 weeks and 39 weeks of Gestational Age



# Defining Premature Infants

- **Late preterm:**
- 34 weeks to 36 weeks and 6 days Gestational Age
- Most premature births occur at this stage



# Defining Premature Infants

- **Moderate preterm:**
- Born between 32 weeks and 34 weeks Gestational Age



# Defining Premature Infants

- **Very preterm.**
- Born between 28 weeks and 31 weeks Gestational Age
- less than 32 weeks Gestational Age



# Defining Premature Infants

- **Extremely preterm:**
- Born before 28 weeks Gestational Age
- Micro Preemies



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**
- Survival is based upon fetal viability
  - An infant's ability to live outside the mother's womb.
- 24 weeks is the tipping point of viability
  - Babies born before this age usually do not survive.
  - Viability for 24 and more weeks can range from 42 % to 59 %
  - Infants born this young are **Extremely Premature**



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**
- Premature baby size categories
- The smaller the baby, the more complex the care, the longer the hospital stay tends to be.

**Low birth weight**

**Very low birth weight**

**Extremely low birth weight**

**Micro preemies**



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**

## **Low Birth Weight:**

Weigh less than 5 pounds, 8 ounces.



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**

## **Very Low Birth Weight**

Weigh less than 3 pounds, 5 ounces.



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**

## **Extremely Low Birth Weight**

Weigh less than 2 pounds, 3 ounces.



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**

## **Micro Preemies:**

The tiniest and youngest

Born before 26 weeks weigh less than 1 pound, 12 ounces.



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**

For all preterm infants:

Survival is better if they are born later

Survival is better if the weight is appropriate for the gestational age

Survival is better if they are provided an appropriate level of care

Survival is best if they are not born prematurely



# Defining Premature Infants

- **What is the survival outlook for a premature baby?**

## My Personal Story of a Micro Preemie

**JT was a preterm female delivered at 25 weeks gestational age during my residency in pediatrics**

**She weighed 1 lb. and 1 oz.**

**Her diagnosis was Respiratory Distress Syndrome of the Newborn**



# Defining Premature Infants

## The Story of a Micro Preemie: JT

**I managed her at the general hospital where I trained.**

**This was before NICUs were well developed, we kept all the sick babies in a high-risk nursery at our hospital**

**She was Intubated, On a Ventilator with CPAP and High Flow Oxygen**

**Surfactant had not yet been invented**



# Defining Premature Infants

## The Story of a Micro Preemie: JT

**JT had a peripheral IV and was fed breast milk, vitamins, and fluids through an NG tube**

**She was gradually weaned off the ventilator  
She began sucking from a bottle with a preemie nipple**



# Defining Premature Infants

## The Story of a Micro Preemie: JT

**After approximately 2 months she was discharged from the hospital and I followed her in my office when I went into practice.**



# Defining Premature Infants

## The Story of a Micro Preemie: JT

**I left private practice 10 years later to take an academic position**

**JT was in 3<sup>rd</sup> grade, growing normally, participating in sports, and thriving.**



# Defining Premature Infants

## The Story of a Micro Preemie: JT

**This was a miracle at that time.**

**Demonstrates that some Micro Preemies with appropriate support and care can do well**



# Defining Premature Infants

Intrauterine Growth; Prenatal Growth

There are 3 patterns:

Appropriate for Gestational Age (AGA)

Small for Gestational Age (SGA)

Large for Gestational Age (LGA)

Premature infants may fall into any of these categories



# Defining Premature Infants

- Short-term health problems
- Breathing trouble.
- Heart issues.
- Brain conditions.
- Low body temperature.
- GI issues.
- Anemia and jaundice.
- Hypoglycemia.
- Infection.
- Long-term health problems
- Cerebral palsy.
- Delayed learning.
- Impaired vision.
- Hearing loss and dental issues.
- Behavioral problems.
- Chronic conditions.



# Defining Premature Infants Health Problems

## Short-term health problems

- **Breathing trouble**
- Preemies have an immature respiratory system
- There is a lack of surfactant
  - This is a phospholipid substance
  - It helps the lungs expand.
  - The level is low when babies are born early
  - Some preemies may develop a lung disorder called bronchopulmonary dysplasia and/or develop apnea.



# Defining Premature Infants Health Problems

Short-term health problems

- **Breathing trouble**
- Bronchopulmonary dysplasia
  - Rapid, labored breathing with wheezing
  - Recurrent infections
  - Treatment includes Diuretics, Bronchodilators, Corticosteroids, Oxygen, CPAP/BiPAP
  - Most infants recover from BPD,
  - Some have long-term problems due to poor lung development



# Defining Premature Infants Health Problems

Short-term health problems

- **Breathing trouble**
- Some infant have intermittent apnea
- Some reasons are:
  - Brain immaturity (Apnea of Prematurity),
  - neurological issues
  - heart disease
  - gastrointestinal issues,
  - infectious causes
  - genetic issues.



# Defining Premature Infants Health Problems

## Short-term health problems

- **Heart Problems**

- Low blood pressure
- Heart defects
- Patent Ductus Arteriosus is common in preterm infants
  - A normal connection between the Aorta and the Pulmonary artery in the fetus that fails to close a birth
- Other congenital heart disease may be present



# Defining Premature Infants Health Problems

## Short-term health problems

### • **Brain conditions**

- Bleeding in the brain may occur
  - May be mild or widespread
- Other terminology specific for areas of brain anatomy
  - Intracranial hemorrhage
  - Intracerebral hemorrhage
  - Intraventricular hemorrhage
  - Subdural hematoma
  - Subarachnoid hematoma
  - Intraventricular hemorrhage
- The outcome may be localized/generalized damage



# Defining Premature Infants Health Problems

## Short-term health problems

- **Hypothermia**
- low body temperature
- Fat deposits in and under the skin are less than in full term infants
- Lower fat levels result in increased heat loss
- Preterm infants have difficulty regulating body temperature
- These infants get cold easily
- Hypothermia interferes with the body chemistry



# Defining Premature Infants Health Problems

Short-term health problems

- **Swallowing, stomach and intestinal issues**
  - An immature gastrointestinal tract
    - More prone to damage of the bowel wall.
    - Stress can reduce the blood supply
      - Causes part to the bowel to die
    - Feeding breast milk prevents potential damage from other food sources and infection
    - Any damage can lead to infection
    - This called Necrotizing Enterocolitis



# Defining Premature Infants Health Problems

Short-term health problems

- **Swallowing, stomach and intestinal issues**
  - Preterm infants have difficulty coordinating swallowing movements
  - They may not be able to suck well or at all
  - They are prone to choking and aspiration



# Defining Premature Infants Health Problems

## Short-term health problems

- **Anemia and Jaundice.**
- Anemia is not enough Red Blood Cells (RBCs)
  - Infection and other problems can cause reduced production of RBCs or break up of RBCs
- Break up of RBCs results in the breakdown of Hemoglobin (Hg) inside the blood vessels
- Broken down Hg is recycled by the body.
  - An intermediary chemical in this process is Bilirubin
- Too much Bilirubin causes Jaundice,
  - Yellowing of the skin and eyes
  - This can also cause brain damage



# Defining Premature Infants Health Problems

## Short-term health problems

- **Hypoglycemia**
- This is low blood sugar
- This may be caused by
  - Poor intake (lack of adequate nutrition)
  - Low fat storage
  - Not enough fat to convert to sugar for energy
- Increase energy demands
  - Breathing real fast due to lung disease
  - Congenital heart disease causing increase heart rate



# Defining Premature Infants Health Problems

## Short-term health problems

- **Infection**
- Premature infants are more prone to infection
  - The immune system is not as well developed as a full-term infant
  - Sepsis can occur
  - Infection in the blood stream
  - Lung infection is more common because of breathing problems, lung malformation, and intubation
- Necrotizing Enterocolitis can occur because of bowel problems
- Meningitis
  - Brain infection can occur because the barriers to infection are not as strong as full-term infants



# Defining Premature Infants Health Problems

## Long-term health problems

- **Cerebral palsy.**
- Cerebral palsy refers to a group of neurological disorders
  - Appear in infancy or early childhood
  - Permanently affect body movement and muscle coordination
- Some patients have Intellectual Disability
- Many have normal intelligence



# Defining Premature Infants Health Problems

## Long-term health problems

- **Delayed learning.**
  - Premature babies may have delayed developmental milestones
  - They may have learning disabilities.
  - As a rule, the closer to the projected delivery date the infant arrives, the less likely that intellectual/cognitive problems will occur.
- **Behavioral problems**
  - Psychological issues are more common in premature babies than those carried to term.



# Defining Premature Infants Health Problems

## Long-term health problems

- **Impaired vision**
- Retinopathy of prematurity (ROP) can affect vision and cause blindness
- The cause is prematurity
  - The severity and frequency is proportional to the degree of prematurity
- It is an eye disorder caused by abnormal blood vessel growth in the light sensitive part of the eyes (retina)
- It is treatable in many cases



# Defining Premature Infants Health Problems

## Long-term health problems

- **Hearing loss and dental issues.**
- Premies may hear less well than full-term babies
  - The most common cause of hearing loss is Cytomegalic Virus infection during the pregnancy
  - This is frequently asymptomatic
  - All newborns are routinely screened at birth
- Dental
  - Premies' teeth may come in late
  - They may be misaligned or appear discolored.



# Defining Premature Infants Health Problems

## Long-term health problems

- 
- **Chronic conditions**
  - An increased risk of SIDS,
  - More likely to experience infections
  - Asthma is more common
  - The feeding problems identified as a **Short-Term Problems** may persist.



# Transitioning the Premature Infant to Home

## Establishing Relationships

Most premature infants who have had problems at birth have specialists who already familiar with them

Most of the more severely ill infants will be seen at the neonatal follow up clinic manned by the neonatologists from the hospital.

Transition teams should ensure the continuity of care and availability of support services



# Transitioning the Premature Infant to Home

## Establishing Relationships

Some of the severely ill premature infants were transferred to facilities quite distant from the parent's home.



# Transitioning the Premature Infant to Home

## Establishing Relationships

In these situations, the hospital and insurance transition teams must ensure:

Identification of a Primary Care Physician (PCP) who has experience and/or training in managing these premature NICU graduates



# Transitioning the Premature Infant to Home

## Establishing Relationships

In these situations, the hospital and insurance transition teams must ensure:

Availability of specialists and subspecialists

These may be local near the preemies' home

It may be the specialist/subspecialists from the hospital

Medical stability, and frequency of need will determine whether the original physicians can fulfil the role.



# Transitioning the Premature Infant to Home

## Establishing Relationships

In these situations, the hospital and insurance transition teams must ensure:

All support services are in place before discharge.

The infant is registered as a STARKids member

Most of these infants will be eligible for the Medically Dependent Children Program (MDCP) Waiver.

In order to apply, the infant must have been approved for Social Security Insurance (SSI)



# Transitioning the Premature Infant to Home

## Establishing Relationships

The SSI application should be submitted as soon as the infant is identified as a premature baby with medical problems

The MDCP Waiver has a waiting list; the caregivers should be encouraged to apply early  
MDCP Waiver provides additional support services, durable medical equipment, and home modifications that are not available from regular Medicaid.



# Transitioning the Premature Infant to Home

## Establishing Relationships

The teams should ensure that the caregiver education has been completed

The caregivers should have the knowledge of

- How to care for the infant

- How to use all the equipment

- When to call for help

- Who to call

- How to obtain transportation, and

- What to do in an emergency



# Transitioning the Premature Infant to Home

## Establishing Relationships

The infant should be referred to Early Childhood Intervention (ECI)

The teams should ensure that the caregiver has been given the opportunity to connect with peer support groups.

The assigned Service Coordinator should be identified and notified when the infant is discharged.



# Transitioning the Premature Infant to Home

## Establishing Relationships

It may be helpful to provide the PCP with  
**Primary Care for Preterm Infants & Children**

Janice Lowe, MD

Jadene Wong, MD

A California Perinatal Quality Care Collaborative  
(CPQCC) Provider Toolkit



# THE FIRST YEAR OF LIFE

Preterm (particularly very preterm) infants

The first weeks of extra-uterine life

Often develop energy and protein deficits,  
Even with caloric and protein supplements

Usually in the NICU

Results in postnatal growth failure

The peak of the weight loss is between 4 and 7 days

After 7 days most preterm infants gain weight.

Birth Weight is usually regained by the 8<sup>th</sup> to 24<sup>th</sup> day of life.

The weight gain is affected by all the problems previously discussed.



# THE FIRST YEAR OF LIFE

Preterm (particularly very preterm) infants display  
“Catch Up Growth”

Approximately 80% show catch-up growth in weight, length and head circumference

The accelerated growth usually starts in the first few months of post delivery life

Catch-up Growth usually occurs over 2–3 years,

Often achieved within the first 2 years of life

However, late catch-up growth has been described throughout childhood and even in adolescence



# THE FIRST YEAR OF LIFE

Preterm (particularly very preterm) infants display  
“Catch Up Growth”

Head circumference is a particularly important  
correlate for neurodevelopmental outcome

Catch-up Growth affecting head circumference is  
beneficial for neurodevelopmental outcome



# THE FIRST YEAR OF LIFE

Preterm (particularly very preterm) infants display  
“Catch Up Growth”

Growth of preterm infants in later childhood

They remain smaller and lighter than their full-term equivalents

It might lead to adverse metabolic consequences such a Diabetes mellitus in adulthood.



# THE FIRST YEAR OF LIFE

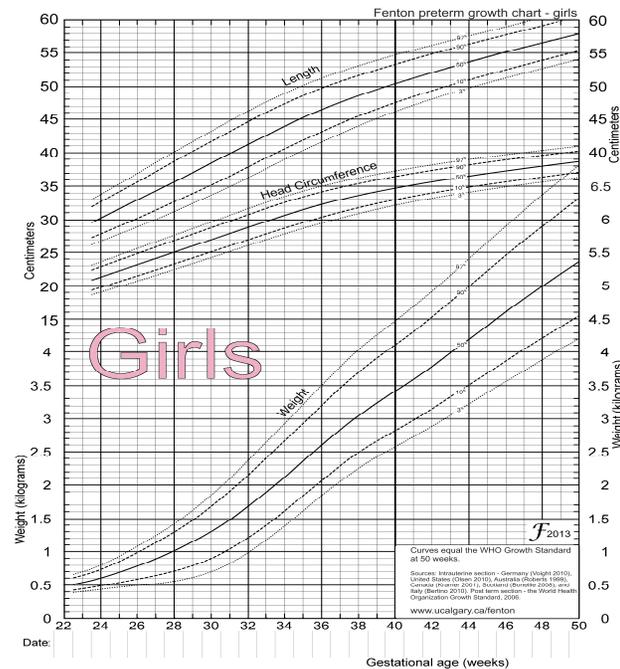
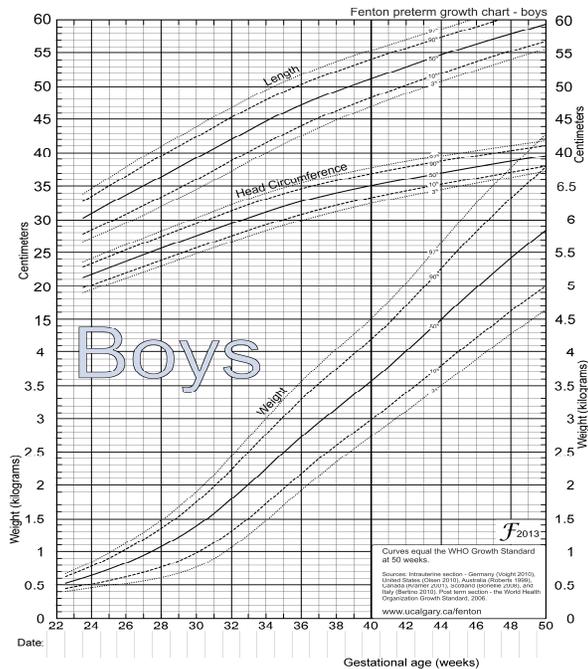
## Developmental Expectations FENTON Preterm Growth Charts

These are the anticipated physical growth expectations

The %ile  
lines = 3,  
10, 50,  
90, 97 %

Weight  
begins at  
0.5 kg  
=1.1 lb

Gestational  
age from  
22 weeks t



# THE FIRST YEAR OF LIFE

## Developmental Expectations

### FENTON Preterm Growth Charts

Provide a benchmark for preterm infant normal physical growth.

Take into account the age at delivery



# THE FIRST YEAR OF LIFE

## Developmental Expectations

The developmental milestones of a premature infant are the same as those as a full-term infant.

An adjustment must be made for the number of weeks that an infant is delivered early.

This is called the Corrected Age



# THE FIRST YEAR OF LIFE

## Developmental Expectations

### Corrected Age

Corrected Age is how we adjust expectations for premature infants

Using Corrected age gives a better idea of when a particular milestone will be met.

This applies to the first 2 years of age.

It allows an assessment to determine if the infant is maturing appropriately.



# THE FIRST YEAR OF LIFE

## Developmental Expectations

### Corrected Age

#### Determining Corrected Age

Use weeks as the unit of measurement

1. Use the Birth date
2. Use the Due date
3. Find the difference in weeks
4. Subtract the difference in weeks from the current age in weeks
5. Round off to the nearest whole month or month and a half



# THE FIRST YEAR OF LIFE

## Developmental Expectations

### Corrected Age

#### Determining Corrected Age

#### Example:

A preterm infant is 1 year old today (Aug 17).

The baby was born on April 10

The due date was May 29

May 29 – April 10 = 6 weeks

Corrected age: 1 year (52 weeks) – 6 weeks =  
46 weeks

Approximately 10 ½ months



# THE FIRST YEAR OF LIFE

Developmental Expectations

Developmental Milestones

There are several good sources that provide the developmental milestones through 5 years of age.

The CDC is a good source

The Website has a milestone tracker

There is also a printable milestone checklist

A good European source is HSE; a project sponsored by the Government of Ireland's Sláintecare Integration Fund



# THE FIRST YEAR OF LIFE

## Developmental Expectations

## Developmental Milestones

I will not test your attention span by going through each month's milestones for the first year of life.

Let's return to our 1-year-old infant who was born 6 weeks early. Corrected Age is 10 ½ months.

He currently:

Can walk holding on

Pokes at things

Understands "No"

Has a vocabulary of 2-3 words; includes mama, dada

Can bang 2 objects together



# THE FIRST YEAR OF LIFE

Developmental Expectations

Developmental Milestones

Expectations for a a 10-month-old are:

Can walk holding on

Pokes at things

Understands “No”

Has a vocabulary of 2-3 words; includes mama, dada

Can bang 2 objects together

These are things a 10-month-old is expected to be able to do



# THE FIRST YEAR OF LIFE

Developmental Expectations

Developmental Milestones

At 1 year he should be able to

Play pat-a-cake

Waves “bye-bye”

Puts an object in a container

Looks for a hidden object

Pulls to stand; walks holding on

Drinks from a cup (no lid) with assistance

Uses pincer function (thumb and 1<sup>st</sup> finger) to pick things up

.



# THE FIRST YEAR OF LIFE

Developmental Expectations

Developmental Milestones

While our 1-year-old can do some of these, he cannot perform all of them.

Without the Corrected Age, he would be considered developmentally delayed.

Using the Corrected Age establishes that he is developmentally appropriate, and intervention is not needed.



# THE FIRST YEAR OF LIFE

## Developmental Expectations

All of the resources for this section are in the references for this presentation.



# **Preterm Infants Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

**As I noted earlier, survival is best if they are not born prematurely**

Recommendations to Reduce Infant Mortality

Reduction of <39-week Gestation Deliveries

Regionalization of Neonatal Intensive Care Units in the State and Improved Maternal Transport Protocols



# **Preterm Infants Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives  
Texas Department of State Health Services

Reduction of <39-week Gestation Deliveries

Perinatal Periods of Risk



# **Preterm Infants**

## **Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives  
Texas Department of State Health Services

Perinatal Periods of Risk

Look at the root causes of infant mortality.

Look at causes rooted in the health of the mother



# Preterm Infants

## Prematurity and the First Year of Life

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

Perinatal Periods of Risk Include:

- Before conception
- During pregnancy
- The care available at the time of delivery
- The infant's health between one month and one year.

There are protocols for addressing each risk group



# **Preterm Infants Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives  
Texas Department of State Health Services

One of the areas of focus:

ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE

**A California Toolkit to Transform Maternity Care**

Available to all physicians



# Preterm Infants

## Prematurity and the First Year of Life

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE) DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE

- Early elective delivery without indications is
  - linked to neonatal morbidities
  - no benefit to the mother or infant.<sup>7</sup>
- The American Congress of Obstetricians and Gynecologists (ACOG) advise against non-indicated elective deliveries prior to 39 weeks gestation



# **Preterm Infants**

## **Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

**ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE**

Elective early labor inductions and cesarean sections  
are common and increasing in the United States

Educating healthcare providers about morbidities  
fosters evidence-based decision-making

Leads to improved practices that reduce harm.



# Preterm Infants

## Prematurity and the First Year of Life

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE

- This toolkit incorporates policies and tools used successfully at multiple hospitals in the United States.
- It outlines best practices
- Provides support materials and guidance
- How to implement a quality improvement program



# **Preterm Infants Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE

The Main Sections Are:

- Making the Case:
  - A comprehensive literature review
- Implementation:
  - A step-by-step guide to assist implementation
- Data Collection and Quality Improvement:
- A guide for measuring and tracking QI



# **Preterm Infants**

## **Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE

The Main Sections Are:

- Clinician and Patient Education:
  - Educational tools for clinicians and staff about consequences of early elective delivery
  - Educational tools for patients about last weeks of pregnancy.



# **Preterm Infants Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE

The Main Sections Are:

- Appendices and References:



# **Preterm Infants**

## **Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives

Texas Department of State Health Services

**ELIMINATION OF NON-MEDICALLY INDICATED (ELECTIVE)  
DELIVERIES BEFORE 39 WEEKS GESTATIONAL AGE**

The Goal:

To develop quality improvement programs to eliminate elective deliveries <39 weeks gestation that do not have a medical or obstetrical indication



# **Preterm Infants**

## **Prematurity and the First Year of Life**

Health Texas Babies Provider Initiatives  
Texas Department of State Health Services

There are also other programs and protocols for addressing mortality and morbidity in the Perinatal Periods of Risk



# Preterm Infants

## Prematurity and the First Year of Life

Why I chose this topic for presentation.

- One in ten infants born in the United States qualifies as a premature birth.
- Many grow up to lead normal lives like their full-term counterparts.
- Medical science has progressed and the care these high-risk infants receive has improved.
- The outcomes have improved.
- Our responsibility as a healthcare corporation is to facilitate the best outcomes possible.
- To do that we must be knowledgeable.



# Preterm Infants Prematurity and the First Year of Life

**QUESTIONS?**

