

Innovations in Maternal/Infant Health Care

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DISCLOSURE: Michael J. Barber is a vice president & stockholder of the General Electric Company

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Healthcare has reached a tipping point

- ✓ Healthcare industry in the U.S. has traditionally led innovation and exported globally
- ✓ Enormous pressure on the US to reduce costs – current model is unsustainable given “demographic” shifts
- ✓ Administrators looking to improve quality, lower cost, and reduce variation in care ...patients want quality and coverage
- ✓ New healthcare models emerging on a global basis

New solutions are required



Healthcare innovation will be transformed

Old way (sequential)

1st

Impact outcomes



2nd

Lower Cost + Increase access



Distribution

Luminary → mainstream
&
U.S. → world

New way

Prevent/treat disease
&
Cost + quality + access



Two way innovation (U.S. ↔ World)
&
Broad-based and Simultaneous

For customers: 100+ innovations

What it means

1. Target

technology for lower-cost outcomes

- + More products and price points
- + Localize ...global ↔ U.S.
- + Expand services beyond installed base

2. Make

health IT faster and more productive

- + Commercialize clinical decision support
- + Financing for IT
- + Automate productivity tools

3. Create

innovation for all

- + Reduce screening cost
- + Broaden rural distribution/financing
- + Health essentials

4. Facilitate

consumer-driven health & prevention

- + Build out partnerships with IT
- + Awareness and motivation
- + Platforms for prevention/detection

Assessment process



Cost savings

- 1) Greater efficiency
 - Asset optimization
 - Maximize throughput
 - Reduce diagnosis & treatment variance
- 2) Therapy decision-support
- 3) Managing chronic diseases

15% ↓



Access improvement

- 1) Maternal & infant care
- 2) Water & sanitation
- 3) Screening for life-threatening conditions
- 4) Technology to extend reach (remote access and portability)

15% ↑



Quality improvement

- 1) Reducing medical errors
- 2) Improving diagnostic capability
- 3) Remote medicine/monitoring
- 4) Early disease detection

15% ↑

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Constant flow of innovation

Better, more affordable health for more people

Innovation pipeline

- ✓ Targeted, simplified innovations to lower cost
- ✓ HCIT financing for rural doctors and hospitals
- ✓ Cost out for customers healthcare delivery redesign
- ✓ Content, rural water & power for health benefit
- ✓ Expand maternal infant care offerings
- ✓ Strengthening of rural health initiatives
- ✓ Hand held ultrasound for ubiquitous imaging
- ✓ Pandemic flu preparedness
- ✓ Patient compliance from media with key healthcare institutions
- ✓ Health Advisory Board

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- ✓ A new business strategy that reflects changing needs and emerging opportunities in healthcare
- ✓ A commitment to increase R&D investment in quality, access and cost and to bring the full focus of business on these issues
- ✓ A pledge to take on one of the world's toughest challenges and help people live healthier lives



Changing demographics

People of color ...

- Are ~50% of the U.S. population under the age of 30.
- Are >50% of the population in our 50 largest cities.
- Will reach 75% within the next ten years in our 25 largest cities
- By 2010, 1 out of 6 people will be Hispanic

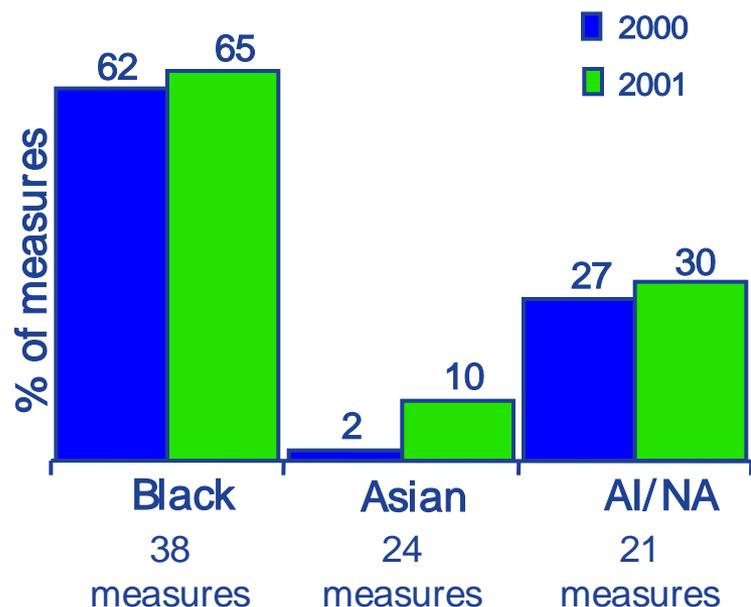


To meet U.S. healthcare needs,
we **MUST** address the disparity of healthcare

Access and quality of care... an issue in healthcare

Care disparity measures below Whites

Quality of care by ethnicity (US)



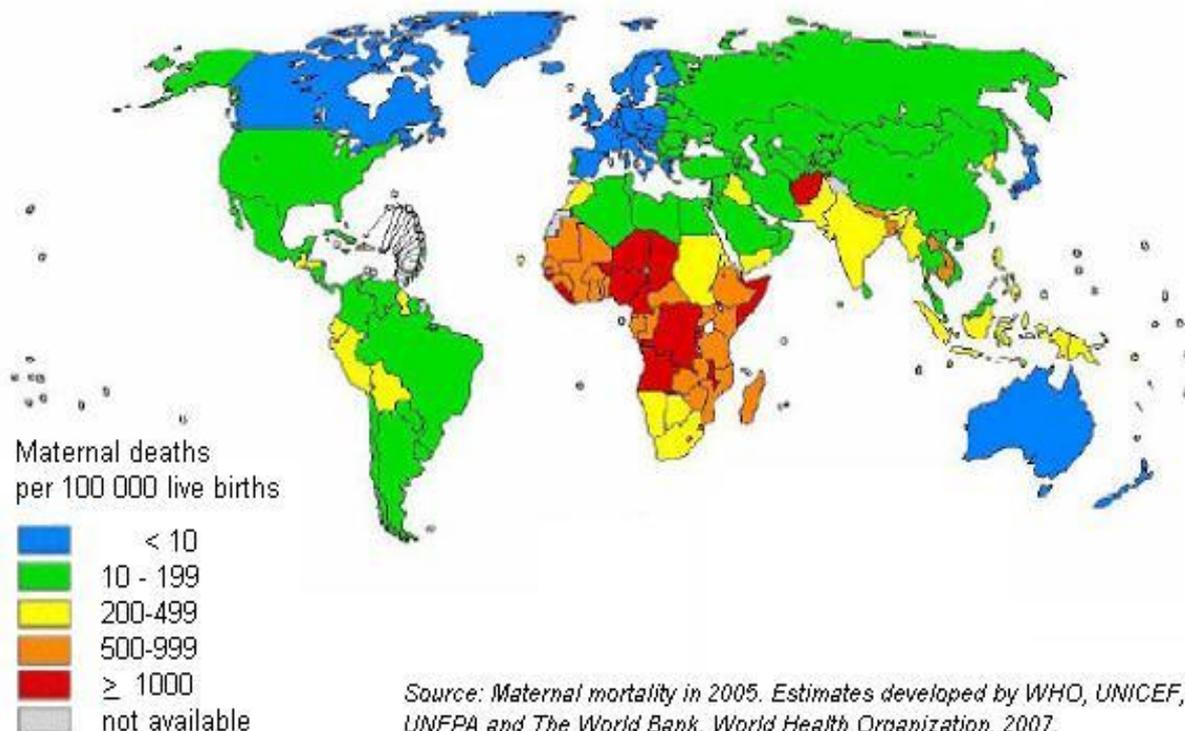
- Ethnic disparities also exist in countries with 'equalized' access
- India has 40M diabetics—projected to be nearly 300M by 2025...less than 30% will have access to care
- 1M U.S. minorities have died prematurely in the last 10 years

Source: National Healthcare Disparities Report
SEER, USRDS, MEPS, CDC AIDS Surveillance System, NVSS-N, NIS- NHIS- NHDS

Maternal/Infant Care

- High risk pregnancies are on the rise
- More than 500,000 mothers die of complications in delivery
- The premature birth rate is increasing ...1 out of every 9 babies
- A premature baby, could be smaller than 400 grams, while full term babies are about 3-4kg

Maternal mortality ratio, by country, 2005



Please see Page 2 for Disclosure and Disclaimer



Clinical Drivers – Global View

U.S. Vital Statistics

- Birth rate rose 2% from 2002 to 2003
- Birth rates rose for women aged:
 - 30-34 ↑ 4%; 35-39 ↑ 6%; 40-44 ↑ 5%
- Birth rates by cesarean delivery rose by 6% to represent 27.6% of all births
- Preterm birth rate @ 12.3% v goal of 7.6% ('10)
- LBW birth rate @ 7.9% v goal of 5% ('10)

Global Developed Markets

- Growing focus on fetal and neonatal brain
- Ongoing cost of neonatal morbidity is a growing concern

Reduce Morbidity

Emerging Markets



- Goals for Maternal-Infant Health
- Not progressing as planned



World Health Organization

World Health Report – 2005: Focus on Mother & Child Health

- Half million maternal deaths per year
- 4 million infants die per year during the neonatal period (first 4 weeks of life)
- 37% of neonatal deaths attributed to **birth asphyxia** and **pre-term births**

Reduce Mortality

Opportunities in ultrasound diagnostics

**The public
health
consensus**

Comprehensive obstetric care has 4 pillars: family planning, prenatal screening, skilled birth attendance, & timely access to EmOC¹

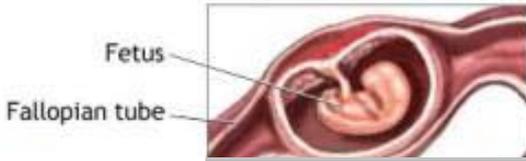
¹ **Emergency Obstetric Care** includes injectibles administration, skilled delivery, C-sections, & blood transfusion.

**Unique
ultrasound
opportunity**

Identifying the 15% of pregnancies² that have OB complications requires full screening coverage. Reaching rural mothers will demand innovation

² **Maine, D. Safe Motherhood Programs: Options and Issues.** Columbia University, Center for Population and Family Health, New York, 1991

Capabilities of Ultrasound

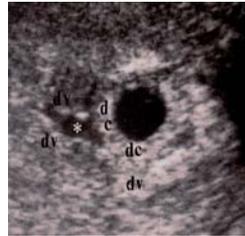


Ectopic Pregnancy

Fetus develops outside the uterus.

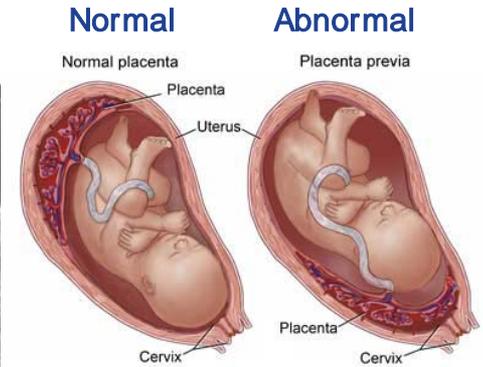
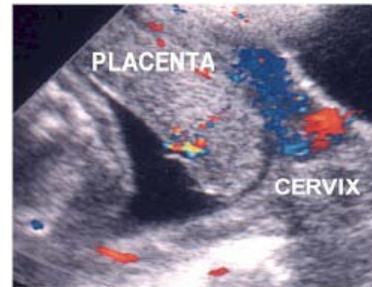
Pregnancy Dating

Accurate determination of menstrual age thru gestational sac.



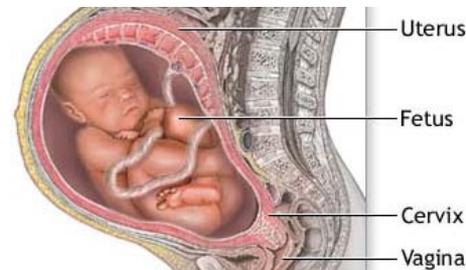
Placenta Previa

Placental misplacement potentially causes fetal growth restriction, congenital deformities, & post partum hemorrhage.



Multiple Gestation

Twins present risk during delivery (including higher likelihood of ectopic).

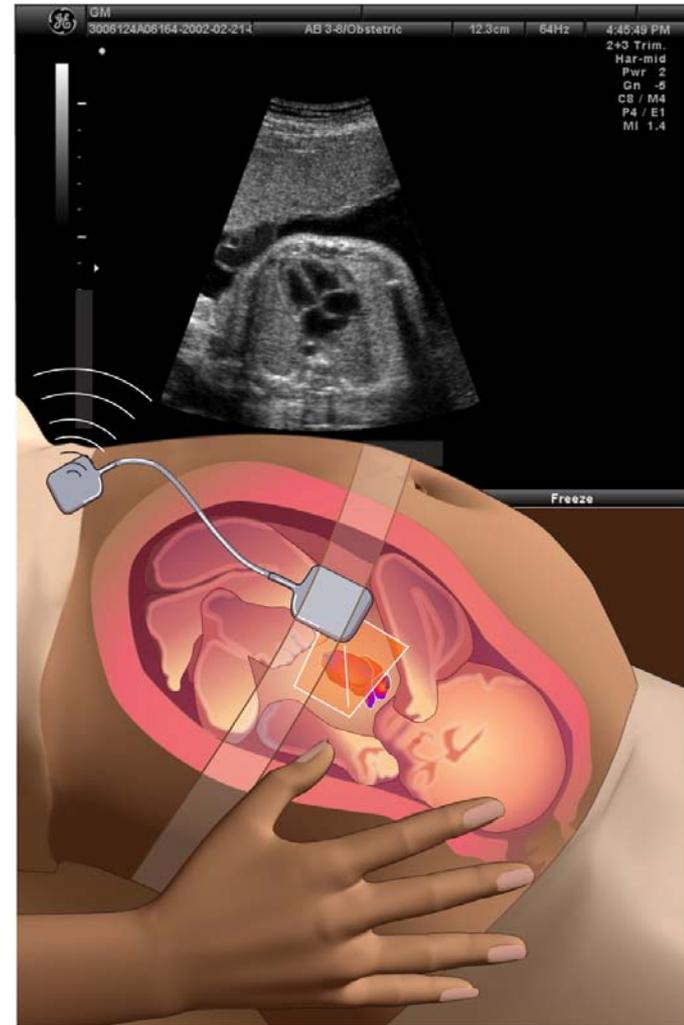


Breech

3-5% chance of single baby deliveries. Without manual repositioning, C-section may be needed.

Maternal/Fetal monitoring concept

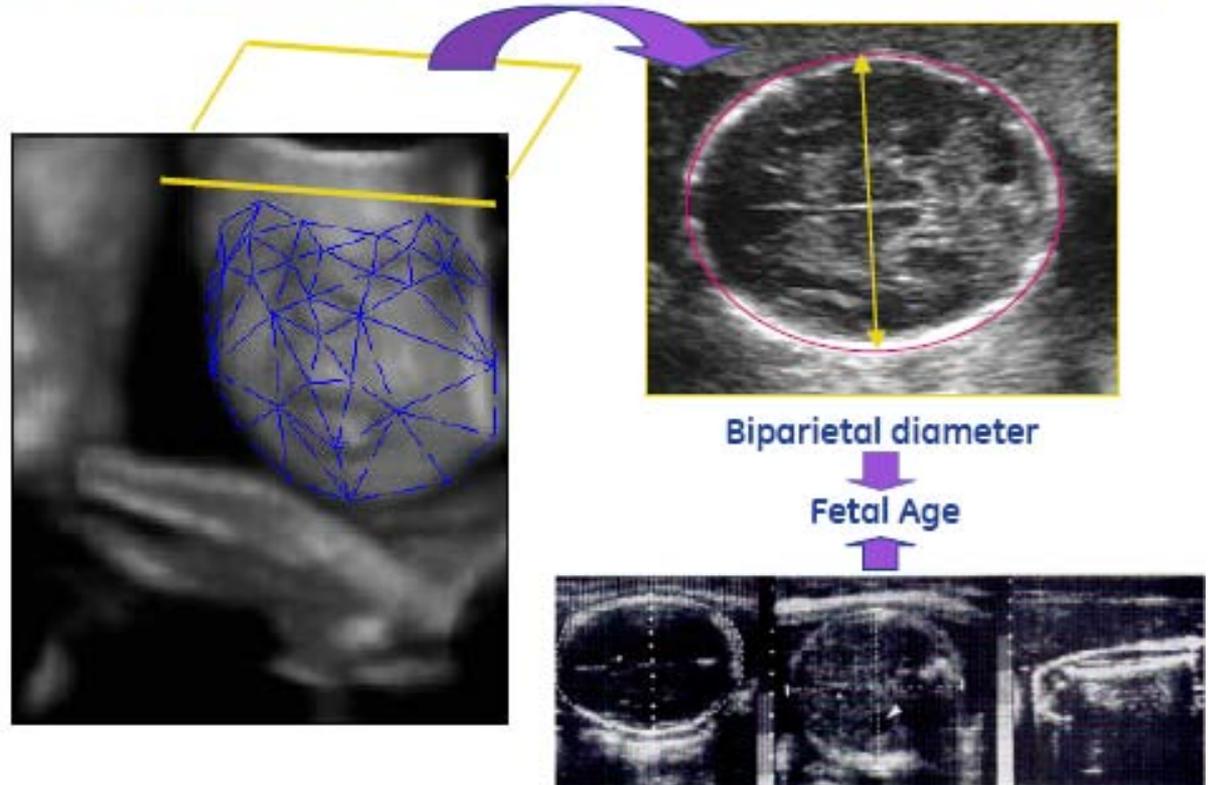
- Fetal Heart Rate Monitoring
 - Automatically locate fetal heart
 - Monitor heart rate changes
 - Track heart with maternal & fetal motion.
- Uterine Activity Monitoring
 - Locate uterine lining
 - Identify contractions
 - Compare w/ fetal heart rate changes



Automated obstetrical measurement concept: Working with 3D data sets



Auto facial
Recognition



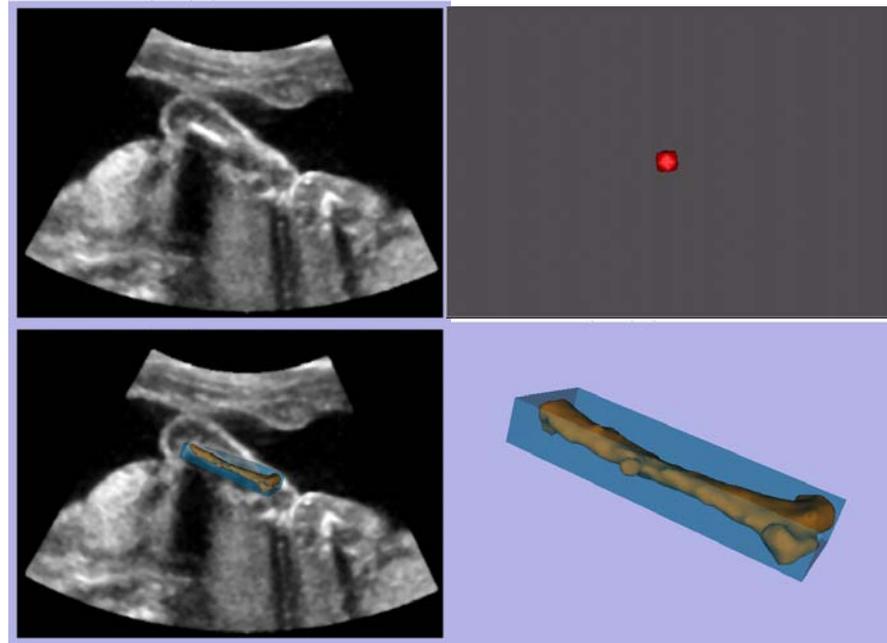
Potential for estimation of fetal age

Concept for automated measurements

Automated searches for multiple gestation, breech, placenta

- Match 3D data to fetal template
- Locate placenta, birth canal, fetal head
- Identify risks to the birthing process

Automate femur length measurement.



FL-GA Table from Hadlock, F.P. et al, Radiology, 1984

The premature patient



Helping the tiniest patients survive

Clinical Condition

- 130MM births annually, 8% are born premature
- Require continuous thermal & respiratory support
- Immature digestive track often necessitates IV feeding

Questions to Ask About Touch...

Does physiological stability differ as a function of the type of microenvironment during procedural touch?

Physiological Responses to Touch

Variable	Pre-Procedure Touch	Intra-Procedure Touch	Post Procedure Touch
Mean Heart rate	138	161	140
Mean Respiratory rate	44	51	46
Mean SpO2	98	91	96
Mean Blood Pressure	38	44	39

Average duration of microenvironment canopy openings:

- Hospital A: 14 minutes
- Hospital B: 10 minutes
- T-value = 4.34, p = .05

Decreasing touch in the NICU

Variable	Traditional RW	Traditional Inc	Advanced RW	Advanced Inc
# of Touches (hourly)	6.9	4.4	3.1	1.6
Duration of Touches (min)	1.5	2.8	1.6	2.9
Total Touch Time (min/hr)	10.4	12.3	5.0	4.6

Average number of microenvironment canopy openings per day

- Hospital A: 3.6 times/24 hours
- Hospital B: 2.1 times/24 hours
- T-value = 2.54, p = .01

Microenvironment concepts...



Bed..from warmer to incubator & back:

- Open bed facilitates procedures but exposes baby to nuisance touch, light, and sound which impacts baby's brain development
- Closed bed facilitates protection from light, sound, touch but makes life-saving procedures more difficult
- Closed bed can be a barrier to parent(s)

Vascular Access

- Used for nutrition, hydration, drugs, blood gas and pressure
- Types: Peripheral IV, Umbilical arterial & venous, Mid-line Catheter, PICC



Vascular Access

Verify tip location with X-ray

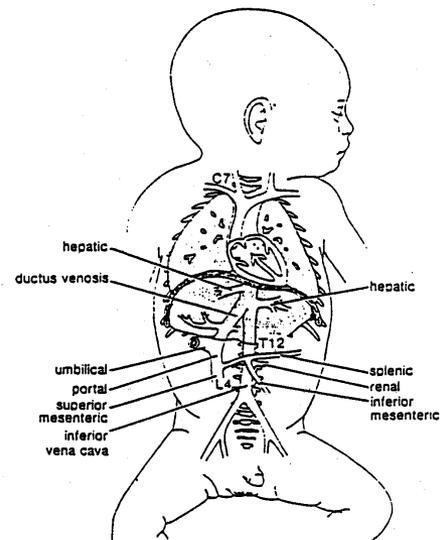
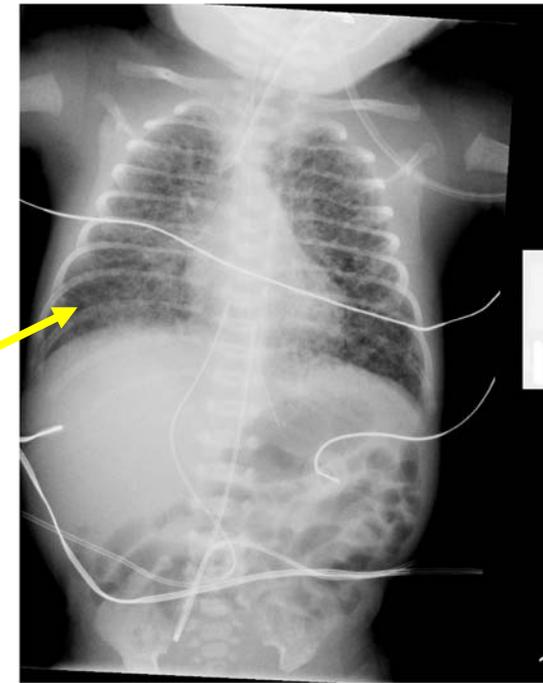
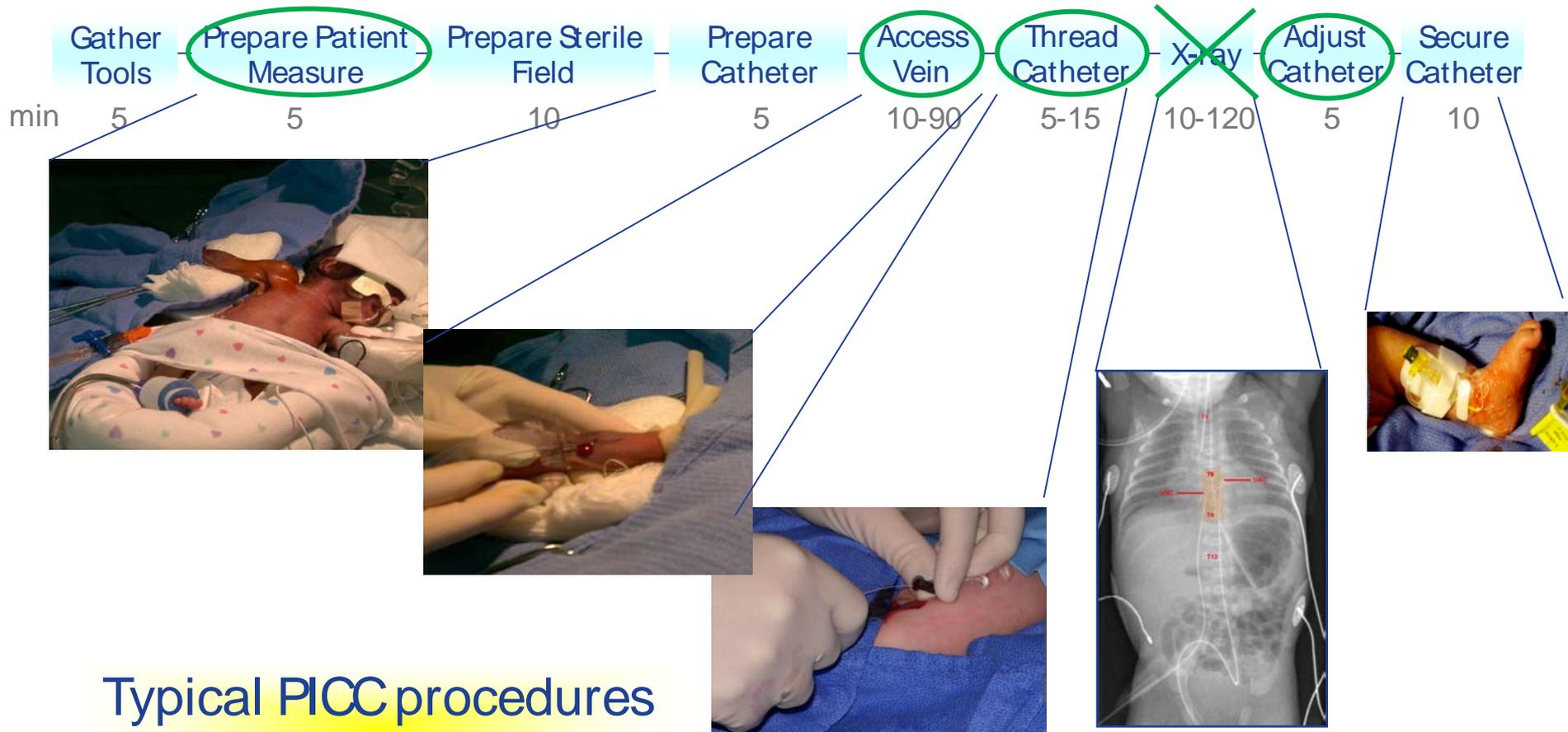


FIG. 26-1
Anatomy of the umbilical and associated veins, with reference to external landmarks.



Vascular Access Workflow: PICC

Typical PICC Workflow

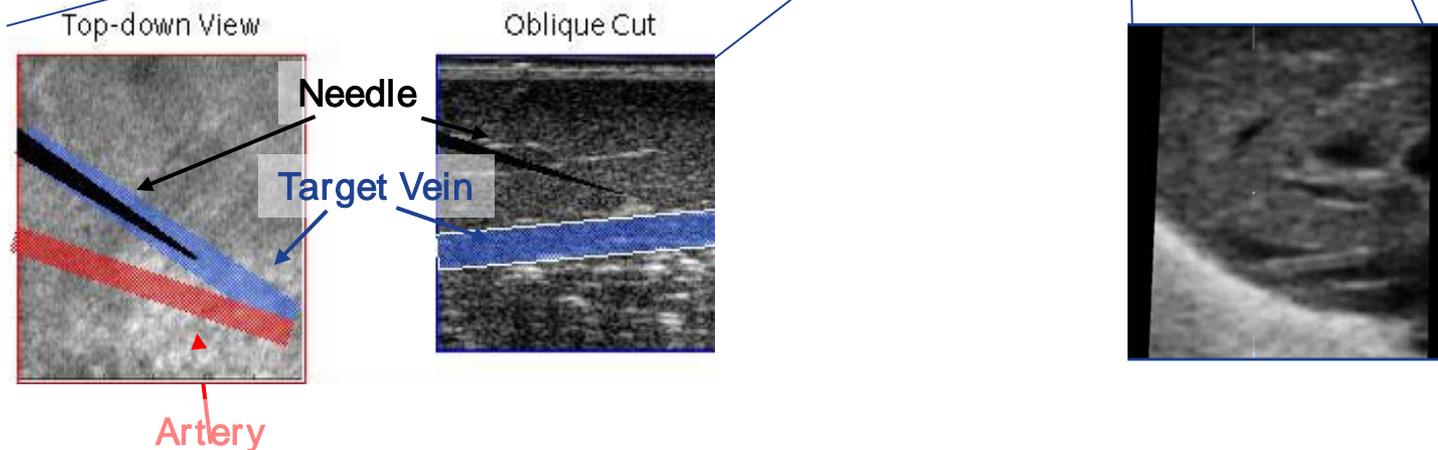


Typical PICC procedures last between 1-4 hours

Possible ultrasound workflow: PICC

Potential PICC Workflow

	Gather Tools	Prepare Patient Measure	Prepare Sterile Field	Prepare Catheter	Access Vein	Thread Catheter	Adjust Catheter	Secure Catheter
min	5	5	10	5	10-45	5-15	5	10



Potential Ultrasound based procedure could save up to 2 hours and eliminate the need to x-ray the babies!

Ecomagination ...for a better planet

+

healthyagination ...for a healthier population

=

a **better** world ...for generations to come

