Risk Management: Hypertension In Pregnancy

LYN HALEY, CLINICAL DIRECTOR
MIST TECHNOLOGIES

Can We Guide You to Do An Effective

HYPERTENSION INTERVENTION?

Two Innovative Physicians

This treatment protocol was developed documented and published by Dr. Thomas Easterling , University of Washington, from 1989-1991. His work has continued and his results are consistent with ours.

Dr. David Chaffin implemented Dr. Easterling's protocol in a clinical setting using a different hemodynamic measurement technology beginning in 2005. His results in nearly 900 births are documented here.

Early Intervention in pregnancies in women at risk of complications involving hypertension, guided by regularly gathered data works. It just simply works!

MIST Technologies

Created software (Obstetrical Hemodynamic Monitoring Software or OHMS) to enable any clinician to apply the data-driven protocol to determine which women with risk factors require surveillance and treatment, to determine which drugs constitute the appropriate treatment, to adjust dosages as required, and to monitor the effectiveness of the treatment protocol on their patients. MIST packages together their OHMS software installed on a portable computer with off the shelf FDA approved Impedance Cardiography equipment to create a turn-key clinical package that is easy to use and makes the testing process affordable. And we teach you how to use the system and provide support after the sale.

Status Quo

Standard of Care

- Waiting until blood pressure gets out of hand (>140/90) or a significant complication ensues and then prescribing medication that might work while treating symptoms
- Who is effected
  - 8%-15% of All Pregnancies

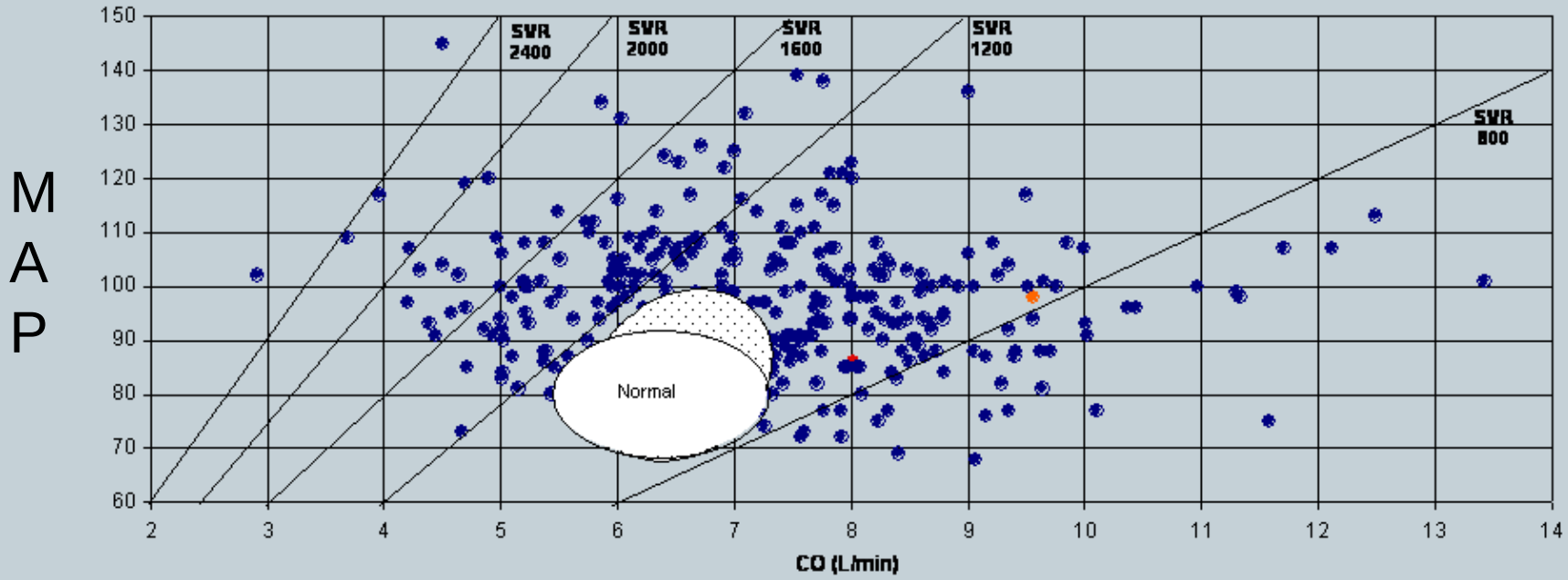
Current Outcomes

- Average Gestation 33+ Weeks (1/3 of Premature Births)
- Notable for ineffective techniques and drugs (Bed Rest, methyldopa)
- Average $50,000 first year care cost for premature babies
- 5% Infant mortality

Can the Status Quo be Changed through Effective Intervention

- Can we select patients
- In selected patients does our intervention protocol help?
  - Improved Outcomes
  - Healthy Mothers, Healthy Babies, Cost Effective
- Is our intervention clinically applicable?
  - Can it be effectively and efficiently employed anywhere
  - Does it make Measurable and data driven care routine
  - Testing may be done by minimally skilled staff

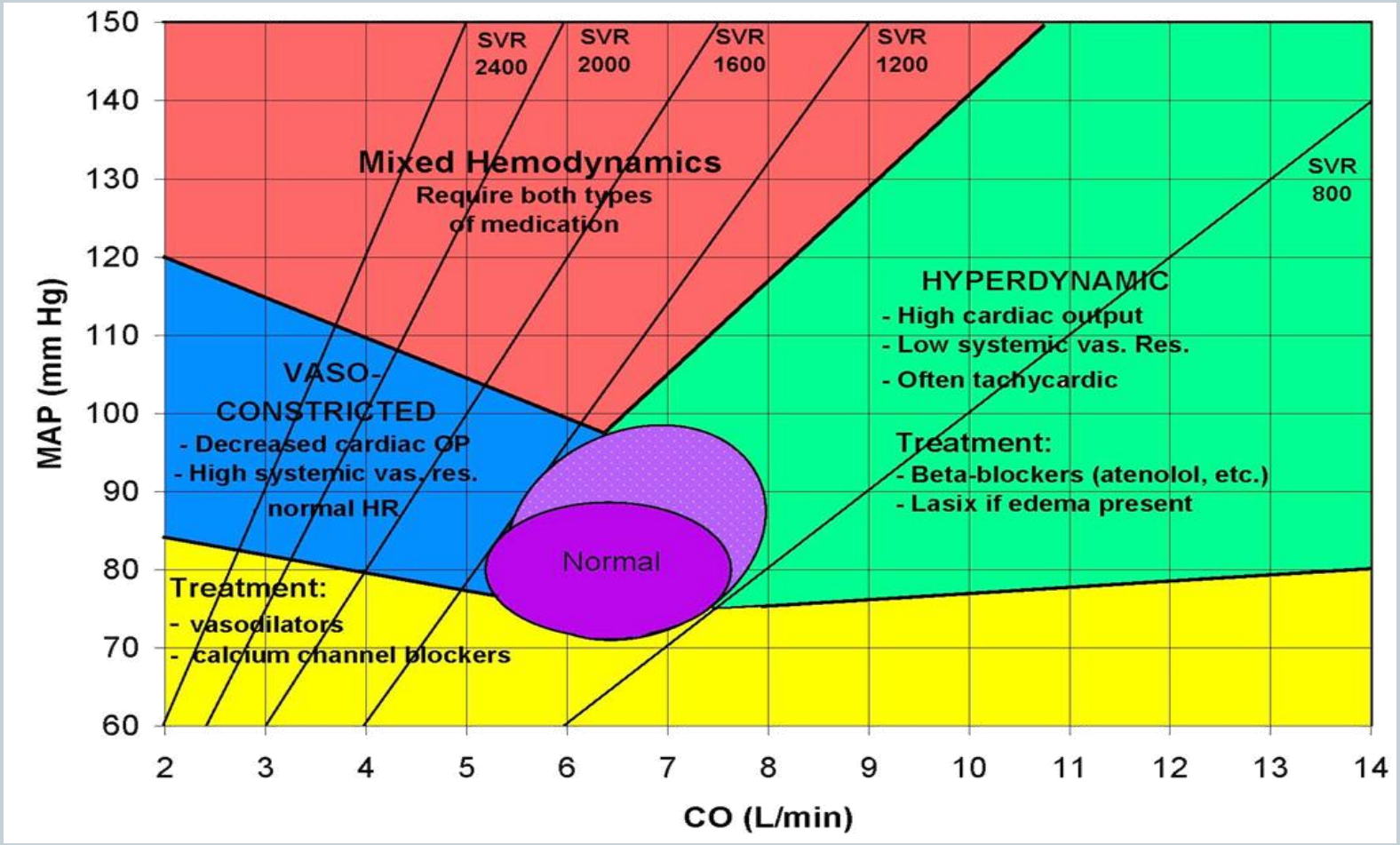
The same Blood Pressure Can be Produced by Very Different Hemodynamics



Can We Select Patients? If So, How?

- Data from Perinatal Center / Maternal Hypertension Center at Cabell Huntington Hospital - Department of Obstetrics – Joan C. Edwards School of Medicine at Marshall University
- 892 Referred Patients (From 40 physicians in 15 practices) go through at least two selection processes
  - First
    - Intake using standard ACOG form
    - One or more risk factors identified and patient referred
  - Second Selection Process
    - All are given one or two tests for screening purposes
    - 23.5 % are dismissed and returned to referring physician Average gestation for these women – 38+ weeks
    - Balance (76.5%) enter intervention program as:
      - Hyperdynamic
      - Mixed Hemodynamics
      - Vaso-constricted (Rarely)

Who to Treat and How to Treat Them



Women with normal hemo-dynamics are dismissed from the center. Average and mean gestation for these women is 38+ weeks

Modified from Easterling, 2001

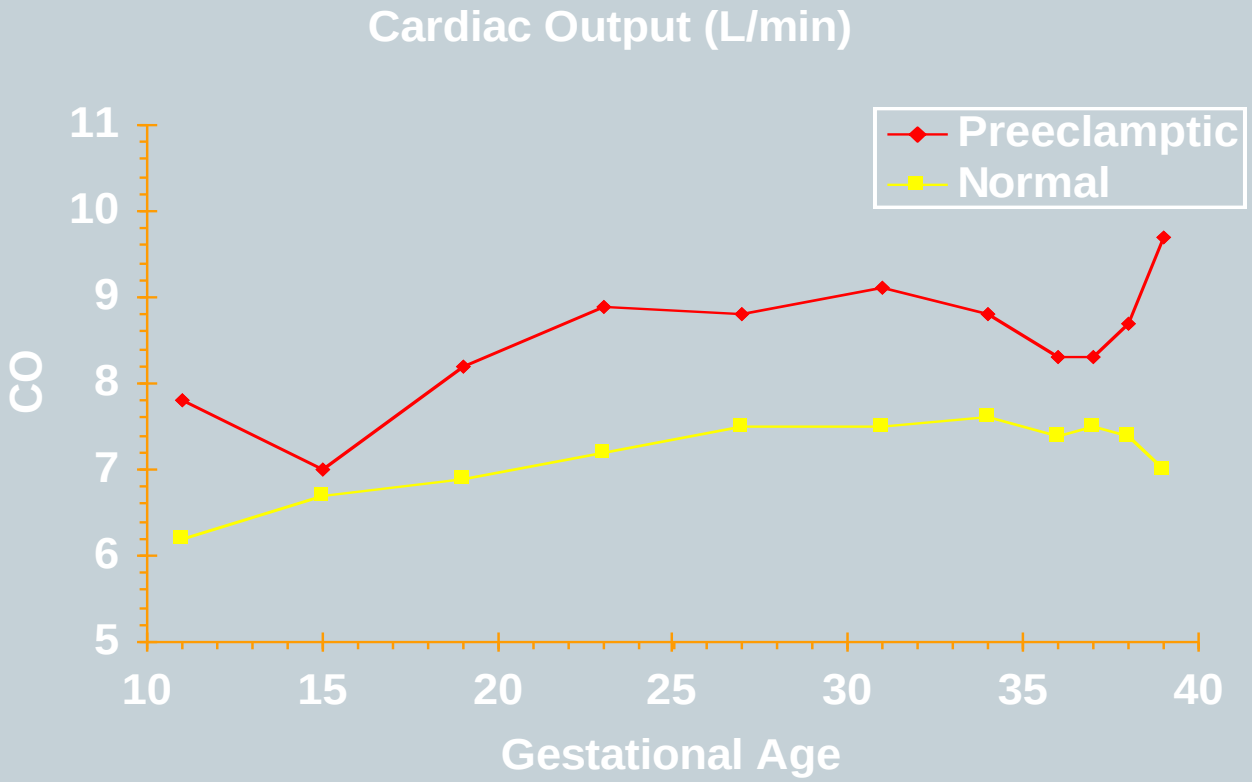
Profile of Referred Patients With Abnormal Hemodynamics

Risk Factor	Number/ Percent	Average Age	Average BMI	MAP	SVR
Chronic Hypertension	550/58.4%	29.1	36.8	99.2	1108
Previous Preeclampsia	41/4.4%	28.5	36	96.5	1029
Diabetes (Type I or II)	98/10.4%	30	36.2	94.8	1083
Renal Disease	14/1.5%	27.4	34.9	99.1	1283.2
Obesity*	673/62.6%	28.7	39.3	98.1	1057.2

Does your high risk patient base correspond to this picture?

* Obesity is not considered a “classic” risk factor, but emerging research suggests its importance. BMI over 30 constitutes obesity.

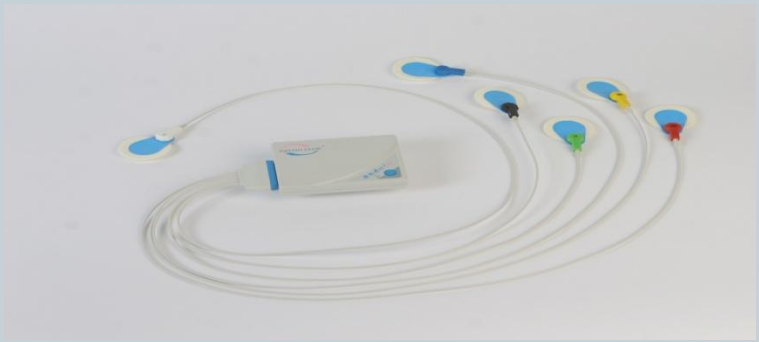
Consider Cardiac Output as a Risk Factor or Predictor of PE



Easterling, et al. Ob Gyn 76:1061, 1990

Noninvasive Hemodynamic Impedance Cardiography (ICG)

- 2 Standard EKG sensors with 6 lead wires placed on neck and chest
- Current transmitted by outer electrodes and seeks path of least resistance: blood filled aorta
- Baseline impedance (resistance) is measured using inner electrodes
- With each heartbeat, blood volume and velocity in the aorta change
- Corresponding change in impedance is measured



Treatment Protocol

- Hyperdynamic
  - Cardiac output > 7.4 lpm
  - Atenolol 25 - 200mg/day
- Vasoconstricted
  - Cardiac Output < 5.0
  - Calcium Channel Blocker
- Mixed hemodynamics
  - MAP > 100 mmg and SVR > 1100 dyne*sec*cm^{-5}
  - Atenolol 25 - 200mg/day
  - Added nifedipine XL 30-120mg/day
- All tests and actions are documented and stored in our proprietary database (OHMS) for outcomes verification and patient comparison and the efficacy of the medications and dosages are reflected in the progress toward normal

Treatment Protocol

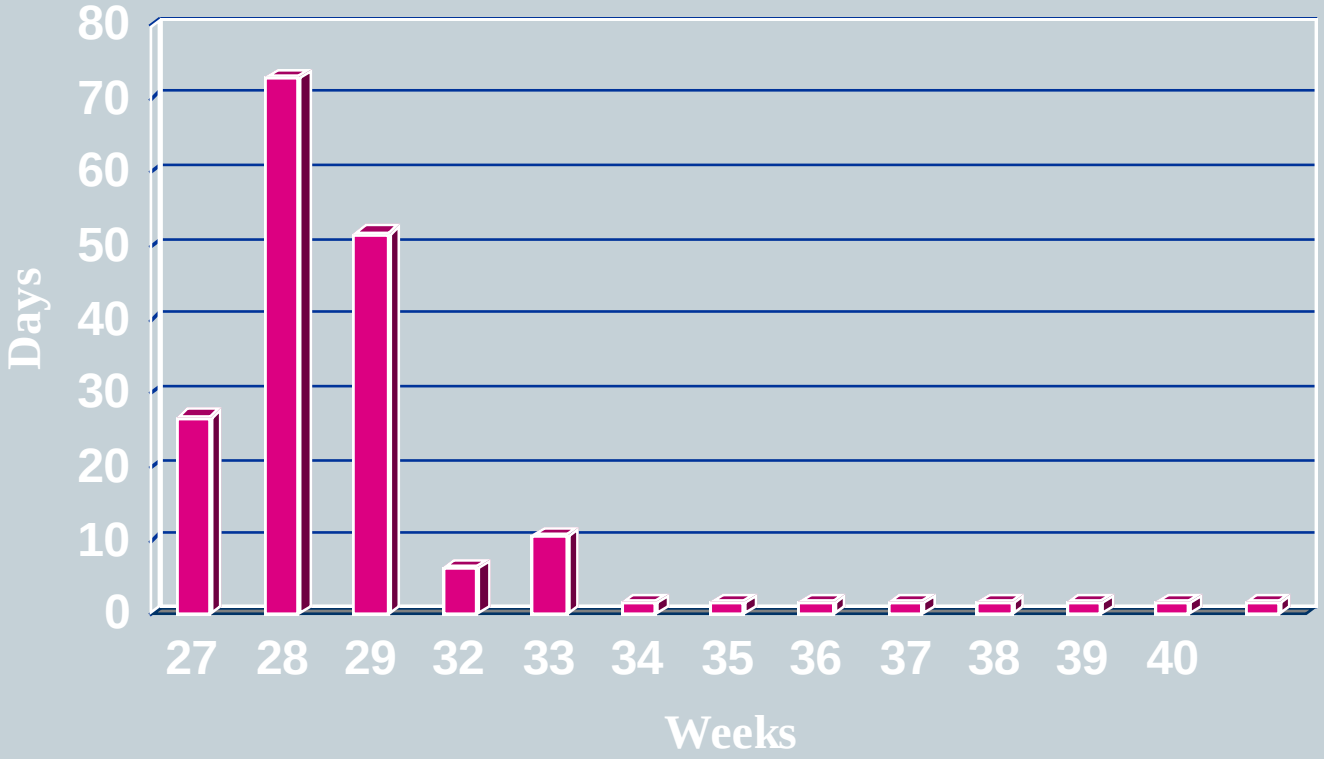
- All patients placed in protocol receive
  - Monthly hemodynamic surveillance beginning at 16-24 weeks until 36 weeks
  - Monthly sonographic fetal weight estimation
  - Bi-weekly surveillance of fetal well being beginning at 32 weeks
  - Delivery after 36 weeks at discretion of referring physicians
  - None of the women have been placed on bed rest to date

Did Our Intervention Improve Outcomes?

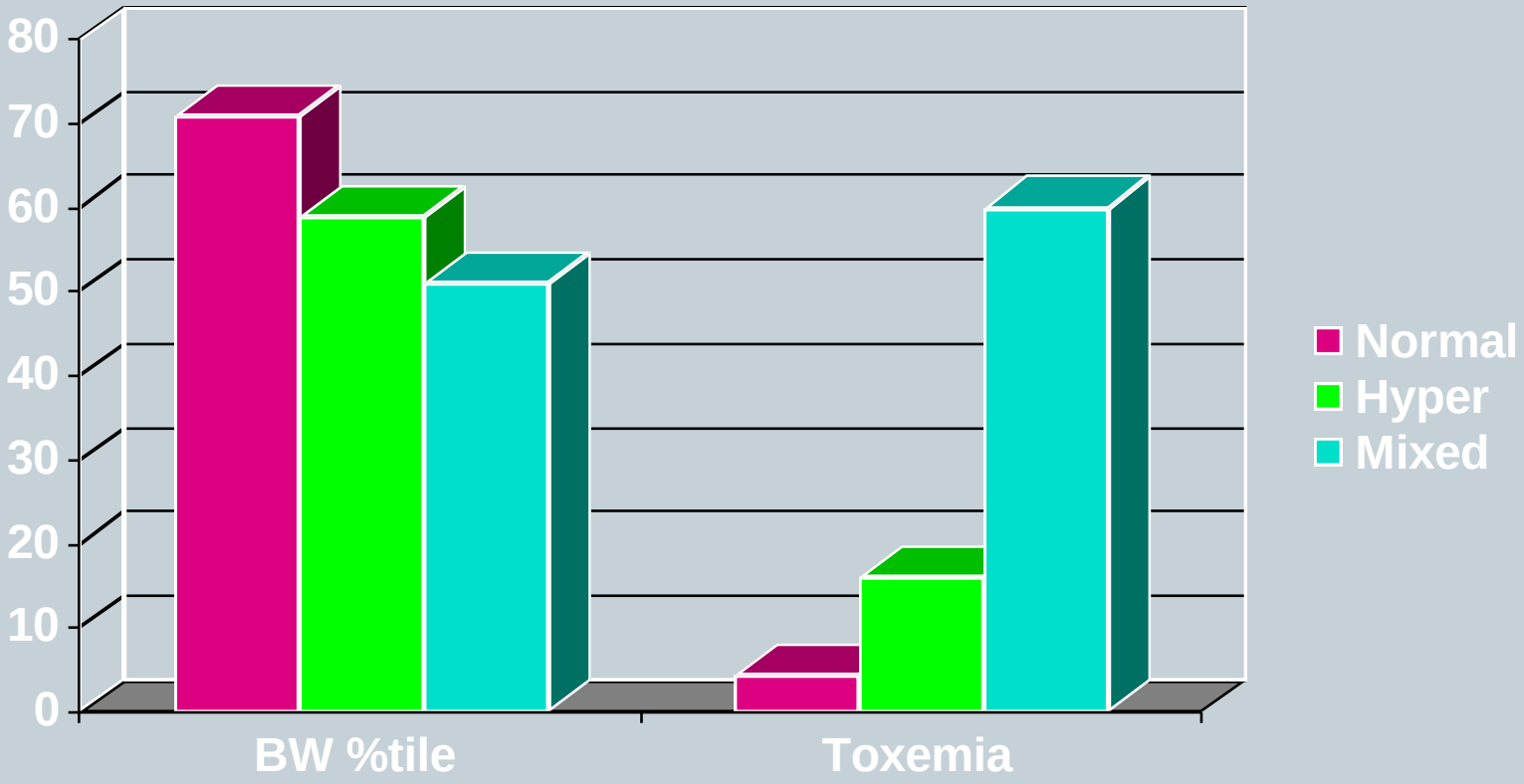
	Gestational Age At Delivery	Hospital Days	Mother's Weight	Birthweight and %
Standard of Care	33+ Weeks	7-10		
Intervention Protocol				
Hyperdynamic	38+ Weeks	2-3	109 kg	2.9 kg - 52%
Mixed Hemodynamics	37 + Weeks	2-3	83 kg	2.8 kg - 53%

In a group of 892 at Risk and mostly (62.6%) obese women, through careful screening (ACOG Form and MIST Test for hemodynamic profile), babies of average weight were delivered at an average and mean gestational age of over 38 weeks, required no NICU care, and went home with their mothers.

NICU Admissions - Median Length of Hospital Stay



Intervention and Diabetes



The MOST Significant Improved Outcome

- 0/892 Hypertension Related Perinatal Mortality

Want to Talk Further about Hypertension Intervention?

CONTACT

LYN HALEY, CLINICAL DIRECTOR

MIST TECHNOLOGIES

848 4TH AVENUE, SUITE 200

HUNTINGTON, WV 25701

(304) 781-6318

INFO@MISTTECHNOLOGIES.COM